

THE A·B·C· OF MODERN QUALITY

SPECIAL
XMAS
ISSUE

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Wireless Magazine

THE BEST

SHILLINGSWORTH IN RADIO

DECEMBER 1931

STARTING RADIO

for £5

FULL
DETAILS
IN
SPECIAL
16-PAGE
SUPPLEMENT

HOW TO
MAKE THE
"NEW
ECONOMY
THREE"
FOR
£5 COMPLETE

HOW TO MAKE
A THREE-VALVE
SCREEN-GRID SET
COMPLETE WITH
DUAL-RANGE COILS,
VALVES,
LOUD-SPEAKER
& BATTERIES



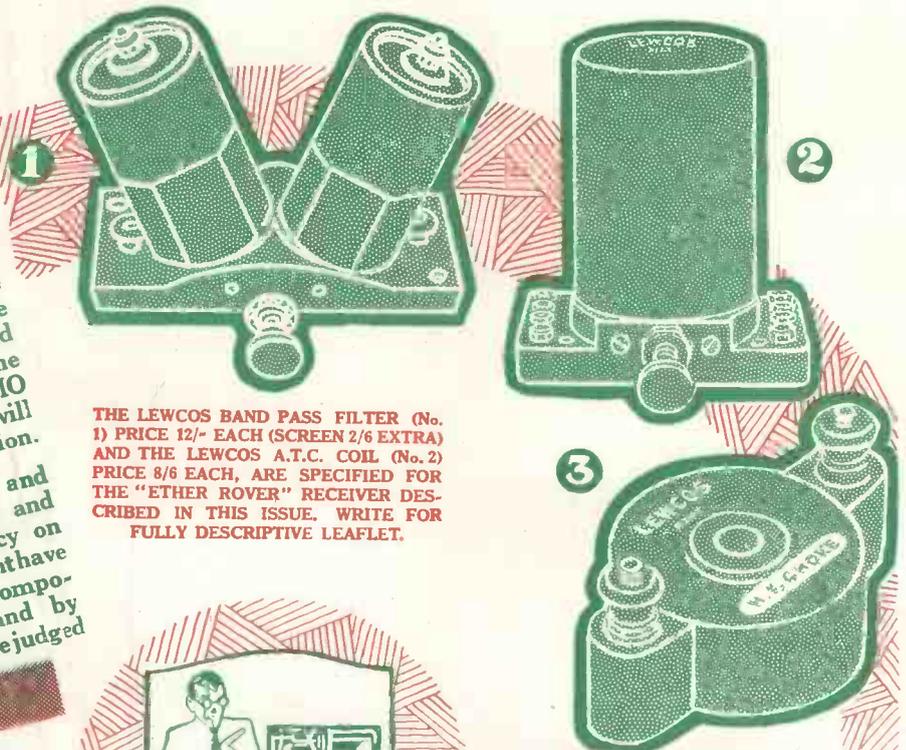


There goes another wise man!!

At this season of the year a man's thoughts naturally turn to the choice of Xmas Gifts for family and friends and to putting everything ship-shape for the great feast.

Wisely he does not forget that old tried friend of the family—the radio receiver—which must be rejuvenated to give the best fare of song and music—and wisely he chooses LEWCOS RADIO PRODUCTS which will ensure super reception.

Perfect symmetry and elegance of design and maximum efficiency on every technical point have made LEWCOS components the standard by which all others are judged



THE LEWCOS BAND PASS FILTER (No. 1) PRICE 12/- EACH (SCREEN 2/6 EXTRA) AND THE LEWCOS A.T.C. COIL (No. 2) PRICE 8/6 EACH, ARE SPECIFIED FOR THE "ETHER ROVER" RECEIVER DESCRIBED IN THIS ISSUE. WRITE FOR FULLY DESCRIPTIVE LEAFLET.

THE NEW LEWCOS H.F. CHOKE, TYPE M.C., PRICE 2/6, IS SPECIFIED FOR THE "ECONOMY THREE" RECEIVER DESCRIBED IN THIS ISSUE. WRITE FOR FULLY DESCRIPTIVE LEAFLET

WRITE FOR SIX RECOMMENDED CIRCUITS INCORPORATING LEWCOS COMPONENTS. REFERENCE R.74.



LEWCOS RADIO PRODUCTS FOR BETTER RECEPTION

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED, CHURCH ROAD, LEYTON, LONDON, E.16

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Wireless Magazine

The Best Shillingworth in Radio

Vol. XIV :: DECEMBER, 1931 :: No. 83

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THE EDITOR'S CHAT

THE new reader, as also the reader economically minded, will turn straightaway to our special supplement where we give him full details of how to start radio for an inclusive sum of £5, which sum covers the components for the New Economy Three, a three-valve screen-grid set complete with dual-range coils, valves, loud-speaker, and batteries.

SPECIAL CHRISTMAS NUMBER

This is a special Christmas issue, as you will have already observed, and one of our Christmas features is a number of hints for the Christmas set buyer, reminding him of the chief points to be borne in mind and generally helping him in his choice.

We review in this issue some popular manufactured sets and speak of the results we have obtained with them. Our own home-constructor sets, apart from the New Economy Three, already mentioned, include: The Ether Rover, a band-pass screen-grid four offered as a sequel to the Ether Marshal, which was a most successful three-valver; in this new four-valver we are using the very latest components available: The Quality Amplifier, a four-valver in three stages, taking its high-tension from D.C. mains and designed especially for use with a moving-coil loud-speaker and available for use as a record reproducer.

REYNER'S BAND-PASS SET

J. H. Reyner, our Technical Editor, has a further word in this issue on his Double Band-pass Three.

Morton Barr contributes, at our request, an article on the work of Thomas Alva Edison, a man who made as great a mark as almost any man known to modern history. It was the "Edison effect"—the effect observed in an early incandescent

lamp—that was the real starting point of the thermionic valve developed a generation later.

In this Christmas issue are many items in lighter vein. J. Godchaux Abrahams interviews Leonard Henry; Whitaker-Wilson gives his views (you cannot stop him) on what is wrong with the Vaudevilles, and then works off a little more gas in "The Leaky Grid."

THE FEATHERWEIGHTING SYSTEM

By the way, Capt. Barnett's "featherweighting" system for pick-ups has aroused much controversy. In particular, the Gramophone Company has challenged it on various grounds and we publish this month a special article (by H. E. Gauss) presenting the company's point of view. I understand from Capt. Barnett that he will reply in a later issue.

I am introducing to our readers this month a writer new to "Wireless Magazine," but by no means new to radio journalism. P. K. Turner is a radio writer and editor of many years' standing, who has had the great advantage of a lengthy devotion to commercial research work.

I am very glad indeed to welcome him to our pages this month, and to announce that further articles from his pen will follow shortly. His opening article, "Modern Standards of Quality," might well be entitled "The A.B.C. of Modern Quality," and as such it is referred to in the top line of our front cover.

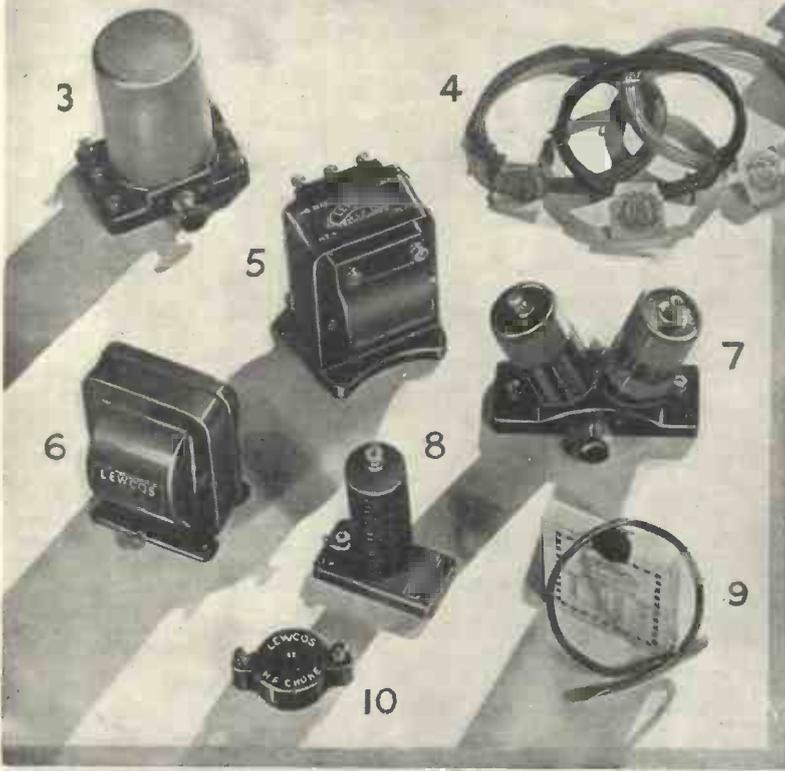
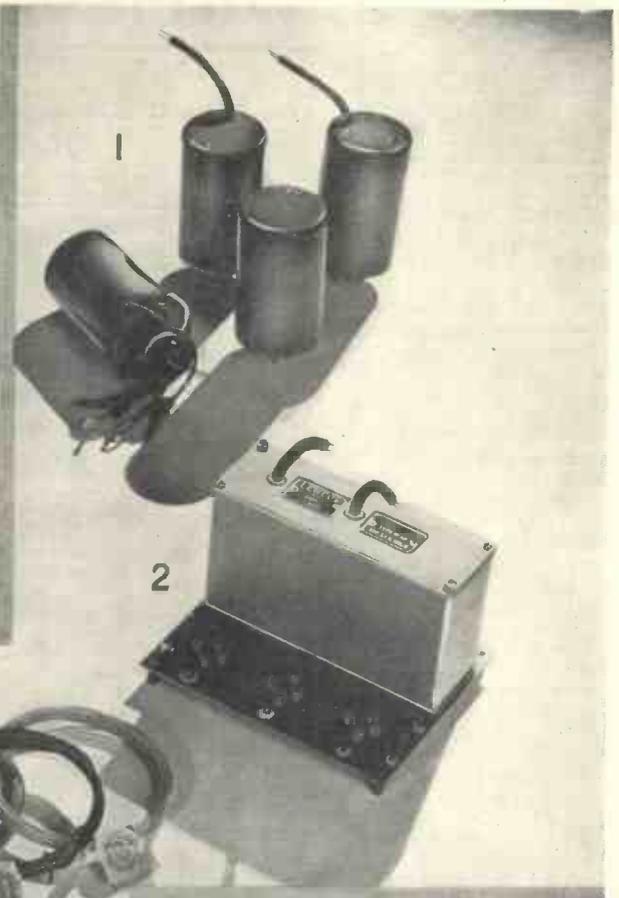
SEARCHING FOR QUALITY

Mr. Turner has spent years in searching for that elusive thing "quality"—a really critical quality that would satisfy the most exacting musician—and in the articles which he is now writing for "Wireless Magazine" he will do his best to place his extremely valuable experience at the service of our readers.

B. E. J.

THE ABC OF MODERN QUALITY—See Page 574

GIVE YOUR RECEIVER A PRESENT TOO—



GIVE IT LEWCOS COMPONENTS and get better reception!!

The Lewcos Products illustrated
above are:

1. The Super-Het Coil Kit No. 1
2. The Intermediate Frequency Unit
3. The A. T. G. Unit
4. Glazite Coloured Connecting Wire
5. The L.F. Transformer (Ref. L.F.T. 5)
6. The L.F. Choke
7. The Band Pass Filter
8. The Super H.F. Choke
9. Spaghetti Resistances
10. The New H.F. Choke (Type M.C.)

WRITE FOR SIX RECOMMENDED
CIRCUITS INCORPORATING
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LEWCOS RADIO PRODUCTS FOR BETTER RECEPTION

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**"MINIVO"
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Suitable for 1, 2 and 3-valve sets. H.T. only.
H.T. OUTPUT—120 Volts at 20 Milliamperes.

- 1 Tapping 50/90 Volts
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Housed in attractive metal box with coloured jacks. Size, 9in. by 5in. by 3½in. Fits any portable set. Price £3 3s.

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Suitable for multiple valve sets, employing Super Power or Pentode valves.
Combined H.T. and L.T. Trickle Charger
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Trickle charger for 2, 4 and 6-volt accumulators at 5 amps.

Coloured jacks and ample control knob. Size, 10in. by 5in. by 3½in. Price £5 5s.

**ANY MODEL DELIVERED FOR
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Suitable for Multiple valve sets.
Combined H.T. and L.T. (Raw A.C.) for Indirectly Heated Valves.

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- 1 Variable tapping .. 0/100 Volts
- 1 Tapping 50/90 ..
- 1 Tapping 150 ..

L.T. OUTPUT—4 Volts, 4 Amps. (Raw A.C.) for indirectly heated valves.

Housed in attractive metal box with coloured jacks and ample control knob. Size, 10in. by 5in. by 3½in. Easily fitted into transportable sets. Price £5 5s.

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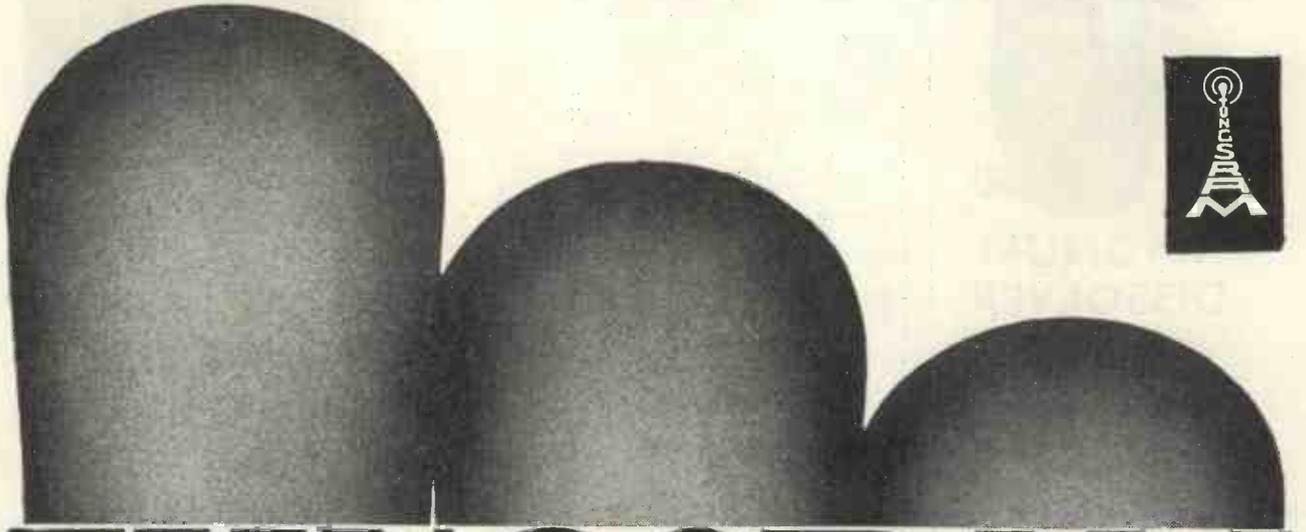
Speedy replies result from mentioning "Wireless Magazine"

VALVES TO USE IN YOUR SET

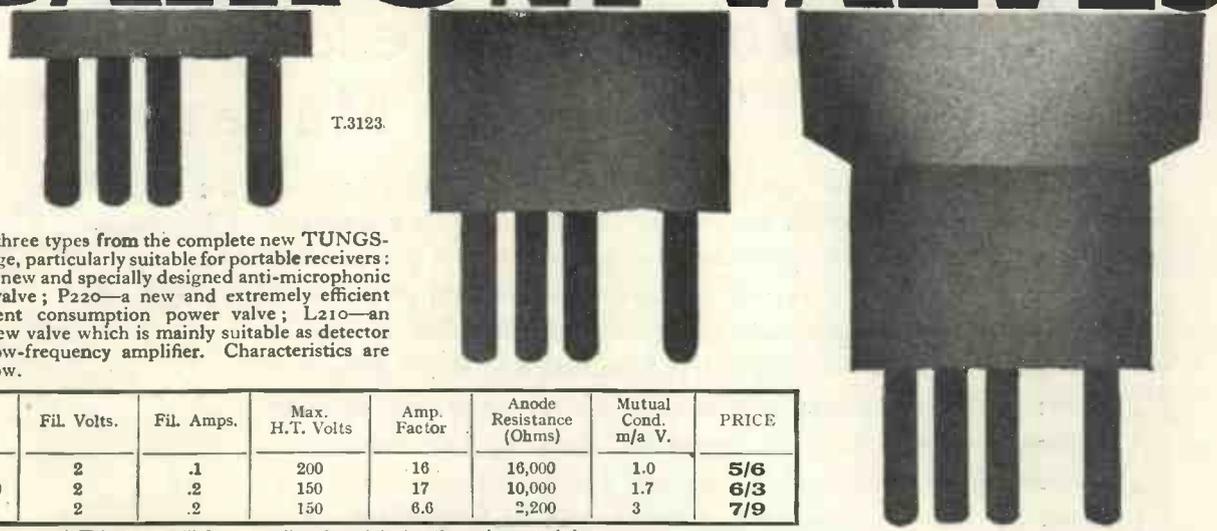
Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
2-volt Three-electrode Valves								
Mazda	H210	59,000	47	.1	.8	.5	.5	1.0
Lissen	H210	58,000	35	.1	.6	1.1	—	1.5
Cossor	210RC	50,000	40	.1	.8	1.5	—	1.5
Tungfram	R208	50,000	35	.1	1.0	1.0	—	1.5
Six-Sixty	210RC	45,400	50	.1	1.1	1.0	—	1.5
Mullard	PM1A	41,600	50	.1	1.2	.75	1.5	1.5
Marconi	H2	35,000	35	.1	1.0	.5	—	1.5
Osram	H2	35,000	35	.1	1.0	1.0	—	1.5
Six-Sixty	210HF	25,000	19	.1	.75	1.5	—	3.0
Eta	BY2023	23,000	20	.12	.85	1.5	—	3.0
Tungfram	H210	25,000	25	.1	1.0	2.0	1.5	3.0
Mullard	PM1HF	22,500	18	.1	.8	1.0	3.0	4.5
Cossor	210HL	22,000	24.0	.1	1.1	.75	3.0	4.5
Lissen	HL210	21,000	18	.1	.85	2.2	1.5	4.5
Mazda	HL210	21,000	26	.1	1.25	3.0	1.5	3.0
Mazda	HL2	21,000	32	.1	1.5	—	—	—
Cossor	210HF	20,000	22	.1	1.1	1.2	1.5	3.0
Mullard	PM1HF	18,500	28	.13	1.5	1.2	1.5	3.0
Marconi	HL2	18,000	27	.1	1.5	1.0	1.5	3.0
Osram	HL2	18,000	27	.1	1.5	1.0	1.5	3.0
Six-Sixty	210HL	17,200	26	.1	1.5	2.0	—	1.5
Tungfram	L210	16,000	16	.1	1.0	4.0	6.0	9.0
Eta	BY1814	14,000	18	.12	1.3	3.0	—	2.5
Cossor	210D-st	13,000	15	.1	1.15	2.5	—	7.5
Six-Sixty	210LF	12,500	10.6	.1	.85	3.0	4.5	7.5
Mullard	PM1LF	12,000	11	.1	.9	3.0	4.5	7.5
Six-Sixty	210D	10,600	17	.1	1.6	4.0	3.0	7.5
Cossor	210LF	10,000	14	.1	1.4	3.0	3.0	4.5
Eta	BY2010	10,000	20	.12	2.0	4.0	1.5	3.0
Lissen	L210	10,000	10	.1	1.0	3.5	3.0	7.5
Marconi	L2/6	10,000	15.5	.1	1.55	4.0	—	6.0
Mullard	PM2DX	10,000	17	.1	1.7	2.0	3.0	4.5
Mazda	L210	10,000	15.5	.1	1.55	5.0	2.5	3.0
Mazda	L2	10,000	19	.1	1.9	3.0	—	9.0
Tungfram	LG210	10,000	10	.1	1.0	4.0	6.0	9.0
Tungfram	PD220	10,000	17	.2	1.7	4.0	4.5	7.5
Six-Sixty	220P	4,800	7.2	.2	1.5	5.0	7.5	12.0
Lissen	P220	4,700	7	.2	1.5	5.0	9.0	15.0
Mullard	PM2	4,400	7.5	.2	1.7	4.0	7.5	12.0
Cossor	220P	4,000	8	.2	2.0	7.5	4.5	9.0
Cossor	215P	4,000	9	.15	2.25	7.5	3.0	7.5
Cossor	220Pa	4,000	16	.2	4.0	10.0	3.0	4.5
Eta	BW1304	4,000	13	.2	3.2	6.0	1.5	6.0
Marconi	LP2	3,900	15	.2	3.85	10.0	—	—
Osram	LP2	3,900	15	.2	3.85	10.0	—	—
Mazda	P220	3,700	12.5	.2	3.4	11.0	3.0	6.0
Six-Sixty	220PA	3,700	13	.2	3.5	10.0	3.0	6.0
Mullard	PM2A	3,600	12.5	.2	3.5	6.5	4.5	6.0
Tungfram	P215	3,300	5	.2	1.5	12.0	9.0	12.0
Eta	BW303	2,700	3	.32	1.1	11.0	15.0	25.0
Marconi	P240	2,500	4	.4	1.6	12.0	15.0	24.0
Osram	P240	2,500	4	.4	1.6	11.0	16.0	24.0
Tungfram	SP230	2,500	5	.3	2.0	15.0	15.0	23.0
Marconi	P2	2,150	7.5	.2	3.5	15.0	—	—
Osram	P2	2,150	7.5	.2	3.5	15.0	—	—
Six-Sixty	220SP	2,060	7	.2	3.4	—	—	—
Lissen	PX240	2,000	4	.4	2.0	14.0	12.5	22.5
Eta	BW602	1,900	6.5	.32	3.4	12.0	4.5	13.0
Mazda	P240	1,900	7	.4	3.7	18.0	6.0	12.0
Mullard	PM252	1,900	7	.4	3.7	14.0	10.5	12.0
Six-Sixty	240SP	1,900	6.6	.4	3.5	16.0	4.5	13.5
Marconi	P2/6	1,850	6.5	.2	3.5	15.0	—	—
Cossor	230XP	1,500	4	.3	2.3	18.0	13.5	22.5
2-volt Double-grid Valves								
Cossor	210DG	27,000	5.1	.1	.19	—	—	—
Tungfram	D6210	5,000	5.0	.1	1.0	—	—	—
Marconi	DG2	3,750	4.5	.2	1.2	—	—	—
Osram	DG2	3,750	4.5	.2	1.2	—	—	—
Six-Sixty	210DG	—	—	.1	.8	—	—	—
Mullard	PM1DG	—	—	.1	—	—	—	—
2-volt Screen-grid Valves								
Tungfram	S210	430,000	300	.12	.8	—	—	—
Mazda	215SG	400,000	450	.15	1.1	—	1.5	1.5
Mazda	S215B	333,000	500	.15	1.5	2.0	—	—
Cossor	215SG	300,000	330	.15	1.1	—	—	1.5
Eta	BY6	300,000	300	.15	1.0	2.5	—	—
Six-Sixty	215SG	220,000	190	.15	.87	2.0	—	—
Mullard	PM12	212,000	200	.15	.94	—	—	—
Cossor	220SG	200,000	320	.2	1.6	—	—	1.5
Lissen	SG215	200,000	180	.15	.9	—	—	24.5
Marconi	S22	200,000	350	.2	1.75	—	—	—
Marconi	S21	200,000	220	.1	1.1	—	—	—
Osram	S21	200,000	200	.1	1.1	3.0	—	—
Mazda	S215A	—	800	.15	1.1	—	—	—
2-volt Pentode Valves								
Lissen	PT225	64,000	90	.25	1.4	7.0	3.0	6.0
Six-Sixty	230PP	64,000	80	.3	1.25	10.0	6.0	12.0
Mullard	PM22	62,500	82	.3	1.3	10.0	6.0	12.0
Marconi	PT240	55,000	90	.4	1.65	9.0	6.0	9.0
Osram	PT240	55,000	90	.4	1.65	9.0	6.0	9.0
Lissen	PT240	22,500	45	.4	2.0	12.5	7.5	10.5
Cossor	230PT	—	—	.3	2.0	11.5	9.0	15.0

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
2-volt Pentode Valves—Continued								
Mazda	220Pen.	—	—	.2	2.5	—	—	—
Cossor	230HPT	—	—	.3	1.8	.95	7.5	12.0
Osram	PT2	—	—	.2	2.5	5.5	3.0	4.5
Mazda	Pen.230	—	—	.3	1.5	—	—	—
4-volt Three-electrode Valves								
Marconi	H410	60,000	40	.1	.66	.5	—	1.5
Osram	H410	60,000	40	.1	.66	.35	—	1.5
Lissen	H410	60,000	40	.1	.66	1.6	—	1.5
Six-Sixty	4075RC	58,000	37	.075	.64	1.35	1.0	1.5
Mullard	PM3A	55,000	38	.075	.66	.3	1.5	1.5
Cossor	410RC	50,000	40	.1	.8	.6	—	—
Marconi	LH410	30,000	25	.1	.83	1.0	2.0	3.0
Osram	LH410	30,000	25	.1	.83	1.25	1.5	3.0
Tungfram	H407	25,000	35	.07	1.4	2.5	1.5	2.0
Lissen	HLD410	21,000	25	.1	1.2	2.5	1.5	3.0
Cossor	410HF	20,000	22	.1	1.1	1.5	1.5	3.0
Tungfram	R406	18,000	25	.06	1.4	3.5	2.0	3.5
Mullard	PM3	13,000	14	.075	1.05	2.0	3.0	6.0
Six-Sixty	4075HF	12,500	13.5	.075	1.1	3.0	3.0	4.5
Lissen	410LF	10,000	17	.1	1.75	3.0	2.0	4.5
L410	L410	8,500	15	.1	1.8	3.5	1.5	4.5
L410	L410	8,500	15	.1	1.77	3.0	2.0	4.5
Osram	L410	8,500	15	.1	1.77	3.5	3.0	4.5
Mullard	PM4DX	7,500	15	.1	2.0	2.0	3.0	6.0
Six-Sixty	410D	7,250	14.5	.1	2.0	4.0	3.0	6.0
Tungfram	LD410	7,000	16.5	.1	2.3	4.5	4.5	7.5
Osram	P410	5,000	7.5	.1	1.5	6.0	6.0	10.5
Osram	P410	5,000	7.5	.1	1.5	6.0	6.0	10.5
Six-Sixty	410P	4,100	7.8	.1	1.9	7.5	7.5	12.0
Cossor	410P	4,000	8	.1	2.0	7.5	4.5	9.0
Mullard	PM4	4,000	8	.1	2.0	5.25	7.5	10.5
Tungfram	L414	3,300	10	.15	3.0	6.0	6.5	9.0
Marconi	P425	2,300	4.5	.25	1.95	14.0	9.0	16.5
Osram	P425	2,300	4.5	.25	1.95	14.0	9.0	16.5
Lissen	P425	2,250	4.5	.25	2.8	28.0	12.5	19.5
Six-Sixty	420SP	2,150	6.5	.2	3.0	10.0	13.5	22.5
Marconi	P415	2,080	5.0	.15	2.4	—	—	—
Cossor	425XP	2,000	7	.25	3.5	—	6.0	13.5
Mullard	PM254	2,150	6.5	.2	3.0	9.0	9.0	15.0
Mazda	P425	1,950	3.5	.25	1.8	26.0	14.0	26.0
Tungfram	P414	1,700	5	.15	3.0	12.0	9.0	18.0
Cossor	4XP	1,200	3	.6	4.0	20.0	12.0	—
Marconi	PX4	830	5	1.0	6.0	35.0	12.0	16.0
Osram	PX4	830	5	1.0	6.0	35.0	12.0	16.0
4-volt Screen-grid Valves								
Tungfram	S407	400,000	350	.07	.9	—	—	—
Mullard	PM14	230,000	200	.075	.87	—	—	—
Six-Sixty	4075SG	220,000	190	.075	.87	3.0	—	—
Cossor	410SG	200,000	200	.1	1.0	—	—	1.5
Marconi	S410	200,000	180	.1	.9	3.5		

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T.3123.

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Type.	Fil. Volts.	Fil. Amps.	Max. H.T. Volts	Amp. Factor	Anode Resistance (Ohms)	Mutual Cond. m/a V.	PRICE
L210	2	.1	200	.16	16,000	1.0	5/6
PD220	2	.2	150	17	10,000	1.7	6/3
* P220	2	.2	150	6.6	2,200	3	7/9

* This type will be generally released during the early part of the season.

Write to Dept. 8.T.4 for full particulars of the complete new range. Prices from 5/6 to 19/-. Tungsramp Barium Valves are manufactured under one or more of the following Patent Nos.: 289,762, 289,763, 311,705, and 313,151.

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1 Watmel H.F. choke, type DX3	4	0	
1 Lewcos band-pass filter coil, type 51	12	0	
1 Lewcos dual-range coil, type 55	8	6	
1 Magnum .0001-mfd. fixed condenser	1	6	
1 Magnum .0002-mfd. fixed condenser	1	6	
2 Magnum .01-mfd. fixed condensers	5	0	
2 Formo 1-mfd. fixed condensers	6	6	
2 Formo 2-mfd. fixed condensers	6	6	
1 British Radiophone .0005-mfd. 3-gang variable condenser with disc drive	2	3	0
1 Ormond .0002-mfd. differential reaction condenser, type R/180	4	0	
1 Ebonite panel, 18 in. by 7 in.	7	0	
1 Grid-leak holder	6	0	
4 Benjamin Vibroders	6	0	
1 Bulgin 0.50 mill. ampere m.-c. meter, type MCS	1	10	0
1 Bulgin 0.2-mill. ampere m.-c. meter, type MC2	1	10	0
6 Belling-Lee wander plugs as specified	1	0	
2 Belling-Lee spade terminals as specified	1	0	
1 Magnum 10,000-ohm spaghetti resistance	1	0	
3 Magnum 20,000-ohm spaghetti resistance	4	6	
1 Magnum 30,000-ohm spaghetti resistance	1	6	
1 Dubilier 1-meg. grid leak	1	9	
1 Magnum Dissolver	10	0	
1 Wearite on-off switch, type 622	1	0	
1 R.I. Hypermu L.F. transformer	1	1	0
1 Readl-Rad Instamat output transformer	1	7	6
2 Lissen terminal blocks	2	0	
1 Six-Sixty valve screen	1	3	
Insulated sleeving, tinned copper wire, screws, etc.	3	9	
Total	£12.5.0		

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Every item's a better item
if you've a **Drydex**

10.15 a.m.

10.30 Time
cast

10.45-11.0
M

12.0

12.45

(Organist to the Society)
Relayed from ALL SAINTS,
MARGARET STREET
Introduction and Passacaglia
Reger
(Note on page 12)
Adagio Lemare
Grand Choeur } (7th) Guilman
Intermezzo... } (Sonata)
Finale
Nocturne Bonnet
Minuet Scherzo Jongen
Fantasy—Toccata
Leslie Woolgate



Some
Written, comp
produced by

ERNEST

Additional

Time Signal, Greenwich, at 1.0

1.30-2.30 Light Music

FRASCATI'S ORCHESTRA
Directed by GEORGES H
From THE RISE

3.30 Symph

Relayed from
Bo
THE BOURNE
O
Conductor,
EDA K
Persian Dan
Violin Conce

Allegro;
Irish Symphony
Allegro; Allegro;

(Note on page
Time Signal, Greenwich, at

4.45 REGINALD NEW
At THE ORGAN of THE BEAUFORT CINEMA
Relayed from WASHWOOD HEATH, BIRMINGHAM
Coronation March, The Prophet Meyerbeer
Selection, The Desert Song Romberg
Sanctuary of the Heart Ketelbey
Introduction, Act III, Lohengrin Wagner

5.15 'The Children's Hour'
by ETHEL MALDEN

7.30 A RECITAL OF GRAMOPHON
By CHRISTOPHER STOR
ECHOES OF OPERETTA

8.0 A Second Helping
of
Cranzlin P

iony
cert

IE (Sopra)
ORCHEST

ucted by
N CLIFFOR

No. 1 in C B
Allegro; A
Allegro

E and Orche
r (Tell me n
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ly (Octet) fr
truments
Allegro moderato;
with Variations; M
two Trios; Finale;

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Songs



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VALVES TO USE IN YOUR SET—Continued from p. 500

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
6-volt Three-electrode Valves—Continued								
Marconi	LS5	6,000	5	.8	.8	—	—	—
Osrham	LS5	6,000	5	.8	.8	—	—	—
Lissen	P610	4,000	8	.1	2.0	6.0	6.0	16.0
Marconi	DE5A	4,000	3.5	.25	.87	9.0	12.0	15.0
Mullard..	PM6	3,550	8	.1	2.25	7.0	6.0	9.0
Cossor	610P	3,500	8	.1	2.25	8.0	5.0	7.5
Marconi	P610	3,500	8	.1	2.25	6.0	6.0	9.0
Osrham	P610	3,500	8	.1	2.25	7.0	6.0	9.0
Tungfram	P615	3,300	10	.15	3.0	10.0	4.5	7.5
Six-Sixty	610P	3,400	7.8	.1	2.3	8.0	6.0	9.0
Marconi	LS5A	2,750	2.5	.8	.9	—	—	—
Osrham	LS5A	2,750	2.5	.8	.9	—	—	—
Cossor	625P	2,500	7	.25	2.8	13.0	3.0	9.0
Lissen	P625	2,500	7.5	.25	3.0	8.0	7.5	12.0
Mazda	P625B	2,500	7	.25	2.8	11.0	6.0	12.0
Marconi	P625	2,400	6	.25	2.5	11.0	6.0	24.0
Osrham	P625	2,400	6	.25	2.5	11.0	6.0	12.0
Tungfram	SP614	2,300	6	.15	2.6	17.0	6.0	18.0
Cossor	610XP	2,000	5	.1	2.5	22.0	7.5	15.0
Six-Sixty	625SP	1,780	5.8	.25	3.25	—	—	15.0
Mullard..	PM256	1,850	6	.25	3.25	—	9.0	18.0
Marconi	P625A	1,600	3.7	.25	2.3	20.0	13.5	36.0
Mazda	P625A	1,600	4	.25	2.5	27.0	10.0	20.0
Osrham	P625A	1,600	3.7	.25	2.3	16.0	13.5	24.0
Lissen	P625A	1,500	4.5	.25	3.0	12.0	13.5	24.0
Six-Sixty	625SPA	1,500	3.9	.25	2.6	25.0	12.0	22.5
Mullard..	PM256A	1,400	3.6	.25	2.6	—	—	—
Marconi	LS6A	1,300	3.0	2.0	2.3	—	—	—
Mazda	P650	1,300	3.5	5	2.7	30.0	12.0	25.0
Osrham	LS6A	1,300	3.0	2.0	2.3	—	—	—
Marconi	DA60	835	2.5	4.0	3.0	—	—	—
Osrham	DA60	835	2.5	4.0	3.0	—	—	—
6-volt Screen-grid Valves								
Six-Sixty	SS6075SG	210,000	190	.075	.9	—	—	1.5
Cossor	610SG	200,000	200	.1	1.0	—	—	—
Mullard..	PM16	200,000	200	.075	1.0	—	—	—
Osrham	S610	200,000	210	.1	1.05	4.0	1.5	—
6-volt Pentode Valves								
Marconi	PT625	42,000	80	.25	1.85	10.0	6.0	15.0
Osrham	PT625	42,000	80	.25	1.85	—	—	15.0
Six-Sixty	SS617PP	28,500	54	.17	1.9	35.0	8.0	14.0
Mullard..	PM26	25,000	50	.17	2.0	—	9.0	15.0
Lissen	PT624	24,000	60	.25	2.5	14.0	7.5	15.0
Cossor	615PT	—	—	.15	1.5	17.0	6.9	7.5
A.C. Three-electrode Mains Valves								
Eta	DV4230	23,000	40	1.0	1.75	2.5	—	1.5
Tungfram	G150	20,000	10	.5	.5	—	—	—
Cossor	4MRC	19,500	50	1.0	2.6	2.0	.5	1.5
Tungfram	R150	18,000	25	.5	1.4	1.5	—	—
Six-Sixty	4DX.AC	17,700	8.5	1.0	4.8	—	—	—
Mullard..	904V	17,000	85	1.0	5.0	3.0	.75	1.0
Six-Sixty	4DX.AC	17,700	85	1.0	4.8	—	—	—
Tungfram	AR4100	16,000	33	1.0	2.0	2.5	—	3.0
Cossor	41MHF	14,500	41	1.0	2.8	2.5	1.5	2.0
Mazda	AC/HL	13,500	35	1.0	3.0	4.5	1.5	3.0
Six-Sixty	4GP.AC	12,000	36	1.0	3.0	—	—	—
Cossor	41MHL	11,500	52	1.0	4.5	3.0	.9	1.5
Mazda	AC2HL	11,500	75	1.0	6.5	3.0	—	1.5
Marconi	MH4	11,100	40	1.0	3.6	4.0	1.5	3.0
Osrham	MH4	11,100	40	1.0	3.6	4.0	1.5	3.0
Mullard..	354V	10,000	35	1.0	3.5	2.0	2.0	3.0
Marconi	MHL/4	8,000	20	1.0	2.5	5.0	3.0	6.0

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
A.C. Three-electrode Mains Valves—Continued								
Osrham	MHL4	8,000	20	1.0	2.5	5.0	3.0	6.0
Tungfram	AG4100	8,000	16	1.0	2.0	5.0	—	6.0
Cossor	M41LF	7,900	15	1.0	1.9	4.5	4.5	6.0
Eta	DW1508	7,500	15	1.0	2.0	5.0	3.0	6.0
Six-Sixty	SS4D.AC	7,000	16	1.0	2.5	7.5	3.5	8.0
Mullard..	164V	4,850	16	1.0	3.3	5.0	4.5	6.0
Osrham	M41P	5,000	10	1.0	2.0	6.5	4.5	7.5
Six-Sixty	4L.AC	5,000	16	1.0	3.2	—	—	—
Eta	DW704	4,500	7	1.0	1.5	10.0	6.0	13.5
Marconi	DW1003	3,300	10	1.0	3.3	12.5	7.5	13.5
Eta	M4	2,800	12	1.0	2.5	—	—	—
Marconi	SS4PAC	3,000	10	1.0	3.3	10.0	5.9	8.0
Six-Sixty	M4	2,860	12	1.0	4.2	12.0	5.0	8.0
Osrham	104V	2,850	10	1.0	3.5	11.0	5.0	8.5
Mullard..	AC/P	2,650	10	1.0	3.75	14.0	6.0	12.0
Mazda	41MP	2,500	18.7	1.0	7.5	15.0	3.0	5.0
Cossor	DW702	2,250	7	.23	3.2	18.0	10.0	17.0
Tungfram	P4100	2,200	7	1.0	3.2	—	—	—
Eta	DX502	2,100	5	.15	2.4	12.0	4.5	15.0
Six-Sixty	HV4/1	2,100	6.3	1.0	3.0	—	—	14.0
Cossor	41XP	2,000	4	1.0	2.0	15.0	12.0	19.5
Mullard..	AC064	2,000	6	1.0	3.0	15.0	9.0	14.0
Tungfram	P430	2,000	5	3	2.5	20.0	—	—
Eta	DW302	1,800	3.5	1.05	1.95	33.0	—	20.0
Cossor	41MXP	1,450	11.2	1.0	7.5	23.0	6.0	9.0
Mazda	AC/PI	1,450	5.4	1.0	3.7	—	—	—
Mullard..	AC044	1,150	4.0	.7	3.5	17.0	16.5	28.0
A.C. Double-grid Valve								
Cossor	41MDG	40,000	10	1.0	.25	—	—	—
A.C. Screen-grid Mains Valves								
Six-Sixty	4SGAC	1,000,000	1,000	1.0	1.0	1.5	—	—
Mullard..	SV4	909,000	1,000	1.0	1.1	—	—	—
Eta	DW6	800,000	1,000	1.0	—	1.0	—	—
Mazda	AC/SG	800,000	1,200	1.0	3.0	5.0	.5	5
Mullard..	ACS2	600,000	3,000	1.0	5.0	—	—	—
Tungfram	ASH100	600,000	900	1.0	1.5	—	—	—
Cossor	MSG/HA	500,000	1,000	1.0	2.0	2.0	1.5	1.5
Marconi	MS4	500,000	550	1.0	1.1	2.2	1.5	—
Osrham	MS4	500,000	550	1.0	1.1	2.2	—	—
Mullard..	S4VA	430,000	1,500	1.0	3.5	1.7	—	—
Cossor	41MSG	400,000	1,000	1.0	2.5	2.0	—	1.5
Marconi	MS4B	350,000	1,120	1.0	3.2	—	—	—
Osrham	MS4B	350,000	1,120	1.0	3.2	3.2	1.0	1.0
Mullard..	S4VB	257,000	900	1.0	3.5	4.0	1.5	1.5
Cossor	MSG-LA	200,000	200	1.0	3.75	4.5	—	1.5
Eta	DW2	200,000	240	1.0	—	2.5	—	—
D.C. Three-electrode Mains Valves								
Mazda	DC/HL	13,000	35	.5	2.7	—	—	—
Marconi	DH	10,800	40	.25	3.7	—	—	—
Osrham	DH	10,800	40	.25	3.7	—	—	—
Mazda	DC3HL	10,000	37	.1	3.7	—	—	—
Marconi	DL	2,660	12	.25	4.3	—	—	—
Osrham	DL	2,660	12	.25	4.3	—	—	—
Mazda	DCP	2,220	10	.5	4.5	—	—	—
Mazda	DC2P	2,220	10	.1	4.5	—	—	—
D.C. Screen-grid Mains Valves								
Marconi	DS	450,000	500	.25	1.1	—	—	—
Osrham	DS	450,000	500	.25	1.1	—	—	—
Mazda	DCSG	—	1,000	.5	2.75	—	—	—
D.C. Pentode Mains Valves								
Marconi	DPT	30,000	90	.25	3.0	—	—	—
Osrham	DPT	30,000	90	.25	3.0	—	—	—
Mazda	DCPen.	—	—	.5	3.5	—	—	—
Mazda	DC2Pen.	—	—	.1	3.5	—	—	—

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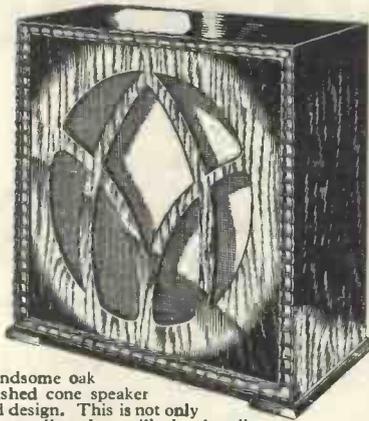
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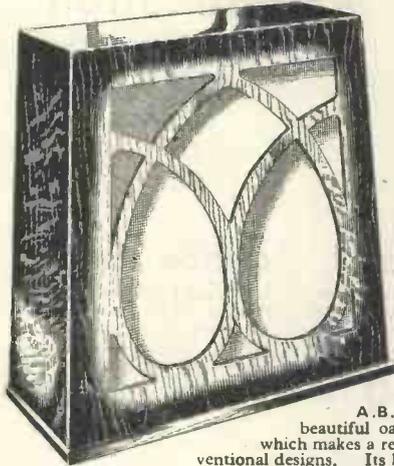
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FOR
25/-

the A.C.6



A.C.6.—Contained in a handsome oak cabinet, this beautifully finished cone speaker embodies a unit of improved design. This is not only constructed to work with a small set but will also handle the output of powerful receivers without distortion.



FOR
50/-

the A.B.4

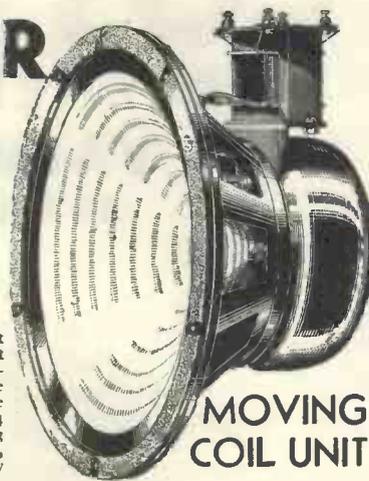
A.B.4.—The modern lines of this beautiful oak cabinet have a severity which makes a refreshing change from conventional designs. Its handsome exterior houses a highly efficient speaker—a balanced armature model with provision for matching to power or pentode outputs. Fifty shillings is indeed a small price for such volume and crisp reproduction. Same model in Walnut 59/6.

And FOR

67/6

the M.C.6

M.C.6.—An extremely efficient moving coil unit, a permanent magnet which is quite as sensitive as a balanced armature speaker, and thus quite suitable to work with ordinary 2, 3, or 4 valve receivers. The matching transformer, fitted as standard, enables the unit to be correctly matched to any output.



MOVING
COIL UNIT

GRAHAM AMPLION LTD., 26, Savile Row, LONDON, W.1

This is the



BRITISH GENERAL

*Band Pass
Unit*

[AERIAL AND
ANODE MODELS]

Both models are specified by the designer of the "Double Band-pass Three" which was described in the November issue of "Wireless Magazine" and further details of which appear in this number. For perfect separation without sacrifice of quality there is nothing to equal these British General Band Pass Tuning Units. Full illustrated details on application.

PRICE

14/6

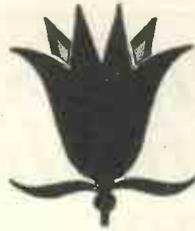
Anode and
Aerial
models.

*Both complete with
non-inductive coupling
condenser.*

From all dealers or direct from the manufacturers.

**British General Manufacturing Co. Ltd.,
Brockley Works, London, S.E.4.**

**THE NEW
WONDER SET,
UNRIVALLED
TONE & VALUE**



HERE'S the ideal family Christmas gift. One which will give years of delight to every member. An All-Mains Receiver needing no expert touch, and bringing station after station at full volume by the turn of a single knob. Each one clear-cut and with a fidelity of reproduction that is perfect in every detail.

Such is the new LOTUS 3-Valve Table Console. Unrivalled throughout the world, this amazing British-made Receiver is obtainable for only

27/9 DOWN

Three Valves (Screened Grid, Detector, and Power). One-knob Tuning, Illuminated Dial in actual wavelengths, Moving-coil Speaker. All self-contained in a luxurious walnut cabinet. For A.C. and D.C. Mains.

CASH PRICE £15.15.0

Model for Battery Operation similar to the Mains Model, but with Balanced Armature Speaker, £9 9s. or 17/9 down.

Ask your dealer for a demonstration and send the coupon for leaflets giving full details of this wonderful receiver.

FREE COUPON

LOTUS RADIO, LTD.,
Mill Lane, Liverpool.

Please send me free descriptive leaflets of the wonderful new LOTUS Table Console.

Name

Address

W.M./12

MOVING-COIL LOUD-SPEAKER, ONE-KNOB TUNING, DIAL IN ACTUAL WAVELENGTHS

The Ideal Xmas Gift



TABLE CONSOLE

**AN AMAZING ALL-MAINS
MOVING-COIL RECEIVER** Ⓟ

LOTUS RADIO LTD., Mill Lane, LIVERPOOL

Speedy replies result from mentioning "Wireless Magazine"

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.



259.3m.

(1,157 kc.)

Power: 2.3 kw.

LEIPZIG*

(Germany)

537 miles from London.

Standard Time: Central European (coincides with B.S.T.).

Announcer: Man.

Language: German only.

Call: *Achtung! Hier Mitteldeutschen Sender Leipzig und Dresden.*

Interval Signal: Metronome interrupted every half minute by four notes, namely B Flat, A, C, B.

Main Programme: G.M.T. 05.30, physical exercises; 06.00, concert (relayed from Berlin); 08.15, sacred service (Sun.); 11.55, time signal; 15.00, concert; 19.00, main evening entertainment; 21.00, news; 21.30, dance music, gramophone records or light orchestra (exc. Thursdays).

Closes down with usual German *Gute Nacht* greetings followed by National Anthem (*Teutschlandslied*).

Relay: Dresden, 318.8 metres (941 kilocycles), 0.3 kilowatt.

Interval Signal: Short theme on musical box (from opera *Oberon*), *New 150-kilowatt transmitter under construction at Pegau; later wavelength may be exchanged with Frankfurt-am-Main.



298.8m.

(1,004 kc.)

Power: 0.7 kw.

TALLINN*

(Estonia)

1,112 miles from London.

Standard Time: Eastern European (2 hours in advance of G.M.T.).

Announcers: Man and woman.

Opening Signal: Bell.

Call: *Hallo! Hallo! Siin Tallinna ja Tartu.*

Main Programme: G.M.T. 16.30, news, gramophone records; 17.05 concert (17.30, Sun.); 18.05, play or concert; 20.00, dance music (Sun., Wed., Sat.). Closes down with the words: *Sellege lopetame tänase saatekava. Hääd ööd koigile, hääd ööd* (With this item we close our to-day's programmes; good-night, good-night).

Relay: Tartu (Dorpat), 465.8 metres, 644 kilocycles, 0.5 kilowatt.

*Will be found in pre-war maps as Reval (Russia).



368.8m.

(813.8 kc.)

Power: 1.5 kw.

SEVILLE

(EAJ 5)

(Spain)

1,018 miles from London.

Standard Time: Greenwich Mean Time.

Announcer: Man.

Language: Spanish only.

Call: (Phon.) *Eh-yah rholá thinko* (EAJ5) oon-ay-own rah-dee-ow Say-vill-e-ya.

Main Daily Programme: G.M.T. 21.00, concert or gramophone records, news and dance music. Frequently relays Madrid (EAJ7). Closes down with Anthem followed by: *Buenas Noches, Senoras y Caballeros, hasta manana.*



1,200 m.

(250 kc.)

Power: 21 kw.

REYKJAVIK

(Iceland)

1,170 miles from London.

Standard Time: Greenwich mean time less one hour.

Announcers: Man and woman.

Opening Call: *Utwarpstod Islands i Reykjavik* (phon.: Ray-hee-yar-veek); abbreviated during intervals in programme to *Utwarp Reykjavik*.

No interval signal.

Main Daily Programme: G.M.T. 19.40, sacred service (Sun.); 20.30, news, weather; 21.00, time signal (clock gong and chimes); 21.5, talks; 21.30, news; 22.0, concert or play; dance music until midnight or later on Sundays.

Closes down with the words: *Goda Nott; Goda Nott*, followed by an old Icelandic hymn.



1.250m.

(240 kc.)

Power: 0.6 kw.

TUNIS-KASBAH

(Tunis, North Africa)

1,360 miles from London.

Standard Time: Centra European (coincides with B.S.T.).

Announcer: Man.

Call: *Allo! Allo! Ici le poste de radiodiffusion de Tunis-Kasbah.*

Main Programme: G.M.T. 18.10, commercial and news bulletins, weather, gramophone and studio concert.

Announcements: In French and Arabic.

Closes down with usual French formula followed by *La Marseillaise*.



A NEW RANGE
OF COMPONENTS
THE LAST WORD IN
DESIGN & VALUE

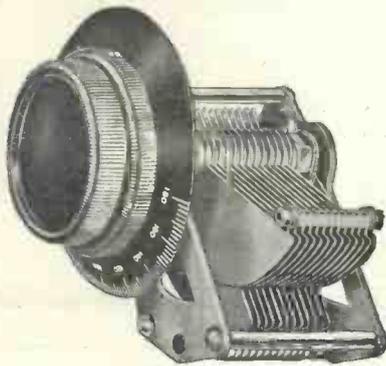
THERE are no more acceptable gifts for constructors and wireless enthusiasts than LOTUS Components.

Whether for inclusion in a new receiver or for the replacement of an inferior part, a LOTUS Component is sure of a splendid reception.

LOTUS Components have always enjoyed the esteem of the radio constructor and the expert. All the leading set designers specify LOTUS.

In addition to the new LOTUS Components illustrated, there are many new lines, including Gang Condensers, Transformers, Chokes, Switches, Slow-motion Drives, etc.

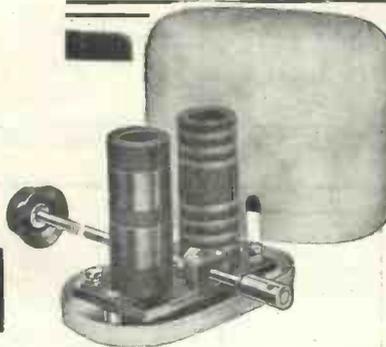
You will be interested in the complete range. Send coupon to-day for full descriptive list.



Slow-motion Condenser.—Stout construction with integral ball-bearing, slow-motion device.

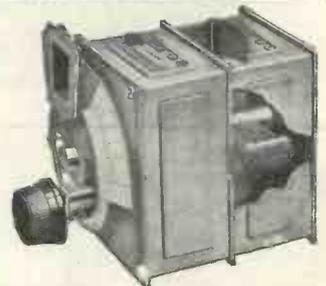
Complete with knob-dial.
Capacity .0008 and .0005.

6/6



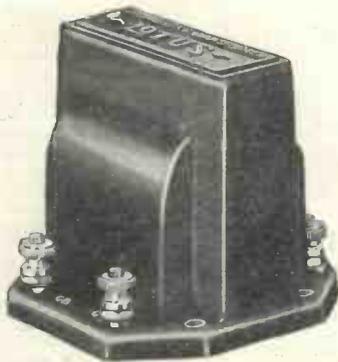
Binocular Dual-wave Coll.—Long and short wave windings on separate formers, silent wave-change switch. These coils are all matched and can be ganged. Completely and compactly screened.

10/6



Ganged Condensers.—Each unit is totally screened and precision matched, and sturdy construction ensures lasting accuracy. With Disc Drive, 5/- extra or with Drum Drive, 7/6 extra. 3 Gang, 30/- 4 Gang, 40/-

2-GANG
20/6



Audio Transformer No. 1.—An inexpensive instrument for the home constructor. It is remarkably efficient and has a good straight-line amplification curve. Ratios 3-1 and 5-1.

5/6



RADIO COMPONENTS

FREE COUPON

Please send my copy of the LOTUS Component Catalogue describing the complete range.

Name

Address

W.M./12

LOTUS RADIO LIMITED,
MILL LANE, LIVERPOOL

When replying to advertisements, please mention "Wireless Magazine"

CAV

THERE IS NO ACID TO SPILL

Perfect
for all
Portables



..... this battery popularised jelly acid cells for portables

This C.A.V. Jelly Acid non-spillable L.T. cell has all the advantages of the ordinary free acid battery.

Buy one—use it in turn with your present battery. You will appreciate the difference and suffer no interruption to the continuity of programmes.

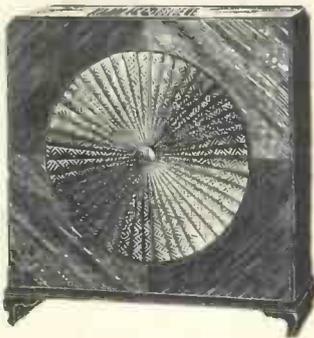
Put it in any position—it is quite safe. There is no acid to spill.

You will find it more convenient with any class of Receiver.

A post-card will bring you our Radio Battery Catalogue and a useful booklet on charging and maintenance.

Have you tried the new C.A.V. Dry High Tension yet?

CAVandervell Ltd;
WELL ST. BIRMINGHAM.



GREATEST IN CONE SPEAKERS!

Never before has there been such a wonderful Speaker. Never before have you heard such amazing Tonal Purity and Volume. Retail, complete Unit only, 12/- Unit and Chassis, 18/6. Full details from :-

42/-

THE LOEWE RADIO Co., Ltd.,
4 Fountayne Road, Tottenham, N.15
Phone: Tottenham 8311/2.

LOEWE RADIO

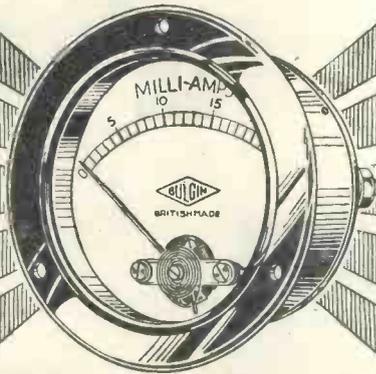
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HAIR LINE INDICATOR

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WIDE OPEN SCALE

COMPLIES WITH E.E.S.A. TEST



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POLISHED BAKELITE CASE

OVERALL DIAMETER 2 in.

MODELS FROM 0.2 M/A TO 0.50 M/A

CALIBRATED AGAINST STANDARD

RANGE

0.2 M/A.

0.5 " "

0.20 " "

0.50 " "

0.100 " "

0.200 " "

30/-

EACH

AN IDEAL CHRISTMAS PRESENT

Bulgin Moving Coil Meters are the smallest and neatest precision instruments offered for use in radio work. They are an indispensable asset to quality reproduction and the wide range offered covers every phase of amateur radio.

The Voltmeters are suitable for calculating the output of Mains Eliminators owing to the high resistance value and exceptionally low current consumption.

Please send 2d. postage for 75-page Illustrated Catalogue and Manual which also gives details of the Bulgin Technical Service.

VOLTMETERS

0.250 v.

1.000

Ohms per Volt:

Current:

1 M/A.

45/-

IN CABINET

52/6



Telephone: Holborn 2072

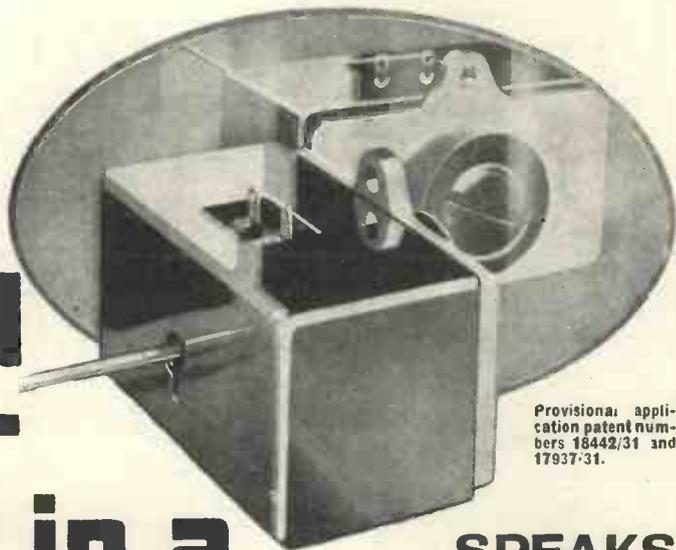
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London Showrooms: 9-10-11 Cursitor St., Chancery Lane, E.C.4.

Telephones: Grangewood 3288/3287

Better service results from mentioning "Wireless Magazine" when writing to advertisers

They knew what they wanted — and got it in a **PURETONE**



Provisional application patent numbers 18442/31 and 17937/31.

SPEAKS FOR ITSELF

An All-British Guaranteed Loud-speaker Unit that gives reproduction free from all distortion. A Loud-speaker unit that is sensitive and has an extremely true to life reproduction. At the same time one that will stand up to hard wear—give length of service—and is a reasonable price.

That is what the "New Economy Three" requires—and **Wireless Magazine** specifies the new **Puretone Loud-speaker unit** to "do the job."

Tone Quality—In addition to reproducing the high and low notes, with equal fidelity, all the overtones receive instant response. Purity of reproduction is the essence of the Puretone and it is guaranteed for one year.

- ALL BRITISH.
- VERY SENSITIVE.
- GIVES A VERY TRUE TO LIFE REPRODUCTION.
- VERY ROBUST. NOT A SCREW OR BOLT IN ITS CONSTRUCTION.
- DIFFERENT BOTH IN DESIGN AND CONSTRUCTION FROM ANY OTHER UNIT ON THE MARKET.
- GUARANTEED FOR ONE YEAR.
- PRICE, 7/6.
- MORE THAN HANDLES THE OUTPUT FROM SUPER POWER VALVES.

SPECIFIED - - - -
by **Wireless Magazine** for use in conjunction with new set, **THE NEW ECONOMY THREE.**

THE PURETONE

Although it is not necessary to use the Puretone to obtain excellent results, the most perfect reproduction is, of course, assured if the unit is used in conjunction with this specially designed cone. Price 2/6.

IT'S BLUE—You can't miss it

Ask your local dealer to show you the new blue Puretone.

This unit has only just been marketed and naturally we have not got complete retail coverage just yet.

N.B.—Orders dealt with promptly

If you experience any difficulty in obtaining a unit please write direct to us for full particulars or a unit and give the name of your local dealer.

A Puretone will be delivered within twenty-four hours.

PRICE 7/6

The **WALTER** **PURETONE** **LOUDSPEAKER · UNIT**

J. & H. WALTER, LTD., 31a, Farm Lane, FULHAM, S.W.6. 'Phone: Fulham 5645

It helps us if you mention "Wireless Magazine"

WAVELENGTHS OF THE WORLD'S BROADCASTERS

WITH SPACES TO RECORD YOUR DIAL READINGS

Wave-length	Name of Station	Dial Readings	Country	Wave-length	Name of Station	Dial Readings	Country
206	Antwerp...		Belgium	349	Barcelona (EAJ1)		Spain
214.2	Warsaw ...		Poland	352	Graz ...		Austria
215.3	Chatelaineau ...		Belgium	355.8	London Regional		Great Britain
217	Königsberg ...		Germany	360.1	Mühlacker ...		Germany
218	Salzburg ...		Austria	364	Trondelag ...		Norway
	Flensburg ...		Germany	364.5	Algiers ...		North Africa
222.9	Picamp ...		France	366.9	Frederiksstad ...		Norway
224.4	Cork ...		Irish Free State	366.9	Seville (EAJ5)		Spain
227	Cologne ...		Germany	368	Helsinki ...		Finland
	Münster ...		Germany	372	Hamburg ...		Germany
230	Aachen ...		Germany	376.4	Glasgow ...		Great Britain
	Malmö ...		Sweden	381	Lvov ...		Poland
232	Kiel ...		Germany	385	Radio Toulouse		France
234	Lodz ...		Poland	390	Frankfurt ...		Germany
235.5	Kristianssand ...		Norway	391	Bucharest ...		Roumania
237.2	Beziers ...		France	398.9	Midland Regional		Great Britain
238.5	Bordeaux-Sud-Ouest ...		France	403.5	Söttnes ...		Switzerland
	Binche ...		Belgium	404	Madrid ...		Spain
239	Nürnberg ...		Germany	408	Katowice ...		Poland
240	Stavanger ...		Norway	413	Dublin (2RN) ...		Irish Free State
242	Belfast (2BE) ...		Ireland	416	Radio Maroc ...		North Africa
244	Basle ...		Switzerland	419	Berlin ...		Germany
244.1	Wilno ...		Poland	424	Madrid (EAJ7)		Spain
245	Schaerbeek ...		Belgium	426	Kharkov ...		Russia
246	Cassel ...		Germany	430.5	Belgrade ...		Yugoslavia
	Linz ...		Austria	435.4	Stockholm ...		Sweden
247	Trieste ...		Italy	441	Rome ...		Italy
249.6	Juan-les-Pins ...		France	447	Paris (Ecole Sup. PTT)		France
253.4	Barcelona ...		Spain	451	San Sebastian ...		Spain
	Gleiwitz ...		Germany	453	Danzig ...		Danzig
255	Toulouse (PTT) ...		France	453	Klagenfurt ...		Austria
257	Hörby ...		Sweden	453.2	Forgrund ...		Norway
259	Leipzig ...		Germany	459	Beromuenster ...		Switzerland
261.3	London National ...		Great Britain	465.8	Tartu ...		Estonia
263.8	Moravska-Ostrava ...		Czechoslovakia	466	Lyon-la-Doua ...		France
265	Lille (PTT) ...		France	472.4	Langenberg ...		Germany
268.3	Valencia ...		Spain	480	North Regional ...		Great Britain
269.8	Bremen ...		Germany	488.6	Lieblitz ...		Czechoslovakia
272	Rennes ...		France	493.4	Trondheim ...		Norway
274.2	Heilsberg ...		Germany	501	Milan ...		Italy
279	Bratislava ...		Czechoslovakia	509.3	Brussels (No. 1) ...		Belgium
281	Copenhagen ...		Denmark	517	Vienna ...		Austria
283	Magdeburg ...		Germany	525	Riga ...		Latvia
	Stettin ...		Germany	533	Munich ...		Germany
283.5	Berlin (E) ...		Germany	542	Palermo ...		Italy
285	Innsbruck ...		Austria	550	Sundsvall ...		Sweden
286.6	Kootwijk ...		Holland	556	Budapest ...		Hungary
287.1	Montpellier ...		France	559.7	Hanover ...		Germany
	Radio Lyons ...		France	570	Kaiserslautern ...		Germany
288.5	Swansea (5SX) ...		Great Britain	574.7	Tampere ...		Finland
	Plymouth (5PY) ...		"	577	Augsberg ...		Germany
290.5	Aberdeen ...		"	579	Freiburg ...		Germany
	Edinburgh (2EH) ...		"	583.5	Ljubljana ...		Yugoslavia
291	Dundee (2DE) ...		"	587	Moscow ...		Russia
293	Bournemouth (6BM) ...		"	597.5	Ostersund ...		Sweden
294	Newcastle (5NO) ...		"	600	Kharkov ...		Russia
296	Lisbon ...		Portugal	601	Leningrad ...		Russia
296.3	Vilpuri ...		Finland	603	Scheveningen-Haven ...		Holland
298.8	Kosice ...		Czechoslovakia	607	Tiflis ...		Russia
	Limoges ...		France	613	Oslo ...		Norway
304	Hliversum ...		Holland	617	Moscow Popoff ...		Russia
307.5	Talinn ...		Estonia	620	Kalundborg ...		Denmark
307.6	Turin ...		Italy	624	Reykjavik ...		Iceland
307.8	Radio Idzerda ...		Holland	629	Istanbul ...		Turkey
309.9	North National ...		Great Britain	635	Boden ...		Sweden
312.8	Bordeaux (PTT) ...		France	641	Vienna (testing) ...		Austria
315	Falun ...		Sweden	645	Moscow ...		Russia
315.5	Zagreb (Agram) ...		Yugoslavia	649	Motala ...		Sweden
318.8	Cardiff (5WA) ...		Great Britain	653	Tunis ...		North Africa
318.8	Cracow ...		Poland	657	Warsaw ...		Poland
322	Natan-Vitus ...		France	661	Eiffel Tower, Paris ...		France
325	Marseilles (PTT) ...		France	665	Moscow (Kom) ...		Russia
328.2	Genoa ...		Italy	669	Ankara ...		Turkey
329	Sofia (Rodno Radio) ...		Bulgaria	673	Davenport (National) ...		Great Britain
332	Dresden ...		Germany	677	Norddeich ...		Germany
332.2	Göteborg ...		Sweden	681	Zeesen ...		Germany
335	Breslau ...		Germany	685	Radio Paris ...		France
337.8	Grenoble ...		France	689	Lahti ...		Finland
341.7	Poste Parisien ...		France	693	Hulzen ...		Holland
345.2	Naples ...		Italy	697	Kaunas ...		Lithuania
	Poznan ...		Poland	701	Konigs wusterhausen ...		Germany
	Brussels (No. 2) ...		Belgium	705	Konigs wusterhausen ...		Germany
	Brunn ...		Czechoslovakia	709			
	Strasbourg ...		France				

The recharging bogey banished by the FULLER 'LIFE PRESERVER'



No longer need you wonder if your accumulator is running down. The Fuller Battery 'Life Preserver' puts an end to all guess work.

Every Fuller L.T. Accumulator of the Free Acid Type in Glass or Celluloid boxes is now fitted with these simple but invaluable indicators. You can't mistake the message. When both balls are at the top, the battery is fully charged. When the white ball sinks to the bottom, part of the charge has been used. When the red ball sinks, the battery needs recharging immediately.

This is just one more illustration of Fuller attention to details. The L.D.G.H., L.T. Accumulator has other patent devices, exclusive to Fuller. Patented double grease-cup terminals (with moulded polarity signs) preventing corrosion from acid. Mammoth plates, with micro-porous paste. A non-slip metal carrying handle which folds out of the way when not in use. Ask your dealer to show you the L.D.G.H.-2v. 60 A.H. Price, 9/6. (Dry charged). Also other sizes for low intermittent current service.

Obtainable through Fuller Service Agents or any reputable dealer.

2-Volt Mammoth Plate		
Types MSGH—SDGH		
—LDGH or R.P.G.		
Amp. Hours	Price	
22	4/6	
25	5/6	
60	9/6	
120	14/-	
Dry charged.		

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CLIX

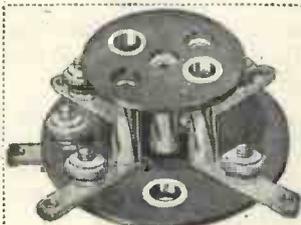
Specified and required

for the

"NEW ECONOMY THREE"

and the

"QUALITY AMPLIFIER"



CLIX VALVEHOLDER

Type B for baseboard mounting

- 4 pin Model with terminals 10d.
- 4 pin Model without " 8d.
- 5 pin Model with " 1/-
- 5 pin Model without " 9d.

"VICEGRIP" WANDER PLUG Specified 1½d.

"FIT-ALL" SPADE TERMINAL 2d. Specified

SOLID PLUG Specified 2d.

SHORT INSULATED SOCKET 2d. Specified

Folder "M" on request.

Cheapest PERFECT Contact

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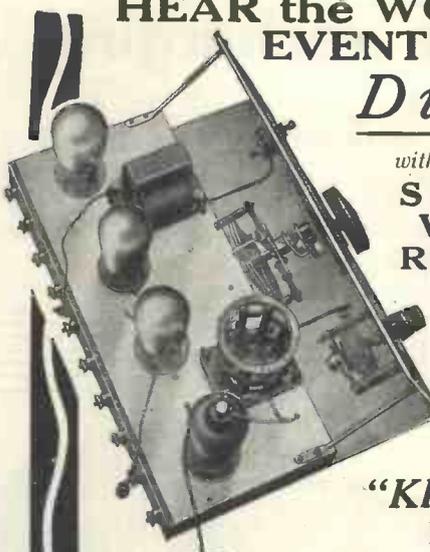
Direct

with a guaranteed

SHORT WAVE RECEIVER

A builder of over 20 Sets says "Yours—is Master of them all . . . and so easy to tune."

THE "KILODYNE FOUR"



The "Kilodyne Four" is a powerful ultra Short-wave Receiver capable of first-class loud-speaker results. It has a wave range of 14-85 metres, but extra coils up to 2,000 metres are available. The set is built on a metal chassis, and tuning is remarkably easy. Reaction is smooth and there are no hand-capacity effects.

For the convenience of Amateurs, components are obtainable individually.

Total Cost of Parts £6 17 6
Blueprint, List of parts and full details, 1/6 post free.

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W.C.2.

Tel.—Temple Bar 2944.



The Cabinet for Your Radio Gram

This is the "Westminster" Radio-Gram Cabinet. It is a fine piece of furniture finished in rich shaded walnut. Ample room is provided for set, speaker, motor and pick-up 28/10/- Write for FREE copy of the new Camco catalogue.



CARRINGTON MFG. Co., Ltd.,
Showrooms: 24, Hatton Garden, London, E.C.1
Phone—BOL 8202. Works—S. Croydon.

NAME

ADDRESS

60 m.a. at 250 Volts with the NEW MAINS UNIT

Recognising the demand for a high-power Unit giving perfect freedom from hum, Heyberd have designed the finest Mains product this season. Guaranteed Three Years against breakdown, Model C.250 is a Unit suitable for every Receiver

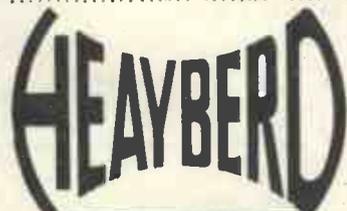
MODEL C.250

Alternative outputs of 250v. or 200v. at 60 m.a. Four H.T. tapings—60/80v. Variable S.C., 0-150 Variable, 100-200 Variable, 250 Fixed. Special smoothing. Westinghouse rectification. Polished Steel Case. Ready assembled. 137/6 Requires wiring up only. Point-to-Point Diagram. L.T. 4v. 6 amps for A.C. Valves, 8/- extra.

I enclose 3d. stamps for full details of the new Mains Units together with circuit diagrams on the latest Transformers.

M

Address



MASTERS OF THE MAINS.

10 Finsbury Street, London, E.C.2

EASY TERMS

We supply all good quality Radio Receivers, Components and Accessories on deferred terms. We carry adequate stocks and can give prompt delivery.

NEW GOSSOR 1932 EMPIRE KIT No. 234.—A remarkable advance on last season's model.

Cash Price, £6/15/0
or 10/- with order and 10 monthly payments of 13/6.

NEW HEYBERD A.C. ELIMINATOR KIT C.150.—Complete Kit of Parts for building an H.T. Eliminator, including steel case. Output 25 m.a., 150 volts, 3 H.T. Tappings, one variable.

Cash Price, £3/18/-
or 7/6 with order and 11 monthly payments of 7/-.

12 EXIDE W.H. HIGH-TENSION ACCUMULATORS (120 volts, 5,000 m/a.). Higher voltages if desired.

Cash Price, £3/15/-
or 7/6 with order and 11 monthly payments of 7/-.

Carriage charged on all orders from Scotland.

N.K. FARRAND INDUCTOR LOUD-SPEAKER UNIT.—Quality of reproduction almost equal to a moving-coil speaker.

Cash Price £3/10/-
or 5/6 with order and 11 monthly payments of 6/6.

B.T.H. PICK-UP AND TONE ARM.—One of the best pick-ups available.

Cash Price, 45/-
or 5/- with order and 9 monthly payments of 5/-.

NEW BLUE SPOT 66R UNIT.—The finest balanced-armature movement on the market. Complete with large Cone and Chassis.

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or 5/- with order and 10 monthly payments of 5/-.

NEW CELESTION MOVING COIL L.S. UNIT (PERM. MAGNET), with Transformer.

Cash Price, £4/5/-
or 13/6 with order and 10 monthly payments of 8/-.

Send list of requirements and quotation will be sent by return.

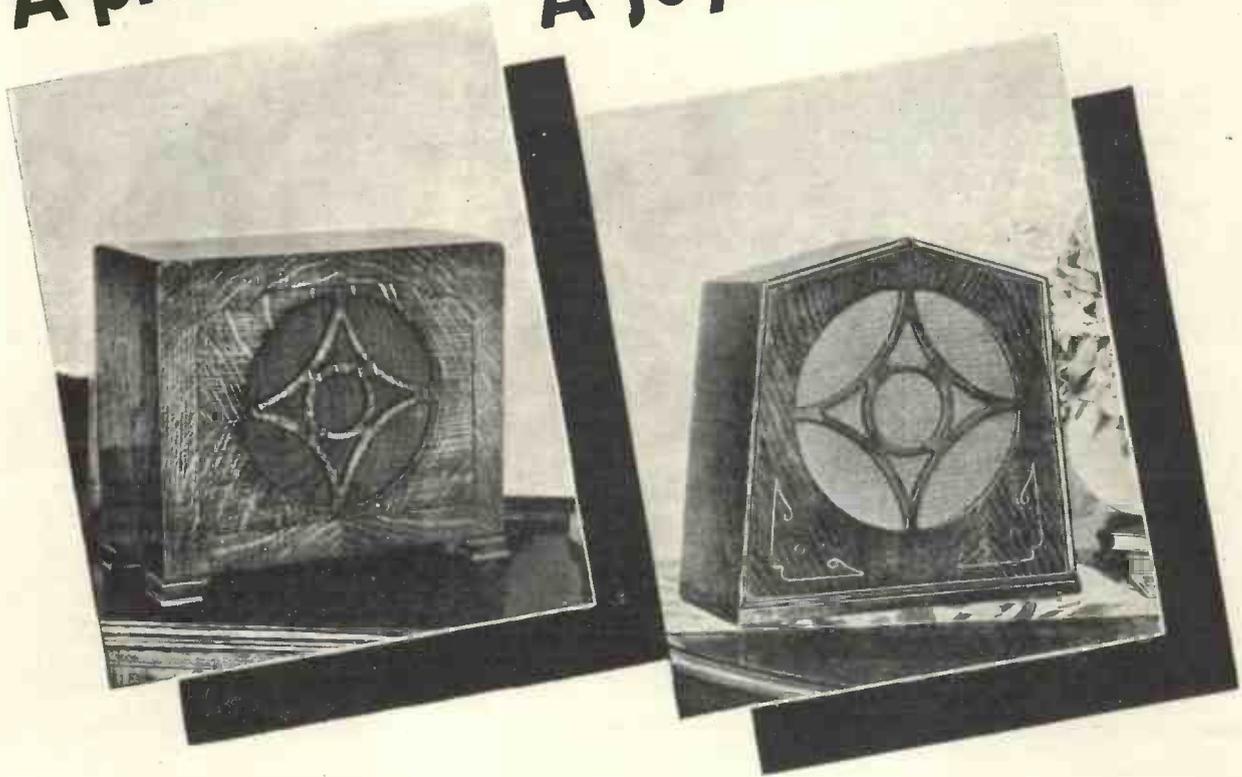
LONDON RADIO SUPPLY CO.

11 OAT LANE

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Telephone: National 1977

A pleasure to look at ...
A joy to listen to !



BRITISH MADE THROUGHOUT

Illustrated above on the left is the
BLUE SPOT INDUCTOR TYPE
SPEAKER 100D.

Price complete **63/-**

Illustrated above on the right is the
BLUE SPOT SPEAKER 44R, also
in Oak. Price complete **52/6**

Write for catalogue W.M.11 showing complete range of speakers.

ARENT they beautiful—these new BLUE SPOT Loud Speakers with their graceful lines, delightful proportions and lovely graining of fine quality woods. They will enhance any room, harmonise with any furniture.

And the beauty of their appearance is reflected in the beauty of their tone, the faultlessness of their reproduction. Harshness is a word meaningless in their presence, distortion and blurring are unknown to them. Their reproduction is life-like, unbelievably, astonishingly life-like. They make listening-in a pleasure—even the most exacting critic will admit their perfection.

Your dealer is proud to sell these speakers. He will demonstrate them with pleasure. Ask him to do so to-day.

Ask to hear the New BLUE SPOT RECEIVERS
—a triumph of modern technical skill. Ask for descriptive leaflet.



Registered Trade Mark

THE BRITISH BLUE SPOT COMPANY LTD.

BLUE SPOT HOUSE, 94/96 ROSOMAN ST. ROSEBERY AV., LONDON, E.C.

Telephone: Clerkenwell 3570. Telegrams: "Bluspot, Isling, London."
Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (Sheffield and London) Ltd., 100, London Road, Sheffield: 22, St. Mary's Parsonage, Manchester: 183, George Street, Glasgow.

IN TUNE WITH THE TRADE

FETTER LANE'S Review of Catalogues and Pamphlets

SEND TO US FOR THESE CATALOGUES!

Here we review the newest booklets and folders issued by five manufacturers. 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.

My name and address are:—

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

WIDE IS THE RANGE

Coils made this way,
Coils made that;
Wide is the range of coils.

(With apologies to the poet.)

THIS is how Lewcos open the first page of their new catalogue. Appropriate, I think, if not complimentary to the poet! The new book is of outstanding importance, because in it are circuits, tuning curves, and details of many newcomers—including band-pass filters and super-het kits.

It is not only a coil book, though. Frame aerials, spaghetti resistances, high-frequency chokes, transformers, and low-frequency chokes are included and there are a number of useful wire tables for Lewcos wire of all kinds.

There are circuits and connection diagrams for many of these parts, such as the low-frequency chokes and transformers, and I really do class this book among those which should be in every set builder's "den." **225**

HIGH-QUALITY MASS PRODUCTION

TEISEN is one of the firms making a real honest attempt at mass production on a high-quality basis. Highbrows are apt to turn up their noses at cheap parts. There is a long-standing impression among knowledgeable wireless folk that good radio gear must be costly.

The real answer is that, provided one goes about the manufacture in the proper way, it is possible to keep up the quality of mass-production parts. The result in the case of Telsen is amazing value.

Take chokes, for instance. Good tapped chokes, having a high inductance value when a reasonable D.C. current is flowing, have been dear in the past.

Telsen set a new standard by bringing out a 40-henry choke for heavy-duty

work at a price of only 8s. Low-frequency transformers with 3 to 1 and 5 to 1 ratios can be obtained for only 5s. 6d.

These are just a few examples of the value I find in the new Telsen catalogue. **226**

NEW VARLEY PARTS

VARLEY have just sent me a very convenient thumb-indexed catalogue. This deals with tuning components, resistance-capacity couplers, and resistances of all types.

The thumb index runs from sections B to E, and the whole manual should be included with your existing Varley literature. Other sections deal with transformers and chokes, power transformers, smoothing equipment, and potentiometers. Since the very early days of wireless Varley have had a famed name for being able to make good wire-wound components.

There is a skilled knack in this, no matter whether it is a resistance or a choke. I know from experience that one can put the utmost faith in Varley wire-wound parts and that is why I feel sure the new series of wire-wound resistances will be popular. **227**

GRAMO-RADIO GEAR

A GOOD many manufacturers produce pick-ups, turntables, volume controls, and other electric gramophone accessories as side lines, but Harlie go in for this side of radio in a wholehearted manner.

I have just been looking through their new booklet—a production I recommend to every gramo-radio enthusiast. Here is a wealth of information about many types of pick-ups, adaptors, gramo-radio switches, tone selectors, and electric-gramophone drives.

The technical section of this booklet includes a number of "hook-ups" which should go a long way towards helping a set user who is not quite clear how to fit accessories, such as pick-ups, tone controls, and scratch filters.

Altogether a useful little book, and free if you write through my catalogue service. **228**

A UNIVERSAL MOTOR

ALL of you who have electric-light mains laid on will be interested—as I was—in the new Macom universal gramophone motor made by Beta Electric Motors, Ltd.

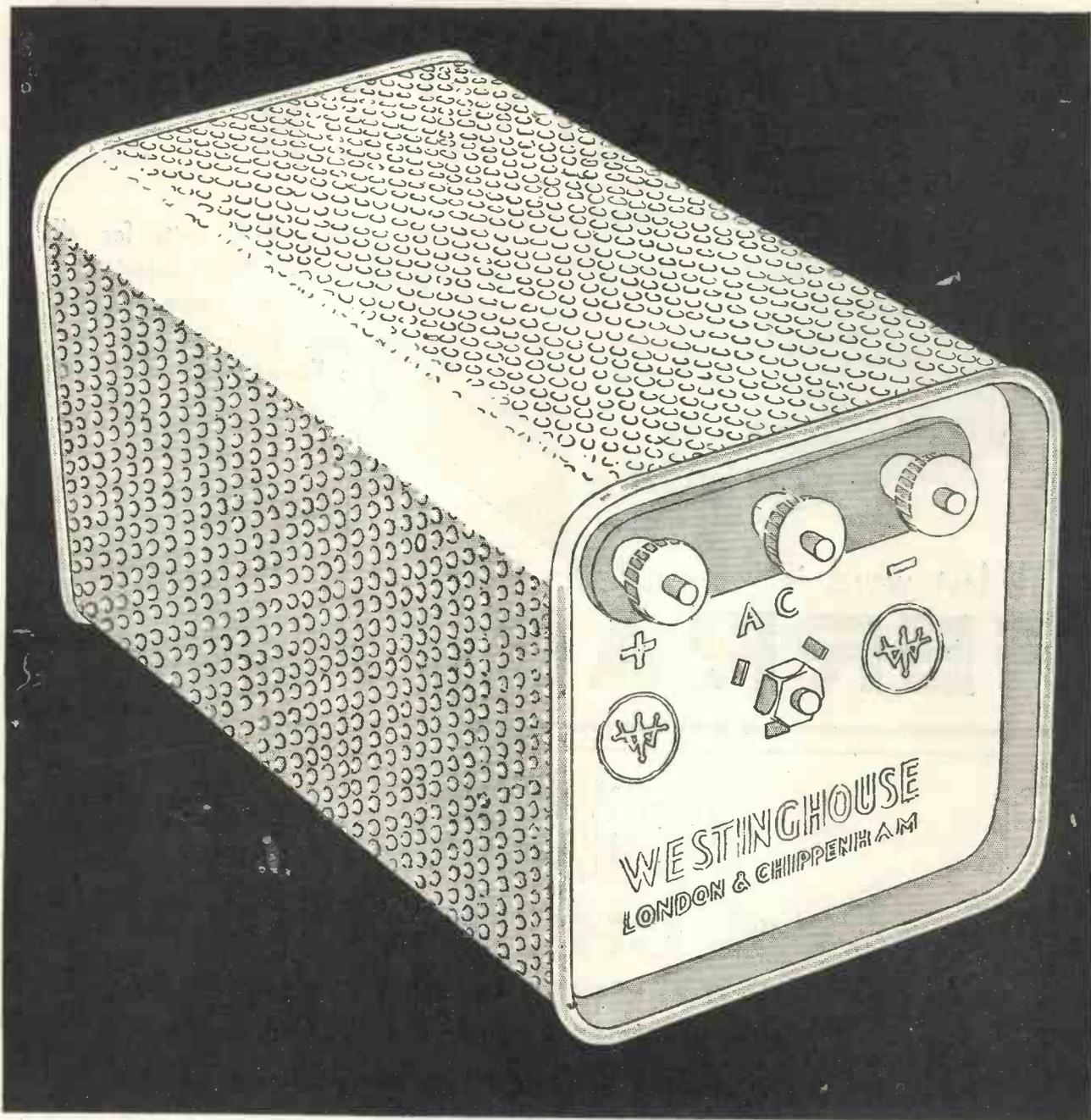
Special points about this production are that it has an on-off switch; a solid base containing a two-pole field winding; turntable and housing for rotor winding; speed regulator; voltage-adjustment tapplings; mains lead; pick-up volume control; automatic start and stop; arm with spring-weight adjustment for Macom (Limit) pick-up; and pick-up terminals.

The unit can be used on A.C. or D.C. mains and the price complete is only £4 12s. 6d. You can get further details if you are interested—and you are certain to be if you have electric light—through my free service. **229**

THE WIRELESS ZOO

*The Interferer is an ape
That wireless fans cannot escape;
His meddling, mischief-loving paws
Grab at a Set, Detecting flaws.
He gibbers: "This is working wrong,"
And yanks it all to bits ere long
Then, dashing off without regrets,
Leaves what was once the prince of Sets
A muddled, wiry hopeless shape—
N.B.—Men do not like this ape.*

LESLIE M. OYLER.



YOU can use this H.T.8, or one of its brothers, for running your radio set from the electricity mains; "The All-Metal Way" tells you how.

The 1932 edition of "The All-Metal Way," which will be sent on receipt of the coupon with 3d. in stamps, gives the information required to build an H.T. eliminator or trickle charger, and details for running moving-coil loud-speakers from A.C. mains. This well-known book has been completely revised, and questions not fully dealt with in our 1931 issue are now discussed in detail.

The H.T.8 has an output of 250 volts 60 m.a. (after smoothing). Its price is 21/- Other H.T. types are from 12/6.

WESTINGHOUSE
METAL RECTIFIERS

-----COUPON-----
 PUBLICITY MANAGER, Westinghouse Brake & Saxby Signal Co., Ltd., 62, York Road, King's Cross, London, N.1. I enclose 3d. in stamps, for which please send me a copy of "The All Metal Way, 1932."
 PLEASE USE BLOCK LETTERS.
 Name

Address.....

.....

W.M. 12

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82, YORK RD., KING'S CROSS, LONDON, N.1. Tel.: North 2415

Mention of the "Wireless Magazine" will ensure prompt attention

SILENT
AMPLE
SAFE

FOR
POWER



New H.T. units for all needs. Your surest way to better radio. Settle your H.T. problem with a Ferranti H.T. Unit.

E1.	115 m/a	200 volts	£11 11 0
E2.	15 m/a	120 volts	£3 10 6
E3.	25 m/a	150 volts	£4 16 6
E4.	70 m/a	240 volts	£8 11 6
and 4 volts 5 amps. A.C. for indirectly heated, & 4 volts 1 amp. for Output Valves ..			
FOR ALTERNATING CURRENT ONLY.			
The Eliminator type E4 has been designed specially for Super Hets.			

The last word is

FERRANTI

FERRANTI LTD. Head Office & Works:
HOLLINWOOD, LANCASHIRE
LONDON: Bush House, Aldwych, W.C.2

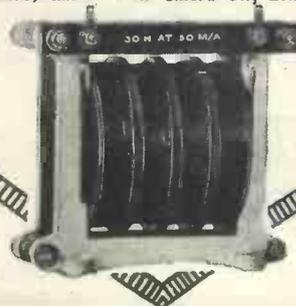
PARMEKO

CHOKES

SPECIFIED IN THE
D.C. QUALITY AMPLIFIER
DESCRIBED IN THIS ISSUE
NOTHING BUT THE BEST IS USED
BY THE "WIRELESS MAGAZINE"

PARTRIDGE & MEE, Ltd.

Leicester (Cent. 22276) and 74 New Oxford St., London, W.C.1. (Mus. 5070)



Advertisers like to know whence the business comes—please mention "W.M."

Buy British by all means but let it be the Best — ROLA



If you want a speaker which brings studio quality and volume into your own home, one which is British built and better in every way than units selling at three times its price, ask for ROLA. Rola responds evenly at all frequencies, is compact, and light; sturdy, and trouble free. That is why it has been unhesitatingly selected for use in the "Music Lover's Two"—it gives the supreme tone quality and volume which music lovers expect and demand. Rola offers both field-excited and permanent-magnet models, suitable for all voltages, and with a choice of speech transformers. Write for catalogue to-day.



Series F units 7 3/4" cones, all D.C. voltages

27/6
EACH

Series P.M. Permanent Magnet, 7 3/4" cones

50/-
EACH.

Transformer—either Single, Push-Pull, or Pentode, 7/6 extra.

THE BRITISH ROLA Co., Ltd.

Wholesale Distributors:

THE ROTHERMEL CORPORATION LTD.
Brondesbury Works, 1a, Willesden Lane, N.W.6
Telephone: Maida Vale 5061

THE NEW INSURANCE SIMPLIFIED

Protects your family from poverty
and ensures an income of
£300 to £3,000 A YEAR
(free of Income-Tax)
for a deposit ranging from
ABOUT £10 A QUARTER
(according to age).

A man can die old and leave behind comparative poverty. YOU can die young and LEAVE THE FUTURE WELL PROVIDED FOR!

WONDERFUL NEW COMBINATION OF BENEFITS

Today, in young manhood, you can secure one of the latest types of Life Insurance Policies, which provides for your widow and dependants. They receive an immediate cash payment and an assured income for the most needful years, followed by another cash payment—all sufficient to keep the family in the comfortable circumstances in which you would have maintained them yourself.

**IT COSTS SO LITTLE NOW TO
MAKE THEM COMFORTABLY
OFF IN LATER YEARS**

Whether married or single enquire now:—

To WALTER HERRIOT, A.C.I.B.,
"Riselaw," Orpington, Kent.

Please send me particulars of The New Life Insurance, which does not place me under any obligation whatever.

Name..... Age.....

Address..... Please write in BLOCK letters

Incorporated Insurance Broker and Organiser of Group Endowment Schemes.

THE POST OFFICE REPLY

A Letter of Thanks from the Postmaster-General

LAST month, in an article entitled "This Pirate Business!" we criticised the "scare methods" employed by the Post Office in its efforts to catch wireless pirates.

On the day of publication a copy of the November issue of WIRELESS MAGAZINE containing this article was sent to the Postmaster-General and his comments were invited.

We are now able to reproduce the official reply received from the Post Office:—

obligation to take out wireless licences.

You will be glad to know that, as a result of the campaign conducted during the last few weeks, upwards of 150,000 new licences have been issued, in addition to renewals of existing licences.

This Department cannot take responsibility for all the statements that have appeared in the Press concerning the conduct of the campaign.

For obvious reasons, it is not considered desirable to make any official announcement describing in detail the types of apparatus used and the exact methods employed in the detection of unlicensed listeners.

I am, Sir,

Your obedient Servant,

F. W. PHILLIPS.

General Post Office,

London, E.C.1.

To the Editor,

WIRELESS MAGAZINE.

SIR,—I am directed by the Postmaster-General to acknowledge the receipt of your letter of the 21st October enclosing a copy of the November number of the WIRELESS MAGAZINE and to express his thanks for the assistance you have given to this Department in its efforts to ensure that all persons who use wireless sets shall comply with their legal

BROADCAST IDENTIFICATIONS

In conjunction with Jay Coote, WIRELESS MAGAZINE has organised a new service that will be of great value to all listeners in calibrating a new receiver or compiling a log.

This Broadcast Identification Service, as it is called, is available for identifying stations from information supplied by readers. Only stations giving a regular broadcast service can be dealt with.

The fee is 6d. for identifying any one station, but if three identifications are required at any one time the fee is only 1s. A stamped addressed envelope must be supplied and the following details given:—

- 1.—What type of set are you using?
- 2.—Date and time when transmission was heard. A.m. or p.m.?
- 3.—Approximate wavelength.
- 4.—Call or interval signal, if heard.
- 5.—Details, if any, of programme received.
- 6.—WRITE LEGIBLY on one side of paper only.

Address your enquiry to Broadcast Identification Service, WIRELESS MAGAZINE, 58/61 Fetter Lane, London, E.C.4.

REALISM

that gives Radio a sparkle of Romance

Once you hear the new MoToR Units you will understand why they are acclaimed to be the loud-speaker sensation of the year. Their startling brilliancy of tone, their punch, and musical beauty are beyond comparison. Rich rendering of bass notes, bell-like clarity of high notes, give a new interest to listening-in . . . A Sparkle of Romance to your radio nights' entertainments. Three MoToR Units, three corresponding Chassis assemblies, and five beautiful Cabinet Speakers are priced to please your purse and to suit the output of YOUR set.



MOTOR SUPER POWER UNIT
Type S9 **35%**

The masterpiece of all balanced armature units—with double magnets, super sensitive adjustment, amazing punch, and beauty of tone.

Unit with special Cone, completely assembled on MoToR Chassis **56%**
C90

MOTOR

LOUDSPEAKERS · UNITS · CHASSIS

TEKADE RADIO & ELECTRIC, LTD.

147, FARRINGDON ROAD, LONDON, E.C.1

Northern Wholesale Distributors: L. KREMNER, Ltd., 2 Bradshaw Street, Manchester.

Agent for Scotland: R. G. J. NISBET, 132 Renfrew Street, Glasgow, C.2.

West of England: BRUNWEC, Ltd., 28 Cumberland Street St. Paul's, Bristol.

INEXPENSIVE KB RADIO!

A star performer

THE K.B. 279 3-valve S.G. All-Electric Receiver for A.C. Mains utilises a screened-grid H.F. Amplifying Valve, Detector and high voltage Pentode output valve. It is very sensitive and selective and will give excellent reception from a good number of British and Continental Stations.

Operation is very simple, tuning being effected by means of a ganged condenser with single knob control, with "trimmer." A clearly marked illuminated condenser scale is provided, calibrated for direct reading of wavelengths on both long and short wave ranges, while an excellent Moving-coil Speaker is incorporated in the handsome Walnut finished Cabinet. Provision is made for mains-aerial reception, the use of a gramophone pick-up and additional speaker if desired.

K.B. 279, complete with Moving-coil Speaker, Valves and Royalties £18 18 0 or 38/- down.

Ask your dealer for demonstration and details of Hire Purchase Terms or send form below.



KOLSTER-BRANDES

BRITISH MANUFACTURE


RADIO
Authorised
DEALER
Look for
this sign

To Kolster-Brandes Ltd., Gray Works, Sidcup, Kent.
Please send me fully illustrated Brochure, describing
K.B. Receivers, with the name of nearest K.B.
dealer. Name Address
W.M.3

You will get prompt replies by mentioning "Wireless Magazine"

THE ECONOMY VALVE FOR THE ECONOMY SET!

AS RECOMMENDED FOR THE "NEW ECONOMY THREE"

MANUFACTURERS: OCTRON LIMITED

LONDON
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BIRMINGHAM
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BRITISH MADE

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BRITISH MADE

HF, HL, LF TYPES 5/-
POWER 6/9 SUPER POWER 8/-
SCREENED GRID 12/6

RECOMMENDED BY THE WIRELESS MAGAZINE
FOR THE "NEW ECONOMY THREE"

THESE VALVES ARE MADE THROUGHOUT IN BIRMINGHAM

HERE'S THE CABINET *for the*

WIRELESS MAGAZINE

"ETHER ROVER"

BUILT by a firm who are specialists in Radiocabinets
constructed and finished to give the greatest efficiency
and perfect acoustic results.

This cabinet, No. 118 Pedestal, is constructed with hinged lid, loose canvas back and a substantially built baffle. The height is 35½ in., length 22 in., depth 12 in. The panel fret is 15½ in. by 5½ in., and is fitted with an 18 in. by 10 in. baseboard.

This cabinet is only one from our extensive range of designs which are ideally suitable for the home constructor. That's why it was selected for this super efficient set. PRICE **£2:11:0** COMPLETE.



RADIOCABINETS

GLOBE WORKS, STAFFORD STREET, **WALSALL**

Agents for London and Southern Counties:
W. J. HOLLAND & CO., 180, BISHOPSGATE.

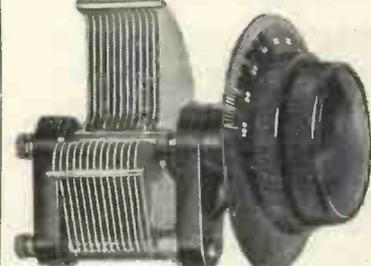
Phone: WALSALL 2475.

as easy as that!



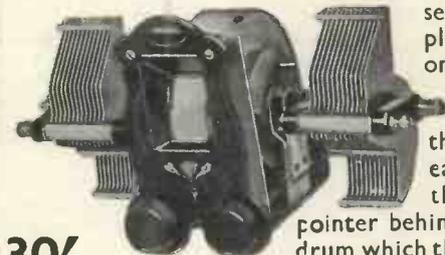
SLOW MOTION CONDENSER
cuts out close stations with amazing accuracy

The selective qualities of your set depend upon the efficiency of the condensers. Fit the new Formo slow motion with the silky drive—it makes all the difference. Price **6/-**



DUAL AND TRIPLE GANGS

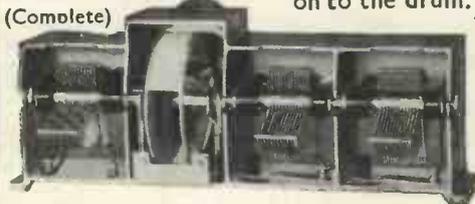
DUAL GANG
The two Condensers are completely insulated one from the other. The position of the stators can easily be seen as there is a hidden



pointer behind the celluloid drum which throws a shadow on to the drum. Price **18/6**

30/-
(Complete)

TRIPLE GANG
(Completely screened)



Incorporating the same stator indicator as Dual Gang. Housed in rigid casting

Obtainable from all Radio Dealers. Ask us to send you complete Catalogue.

ARTHUR PREEN & CO., LTD.
GOLDEN SQUARE, PICCADILLY CIRCUS, LONDON, W.1.
See also pages 618 and 499

12/6
45/-

Comparisons
The acid test of a loud-speaker's qualities, or lack of them, lies in performance. Appearances can be deceptive, and price is no criterion. Compare the R. & A. "100" with any other Permanent Magnet Moving Coil at any price and note its superiority. Compare it with other low priced P.M.M.C. Speakers and the difference will amaze you. You need a speaker which will faithfully reproduce speech and music, and render years of unvarying service and a high quality of reproduction. In short you need an R. & A. "100."

Ask your dealer to demonstrate and refuse a substitute. Write us for descriptive leaflet. Post Free.
REPRODUCERS & AMPLIFIERS LTD.
Frederick Street
Wolverhampton.

The R & A "100" PERMANENT MAGNET MOVING COIL REPRODUCER

BECOL QUALITY EBONITE
SPECIFIED FOR
DOUBLE BAND-PASS THREE QUALITY AMPLIFIER
14" x 7" 5s. 10d. 12" x 6" 4s. 1d.
USE THE FAMOUS BECOL FORMER 26 TYPES

SOLE MAKERS:
The BRITISH EBONITE Co., Ltd.
HANWELL, LONDON, W. 7

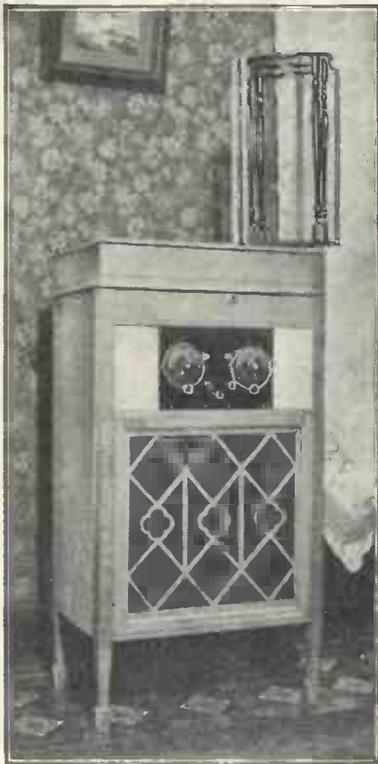
IT'S THE LIMIT YOU ARE WANTING

THE PICK-UP with the Adjustable Reed
Combined Pick-up and Arm

H. T. BARNETT, Esq., writes: "The variable damping feature is so valuable that the LIMIT should certainly be added to the Radiogram."
Pick-up only with leads and Ferrules 21/-
32/6

LIMIT RADIO LTD., 15-23 Windsor Street, Essex Road, N.1

It helps us if you mention "Wireless Magazine"



A NEAT JOB
Here is a Super 60 constructed by a Kensington reader. It delivers the goods!

SUPER 60

(March, 1931)

BELFAST.—I am very satisfied with the Super 60. I am not a knob-twister, however, and am looking forward to seeing a new version for battery-users with a *de luxe* output stage.

BETHNAL GREEN (London).—I am very proud of the Super 60. As I live in "buildings," I have not been able to get many stations until building your marvellous set. My friends who have seen and heard it admire the work of Mr. James.

CARMARTHEN (South Wales).—I built the Super 60 soon after you published the details and have had no trouble to get results equal to those you claim. The uncanny selectivity of the set is a wonderful asset on the medium waveband, where such a fine selection of worth-while programmes are broadcast. I have never counted all the stations I have picked up, but have had all the usual ones on long and medium wavebands. Results on the short waves have been remarkably good, Moscow, PCJ, and Rome being the most consistent. I

am sure that anybody who builds the Super 60 will find that it does all you claim.

DOVER.—Stations are too numerous to mention and all are received at loud-speaker strength and absolutely clear of interference and heterodynes. I consider this the finest set; selectivity, quality, and volume are all that one can wish. I have heard several American stations and several European on the ultra-short waves. It puts everything else in the shade. Mr. James will certainly have to

think hard before he can produce a better one, even at double the price.

GRIMSBY (Yorks).—I am more than delighted with the results; it does all that is claimed. Before building the set I never knew there were so many stations and such an easy manner which they can be tuned in. One has to handle the set to believe it. Quality is the most outstanding feature.

HAWKHURST (Sussex).—I am absolutely amazed at the performance it puts up. The conclusion I have come to is that if you are going to be absolutely frank about it and you really do want good quality of reproduction, coupled with real knife-like selectivity, you must have a Super 60. I think I say this with every proof, as I have been intimately connected with the radio business since 1921.

OLTON (Warwick).—It is truly a marvellous set. On the long-wave band Hilversum, Königswusterhausen, Radio Paris, Daventry, and Eiffel Tower are received at good strength during daylight.

STOCKPORT (Cheshire).—For power, selectivity, and quality it is my honest

opinion amongst all the sets I have heard, or heard of, the Super 60 stands alone. I heartily endorse all the claims made for the set. Everyone who has heard my outfit has nothing but praise for the set and when they see the high-power stations disappear on half a degree of the dial it seems like magic.

From Overseas

JALNA (India).—The Super 60 is the ideal set for India. I have received all the usual good stations, including Chelmsford, Rome, PCJ, Sydney, Schenectady, Moscow, and several others which I have not identified. All these at loud-speaker strength.

OSLO (Norway).—I have not a moment's hesitation in saying that Mr. James' Super 60 is by far the best receiver I have ever had, and I have hooked up quite a number of sets during past years. What strikes me is the wonderful selectivity, combined with excellent quality of reproduction and ease of operation. These are factors to which I attach considerable importance. My station log, as at October 1, shows a total of eighty-nine. Of course, not all of these stations are equally good, but it remains a pleasant fact that the entertainment value of the Super 60 is of a very high order.

What has hitherto been considered an impossibility in this city is easily accomplished by the Super 60. I refer to receiving Kalundborg quite free of any interference from our local powerful Oslo station. That alone is sufficient proof of the outstanding nature of the Super 60.

PORT ELIZABETH (South Africa).—I can log stations on practically every degree of the oscillator condenser. London Regional and Mühlacker come through with tremendous volume.

The market, locally, is being flooded with American sets and I have compared the Super 60 with expensive consoles and special A.C. commercial jobs, but the per-

formance is not to be compared. Volume without quality is of no use to me.

PRETORIA (S. Africa).—On the medium waveband the results obtained are remarkable. During July the following stations were received at loud-speaker strength: London National and Regional, Mühlacker, Rome, and Stockholm. Although selectivity is of little importance in South Africa, it was interesting to be able to receive Rome on 441 metres without a trace of Johannesburg. Johannesburg operates on 450 metres and about 15 kilowatts, thirty-six miles from Pretoria.

A.C. SUPER 60

(May, 1931)

CONISBOROUGH (Yorks).—Results are excellent. For quality and selectivity I could not wish for anything better. Long-wave reception is good in daylight. I can log Hilversum every morning, for breakfast-time music, at splendid volume and quality. I can get Berlin when 5XX is working, which is a good test. I have not kept a log of stations heard, but the sixty stations claimed is a conservative estimate for this set.

HARRINGAY (N. London).—It really gets stations well. I have logged about thirty on the medium waves and about five on the long waves. I am enraptured with the performance of the set, because the area where I live is very bad for reception. Last night I was listening to Rome, and German and Swiss stations, and in most cases the volume was so great that I had to reduce it.

HARLESDEN (N.W. London).—A line in appreciation of the hours of joy that Mr. James and his A.C. Super 60 have given me. The all-round performance cannot be put on paper, it has got to be heard and seen to believe. My set is open for inspection. My lcg so far is 146 stations, and not out yet. The American stations, WGY, etc., come in at wonderful strength.

WIRELESS BATTERY CELEBRATES A "BIRTHDAY"

London Owner Amazed

Are you interested in longer life for your wireless batteries? If so, read this letter from Mr. Harris, of London.

Dear Sirs,

On the occasion of the first birthday of my 105 volt EVER READY POWER Battery put into use on the 21st March, 1930, I should like to congratulate you on its remarkable performance.

It has had an average use of 5½ hours per day on a 3-valve set—the majority of the time on the highest voltages for Continental reception.

My friends are all amazed at the clarity of reception and the length of service compared with other makes. I feel I owe you something more than the 24/- I originally paid over a year ago—and so this letter of congratulation and thanks.

Yours faithfully,

F. W. HARRIS, London.

(This letter may be inspected at the offices of the Company.)

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Patentees: Pifco Ltd., High St., Manchester.

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De-Luxe Model shown above on right. For Battery Operated Sets, Electric Receivers and Mains Units. Price 22 : 2 : 0



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IN

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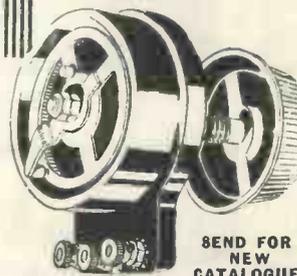
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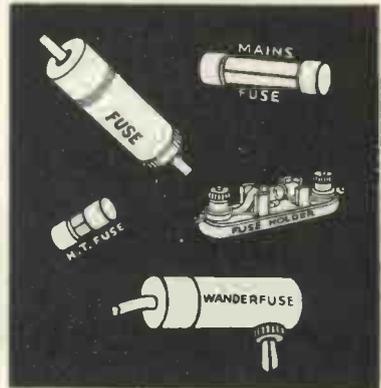


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The Completed Model showing set panel in position.

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102



11



501



L.S.7

Automatic Record Player

(Model 117). In a handsome walnut cabinet of compact design is fitted the new "His Master's Voice" automatic record-changing mechanism, pick-up and volume control. By connecting it to your radio receiver, eight 10 or 12 inch records (unmixed) may be played at one loading or a single record repeated up to eight times. A unit you have been waiting years for. A.C. or D.C.
Price 18 guineas

Armchair Record Player

(Model 116). The new "His Master's Voice" pick-up, volume control, electric turntable motor and automatic start and stop, housed in an oak cabinet of pleasing design. By connecting it to a loud-speaker radio-receiver records may be played from one's armchair. Interchangeable resistances may be clipped in to the volume control to match the pick-up to any radio receiver. A.C. or D.C.
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Moving Coil Loudspeaker

(L.S.7). A permanent magnet moving-coil loudspeaker in an arched walnut cabinet of attractive design. It is extremely sensitive and will handle up to 3 watts without difficulty. A universal input transformer incorporated in the instrument enables it to be matched to receivers with triode, pentode or push pull output.
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(Model 501) 3-valve all-electric (A.C. or D.C.) Moving Coil Loudspeaker. One operating switch. One tuning knob. One volume control. Illuminated wave-length scale. Mains aerial. New type gramophone pick-up with reversible head—operating automatic brake. Plugs for two additional loudspeakers. In walnut cabinet.
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(Model 102). Entirely new cabinet design. New all-metal, one piece sound-box. New metal detachable record tray—capacity 14 ten-inch records. New "slip in" winding handle. New lid-stay, one hand operated. Chromium plating. Automatic brake works without previous setting, on any record. Fittings include leather carrying handle, new lid lock, pivoted needle container, spring clip for box of "Tungstyle" needles.
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Pick-up (Model 11).

This pick-up is similar to the one fitted to all our new instruments. It can be attached easily to any type of tone-arm and is supplied complete with a logarithmic volume control and connecting leads. The weight of the pick-up is 5½ ozs.; it has an input of over 1 volt R.M.S., and a D.C. Resistance of 6,000 ohms.
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"His Master's Voice" December list comprises over 90 records. Every type of music for the festive season is included . . . Dance, Vocal, Instrumental, Orchestral and Humorous, also Hymns and Carols . . . and every one is made by world-famous artists exclusively for "His Master's Voice." No matter what your taste in music may be, you cannot fail to find in the list the records you want.

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PORTABLE ADVANTAGES

One great advantage of a portable set is that it can be moved to any part of the house without difficulty. This photograph shows how it could be used to relieve the drudgery of Christmas cooking. The model illustrated is made by Marconiphone and is one of the most popular ever put on the market.



Buying A Set for Christmas!

By ALAN HUNTER

THIS year the set makers have tried hard to give set buyers better value for money. Compared with previous years, there is every reason to congratulate the radio industry on its efforts. But with such a welter of counter claims relating to performance the average set buyer may excusably be confused when trying to decide which particular model meets his needs.

Worth-while Improvements

I do not propose to mention any sets by name in this article, being more concerned with a just appraisal of the developments the new sets embody. I hope to show what represents worth-while improvement, so that the various claims can be examined by the reader with reserve!

The first thing that strikes me about the new sets, by which I refer, of course, to the factory-built sets, is that they are more complete installations. To-day you usually buy the whole box of tricks *en bloc*, and are not put to endless expense for such extras as loud-speakers, batteries, and valves.

The cabinet of the piece of apparatus designated "set" now more often than not houses the loud-

speaker and the power supply—either a mains unit or batteries.

The only extra is, therefore, the aerial equipment. In many of the mains sets even the aerial is included—in the form of an attachment to utilise the mains conduit as the signal pick-up. Then only an earth is required to put the set into action—not forgetting a suitable mains plug, of course.

This self-contained aspect of the modern set has advantages not perhaps fully realised by the non-technical set buyer. A little thought will show that having the loud-speaker in the cabinet imposes an added responsibility on the manufacturer. His reputation for the set now depends on the correct choice of loud-speaker—and as that choice rests with him there is less chance of ill-matching than when the choice was left to the set buyer.

Types of Loud-speaker

In the self-contained sets of to-day we find two types of loud-speaker. Most common is the moving-coil, either a permanent-magnet model or one deriving its field current from the high-tension supply.

Not all these moving-coils are

capable of the perfection of reproduction attributed to them. Some of them have a bad low-frequency resonance, which is infinitely more objectionable than the entire absence of low notes characteristic of the ordinary balanced-armature cone loud-speaker!

Balanced Tone

Another type of loud-speaker found quite frequently in modern sets is the inductor, and all I have so far heard have been extremely pleasing, giving a balanced tone devoid of boom and yet quite rich in the low notes. Quite without bias, I should say that the inductor loud-speaker gives better quality than the cheap moving-coils of transatlantic inspiration incorporated in some of our so-called "all-British" sets.

As in the previous two years, the mains-operated set has swamped the market, in spite of the fact that statistics prove there is less than half the country on an electric-light supply! The idea of an all-electric transportable has received very little support, only one firm of note retaining a set with frame aerial. Most of the mains sets need the connection of an external aerial for the reception of all

What You Get from the New Receivers!

BUYING A SET FOR CHRISTMAS—Cont.

SETS WE CAN RECOMMEND

FOLLOWING is a list of new sets tested by "Wireless Magazine" that can be recommended; for convenience they are arranged in order of price. The name of the month in brackets indicates the particular issue in which a full-page test report appears:

£3. **EELIX SHORT-WAVE ADAPTOR.**—Converts any battery-operated set for short-wave reception. The coil supplied tunes between 20 and 60 metres. (September.)

£5. **COLUMBIA MODEL 351 TWO-VALVER.**—A two-valve set complete with cabinet, valves, batteries and loud-speaker. (See page 568.)

£6 15s. **REGENTONE A.C. TWO-VALVER.**—A two-valve A.C. set in a brown moulded bakelite case. No loud-speaker is incorporated. (October.)

£11 10s. **MARCONIPHONE MODEL 246 A.C. TWO.**—Incorporates two mains valves, but has no loud-speaker. A table-cabinet set. (November.)

£15 15s. **FERRANTI THREE-VALVE CONSOLE.**—A three-valve A.C. set with built-in inductor loud-speaker. The dial is calibrated in wavelengths. (See page 569.)

£15 15s. **EKCO THREE-VALVE CONSOLETTA.**—A three-valve table-cabinet set with balanced-armature loud-speaker. Works from A.C. mains. A moulded bakelite cabinet is used. (November.)

£18 18s. **KOLSTER BRANDES KB279 THREE-VALVER.**—Walnut-finished cabinet with built-in moving-coil loud-speaker. Terminals are provided for using a pick-up. (See page 570.)

£21. **GECOPHONE TABLE FOUR.**—A table-cabinet set with two screen-grid valves. Power is taken from A.C. mains and an external loud-speaker is needed. (November.)

£27 10s. **GECOPHONE SIX-VALVE SUPER-HET.**—A battery-operated six-valver, operating on wavelengths between 13 and 730 metres. (September.)

£30 9s. **HIS MASTER'S VOICE TABLE RADIO GRAMOPHONE.**—A three-valve set with moving-coil loud-speaker, electric turntable and gramophone pick-up. Works from A.C. electric-light mains. (November.)

£50 8s. **McMICHAEL RADIO GRAMOPHONE.**—An A.C. set in a handsome walnut cabinet. Three valves are incorporated—screen-grid, detector, and pentode. (September.)

but the local broadcasting stations.

I find that the mains aerial attachment—which is nothing more than a fixed condenser connected between the mains aerial terminal and one of the mains leads—works extremely well with the bigger sets, such as four- and five-valvers, but severely limits the possibilities of the three-valvers. For these sets nothing less than an external aerial will do, unless only the local stations are desired.

More Valve Stages

Generally speaking, sets this year are using more valve stages. There is a welcome tendency to incorporate two screen-grid stages, followed by a power-grid detector. This means that only a small aerial is needed to get quite a number of foreign stations at good strength.

Other significant improvements include band-pass tuning, first used by the amateur and now adopted by the factory designer as the only way of obtaining 9-kilocycle separation of stations without greatly adding to the number of valves. Fortunately, this complication of tuning has not meant any increase in the number of tuning knobs, due to the development of gang condensers with accurately matched sections.

These condensers are now usually screened, and so are the associated coils, these tuning components forming part of all-metal chassis that make for stability, ease of assembly, and low production costs.

The undistorted power output of

the latest sets is greater than ever, being between 1 and 2 watts for the average three- and four-valvers. This means that more volume without blasting on the loud passages can be obtained. Most of the sets give more volume than is needed for the average domestic requirement. There is a tendency to overlook the fact that most people live in relatively small rooms these days. Some of the sets seem to be designed to fill the whole house!

Almost without exception the new sets have improved controls. The most notable improvement is in tuning. Instead of marking the dials in degrees they are now calibrated in wavelengths. These must not be taken too literally, but most of them are near enough for all practical needs. More ambitious makers have calibrated the dial in stations. Let us hope they have spare discs in readiness for the successor to the Prague Plan!

Better Volume Controls

Having grumbled consistently about volume controls in previous years, I must acknowledge the fact that most of the better sets in this year's ranges provide an admirable control of volume, and some even provide control of the pick-up output. The difficulty of controlling the volume of stations varying in strength from the powerful local to the weak foreigner has been overcome by the fitting of a local-distance switch.

In the "local" position, this switch

shunts the input tuning circuit with a suitable resistance, so that the first valves are not overloaded and the volume control has a chance to do its job.

Mechanical Ingenuity

The mechanical ingenuity of some of the switches on the new sets is deserving of considerable praise. I find the most unexpected things being done by innocent-looking little switch knobs! The mains or battery switching is now frequently incorporated in the wave-changing switching, and sometimes this also includes the gramophone pick-up switching.

What a pity all these improvements should be devoted almost exclusively to the mains-operated sets. Except for one or two good portables, there is absolutely nothing to record about battery sets. I do think this neglect is remarkable, yet it seems to be universal.

Among kit sets we find more attention given to the battery listener, who this year is well served with three-valvers of excellent design. Band-passing is not very popular among the kits makers, presumably on account of expense.

Radio Gramophones

One of the most remarkable price competitions in the radio trade centres around radio gramophones, which started as luxury instruments for the connoisseur, but which now bid fair to oust the ordinary pedestal set from the popular price market!

Three- and four-valve radio gramophones, provided with moving-coil loud-speakers and working from A.C. mains, are now selling at 30 and 40 guineas.

Other average prices will interest intending set buyers. I should say £20 is a fair price to pay for a three- or even a four-valve A.C. set with self-contained moving-coil or inductor loud-speaker. The local-station listener with mains can get a good two-valver for under £10.

Efficient portables for battery operation should not cost more than £20 and several are available around £15. Complete three-valve kit sets are sold for about £8. Nobody need spend more than £30 on a completely satisfactory installation, although for the plutocrat there are a few super-het radio gramophones at about £70!

Give Radio Gifts!



It is not easy to pick out a selection of radio gifts suitable to go with any type of set. Here, however, we give seven suggestions that will be acceptable to the owner of almost any type of receiver. The prices of the gifts vary from 2s. 6d. to £5—there is something to suit every pocket.



Great fun can be had with a home-recording outfit, which can be used in conjunction with any radio gramophone. The complete Kingston-Wearite gear for making records of broadcast programmes costs £3 7s. 6d. For making personal records, either of speech or of music, a microphone is needed in addition; the cost of this is 2 guineas.



The Magnum Short-wave Converter enables any battery set to be used for the ultra-short wave stations. The price of £3 15s. includes two coils that tune from 20 to 40 and from 40 to 80 metres respectively. The unit has been tested and can be thoroughly recommended. It will give the ordinary set owner an entirely new range of programmes.



Any housewife who has had a carpet spoilt by spilled acid will be glad to see a C.A.V. jelly-acid accumulator, which is quite unspillable and can be used in any position. This is a good gift to give to any battery-set owner. The cost of a 2-volt cell having a capacity (actual) of 20 ampere-hours is 13s. 6d.



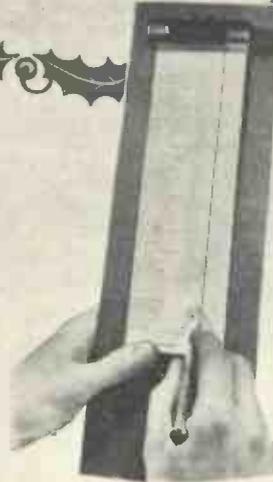
This outfit will convert any set into a radio gramophone if an electric supply is available. It consists of an electric turntable that can be run from any voltage A.C. or D.C. mains, an efficient pick-up, and a volume control. It is the Macom model D and costs £4 12s. 6d.

Here is a unit that can be connected to any type of radio set to improve the selectivity. It is the Phillips Philector (model 4180) and the price is £1 15s. The wavelength range covered is from 200 to 600 metres. A special feature is that the unit can be used with any type of aerial tuner that happens to be incorporated in the existing set. A gift for anybody suffering from interference.



Why not give yourself one of these presents?

A gift that any gramo-radio enthusiasts will appreciate—the Novotone compensator. This unit increases the bass response of the pick-up. Two models are available; type J for most standard pick-ups costs 3 guineas, while type H, specially for high-resistance pick-ups, is £5.



Just the thing for the foreign-station collector. This Bulgin station log is made on the roller-blind principle and automatically winds up out of the way when not needed. There are three columns for recording the readings for sixty British and Continental stations, the strip being made of linen. The price of this useful accessory is only 2s. 6d. It can be fixed to the side of a cabinet.



EDISON AT WORK

An early photograph of Thomas Edison at work in his laboratory. A photograph of one of his first phonographs appears on page 545

THOMAS ALVA EDISON was the most prolific and versatile inventor of his time. Though not of the same intellectual calibre as, say, Clerk Maxwell, or Lord Kelvin, he was gifted with an extraordinary talent for seizing upon essential scientific principles and applying them to commercial use.

His inventions embrace the phonograph—the first instrument to reproduce the human voice by purely mechanical means—and the first practical form of kinematograph. He was one of the pioneers of the electric-lighting industry, and made notable improvements in telegraphic “tape tickers” and typewriters.

Multiplex Telegraphy

He invented new multiplex systems of telegraphy, and adapted the carbon microphone to the service of modern telephony. He combined the phonograph and the kinema to make the first “talking” picture and last, but not least, produced the alkaline or nickel-iron storage battery.

Though covering such an extensive field of activity his chief interest was centred in electricity and its industrial applications. Starting life as a telegraph operator at the early age of fifteen, he devoted himself for some years to the problem of increasing the

A Master Inventor

Everybody regrets the recent death of Thomas Edison, probably the world's greatest inventor. In these notes Morton Barr reviews Edison's contributions to electrical science

number of messages that could be carried over the same line.

By an ingenious use of differential relays he succeeded in sending out two separate signals simultaneously in one direction, whilst two other messages were passing along the same line in the opposite direction, thus quadrupling its normal carrying capacity.

As early as 1875 Edison stumbled more or less accidentally upon an occurrence which brought him within an ace of discovering the existence of ether waves. Had he pushed his researches a little farther he would have laid the foundation of wireless twelve years before Heinrich Hertz published his now famous treatise in 1887.

In the course of carrying out some experiments with an electromagnetic make-and-break contact in his Newark laboratory, the inventor noticed sparks issuing from the core of the magnet, and being satisfied that they were not due to an ordinary induction effect, determined to investigate them more closely. He first connected the magnet to a sheet of tinfoil measuring about 12 in. by 8 in., and then placed a second similar piece of tinfoil some distance away.

To his surprise he found that sparks could be drawn from the second sheet, although it was electrically separated from the first. These sparks were carefully measured by means of a “dark box” containing a pair of carbon contacts adjusted by micrometer screws.

It was obvious that some transfer of electric force had taken place between the two pieces of tinfoil. Edison fully appreciated this fact and was convinced that he had discovered an entirely new “effect.”

Unfortunately, owing to the pressure of other affairs, he dropped his investigations at this point, though he went so far as to publish an

account of them and to announce the discovery of what he called a new “electric force.” The paper, however, attracted no serious attention, and was more or less pooh-poohed by the scientific experts of the time.

Yet the fact remains that he actually witnessed the passage of the “electric spark” across space, using much the same “detector” for the ether waves as Hertz did many years later. A little more perseverance and he might have added the new science of radio to his many other achievements.

Signals Across Space

Later on he did invent a successful system of transferring signals across the space between a moving train and a neighbouring telegraph wire. This proved quite successful in practice and was christened the “grasshopper” telegraph.

However, the passage of the signals from the stationary line to the moving train took place by electrostatic induction, as distinct from high-frequency radiation, so that the effective signalling range was limited to a few feet.

The thermionic valve has been called the modern Aladdin's lamp but even the author of *A Thousand and One Nights* hardly dreamed that one day a magic “lamp” would allow words spoken to an audience, say, in Australia, to be heard in England as quickly as by those seated in the same room as the speaker.

Magic “Lamp”

Yet so it is, and before long the same magic “lamp” as used in television may bring immediately before our eyes scenes that are taking place just as far away.

Edison was on the very threshold of discovering the secret of the thermionic valve in 1883—whilst investigating the properties of electric lamps—but once again missed the

full significance of what he had done. His achievement is, however, recorded in modern text-books as "the Edison effect."

In examining the behaviour of the new incandescent lamp, he noticed first that the carbon filament broke very easily and secondly that as the lamp continued in use the inside of the glass bulb became so blackened as to seriously diminish the amount of light given off. This clearly indicated that some kind of emission was taking place from the carbon filament.

Filament Disintegrated

The substance of the carbon seemed to be gradually disintegrated by the action of the electric current, the particles torn away being deposited as a layer on the inside of the bulb.

Next he observed that the deposit on the bulb was not uniform. There was a more or less clear line left on the glass where one limb of the filament "shielded" the bulb from the carbon particles shot off from the opposite limb. The inference was that the particles moved with considerable velocity, so that they kept a straight line—like a bullet from a gun.

Edison next made a special lamp in which he fixed a small metal plate near the filament. He was surprised to find that if this plate was connected to the positive pole of a battery, and the negative pole connected to the filament, a small flow of current took place. Obviously the current must have passed across the "space" inside the bulb between the plate and the filament.

Curiously enough no current would pass if the connections were reversed, so that the "plate" was negative and the filament positive.

Clue to the Valve

We know now that the current was carried by the stream of negative electrons given off by the heated filament. Edison had, in fact, stumbled on the clue to the original two-electrode valve—the first valve rectifier.

He filed a patent in 1884 to protect this discovery for use as a current meter or indicator. As the current fed to the filament increases, so does the current passing across the "space" inside the lamp. One can therefore be used to measure the other and this was the only application that Edison could see for his discovery at the time.

It was not until twenty years later that Fleming embodied Edison's dis-

covery in the now famous thermionic valve. But Edison must at least be given credit for having laid the foundation stone of the modern science of thermionics.

In 1877 he invented the first successful telephone transmitter, utilising the known principle that the electric resistance of loose contacts, such as a mass of carbon particles, varied with the applied pressure.

In the previous year, 1876, Gray and Bell had both filed separate American patents covering systems of telephony, the applications being filed on the same day and within a few hours of each other. After considerable litigation the Bell patent was given priority and the first telephone came into operation.

But Bell used the same instrument—the magnetophone—both for transmission and reception. For reception it was quite successful, but as a transmitter it was very far from perfect, and because of this the whole system was threatened with failure. It was at this stage that Edison came to the rescue with his carbon-button microphone, and so saved the day. The same microphone is, in fact, still used, with certain modifications, in the modern telephone system.

All broadcast transmissions are, of course, dependent upon the microphone, which we owe to Edison. On

the receiving side, although he did not actually invent the thermionic valve, he pointed the way to its discovery. Judged by these two achievements alone, he is entitled to be recognised as one of the pioneers of radio science.

Another invention of radio interest was an early form of loud-speaker which, though constructed on an extremely ingenious principle, did not long survive the test of time.

Finding a Substitute

At the time, in 1876, the only telegraphic sounder or relay suitable for recording telegraphic messages consisted of an electromagnet with a spring-retracted armature. This was covered by a patent in the hands of the Western Union. It was Edison's task to find a substitute—and he produced the "electromotograph."

Instead of using a magnet and armature, the electromotograph depends for its action upon frictional effect between a rotating chalk cylinder and a small pad moistened with a chemical solution, and connected to an arm attached to a sounding diaphragm.

The effect of passing incoming signal currents across the contact between the chalk surface and the pad is to reduce the normal drag or friction between the two. The variations in "slip" are communicated to the diaphragm, which is therefore vibrated according to the strength of the received current. Though originally designed for the reception of morse telegraphy, the electromotograph was soon adapted for the reproduction of speech.

"Stentorian Efficiency"

Mr. George Bernard Shaw—who was once employed in the London office of the Edison Company—described it as "a telephone of such stentorian efficiency that it bellowed your most private communications all over the house, instead of whispering them with some sort of discretion."

In conclusion, the Edison alkali or nickel-iron accumulator is still unique in certain features that make it particularly suitable for use by radio listeners. It has a long life, a low maintenance cost, and will stand up to rapid discharge or overcharge, as well as to prolonged periods of idleness, without damage.

Edison made over 50,000 experiments in developing this battery and has referred to it as "one of the hardest nuts he ever had to crack."

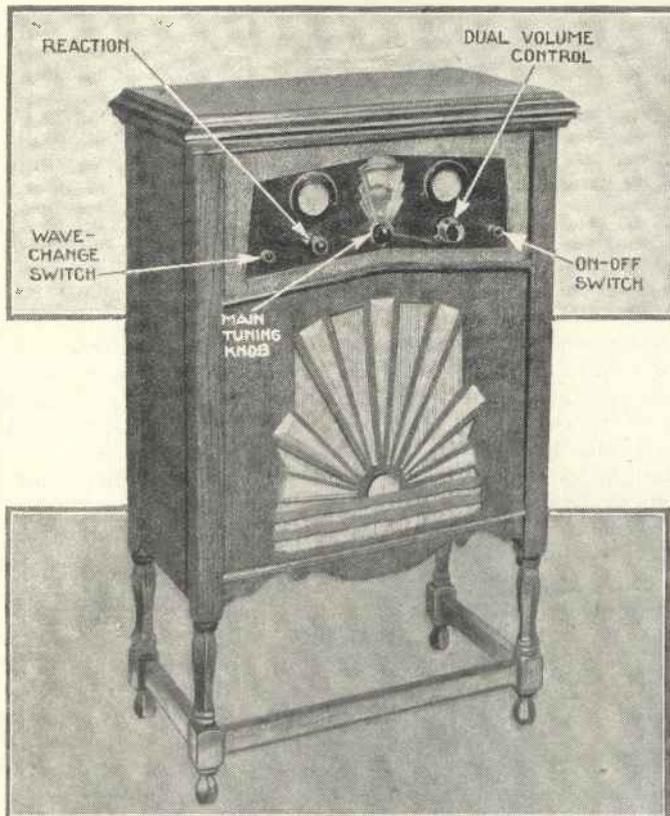


AS A BOY

Thomas Edison at the age of eight years was bright and intelligent, as this photograph proves. At fifteen he began work as a telegraph operator

The Ether Rover

DESIGNED BY THE "WIRELESS MAGAZINE" TECHNICAL STAFF



A HANDSOME CABINET
Here is the Ether Rover complete in its console-type cabinet. A corresponding radio-gramophone model will be shown next month

THIS set has been designed by the WIRELESS MAGAZINE Technical Staff in response to a large number of inquiries from keen readers. Many constructors built the Ether Marshal—a band-pass screen-grid three—when it was described in the August issue and since then many requests have been received for an efficient four-valver on the same lines. The Ether Rover is the result.

Better-than-usual "Straight" Set

Only in essential circuit features is the Ether Rover similar to the Ether Marshal—different parts are used in the actual construction. This design, indeed, incorporates all the latest in radio components. Being absolutely up-to-date, it will interest a large number of constructors who want a "straight" set that is better than usual.

The actual circuit used, as can be seen from the diagram on page 537, is a screen-grid high-frequency

amplifier with band-pass tuning in the grid circuit; a leaky-grid detector for the best compromise between selectivity and sensitivity; a stage of resistance-coupled low-frequency amplification; and a final transformer-coupled power valve, provided with a tapped output transformer in order to get the best matching with the loud-speaker used.

"Fader" Potentiometer

An important feature about the low-frequency side is the inclusion of a "fader" potentiometer which makes the change from radio to gramophone-reproduction and also controls volume for both. All this is done by turning one knob on the panel.

A glance at the photograph alongside will reveal the simple nature of the panel layout. There is the main tuning knob in the centre; this works a three-gang condenser that tunes the two band-pass circuits and also the grid circuit of the detector valve.

On either side of the main dial there is a milliam-

THE SET YOU WANT!

A special feature is the inclusion of two milliammeters that enable the operator to see just what is happening when he tunes the set. With the Ether Rover there is no "working in the dark"!

Those who want to build only a three-valve band-pass set are recommended to look at the Ether Marshal, a successful receiver that was described in these pages last August. This four-valve is a sequel to that popular design.

meter. That on the left is in the anode circuit of the detector valve and gives a visual indication of when the set is "band-passing" properly, while that on the right is in the anode circuit of the power valve and gives a visual indication of the presence of distortion before it is bad enough to be perceived by the ears.

These milliammeters add considerably to the utility of the set, for they enable the very best adjustments to be made and so raise the general efficiency of the receiver. If desired, of course, they can be omitted without affecting the rest of the circuit in any way—nor will the panel layout be spoilt at all.

Still, if they can possibly be afforded they should be

retained. They make the set a much more interesting proposition to handle.

The small knob on the extreme left of the panel is the wave-change switch. It controls all three tuning circuits. Just to the right of this is the knob of the differential reaction condenser.

Other Controls

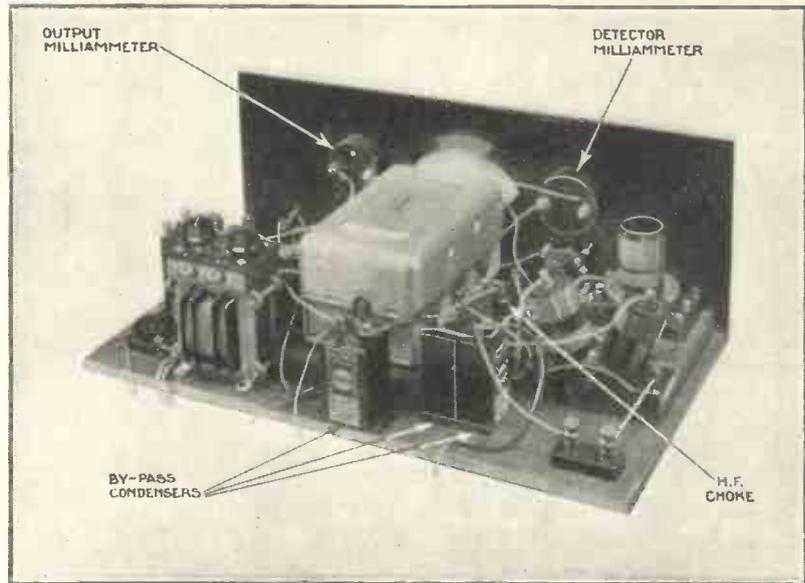
The on-off switch is on the extreme right of the panel. Next to it (on the left) is the knob of the "fader" potentiometer already referred to in a preceding paragraph.

Our photograph shows the Ether Rover is a console type of cabinet, which will accommodate all the batteries (or mains unit) and the loud-speaker without any difficulty. It should be specially noted that a similar radio-gramophone cabinet is available and next month we shall show how to add the accessories to convert the set into a complete and self-contained radio gramophone.

New Band-pass Tuner

Before dealing with the actual construction, let us first look into one or two of the more interesting circuit details. The band-pass tuner is of a type not previously used in any WIRELESS MAGAZINE design because it has been on the market only a short time.

DESIGNED IN RESPONSE TO MANY REQUESTS



ONE OF THE BEST-MADE THREE-GANG CONDENSERS

For the band-pass and grid tuning circuits of the Ether Rover one of the best three-gang condensers yet put on the market is utilised

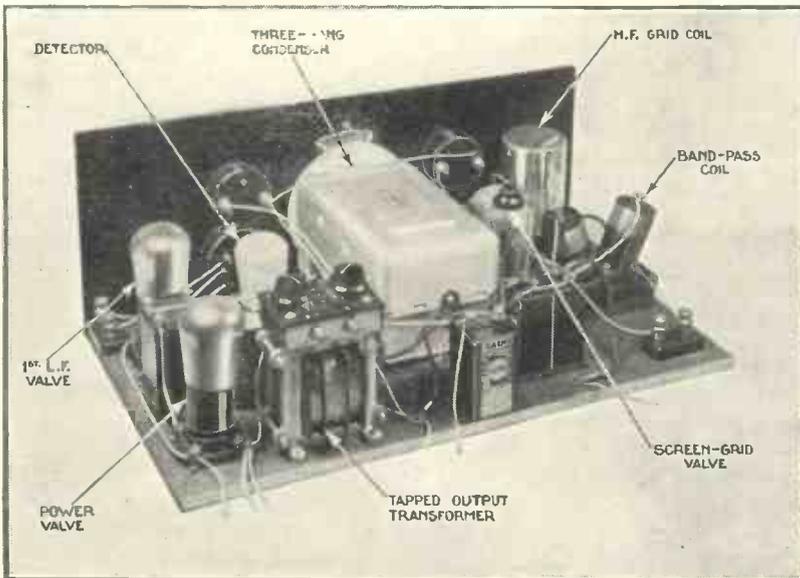
In practice it has been found to be very efficient and it is also convenient to use because of its small size.

The coupling condenser used for the band-pass circuit has a rather lower value than usual, namely, .01 microfarad. There is also a 30,000-ohm fixed resistance at this point to prevent the possibility of the

grid circuit of the high-frequency valve from being choked up with too much high-frequency current.

Choke feed is used for the tuning circuit that couples the screen-grid valve to the detector. For this purpose an efficient high-frequency choke is placed in the screen-grid anode circuit, which is coupled to the detector grid circuit by means of a .0002-microfarad fixed condenser.

CAN BE USED WITH A MAINS UNIT



COMPACT BUT VERY SIMPLE TO BUILD

This photograph shows the compact layout of the set, which at the same time is simple to construct at home

Plenty of Decoupling

Decoupling devices are provided for the grid and anode circuits of the screen-grid valve to prevent any possibility of instability. In the anode circuit there is a 10,000-ohm resistance and a 1-microfarad condenser; in the screening grid circuit there is a 20,000-ohm resistance and another 1-microfarad condenser.

Differential Reaction

Reaction in the anode circuit of the detector valve is made possible by a high-frequency choke and a .0002-microfarad differential condenser which controls the amount of feedback to the grid circuit.

In the anode circuit there are also the components needed for the resistance-capacity coupling to the first low-frequency amplifier—a 20,000-ohm resistance and a .01-microfarad fixed condenser. A second 20,000-ohm resistance is used in conjunction with a 2-microfarad

THE ETHER ROVER—Continued

A RADIO-MARINE TRAGEDY!

I wonder what Captain *Filament*,
When from the *bridge* he cried:
"We've sprung a *leak* in this here ship,
I've found it in the *side*!"
"You'll never see your *ohms* no more
You won't, my bonny boys,
Unless you *plug* that *gapin'* ole
And moderate your *noise*!"
And up and down the captain *charged*
A-*blasting* good and fast;
Sometimes he *buzzed* around the hold
And then he'd *shin* the *mast*.
"Oh, dear," said he, "*long waves* I see
A-comin' all across,
An' *dis* 'ere ship, with all aboard,
Will be a total *loss*.
"If I'd *anode* this 'ere mishap
Was goin' to 'appen to me,
I'd a took a *landsman's* job I would
Instead o' goin' to sea!
"A *landsman's* job would suit me well,
A-hiking or a-camping,
Or even a *perishin'* criminal's *cell*
Is better than this 'ere *damping*!"
Just then the *baffled* captain saw
A truly welcome sight—
Approaching with *velocity*
Was the S.S. "*Ebonite*."
Across the *currents* sailed the ship
But the skipper he failed to plot 'em,
For on the way she struck a rock—
Now both are at the bottom!

C. P. P.

condenser as a motor-boat stopper. In the grid circuit of the first low-frequency valve is the "fader" potentiometer already referred to. It comprises two 500,000-ohm sections wired in series, but only one half is in use at a time.

One slider travels over both sections; it will be seen that one half controls radio volume while the other half varies the input from a gramophone pick-up. An advantage of this system is that the pick-up can be kept permanently connected

to the set, ready for instant use when required.

The coupling from the first low-frequency valve to the power valve is made by means of a standard low-frequency transformer. Another decoupling device is provided in series with the primary of this; it consists of a third 20,000-ohm resistance with a 2-microfarad fixed condenser.

In the anode circuit of the last (power) valve is the tapped output transformer. Both primary and

secondary are tapped and the following five ratios are obtainable by adjusting the two tapping switches mounted on the top of the instrument: 1 to 2, 1 to 1, 1.5 to 1, 2 to 1, and 3 to 1.

One of these ratios will give the best possible reproduction, both from the points of view of power output and quality, with any high-resistance loud-speaker.

Full-Size Blueprint Available

As far as the construction of the Ether Rover goes, every detail will be clear from the photographs and diagram reproduced in these pages. Should one be desired, however, a full-size blueprint layout and wiring guide can be obtained for half price, that is 9d., post free, if the coupon to be found on the last page of this issue is used by December 31.

Address your application to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4., and ask for No. WM266.

It will be noted from a glance at the quarter-scale wiring diagram reproduced on page 538 that each wire is numbered separately. This is done to save the constructor as much trouble as possible, for the numbers indicate the best sequence of placing the connecting leads in position.

Wiring Up the Set

When wiring up the set, start with the lead numbered 1 and then carry on in the numerical order indicated. In this way the wiring will be built up in the most convenient way and there is no possibility of making a mistake if each number on the blueprint or on the diagram on page 538 is crossed through as the corresponding connection is completed.

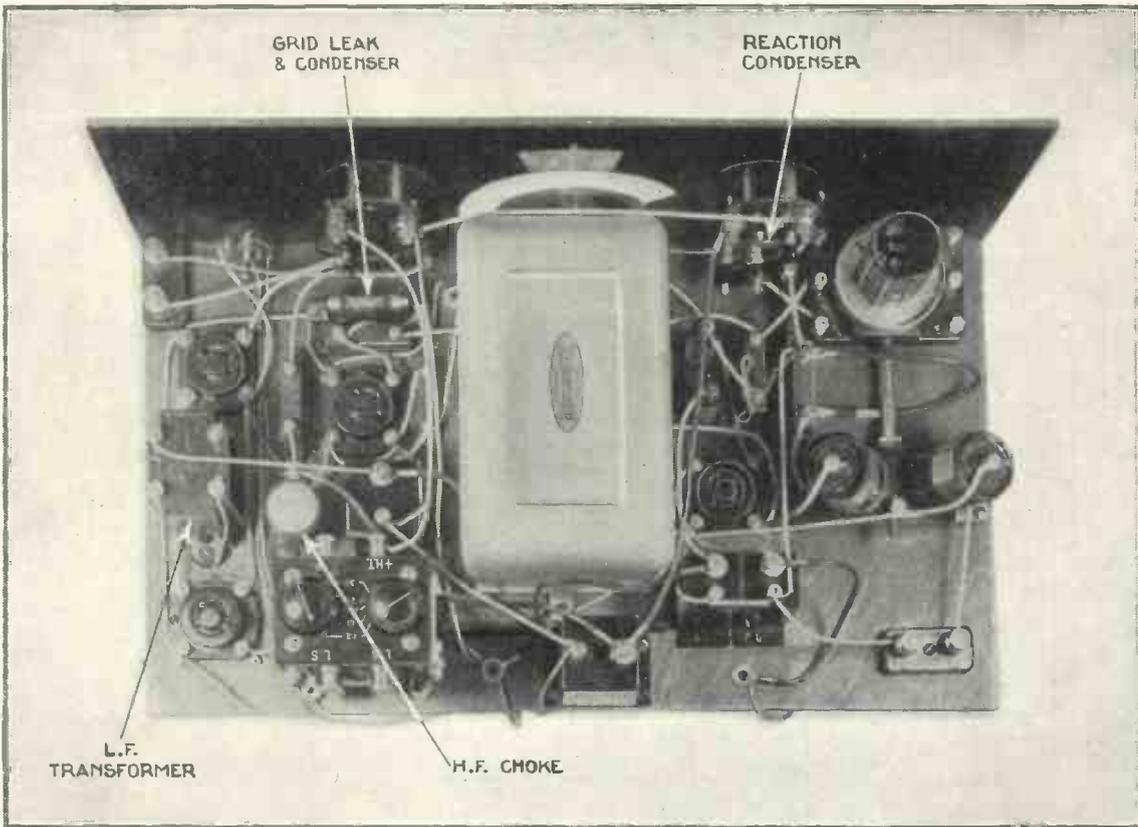
Care should be taken to fit the three-gang condenser in exactly the right position, otherwise the set will not fit into the cabinet properly. A glance at the photograph on page 534 will show that the escutcheon plate of the condenser only just fits in the panel opening; if it is just a little too high or a little too low the escutcheon will foul the opening.

Mounted on Wood Blocks

Note that the gang condenser and also the tuning coils are mounted on $\frac{7}{8}$ in. and $\frac{3}{4}$ in. blocks to raise them above the baseboard so that the controls come in the right positions.

If for any reason it is desired to

A POWERFUL BAND-PASS FOUR-VALVER



DISPOSITION OF THE MORE IMPORTANT COMPONENTS OF THE ETHER ROVER

This special photographic plan view shows clearly the disposition of the parts in the set. A quarter-scale wiring diagram appears on page 538

omit the two milliammeters, the wires that are shown going to the two terminals on each should be connected together. The circuit will then be completed.

Suitable valves for use in the set are indicated in the list of components on page 538. It will be seen that they are all standard types and

can be obtained without difficulty. Equivalent valves of other makes can easily be found from the list that appears in the front part of this issue. Any other valves of similar impedance to those included in the list of parts will be satisfactory.

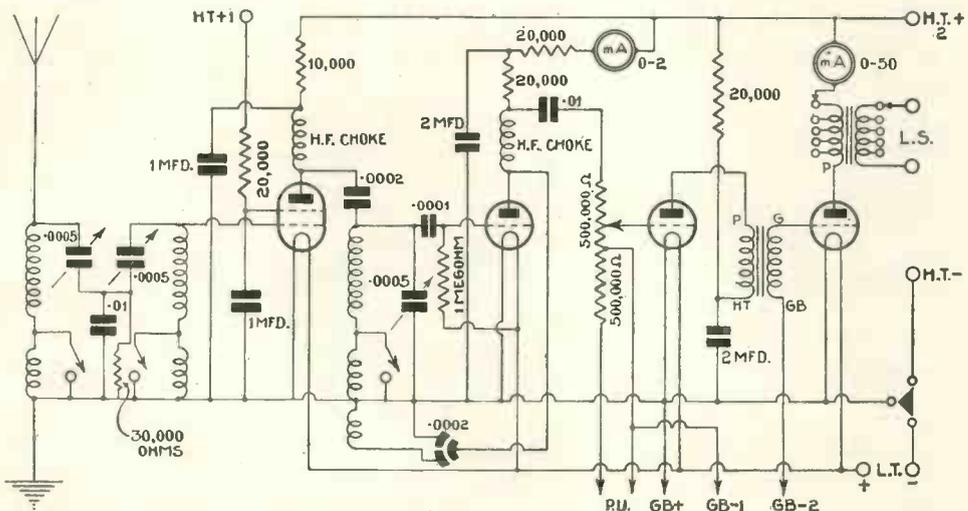
As the circuit is completely decoupled there is no risk of trouble if a

mains unit is used for supplying high tension. If electric mains are available this course is to be recommended, for it enables the operator to use a larger power valve than can be economically run from dry batteries and naturally that will improve the output of the receiver.

The tapped output transformer

CIRCUIT OF THE ETHER ROVER

The valve combination consists of a screen-grid high-frequency amplifier, leaky-grid detector, resistance-coupled low-frequency stage, and a final transformer coupled power valve. A dual-range band-pass tuner is incorporated in the aerial circuit and the high-frequency stage uses a tuned-grid circuit; all three circuits are tuned by a single three-gang condenser, thus giving one-knob operation. A special feature is the inclusion of a tapped output transformer to give the best matching with the particular loud-speaker used. Each stage is effectively decoupled to prevent the possibility of motor-boating



Vaudeville Artistes MUST Study the "Mike"!



Here Whitaker-Wilson, the "W.M." Music Critic, gives his explanation of the poor quality of the vaudeville programmes put over by the B.B.C. We believe that most listeners will agree with him when he says that the vaudevilles are steadily getting worse, but we shall be glad to hear from you if your views are different—vaudeville programmes are of vital interest to every listener.



"DOING" RATHER THAN "SAYING" IS THE TROUBLE

"The trouble is that the average comedian, being quick to seize a chance, is quite likely to make the 'microphone' mistake of convulsing his small audience by something he does rather than by something he actually says"

THE vaudevilles are steadily getting worse. They have never been good, for the simple reason that those responsible for their production have not impressed upon the artistes the necessity—the absolute necessity—of studying the microphone; lately they have become distinctly worse.

In the early days of broadcasting a comedian was led to the microphone, was left alone and told to "do his stuff." He was warned to wait for the laughter he provoked, but could not hear, and in most instances he had to write down what he was going to say before he said it.

If anyone chanced to be in the

studio (other than a fellow-artiste or accompanist) he was expected to laugh inaudibly—if there was anything to laugh at.

Apparently this was found too much for the general run of comedians and there was a fear that the percentage of suicides in their ranks would tend to increase.

I can understand it, from their point of view, well enough; it must be appalling to set out to amuse and be entirely deprived of an audience.

The first time I broadcast person-

ally was at Bournemouth. I was left alone to give a talk—I forget what it was about, but it was more or less serious. I remember feeling as though I had suddenly developed the bad habit of talking to myself; I could not even make myself think I was talking through a telephone.

I have broadcast well over fifty

A Timely Article by Whitaker-Wilson

VAUDEVILLE ARTISTES—Cont.

BEFORE AUDIENCES WERE ALLOWED

"If anyone chanced to be in the studio (other than a fellow-artiste or accompanist) he was expected to laugh inaudibly—if there was anything to laugh at."



times since then and I do not remember ever having had anybody in the studio, unless it was the announcer (who was generally occupied with his own business), excepting on one occasion when I conducted a work of my own with the B.B.C. Orchestra.

Modified Views

So that when an audience was permitted for what became known as vaudevilles, I felt that the step was one in the right direction. Lately, I have modified my views considerably. I do not suggest that the audience in the studio is a nuisance from the listener's point of view; at least, if it is so it is not the fault of the audience itself.

It is primarily the fault of the producers for allowing the artistes to cause amusement by means of action or mime.

In saying this I do not wish to suggest that the producers do not know what they are about; indeed, I think it is distinctly otherwise. Some of the vaudeville productions have been admirably carried out.

The trouble is that the average comedian, being quick to seize a chance, is quite likely to make the microphone mistake of convulsing his small audience by something he

does rather than by something he actually says.

It is perfectly natural, of course; one can hardly blame these mirth-producers for using any means that happen to lie close to their hands. All the same, it is rather irritating to listeners to miss what causes the merriment.

That is why I have always regarded those items relayed from the Palladium, and other such places, as partial failures. In their case it is perfectly obvious that the first consideration must always be the actual audience present. If the listener hears a roar of laughter for which he can himself give no possible reason, he can only make allowances for what he knows to be a music-hall turn, and extract all he can out of what floats his way.

Listeners' Interest

When it comes to a studio vaudeville, which in many respects resembles a relay from a music-hall, listeners have a right to ask that their interests shall be the first consideration.

While I feel it is the intention of the producers that it shall be so, mistakes have been made and listeners have undoubtedly felt that

those present in the studio have been obtaining much more entertainment than they themselves.

If listeners could only see, obviously all entertainers could use asides, mimicry, facial expression, etc., as a powerful vehicle for effect.

Surely, however, the very fact that the listener is deprived of every faculty, so to speak, except the strictly auditory, constitutes a complete negation of anything and everything that is not actual sound.

Sounds only Permissible

There is some proof of this in the fact that the noises used as stage effects during plays are not any too easy to appreciate. Sounds—direct, intelligible sounds—alone are permissible.

A short while ago I listened to a vaudeville in which Sandy Rowan and Tommy Handley took part. Both were exceedingly amusing. On the other hand every few moments one could hear yells of laughter which must have been at something one or other of them did, whereas we (of the infinitely greater audience) could only wonder what was going on.

In more than one instance in that same broadcast I could actually hear the laughter when nothing was coming through the microphone.

As I say, it is only natural; even so, it ought to be stopped. I am sure both Sandy Rowan and Tommy Handley will be the first to recognise it. Gillie Potter, merely by reason of the type of broadcast he gives, does not run this danger. He obviously prepares his work and goes ahead with it, only stopping if the laughter in the studio is prolonged.

Inaudible Asides

That is all to the good; he uses that laughter as a guide to the length of our laughter. Even with him there is a tendency sometimes to throw in an aside which is not always audible to us, the laughter in the studio often completely drowning it.

I hear that there is to be a special vaudeville studio with a small stage at Broadcasting House, the idea being to place, as far as is possible, the actors in homely surroundings. I think this an extremely dangerous proceeding. The studio will actually be a small theatre. What will be the consequence?

Personally, I think the tendency

THEY MUST LEARN to STUDY the "MIKE"!

will be for the comedians to convulse their audience with mirth *at our expense*. We shall be the losers. The idea of the vaudeville stage at Broadcasting House has been brought forward too soon; it will be the very thing we shall want when television has been perfected. It will serve no good purpose before television comes; of that I am quite certain.

While on the subject of vaudevilles, which I have stated to be (in my opinion) deteriorating, I do appeal for less rubbish between the few good turns we get. I do not wish to mention names here—though many occur to me—for the simple reason that I am not criticising an individual programme. Neither do I wish to be discourteous to any particular artiste.

Poor Entertainment

For all that, I am inclined to point to concertinas, xylophones, mandolines, and other similar weapons as being poor forms of entertainment. A concertina sounds appalling through a loud-speaker.

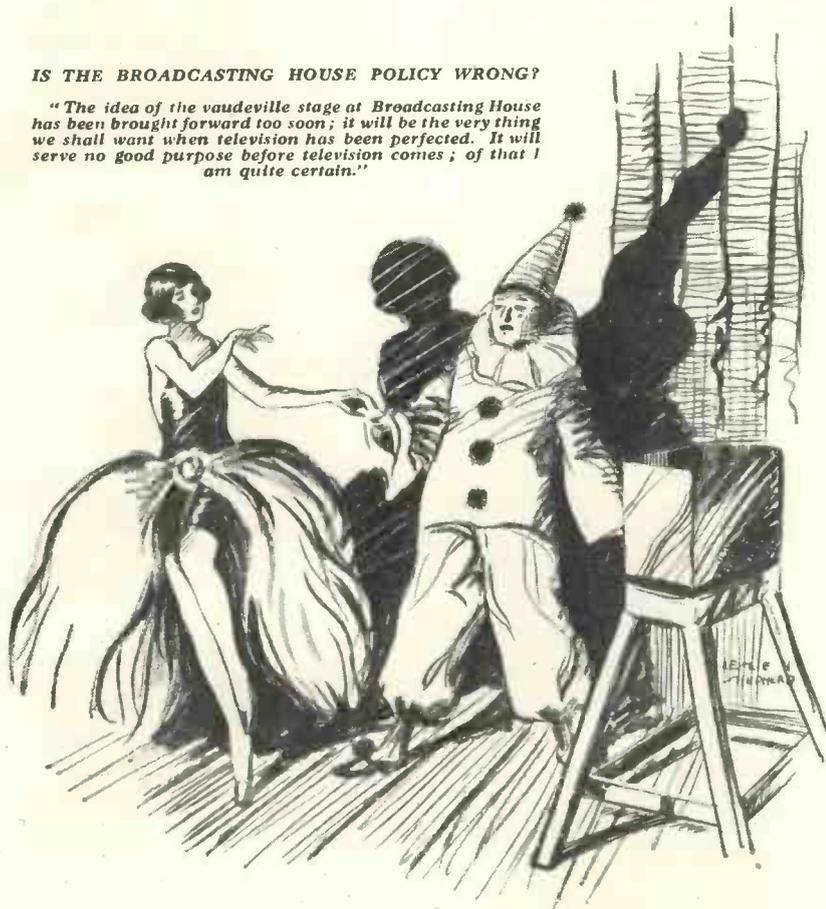
Then again, a vaudeville is obviously the type of programme that should contain a certain number of light vocal items. Even so, I cannot see why such *awful* voices as those I have frequently heard should be allowed to sing them. I have every respect for light music because I think it gives great pleasure to many who do not care for what is picturesquely called "straight stuff," but I have no respect for some of the voices I have heard.

I have trained several hundred voices during my professional career; sometimes I write at the elementary vocal blemishes that are evident in far too many of the vaudeville singers I have heard.

Come on, B.B.C.! *The standard is not good enough*. These vaudevilles want going over with a very fine comb. Singers who have obviously not learned the elements of their art have no business in the programmes at all. A higher standard all round is needed. Let us have it, please!

IS THE BROADCASTING HOUSE POLICY WRONG?

"The idea of the vaudeville stage at Broadcasting House has been brought forward too soon; it will be the very thing we shall want when television has been perfected. It will serve no good purpose before television comes; of that I am quite certain."



Stories of the Operas

PAGLIACCI ("Clowns")

(Leoncavallo)

CHARACTERS

CANIO, a strolling player Tenor
 NEDDA, wife of Canio Soprano
 TONIO Baritone
 BEPPE Tenor
 SILVIO, a villager Baritone

Chorus of Villagers.

Place: Montalto, in Calabria.

Time: Feast of the Assumption, about 1865-70

THE opera opens with the well-known Prologue which the clown Tonio sings, first putting his head through the curtains.

ACT I

The Feast of the Assumption is being celebrated in the village of Montalto, and the villagers hail the arrival of strolling players. Canio, a clown, addresses the crowd. He will be Pagliaccio in a play to be performed that evening. Nedda, his wife, will be Columbine; Tonio will be a clown; Beppe will be a Harlequin.

A villager asks Canio to drink with him at a tavern. Canio asks Tonio to go also. He excuses himself as he has to groom the donkey. A villager suggests he is really staying to make love to Canio's wife, Nedda. Canio says that, in the play, he does, but he can beware if he does so in real life.

Canio and Beppe go to the village tavern. Nedda is alone. Canio's words worry her. Tonio enters and makes violent love to her. She strikes him with a whip and he departs, vowing vengeance.

Silvio, a villager, enters. "Silvio!" she cries, "at this hour . . . what madness!" He persuades her to run away with him after the show that evening.

Tonio has overheard this and reports to Canio. He arrives in time to hear Nedda call after Silvio, who has climbed the wall, "For ever, I am thine!" He demands her lover's name; she refuses it. Canio tries to kill her, but Tonio restrains him. Her lover will surely be at the play, which is now due to begin.

ACT II

Same scene. Silvio arrives. Nedda, as Columbine, collects money in the audience; she warns Silvio to be careful. Tonio, as Taddeo, enters and makes exaggerated love to her. Canio, as Pagliaccio, enters.

Nedda calls "Pagliaccio," trying to keep in the play. "No," cries her husband, "Pagliaccio no more!" The audience thinks it dramatic, except Silvio, who is anxious. "Your lover's name." The audience realises this is no acting. Silvio pushes through to the stage. Canio first stabs Nedda and then Silvio. Canio sings "The Comedy is ended."

WHITAKER-WILSON.

RADIO IN REVIEW

By MORTON BARR

THIS is the time of year when one has, perforce, to occupy one's mind with the problem of Christmas gifts, and indications were never so strong in favour of choosing something in the wireless line. In the first place the new season's models, so far as circuit design and performance are concerned, are probably the best in the world.

Cheaper Than Ever

In the second place sets are cheaper to-day than ever before, and so far as one can judge prices are more likely to go up in the future than to come down. For instance, visitors to the radio shows at Olympia and Manchester are unanimous in agreeing that prices showed an all-round reduction of at least 20 to 25 per cent. on those ruling last year.

In these times of financial stress most people are looking around to see where they can effect economies, and the amusement side of the domestic budget is naturally the first to come under review. In this connection there is nothing, at present, to compete with broadcasting for economical entertainment and relaxation.

Those who are already in possession of a set will agree that this is so, whilst those who have not yet tried it out should make the experiment.

Conditions in Germany

It is a significant fact that in Germany, where conditions are far worse than they are here, the number of broadcast listeners is increasing by leaps and bounds. Herr Schmidt and his wife and family have discovered that it is far cheaper to sit quietly at home and listen to the broadcast programme in comfort than it is to go out and patronise a café or Bierhalle, where prices are always going up.

Although the B.B.C. programmes may fall a long way short of perfection, they are, on the whole, quite as good as anything to be heard on the Continent. Foreign stations, of course, have their bright spots from time to time, and a good radio set will bring them in, and one gets the whole thing, year in and year out.

for the initial cost of the set and the P.M.G. licence fee of ten shillings a year. Look where you will, it is a bargain hard to beat for the money.

The superiority of the new models is largely due to the influence of recent advances made in valve construction, particularly the mains-driven or indirectly-heated type, the working "characteristics" of which have been improved almost beyond recognition.

For instance, one sees valves with a mutual conductance factor of between five and six milliamperes per volt as compared with a former figure of from two to three.

The amplification factor has been increased to an even greater extent both on the high-frequency and low-frequency side. In fact, for the ordinary listener a three-valve mains-driven set will now give him all the range and power he can reasonably expect.

The new "variable-mu" valve is perhaps one of the most interesting innovations. Volume control by varying the applied grid bias is apt to be a troublesome problem, particularly on a long-range set. It may function well enough when foreign programmes are being received, but shows a tendency to "blast" and distort on the local station.

This is due to the curved characteristic of the valve, and to the fact that amplification varies according to the amount of applied grid bias.

This difficulty has now been overcome by using a spiral grid in which the "pitch" is increased gradually along the length of the cathode instead of being kept constant. The result is to make the valve less sensitive as the signal input increases, and vice versa, so that volume control by grid bias becomes both smooth and elastic.

Another popular feature is the "metallised valve," where a fine film of conducting material is deposited over the inner surface of the glass. The metal film is connected to the cathode inside the bulb, and serves to eliminate the residual electrode "capacity" coupling that exists to

some extent even in a screen-grid valve. The result is improved stability and a higher gain in each stage of amplification.

"Mains." Aerials

Quite a number of the new all-mains sets make a point of using the electric-supply leads as a receiving aerial, the mains being connected to the receiver through one or more small coupling condensers, in the same way as the old Dubilier Ducon plug adapter which made its first appearance several years ago. With the enormous amplification factor of the modern screen-grid valve, even the small "pick-up" obtained in this way is quite sufficient to give good volume.

The chief advantage is that the set can be made more compact than when an enclosed frame aerial is used. At the same time it can be operated in any room provided with an electric-supply point.

It will be wise, however, before investing in such a set to try it out at home in case the local supply service should prove "noisy."

Accessories

An electric gramophone motor is a useful gift for those who have a spring-wound gramophone. An attractive model is the flat inductor type which is very easily attached to any turntable and, being little more than an inch in depth, takes up very little room.

All that is necessary to make the change-over is to remove the old turntable and clamp the new unit on the spindle in place of it.

As regards loud-speakers, the "pot" moving-coil type is still probably the best where the electric mains are available and the extra energising current is a matter of small moment. For battery-driven receivers, economy in "juice" is more important, and here the permanent-magnet type is to be preferred.

In the cheaper range of instruments both the inductor and balanced-armature movements now give surprisingly good results.



THIS MACHINE CHANGES THE RECORDS FOR YOU

Mr. Richard Arbib of the Gramophone Company explaining to an interested listener how the His Master's Voice automatic record-changing mechanism works. Eight records can be played at one "filling."

A REPLY TO "FEATHERWEIGHTING"

IN the August, September, and October issues of WIRELESS MAGAZINE there have appeared three articles by Captain Barnett on the subject of the "featherweighting" of gramophone pick-ups.

Although these articles presumably represent only the personal opinion of their author, the fact of their appearance in such a responsible journal as WIRELESS MAGAZINE gives them an imprimatur of authority which may lead some people to act on them. For this reason it is felt that some comment is necessary upon the startling assertions made by Captain Barnett.

Claims Made

First of all, he states that he has made the discovery of counterbalancing, by spring control, a pick-

*By H. E. Gauss, B.Sc., of
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Ltd., His Master's Voice
Research Laboratories,
Hayes, Middlesex*

up so that the weight on the needle is so small "that it could neither be weighed nor estimated," and that by such weighting full volume is obtained with decreased surface noise and without "that roughness in tone quality now indubitably proved to be due to the friction between the weighted needle and the record groove."

Ignoring the exaggeration and granting a loading of about half an ounce (which it is quite possible to measure), a little thought will tell us the results to expect, and a simple

experiment will demonstrate them.

The groove of a gramophone record has sloping sides which act as a double wedge, driving the needle to and fro according to the modulation. The wedge-shape does not continue to the bottom of the groove, but is radiused off. The needle should rest, not on the bottom, but on the sloping sides.

Wedging Action on Needle

When the needle runs in a groove modulated by music, it experiences a wedging action which has two components—one in an upward direction, tending to lift the needle out of the groove, and one in a horizontal direction, tending to force the needle to follow the full side-to-side movements of the groove.

The first of these components

A REPLY TO "FEATHERWEIGHTING"—Cont.

must be eliminated, and this is done by the weight of the pick-up.

The actual weight necessary depends somewhat on the characteristics of the moving system of the pick-up. If this weight is decreased then the needle will be free to ride up the sides of the groove, producing in consequence wave-distortion and a fuzzy reproduction.

In addition, the quality of reproduction was altered, the result being "tinny" and lacking bass and extreme treble.

Measurements were made with constant-frequency records and a valve voltmeter, and the results were enlightening. The curves are shown in Fig. 1. It will be seen that the curves are "hinged" at 2,000

results coincide exactly with the aural tests on music records.

Soft-tone Needles

Now, Captain Barnett recommends the use of soft-tone needles. Though soft-tone needles may be excellent for use with an acoustic gramophone, they are scarcely necessary with a pick-up, since volume control can be effected more conveniently by electrical means without any change in quality, and owing to their high compliance they are not ideal for pick-up work.

Moreover, soft-toned needles tend to be too sharp, and by riding on the bottom of the groove they give poor definition.

However, tests were made with these needles and at normal loading a resonance at 4,000 cycles of 7 decibels magnitude was obtained as compared with 5,700 cycles and 1½ decibels magnitude when using loud-tone needles. The curves are shown in Fig. 2. The quality of reproduction is as the curve suggests—very shrill and, owing to the sharpness of the needles, the definition is not good.

Questionable Advantages

Regarding the reduction of surface noise and needle wear with "featherweighting," Captain Barnett is correct. But what use are these advantages—and they are only small—with such impossible reproduction?

One does not have to be musical to dislike smudgy and indefinite music, and this just describes the

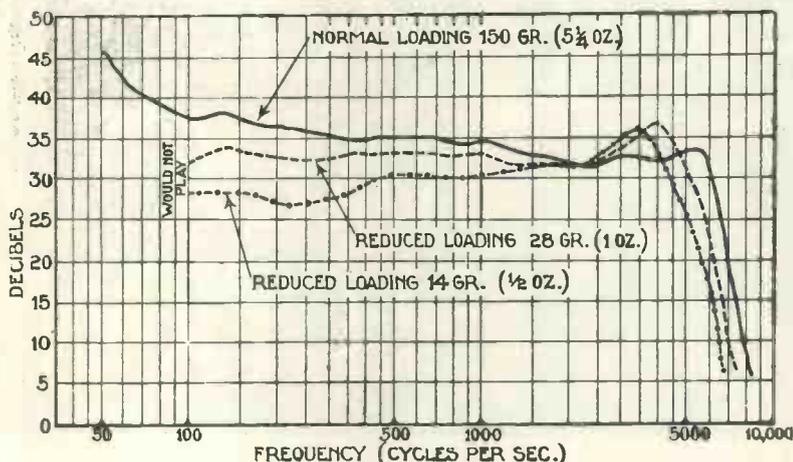


Fig. 1.—Response curves of a Marconiphone pick-up under different weighting conditions. An H.M.V. loud-tone steel needle was used

The dimensions of the needle are important. If it is too blunt it will quickly wear a shoulder and ride on the "land" between the grooves, to the detriment of the record.

If it is too sharp it will rest on the bottom radiused portion of the groove. Here the wedging action is small, and consequently the needle will have a certain amount of freedom to move from side to side without being driven, and will tend to ride over the music instead of following faithfully the vibrations. The result again is fuzzy and indefinite reproduction.

With an H.M.V. Pick-up

The writer has tested this out himself with a standard Marconiphone pick-up, using His Master's Voice loud-tone steel needles. Examining these needles under a microscope, one finds them to be of such dimensions as to fit the groove snugly.

Counterbalancing was effected by using a spring balance. The effect was, as expected, even with a small reduction in weight, that the definition was noticeably poorer and, when reduced to half an ounce, it was unbearable.

cycles; below this frequency the pick-up at reduced loading gave a smaller and smaller output the lower the frequency, amounting to nine decibels at 100 cycles for a load of half an ounce.

Above this frequency the effect was to lower the top resonance and increase its magnitude (now five decibels), with a consequent lowering of the top cut-off. In the extreme bass the pick-up simply would not track the record. These

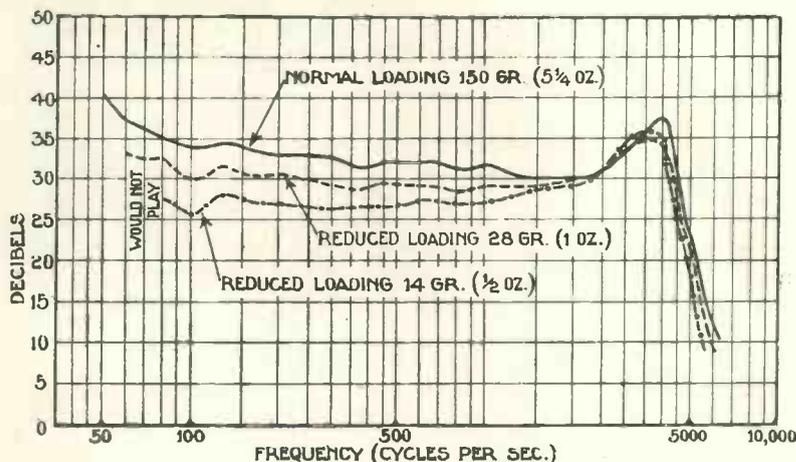


Fig. 2.—Response curves of a Marconiphone pick-up under various weighting conditions and with a soft-tone steel needle

CAPT. BARNETT IS CHALLENGED

effect of "feather-weighting" as experienced by the writer. That the surface noise is reduced and the needle made everlasting become valueless.

Incidentally, Tungstyle needles are blamed for the ease with which the point is bent over; in fact, in Captain Barnett's hands one became so bent as to be dangerous to continue playing, even though used with a featherweighted pick-up.

Inconceivable Results

Such results are inconceivable; there is no reason, with quite moderate handling, why these needles should not last a large number of playings, and with normal loading.

There has been much written about perfect tracking, and its virtue has been greatly exaggerated. Since the pick-up has only electrical connections, instead of acoustical connections to a horn as in the case of the soundbox, there are no limitations on the method of its support.

Inventors have been busy, therefore, in designing gadgets that carry the pick-up along a radial line, which is ideal from the tracking point of view, but none of them are popular owing to their cumbersome nature. Moreover, a few degrees error in the tracking makes no appreciable difference to the reproduction. Yet some people still attribute differences in quality of pick-ups to tracking errors, however small they may be.

Needle Angle

Then on the subject of needle angle, Captain Barnett makes some remarks which cannot be allowed to pass without comment. From the points of view of design and needle wear, the needle should be vertical, but it is well known that a small angle to the vertical is advisable to reduce surface noise.

The angle of 50 degrees which Captain Barnett recommends seems unnecessarily low, and it is a wild statement to make that "it is always the best angle." On the contrary, the best angle must be bound up with the weight and stiffness of the pick-up.

Again, such a small angle as suggested produces a large "flat" on the needle with a consequent loss of

extreme treble—but Captain Barnett seems to dislike extreme treble. It is also an exaggeration to say that 55 degrees is passable and that "60 degrees always shows notably rougher reproduction."

The term "rough" so frequently used by Captain Barnett is somewhat vague and it is a little difficult to know what he really means. If it is due, as he says, to the small tracking errors and the needle angle, it must be a difference in quality that only those few with exceptionally musical ears can detect; if, indeed, it is possible to detect it at all.

That any improvement in results can be obtained on existing pick-ups by "featherweighting" is a contention which is not borne out by scientific theory or by carefully carried out experiments.

That surface noise, needle wear, and record wear can be completely eliminated without loss of quality is impossible, owing to the fact that there must always be friction between the needle and the record.

The conclusions above have been reached after years of scientific, unremitting and carefully co-ordi-



WHAT EDISON DID IN 1898
One of the first Edison phonographs, operated with foot pedals. An appreciation of Edison's radio work appears on page 532.

nated research, backed up by the greatest resources available in the industry, and it is hardly likely that improvements can be made by superficial observations based on casual experimentation.

[Captain Barnett will reply to these comments in the next issue of WIRELESS MAGAZINE.]

CAPT. BARNETT AND THE MARCONIPHONE PICK-UP

To the Editor, WIRELESS MAGAZINE.

Sir,—We must take strong exception to the remarks made by Captain Barnett about the Marconiphone pick-up in his article on "featherweighting," in the October issue of WIRELESS MAGAZINE.

We are concerned particularly with two remarks. Captain Barnett says: "The Marconi pick-up and arm is the heaviest thing I know on records." The exact meaning of this sentence is not quite clear. If it is meant to imply that it causes excessive record wear, then the statement must be categorically denied.

Careful and prolonged tests have conclusively proved that record wear with the Marconiphone pick-up is extremely small.

The other point is Captain Barnett's remark that "the 60-degree needle angle and the rather unsatisfactory tracking . . . caused a rougher reproduction than I am accustomed to." Slight tracking error makes no appreciable difference to the quality of reproduction. In point of fact the tracking error of the Marconiphone pick-up is only a matter of 4 degrees at the maximum, and is so small as to make no noticeable difference to the reproduction.

In fairness to the Marconiphone pick-up, which has been acclaimed by responsible technicians and musicians as one of the best on the market, we trust you will give adequate prominence to this statement.

MARCONIPHONE CO., LTD.

Records for Your Christmas Dance

At this time of the year dancing comes into its own again. Many people want to know which are the best dance records, and in these notes Capt. H. T. BARNETT recommends a selection of the best *non-vocal* dance numbers. For a few shillings a varied selection of discs can be obtained that will make your winter evenings dances as enjoyable as if you had the best dance bands actually in the house

At this time of year I always get some letters asking for a list of records for a dance in which the music is not spoiled by vocal refrains.

Some vocal refrains, of course, are really well sung, and the highest praise on this score can be given to those on the Parlophone list sung in German and to those on the Edison-Bell and Broadcast lists sung by John Thorne.

I like these very good ones as concert numbers but, no matter how good the singing may be, I hate them for dancing to and so do most of my friends.

I have looked out from my recent and moderately recent records enough for quite a nice little dance; not one of them has a voice part in it. Each is a good double.

I have mixed up a good variety in style and in tonal quality; one so soon gets tired of dancing number after number played by the same band or even by the same kind of band, no matter how good the performances may be.

Fox-trots

My first is an Edison-Bell Radio (1s.), *The Match Parade* and *When the Circus*, No. 1533. There is a xylophone part in it. Then there is a beautiful pair by the Roof Garden Orchestra, *Dream Avenue* and *For You* (2s. 6d.), Parlophone R700; these are orchestral and, I think, concert hall recordings.

Now we come to an entirely different style which, in my opinion, should receive greater recognition for dancing, in addition to the great vogue it already has as concert music: Raie da Costa and her

orchestra playing *The Wedding of the Painted Doll* and *The Little Dutch Doll*. The piano part, of course, is the principal one.

As you will see from the Parlophone list this group is a good one and offers wide scope for selection, giving an entire change of tone quality from ordinary dance records. The number of the pair mentioned is R472 and the price 2s. 6d.

"Hot" Fox-trots, etc.

Quite the most wonderful thing of this kind I ever heard is Duke Wellington's *Hot and Bothered* quick-step. It should certainly be bought, in spite of the fact that the reverse of it is a piano solo in the hot style, which one could hardly dance to. Parlophone R582 (2s. 6d.).

Other good pairs containing some reasonably hot playing are Parlophone R924, *I've Found a New Baby*, fox-trot, and *Rockin' in Rhythm*, fox-trot (splendid work); R1004, *Following the Drum* and *Do, Do, Do*, fox-trots; R1005, *No Time for Anyone* and *Mousie*, fox-trots.

Tangos

A pair on one disc is the Edison-Bell Winner (1s. 6d.), *O Cara Mia* and *Mara*. A few good shilling pairs will also be found on the Radio list.

In the half-crown class I have *Give Me Your Little White Hand*, with a fox-trot, *Elizabeth*, on the reverse, R828, both outstanding performances. *I Sing You a Love Song*, with the fox-trot *Chemin du Paradis* on the reverse, R971. *O Miss Greta*, with *Drink, Brothers*,

Drink, waltz, on the reverse, R859. They are all Parlophone tangos and each is played by a different band.

Slow Fox-trots

I only have one of these, a beauty. *You're the One Girl*, and it has the popular *Love Waltz* on the reverse. Parlophone, R745, 2s. 6d.

Waltzes

Possibly you have enough waltzes already coming to you on the backs of your fox-trots and tangos; if not, there is a 1s. 6d. pair on Winner 5195, *Bitter Sweet* and *Frederica*. A very beautiful one from *The Smiling Lieutenant (Waltz Dream)* has the fox-trot *Piccolo, Piccolo* on the reverse. Parlophone R998, 2s. 6d.

And then, of course, there is the huge choice of magnificent recordings in the Edith Lorand and Orchestra Mascotte series. I use these more as concert numbers than for dancing to, invariably leading off with a pair for a miscellaneous recital.

Galops

There is a Winter Garden Orchestra pair for 1s. 6d., *Storm Galop* and *Thunder and Lightning*, Parlophone E6249.

Cuban Bolero

If you do not know this dance, a gorgeous thing for any recital is *Speak Easy*, Edison-Bell Winner, 5337, 1s. 6d.

Lancers

An excellent set on those long-playing records, Broadcast Twelves, two discs at 2s. each, is *Harry Lauder's Lancers*, 5116-7.

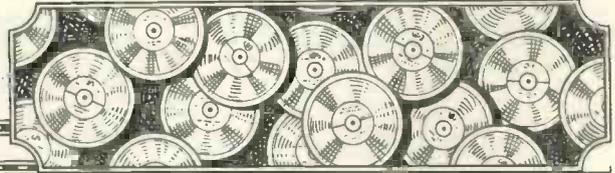
Six-eights

Probably you use your military band marches in six-eight time for these; if not, here are two good ones, *Good Friends*, R912, and *I Drive Out*, R999, both Parlophones at 2s. 6d. each.

If, for once, you will bear with the voice (and in this solitary exception I think you should), get that perfectly topping Broadcast Nine (1s.) *Fall In and Follow the Band*.

CHOOSING YOUR RECORDS

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



SACRED MUSIC

A Gospel Song Service, William MacEwan and Rev. H. D. Longbottom (d.s.), 4s. COL DX282

It is quite well done. I can recommend it to those to whom it is likely to appeal.

(a) Oh for a Closer Walk with God, (b) All Hail the Power of Jesus' Name, St. George's Chapel Choir, 2s. 6d. COL DB604

Quite to be recommended for the performance is good. Anyone interested need have no fear in purchasing this.

★(a) Salve Regina, (b) Alma Redemptoris, Westminster Cathedral Choir, 4s. H.M.V. C2256

Beautiful choral singing and a delicious echo. Any lover of real beautiful, if solemn, choral singing should get this at once. I thoroughly enjoyed it.

GRAND OPERA AND CLASSICAL ARIAS

★(a) Gut'n Abend, Meister! (Good Evening, Master), (b) Ich Seh' Nur (I See Why 'Twas), London Symphony Orch., 6s. H.M.V. D2001

From *The Mastersingers*. Very good Wagner, too! Lovers of opera should get this; it reproduces splendidly on an electrical machine.

★(a) In the Town of Kazan, (b) Song of the Flea, C. E. Kaidanoff, 2s. 6d. H.M.V. B3928

This is worth having. It is from the opera *Boris Godunov*. Both songs are popular and are here well sung. Ask for it.



KAIDANOFF

★Maritana, Stiles Allen, Hardy Williamson, James Baker, opera chorus (d.s.), 2s. WIN L5370

Quite worth hearing. It is very well produced and all the singers are distinctly good. Many people enjoy music from *Maritana*, even in these modern days; I recommend the record on that account.

Pagliacci, Sydney De Vries (d.s.), 1s. 1d. PIC 805

A good voice but the orchestra is none too good. In any case, are there not enough records of the Prologue? I fancy I have heard several.

★Pronto Io Son, Berlin State Opera Orch. (d.s.), 6s. H.M.V. DB1546

From Donizetti's *Don Pasquale*, with soprano and baritone. The general mellowness of the tone is unusual for these elaborate recordings. It is really beautiful.

★(a) Verachtet Mir Die Meister Night, (b) Jerum! Jerum! Berlin State Opera Orch., 4s. H.M.V. C2255

(a) is the finale of the *Mastersingers*; (b) is the Cobbling Song from the same opera. Rudolph Bockelmann, the singer, has a fine voice. I recommend this disc to any Wagner-lover unreservedly.

★Vocal Gems from "Rigoletto," Grand Opera Co., with full orch. (d.s.), 1s. 6d. BRDCST 3094A

A splendid grand opera record—surely at a record price! It is very well produced.

CLASSICAL ORCHESTRA

★Francesca Da Rimini, London Symp. Orch. (d.s.), 6s. H.M.V. D1929 and 1930

A fine rendering under Albert Coates. Two complete records of it with flawless recording. I heartily recommend it.

★Mastersingers of Nuremburg, Berlin State Opera Orch. (d.s.), 4s. H.M.V. C12188

A good rendering; the under parts—which are so important in this work—come out clearly. I should call it an authoritative rendering; they know how to render Wagner in Germany!

★Prelude a L'Après Midi D'un Faune, Walther Stra-

ram Orch. (d.s.), 4s. COL DX279

This is one of Claude Debussy's most beautiful works. I knew him personally; perhaps that fact wins me to his music. Anyhow, I suggest you ask to hear this; it is most delicately played—as it should be—and perfectly recorded. Congratulations to Columbia upon a very artistic production!

ORGAN MUSIC

(a) Indian Love Call, (b) A Perfect Day, Beaufort Cinema Organ, 1s. BRDCST 756A

A lovely wobbly one! Do have it; it is as good as electric massage!

★Prelude and Fugue in C Minor, Marcel Dupre (d.s.), 6s. H.M.V. D2003

Organists should get this; Dupre gives a splendid rendering



MARCEL DUPRE

of it. He is one of the few organists for whose technique I have much respect. I do not mean to be rude to the others, but his technique is certainly above everyone's. I feel towards him what every serious organist should feel towards someone whose technique is in advance of his own. This is a record for Bach players who should study it with a score. I profoundly admire it.

Song Hits—Organ Medley, Terance Casey (d.s.), 2s. 6d. COL DB622

Sez Terance! In Casey's offended I will say he does it quite well—but I cannot see much value in records of this kind.

(a) Would You Take Me Back Again? (w), (b) Sally, Harry

Davidson, 1s. 6d. WIN 5366

These are organ solos. They should awake tender memories in the hearts of confirmed cinema-goers, for every cinema-organ effect is given full rein. It ought to sell!

PIANO SOLOS

★(a) Etudes in G flat and C minor, (b) Concert Etude in D flat, piano solo, Maurice Cole, 2s. BRDCST 5253A

Maurice Cole's Chopin is not amiss by any means, though I do not agree with all his tone. However, this is worth recommending. A cheap record for students of Chopin who can learn much from him.

Faust (w.), Mark Hambourg (d.s.), 4s. H.M.V. C2242

Mark is suffering from *Crash-tangococcus*. It is a long time



MARK HAMBOURG

since I heard him; he bangs as much as ever. And why on earth need he play this on a piano? I say, Mark! Pull yourself together!

CHAMBER MUSIC

★(a) Baccarolle—Transcription, (b) Gavotte—Transcription, Lener String Quartet, 2s. 6d. COL DB599

I am not keen on the transcriptions personally, but that does not prevent me from recommending this record for its actual recording and also for the exquisite playing of this splendid quartet. Do hear it!

★Concerto in A Major, London Symphony Orch. (d.s.), 6s. H.M.V. DB1498

CHOOSING YOUR RECORDS—Continued

Rubinstein is the pianist and Mozart's is the concerto. It is exquisitely produced and I recommend it to those of you who like good piano playing and who also like Mozart. It appealed greatly to me. (Three complete records.)

- (a) *Serenata*, (b) *Cavatina*, Diez Weismann, 2s. 6d. H.M.V. B3770

One of the pleasantest light-violin records I have heard recently. Weismann plays well in tune and with great taste. I think this record might be good for young violinists, apart from its general utility.

- ★(a) *Simple Aveu*, (b) *Le Cygne*, oboe solo by Leon Goossens, 2s. 6d. COL DB800

Both works are, of course, well known. I often play them at weddings. Here they sound really beautiful. Goossens as an oboist cannot be beaten. Buy it at once; I have every admiration for it. As he plays these works they become refined and delicate chamber music. I place the record in that section for that reason.

LIGHT ORCHESTRAL MUSIC

- ★(a) *Autumn Leaves*, (b) *Liebesfreud*, Viennese Cafe Orch., 1s. 1d. PIC 819

I recommend this to anyone who wants something in the light orchestral line. It is quite good at this price.

- (a) *Danses Tziganes*, (b) *Ballet Music*, violin solo, Winifred Small, 2s. BRDCST 5254A

(b) In the Schubert Ballet Music. Miss Small's double-stopping (which makes excellent chordal effects) is first rate. Students of the violin should get this.

- ★*Fantasia on Melodies of Johann Strauss*, Marek Weber and his Orch. (d.s.), 4s. H.M.V. C2198

This is a most attractive light orchestral record. H.M.V. seems to be specialising in such records; they will be welcome. I sincerely recommend this one.

- (a) *Hungarian Melodies*, (b) *Czardas*, Alfred Rode and his Tzigane Orch., 2s. 6d. H.M.V. B3918

This is quite a good orchestra. The music of both sides is a



ALFRED RODE

little on the café-music side, but it is excellent light music for all that. Ask to hear it.

- (a) *Imploring*, (b) *An Old Spanish Tango and a Lady Like You*, Pippo Racho and

his Argentine Tango Band, 1s. RAD 1542

I am not too keen on this—the recording does not seem quite up to Racho standard. I tried a new needle, but it was just the same.

- (a) *In the Sudan*, (b) *Kisses in the Dark*, Commodore Grand Orch., 1s. 6d. WIN 5362

The first is distinctly attractive and makes an excellent light music record with an Eastern flavour about it. I was disappointed in the other.

- (a) *Jollification*, (b) *Uncle Pete*, New Mayfair Novelty Orch., 2s. 6d. H.M.V. B3939

Light lunch-time-type of music, very well produced. It is a nicely balanced orchestra.

- (a) *A Little Love, a Little Kiss*, (b) *Solveig's Song* (Peer Gynt), International Octet, 1s. RAD 1538

Light orchestral music is always welcome if it is good. This is good; the only criticism I pass is that the two sides do not match better.

- Musical Comedy Memories*, Peggy Cochrane with dance band accom. (d.s.), 1s. 6d. BRDCST 3097A

Peggy plays the piano with the D.B. Very effective; she does not thump. This record makes good light music.

- (a) *Over the Top*, (b) *My Irish Lass*, Rudy Starita with orch., 1s. 6d. WIN 5355

These are played up to full tone and make a good light music record. The xylophone records well, of course.

- ★*Pique Dame*, Vienna Philharmonic Orch. (d.s.), 4s. H.M.V. C1677

A splendid piece of light orchestral writing which I most sincerely recommend to all lovers of orchestral music. It is one of the best records of its type which I have ever heard.

- ★*Selection of Famous Waltzes*, Viennese Light Orchestra (d.s.), 2s. BRDCST 5255A

These are so well played that I unhesitatingly place them in the starred list.

- Stealing Thro' the Classics*, No. 3, Debroy Somers' Band (d.s.), 4s. COL DX283

This time they are stealing through the oratorios. Bits of Handel's *Largo*, an extract from Haydn's *Creation*, Stainer's *Crucifixion*, Mendelssohn's *Elijah*, etc., etc., go to make up a piece of unwanted musical vulgarity. Columbia! Do stop this sort of thing! Have some respect or your excellent name, even if you have none for the unfortunate but great masters whose works you desecrate by recording them in medley. I have no intention of recommending such a production. Sorry! But I must be honest!

- Tancredi*, Athenaeum Symp. Orch. (d.s.), 1s. 1d. PIC 818

The overture to *Tancredi*, by Rossini, is always popular. It makes admirable light music. This is a good record of it.

- (a) *Tunes of Not So Long Ago—1921*, (b) *Tunes of Not So Long Ago—1922*, New May-

fair Orch., 2s. 6d. H.M.V. B3944

The title gives you a good idea of the contents of this well-produced record. It is, of course, a medley.

- ★*Viktoria and Her Hussar*—Selection, Marek Weber and his Orch. (d.s.), 4s. H.M.V. C2261

This is very well produced. Marek Weber infuses strong individuality into his work. Even with an admittedly light



MAREK WEBER

type of record personality should always count. This is quite worth having, for the music is attractive.

- ★*Waltzes from Vienna*, Jack Hylton and his Orch. (d.s.), 2s. 6d. H.M.V. B6063

This should be popular. The recording is first-class, and the tunes are, of course, most attractive. A typical Jack Hylton record.

- White Horse Inn*, London Orch. (d.s.), 2s. 6d. ZONO 5941

This contains all you can possibly want to hear of the music of *White Horse Inn*. I recommend it as being well recorded and well produced.

- (a) *Wood Birds' Morning Greeting*, (b) *Hawaiian Memories*, Karl Reich, Bremen, 2s. 6d. H.M.V. B3958

Actual singing of birds. It ought to go into the Aviary Section only I haven't one. But the other side can go into the light orchestral section. Not bad, but I couldn't live with it.

LIGHT OPERA AND SONGS

- (a) *Bitter Sweet* (w.), (b) *You Are My Heart's Delight*, Zonophone Salon Orch., 2s. 6d. ZONO 5946

Quite effective as light music. I have no opinion of the *Bitter Sweet* waltz, but I hated the whole production when I saw it. Still, others may be glad of this disc.

- ★*Dollar Princess*, Savoy Light Opera Singers and Players (d.s.), 2s. WIN L5369

A very good light opera disc. The Savoyards are splendid in it. Ask to hear it.

- ★*Duchess of Dantzig*, Light Opera Co. (d.s.), 4s. H.M.V. C2262

A splendid light opera record. This is a splendid record. I think this music never loses its freshness. It brought old memories to me and I thoroughly enjoyed it. The singing is

splendid and every word is enunciated distinctly.

- ★(a) *Good Night!* (w.), (b) *Pardon, Madame!* (w.), Rolando and his Blue Salon Orch., 1s. 6d. WIN 5361

Both these are from the musical play *Viktoria and Her Hussar*, which seems to be causing a stir. The production here is distinctly good with a noticeable absence of surface noise. A good record.

- ★(a) *Good Night, Sweetheart*, (b) *My Sunshine is You*, Jack Hylton and his Orch., 4s. H.M.V. C2283

This is one of the best records of the month in my opinion. If you want a record of a light song with a most attractive orchestral accompaniment get this. You will be pleased with it, I am sure.

- ★(a) *I Found You*, (b) *Whistling in the Dark*, Layton and Johnstone, 2s. 6d. COL DB610

These artists have an individuality that is very distinct. I imagine there are many people who collect everything they do.

- ★(a) *I'll Keep You in My Heart Always*, (b) *Hawaiian Stars* are Gleaming, Megan Thomas and Herbert Thorpe, 2s. 6d. ZONO 5943

Zonophone, I congratulate you on having your light music well sung. Some of these light tunes are worth having properly sung. I have been asking, for two years or more, to have our dance tunes sung, and not gargled by incompetent vocalists who cannot sing. I think you have done recording a signal service in having two singers like Megan Thomas and Herbert



MEGAN THOMAS

Thorpe. I generally connect Megan Thomas with more serious work, but she is none the less welcome in a lighter vein. Please go on with the good work!

- ★(a) *I Love You More and More*, (b) *Faithfully Yours*, Jack and Jill, 2s. 6d. ZONO 5948

Very well done. Jill is a little hard in her tone but not offensively so. I think if she took a little more care in her production she would be very successful. Both artists sing the songs well.

- ★(a) *I Wanna Sing About You*, (b) *Whistling in the Dark*, Bob and Alf Pearson, 1s. 6d. BRDCST 3098B

They are as good as ever—which is pretty good. Buy it at once!

- (a) *Just One More Chance*, (b) *Whistling in the Dark*, Derickson and Brown,

TAKE YOUR CHOICE FOR CHRISTMAS!

2s. 6d. **H.M.V. B3943**
The diction of the singer is first-rate and the pianist is evidently a good player. Quite worth having.

(a) Limehouse Blues (f.), (b) Echoes of the Jungle (f.), Duke Ellington and his Cotton Club Orch., 2s. 6d.

H.M.V. B6066
I was not struck with this; rather noisy and dissonant. Reminded me of Hindemith at his deadliest! Not keen!

(a) A Little Love Nest for Two, (b) Just a Little Lady, Ethel Hook, com., 2s.

BRDCST 5252A
I like her voice. Not too keen on her literature, but others may like it very much. Quite a good record.

(a) Mama, (b) Mausie, Oscar Denes and Lizzi Waldmuller, 2s. 6d. **H.M.V. B3946**

Two further excerpts from the popular *Viktoria and Her Hussar*. I am getting a little tired of the lady—but I must admit the attractiveness of the music; this is excellently done.

★(a) My Heart is Where the Mohawk Flows To-night, (b) Rocky Mountain Lullaby, Bud Billings, 2s. 6d.

ZONO 5951
Very attractive melodies, both of them. The recording also is first class. I enjoyed both sides.

★(a) Nevertheless, (b) Without That Gal, Ruth Etting, 1s. 6d. **WIN 5373**

She has an attractive way of singing these quite good light songs. I think I can recommend the record for what it is.

★(a) Nun Me Sceta (A Dream of Capri), (b) Ammore Canta, Aureliano Pertile, 4s.

H.M.V. DA1197
This is worth having from the vocal point of view. His is a



AURELIANO PERTILE

fine, robust tenor voice. I was greatly impressed with some of the passages. Ask to hear it. Both arias are from the film, *City of Song*. They are very operatic, which shows how film music is improving. Very welcome!

(a) Only One Girl in the World for Me, (b) Star of My Night, Winnie Melville and Derek Oldham, 2s. 6d.

H.M.V. B3954
Two excerpts from *Viktoria and her Hussar* which are worth listening to. Both singers are distinctly good.

(a) Pardon, Madam, (b) Good Night, Jeanette Macdonald, 2s. 6d. **H.M.V. B3952**
Not too struck with her voice.

to be quite candid. *Good Night*, as a song, leaves me as I was! Takes too long to say it!

(a) Rich Man, Beggar, Pauper, King, (b) Life, Douglas Graham, bar., with orch., 1s. 1d. **PIC 822**

From the title of (a) I expected something to go with a rush; instead I found a somewhat stodgy song and a recitation which rather misses the mark. Life (is only what you make it) gives a good idea of the song. I was not very keen on either, but hear them. You may think differently.

★Shamrockland, Irish Singers and Players (d.s.), 1s. 6d. **WIN 5376**

Irish readers—try them! I think you will appreciate the singing (male chorus, chiefly) of all your favourite themes.

★(a) Songs Made Famous, Harry Champion, (b) Songs Made Famous, Gus Ellen, 1s. **BRDCST 752A**

Two good classifications. Gus Ellen's style is certainly attractive. Ask to hear this; it is decidedly attractive.

(a) Springtime Reminds Me of You (w.), (b) Little Sweetheart of the Prairie (w.), Sam Brown, 1s. **RAD 1537**

Not particularly suitable for dancing—the former especially. The rhythm is interfered with for the sake of expression, which in no way affects the record as music. I enjoyed it.

Vesta Victoria—Old-time Medley, Vesta Victoria and chorus (d.s.), 4s. **COL DX290**

Very pleasant. At first I thought it was Viktoria and those Hussars of hers, but I was agreeably surprised. Ask to hear this, especially if you can remember when she first sang these songs.

★Viktoria and Her Hussar, Oskar Denes and Barbara Diu (d.s.), 2s. 6d. **COL DB645**

Very nice, but superannuate the lady while she is young! I have done nothing but review records of her lately. It is good, I admit.

Palace Theatre Male Chorus (d.s.), 2s. 6d. **COL DB646**
I am heartedly sick of

Viktoria and her wretched Hussars, but I must recommend this as being an excellent edition of some of its music.

(a) Waltzes from Vienna—Love and War, Dennis



DENNIS NOBLE

Noble and chorus, (b) Waltzes from Vienna—For We Love You Still, Marie Burke, sop., 2s. 6d. **COL DB620**

How popular this is! An admirable production.

MILITARY BAND

(a) Bells of Auld Lang Syne, (b) Bells of St. Malo, Band of H.M. Scots Guards, 1s. 6d. **WIN 5352**

Not too much military band atmosphere about it, but the effect, in (b) specially, is singularly attractive.

(a) Bosnia March, (b) Bandmaster March, Brooklyn Military Band, 1s. 1d. **PIC 821**

Quite the conventional military march, both of them. The recording is not so good as Piccadilly can produce.

★(a) Old Frog Pond, (b) Parade of the Elephants, Regimental Band of H.M. Grenadier Guards, 2s. 6d. **COL DB597**

A little out of their usual line, but very attractive. What a splendid band it is!

HUMOROUS RECORDS

(a) Dear Old Cronies, (b) We

all go Home the Same Way, Harry Lauder, 6s. **H.M.V. DB4003**

Not too impressed. I have heard him to greater advantage. The lyrics are not nearly as good as he generally has for his songs. Rather disappointing musically, also. Patter quite good.

(a) Golfing, (b) The Conjurer, Nor Kiddie, com., 1s. **BRDCST 751B**

"Fair to mod." I cannot say more. The humour is very laboured.

Harry Champion—Old-time Medley, Harry Champion (d.s.), 4s. **COL DX289**

Another old-time medley. Not brilliant, but quite entertaining. Ask to hear it. I cannot make up my mind whether to recommend it or not. Sorry to be so vague.

★(a) Jolly Good Company, (b) Rarzo the Rajah, Bobbie Comber, com., 1s. **BRDCST 750A**

I think this can be recommended as being quite humorous. It is not a *scream* by any means, but you may smile at it.

(a) Mrs. Flanagan's Fish Stall, (b) Mrs. Flanagan Buys a Pair of Shoes, Denis O'Neill and his Irish Players, 1s. 6d. **WIN 5377**

Not wonderful, but quite humorous. I do long for something really funny. Can't someone produce a *really* humorous record?

Radio Tit-bits, Jenny Howard (d.s.), 1s. 6d. **WIN 5351**

Rather unusual in style. Not exactly funny, but quite entertaining. Ask to hear it; I think it decidedly original.

DANCE MUSIC

★(a) Down Sunnyside Lane (f.), (b) Radio Nights (f.),



JACK PAYNE

Jack Payne and his B.B.C. Dance Orch., 2s. 6d. **COL CB345**

Another excellent Jack Payne record.

★(a) Good 'Eavens, Mrs. Evans! (f.), (b) Parkin' in the Moonlight (f.), Randolph Sutton, 1s. **RAD 1545**

Jolly tunes both and Sutton's jolly way of singing makes this disc splendid for dancing. I very heartily recommend it.

(a) Heartaches (f.), (b) Wrap Your Troubles in Dreams (f.), Jack Leon and his Band, 1s. 1d. **PIC 828**

ABBREVIATIONS USED IN THESE PAGES

bar. ..	baritone	IMP ..	IMPERIAL
BRDCST ..	BROADCAST	orch. ..	orchestra
BRUNS ..	BRUNSWICK	PHONY ..	PHONOCORD
COL ..	COLUMBIA	PIC ..	PICCADILLY
com. ..	comedian	RAD ..	RADIO
con. ..	contralto	sop. ..	soprano
DEC ..	DECCA	ten. ..	tenor
d.s. ..	double-sided	w. ..	waltz
f. ..	fox-trot	WIN ..	WINNER
H.M.V. HIS MASTER'S	VOICE	ZONO ..	ZONOPHONE

(a) and (b) indicate the titles of both sides of a record.

CHOOSING YOUR RECORDS—Continued

These are two good fox-trots. They will reproduce well on an electric machine.

- ★(a) **Honeymoon Lane** (f.), (b) **Hang Out the Stars in Indiana** (slow f.), New Mayfair Dance Orch., 2s. 6d.

H.M.V. B6058

I like this orchestra. The vocalist seems to "tone" up to the players in an extraordinary fashion. I recommend this disc unreservedly.

- (a) **Honeymoon Lane** (f.), (b) **What Are You Thinking About, Baby?** (f.), Blue Jays, 1s. 6d. WIN 5364

This is a good band and the singing is not amiss by any means. If you want either of these melodious fox-trots, this is a good version to get.

- ★(a) **I'm Happy When You're Happy** (f.), (b) **Cherie, C'est Vous** (quick-step), Deauville Dance Band, 1s. 6d. WIN 5359

The quick-step is splendid; it has a real swing about it. I sincerely recommend the disc for this side alone.

- ★(a) **Just a Dancing Sweetheart** (w.), (b) **Whistling in the Dark** (f.), Harry Hudson's Melody Men, with Vocal Chorus, 1s. RAD 1536

This is a typical Hudson record. I think it will be found excellent for dancing purposes. There is no doubt about the quality of the band.

- ★(a) **Just One More Chance** (slow f.), (b) **I'm Sitting at a Table Laid for Two** (f.), Jack Harris and his Grosvenor House Band, 1s. 6d. BRDCST 3100A

Another quite good Harris record. He is certainly in the first six. I don't know who the other five are, from memory, but I mean to suggest that his is one of the dance bands.

- ★(a) **Just One More Chance** (f.), (b) **You Can't Stop Me from Loving You** (f.), Ambrose and his Orch., 2s. 6d. H.M.V. B6061

Quite a good record from the dance point of view. The tone of the band, coming after reviewing so many records on large orchestras, struck me as being very individual. Both tunes are good; the singing is the worst part. Even that is passable.

- (a) **Little Old Church in the Valley** (w.), (b) **Dream a Little Dream of Me** (f.), Jack Leon and his Band, 1s. 1d. PIC 824

Quite attractive, the waltz especially. The singing is quite good.

- ★(a) **Makin' Faces at the Man in the Moon** (f.), (b) **Cherie, C'est Vous** (f.), Jack Payne and his B.B.C. Dance Orch., 2s. 6d. COL CB347

I think this one of Jack's very best. You had better buy it before the "next feller" makes a corner in it.

- (a) **Many Happy Returns of the Day** (w.), (b) **Why Dance** (w.), Rudy Vallee and his Connecticut Yankees, 2s. 6d. H.M.V. B6073

Two very melodious waltzes. I like the band very well, though H.M.V. has recorded better.



RUDY VALLEE

Some of the instruments are a trifle harsh.

- (a) **Mousie** (f.), (b) **Viktoria and Her Hussar** (f.), Jack Hylton and his Orch., 2s. 6d. H.M.V. B6054

Both are quick fox-trots. They are very well done, but not quite so well as the others I have heard to-day. *Mousie* is an attractive tune.

- ★(a) **Oh, Glory** (f.), (b) **Love for Sale** (f.), Howard Godfrey and his Waldorfians, 1s. 1d. PIC 815

Rather attractive. The recording is quite good and I think the disc is worth considering. It is not expensive, at all events.

- (a) **One Little Raindrop** (f.), (b) **Heartaches** (f.), Lew Sylvia and his Band, 1s. BRDCST 760A

Quite good, but the tone of the band is not wonderful by any means.

- ★(a) **One More Time** (f.), (b) **I Love You in the Same Sweet Way** (f.), Ted Lewis and his Band, 2s. 6d. COL CB351

A good band in the dance sense and well worth hearing. The singing is also good. These Columbia dance records are



TED LEWIS

really amazingly good. I have every admiration for this one.

- ★(a) **Pardon, Madame** (w.), (b) **Good Night** (w.), Jack Hylton and his Orch., 2s. 6d. H.M.V. B6053

Nice, slow waltzes, with well-marked rhythms. Electrically reproduced, they would fill quite a large room. Effective scoring is a feature of both sides.

- (a) **Pardon Me, Pretty Baby** (f.), (b) **Poor Kid** (f.), Howard Godfrey and his Waldorfians, 1s. 1d. PIC 816

(a) is a very jolly tune and rhythmically played. This band is quite well worth hearing and the singing is none too bad

either. I think I can safely recommend this disc.

- ★(a) **Pardon Me, Pretty Baby**, (b) **Two Heads in the Moonlight** (f.), Rhythmic Eight, 2s. 6d. ZONO 5954

A perfectly safe record; the whole style of these excellent artists is eminently suited for recording. One of the best discs I have recently heard.

- (a) **Rocky Mountain Lullaby** (w.), (b) **Honeymoon Lane** (f.), Jack Leon and his Band, 1s. 1d. PIC 827

Rather an attractive lilt makes the melody of the waltz stand out from the ordinary run of such things. A good band, too.

- ★(a) **Roll On, Mississippi, Roll On** (f.), (b) **Heartaches** (f.), Sid Phillips and his Melodians, 1s. 6d. WIN 5358

Both well done. Good recording-reproduction generally make this an outstanding disc.

- ★(a) **Smile, Darn Ya, Smile** (one-step), (b) **Nevertheless** (f.), Ambrose and his Orch., 2s. 6d. H.M.V. B6067



AMBROSE

Very well done. Ambrose records are generally safe; this is no exception.

- ★(a) **Smile, Darn Ya, Smile**, (b) **To-day I Feel so Happy**, Walter Miller with the Radio Rhythm Boys, 1s. 6d. WIN 5372

Splendid recording. This is in every way an outstanding dance record. The singing and playing are alike—excellent.

- (a) **Time Alone Will Tell** (f.), (b) **Maybe It's the Moon** (slow f.), Lew Sylvia and his Band, 1s. BRDCST 759A

Maybe it's the recording, anyhow there is something wrong with it. Quite well sung, though.

- (a) **Trees** (f.), (b) **Smile, Darn Ya, Smile** (f.), Billy Cotton and his Band, 2s. 6d. COL CB350

(a) is a good tune and the deep voice is distinctly pleasant, I am not so keen on the other one. Still, a good record.

- ★(a) **Twilight Waltz**, (b) **Blaze Away** (one-step), Orpheus Dance Band, 2s. 6d. ZONO 5952

An excellent record. The one-step is especially good. The singing is a feature of the record. Quite worth having.

- ★(a) **Viktoria and her Hussar**—Pardon, Madame (w.), (b) **Viktoria and her Hussar**—

Good Night (w.), Jack Payne and his B.B.C. Dance Orch., 2s. 6d. COL CB343

There is a verve about all Jack Payne's records that I wish could be imitated by all other dance orchestras. He is certainly the leading firm.

- (a) **When It's Night-time in Nevada** (w.), (b) **Ain't that the Way it Goes?** (f.), Cunard Dance Band, 1s. 1d. PIC 826

The waltz is a little dull in the matter of its "tune." The foxtrot, on the other hand, has a swing about it that is quite attractive.

- (a) **When the Moon Comes Over the Mountain** (w.), (b) **Down Beside the Mill** (w.), Sid Phillips and his Melodians, 1s. RAD 1534

Two good waltzes and worth having. The playing is quiet and expressive. The sort of "supper waltz" at a dance!

- ★(a) **When Your Lover Has Gone** (slow f.), (b) **It's the Girl** (f.), Deauville Dance Band, 1s. 6d. WIN 5371

Attractive tunes, both of them. Moreover, the Deauville Dance Band is worth hearing. I recommend this unreservedly.

- ★(a) **Would You Take Me Back Again** (w.), (b) **Jolly Good Company** (six-eight), Jack Hylton and his Orch., 2s. 6d. H.M.V. B6069

(b) is a very jolly tune. The



JACK HYLTON

whole record is splendidly produced. I think 2s. 6d. very cheap for it.

- ★(a) **Wrap Your Troubles in Dreams**, (b) **Roll On, Mississippi, Roll On** (f.), Deauville Dance Band, 1s. RAD 1550

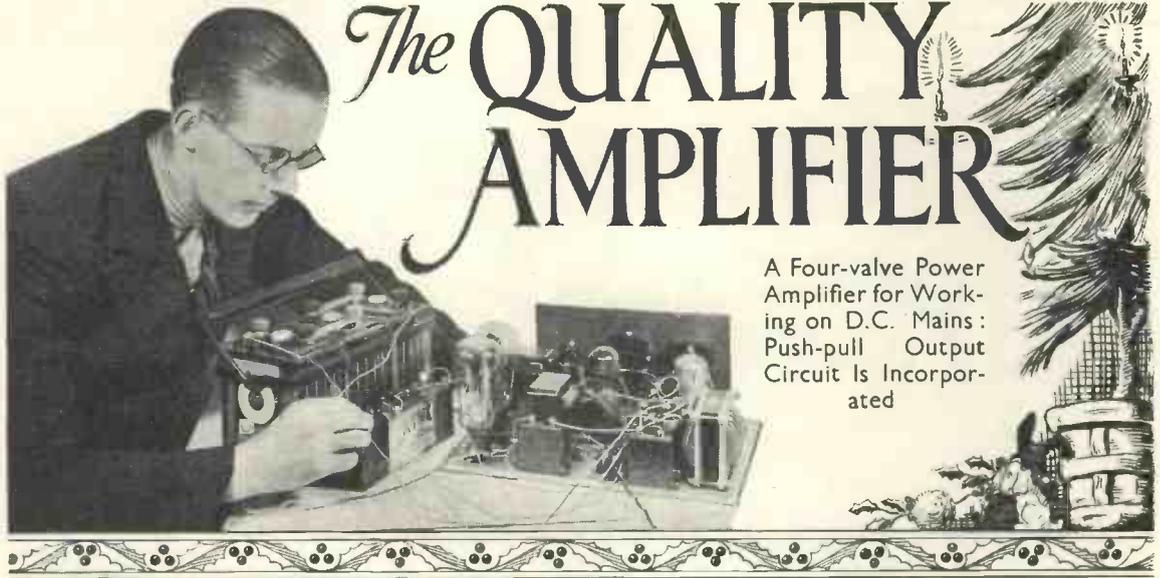
This is very good from the dancing point of view. (b) is a very good song and sung in a jolly way.

- ★(a) **You Can't Stop Me from Lovin' You** (f.), (b) **You are My Heart's Delight** (f.), Jack Harris and his Grosvenor House Band, 1s. 6d. BRDCST 3101A

A good dance record by a good dance band. The recording is not perfect but there is nothing seriously amiss.

- ★(a) **You Can't Stop Me from Lovin' You** (f.), (b) **What's Keeping My Prince Charming?** (f.), Jack Payne and his B.B.C. Dance Orch., 2s. 6d. COL CB342

Quite up to his best form. I do not think I can add anything of value to such a remark. A splendid dance record.



A Four-valve Power Amplifier for Working on D.C. Mains: Push-pull Output Circuit Is Incorporated

ONE of the most useful and interesting additions that can be made to the average radio installation is to equip it with a power amplifier that can be used for boosting up ordinary broadcast programmes or for reproducing gramophone records electrically.

The unit described and illustrated in these pages is intended for use with D.C. (direct-current) electric-light mains. It will definitely give better reproduction than can be obtained with the type of output stage incorporated in the majority of receivers. It is a three-stage job, but uses four valves because the last two are arranged in push-pull.

Use of Battery Valves

A feature of the design is that standard battery-type valves are used. (We have previously expressed the opinion in these pages that D.C. mains valves need further development before they can be recommended for general as distinct from experimental use). High tension is taken from the mains but the low-tension supply is, of course, obtained from an accumulator in the usual way.

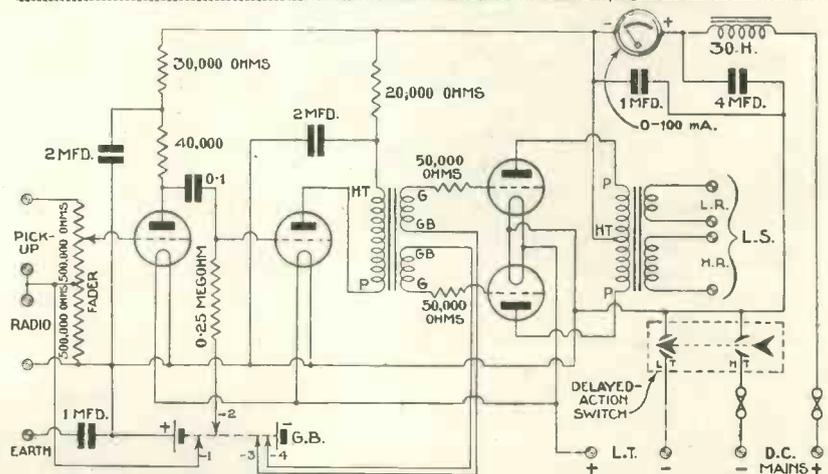
The larger battery valves have been developed to a high degree of efficiency and can be relied on to give consistently good results for many, many months without any attention whatsoever. Indeed, there is no reason at all why such an

amplifier as that described in these pages should not give satisfactory service in normal use for a period of several years.

It has already been pointed out that the Quality Amplifier can be used in conjunction with a radio set for boosting up ordinary signals

course, it can be used with any other type of reproducer that will stand the great power output.

Because the unit is capable of giving great power it must not be assumed that it will be too loud for the average home. An efficient form of volume control is provided and



CIRCUIT FOR VOLUME—BUT CHIEFLY FOR PURITY

Although this is only a three-stage amplifier, it uses four valves, because two are arranged in push-pull. Terminals are provided for the connection of a radio set and a pick-up

or on its own for the electrical reproduction of gramophone records. It is thus of considerable utility to those who already have wireless sets, especially if the latter are not quite as powerful as might be desired.

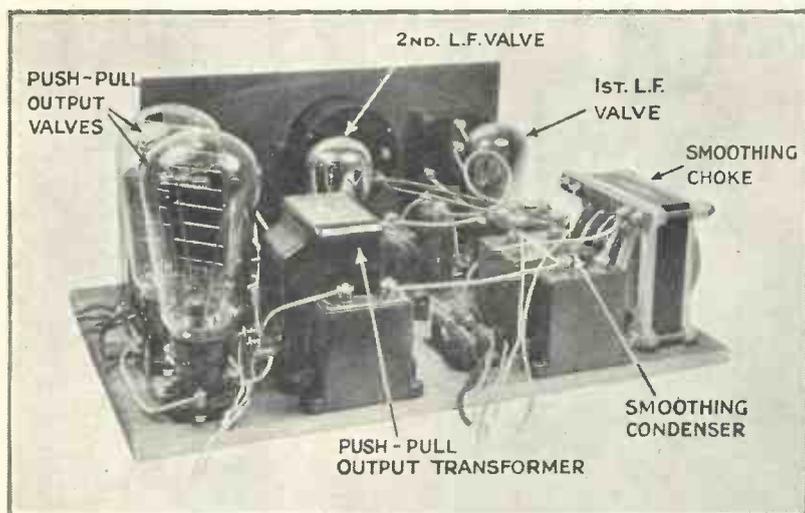
Primarily, the amplifier has been designed for use in conjunction with a moving-coil loud-speaker but, of

the input can be controlled from a mere whisper to floor-shaking volume—which is very useful at a dance party, for example.

The input circuit is so arranged that a radio set and a gramophone pick-up can be kept permanently connected. The turn of a single switch then puts one or the other in

This Unit Takes Its High Tension from D.C. Mains

THE QUALITY AMPLIFIER—Continued



JUST WHAT YOU WANT IF YOU HAVE D.C. MAINS
This power amplifier takes all its high tension from D.C. electric-light mains

the quality of reproduction is taken into consideration. It is not too much to say that the results obtained with this unit will be a revelation to those who have previously used only battery-operated sets.

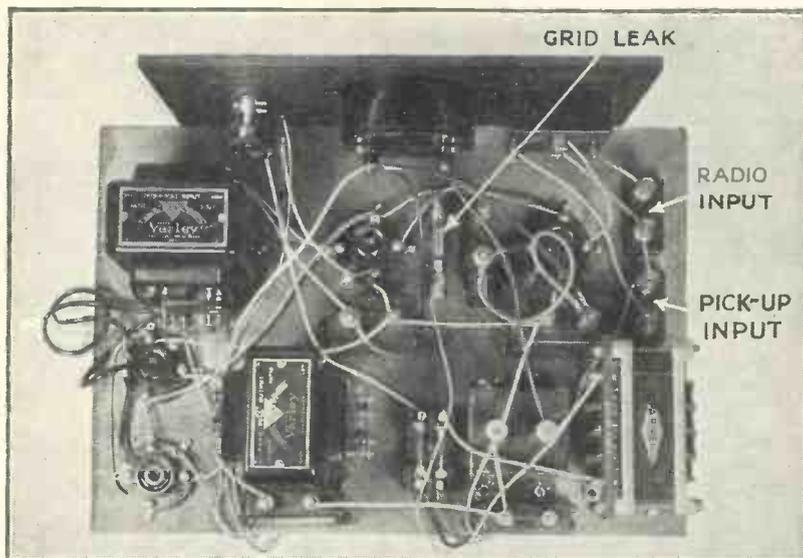
Quality and Volume

The question of quality is very largely bound up with the type of matter that is being reproduced. Speech sounds poor, as a rule, if it is reproduced much louder than the original; on the other hand, the only way to get really good quality from a symphony orchestra is to reproduce it at approximately the same volume as would be heard if one were in the concert hall listening to the original. This amplifier will give all the volume needed to do justice to every type of broadcast or recording.

It is always a difficult matter to decide what form an amplifier should take to meet the needs of the greatest number of constructors. We have compromised with the standard vertical panel and horizontal baseboard assembly. The complete job can then be housed in a special metal or wood cabinet or it can be conveniently placed as it is in the bottom of a radio-gramophone cabinet.

Control of Volume

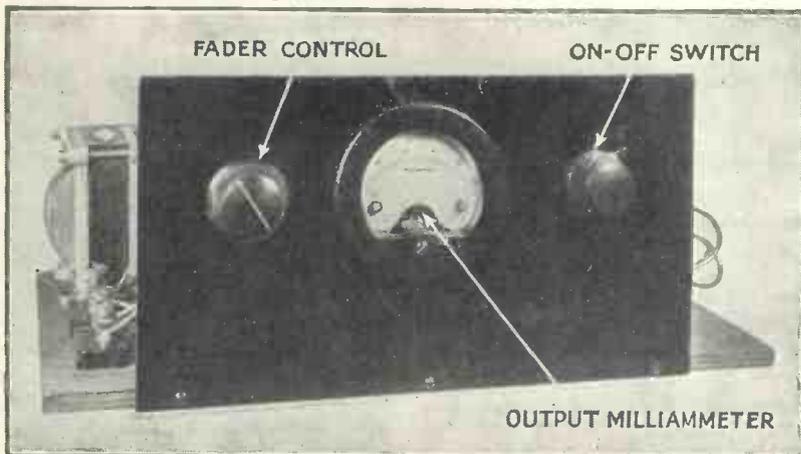
The circuit employed will be clear from the diagram on page 551. The radio and pick-up inputs are taken direct to a split potentiometer, each half of which has a resistance of 500,000 ohms. As the slider is moved round a change is made gradually from full record volume down to a zero point, and then up to full radio volume.



QUITE STRAIGHTFORWARD AND SIMPLE TO BUILD
There is nothing complicated about the construction, especially if a full-size blueprint is used

circuit and at the same time controls the volume. Note particularly that the *one* knob acts as a change-over switch and as a dual volume control—that is a feature of the greatest convenience to the user and one that will be appreciated by everybody who builds the unit.

Because it is designed especially for good quality the component parts are not cheap; the unit will appeal to those who want something a little better than the ordinary run of sets and amplifiers. But, although low cost has not been the chief consideration, it must not be assumed that money has been wasted; all the parts used are worth what they cost when



THE MILLIAMMETER SHOWS UP DISTORTION
As soon as distortion occurs the needle of the meter moves

A "W.M." TECHNICAL STAFF DESIGN

The first two valves are coupled by the resistance-capacity method, which has the merits of cheapness and even response to all audio frequencies if the proper values of resistance and capacity are chosen. In this case the anode resistance is of 40,000 ohms; the coupling condenser has a capacity of .1 microfarad, and the grid leak is of .25 megohm. In series with the anode resistance is another of 30,000 ohms; this performs the dual function of reducing the voltage applied to the valve and also acts as a decoupling device in conjunction with a 2-microfarad condenser.

Push-pull Transformer

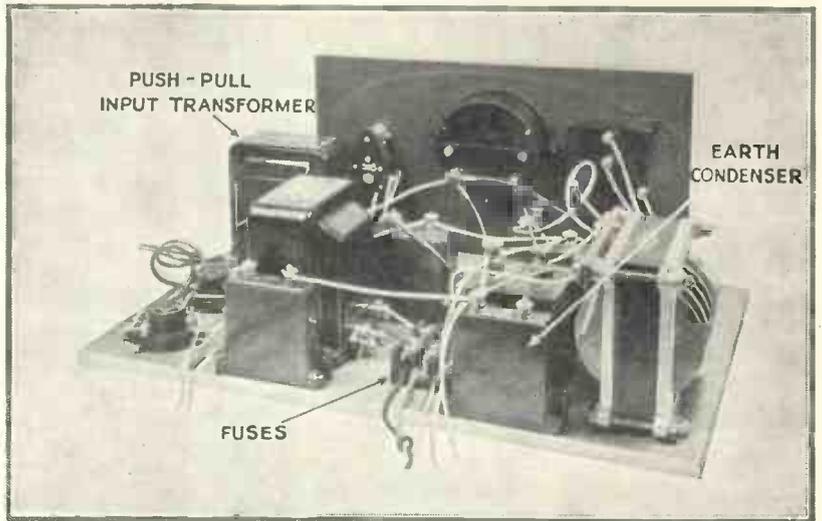
The output from the second valve is taken directly to the primary winding of a push-pull input transformer. This is similar to an ordinary transformer except that it has two secondaries, these being connected to the grids of the two push-pull valves.

In some transformers the secondary is centre-tapped; in this case, with separate secondaries, it is possible to apply different bias to the two valves, which is an advantage if they are not obtained specially matched. In order to prevent any possibility of low-frequency oscillation a 50,000-ohm resistance is placed in each grid lead.

Output

In the anode circuits of the two push-pull valves is the centre-tapped primary of an output transformer. This is provided with two secondary windings, one for use with high-resistance loud-speakers and the other for use with low-resistance models.

It will be seen that the power supply from the mains is smoothed by means of a 30-henry choke and a 4-microfarad condenser. Directly in the high-tension circuit there is also a milliammeter to facilitate the correct



EXCELLENT RESULTS WITH A MOVING-COIL LOUD-SPEAKER

This amplifier gives excellent results when used in conjunction with the small Magnavox loud-speaker

adjustment of the valves and to provide a visual indication of when distortion is taking place.

quite steady on the loudest passages, but as soon as distortion occurs the needle begins to move. That is an indication that the input must be

Normally, the needle will remain

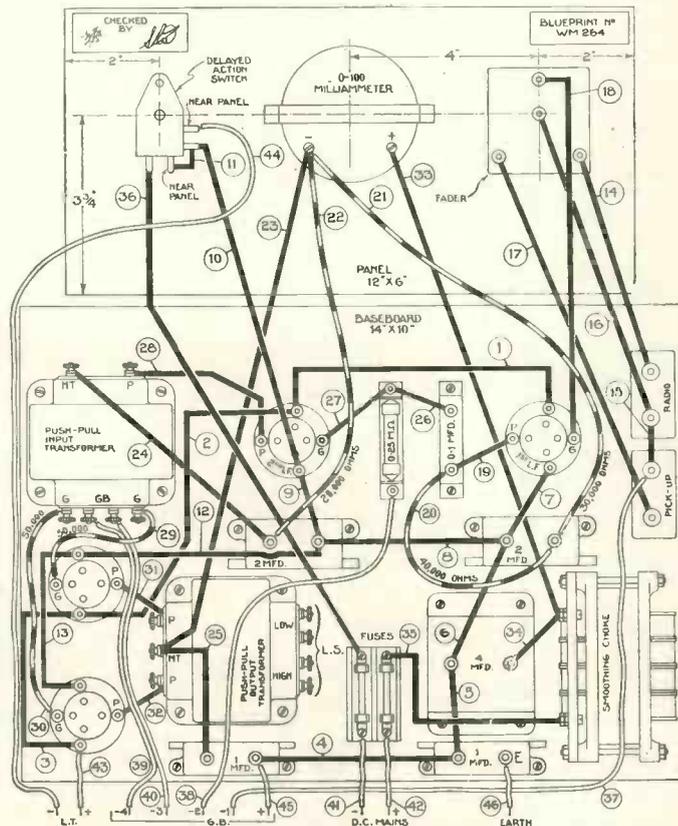
reduced by readjusting the volume control.

The values of voltage-dropping resistances given will be suitable for all mains between 200 and 240 volts. The current being taken by any particular valve can easily be measured with the milliammeter and the bias increased if the reading is too high.

"Delayed Action"

The "delayed-action" switch may puzzle some constructors, but it is really quite straightforward. The contacts are so arranged that the low tension is automatically switched on a moment before the high-tension circuit is made; conversely, the high tension is switched off before the low-tension circuit is broken.

As far as the actual construction is concerned, there is little to be said. The assembly is quite



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

A full-size blueprint can be obtained for half price (that is 9d., post free) if the coupon on the last page is used by December 31. Ask for No. WM264. Wire up in the numerical order indicated

THE QUALITY AMPLIFIER—Continued

COMPONENTS NEEDED FOR THE QUALITY AMPLIFIER

CHOKE, LOW-FREQUENCY

- 1—Parmeko 30-henry 50-milliampere, £1 7s. 6d. (or Tunewell, Wearite).

CONDENSERS, FIXED

- 1—T.C.C. 1-microfarad, type 50, 1s. 10d. (or Dubilier).
- 2—T.C.C. 1-microfarad, type 50, 5s. 8d. (or Dubilier, Telsen).
- 2—T.C.C. 2-microfarad, type 50, 7s. 8d. (or Dubilier, Telsen).
- 1—T.C.C. 4-microfarad, type 61, 6s. 3d. (or Dubilier, Telsen).

EBONITE

- 1—Permal, 12 in. by 6 in., 3s. 6d. (or Red Triangle, Becol).

FUSES

- 1—Bulgin twin fuseholder and fuses, 2s. 6d. (or Belling-Lee).

HOLDER, GRID-LEAK

- 1—Readi-Rad, 6d. (or Bulgin, Telsen).

HOLDERS, VALVE

- 4—Lotus 4-5 pin with terminals, type VH/31 10d. (or W.B., Benjamin).

METER

- 1—Ferranti 0-100 panel mounting milliammeter, type 29F, £1 16s.

PLUGS AND TERMINALS

- 5—Belling-Lee wander plugs, marked:—G.B.—1, G.B.—1, G.B.—2, G.B.—3, G.B.—4, 10d. (or Clix, Ealex).
- 2—Belling-Lee spade terminals, marked: L.T.—, L.T.—, 9d. (or Clix, Ealex).

RESISTANCES, FIXED

- 1—Bulgin 20,000-ohm, flexible type, 1s. 3d. (or Lewcos, Sovereign).

- 1—Bulgin 30,000-ohm, flexible type, 1s. 6d. (or Lewcos, Sovereign).

- 1—Bulgin 40,000-ohm, flexible type, 1s. 6d. (or Lewcos, Sovereign).

- 2—Bulgin 50,000-ohm, flexible type, 3s. 6d. (or Lewcos, Sovereign).

- 1—Dubilier .25-megohm grid leak, 1s. 9d. (or Telsen, Watmel).

RESISTANCE, VARIABLE

- 1—A.E.D. 500,000-ohm dual volume control, 8s. 6d.

SUNDRIES

- Tinned copper wire for connecting (Lewcos).
- Lengths of insulated sleeving (Lewcos).
- Length of twin flex for mains leads (Lewcos).
- 1—Bulgin mains plug.
- 2—Lissen terminal blocks, 2s.
- 1—Baseboard, 14 in. by 10 in.

SWITCH

- 1—Wearite delayed action on-off type G44, 3s.

TRANSFORMERS, PUSH-PULL

- 1—Varley input, type DP6, £1 5s.
- 1—Varley output, type DP7, £1 4s.

ACCESSORIES

BATTERIES

- 2—Ever Ready 16-volt grid bias, type Wuu 16, 3s. 6d. (or Siemens, Pertrix).
- 1—Oldham 6-volt accumulator, type 3CL64, £1 18s. 3d. (or Tudor, Young).

LOUD-SPEAKER

- 1—Magnavox moving-coil, model DC142, type H, £2 17s. 6d.

VALVES

- 2—Mazda HL610, 17s.
- 2—Mazda P650, £1 10s.

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

milliammeter gives a check on the anode-current consumption), the amplifier is ready for use as soon as a radio or pick-up input is provided.

The unit is switched on by turning the knob at the right of the panel towards the right. Volume is controlled by the knob on the left of the panel. When this is turned as far as possible to the left full volume is obtained from the "radio" input. As the knob is turned to the right volume is gradually reduced until, exactly at the half-way position, nothing is heard at all.

Bringing in the Pick-up

If the knob is turned farther to the right the "pick-up" input will be brought into circuit, first at reduced volume and finally at full volume when the knob is turned as far as it will go to the right.

Of course, if the operator so desires, a second pick-up can be connected to the "radio" input terminals instead of a wireless set. Comparisons can then very quickly be made between any two pick-ups, or two turntables can be used so that when the record on one is finished a second one can be switched on.

straightforward and can be followed from the diagram on page 553 and the photographs. If desired, a full-size blueprint can be obtained for half price, that is 9d. post free, if the coupon on the last page of this issue is used by December 31. Address your inquiry to Blueprint Department, WIRELESS MAGAZINE, 58/61 Fetter Lane, London, E.C.4.

It should be noted that each connecting wire is numbered separately. When wiring is started it will be found best to proceed with the connections in the numerical order thus indicated. Note that the connecting leads numbered 20, 21, 22, 29 and 30 are flexible resistances.

Suitable Valves to Use

Suitable valves for use in the Quality Amplifier are indicated in the list of components above. The two Mazda P650's are, of course, the push-pull power valves. If different types are used—as they can be, of course, if desired—it may be necessary to change the values of the resistances included in the circuit. Most readers of WIRELESS MAGAZINE will be able to work out the proper values for themselves for the method has been explained frequently in these pages.

When the valves have been in-

serted and the grid bias adjusted according to the makers' recommendations (remember that the

AN ANTI-WIRELESS WAIL

(After Longfellow)

*Tell me not in mournful numbers
Nights pass like a pleasant dream,
For the man is deaf who slumbers
When loud-speakers reign supreme.*

*Long accounts of football matches
Are recorded goal by goal,
Concert parties, jazz in snatches,
Talks on finance and the dole.*

*Wireless neighbours oft remind us
That, as we can get no peace,
We, departing, leave behind us
Large loud-speakers which won't cease!*

LESLIE M. OYLER.

Why I Believe in the SUPER-HET

IF you want to receive the local stations only, the best set is probably a two- or three-valve arrangement. It would be foolish to use a bigger set for the purpose and very good quality, with ample volume, can be obtained from a set using only two or three valves.

Three- and Four-Valves

Many people like to be able to receive on occasions a few other stations decently and for the purpose use a three- or four-valve receiver. These sets will, I know, bring in numerous stations when the conditions are good. The quality can be made good and the selectivity enough for clear reception.

There is a limit to the range and power of these sets, however. While there may be amateurs who find that all the stations desired can be brought in, there are many who cannot receive as many stations as they would like.

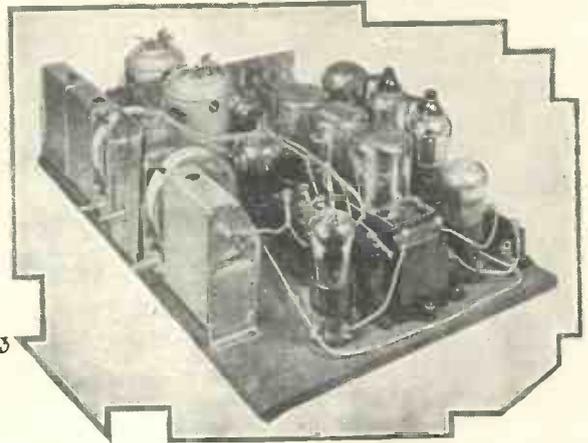
The reason may be lack of selectivity, lack of sensitivity, or both. Now a four-valve set having fair selectivity is not so easily made, even by amateurs who have had a fair experience of set building. The difficulty lies in the tuned circuits. For the best results a band-pass tuner would be used, having a two-gang tuning condenser. There would be one or two more tuned circuits as well. These must be accurately made and adjusted, and this is where the difficulty lies.

Tuning Difficulties

Properly made coils are not easily obtained and results show that amateurs have difficulty in adjusting numerous tuned circuits.

Circuits which are not in tune over the whole wavelength range must weaken the signals and the selectivity suffers. With poor selectivity and

**W. JAMES'
LATEST DESIGN**
This is the Super Senior, fully described in the October issue of "W.M." It has seven valves—screen-grid amplifier, first detector, oscillator, two intermediate screen-grid amplifiers, second detector, and power stage.



In this article W. JAMES reviews all the advantages of the super-het type of circuit, which was popularised by the original Super 60, described in the March issue of "Wireless Magazine." The Super 60 was followed by the simplified edition (August) and the Super Senior with preliminary high-frequency stage (October)

volume and the tuning, perhaps, a little tricky with reaction as well as volume to be adjusted, the general level of results falls short of what might reasonably be expected.

Many people cannot gang a three-circuit tuner. They adjust first one circuit and then the other, and finally put up with unsatisfactory results.

In the super-heterodyne receiver we avoid certain difficulties without adding much, if at all, to the cost. We use fixed tuned circuits, for example. There were six of them in the Super 60, all adjusted by the makers to the same frequency. There were three units, each having a band filter consisting of primary and secondary-tuned circuits, enclosed in a copper shield. These coils are not expensive, will last for years, and can be used by anyone without skill, as no tuning is necessary.

The two tuning adjustments of the Super 60 were in the oscillator and frame-aerial circuits. There was no ganging in this set—and no trouble.

Now compare the selectivity of the Super 60 with that provided by any other type of set and remember its low cost. The selectivity was good in that a band of frequencies was passed and the set will cut out a powerful local station and get another 9 kilocycles away.

So on a cost and results basis, you cannot beat a set such as the Super 60. This particular set is not perfect by any means, as was well known at the time it was first described. But anyone can build it and use it to get plenty of stations with fair quality.

Essentials for Good Quality

A good set would provide excellent quality and plenty of power. The last valve, its power supply, and the loud-speaker are very important factors. When there is an ample supply of high tension and a good-sized output valve feeding a well-made moving-coil loud-speaker, good quality is fairly easily obtained.

There is nothing in the super-heterodyne principle to spoil quality.

WHY I BELIEVE IN THE SUPER-HET—Cont.

In fact, it is my view that the quality to be obtained cannot be improved upon.

If we use an elementary form of volume control we shall, of course, expect a certain amount of distortion in dealing with the more powerful stations.

Easy to Get Good Quality

If the circuits are badly adjusted and the second detector is not right, we shall also get some distortion. This applies to any set, however, and I believe it is easier to get good quality from an average super-heterodyne set than from the average multi-valve set made to be selective.

In discarding the frame aerial and fitting a band-pass coil for use with an open aerial we come a step nearer perfection, although there is a number of amateurs who prefer the frame aerial. The band-pass aerial coil is easily ganged and tuned. There are several makes of well-made band-pass filters manufactured, but there are not too many good gang condensers.

The next step is the addition of a high-frequency stage before the first detector. This adds a tuned circuit, so that, if there is band-pass aerial tuning and a single tuned circuit joined to the high-frequency valve, there are three circuits to be ganged. This is not such a difficult job, given good parts. The number of makers interested in this class of work will undoubtedly increase.

A five- or six-valve A.C. mains super-heterodyne will bring in most stations. The quality can be made as good as desired, the selectivity is enough for present-day conditions, and the set is easy to operate. True one-knob tuning can be obtained by ganging the oscillator with the other circuits, but at the moment the difficulty is to obtain a supply of matched parts for the amateur constructor.

A Set Without Equal

Later on suitable parts will, no doubt, be available and then we shall be able to make a set having no equal.

The super-heterodyne principle is an old one. Super-heterodyne sets were built six years ago. Circuits have not changed very much, but the parts now being produced are much superior. Besides, we now have screen-grid valves and great amplification is readily obtained.

SUPER-HETS FOR YOU TO BUILD!

¶ **SUPER 60.**—The most popular home-constructor set yet produced. Fully described in the March, 1930, issue of "Wireless Magazine." A full-size blueprint (No. WM239) can be obtained for 1s. 6d., post free.

¶ **A.C. SUPER 60.**—Two models are available—a radio gramophone and a table version. The circuits are similar to that of the original Super 60. Full-size blueprints (No. WM245 and WM239) are available at 1s. 6d., post free.

¶ **SIMPLIFIED SUPER 60.**—Almost the same as the original Super 60, but with a combination valve and coil base that saves approximately twenty connections. Full-size blueprints of two different versions (Nos. WM249 and WM251) for 1s. 6d. each, post free.

¶ **SUPER SENIOR.**—A set on the lines of the Super 60, with a preliminary stage of screen-grid amplification. It utilises an open aerial instead of a frame. A full-size blueprint (No. WM256) can be obtained for 1s. 6d., post free.

Copies of the issues of "Wireless Magazine" describing the construction of these receivers can be obtained for 1s. 3d. each, post free, from the Publisher, "Wireless Magazine," 58/61 Fetter Lane, E.C.4.

We change the frequency of the signal in the first detector and magnify from this stage at a lower frequency. The new signal is filtered and magnified. With two stages we can use six tuned circuits and obtain all the magnification needed for practical purposes.

In fact, one stage is often enough when the set has A.C. mains valves. This stage will have two band filters (four circuits) connected to it and they are selective enough as a rule, particularly when an input band-pass tuner is used with the aerial.

Low Total Cost

Looking at present-day super-heterodyne circuits one must be struck by the relatively cheap filtering needed in the power circuits. In fact the total cost of all parts is not high, considering the results. I should like to see a five-valve straight set that is as good as a five-valve super-heterodyne receiver, both running from the mains and costing equal amounts. The "super" will be the better set easily.

There can be no doubt about the better selectivity, for example, and the ease of tuning. The sets already described demonstrate the truth of the assertion that the selectivity is about all that can be desired. Then, again, the cost of these sets shows what can be done in comparison with other types.

Circuits are straightforward enough and there are few points needing attention in setting up. Taken all round, the super-heterodyne set is the right set for those wanting to receive many stations as cheaply and as easily as possible.

Possible Improvements

We have not reached finality in super-heterodyne receiver design by any means. There are several possible improvements which will be introduced as soon as practicable. They will go far to making this type of set as easily constructed as a simple three-valve one.

Better and easier tuning than at present is a possibility. So is lower cost. Quality is good now and can, generally speaking, be improved only when more power is available. There is nothing to touch a modern super-heterodyne set on any count and it will receive the worth-while stations on any waveband.

More British Broadcasters!

Although art is international, it is good news that the B.B.C. are prepared to engage more British musicians. In these notes T. F. HENN explains what steps have been taken to this end; he also reveals some of the B.B.C.'s plans for future broadcasts that are worthy of your attention

"BUY British!" is to-day's slogan and it is interesting to note how the B.B.C. has followed it in the musical world.

Last year 140 foreign artistes were engaged for the symphony concerts; this year there are only forty. At the Queen's Hall there are eleven British and five foreign conductors this year, compared with six British and eleven foreign last year.

Artistes' Suspicions

It is only during the past few years that the British artiste has been attracted by the wide scope offered by broadcasting. With his usual conservatism, he left it alone, regarding it with some suspicion.

I learn that the B.B.C., in its encouragement of the British artiste, has even gone so far as to suggest that very difficult works, performances of which have been considered almost the sole right of the Continental artiste, should be studied carefully and performed with an Englishman as the soloist.

Such ideas have been received with enthusiasm, and we appear to be approaching the era when the programmes will be nearly 100 per cent. British. Of course, it does not imply that great Continental musicians—Dr. Richard Strauss and Furtwangler, for example—will

disappear from B.B.C. performances; such world-famous men are not replaceable and it is not desirable to strip British music to that extent.

English vocalists and instrumentalists will be engaged as often as possible. This is a lead that other concert organisers might well follow.

If the Queen's Hall concerts maintain their present standard, there will be three December programmes well worthy of everybody's attention. In these concerts, broadcast on Wednesday evenings at 8.15 p.m., all grades of classical music—from the well-worn Bach and Beethoven to the lesser-known works of Chausson, Constant Lambert, and Dame Ethel Smyth—will be heard.

Beethoven's *Concerto No. 3, in C Minor, for pianoforte and orchestra*—Myra Hess will be the solo pianist—and the Egmont overture will be the



Gillie Potter needs no introduction to listeners!

chief items in the concert to be conducted by Adrian Boult on December 2.

Sir Henry Wood will conduct on December 9, when the *Concerto in A Minor*, for violin and strings, by Bach; Chausson's *Poeme*, for violin and orchestra; and *The Song of the High Hills*, a delightful composition by the blind English composer, Delius, will be played. The solo violinist will be Thibaud.

Last Symphony Concert

The last Queen's Hall symphony concert of the year, to be conducted by Adrian Boult on December 16, is noteworthy. Suggia, the greatest of all women 'cellists, is to play in Schumann's *Concerto in A*, for violin-

cello and orchestra. *Music for Orchestra*, by Constant Lambert, and Vaughan Williams' *Pastoral Symphony* are also included in this interesting programme.

An innovation in the programmes is the mid-week service broadcast on Thursdays immediately before



Sidonie Goosens is the leading harpist in the B.B.C. Symphony Orchestra



A famous concert singer, Evelyn Scotney has figured in many big programmes

MORE BRITISH BROADCASTERS!—Cont.



A soprano who frequently broadcasts from Irish stations, Dorothy Camlin



Frank Mannheimer, a clever German pianist, has been heard



A favourite in musical comedy broadcasts, Tessa Dean, soprano



Owen Bryngwyn, a Welsh baritone, has broadcast in recent programmes

Jack Payne's late dance-music period. I see no objection to the general principle of this service, but I do question the wisdom of its being sandwiched between two exceptionally light types of programme matter.

Two Alternatives

There are two alternatives which would do away with this somewhat objectionable timing. The first is to change the times altogether. The B.B.C. has practically suggested the

other. In a recent announcement it was stated that the public were invited to attend the service at St. Michael's, Chester Square, pointing out that an organ recital, by G. D. Cunningham, is given from 10 p.m. to 10.30 p.m. If this recital was broadcast, I am certain it would be appreciated by a large number of listeners, the sandwiching problem automatically being solved.

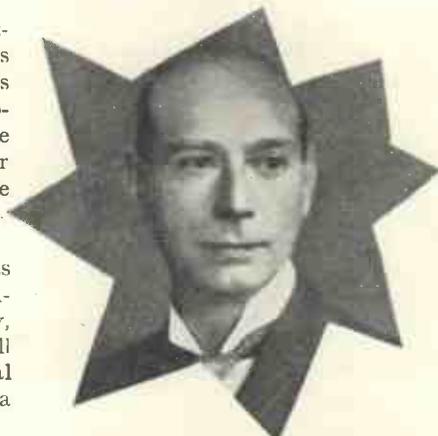
There is no doubt that the light-orchestral side of the programmes is bucking up. The Theatre Orchestra is taking up quite a large part of programme time. Its performances are good but it seems that if the number of string players were doubled, the overall effect would be vastly improved.

There are two other orchestras always worth hearing. The Commodore Orchestra, which, by the way, now broadcasts on Mondays as well as Saturdays, is free from the usual muffle effect associated with cinema transmissions.

The other is Reginald King's

Orchestra. Last month I mentioned the lack of melody to be found in the average English dance orchestra. Reginald King's band, although not of the dance variety, can bring out melody together with good time. An excellent combination.

A new operetta, written and composed by Cyril Scott and produced by Gordon McConnell, is to be given in the Regional programme on Novem-



An artiste who broadcasts from Midland Regional, Mark Mallers, baritone



Appleton Moore makes a special feature of English songs in his broadcasts



A provincial singer heard in Midland programmes, Norah Savage



Renowned for his inimitable Mrs. 'Arris sketches, Fred Spencer

B.B.C. PLANS FOR THE FUTURE

ber 26 and the National on November 27.

The story of this operetta—it is called *Janet and Felix* or *Singing Sickness*—is very original. A young man is turned down by his fiancée because he cannot sing. He goes to a wishing seat in Yorkshire, and then misfortune befalls him. He is condemned to sing everything and loses the power of talking. Returning south, he visits his lover—singing.

Out of the Ordinary

This operetta should be quite amusing. With Gordon McConnell as producer we may look forward to something out of the ordinary.



A new combination that recently made its first broadcast, the Portland String Quartet

Turn to page 539 for Whittaker-Wilson's opinion of the Vaudeville programmes



Johnson Clark, ventriloquist, who has recently broadcast

Another forthcoming production which should prove interesting is a concert version of *Tantivy Towers*, which recently had a successful run at King's Theatre, Hammersmith. This will be another "diagonallised" performance, the term used by the

usual run of programme material and it is changes that give freshness to the programmes. They are not so bad as many critics make out.

I was impressed by the recent performance, during a vaudeville show,

B.B.C. for separate National and Regional presentations. December 4 and 5 are the dates fixed for this show.

of Max and Harry Nesbitt, two old broadcasters, who have not been heard for some considerable time. The mere fact of saying that they are entirely different from everybody else means a lot. I thoroughly enjoyed their novel harmony and syncopated effects.

The Ridgeway Parades have again started. Although I do not consider these anywhere near perfect, I must give some credit to the producer and say that they are better than the last series. Anyway, they are a definite change from



A bass baritone who is heard from North Regional, Albert Murgatroyd



One of the best-known provincial broadcasters, Gwladys Garside, contralto



An old-time music-hall artist who has turned to radio, George Mozart



Heard in Midland Regional revues, Ann Bradley, a clever young actress



PART OF A TALKIE FILM
This is an enlargement of a piece of talkie film. The sound track is seen on left-hand side

KENNETH ULLYETT
is taught how to read
talkie-film sound tracks

RECENTLY a daily paper came out with a "scare" story of a talkie-film engineer who had made a synthetic voice. In other words he had drawn a talkie-film sound track which, when run through the projector, produced words which had never passed human lips.

When I chatted about this to Mr. A. C. Blackmore, the technical manager of Warner's, he explained to me how this is done by drawing the sound track very large, and then reducing it photographically to the correct width for the film strip.

Amazing Process

He showed me another process which is equally amazing and which, as it is not a stunt, but a thing which enters into the daily production of films, is of even greater utility.

The experts in the film laboratories who handle all spools before they are released or even passed by the censor for production in this country can actually read words direct from the sound track.

I don't know if you have ever examined a talkie film. To the uninitiated the sound track is simply a grey strip of puzzling irregularity in tone down one side of the picture. It seems incredible that anyone should be able to translate these varying tones into words, but I have seen it done and have made a good shot at it myself!

As a wireless enthusiast I was interested in the apparatus used in the

Reading A Talkie Film

first stages of film checking. It is called the Moviola, and through it run two identical films. One can be viewed through a small peep-hole behind which a powerful light is shining, and the other is utilised only on its sound track and the synchronised sound is heard through a small loud-speaker at the top of the Moviola.

At the back of the film which is used for reproducing is an ordinary photo-electric cell, just as in an ordinary cinema projector where a talkie film is running.

This is connected up to a Loftin-White type of two-valve amplifier in the base of the Moviola, a screen-grid valve being used in the first stage on account of its big step-up. Also the grid-circuit characteristics of the American A.C.-fed screen-grid valve used are well suited for coupling up to the photo cell. A second valve, an ordinary A.C. power job, is transformer-coupled to the loud-speaker.

When one of the laboratory men wants to check a new talkie film for the purpose of cutting or censoring, he runs the twin spools in the Moviola and, hearing the sound effect through the loud-speaker, watches the other film through the peep hole.

If he overshoots the point where the cut is required he touches a switch which reverses both films and, for a few seconds, the sound can be heard backwards!

Then he takes the film out of the Moviola and, noting any special dialogue or loud sound which makes an obvious mark on the film track, he reads back along the film, until he gets to the point where the cut must be made.

This reading is not easy if the cut has to be made in the middle of a long speech by one actor, because it is difficult to get a "landmark" among the varying grey patches of the sound track. A sudden sound or the break in a dialogue, however, will cause an obvious dark or light series of bars to appear for a fraction of an inch or so on the film, and these are the guides

used in reading the words from a film.

Certain familiar noises—such as the running of a motor-car or the ringing of a telephone bell—make sound patterns on the track which are well known to the engineers.

Once a cut has been decided upon it is quite an easy matter to read and alter the sound tracks on all duplicate films in the same way because at the side of each film—outside the perforations—are small marks showing the footage from the start of the film.

Utmost Importance

I was told that it is of the utmost importance to be able to read a talkie, because on occasions films come up from the laboratory in which the sound track has not been printed in exact synchronisation with the picture side. While it is possible, when showing the film in a cinema, to make slight variations each way, in synchronisation between the sound track and what is known as the "mute" track (that is the picture side), this cannot be done if the two are out of synchronisation more than an inch or so in one direction, and not at all in the other.

The sound track, as is probably well known, is always nineteen frames ahead of the picture side of the film. The two are made separately in the studio, the sound track being printed the actual size on a separate film strip running synchronously with the film, used for the taking scene.

Cutting of the Picture

It was news to me that the sound track, when printed on the mute track, actually cuts off part of the picture. I had always thought that space was left on the film so that no actual picture was lost by the imposition of the sound section. Apparently, though, the full width of the film is left so that for a silent version of the film, or where the sound is taken from the film track and put on a gramophone record, the full width of the picture film is available.

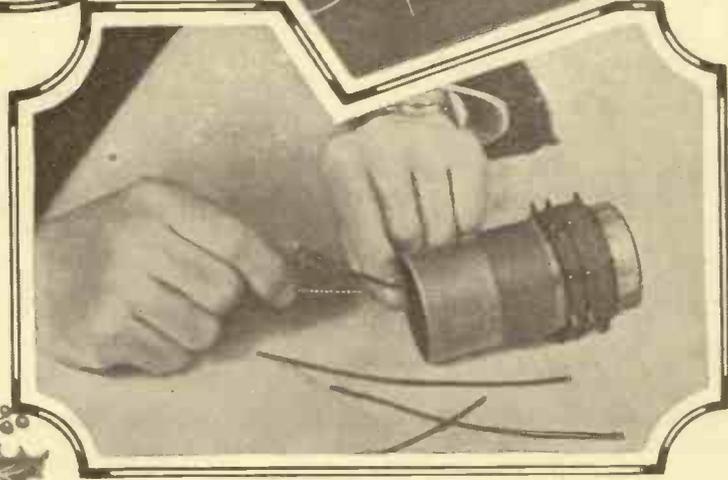
STARTING RADIO FOR £5



With the New
ECONOMY THREE



The "Wireless Magazine" is proud of its achievement in producing a screen-grid three-valver that can be built—complete with valves, dual-range coils, loud-speaker, and batteries—for as little as £5. Even in these days of cheap components that is something out of the ordinary—and that is why a special sixteen-page supplement has been devoted to its description. Thousands of New Economy Three's will be built during the next few weeks. Why not make one yourself in time for Christmas?



★ ★ ★ ★ ★ THE ★ ★ ★ ★ ★
NEW ECONOMY
THREE

A STAR
 ★
 SET



HERE is a set that will interest thousands of constructors! It is ideal for the beginner and will also give the experienced amateur many hours of pleasure in simple experimenting.

Although very cheap and simple, it is nevertheless surprisingly efficient—the WIRELESS MAGAZINE Technical Staff never anticipated that they would be able to produce such a successful design when they decided to tackle a receiver for the new economy conditions.

An Achievement

To design a three-valve screen-grid set—complete with dual-range coils, valves, loud-speaker and all the necessary batteries—is something of an achievement even in these days of cheap components; that is why a special sixteen-page

supplement has been devoted to its description.

There is no question about the efficiency of the New Economy Three and its capabilities in the way of foreign-station reception. A glance at the test report printed on the opposite page will convince the prospective constructor that the set has a performance as good as that of the average three-valver at double the price.

Almost anywhere in the British Isles it will pick up from twenty to thirty Continental stations well enough for the whole family to enjoy the programmes.

This set is final proof that radio is the cheapest form of home entertainment yet made available to the masses and there is no question that thousands will be built during the next few weeks.

Even if you have never tackled the building of a radio set before, you will not for a moment doubt the simplicity of construction after a glance through the rest of the pages of this supplement. Every detail that the constructor can possibly require is dealt with fully.

Using Spare Parts

Those who have already built sets for themselves will also be interested in this design. Many “old hands” will be able to put it together from spare parts that they already have on hand.

One thing is certain—for its price the New Economy Three is quite unbeatable on the score of performance. There is no commercial set at anything like the price to compare with it for station-getting properties.

Build This Set in Time for Christmas!

WHAT THE SET WILL BRING YOU

ONLY a few minutes' knob-twisting on this new three-valver was necessary before I realised that here was a set in which performance is not controlled by cost. That, indeed, is my considered opinion. The New Economy Three is a set costing about £5 and capable of giving results equal to many costing £10.

I connected up the set in the usual manner with 60 volts on the screen-grid tapping, 90 volts on the detector, and 120 volts on the power valve.

Valves Used for Testing

Cossor valves were used throughout for my test. An SG215 was found most suitable for the high-frequency stage, an HL210 for the detector, and a P220 for the power.

The total anode current was found to be 12 milliamperes, which is reasonable for a three-valver. The filament consumption of the three valves is .45 ampere, therefore a 20-ampere-hour accumulator will last nearly forty hours for one charge.

Tuning with the small knobs was easily mastered after a few minutes' handling. It is quite obvious that as they are so small great care has to be taken when tuning—especially when searching for foreign stations. Careful and

precise handling is essential—one slight move and a station is passed over.

Tests on this compact set were

evening was chosen in order that full advantage could be taken of testing both when Brookman's Park was closed and working.



YOU CAN GET MOSCOW, TOO!

Tested in South London, the New Economy Three picked up Moscow at good loud-speaker strength. This photograph shows the chief announcer and his lady assistant. Why not build this set and listen for them?

carried out in South London, using an outdoor aerial 60 ft. long. The local regional station is about twenty miles away. A Sunday

I first switched on at 7.30 p.m. and in the course of the half hour before Brookman's Park opened, no fewer than fifteen stations were logged on the medium waveband. The outstanding feature of this preliminary test was the enormous strength of Mühlacker.

At 8 p.m. the good selective properties of the set became evident. Toulouse was entirely free of interference from London Regional, as also were the two adjacent high-power stations, Midland Regional and Sötten. Surely no one can expect more for £5!

Long-wave Surprises

Tests on the long waves provided the biggest surprise of the evening. Ten stations were received, all at good loud-speaker strength. Huizen was loud; Radio Paris was entirely clear of Daven-try; likewise Eiffel Tower. Warsaw and Moscow came in at really extraordinary strength.

A. BROCK LEA.



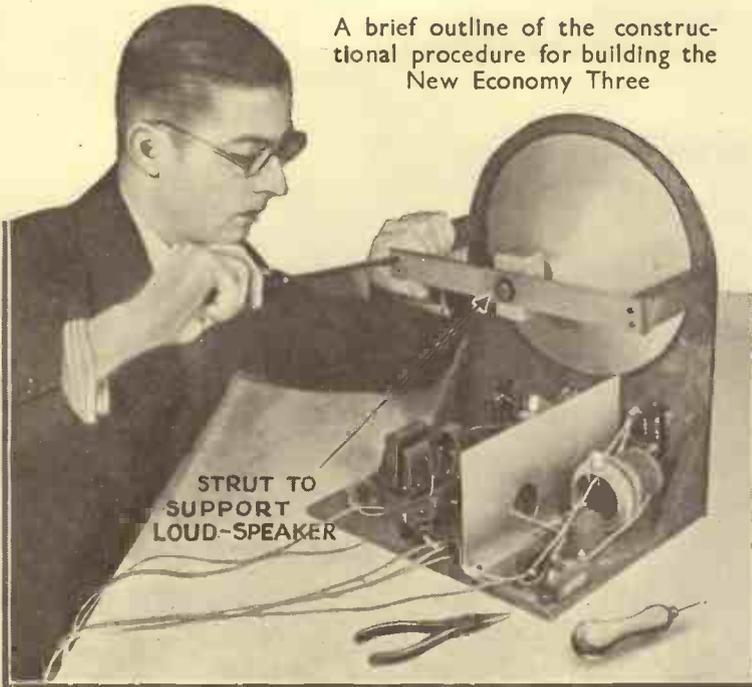
ANOTHER STATION YOU WILL BE ABLE TO GET

Berlin also came in well. Here you see one of the "aunties" broadcasting hints for making cheap and amusing Christmas presents. The New Economy Three will bring many other German stations to your fireside

CONSTRUCTIONAL POINTS ABOUT—

A brief outline of the constructional procedure for building the New Economy Three

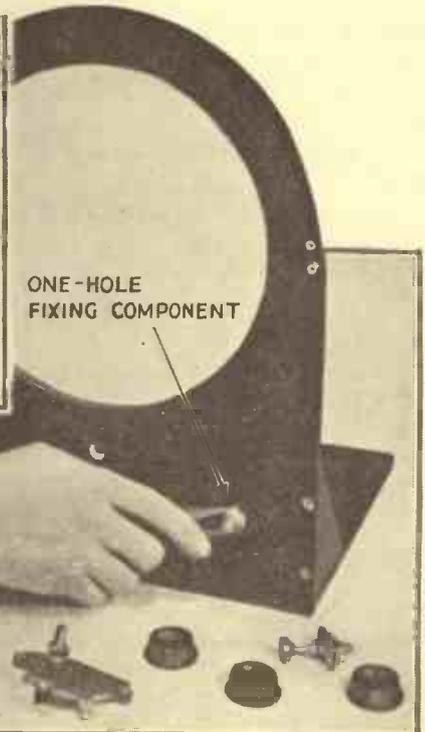
scale layout and wiring diagram, reproduced on Pages Ten and Eleven. This will be enough for most constructors, but those who desire one can obtain a full-size blueprint for half price, that is 6d. post free, if the coupon to be found on the last page of this issue is used by December 31. Address your application to Blueprint Dept.,



STRUT TO SUPPORT LOUD-SPEAKER

ALMOST READY FOR USE

Screwing the loud-speaker in position ready for switching on and listening to the Continent. This photograph shows clearly the simple nature of the design



ONE-HOLE FIXING COMPONENT

IT is not our intention in these pages to go deeply into theoretical considerations of the New Economy Three; we shall confine ourselves almost entirely to a discussion of the practical points of importance to every constructor.

The general scheme of the set will be clear from the photographs on this and the opposite page. A "chassis" form of construction is employed. The bulk of the component parts are fixed to a horizontal baseboard, while the parts that have knobs that must be adjusted before stations can be received are mounted on the vertical wood front.

Loud-speaker

This is made large enough to act as a mount for the cone loud-speaker included in the outfit.

Every essential detail for the building of the set is included in this supplement. There are instructions for winding the special dual-range coils,

making the loud-speaker, fixing and wiring up the components, and operating the finished receiver.

A special feature is the inclusion of a half-



SUPPORT FOR SCREEN GRID VALVE HOLDER

FIXING THE HOLDER FOR THE SCREEN-GRID VALVE
The holder for the screen-grid high-frequency valve is mounted on a small block of wood fixed to the baseboard with screws from the underneath

THE FIRST STAGE
There is no difficulty about fixing the parts to the wood front of the set. All of them are of the one-hole fixing type and there is only one nut to fix each

WIRELESS MAGAZINE, 58/61 Fetter Lane, London, E.C.4, and ask for No. W.M.263. A copy will be sent by return of post.

Making the Coils

The first part of the construction to be undertaken should be the making of the dual-range coils. Two of these are needed and complete instructions will be found on Pages Six and Seven. If the reader does not desire to make the coils at home they can be

-THE "THIRTY-STATION" THREE

TOOLS YOU WILL NEED

This set is so simple to build that only the most elementary tools are needed. Here is a list of what you will want: Small screwdriver, long-nosed pliers that will also cut wire, fretsaw for cutting wood and a hole in the metal screen, bradawl for starting screw holes, pair of scissors for cutting paper cone, and assortment of $\frac{1}{8}$ in., $\frac{1}{4}$ in., and $\frac{3}{8}$ in. No. 4 screws.

These items can be obtained from any "sixpenny" stores or from the local Ironmonger.

bought for a few shillings from one or other of the advertisers in this issue of WIRELESS MAGAZINE.

Many people will want to make their own coils, however, just for the fun of the thing. Radio construction is one of the most fascinating pastimes yet invented for whiling away a winter evening and this set will serve as a good introduction to those who have not yet tried any radio work of their own.

There is a great thrill in listening to concerts from all Europe with a receiver that you have made from start to finish with your own hands. Try it and see!

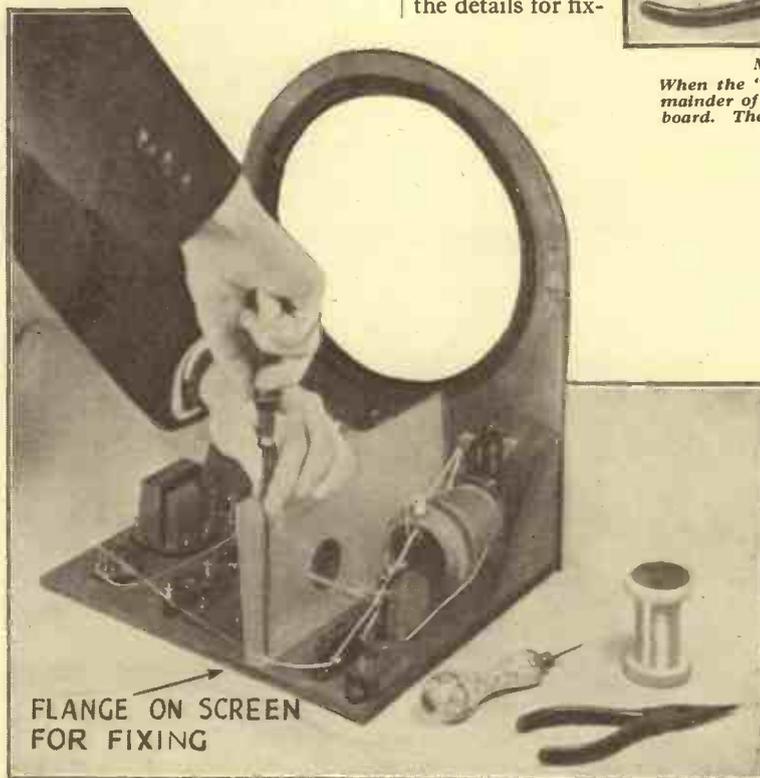
Having made the coils, the next step should be the construction of the wood chassis, which is fully explained on Page Eight. Until this is done it is impossible to proceed with the rest of the set for all the component parts are mounted on it.

On Pages Nine, Ten, and Eleven will be found all the details for fix-



MOUNTING THE COMPONENTS

When the "panel" components have been fixed the remainder of the parts can be screwed down on the baseboard. The exact positions will be clear from the layout guide on Pages Ten and Eleven



SCREWING DOWN THE METAL SCREEN THAT GIVES STABILITY

The aluminium or copper screen is provided with a flange so that it can be screwed on the baseboard. The dimensions will be found on Page Nine. The hole is for the screen-grid valve, which is mounted horizontally

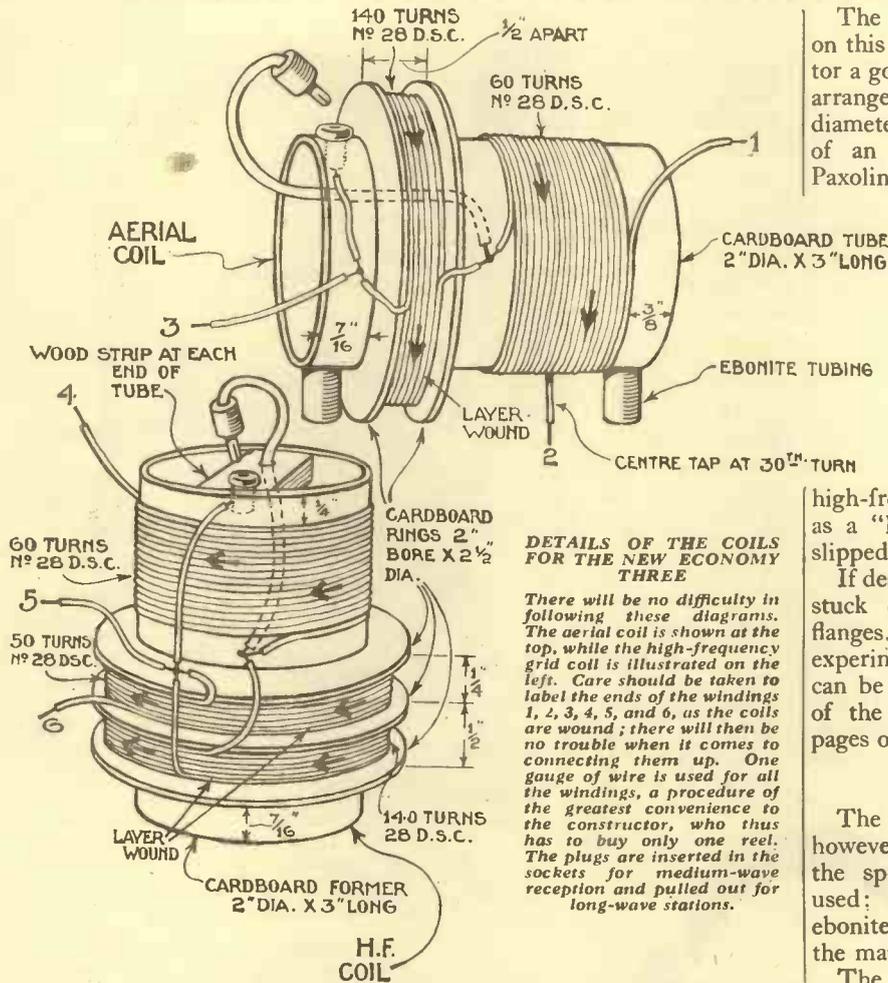
ing and wiring up the parts so that the set can be operated. When the wiring has been completed the only part of the construction still to be done is the assembly of the cone loud-speaker unit; this is explained on Pages Twelve and Thirteen.

Operating the Set

Instructions for getting the best results from the set—written in such a way that even the beginner will not have the slightest difficulty in following them—are given on Pages Fourteen and Fifteen. A list of parts and a theoretical circuit diagram, which will interest the more technical constructor, will be found on Page Sixteen.

Most houses will already contain the few tools needed for building the set—a small screwdriver, a pair of pliers that will also cut wire, a fretsaw, a bradawl, and a pair of scissors. If tools have to be bought, they can be obtained for a few pence from any "sixpenny" stores.

"ECONOMY" DUAL-RANGE COILS—



DETAILS OF THE COILS FOR THE NEW ECONOMY THREE

There will be no difficulty in following these diagrams. The aerial coil is shown at the top, while the high-frequency grid coil is illustrated on the left. Care should be taken to label the ends of the windings 1, 2, 3, 4, 5, and 6, as the coils are wound; there will then be no trouble when it comes to connecting them up. One gauge of wire is used for all the windings, a procedure of the greatest convenience to the constructor, who thus has to buy only one reel. The plugs are inserted in the sockets for medium-wave reception and pulled out for long-wave stations.

The photographs and diagrams on this page will give the constructor a good idea of how the coils are arranged. Each is wound on a 2-in. diameter tube. The tubing is made of an insulating material called Paxolin, but ordinary cardboard could be used. It must, however, be of exactly the right diameter.

Windings

In each case the medium-wave winding is a single layer of wire wound tightly round the tube. The long-wave windings (and the reaction winding on the high-frequency grid coil) are wound as a "hank" on bobbins that are slipped over the main former.

If desired, cardboard rings can be stuck on the former to act as flanges. That is how the first experimental coils were made, as can be seen from the photographs of the set that appear on other pages of this supplement.

Ebonite Bobbins

The coils look much neater, however, and are easier to wind if the special Wearite bobbins are used; these are turned out of ebonite and are simpler to fit on to the main tube.

The method of anchoring the

A FEATURE of the design of the New Economy Three that will appeal to a large number of constructors is that the two dual-range coils needed can quite easily be made at home with a few simple materials. Making one's own coils adds considerably to the pleasures of set building and it also, of course, saves considerably on the total cost.

Simplified Design

For the sake of convenience the coils have been so designed that only one gauge of wire is needed for all the windings. This is not the usual practice; normally, two or three different gauges of wire are needed for a dual-range coil. We feel sure that all constructors will agree that the use of one size of wire is a step in the right direction. No efficiency is lost by this procedure.



FIXING THE DUAL-RANGE ATTACHMENT

The change from long- to medium-wave reception is made by a short-circuiting plug. This photograph shows the plug being connected to the end of one of the windings.

-YOU CAN MAKE AT HOME

ends of the wire on the former is to drill two small holes about half an inch apart; the wire can then be threaded through these holes once or twice, when it will be firmly held in position.

Directions of Windings

There will be no doubt about the directions of the windings if the diagrams on the opposite page are carefully followed. The arrows show clearly which way the wire is wound on.

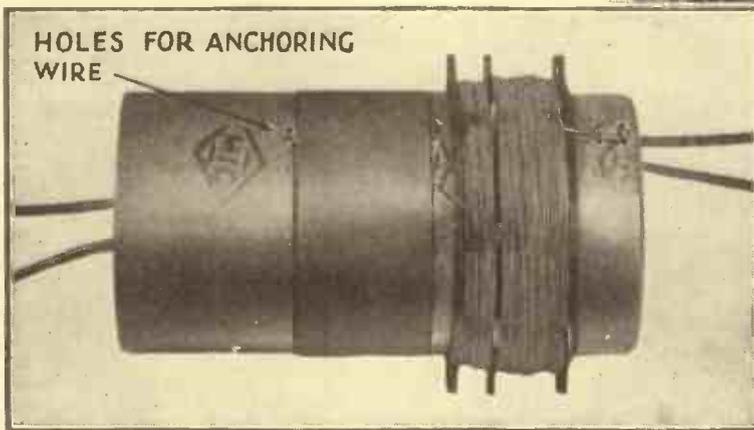
All the windings are made with No. 28 gauge d.s.c. (double silk-covered) wire and about $\frac{1}{4}$ lb. will be needed altogether. It is impor-

tant that d.s.c. wire should be used.

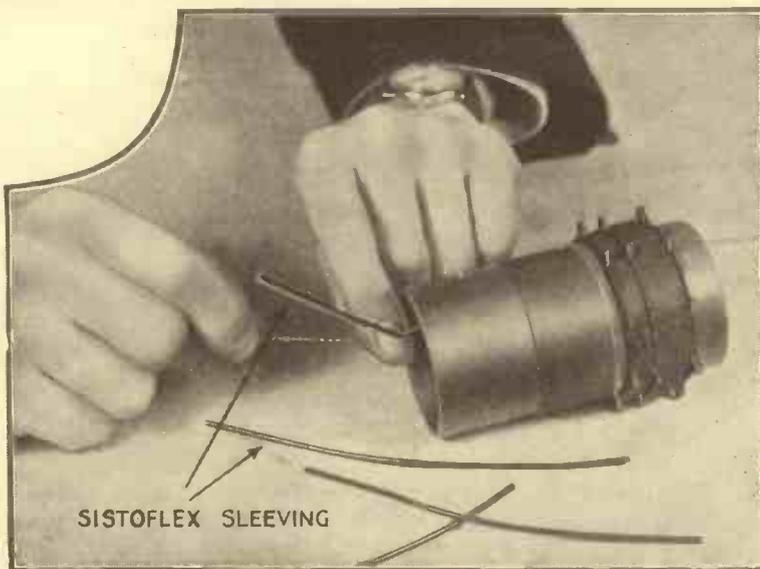
The medium-wave aerial winding consists of 60 turns with a tapping taken at the centre point. The easiest way to make this tapping is to make a loop in the wire when 30 turns have been put on the former. A connection can then be made to the



SCREWING THE COILS IN POSITION
The coils are easily fixed to the baseboard. The aerial coil should be raised slightly by means of short pieces of ebonite tubing through which the fixing screws can be passed



THE COMPLETED HIGH-FREQUENCY GRID COIL
Here is the completed high-frequency grid coil. A Wearite ebonite bobbin has been used for the long-wave and reaction windings, but cardboard flanges can be used if desired



PROTECTING THE ENDS WITH INSULATING SLEEVING
It is a good plan to slip pieces of insulating sleeving over the ends of the windings. The fine wires will not then be so easily broken off

loop when the coil has been completed.

It is important to start the winding at the exact distance from the end of the former indicated in the diagram. The long-wave winding, wound on the ebonite bobbin or between two cardboard flanges stuck on the former, is in the same direction. It consists of 140 turns altogether; it has no tapping.

H.F. Grid Coil

The medium-wave winding on the high-frequency grid coil also consists of 60 turns of wire, while the long-wave winding has also 140 turns as before. Between these two windings come the reaction section, consisting of 50 turns. All three windings are wound on the former in the same direction.

Several advertisers in WIRELESS MAGAZINE are prepared to supply the coils for the New Economy Three, wound to the specification detailed in these pages, at 7s. 6d. the pair.

WIRING THE NEW ECONOMY THREE

WHEN all the components have been fixed firmly in position on the wood chassis the wiring up can be proceeded with. This is not at all difficult and the connections are explained in detail in the following two pages.

Connecting Leads

The most convenient way of making the connections is with No. 20 gauge tinned-copper wire, covered with oiled-cotton insulating sleeving. The sleeving is cut in lengths that will reach between the pairs of terminals to be connected together and then the wire is threaded through, sufficient to be twisted under the terminal heads being left protruding at each end.

Alternatively, rubber-covered flexible wire can be used for all the connections. Before a lead is put in

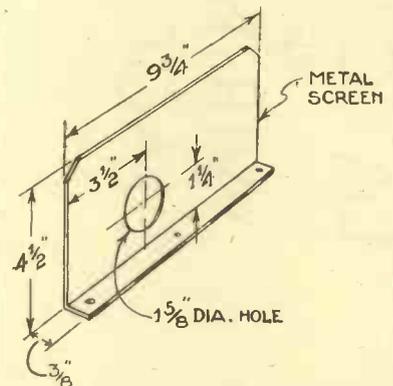
position, of course, the rubber insulation must be removed from the ends, otherwise no electrical connection will be made.

Still another method is to use the Jiffilix connectors made by the Ready Radio people. These consist of lengths of insulated wire provided with eyelets that can easily be screwed under terminal heads. They are obtained in packets, costing only a shilling or two, which contain an assortment of connectors of varying lengths.

Note that it will be necessary to make three holes in the metal screen (details of which are given in the diagram reproduced on this page) for connecting leads to pass through. These holes can be made with a bradawl.

If the wiring guide on Pages Ten and Eleven is carefully followed, there will be no difficulty about the

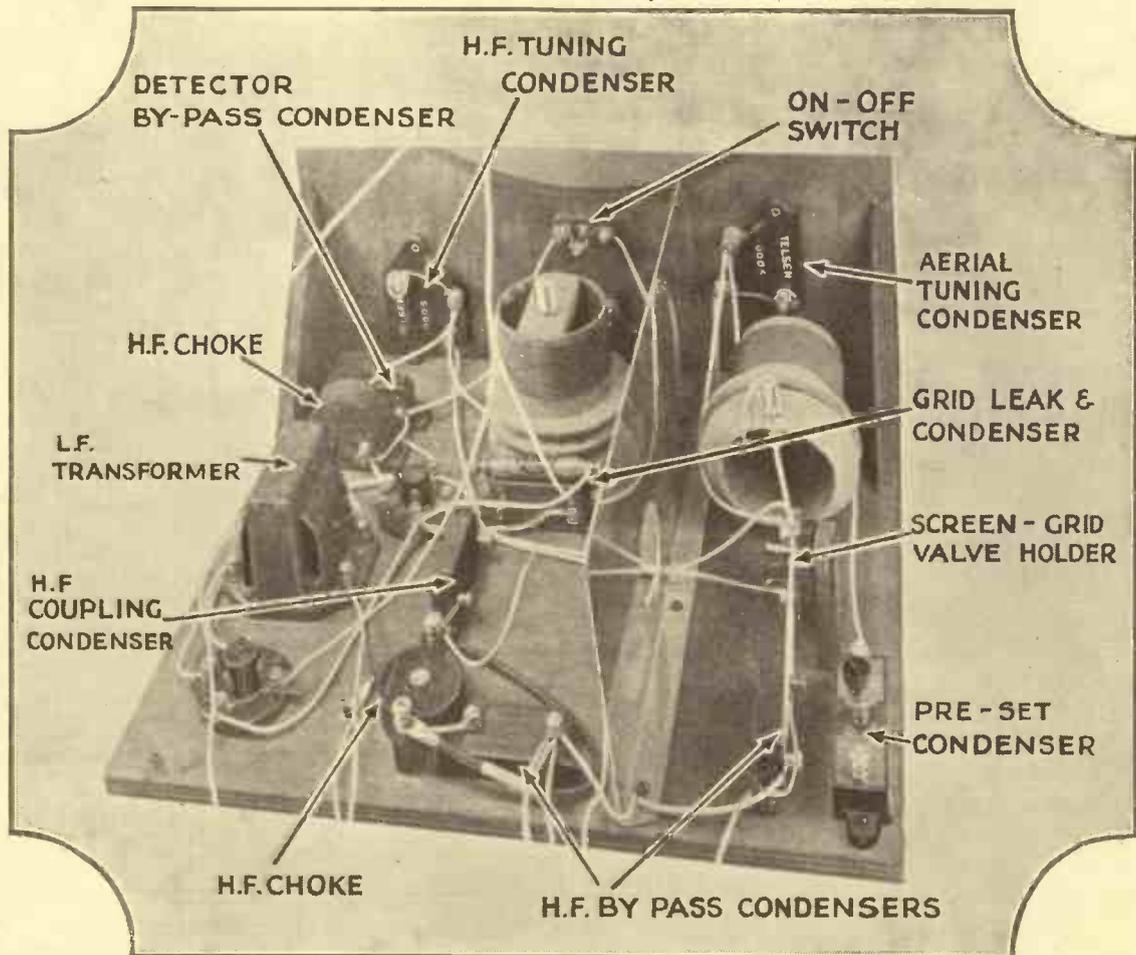
wiring of the New Economy Three, which is one of the simplest con-



DETAILS OF METAL SCREEN

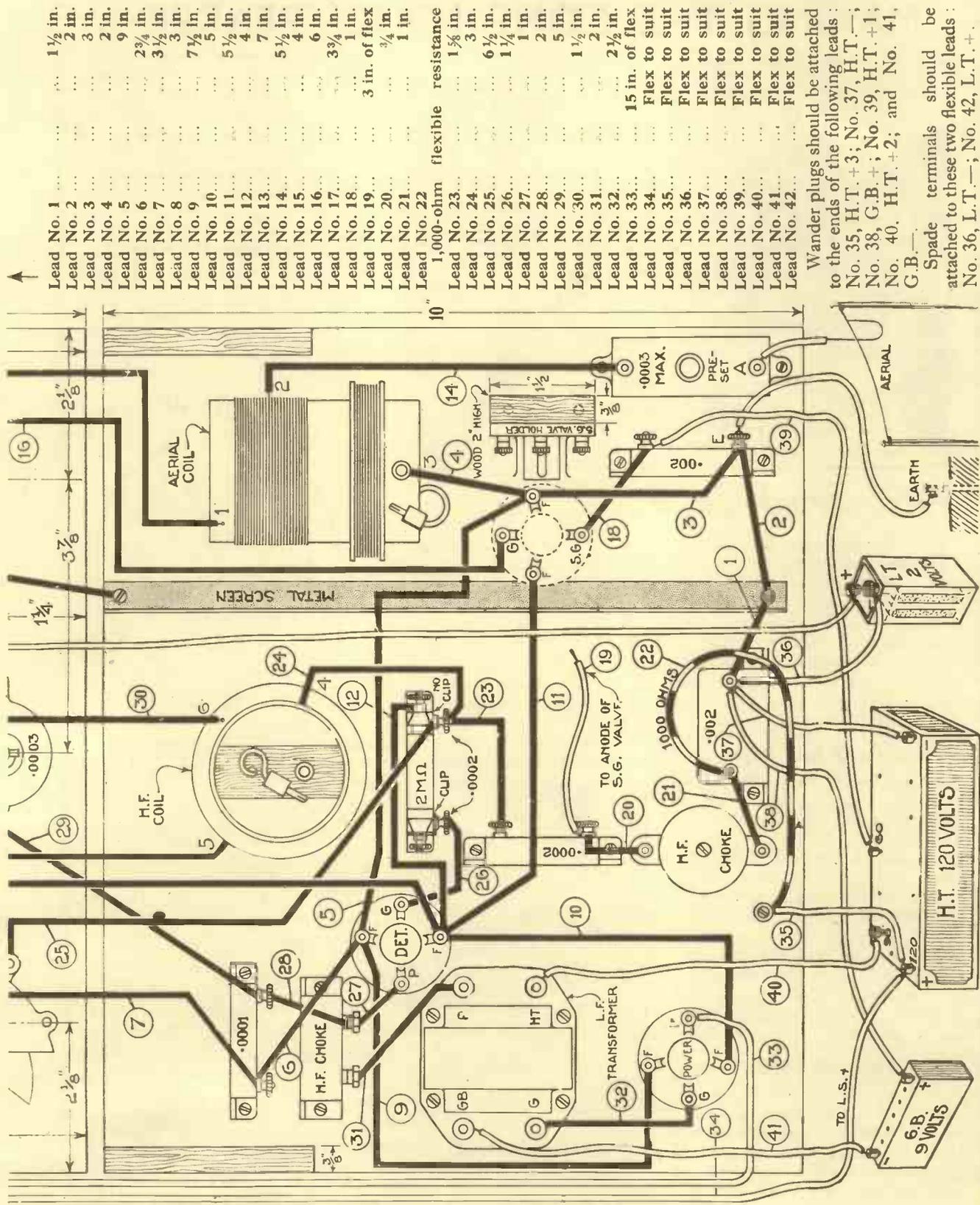
This diagram shows the dimensions of the metal screen, which can be of aluminium or copper. It is an important factor in the stability of the set

structural jobs the listener could tackle.



A PHOTOGRAPHIC GUIDE TO THE VARIOUS COMPONENTS

If you are a newcomer to radio this special photographic plan view will enable you to recognise the components used in the New Economy Three without difficulty. It should be referred to in conjunction with the layout guide on Pages Ten and Eleven



- Lead No. 1 1 1/2 in.
- Lead No. 2 2 in.
- Lead No. 3 3 in.
- Lead No. 4 2 in.
- Lead No. 5 9 in.
- Lead No. 6 2 3/4 in.
- Lead No. 7 3 in.
- Lead No. 8 7 1/2 in.
- Lead No. 9 5 in.
- Lead No. 10 5 1/2 in.
- Lead No. 11 4 in.
- Lead No. 12 7 in.
- Lead No. 13 5 1/2 in.
- Lead No. 14 4 in.
- Lead No. 15 6 in.
- Lead No. 16 3 3/4 in.
- Lead No. 17 1 in.
- Lead No. 18 3 in. of flex
- Lead No. 19 3/4 in.
- Lead No. 20 1 in.
- Lead No. 21 3 in. of flex
- Lead No. 22 1 in.

- 1,000-ohm flexible resistance
- Lead No. 23 1 3/8 in.
- Lead No. 24 3 in.
- Lead No. 25 6 1/2 in.
- Lead No. 26 1 1/4 in.
- Lead No. 27 1 in.
- Lead No. 28 2 in.
- Lead No. 29 5 in.
- Lead No. 30 1 1/2 in.
- Lead No. 31 2 in.
- Lead No. 32 2 1/2 in.
- Lead No. 33 15 in. of flex
- Lead No. 34 Flex to suit
- Lead No. 35 Flex to suit
- Lead No. 36 Flex to suit
- Lead No. 37 Flex to suit
- Lead No. 38 Flex to suit
- Lead No. 39 Flex to suit
- Lead No. 40 Flex to suit
- Lead No. 41 Flex to suit
- Lead No. 42 Flex to suit

Wander plugs should be attached to the ends of the following leads: No. 35, H.T.+3; No. 37, H.T.-; No. 38, G.B.+; No. 39, H.T.+1; No. 40, H.T.+2; and No. 41, G.B.-.

Spade terminals should be attached to these two flexible leads: No. 36, L.T.-; No. 42, L.T.+.

MAKING THE CONE LOUD-SPEAKER—



You can, of course, use this loud-speaker with any other set should you so desire

it is mounted in position and a fairly air-tight joint is thus provided. Instead of felt, a piece of thick flannel can be utilised.

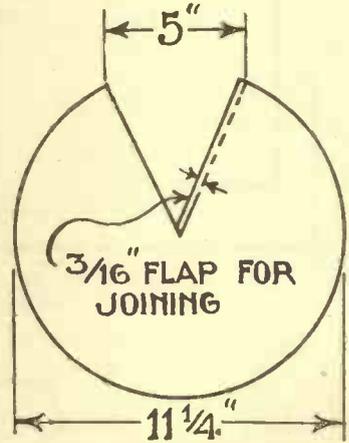
In this way the wood front of the main chassis acts to some extent as a baffle and improves the reproduction obtained from the loud-speaker unit.

Attaching the Cone

When the Seccotine that sticks the edges of the cone together is quite dry, the loud-speaker can be completely assembled. The unit should be screwed to its supporting strip and the cone attached to the

CUTTING OUT THE PAPER CONE DIAPHRAGM

The paper used should be stiff, but not too heavy. All the necessary dimensions for marking out will be found on the diagram printed alongside



DETAILS OF THE CONE

This diagram gives all the details for cutting the paper cone, which has a radius of 5 1/2 in.

THOSE who have never tried it may think that the making of a loud-speaker is not an easy job, but in that they are wrong. The construction of the loud-speaker for the New Economy Three amounts to very little more than cutting out a piece of paper and sticking two edges together to form a simple cone shape.

Choice of Best Paper

More difficult than the actual construction is the choice of a paper that will give the best results. The paper should be stiff, but it must not be too heavy. Thin cartridge paper is usually very satisfactory. It is worth while making up several cones with different kinds of paper.

It is interesting to compare the results obtained with the different samples. A little experimenting in this direction will be amply repaid by the improved results that can be obtained.

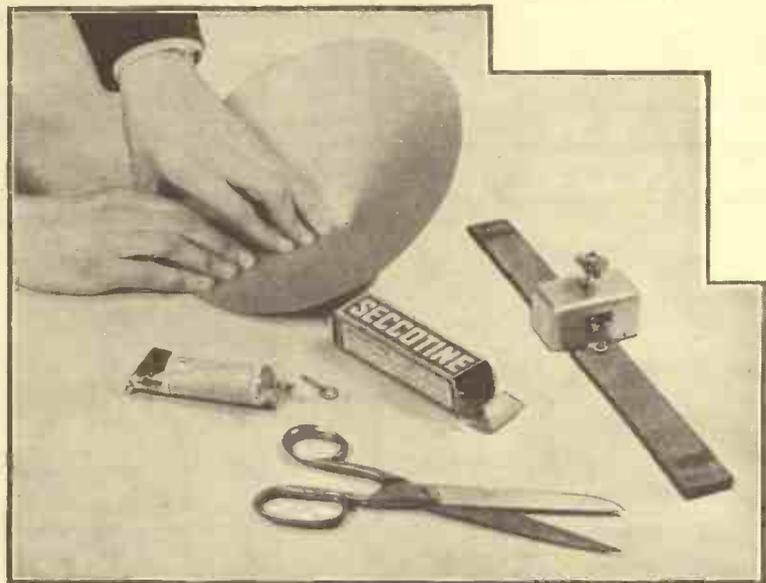
Practical Hints

With a piece of string or with a pair of pencil compasses mark out on the sheet of paper a circle of 5 1/2 in. radius, as indicated in the diagram on this page. Then take a ruler and mark off an arc of 5 in. somewhere on the periphery. Cut out a V-shaped section, leaving a 3/16-in. flap for joining. This will be

clear from the diagram alongside.

The next step is to apply a thin coating of Seccotine to the flap and then to stick the two edges together. This part of the construction is illustrated by the photograph at the bottom of this page.

Before the loud-speaker can be fixed to the main chassis of the set, it is necessary to stick a ring of felt round the opening in the wood. The cone bears up against this when



FORMING THE PAPER INTO A CONE SHAPE

This photograph shows how the edges of the V-shaped opening are stuck together with Seccotine to form a cone shape. Do not proceed any further with the construction until the Seccotine is quite dry

- FOR THE NEW ECONOMY THREE

driving rod by means of a chuck. This should be left unscrewed until the unit has been fixed to the chassis; it should then be pushed along the driving rod until the edge of the cone is tight up against the felt ring.

From this description and the photographs reproduced in these pages it will be clear that the loud-speaker assembly is not at all difficult. There will be no trouble about dismantling the unit when it is desired to try a different cone diaphragm.

Buying Complete Cone

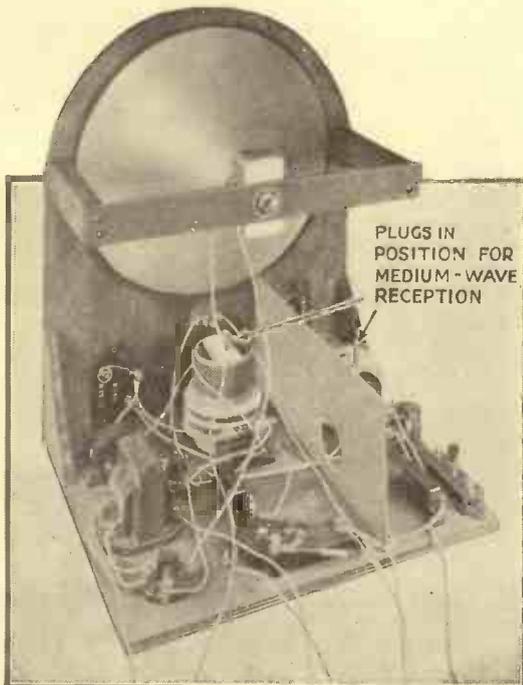
Of course, those who do not want to make their own cones can buy one complete from the local radio dealer. Most dealers stock complete cones in all sizes and of different materials. There should be no trouble about obtaining one that will be suitable for the New Economy Three.

An alternative form of construction that may appeal to some amateurs is to assemble the set on a small wood or ebonite panel and baseboard and then use it with a separate loud-speaker housed in its



THE CONE SLIPPED OVER THE DRIVING ROD OF THE LOUD-SPEAKER UNIT
The apex of the cone is held in a chuck that can be slipped over the driving rod. It should not be screwed up until the unit has been fixed in position on the main chassis

own cabinet. If this course is adopted, the constructor will have a wide range of loud-speakers from which to make his choice. However, the reader must make his own decision.



COMPLETE AND ALL READY FOR USE
Here is the New Economy Three completely assembled, with the loud-speaker in position and ready for receiving programmes from all over Europe

WHERE YOU CAN SEE AND HEAR THE NEW ECONOMY THREE

READERS who live in Birmingham, Liverpool, London and Manchester will have an opportunity of both seeing and hearing the New Economy Three should they so desire. Arrangements have been made with a number of firms whereby they will have on view throughout the currency of this issue of "Wireless Magazine" duplicate models of the set. There is no doubt that hundreds of prospective constructors will take advantage of this opportunity.

Here are the places where the set can be seen and heard :

BIRMINGHAM.—Lewis', Ltd., Bull Street.

LIVERPOOL.—Lewis', Ltd., Ranelagh Street.

LONDON.—Ready Radio Showrooms, 159

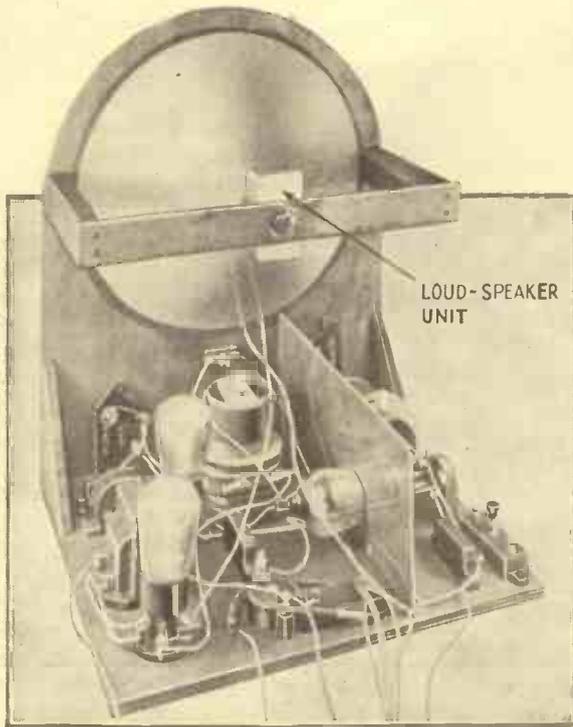
Borough High Street, S.E.1.

Selfridge's, Oxford Street, W.1.

MANCHESTER.—Lewis', Ltd., Market Street.

When you have built your own model of the New Economy Three the Editor of "Wireless Magazine" invites you to send him a report on its performance. Notes on what the set will accomplish in different localities are of the greatest value to the "W.M." Technical Staff.

HOW TO GET THE BEST RESULTS—



READY TO TAKE YOU ROUND EUROPE!

Here is the New Economy Three complete and ready for use. It will bring most of Europe to your fireside—and at very low cost

BEFORE the New Economy Three can be used for the reception of radio programmes the valves must be inserted in their holders and the batteries must also be connected up so that the right voltages are applied to the different leads.

The screen-grid valve, that is the one with the terminal on the top of the bulb, is poked through the hole in the metal screen and inserted in the holder mounted vertically on a block of wood.

Power and Detector Valve Positions

The power valve is inserted in the holder fixed in the left-hand corner of the baseboard (looking from the back of the set). The detector valve is, of course, placed in the remaining holder.

There will be no difficulty about connecting up the batteries; the positions of the leads will be clear from the wiring diagram reproduced on Pages Ten and Eleven. The grid-bias voltage for the power valve should be adjusted according to the maker's recommendations, whilst the voltages applied to H.T.+1 and H.T.+2 can be varied until the best results are obtained.

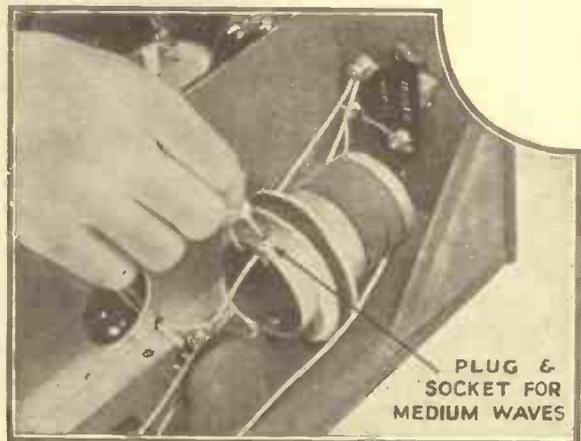
Conserving Life of Battery

The object should be to use the lowest voltages consistent with satisfactory reception; in that way the life of the high-tension or anode battery will be conserved. Note also that the greater the grid bias applied to the power valve the less current will be taken from the high-tension battery.

Before the set is actually switched on take care to connect the flexible wire No. 19 to the terminal on the bulb of the screen-grid valve.

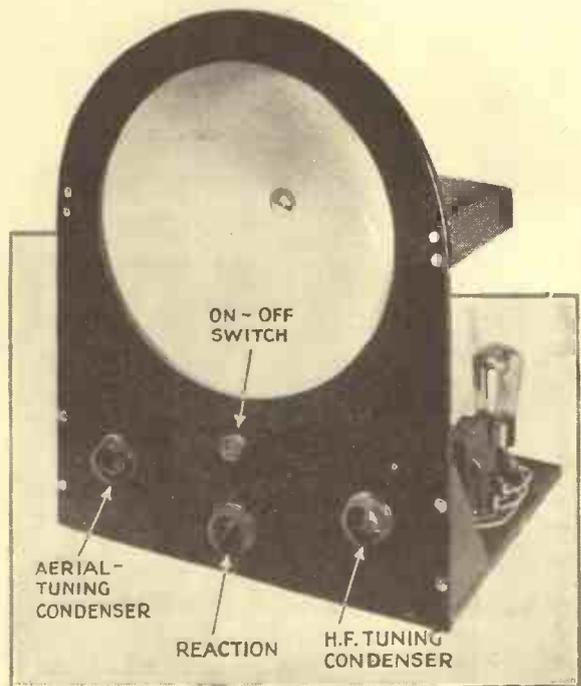
The set is adjusted for medium-wave reception, that is for wavelengths from about 200 to 600 metres, by placing the plugs on the two coils in their sockets. When both plugs are pulled out of their sockets the set is ready for reception on the long waves, that is on wavelengths between about 1,000 and 2,000 metres.

To switch the set on, pull out the knob of the on-off switch in the centre of the panel, just under the



INSERTING THE PLUG FOR MEDIUM-WAVE RECEPTION

For medium-wave reception both coil plugs must be inserted in their sockets. The plugs are pulled out for long-wave working



ARRANGEMENT OF THE CONTROLS

All four controls are clearly indicated by this photograph. The method of using them is explained in detail above. They are very simple to operate

-FROM THE £5 THREE-VALVER

loud-speaker. The set is switched off when reception is finished by pushing this knob in.

Next turn the two tuning knobs—those on the extreme left and right of the panel—so that they are both as far as possible to the left. That means that they are at their minimum capacity because the vanes will be right out of mesh.

Adjusting Wavelength

As these two knobs are turned to the right the capacity is increased (because the vanes are put in mesh) and the wavelength to which the receiver is adjusted will be increased also.

But before the knobs are actually turned in a search for programmes the reaction knob (just under the on-off switch) should be adjusted so that the circuit is on the verge of oscillation and therefore in its most sensitive condition.

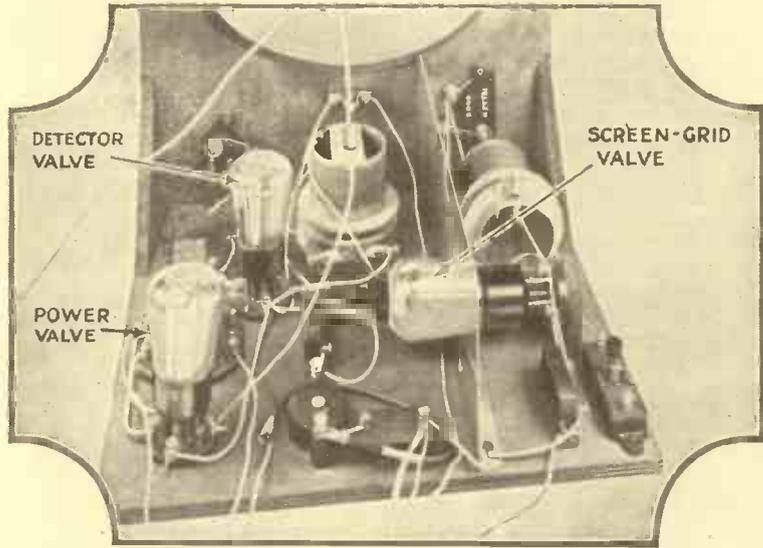
This state is indicated by a slight rustling sound from the loud-speaker. The effect is difficult to describe in writing, but it will easily be recognised in practice.

When the reaction knob is turned as far as possible to the left the loud-speaker will sound "dead." As it is turned to the right, though, a point will be reached when a live "breathing" sound is heard; that indicates that the oscillation point is being approached. The knob should not be turned any further or the set will burst into full oscillation and will in all probability start whistling.

Searching

When this sensitive state has been reached the two tuning knobs should be turned slowly round to the right, in unison, until a station is heard. Next the reaction control should be readjusted until the best results are obtained from the particular station received.

The pre-set condenser is adjusted for the best compromise between selectivity (the power of



WHERE TO INSERT THE DIFFERENT VALVES

The positions of the three valves are clear from this photograph. Do not forget to make the connection to the terminal on the bulb of the screen-grid valve mounted horizontally on the right

separating adjacent transmissions) and signal strength. The more the knob is screwed down the greater will be the selectivity.

The tuning condensers actually

used in the set are not supplied with calibrated dials. It is therefore worth while to stick pieces of paper, with semi-circles marked out in

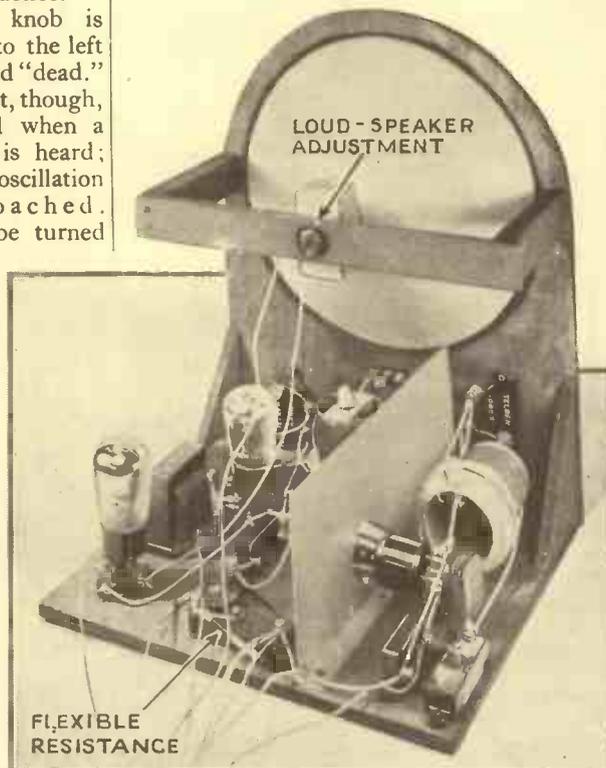
degrees, on the front of the set so that the positions of the knobs can be noted without difficulty.

A better plan still is to get two small calibrated dials that can be screwed to the condenser spindles in place of the plain knobs.

Voltagages

When one or two stations have been tuned in it is a good plan to try readjusting the voltages applied to H.T. +1 and H.T. +2. The normal voltages recommended for these points are 60 and 90 volts respectively, but with different valves higher or lower values may give better reception.

A good aerial is a great help to efficient reception; it should be as high up as possible and about 40 to 60 ft. long. The earth connection can be made to a tube buried in the ground or to a water pipe.



ANOTHER VIEW OF THE COMPLETED RECEIVER

The whole construction and wiring of the New Economy Three can be completed in a couple of evenings. Turn over to the next page for a list of the parts you will have to get

COMPONENTS NEEDED FOR THE SET

COMPONENTS NEEDED FOR THE NEW ECONOMY THREE

CHOKES, HIGH-FREQUENCY

- 1—Lewcos, type MC, 2s. 6d. (or Readi-Rad, Graham-Farish).
- 1—Telsen, type 75, 2s. (or Watmel, Lissen).

COILS

- 6-in. length of 2-in. diameter Paxolin tubing and two bobbins for long-wave windings (Wearite).
- ¼ lb. No. 28 d.s.c. wire, 1s. 10d. (Lewcos).

CONDENSERS, FIXED

- 1—Graham-Farish .0001-microfarad, 6d. (or Telsen, Readi-Rad).
- 2—Graham-Farish .0002-microfarad 1s. (or Telsen, Readi-Rad).
- 2—Graham-Farish .002-microfarad, ½s. (or Telsen, Readi-Rad).

CONDENSERS, VARIABLE

- 2—Telsen .0005-microfarad, bakelite dielectric, 5s.
- 1—Telsen .0003-microfarad reaction, 2s.
- 1—Formodensar .0003-microfarad, type J, 1s. 6d. (or Igramic, Sovereign).

HOLDERS, VALVE

- 3—Lissen, rigid type, 1s. 1½d. (or Clix, Telsen).

PLUGS

- 2—Clix plugs and sockets for coil switching, 6d. (or Belling-Lee, Eelex).
- 6—Clix winder plugs, marked: G.B.—, G.B.—, H.T.+1, H.T.+2, H.T.+3, H.T.—, 9d. (or Belling-Lee, Eelex).
- 2—Clix spade terminals, marked: L.T.—, L.T.—, 4d. (or Belling-Lee, Eelex).

RESISTANCES, FIXED

- 1—Lewcos 1,000-ohm, flexible type, 9d. (or Bulgin, Readi-Rad).

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

- 1—Graham-Farish 2-megohm grid leak, 10d. (or Telsen, Readi-Rad).

SUNDRIES

- Tinned copper wire for connecting (Lewcos).
- Lengths of Lewcos oiled-cotton sleeving.
- 1—Readi-Rad metal screen, 1s. 6d. (or Peto-Scott, Wearite).
- 1—Tonax loud-speaker chuck, 1s.
- 1—Piece of wood, 2 ft. 6 in. by 12 in., for chassis.

SWITCH

- 1—Graham-Farish on-off, 8d. (or Readi-Rad, Telsen).

TRANSFORMER, LOW-FREQUENCY

- 1—Lotus, type AT13, 5s. 6d. (or R.I. Dux, Telsen Ace).

ACCESSORIES

BATTERIES

- 1—Fuller 120-volt, type F24, 10s. 9d. (or Ever Ready, Drydex).
- 1—Fuller 9-volt grid bias, type F51, 1s. (or Ever Ready, Drydex).
- 1—Exide 2-volt accumulator, type DTG, 4s. 6d. (or Oldham, Pertrix).

LOUD-SPEAKER

- 1—Puretone loud-speaker unit, 7s. 6d. (or Graham-Farish, Telsen).

VALVES

- 1—Cossor 220SG screen-grid, £1 (or Octron SG2, Lissen SG215).
- 1—Cossor 210HL detector, 8s. 6d. (or Octron HL, Lissen HL210).
- 1—Cossor 220P power, 10s. 6d. (or Octron PP2, Lissen P220).

Beginners who have no apparatus at all in their possession will be interested in the complete kits of parts supplied by various firms who advertise in WIRELESS MAGAZINE. The advantage of buying a complete kit is that all the parts are obtained at once and nothing is overlooked.

The set has been shown in these pages in chassis form. That type of construction was adopted to keep the price down to the £5 level. The constructor who does not mind spending a few extra shillings, however, will be interested in the special cabinet designed for it by the Peto-Scott Co., Ltd. This costs one guinea.

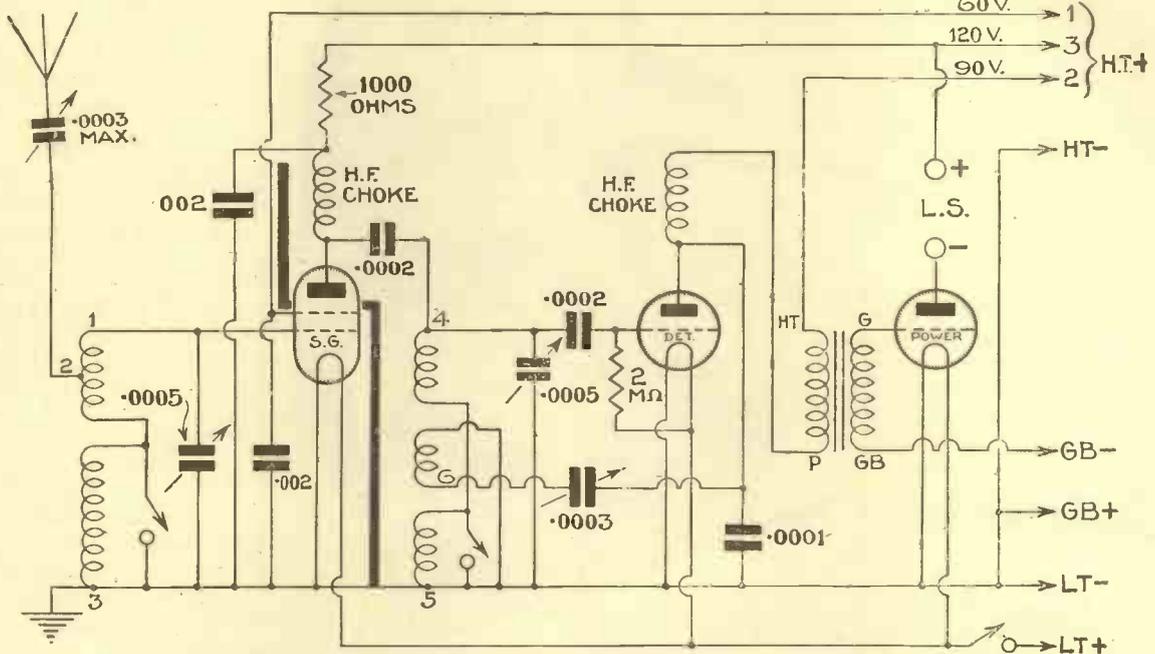
Ready-made coils

It has been mentioned elsewhere in this supplement that those who do not wish to wind their own coils can obtain them ready made. Ready Radio can supply them for 7s. 6d. the pair, while Peto-Scott's price is the same.

It should be noted that the price of £5 for the New Economy Three includes not only the loud-speaker and the necessary batteries, but also three valves made by one of the best-known British "ring" firms.

NOW that the reader has learnt all about the construction and operation of the New Economy Three it is time to say a few words about the parts that will be needed.

Except for parts that can be made at home—the chassis, coils, and loud-speaker cone—everything is standard and can be obtained from any radio dealer.



HERE IS THE THEORETICAL CIRCUIT OF THE NEW ECONOMY THREE

The valve combination is a screen-grid high-frequency amplifier, leaky-grid detector and transformer-coupled power stage. Dual-range coils are used and the screen-grid valve is provided with by-pass condensers to give stability. Parallel feed is used between the high-frequency valve and the detector

J. GODCHAUX ABRAHAMS
Interviews

LEONARD HENRY

In Semi-Serious Mood

Leonard Henry is not allowed to "escape" from the "mike"

The Popular Broadcast Comedian "Spills the Beans"

WHEN I last saw Leonard Henry in the flesh he was organising, producing, and starring in an original show of his own at one of the popular seaside resorts on the south coast.

I caught him at a rehearsal; "trapped him" would be more correct, for before I could make him talk I was obliged to lure him off the stage, seize him bodily—he is not a big man—plump him down in an armchair, pen him in to prevent any attempt at escape, and feed him with cigarettes.

Leonard Henry possesses a mercurial temperament; when working he is here, there, and everywhere. "That's Leonard Henry that was" is a befitting slogan. But although you may not realise it, he can be serious at times.

About Himself

"Tell me something about yourself," I said severely.

"Is there anything in my life," he asked, "which could interest your readers?"

"Where you were born," I retaliated, "how old are you, and why?"

"Born? I am a Cockney—age does not matter much—and my early days were spent in a house at no great distance from Kennington Gate."

"Do you come of a theatrical family?" I queried.

"Heavens, no! Like many other professionals to-day, I was never

intended for the stage. I am an Old Alleynian and specialised in chemistry, to which my father apprenticed me for some years. One day, messing about as usual, I almost gassed myself; as a matter of fact, it was no joking matter, for I was so seriously poisoned that I had to drop everything and go to Westcliff-on-Sea to recover from the ill effects. It was there I was given my first chance of blossoming out as a full-fledged—although somewhat youthful—comedian."

"How was that?"

"Oh, just luck or, perhaps, unmitigated impudence on my part. At one of the local shows an artiste dropped out of the cast and in the full innocence of my youth I had the colossal cheek to offer myself as a substitute. The manager gave me a trial and, although painfully nervous on my first appearance on the stage, I must have made good; at least, I suppose I did, as the audience enthusiastically applauded my exits!"

"Hm! How were you received when you came on?"

"They did not realise that I was such a raw beginner, I expect; they were most kind. Anyhow, that was my first engagement, and it led to others. Chemistry became a dead letter; I had done with it and I cannot say that I have any keen hankering for stinks to-day."

"Had you much experience before you broadcast for the first time?"

'Fair to middling. I had played in André Charlot's high-speed revue, *The New Waiter*; I filled a part in the *Bow Wows* at the Prince of Wales' Theatre; in fact, in the course of a relatively short career I seemed to have worked in revue, musical comedy, broadcast, and both silent and talkie films. It is nearly five years ago since I first broadcast for the B.B.C. and my stage and concert engagements have been numerous since I appeared before the 'mike' on that occasion."

"That spells harder work."

"Undoubtedly, but it is a flattering compliment; I suppose the general public likes to see what a wireless artiste looks like if his broadcast has pleased them."

Peculiar Talents

The fact is that Leonard Henry is blessed with peculiar talents of his own. He can provide a continuous flow of witty patter; he is at his best when he can gag to his heart's content or when he can slip into his utterances up-to-date topical allusions or sly—but never malicious—digs at his fellow artistes. He is a born humorist who, quickly seeing the funny side of most situations, makes the most of them.

In some ways, to my mind, in appearance and mannerism, he slightly recalls Billy Merson; in his quality of humour, however, he evokes memories of Lewis Sydney,

LEONARD HENRY *in* SERIOUS MOOD—Cont.



MAURICE COLE
is a well-known pianist and frequently broadcasts

of the original Pelissier "Follies."

He possesses the gift of adding pep or zip to any show in which he may be taking part; if the action lags or lacks fire he hastens it on, possibly because his fertile imagination enables him to talk nonsense by the yard. He keeps his audience always amused and, above all, his humour is clean.

Much of this you will realise when you see or hear him broadcast. His arrival in the studio brings with it an atmosphere of gaiety, a feeling of irresponsibility so infectious that within a few minutes he has captured the undivided attention of his audience.

No Forced Effects

Your immediate neighbour, just recovering from a fit of laughter at some nonsensical quip, will nudge you with his elbow and say, "The man's a fool." It is the greatest compliment that could be paid to Leonard Henry, for it is not given to every stage comedian to play the fool in such a perfect manner without resorting to forced effects.

It is true that he enjoys every moment of this fooling himself; he is laughing at himself with his audience and his laugh is contagious.

When I pointed this out to him, he said: "It is a great pleasure to cheer up hundreds of thousands of people in these hard times and it is very encouraging to receive appreciative

letters from persons you have never seen and, probably, may never meet."

"Do you—" I began.

"Yes, I do. I know what you wanted to ask me. I write most of my own sketches and songs. Fortunately, I can also play the piano and often compose my musical settings. It is hard work to think out something new. Ideas come to me at any time and, when possible, I rush home, jot them down, expand them quickly, and type them out whilst they are still hot. It is just the same with tuneful melodies; they have got to fit the words and not vice versa."

"Some of your ideas for broadcast are distinctly original," I conceded gracefully.

"Thanks," was the answer. "I have also been accused of *that*, but the trouble is that more and more material is required for microphone consumption and humorous material is hard to find. It is distinctly scarce."

"The nightly audience is so huge that in a few transmissions millions of people have heard your jokes and they may even repeat them to their friends. New forms of humour have to be thought out. This will prove eventually a serious problem for the studios, and especially when television has become a matter of widespread occurrence."

"A serious problem which affects all plays and that kind of entertainment?"



BILLY THORBURN
is best known for his syncopated piano playing

"Yes, for whereas in the early days, with the exception, perhaps, of the announcer, the broadcaster was alone in the studio, it was possible to read from notes, to-day he is called upon to memorise all his words and part in a play. No prompting can take place to assist him. In the near future, with television as an accomplished fact, in some respects we shall put ourselves on a par with the talkie films. You can see that the same difficulties beset the talkies."

Simultaneous Projection

"Whereas in a theatre, a play is presented to a daily audience numbering anything from two to four thousand people, a film, when generally released, may be simultaneously projected for the benefit of tens of thousands every day."

"In broadcasting the matter is a hundred times worse for, if we assume that a B.B.C. transmission through its system reaches ten million listeners, we have soon exhausted our unseen hearers in the United Kingdom. Bring television in on the same scale and you will readily realise what happens. Your specially written play, once broadcast and televised, enjoys a very short run."

"Surely," I added, "you do not foresee such an eventuality in the immediate future?"

"No, but it must come sooner or later—probably sooner than we expect—and broadcast artistes must prepare themselves to meet this emergency and adapt themselves to the new conditions. However, like many others I know, I am not afraid of hard work; I enjoy it."

Rehearsal of a New Sketch

Leonard Henry does. He left me to "push on" with the rehearsal of a new sketch. I watched him as in turn he coached each of his fellow artistes and showed them what they were required to do. He had written the playlet overnight, had composed special musical numbers for it, and was the first to arrive at the theatre in the morning to supervise the setting of some new scenery.

"It's got to go to-night with a swish," he told the cast.

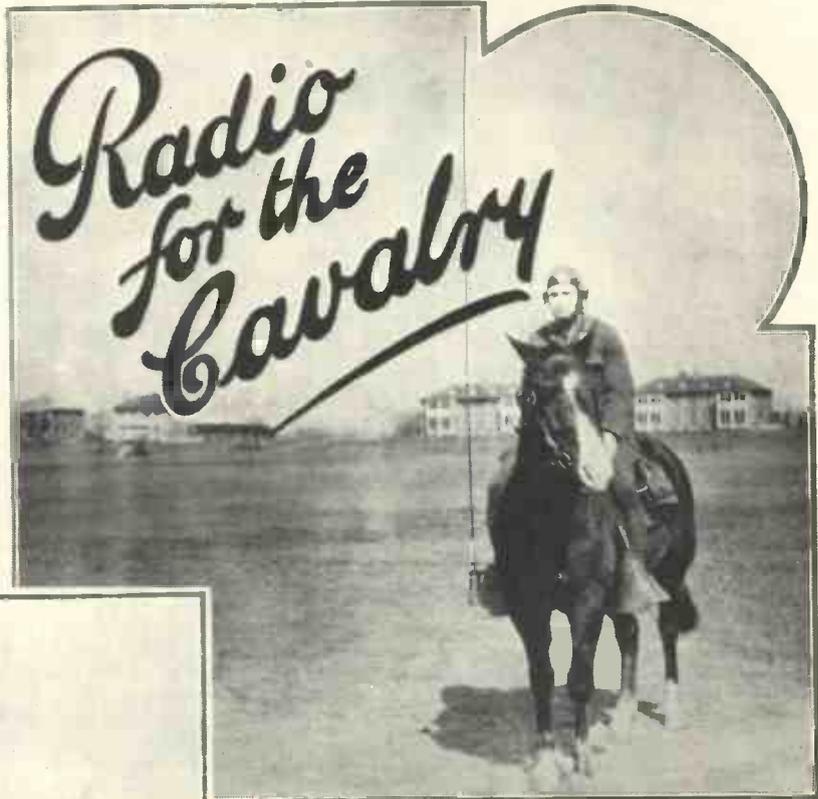
Later, I witnessed the first performance; it did. It was the beginning of a long and successful season. If Leonard Henry is a wireless star to-day, unreservedly he fully deserves it.

RECOGNISING the utility of the mobile radio receiver, the United States Government has recently undertaken the equipment of the cavalry with small individual radio receivers. The first troops so equipped are stationed along the Mexican border.

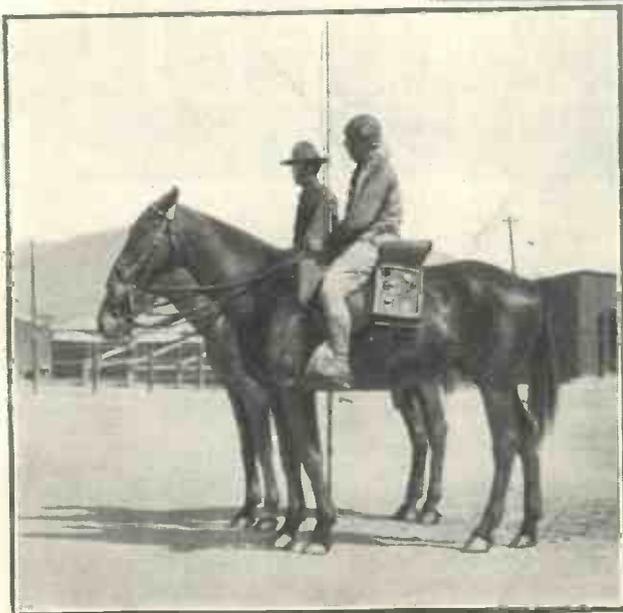
Headquarters Transmitter

At present the individual members of the command are furnished with the receivers as illustrated in the accompanying photographs, there being a medium-wavelength transmitter located at headquarters which keeps in contact with the men through the receiver mounted just to the rear of the saddle.

A new type transmitter-receiver is now in the process of development by engineers of the Signal Corps which



THE HORSE THAT CARRIES A RADIO STATION!
An American cavalryman equipped with a radio set that keeps him in touch with headquarters. Note the fishing-rod type of aerial



COMPACT, BUT DOES WHAT IS NEEDED
Another photograph of U.S.A. border troopers with their radio equipment. The compact gear is slung just behind the saddle

CANADA'S PROBLEM

WHETHER received by the government, no new licences for the establishment of broadcasting stations have been issued and, in the uncertainty of the situation, owners of existing stations have not been in a position to make improvements. Broadcasting facilities, therefore, are largely obsolete and the Canadian service is unsatisfactory.

A Dilemma

In the mind of the responsible minister, Hon. Alfred Duranleau, is a question as to whether this situation will be allowed to continue and become worse pending determination of policy, or whether private interests should be permitted to establish modern powerful stations at strategic points.

A factor which concerns the minister is the general complaint about dependence on the United States for radio entertainment. This dependence is due in part to the refusal of the United States to agree to what Canadian authorities contend would be an equitable division of air channels.

F. P.

will enable the individual parties to keep in two-way communication with their headquarters.

The communication system as devised enables distant patrolling parties which make a daily reconnaissance of the Mexican-United States border to keep in instant touch with their headquarters.

Satisfactory System

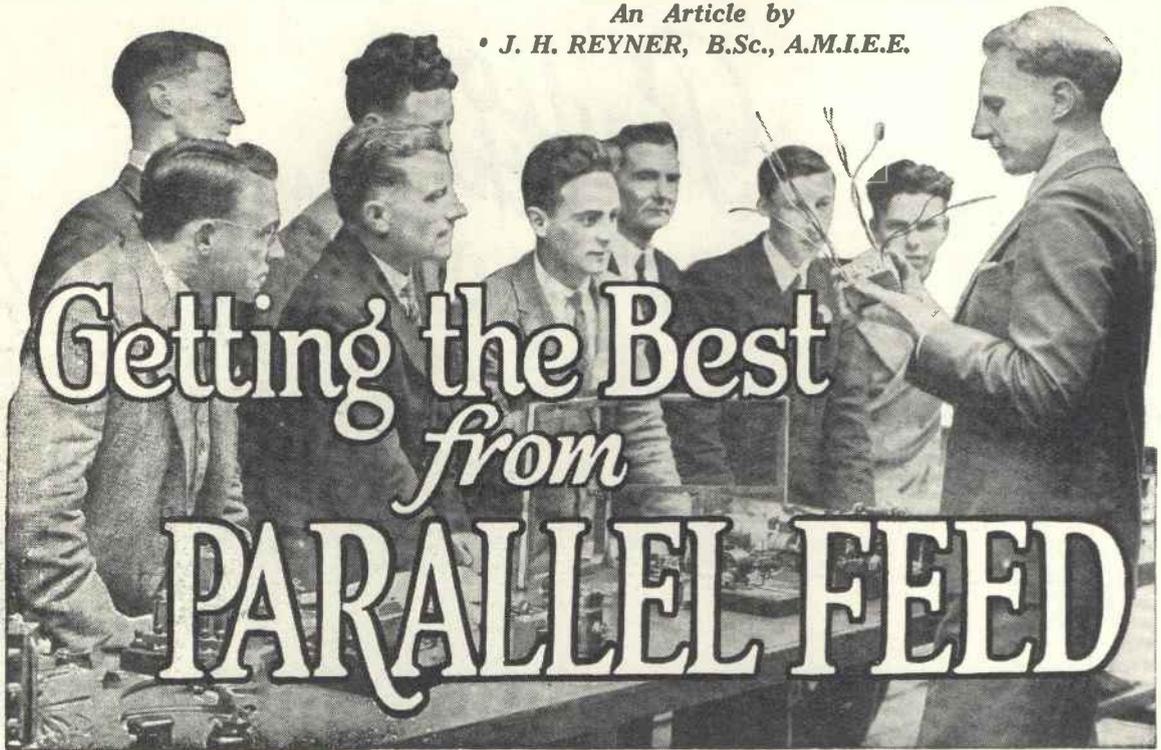
The system has proved to be eminently satisfactory and it is planned to broaden the scope of the cavalry radio system at the conclusion of experimental endeavours which are now going on to perfect the two-way transmitter-receiver. M.

until the courts at Ottawa have decided the constitutional question of jurisdiction between the Dominion and the provinces.

That will not be for some time, depending on whether there is to be an appeal to the judicial committee of the Privy Council in England from the decision of the Supreme Court in Canada. In any case, broadcasting policy cannot be settled until the 1932 session of Parliament.

In the meantime radio development in Canada is at a standstill and has been for two years. From September, 1929, when the report of the commission, headed by Sir John Aird, recommending nationalisation was

An Article by
 • J. H. REYNER, B.Sc., A.M.I.E.E.



Marconi phone users undergoing a course of instruction in service work

Getting the Best from PARALLEL FEED

WHEN the use of the parallel-feed connection first became popular, it was hailed by many as possessing great possibilities. Indeed, visions of transformers having step-up ratios of 25-1 were conjured up and it seemed as if low-frequency practice would be revolutionised.

More mature examination of the

obtained in this case through a resistance, while the low-frequency currents are by-passed through the condenser on to the primary of the transformer. Therefore, no D.C. flows through the primary winding, and the customary saturation of the iron circuit is avoided.

Effective use of Iron

The variation in the inductance of a transformer primary according to the steady current in the windings is well known, and it will be appreciated that the working value of inductance is considerably less than the initial value with no D.C. Consequently if we can, by the use of this parallel-feed system, avoid the flow of D.C. through the windings, we can make a much more effective use of the iron in the transformer.

This has more effect than appears at first sight. To obtain a given value of inductance we have to use a smaller number of turns. Therefore we can use a smaller coil, which, in turn, requires a smaller size of iron stamping in which to house it.

But, if we reduce the size of stamping we also reduce the length of the iron path through which the magnetic field has to travel. The inductance is inversely proportional to this length, so that if we halve the iron path we double the inductance.

Consequently the reduction in the size of the coil due to the smaller number of turns automatically increases the inductance again, and we are able to reduce the number of turns still further.

There is obviously a limit to this process, but the results of intelligent application of these principles can be seen in the components now on the market. There is, for example, a transformer on the market having a primary inductance of 100 henries in a size little more than a 1-in. cube. It is not intended to carry any D.C. and, indeed, even half a milliampere will completely paralyse it, as shown in Fig. 2.

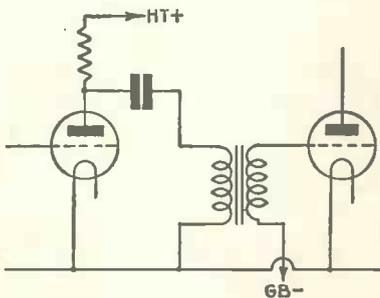


Fig. 1.—Simple form of parallel-feed circuit; the high-tension supply to the anode is taken through a resistance

problem showed that this line of development would not prove practicable, but an equally promising line of research was opened up in the direction of reducing the size, weight, and cost. This second possibility has proved distinctly fruitful.

A simple parallel-feed circuit is shown in Fig. 1. The high-tension supply to the anode of the valve is

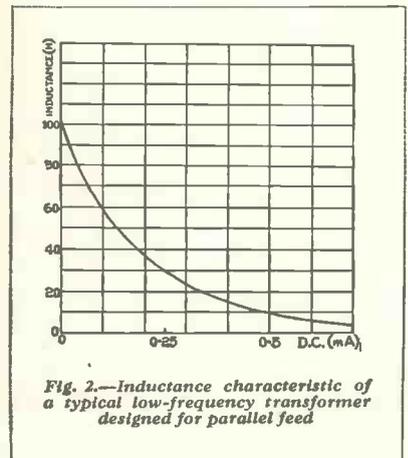


Fig. 2.—Inductance characteristic of a typical low-frequency transformer designed for parallel feed

Still another advantage of the parallel-feed arrangement is that an auto-transformer connection can be adopted. Here the primary winding is so connected as to assist the secondary, giving a larger step-up than otherwise would be obtained.

For example, if we have a transformer with a 3-1 ratio and we auto-couple it so that the primary merely becomes part of the secondary, as shown in Fig. 3, we then have a

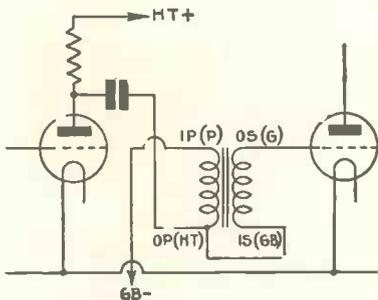


Fig. 3.—Connections of a 3-to-1 transformer to give a step-up ratio of 4-to-1

transformer giving an effective ratio of 4-1.

Alternatively, if we only require a 3-1 ratio, the secondary need only have twice the number of turns on the primary. This enables us to use either a thicker gauge of wire or to reduce the size of the transformer.

With these attractive possibilities in mind, one may be tempted to suggest that the older form of direct-feed transformer will ultimately be replaced by the parallel-feed type.

I have, myself, suggested such a possibility in these columns. The present use of the system, however, is almost exclusively confined to the resistance-feed version, and experience of this type of circuit has brought to light facts which tend to modify this view, if not to change it entirely.

Average Experience

The greatest of these facts is the experience of the average user with resistance-feed transformers. I have often heard the view expressed that the system introduces troubles which more than outweigh the advantages, the most serious and prevalent accusation levelled at the circuit being that of instability.

Now it is a very common fallacy that a resistance-feed arrangement also decouples the circuit, and avoids feedback and instability due to internal resistance of the battery or the high-tension supply. It is well

known that when a high-tension battery becomes partially run down it develops a relatively large internal resistance and this sets up a low-frequency reaction effect which will distort the quality and may in serious cases cause continuous whistling.

Mains and Motor-boating

Where the high-tension supply is not a battery but a mains unit containing inductance, the instability is usually of a very low frequency and gives rise to the effect known as motor-boating.

Many users of simple types of set are suffering from battery feedback without being aware of it. Definite oscillation is not always present. A very common form of the trouble is an incipient squeal which is often heard, particularly with a run-down battery. It gives a high-pitched quality to the reproduction and makes it very unpleasant.

We overcome the difficulty by the process of decoupling. This is a method of isolating the low-frequency currents from the battery, by arranging that at some point in the circuit the low-frequency currents shall have a choice of two possible paths. One of these (that through the battery) is of high impedance while the other, of

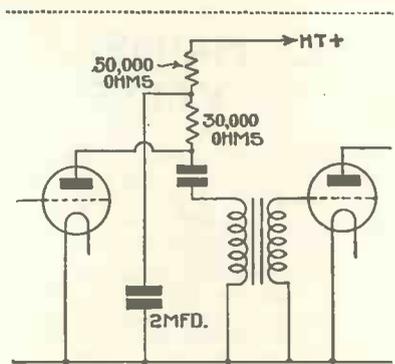


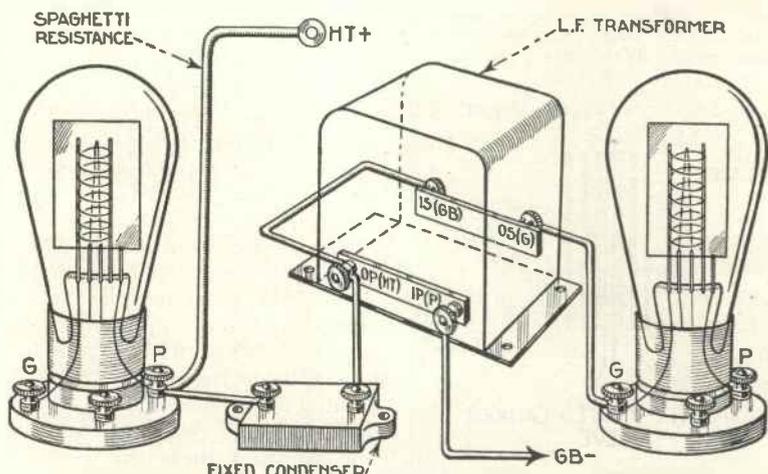
Fig. 4.—Parallel-feed circuit with decoupling added to prevent motor-boating

the feed resistance. Do they do so in actuality?

Let us consider the transformer previously referred to, having an inductance of 100 henries. At 100 cycles this inductance will give us an impedance of 62,800 ohms. The feed resistance is usually of the order of 30,000 ohms, so that of the two possible paths that through the battery has only half the impedance, and the low-frequency currents will prefer to go through the battery rather than through the transformer.

At 500 Cycles

If we consider the position at 500



Diagrammatic sketch of the Fig. 3 arrangement to get a step-up of 4-to-1 from a 3-to-1 transformer

relatively low impedance, takes the current to low-tension negative without passing through the battery.

It appears at first that the resistance-feed arrangements of Figs. 1 and 3 comply with this condition. Low-frequency currents are intended to pass through the condenser and primary of the transformer, and not to any appreciable extent through

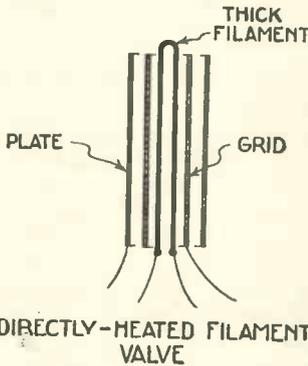
cycles the discrepancy becomes even worse, more than 90 per cent. of the current going through the battery. Beyond this point the impedance of the transformer tends to fall due to self-capacity, but it will be clear that under working conditions the greater part of the current flows through the high-tension battery, and there is no appreciable decoupling action.

PARALLEL FEED—Continued

A.C. MAINS VALVES

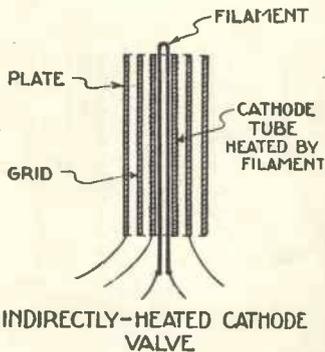
THE two types of valve in general use at the present time in which the filament is heated by raw A.C. are the directly-heated filament valve and the indirectly-heated cathode valve.

The filament in the directly-heated valve is made specially thick so that its temperature when heated does not change with the alternations of the A.C. current and cause A.C. hum to become induced into the circuit. This



type of valve is used chiefly for the output stage of the set and is fitted with four legs, just as an ordinary battery-operated valve.

In the case of the indirectly-heated cathode valve the sole purpose of the filament is to heat a tube of insulating material which is coated on its exterior surface with an electron-emitting composition. As this tube is compara-



tively thick compared to the filament it retains its heat irrespective of the alternations of A.C. current in the filament and the flow of electrons from the tube, or cathode as it is technically termed, remains constant.

In order that the valve shall function correctly an electrical connection must be made to the electron-emitting surface of the cathode tube and this is brought out to a leg situated in the centre of the base, midway between the four pins normally connected to grid, plate and filament.

A.P.

It may be asked why the system should work at all if this is the case. The point, however, is that currents flowing through the feed resistance develop a voltage across it, and this voltage is applied across the primary of the transformer.

Now the voltage which is developed in the anode circuit does not vary very much with the anode resistance, provided that this is reasonably high compared with that of the valve.

Consequently, when studying the amplification, the anode-feed resistance and the primary of the transformer in parallel must be considered as one combination. Provided that the impedance of this combination is two or three times that of the valve, a satisfactory proportion of the full amplification is obtained irrespective of the actual distribution of current between the resistance and the transformer.

Indeed, the use of the parallel-feed system tends to render the amplification more uniform. This does not affect our argument, and the fact remains that the resistance-feed arrangement does not decouple the circuit and is very little better than the ordinary straight circuit.

Battery Coupling

Moreover, practical experience shows that a high-inductance transformer is more liable to give rise to battery coupling; particularly when used with a mains unit, so that we must really regard a resistance-feed system as predisposed towards battery coupling even more than a straight circuit.

Hence the customary decoupling arrangements must be added in addition to the resistance-feed arrangement, a suitable circuit being shown in Fig. 4. The feed to the high-tension battery goes first through the parallel-feed system and then through the decoupling resistance, the junction point of these two being bypassed to earth through a large condenser.

Then, provided the condenser impedance is small compared with that of the decoupling resistance, most of the audio-frequency currents will be shunted to earth without flowing through the battery.

Remember, however, that this proviso is not one which may be taken for granted. Working again at a frequency of 100 cycles it is found that a 2-microfarad condenser has an

impedance of approximately 800 ohms. If we use a decoupling resistance of 50,000 ohms we shall only have six times the impedance of the by-pass condenser, which is none too much.

Moreover, 50,000 ohms in series with 30,000 is going to give rise to a very heavy drop in anode voltage, and if we only have 120 volts available it is doubtful whether we shall get more than about 40 volts on the valve.

Resistances Questionable

Having regard to these considerations it becomes questionable whether resistance feed is really worth while. The parallel-feed principle remains sound, but the interpretation of the idea by using a resistance in the anode lead is of questionable utility.

The difficulties are minimised if we use a choke in the anode lead. Such a choke should have an inductance of at least 100 henries when carrying the anode current of the valve. Fortunately this is only a few milliamperes in most cases and therefore the construction of such a choke is not expensive. Moreover, an appreciable amount of resistance can be afforded in a choke for this purpose, since as much as 5,000 ohms would only produce a drop of about 10 volts.

Such a choke would have an impedance comparable with that of the transformer at all frequencies and therefore would provide at least a 50 per cent. by-passing action, which in many cases is sufficient to avoid any battery coupling, particularly if an output circuit is used.

High-inductance Chokes

High-inductance chokes have hitherto been somewhat expensive, but there are signs that small chokes of relatively low current-carrying capacity will be available in larger numbers in the future. One particular choke has an inductance of 125 henries and yet only costs 5s. Although, of course, this value falls with the D.C., it is still high if the anode current does not exceed about 2 milliamperes.

There is also a new constant-inductance choke giving an inductance of 100 henries at a price of under 10s. Probably similar types of component will become available in the near future, and with their use it is reasonable to assume that parallel feed will take on a new aspect.

WE TEST BEFORE YOU BUY

Why Not Get A New Set in Time for Christmas ?

SET buyers anxious to install a new set before Christmas will be interested in the five test reports in the following pages. In this month's selection of set reports we have changed the method of presentation. Set buyers will notice that all the illustrations are plainly lettered, not only to indicate the purpose of the various control knobs, but to give some idea of the internal layout.

We believe these details will be of greater value in pictorial form than in the text. A brief analysis of the main points to look for in these pictures will be useful, especially to those about to buy a new set for Christmas.

Array of Knobs

It is conceivable that many non-technical set buyers are confused by the array of knobs on the modern set, in spite of the fact that the actual number of controls has been appreciably reduced during the last year or so.

On all sets there is a main tuning control—usually a large knob mounted at the centre of the control panel. This knob actuates the tuning condenser inside the set, either a single, two-gang or three-gang unit. In addition, the main tuning knob rotates the tuning scale or wavelength indicator.

Usually this scale is marked in wavelengths, although in the cheaper sets wavelength calibrations are omitted and only degree divisions are marked.

In the mains-operated sets the tuning scale is illuminated from behind by means of a small electric bulb wired in parallel with the filament supply.

Trimmers for Weak Stations

In most sets with not more than three valves there is a tuning trimming device, taking the form of an extra knob mounted on top of the main tuning knob or by the side of it. This trimmer does not have to be adjusted for every station received—usually it can be ignored except for the reception of a weak station not absolutely accurately tuned-in on the main knob.



FREE ADVICE TO PROSPECTIVE SET BUYERS

To take advantage of this service it is necessary only to mention (1) the maximum price and whether this is for a complete installation or the bare set; (2) where the set will be used; (3) what particular stations are desired; (4) whether a self-contained set (with or without aerial) or an ordinary set with external accessories is preferred; and (5), in the case of mains-driven sets, whether the mains are A.C. or D.C.

A stamped-addressed envelope for reply is the only expense. Address your inquiry to Set Selection Bureau, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4. There is no need to send any coupon, but it is essential to give the information detailed above on one side of the paper only. Tell your friends about this useful service.

A volume control will be found on all the latest sets, except perhaps the simplest two-valver, where reaction is usually made to serve this purpose.

In all but the largest sets there is a reaction control, to assist the high-frequency amplification. The minimum number of controls is therefore three.

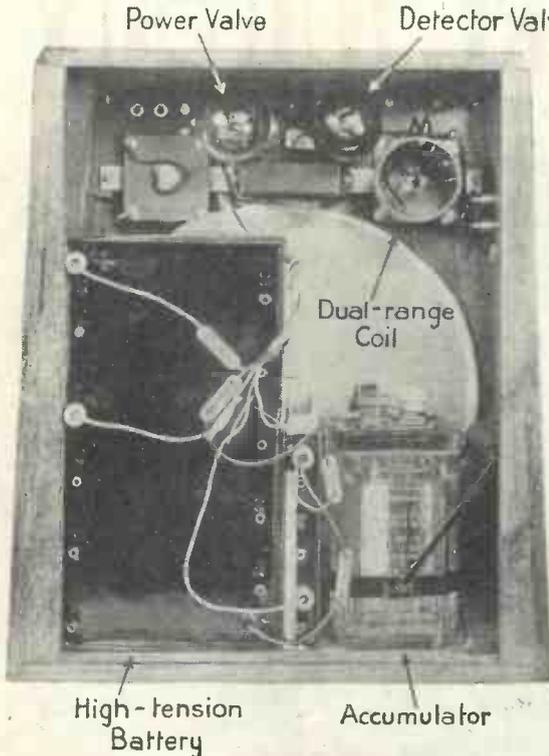
Sets with Only One Tuning Knob

On the larger sets reaction is dispensed with. The great amount of amplification in the big set also enables slight discrepancies of tuning to be tolerated, so that only one tuning knob—without a trimming device—is needed.

The other controls found on modern sets take the form of switch knobs, for changing the wavelength range, bringing in a gramophone pick-up and switching on and off the mains or batteries.



COLUMBIA MODEL 351 TWO-VALVER



ABSOLUTELY SELF-CONTAINED!
At the price, this Columbia set is probably the best value in self-contained receivers on the market

ONE of the cheapest of self-contained sets, the Columbia two-valver provides full loud-speaker reception of the local station. And if, as with us, the local station is a regional centre, the two alternative programmes are receivable without mutual interference.

Batteries Enclosed

Everything, except the aerial and earth, which should be as efficient as possible, is contained within the neat oak cabinet. That is to say, in addition to the simple set chassis fitted in the top, the cabinet houses below the cone loud-speaker and behind this the batteries, comprising a 99-volt high-tension battery, a 9-volt grid-bias battery, and a 2-volt accumulator.

These batteries are held off the back of the cone by a wooden strip and rest comfortably in the case.

The back of the cabinet is arranged to slide off, so that

it is easy to get at the inside of the set for insertion of valves.

Apart from the few simple controls, which are detailed in the photos, there is a neat aerial-and-earth panel let into the left-hand side of the cabinet. The two sockets are for alternative aerial connections, "A1" being the normal and "A2" being for use when the set is a long way from a station. The plug on this little panel is for the earth connection. This plug-and-socket arrangement of the aerial and earth is useful, since it enables the aerial and earth leads to be joined together very conveniently when the set is not in use.

This is an easy little set to fit up, the two valves plugging into the top and the plainly marked battery leads

plugging into appropriate sockets on the batteries. An Osram HL2 valve is used for the detector and an Osram LP2 as the output valve. The two are naturally transformer coupled. The detector is preceded by a simple tapped tuning circuit, made up of a dual-range solenoid coil tuned by a solid dielectric variable condenser.

separation was, therefore, obtained.

Using terminal "A2," we noted an increase in strength, with, of course, a decrease in selectivity, but even so there was no serious over-lapping.

Other stations heard during the test on "A1" were Midland Regional at 110 degrees and North Regional at 140 degrees, both at fair

A BRIEF SPECIFICATION

MAKER: Columbia Graphophone Company, Ltd.

TYPE: Model 351.

PRICE: £5.

VALVE COMBINATION: Detector and power output valve.

POWER SUPPLY: Self-contained batteries.

FINISH: Oak cabinet, which contains the cone loud-speaker, set, and all batteries.

The reaction condenser is of this type also.

The makers recommend the set to be used with an aerial of 70 to 100 ft., so we made our tests with the standard length of 60 ft. On the "A1" aerial terminal we got London National at 50 degrees and London Regional at 95 degrees. These two stations were received at full loud-speaker strength, the total spread of each over the tuning dial being not more than 20 degrees. Complete

but naturally not full loud-speaker strength.

The set behaved rather exceptionally on the long waves, getting Daventry National at fine strength at 105 degrees and Radio Paris at quite good loud-speaker strength at 130 degrees. Eiffel Tower, below Daventry, was also clearly heard at 90 degrees.

We were pleased to find that reaction was smooth—an essential condition in a two-valver relying on reaction

for its sensitivity. The point of oscillation could be approached without making a squeal, and this, no doubt, accounts for the ease with which several foreigners were logged during subsequent tests.

Really, the set has fulfilled its job when it gets the locals and perhaps Daventry, if that long-wave station is within a hundred miles.

Quality

Quality of reproduction is fair and can be considered quite good if the volume is kept down to the degree commensurate with the output of the LP2 power valve. The adjustment on the loud-speaker is good.



ONLY THREE CONTROLS

As this photograph shows, there are only three controls on the set



FERRANTI THREE-VALVE CONSOLE

THE recent sensational price reduction in this set, which was first listed at 22 guineas and is now only 15 guineas, is a tribute to the makers' confidence in the labour-saving capabilities of the conveyor belt system of

Ferranti set is different, owing to its rexine-covered metal container. Our model was very attractively finished in brown, but there are several other finishes to suit the decorative schemes of most homes.

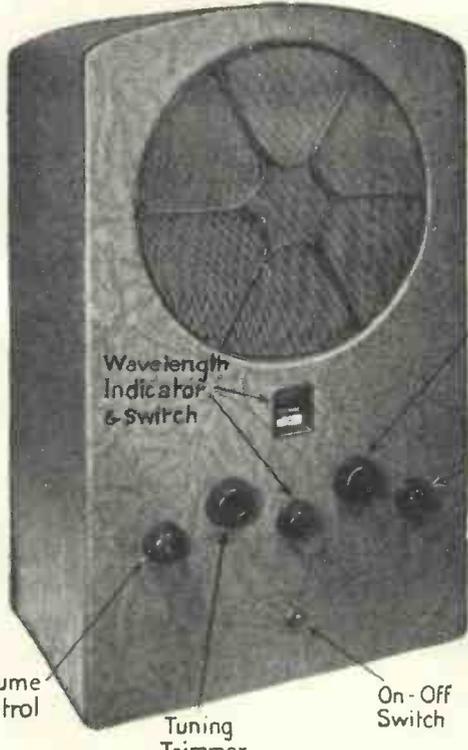
A BRIEF SPECIFICATION

- MAKER:** Ferranti, Ltd.
- TYPE:** Inductor Console.
- PRICE:** 15 guineas.
- VALVE COMBINATION:** Screen-grid amplifier, detector, and power output valve.
- POWER SUPPLY:** A.C. mains, 200 to 250 volts, and usual periodicities.
- FINISH:** Rexine-covered metal container, in which is housed the inductor dynamic loud-speaker, set, and power supply.

production just installed at Hollinwood.

We look upon the newly priced Ferranti console under review, with its self-contained inductor-dynamic loud-speaker, as one of the best three-valvers of the season. In outward appearance the

There is no need to go into all the details of the layout of the controls, which will be readily seen by reference to the two illustrations. The set rests conveniently on a small occasional table, taking up very little room and needing only an external earth and



Labels for the front view of the console:
 Wavelength Indicator & Switch
 Main Tuning Knob
 Reaction Control
 Volume Control
 Tuning Trimmer
 On-Off Switch

ALL CONTROLS FOR BEST RESULTS

The controls provided ensure that the very best performance can be obtained from the set

aerial, with a convenient electric-light socket, to bring in a host of home and foreign stations.

The whole of the back of the container comes off when the screws are removed. Taking off the back automatically breaks the mains circuit by interrupting the mains output at the fuse point. It is, therefore, impossible to meddle with the interior while the mains current is flowing through the set—a commendable safety measure.

Inside one views an impressive metal chassis, comprising the three-valver and its A.C. power supply. The positions of the different valves are clearly engraved nearby their sockets, so there is no possibility of a mistake when renewals are made.

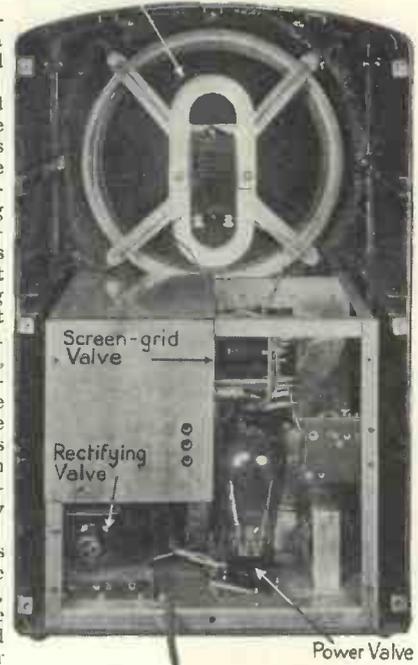
A plainly marked mains input panel has three sockets, one for 200 volts, another for 220 volts, and the third for 240 volts. The plug is inserted into whichever socket is appropriate to the mains voltage.

The back of the container is engraved to indicate the purpose of the various sockets on the chassis, such as the external aerial, the mains aerial, and the gramophone pick-up.

In testing the set on a 200-volt supply, we found the controls easy to manage and admirable in action. The volume-cum-selectivity control knob on the left made a great deal of difference to the results. With this control at its mid-way position, we were able to confine the local stations to a reasonably small part of the tuning dial.

For example, London Regional, maximum at 356 metres, was entirely silenced

Inductor Loud Speaker



Screen-grid Valve

Rectifying Valve

Power Valve

WITH AN INDUCTOR LOUD-SPEAKER

This set is interesting because it incorporates an inductor type of loud-speaker that is nearly as good as a moving-coil model

at 340 and 360 metres. With the standard aerial there was no question of local-station swamping. The tuning circuits are remarkably efficient, and we doubt whether it is possible with two tuned circuits to get better selectivity than is obtained on this set, at least not without sacrificing quality by cutting high notes.

On the long waves, particularly, the good balance between quality and selectivity given with the set was appreciated.

Calibrations

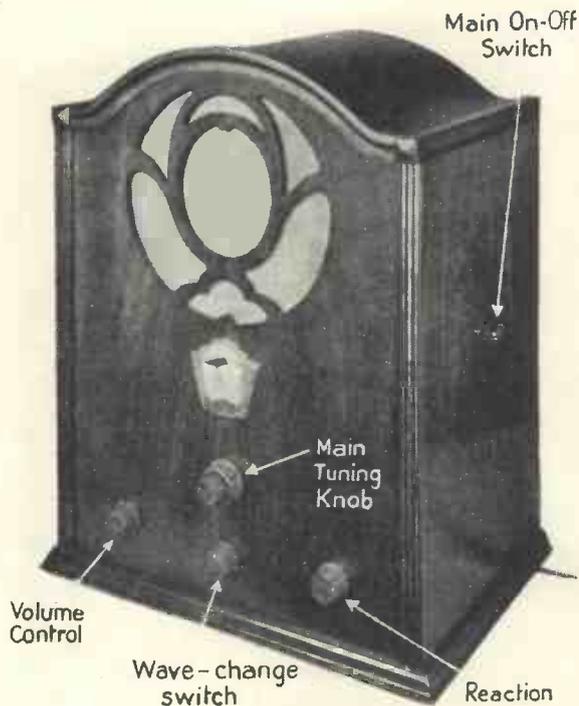
We much appreciated the wavelength calibrations on the cleverly arranged tuning scale, and these were found quite accurate enough to be found distant stations to be enabled without much searching.

We are of opinion that the outstanding attribute of this console is the quality of the reproduction

Altogether, during tests, we logged fifteen stations on the medium waves, all at good strength.



KOLSTER BRANDES MODEL KB279



A SET WITH A CLEAN APPEARANCE

The Kolster Brandes self-contained three-valve A.C. set has graceful lines that will attract many listeners

“THREE valves working from A.C. mains and with a self-contained moving-coil loud-speaker”—that is a specification we are repeatedly coming across in readers’ letters and in set makers’ literature. The Kolster Brandes set under review is typical of this combination. At its moderate price, the new model KB279 will create wide interest.

Clean Layout

In the walnut-finished cabinet are contained the metal-chassis three-valver and moving-coil loud-speaker. Looking inside the cabinet, we gained an impression of a clean layout, with accessible sockets for the receiving valves and the valve rectifier.

The moving-coil loud-speaker is of the energised type, deriving its field current from the power supply unit.

Three Mullard valves are used in the receiving circuit, comprising an S4VA screen-grid, a 904V detector, and a PM24B pentode output valve. Altogether a powerful com-

bination, deriving anode current from a Philips 1807 valve rectifier.

Except for the aerial and earth and mains connections, this is a self-contained set—a table console. Here we should mention that provision is made for using the mains as an aerial, a very useful attachment for flat dwellers and others will appreciate.

Other provisions worth noting are terminals for the external connection of a loud-speaker, as for a servant or other remotely situated subscriber to the set’s output. Then there is a jack for the connection of a pick-up which, if used, will need an external volume control. Coloured fuses are fitted as a safety measure.

In keeping with what is evidently a determined policy on the part of the makers of K.B. sets, none of the controls on the front of the set is in any way marked to indicate its action. As against this omission, we must remember that the instruction booklet contains

set user has become accustomed to the set. A curious business!

The layout of the controls below the loud-speaker grille is shown by the illustrations. Our tests show that these controls are easily mastered, the tuning control, with super-imposed trimmer, being

POINTS ABOUT THE DESIGN

MAKER: Kolster Brandes, Ltd.

TYPE: KB279.

PRICE: 18 guineas.

VALVE COMBINATION: Screen-grid amplifier, detector, and pentode output valve.

POWER SUPPLY: A.C. mains, 100 to 250 volts, 40 to 60 cycles.

FINISH: Table cabinet, containing the set, loud-speaker, and power supply. Walnut finish of attractive appearance.

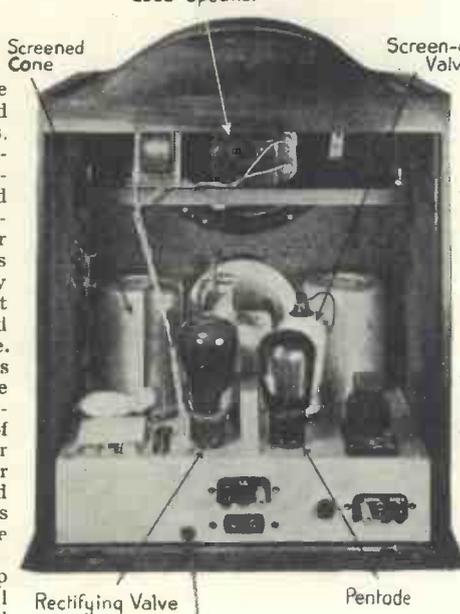
very complete details of the controls.

Obviously as a concession to those who like to know which knob is which by reference to the actual controls, the makers have provided temporary paper indicating rings, presumably to be thrown away when the

particularly free from snags.

This knob actuates the gang condenser and a well-engraved tuningscale, marked in medium and long wavelengths. The scale is easy to read when the set is working, thanks to the bright illumination provided by a bulb at the back inside the case.

Loud Speaker



Sensitivity was found to be equally good on the medium and long waves, being rather better than the average on the long waves. Thus Zeesen was heard at good loud-speaker strength almost clear of interference from adjacent stations.

Selectivity in the Kolster Brandes set under review depends, as with most three-valvers, on the setting of the pre-detector volume control. With this at its minimum the selectivity is very good.

Quality of reproduction had a characteristic low-pitched timbre, which many listeners in this country and all listeners in America insist upon.

The available output is very considerable and many users will take advantage of the pick-up facilities provided.

COMPACT—YET ACCESSIBLE

This view shows the internal arrangement of the receiver, which is very neatly designed and constructed



MULLARD 1932 THREE-VALVER (KIT SET)

WHEN we unpacked the carton containing the parts of the new Mullard three-valve kit set, we were immediately impressed with the neat and efficient looking chassis construction. To see how quickly the assembly work could be done, we timed ourselves at the start. The last wire was put into position just under two hours after we had unpacked the carton.

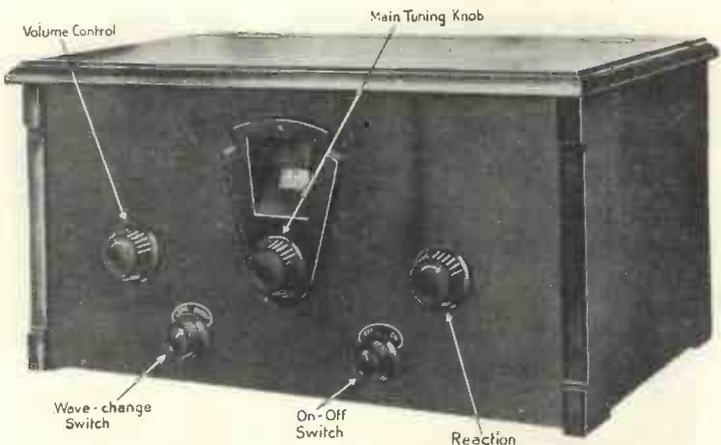
Evening's Work

Taking plenty of time to study the large and explicit instruction sheet, the amateur constructor should find the assembly of the Mullard kit a very easy evening's work.

To simplify the assembly,

panel components is greatly aided by the numerous photographic views given with the instructions.

Apart from the coils, the two-gang tuning condenser is a very important part of the assembly. This condenser is provided with trimming devices on each section and these greatly help the constructor to obtain accurate tuning. This



SIMPLE AND STRAIGHTFORWARD TO OPERATE

The controls of the Mullard kit set are well arranged and do all that is necessary to ensure good reception

A BRIEF SPECIFICATION

MAKER: Mullard Wireless Service Co., Ltd.

PRICE: £7 2s. 6d.

VALVE COMBINATION: Three valves, consisting of a screen-grid high-frequency amplifier, a detector, and a transformer-coupled pentode output valve.

POWER SUPPLY: Batteries. These consist of a double- or treble-capacity high-tension battery of 120 to 150 volts, a 2-volt accumulator, and a grid-bias battery.

TYPE: Kit set. Full instructions are supplied with the kit of parts for the complete assembly of this Mullard three-valver.

FINISH: The cabinet, although home assembled, has a good appearance.

the instruction sheet has been divided into eighteen steps. The first step is a preparation of the metal work for the screening of one tuning coil from the other. The constructor is then taken through progressive steps until finally the cabinet is built up round the completed set.

The two tuning coils are somewhat large, being wound on massive coil formers with a thick gauge of wire. As these coils are mounted at right angles to one another and a screening partition comes between them, induction effects between the two coils are reduced to a minimum.

Although the screening assembly is quite simple, it very effectively shields the two circuits of the high-frequency valve from one another. The assembly and wiring of the baseboard and

means that although tuning is done with one knob there

is no loss of signal strength on distant stations through mis-ganging.

Both the tuning coils are provided with simple coil-switching mechanisms. A rod runs through both coils and is actuated by a panel switch knob. The action of the coil-changing switch is very satisfactory and places the Mullard kit set in the front rank of its species.

Control of the completed kit is, generally speaking, conventional. Apart from the tuning control knob mounted on the escutcheon plate, there are four other control knobs.

Handling these controls,

we appreciated the ease with which the Mullard kit set can be operated. The excellent ganging provided by the tuning condenser means that real one-knob tuning is achieved without sacrificing sensitivity.

The reaction is inclined to be fierce, but since a large number of stations were brought in without the application of any reaction, this is a small shortcoming.

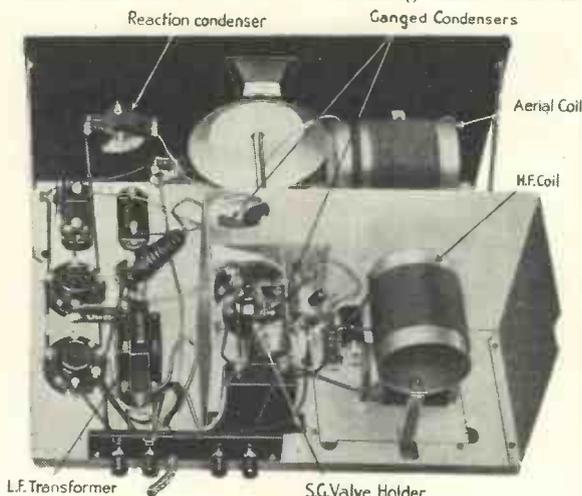
Naturally, the three valves used are selected from the Mullard range. The high-frequency valve is a Mullard PM12. This is coupled to the detector valve, a Mullard PM1HL.

Good Selectivity

Reception tests made in south-west London with a 60-foot aerial showed that the local stations, namely those at Brookman's Park, could be cut out completely within six degrees. On the long waves Daventry 5XX had a spread of only ten degrees. The set is selective enough to be used quite close to regional stations.

To assist the constructor to log distant stations, a long list of approximate dial readings is included in the instruction sheet. We logged many foreigners, including Brussels, Rome, Söttens, Prague, and Hilversum, at dial readings within a degree or so of the maker's calibrations.

Altogether, we were able to get thirty-one stations on the medium band.

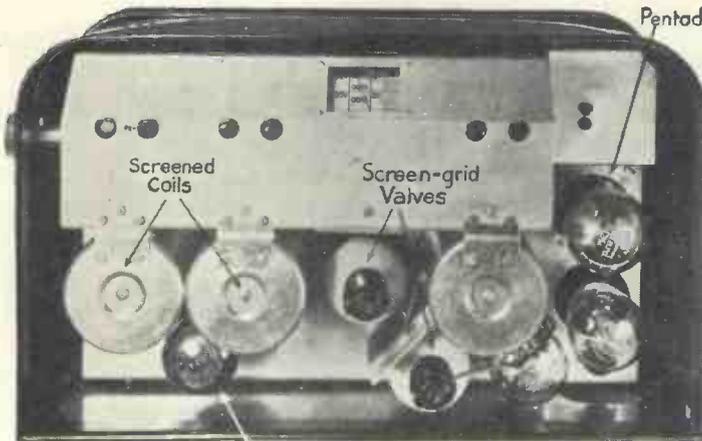


A WORKMANLIKE JOB

The general layout of the set is efficient and also attractive in appearance, as this photograph shows



PHILIPS MODEL 720A FIVE-VALVER



Rectifying Valve

EVERYTHING SCREENED FOR EFFICIENCY

Everything is well screened in the Philips five-valver for the sake of efficiency. Two metallised screen-grid valves are used

IN its bakelite-moulded container, the new Philips five-valve table model, for use with an external loud-speaker, makes an interesting addition to the popular Philips range. This is one of the few really powerful sets designed for use with an external loud-speaker.

Meeting a Need

Most of the new season's sets have incorporated loud-speakers. We consider there is still a big need for this Philips type of set, for there are many set buyers loath to part with or to scrap their existing loud-speakers, although they may be anxious to increase their range of reception with a new set.

Considering the power of the new Philips model, its price is very reasonable and we shall, no doubt, have occasion to recommend it quite a lot during the season.

The circuit of Philips model 720A differs from standard practice. Two of the five valves are screen-grids, thus imparting a good measure of sensitivity. The third is the detector, and then come two stages of resistance-capacity-coupled low-frequency amplification, the last valve being a pentode.

The use of resistance-capacity coupling provides good quality of reproduction and just that little extra

amplification after detection so useful in out-of-the-way localities, or for the reception of a very distant station.

The moulded lid of the container is not screwed down in any way, and on lifting it we see the well-screened five-valve chassis with accessible valve sockets. The mains indicating dial at the back is really clever, enabling the correct voltage of supply to be fixed up with the minimum of effort.

Testing the set, we appreciated the extreme simplicity

Wavelength
Calibrations



CONTROLS AT THE SIDES OF THE CABINET

The controls, which are commendably few in number, are arranged on the sides of the cabinet

of the controls, which are remarkably few in number. The tuning control is on the right of the set and the volume control on the left. But these two controls combine other functions; the tuning "push pulls" for wave-changing and the volume control in its minimum position cuts off the mains supply.

This set is, therefore, a good example of the new trend in pruning down the number of knobs, by combining several functions in the few knobs that are retained.

The tuning scale at the

centre of the moulding is one of the most comprehensive we have seen. It gives medium and long waves, as well as a clear divisioning of degrees. The scale is brightly illuminated when the set is switched on.

Fine Results

This is a wonderful set to control, as tests have clearly shown. We gained a favourable impression as soon as the set was put on test—with a good make of moving-coil loud-speaker. As would be expected from the circuit combination, which includes an aerial band-pass tuning circuit, the overall performance was spectacular.

With the volume control at maximum the strength of foreign stations was simply terrific, and with this control turned down a little the selectivity was equally impressive, Mühlacker being

IN A NUTSHELL

MAKER: Philips Lamps, Ltd.

PRICE: 17 guineas.

TYPE: Philips 720A.

VALVE COMBINATION: Two screen-grid stages, detector, and two resistance-capacity coupled low-frequency stages, with pentode output valve.

POWER SUPPLY: A.C. mains, covering all standard voltages and frequencies.

FINISH: Special bakelite moulding, of very attractive appearance.

almost clear of London Regional on our standard test aerial.

Sötens clear of Midland Regional, Langenberg clear of North Regional, Hilversum clear of North National—these were some of the indications we obtained of the high degree of selectivity during tests.

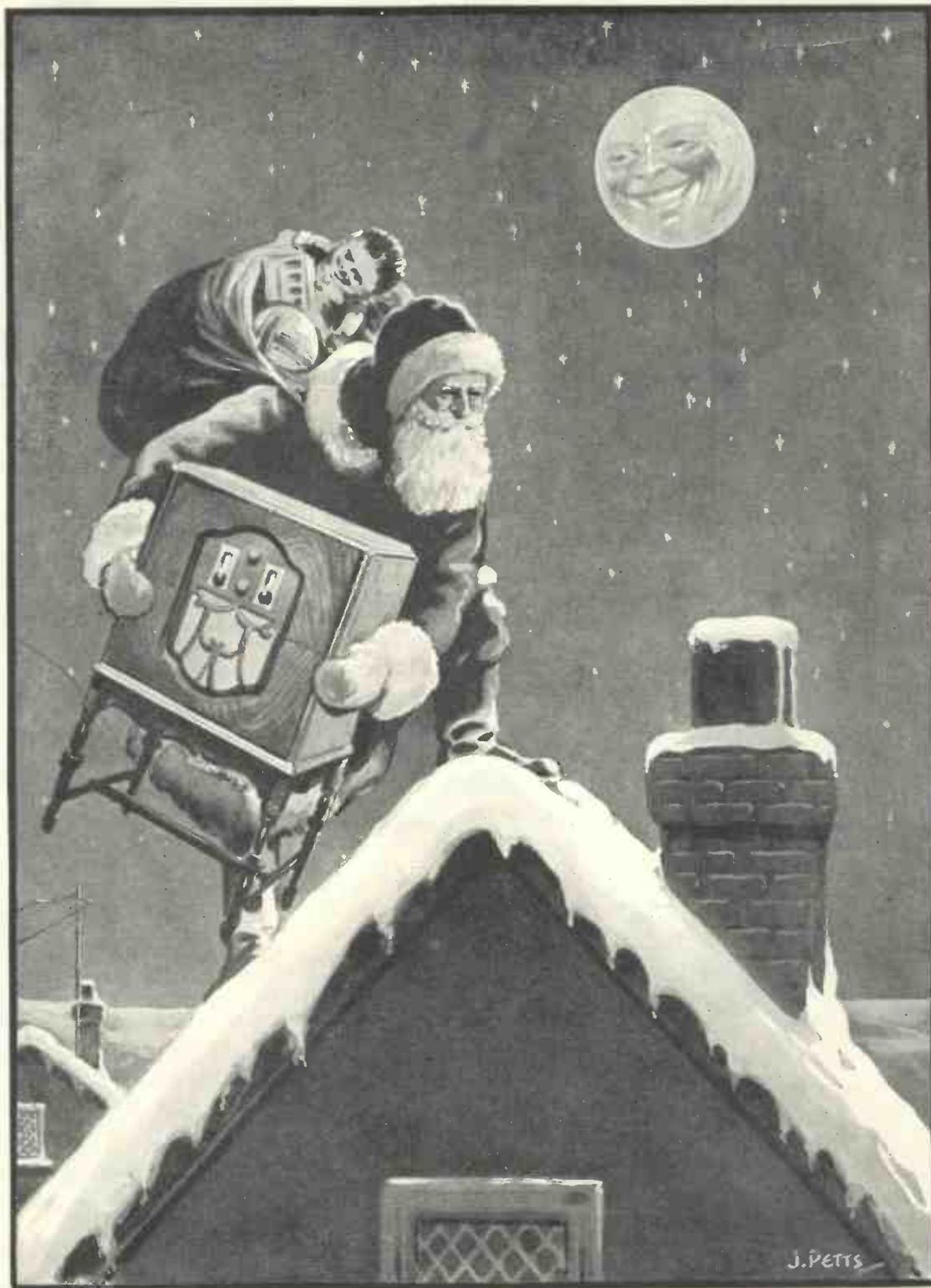
London Regional was maximum at 49 degrees and had disappeared entirely at 47 and 51 degrees.

National at 27 had gone at 26 and 28, so there is hardly any local station interference.

The tuning goes right down to 150 metres and up above Budapest on the medium waves.

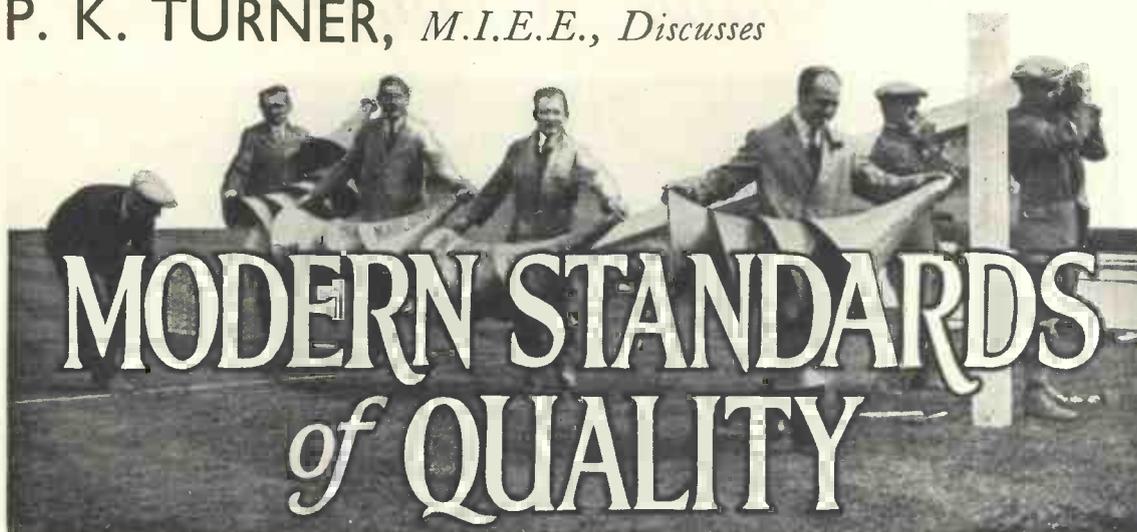


A Seasonable Radio Problem!



FATHER CHRISTMAS : "This gift business seems to be getting more difficult— especially when it comes to the Super Senior!"

P. K. TURNER, M.I.E.E., Discusses



MODERN STANDARDS of QUALITY

QUALITY AND POWER ARE NEEDED FOR A SUCCESSFUL PUBLIC-ADDRESS SYSTEM
Radio engineers fixing up loud-speakers at Wembley for a cup-final football match. A huge amplifier is used and there are many reproducers fixed all round the ground

The author tries to specify standards of quality and states that too few receivers attain the highest standard

FOR some time, I am afraid, I've been rather out of touch with other receivers of broadcasting. My own set satisfies me very well, and I have been working on other forms of reproduction—"talkies" and gramophone recording.

But just lately I've had reason to look closely at present-day receivers: production ones at the show and also a whole series of receivers described in the radio papers. And the examination has rather surprised me.

Doing Justice to the B.B.C.

Are we doing justice to the B.B.C.? Are our sets good enough to make the best of the transmissions?

My own opinion is that they aren't. I realize fully that because sets have to be designed to suit all pockets and conditions of use, some of them are bound to be below the highest standard. But it seems to me that even among mains-driven receivers, where cost has not been the deciding factor, too few are designed for really first-class reproduction, nor are cheap receivers as good as they might be for their cost.

An Analogy

Perhaps an analogy may make clearer what I mean. As I go along the road, I see one man in a Rolls-Royce and another in a second-hand Austin Seven. The Austin man

knows that his car isn't as good as the other, but it is good value for the money, and it suits his purpose. But we should smile if he asked us to believe that it was simply perfect, and that there was no need for anybody, for any purpose, to get anything different.

Now take the radio case. I know quite a lot of people with radio sets that are not even Austin Sevens; they are obsolete Model T Fords. And their owners don't even know that there is such a thing as a modern Austin Seven, let alone a Rolls-Royce!

Now, before I can attempt to justify that rather rude statement, we must come to some agreement about standards of quality—what *is* and what *isn't* first-class; and before putting forward some suggested standards I want to clear the air by just reminding my readers about the very beginning and end of broadcasting—musical sounds.

The simplest musical sound is a continuous pure note. You hardly ever hear such a thing outside the laboratory, but the lower notes of a flute are sometimes nearly pure. A pure note has only two properties: its *strength* and its *pitch*.

You will, of course, remember that pitch is simply a matter of frequency; every octave just doubles the frequency.

The next more complicated sound is a continuous *complex* note—such as is given by a violin, oboe, horn or, in fact, any ordinary musical instrument. It is made up of first, a

pure note (called the *fundamental*) and on top of that a whole series of *harmonics*—notes whose frequencies are twice, three times, four times, etc., that of the fundamental.

Such a note has *three* properties—strength and pitch as before (the pitch being that of the fundamental), and also its *tone colour* or quality, which can be specified by stating how strong each harmonic is, compared with the fundamental. It is this tone-colour that makes the difference between, say, a violin and a trumpet.

More Complicated Sounds

There are other, more complicated sounds, such as chords and sudden, non-continuous sounds. But the two first will give us enough trouble to go on with.

The first and probably the most important question in thinking of reproduction is the range of pitches we have to cover. The piano, as a first example, begins at about 20 cycles and goes up to just above 4,000. One or two other bass instruments go down to about the same bottom limit, and some organs go lower still. At the other end of the scale, the violin and piccolo both go up to about the same pitch in the treble.

Perfect Reproduction

But we must not forget that these treble ranges are for the fundamentals; if a piccolo top note is 4,000 cycles, its second harmonic is at 8,000, its third 12,000, and so on.

So it seems that for perfect reproduction we should start at 20 cycles and go up goodness only knows how far.

But let us consider it from the other side. Forget for the moment what the orchestra can do; what can the ear hear?

Curiously enough, we can't hear a pure note of 20 cycles at all! I know you'll say this is nonsense, for that is the bottom note of the piano and you can hear it. But it isn't really nonsense.

Shaking the Floor

A pure 20-cycle note, with no harmonics, shakes the floor and may give you a funny feeling in your tummy, but you can't actually hear it—there's nothing in the ear that answers to it. When someone plays bottom A of the piano, the sound isn't a pure note. It is a mixture of 20, 40, 60, 80, and other frequencies, and these combine in the ear and make the brain believe that it has heard 20 cycles, although 40 is the lowest actually heard.

This can be proved in a very striking way by playing a complex bass note—say at 60 cycles, from a double-bass—in front of a microphone, and then faking the amplifier

You may naturally ask, if loss of the true bass notes still leaves them apparently of the same pitch, why does anyone bother about reproducing the bass?

Because an amplifier with bass cut-off, though it apparently brings out the bass notes, gives them the wrong tone-colour. If the fundamental is lost, the harmonics can't be the right strength compared with it; they must be too strong. And the result is a "tinny" or "reedy" quality, with no richness.

How low must we go to avoid this? Well, the answer can't be absolutely definite, for ears vary in sensitiveness to the defect. But a really critical ear will detect it now and then if the amplifier doesn't go down to nearly 40 cycles.

I should say that the frequencies in the following list should be reproduced at almost, if not quite, full strength.

Here are the standards of quality, not only for bass notes, but for performance in general, that I use in my own mind when thinking about the design of receivers from the audio-frequency point of view. Of course, they have nothing to do with the range of the set on distant stations, or its selectivity.

to, but no attempt at exact reproduction of the original.

Bottom limit 150 cycles

Z Quality.—Definitely bad: The sort of thing that one gets from an obsolete set and horn loud-speaker.
Bottom limit 250 cycles

Now, what about the other end of the scale? The harmonics go up to 30,000 cycles or so, but the ear doesn't. A youngster's ear usually goes up to 16,000 or 20,000, and the range falls off as one gets older. Actually we can usually take the average *effective limit* as about 10,000.

Sounding the Same

What happens if we don't reproduce the top notes properly? Well, it's fairly easy to think out. As I said above, the difference in tone-colour between different instruments is due to their different harmonics. If we cut off at 4,000 cycles, the highest notes will lose all their harmonics, and they all sound the same.

It is useful to note that the "s" sounds in speech are of very high frequency, and one sign of insufficient top is that they sound like "th"—the thpeaker lithpht.

Treble Standard

Corresponding to the table for bass, we can make out one for the treble range required to attain the same quality. We will say that the falling-off should not be more than 30 per cent. at the given frequency.

A Quality.—
Top limit 9,000 or 10,000 cycles

B Quality.—
Top limit 6,000 cycles

C Quality.—
Top limit 4,500 cycles

Z Quality.
Top limit 3,000 cycles

The matter of strength or loudness seems to have caused more confusion than almost any other in the whole question of receiving outfits. For one thing, it tends to get mixed up with that of the actual amount of magnification in the set.

I have often told some proud owner that his set hadn't nearly enough power for proper results, and he has retaliated by proving that he could get very loud signals—at the cost of horrible distortion!

Distinct Requirements

There are two distinct things: a set should have enough amplification to give the required loudness, which is easy; and each stage in it should be

SUGGESTED STANDARDS OF QUALITY

Quality	Description	Frequency Range	Power for Last Valve
A	The best attainable with ordinary methods	40-10,000	25 watts 50 milliamperes at 500 volts or 120 milliamperes at 200 volts
B	Good enough for most; better than gramophone or talkies	80-6,000	10 to 12 watts 40-50 milliamperes at 200 or 250 volts
C	No attempt at true reproduction; but a pleasant noise all the same	150-4,500	3 to 6 watts 20-30 milliamperes at 150 or 200 volts*
Z	Out of date, but still often found	250-3,000	Less than the above

*Or a special push-pull stage giving the same output for less high-tension consumption

so that it first cuts off below 50 cycles, then below 100, and then below 150. The note consists of 60, 120, 180, and higher frequencies.

The amplifier passes it all at first; next, the fundamental is lost, and then both fundamental and second harmonic. But the pitch still sounds the same to the ear, and anyone not up to the trick would probably be willing to swear on oath that in all three tests the amplifier must have amplified the 60-cycle note, because he heard it.

A Quality.—This is the best that can be got with our present knowledge. It means using a moving-coil loud-speaker of much better quality than most of those on the market.
Bottom limit 30 or 40 cycles

B Quality.—Good enough for most purposes. Distinctly better than the best gramophone records or "talkies."
Bottom limit 70 or 80 cycles

C Quality.—The sort of result referred to as "Austin Seven"; a good sweet tone and nice to listen

MODERN STANDARDS OF QUALITY—Cont.

so designed as to handle the power that passes through it without distortion, sometimes very difficult.

Let us first reckon the actual power requirements. For first-class results, there is no doubt at all that the listener must hear sounds of the same loudness as at the original performance. This is where many, many people have fallen into a trap.

It does *not* mean that the loud-speaker must make as much noise as the Queen's Hall orchestra. As you rightly exclaim, that would be unbearable in a small room. It would also mean that good reproduction of a big orchestra in a small room would be absolutely impossible, which is by no means the case.

Power in One's Ears

What one must remember is that in the Queen's Hall only perhaps a millionth of the total power floating about ever gets into any one man's ears. And it is the power that gets into one's ears that matters.

If your own room with the set in it is a small one, perhaps a hundredth of the total power reaches your ear. Then to get the same "ear power" in each case, the set must put out just one ten-thousandth of the total power of the orchestra.

I repeat again: what we need for first-class results is the same power *at our ears in our room* as we should get from the original performance in its hall or studio.

Why do I insist on this strength as being very important? To answer fully would take us very deep into the behaviour of the ear and brain; all I can do in simple language is to say that if we gradually cut down the strength of a musical performance, all parts in proportion, the ear doesn't hear an equal weakening. Some notes get lost first and the whole sounds quite different.

Power for Quality

I am putting off till a little further on my list of powers required for the various standards of quality, because the power needed depends on the amount of distortion allowable, and I am going to consider that next.

In the wide sense of the word, distortion means any change in the tone-colour of sound; so the defects already mentioned, due to top or bottom cut-off, are a form of distortion. But what we most usually mean by the word is the creation of *false*

harmonics anywhere in the musical scale, due to defects in the receiver.

To a certain extent this may happen in the high-frequency amplifier; but by far the most important source of it is in the low-frequency side, especially in the detector and the last stage.

The detector deserves an article to itself. For the present all I will say is that it is now known by everyone that the grid-leak type of circuit is the best if properly arranged—three years ago I was called a lunatic for saying this, but it was just as true then as now!—and that the important things are: plenty of high-tension supply for the detector valve, and enough high-frequency amplification, if required, to get just about the right amount of power into the detector grid.

When we come to the amplifying valves, absence of distortion is just a matter of avoiding grid current and working on fairly straight parts of the valve curves. But all valve characteristics are more or less curved, and if we try to get too much audio-frequency power out of a valve, we shall get distortion.

Luckily, a certain amount of distortion can be allowed before the ear notices it. This varies over the scale, the ear being most sensitive to it when the fundamental is a bit above the middle of the piano—say, 500 cycles or thereabouts. Under *test* conditions, with pure notes, a harmonic about one-twentieth as strong as the fundamental, that is 5 per cent., is perceptible. But when listening to music we can allow more; very few people will notice 10 per cent.

Fifth or Quarter Efficiency

Now, working to these limits, the best a carefully designed ordinary last stage will do is to put into the loud-speaker about a fifth or a quarter of the power it gets from the battery or mains unit.

Valve makers sometimes claim more, but this is a good safe figure. Special (*not* ordinary) push-pull stages can do better, but need very careful design.

After all this, we can combine the power and distortion requirements, and get some idea of how big the last stage must be.

A Quality.—When we are striving after first-class results, we usually also think of fair-sized rooms, and we keep the harmonics strictly within 10 per cent. With loud-speakers of average efficiency, it is essential that the amplifier should be able to put out about 5 watts of audio-frequency power.

Suitable last stages are a Marconi or Osram LS6a, or a Mullard DO24 valve, or perhaps the new 25-watt pentode, the Mullard PM24d; any of these take about 50 milliamperes at 500 volts.

I know this sounds terrific to the ordinary listener, but, believe me, the highest standard of quality cannot be attained without such power.

On D.C. Mains

For those on D.C. mains, of course, 500 volts cannot be got and the best that can be done is to use two valves such as the Marconi or Osram PX4 or Mullard ACo44 (rated at 10 or 12 watts each), taking together about 120 milliamperes at 200 volts. The result is not quite so good—the valve makers have had to face the possibility of extra distortion in getting a 12-watt valve to work on only 200 volts.

This quality cannot be got with ordinary high-tension batteries. It



A 2-VOLT BATTERY PENTODE
Two-volt battery pentodes are not recommended for general use in C-quality sets, but they can be used in other grades

AN EXCLUSIVE ARTICLE BY P. K. TURNER

can with high-tension accumulators or super batteries, but the cost is so high that few will consider it.

B Quality.—Here the frequency range is rather less, and we are only aiming at a quality rather better than that of the best gramophone records electrically played. We are also designing for ordinary moving-coil loud-speakers, which themselves distort somewhat. So it is natural to allow a bigger chance of overloading the amplifier.

Output Required

Therefore, I should specify an output of about half that for A quality—say about 12 watts, or at a pinch one of the larger pentodes, rated at 8 watts. The latter is really not enough.

The battery user is still rather in difficulties, for even so low a power as 8 watts means 40 milliamperes at 200 volts. Probably his best way out is a special push-pull stage. Such a stage may have an efficiency of 35 per cent. or more, and has the advantage that when the music is quiet the high-tension consumption falls to quite a low figure.

Hence, two of the modern 2-volt power valves, rated at 6 watts in all, may be made to give practically as much output as a 10-watt valve run in the usual way. The average high-tension current is only 8 milliamperes or so, but one needs plenty of volts in the battery.

C Quality.—Here we have definitely given up the idea of "reproducing" the original performance. The idea is simply to give a pleasant sound—enabling the music to be recognised, but not necessarily all the individual instruments in their proper proportions.

Also, the measure of loudness will be what the set can do and not what the original performance calls for.

Not Contemptuous

You who read this, please don't think I'm being contemptuous about C-quality sets. I know quite well that they give pleasure to tens of thousands of people quite as good as myself. I know also that those whose means are limited, or who have other hobbies and don't care to spend much on radio, or above all, those who are limited to dry batteries for high tension, cannot do better.

If I lay stress on A quality, it is firstly because I have worked for years at getting it, and secondly because too many people don't even know that such quality *can* be obtained.

Coming down to brass tacks, the C-quality set will probably work a moving-iron loud-speaker, and we must reckon on an even higher percentage of harmonics and a lower loudness altogether than in the previous cases.

If it is a mains-driven set there is no sense in cutting down the high-tension consumption very low, and it is simplest to use a valve of about 5 watts rating. The 10-watt size is hardly necessary, for in most cases the loud-speaker wouldn't stand its full output. For A.C. sets the indirectly-heated Marconi or Osram ML4 or Mullard 104V would suit (I haven't the Mazda list by me, but they make the same sort of valve).

Suitable 2-volt Valves

For D.C. mains or batteries the 2-volt power valves will serve, but for most loud-speakers the low-impedance ones, of about 2,000 ohms, should be chosen (Marconi or Osram P2 or Mullard PM202), not those of 4,000 ohms or so. The one thing is plenty of high-tension *volts*, even if for economy the current must be cut down. Twenty milliamperes at 150 volts gives much more audio output than 30 milliamperes at 100 volts, and actually costs less per year in batteries.

It is my strong conviction that the pentode should *not* be used for sets of this type. It would take too long to go into all my reasons—there are plenty—but I will simply say that by the time one has faked the circuit to suit the loud-speaker it will probably have less actual magnification than a modern 2-volt power valve, cost more in itself and in components, and take just as much high tension.

Z Quality.—I'm not going to say anything much about Z-quality sets (which include most bought portables) except to deplore the fact that there are so many about, giving radio a bad name.

Quite often it would cost very little to make a Z set into a C one, and the owner would do it if he realised the difference so let my readers (none of them, of course, have Z sets



FOR A-QUALITY SETS
This is the Marconi LS6a, suitable for
the last stage of an A-quality Set

themselves) go and persuade the Z owners into re-conditioning them.

Now let me come back to my first point. Are we doing the B.B.C. justice? Most of the B.B.C. output is A quality. Some of the older stations are only B, and sometimes a long land-line or other trouble reduces the quality nearly to C level. But on the whole nothing but an A-quality set will make the best of a transmission from any of the new regional-scheme stations.

What Do We Find?

And what do we find among receivers? Naturally, I cannot speak of all the home-built sets, but at Olympia I saw *only one A-quality set*. There were several B's (mostly at prices just as high as the only A), and dozens and dozens of C's; also, I regret to say, several Z's—though not so many as there used to be.



ANCIENT AND MODERN
A fine photograph of the plough—one of mankind's oldest inventions—being used in the shadow of the aerial masts at Brookman's Park, the B.B.C.'s giant station just outside London

WITH the Olympia, Manchester, and other big wireless exhibitions well behind us, and Christmas not so very far in front of us, it is time our winter work was showing signs of progress.



Your special work this winter

What is your special work this winter? If we could all of us compare notes on the experiments we are doing this season, I think we should find that, between us, we were covering all that is worth while from the listeners' point of view.

I wonder how many of you have gone over to short-wave work for the first time this winter. There are some specially attractive features about short-wave reception these days. For instance, it is now possible to use high-frequency amplification with ganged control, and it is also possible to build a receiver to operate on A.C. mains.

Another very interesting branch of experimental work which I feel sure many of you are tackling is volume control. I also feel sure that a good number of you are working on the very pressing problem of selectivity.

I wish it were possible for us to compile a list of our winter activities.

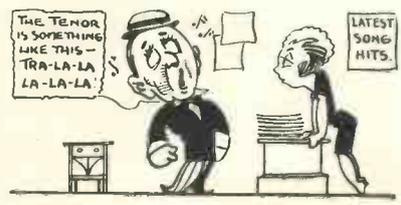
What interesting reading such a list would make, and wouldn't it be a grand thing if all those experimenters who are working on each one particular problem could exchange notes and compare results to date?

New Goods

By this time the new season's sets and component parts will have found their way into all our local wireless shops, even into those in the remotest districts. What do you think of the new goods now that you can see them and handle them at your leisure, and what does your local dealer think of them?

I drop in two or three times a week to see my local dealer, and he has not yet stopped drawing my attention to the cheapness of his new supplies. How do you find these new low-priced components? I find them very satisfactory indeed.

So far the new components have not caused me any great trouble. Often enough when you buy a new part you find there is some little difference in it which makes it necessary for you to fix it in slightly different fashion from the old component. For example, a couple of



When you buy a new part

new wire-wound resistances I bought last week did not fit into the old holder as I should have liked so I had to buy a new holder.

One of the neatest improvements I have noticed this season is the way in which the flush-with-panel milliammeters of a well-known firm are mounted. Instead of the three tiresome little screws, and the even more tiresome holes which had to be drilled for those screws, there is a simple bracket which holds the milliammeter to the panel, and which is absolutely no trouble at all to fix.

Canadian Statistics

Why is it that we never see statistics of the wireless trade in our coun-



Compare them with the Canadian figures

try similar to the statistics published regularly in Canada and the United States? Such statistics make cheerful reading in these days of trade depression and I think they would be well worth the trouble of compilation and classification.

I have just been looking through the Canadian wireless statistics for last year and I find them most interesting reading. During the year 1930, 170,000 receiving sets were

manufactured in Canada, the average value of those sets being £22 10s. How many sets were manufactured in our country during 1930, and what was their average value? It would be most interesting if we knew our own figures and could compare them with the Canadian figures.

Analysis of the Canadian statistics for 1930 shows that, of the total number of sets manufactured, 81 per cent. were A.C. mains sets, 13 per cent. were combined wireless sets and gramophone amplifiers, and 6 per cent. were battery sets.

These percentage figures show very clearly the trend of progress in Canada. I wonder if similar percentage figures for our country would show a similar decline in the popularity of the battery set. I rather doubt it, don't you?

Regional Names

Now that the site of the new Western Regional broadcasting station has been definitely fixed at Washford Cross in the parish of



We can marshal the names

Williton, Somerset, we can marshal the names of our regional stations and see what we think of them. Here they are in order of date: Daventry, Brookman's Park, Moorside Edge, Westerglen, Washford Cross.

How do you like the collective sound of these names? Which name do you like the best and which the least? In my opinion our old and well-tryed Daventry is the best-sounding name on the list. If any one of the other four runs it close, I should say it was Westerglen, the name of the Scottish Regional station near Falkirk.

Somehow or other I have never liked the name Brookman's Park. I cannot tell you why unless it is because I thought it a strange substitute for the familiar 2LO. Moorside Edge is a name which might be used in any moorland countryside, and the latest addition, Washford Cross, is only fair.

Of course, we shall not hear these place-names of our regional stations announced in our broadcast programmes. Westerglen will be the Scottish Regional station, and Wash-

ford Cross the Western Regional station, just as Daventry, Brookman's Park, and Moorside Edge are the Midland, London, and Northern Regional stations respectively.

By the way, if you were a B.B.C. engineer, at which regional station would you choose to work and live? George says he would take Brookman's Park in the winter, and Washford Cross in the summer—yes, thank you.

From Gourock

One of the letters I received this morning puzzled me a little, so when George came round to see me to-night I sought his opinion on it.

"Listen to this letter, George," I said, "I should like you to tell me what you think about it."

"Where's it from?" asked George. "Gourock, Scotland."

"An old correspondent of ours?"

"No, George, the writer uses a nom-de-plume, so I have no idea who he is. He says he is surprised that my aerial has collapsed at the tree end, and that it is not long ago since the painter found my aerial to be in a bad state at the house end. He does not recommend me to purchase a steel mast because I should be sure to get entangled in the stay wires and then there would be more trouble to write about."

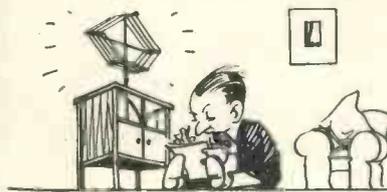
"Very neat."

"He recommends me to buy a screen aerial which can be fitted under the table and——"

"Do you mind if I read the letter myself?" asked George.

"Certainly not," I replied, as I passed the letter over to him.

"Now, I rather like this letter," said George, after he had read it.



Writing my notes under the aerial

"I thought the kindly references to yourself would please you, George. How do you like the suggestion of my writing my notes under the aerial under the table 'after a hectic night out with George'?"

"Is that an invitation?"

"Certainly not, George. What I want you to do is to tell me what to do about this letter."

"Well! if I were you I should tell the truth about your aerials, how

your two aerials at home are——"

"I seem to have said too much already about my home aerials, George."

"Then write a true description of the big aerial at your—er—place of business. That will surprise your Gourock correspondent."

"A splendid idea, George."

So here goes.

My Big Aerial

The first thing I ought to tell you



What George calls my place of business

about my big aerial at what George calls my place of business is that it has been up for seven years and that it has never caused me the slightest trouble during that time. Perhaps my Gourock correspondent will make a special note of this.

When the aerial was erected I had the wooden mast set in concrete. This mast is 35 ft. high, and there are two pulleys at the top, each with its own rope, of course.

My place of business is a building 40 ft. high and the "business end" of the aerial is attached to a point just outside the highest window. The horizontal part of the aerial wire is 73 ft. long, and the vertical down-lead is 27 ft. in length. This down-lead comes into the building through a window which is above ground level, the point of entry of the down-lead being 8 ft. above the ground.

For the earth connection I have five wires running out in various directions under the aerial, each wire at its far end being soldered to a copper rod driven a foot into the ground.

This big aerial of mine at my place of business is really a splendid aerial both for reception and for——well!

Our Valves

There is one thing in wireless in which we ought to take a greater pride than ever this winter, namely our British valves. America may keep in front of us with regard to television broadcasts. Germany may know more about 7-metre transmission and reception than we do in England.

Canada may know more about mains sets than we do, and other

UNDER MY AERIAL—Continued



No new type is too expensive

countries may be in advance of us in minor details, but there is one branch of wireless where we undeniably lead, and that is in the manufacture of valves.

Even in the matter of the world's biggest valve we now hold the record with the 500-kilowatt valve made for Rugby. We can safely say that, from the biggest valve to the very smallest, British valves are the best in the world.

As listeners we get many advantages from our British valve supremacy. First and foremost British valves are best of all in performance. Secondly, in their efforts to keep the British valve in the premier position, our manufacturers are constantly improving our valves. No improvement in design or in manufacture is too small for attention, and no new type is too expensive for them to modify to suit our needs.

It is a grand thing for the British listener, this British valve supremacy, and I am sure you would join me in expressing our appreciation of the great and continuous efforts made by our valve manufacturers and their engineers to retain this supremacy.

Switches

Have you ever thought what an important component part the switch is? Most of us switch on and off our aerials and our sets day after day without giving the slightest attention to the switches we use.

Right from the time I first started wireless I have been interested in switches and I have tried all kinds of switch—tumbler switch, toggle switch, moving-arm switch, knife-edge switch, and many types of moving contact switches—and I have an idea that



A real need for a good switch

the switch is a somewhat neglected component part. There is no doubt a real need for a good switch, well designed, well made, certain of its contacts, and capable of long service.

One afternoon last week I happened to call in the laboratory of a scientist who takes a great interest in wireless and I noticed that he was using a very simple type of plug-in switch in some of his apparatus.

The switch consisted of two blocks of brass separated by a gap about $\frac{1}{8}$ in. across. In the two blocks of brass there was a tapering hole in the line of the gap. Part of the hole was

in one block, part in the other, and part of the gap was in between.

To close the switch a plug with an ebonite knob was placed in the tapering hole. This brass plug had been ground to fit the hole exactly, and I was told that, when the switch was closed by the plug, the resistance of the switch was zero.

I came away wondering whether there was not the idea for a good wireless switch in this simple plug switch. Have you ever seen such a switch used in wireless?

Puff Puff

"George, old man," I said to my technical adviser as I looked thoughtfully at him across my reception room last night, "you're a wireless expert—er—of sorts, aren't you?"

"Out of sorts just now," said George. "I've been trying to solve a problem connected with a mains unit for over a week now and I'm as far off a solution as ever. That sort of thing makes you feel humble, if only wirelessly humble."

"Quite so, George, but I dare say



To avoid the possibility of a shock

you are sufficient of an expert to tell me why it is that, when a wireless expert has his photograph taken these days, he holds a pipe in one hand and hides the other hand in his coat pocket."

"The pipe is modern. I've noticed it myself. In the old days the expert merely held one hand in his pocket. Everybody knew what that was for. It was to show, of course, that the expert had the expert's first qualification, namely the trick of keeping one hand in his pocket during experimental work so as to avoid the possibility of a shock by touching the apparatus with both hands at one and the same time."

"I know all that, George, but why the pipe these days?"

"I expect it's to show that the expert is doing well enough to be able to afford to smoke a pipe even in these days of economy and heavy taxation—what the American press agent calls a puff, you know."

THE WIRELESS ZOO

*The Grumbler is a dog who growls
Throughout the day and nightly howls.
He snarls: "Transmission is not clear"
Or "My Coherer won't cohere!"
He growls at programmes grave or gay,
Grouses because he has to pay
His Wireless Licence. Often he
Fiercely attacks the B.B.C.
His face is very long indeed,
He is of the Dalmatian breed.*

LESLIE M. OYLER.

The Cinema Organist

QUENTIN MACLEAN Discusses the Merit of the Cinema Organ with T. F. HENN.

IT is an established fact that many church organists have an intense dislike of the "contraption down the road" at the cinema.

My interest was aroused by a recent outburst of a church organist. His description of the cinema organ amazed me. Such expressions as "sheer torture to me" and "wobbles like a jelly on a plate" seemed to show a lack of any entertainment appreciation.

Unfounded Arguments

His arguments seemed so unfounded that I decided to take up the challenge. Consequently I approached Quentin Maclean, one of the best cinema organists in the country, to get, first-hand, his opinions on this very controversial subject.

Mr. Maclean broadcasts every Wednesday from the Trocadero Cinema on the largest Wurlitzer organ in Europe.

A surprise greeted my first inquiry. "What is the difference between church and cinema organs?" I asked.

"Very little. There is no basic difference. All organs, whether church or cinema, are built on the same principle. Both have their tremulant stops, but the cinema organist makes more frequent use of the tremulant to get greater variation to please cinema audiences."

Mr. Maclean admitted that in many cases too much use is often made of this effect.

Insufficient Practice

"Of course," he said, "there are many cinema organists who find it impossible to get sufficient practice. I do all my practice after the show has finished at midnight. I have to keep fairly quiet for fear of disturbing local residents. The cinema is usually raided by cleaners in the morning, or else it is rehearsals, and useful practice is out of the question.

"I am convinced that if cinema organists had better facilities for practice, the standard of playing in the cinema would be higher than it is at present."

He seemed taken aback by my next question. "To what extent can a cinema organist encroach on the classics?" I asked.

"Encroach?" he replied, almost with indignation. "There is no limit to the repertoire of a cinema organist, of course, within reason."

"Would you play a Bach Fugue, say, on the organ here?" was my next suggestion.

"No," he replied, with some emphasis, "the cinema does not lend itself to such works. Actions speak louder than words. Come along and see why."

We walked along winding passages and up a narrow flight of stairs till we came to a small door. Opening this I saw the "innards" of a cinema organ. Rows and rows of pipes, big and small, were neatly arranged in a good-sized room.

Quentin Maclean then gave me his reason for not playing a Bach Fugue. "I would not play a work of that nature because I could not get the clean, open effect that is necessary to do it justice."

The instrument at the Trocadero, like those in a great many churches, is divided into two parts. In this case there is the stage separating the two sections. Each part is literally boxed up, shutters providing the only means of sound penetrating into the auditorium.

I have often wondered why a cinema organ often sounds "woolly." The reason for my wondering was explained. Unlike a church, the



A WIZARD OF THE WURLITZER
Here is Quentin MacLean at the organ of the Trocadero Cinema, Elephant and Castle. He broadcasts weekly

plaster decoration of the building tends to "strip" the sound of that crispness so noticeable with the church organ.

Of course, the B.B.C. have mastered the technique of cinema-organ broadcasting simply because there is little or no echo in the building, thus making it exactly similar to a studio.

My next inquiry was easily answered. "How are all the effects, such as drums and xylophones, operated?"

"They are not effects, but actual instruments mechanically controlled," replied Mr. Maclean.

It is interesting to note that this organ has about 2,000 pipes.

Number of Stops

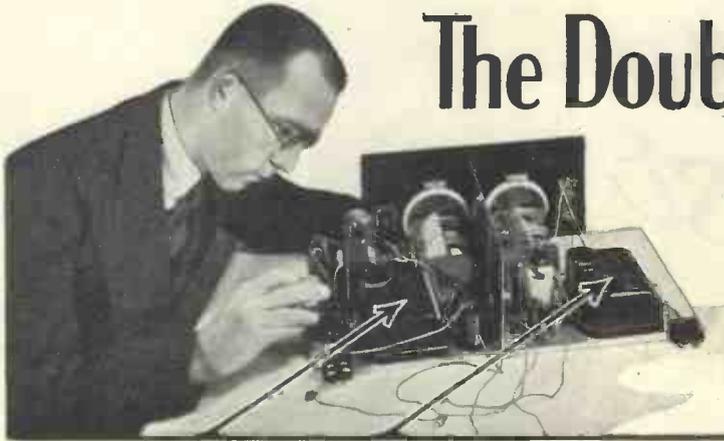
I picked up my hat to go and at the same time fired my last question: "How many stops have you actually on the console?"

"Two hundred and fifty, about," was his startling reply.

This very interesting conversation has solved my own doubts about the cinema organist and his music. If he can play a classic as it was intended to be interpreted by the composer there is no reason why anybody should cast a slur on this latest addition to our entertainment.

The cinema organ itself is practically the same as that found in our churches, only its surroundings and acoustical properties prevent it from doing justice to the great organ music we are accustomed to take as our standard.

The Double Band-Pass Three



The arrows indicate the positions of the band-pass coils in the Double Band-pass Three, which was fully described last month

In this article J. H. REYNER, B.Sc., A.M.I.E.E., writes more about the screen-grid receiver he described in detail in the November "Wireless Magazine." The design has aroused considerable interest among listeners and there is no doubt that it meets the needs of many amateurs

AS was to be expected, the suggestion of using a band-pass tuner in the anode circuit of a screen-grid stage has aroused considerable interest, and the publication last month of the first constructional

it is advisable to make sure that the switch has gone well home on the long-wave position (with the rod pushed in).

It is preferable to push the switch rod in on the coil itself, and then insert the extension switch rod into the coupling and screw this up. No difficulty is experienced, of course, in the medium-wave position with the switch pulled out, but unless the switch goes right home on the long-wave position, the tapping either on the aerial or on the anode coil is not changed over from one coil to the other, and misleading results will be obtained.

I mentioned in the last article that it was desirable to insert a small piece of paper under the coils to prevent any of the contacts short-circuiting to the copper foil. No particular damage will result if this does happen, but there is a danger that the coupling condenser may be short-circuited, in which case the signal strength will suffer considerably.

For the same reason the screen or foil on the baseboard should not be allowed to come in contact with the metal chassis of the tuning condensers. Reference to the diagrams will show that the screen and foil are in connection with the earth side of the coils, whereas the moving plates

of the condensers are connected to the other side of the coupling condenser.

If these two points are allowed to come into contact the coupling condenser will be short-circuited once again.

Alternative Condenser

Incidentally, since the set was first made up the Cyldon people have placed on the market a very compact two-gang condenser with trimmers and a slow-motion dial which is excellent in every respect, and gives rather more room than I was able to obtain with the original condensers.

As regards the wiring, it is best to take this by the shortest route between the coils and tuning condensers, keeping the wires free of metalwork as far as possible. I deliberately

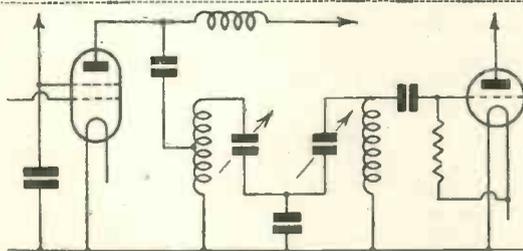


Fig. 1.—Circuit with double band-pass tuners, giving the greatest possible efficiency from the valve

details has afforded ample proof of the practicability of the proposal.

In point of fact this particular receiver was developed some time before the Radio Exhibition, but it was deliberately held up so that it could be tried out under various conditions in order to make sure that it was not only easy to handle, but simple to construct and effective in performance.

Definite Step Forward

Under such conditions there is little to add to the details given last month, but I wish to emphasise some of the points made in the previous article, and then to indicate in a little more detail why I feel that this set marks a definite step forward.

The only difficulty which I have experienced in connection with this set has arisen from the switch rods. The length of extra spindle supplied with the coils is only just long enough to come through the front panel.

Therefore, when assembling the set

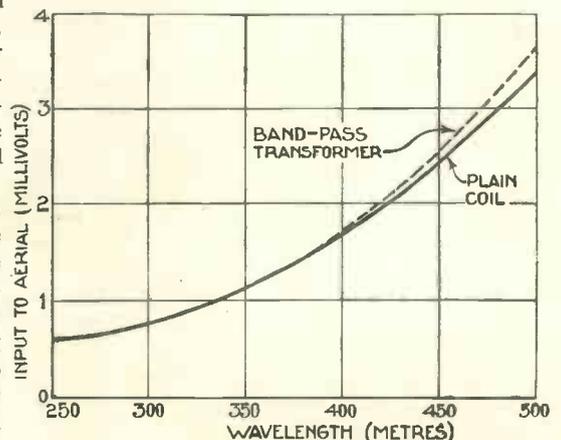


Fig. 2.—Efficiency curve of the Double Band-pass Three, showing effect of two band-pass circuits

used "hay" wiring on the original model to make quite sure that the set was not critical in its construction, but, of course, the better the wiring the better the results.

Simple Trimming

The trimming should present no difficulty. I gave detailed instructions on this last month, and my subsequent experience has not brought to light any simpler way of carrying out the process.

It only remains to give an approximate indication of the wavelength ranges on the two switch positions. This can only be approximate, because the actual tuning is determined by the setting of the trimmer, particularly towards the bottom of the scale. The charts accompanying this article were obtained on the original set using Polar condensers, and should serve as a sufficiently reliable guide.

Let us now turn to the other question, that of the amplification obtainable with a band-pass high-frequency transformer. I suggested in my preliminary article that it was possible to obtain more amplification from a valve using a band-pass high-frequency transformer than with a plain coil arrangement.

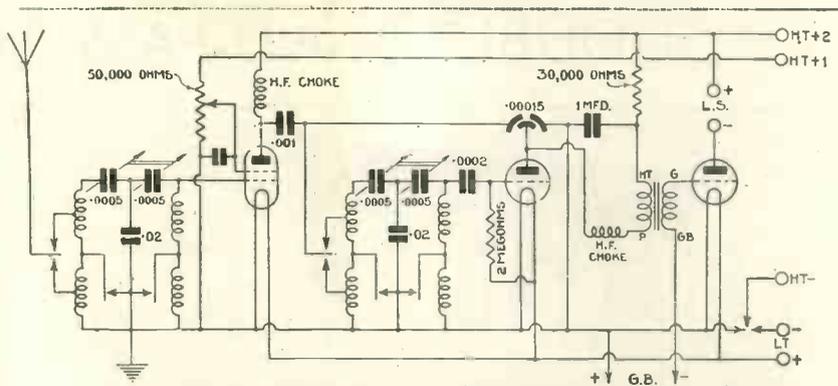
Less Detector Damping

The reason for this is that the detector damping which is normally present in a high-frequency transformer is removed in a band-pass filter to the second half of the circuit and the first half of the arrangement is, therefore, able to extract more amplification from the valve, and hand more voltage over to the detector.

Against this there is the inevitable loss due to the presence of two tuned circuits instead of only one. My contention was that the ordinary loss of about 30 per cent. in a band-pass filter was at least made up by the increased amplification from the valve, and in certain circumstances might be increased.

Challenged

This statement has been challenged by several people, and I have, therefore, looked into the point again, partly from a theoretical point of view and partly by actual measurements, as a result of which I see no



STRAIGHTFORWARD CIRCUIT WITH NO SNAGS
This is the circuit of the Double Band-pass Three. It comprises a screen-grid stage, leaky-grid detector and transformer-coupled power stage

reason to modify my views at all. Consider a valve having an amplification factor of 200, and an internal resistance of 200,000 ohms. Let us assume that we have a band-pass arrangement, each of the circuits consisting of an inductance of 200 microhenries, a capacity of .0002

microfarad, and a high-frequency resistance of 5 ohms. The dynamic resistance of each circuit is then 200,000 ohms.

Finally, let us assume that following this stage is a detector valve working on a grid-detector arrangement and that the resistance of the grid-to-filament path is 100,000 ohms.

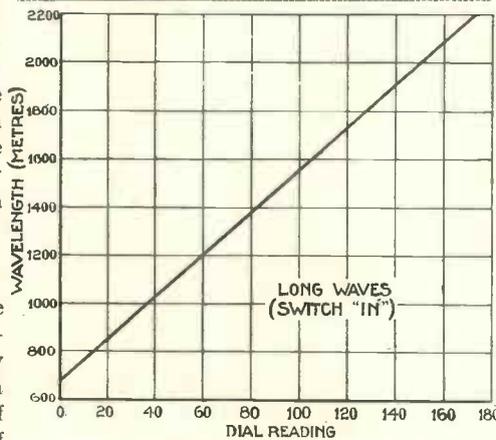
Consider now the amplification obtained with only one of the tuned circuits in use and with a detector valve connected straight across this circuit. The optimum ratio for such an arrangement is really a transformer having a step-down ratio of 1.8 : 1, under which conditions the amplification from the valve is 85.

Inconvenient

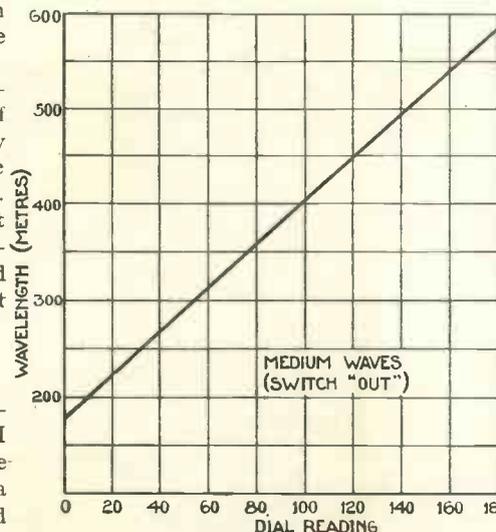
We do not use such an arrangement in practice, partly because it would be inconvenient, and partly because the selectivity would be very poor. If we use a plain tuned anode the amplification would be 50, and if we use a centre-tap, which is the most likely arrangement, giving a 2 : 1 step-up and increased selectivity, the stage gain would be 53.

Now let us consider what happens if we use a band-pass arrangement. Under these conditions the anode circuit of the valve contains only the first tuned circuit shown in Fig. 1. This circuit is enabled to make the greatest possible use of the valve amplification, unhindered by the grid damping of the detector.

Some of the energy set up in the circuit is then transferred to the second circuit in the filter, which admittedly suffers from the detector damping, in that it cannot build up such a high voltage as

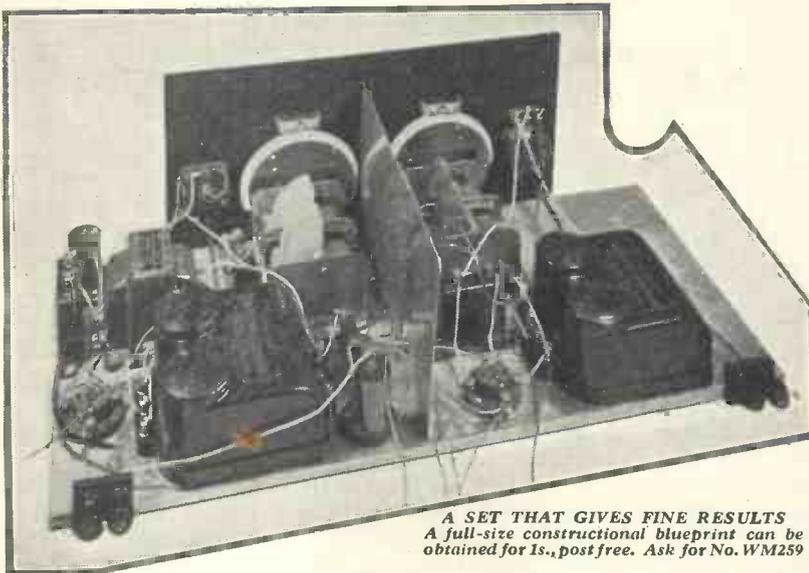


Dial readings for long wavelengths on the Double Band-pass Three



Dial readings for medium-wave stations on the Double Band-pass Three

THE DOUBLE BAND-PASS THREE—Cont.



A SET THAT GIVES FINE RESULTS
A full-size constructional blueprint can be
obtained for 1s., post free. Ask for No. WM259

it otherwise would, but this does not affect the marked increase in the amplification obtained from the valve.

In the example we have just considered the dynamic resistance of the circuit is 200,000 ohms, and this requires a transformer ratio of 1 : 1, or in other words a plain tuned-anode circuit, for maximum amplification. The actual gain would be 100, as against 85 for the preceding case.

As usual, however, we should not use the valve in this manner from considerations of selectivity, but we should tap the anode halfway down the coil, in order to obtain better selectivity. In this instance, however, the amplification is still well maintained, being 80 as against 53 for the single coil.

Showing Up Well

It will be seen, therefore, that however the arrangements are compared the band-pass circuit shows up well. Even comparing a band-pass transformer with a centre-tap, and the single circuit with the optimum step-down transformer, the ratio in favour of the latter is only $\frac{85}{80}$ and the selectivity by comparison is absolutely hopeless.

The effect of the detector load across the second circuit is a matter which concerns the designer of the band-pass filter. He can allow for this in the first place and arrange his coupling between the two circuits to compensate for any loss caused by this means.

A discussion of the theory of this

point is rather too involved in the present article, but I think I can best conclude by quoting some results taken on the actual set under discussion. These results will also give some idea of the sensitivity of the receiver.

They were taken by the method used in all receiver tests. A small artificial signal is introduced into the receiver, and the strength is adjusted until it gives a standard output of 50 milliwatts in the loud-speaker cir-

cuit. No reaction is used for this test, and the actual high-frequency voltage introduced into the aerial circuit is measured. It will be clear that the smaller the high-frequency voltage that has to be introduced in order to give the standard output, the more sensitive will the receiver be.

Practical Results

The curve shown in Fig. 2 illustrates the results. You will observe that over most of the scale the input required with the band-pass filter was practically indistinguishable from that required with the plain coil. The coil, in this instance, was merely the first half of the band-pass filter, the other half being entirely disconnected.

Remembering that there is ordinarily a loss of at least 30 or perhaps 50 per cent. in voltage by using a band-pass filter, it is clear that some influence is at work to obtain more amplification from the set when a band-pass filter is used, whereby the normal drop in signal strength has been compensated for. This is not accounted for by inherent reaction or instability for particular care was taken on this point.

At the upper end of the broadcast band it appears that with the particular filters in use the loss in going

COMPONENTS NEEDED FOR THE DOUBLE BAND-PASS THREE

CHOKES, HIGH-FREQUENCY

2—Wearite, type HFO, 13s. (or Lewcos, Watmel DX3).

COILS

2—British General band-pass tuning units, types aerial and anode, £1 9s.

CONDENSERS, FIXED

1—T.C.C. .0002-microfarad, type 34, 1s. 6d. (or Telsen, Readi-Rad).

1—T.C.C. .001-microfarad, type 33, 1s. 10d. (or Telsen, Readi-Rad).

2—T.C.C. 1-microfarad, type 50, 5s. 8d. (or Telsen, Formo).

CONDENSERS, VARIABLE

2—Polar Uniknob two-gang .0005-microfarad, with disc drives, £2 2s. (or Cylidon).

1—Polar .00015-microfarad differential reaction, 2s. (or Lotus).

EBONITE

1—Becol 14 in. by 7 in. panel, 5s. 10d. (or Lissen, Pilot).

HOLDERS, VALVE

3—Telsen four-pin, 1s. 6d. (or W.B., Lotus).

PLUGS AND TERMINALS

4—Belling-Lee terminals marked; Aerial, Earth, L.S. +, L.S.—, 2s. (or Clix, Ealex).

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

6—Belling-Lee wander plugs, marked: H.T. + 2, H.T. + 1, H.T.—, G.B. +, G.B.—, 1, G.B.—2, 1s. (or Clix, Ealex).

RESISTANCES, FIXED

1—Readi-Rad 30,000-ohm flexible type, 1s. 6d. (or Telsen, Lissen).

1—Readi-Rad 2-megohm grid leak, 10d. (or Telsen, Watmel).

RESISTANCE, VARIABLE

1—Sovereign 50,000-ohm potentiometer, 4s. 6d. (or Wearite, Varley).

SUNDRIES

1—Readi-Rad 10 in. by 6 in. screen, 2s. (or Peto-Scott, Parex).

Tinned copper wire for connecting.

Length of Sistoflex sleeving.

Sheet of copper foil, 18 in. by 4 in. (Readi-Rad, Peto-Scott, Parex).

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

SWITCH

1—Telsen three-point, 1s. 3d. (or W.B., Lissen).

TRANSFORMER, LOW-FREQUENCY

1—Telsen Radiogrand, ratio 1 to 7, 8s. 6d. (or Lotus, Igranic).

ACCESSORIES

BATTERIES

1—Fuller 2-volt accumulator, type LDGH, 9s. 6d. (or Ever Ready, Exide).

1—Fuller 120-volt super, 15s. 3d. (or Ever Ready, Drydex).

1—Fuller 9-volt grid-bias, 1s. (or Ever Ready, Drydex).

CABINET

1—Pickett special table model, 18s. 6d., in oak (or Camco, Lock).

LOUD-SPEAKER

1—Graham-Farish cabinet model, £2 2s. (or Blue Spot, Amplion).

VALVES

1—Cossor 220SG, £1 (or Osram S21, Mullard PM12).

1—Cossor 210HL, 8s. 6d. (or Osram HL2, Mullard PM1HL).

1—Cossor 220P, 10s. 6d. (or Osram LP2, Mullard PM2A).

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 LEAKY GRID

Whitaker-Wilson Has His Special Set-construction Supplement

POSSESSING (as I undoubtedly do) a profound technical knowledge of all wireless matters and also a distinctly inventive mind, I am

YELLOWPRINT COUPON

Valid only until the day before you buy the Magazine (or until 1936 for overseas readers, or for any who are almost overseas). Not valid for teetotallers.

If you want my full-size yellowprint (thirty-five feet six inches square) for half-price, cut out the above coupon and send it, together with a cheque for three guineas, to me at the usual address.

designing my own sets this month as well as discussing other matters of world wide importance.

First, there is this vexed question of low-frequency notes. You saw how, last month, I got into hot water with the writer of "Radio Medley" over what I said in *Amateur Wireless* about hearing Jetsam sing a low D flat, frequency roughly 67. BM/PRESS described the set on which I heard it.

Ah, but he did not know that I have invented a dear little gadget by which I can hear any note I want to on my set. Last night I actually heard the announcer change his mind, frequency twice.

All I have to do with my gadget, which consists of a bent bodkin soldered into an empty sardine-tin, is to *listen*. If I hear a sound lower than frequency 100 I know the sound has been made; if I don't hear it I conclude that it has not been made.

I am at work on a further gadget whereby I can hear any note or notes that anybody may make in the future. I shall do well with this, of course, because it will be possible for me to write to the people beforehand and send them a gramophone record of what they are going to do.

When they hear it they won't do it. Thus I shall heighten the standard of broadcasting.

Now for my latest set. I have called it "Nobody's Ramogradiogram" and I want you all to try to build it. You must order a low-frequency choke. I don't know why, but it is

the thing to have one. It had better be of the Atlas type because it has its own map of Europe showing all the aerial landing stations. Amy Johnson always uses this type.

The high-frequency choke is the Wearout type. For plugs, get the Belling-Lee wander plugs, marked G.B. If you find one marked G.B.S. kindly return it to him; I know he has recently lost one.

That is the worst of wander plugs; you never know where they will wander to. I have tethered mine to a stake on the lawn. My pet tortoise and my wife's goat have great fun with it.

Resistances: any old spaghetti type will do, but if you find them Bulgin out of the set, scrap them and buy some other sort. Now for the valves. I think those made of Ramstung are the most suitable, but Cossor, Cissor or Cursor are very good makes.



Some weeks ago I told Mr. Reyner all about batteries. There is nothing about battery that I do not know, and I am always pleased to give the staff here a little encouragement and help for their articles.

If you apply force to a person without his consent, that is battery. I am quoting the Common Law of England. Rather silly, I call it. Nobody would be likely to *ask permission* to apply force to a person; still, that is the wording of the law.

Now Lissen to the Law again. If you aim an angry blow at A (no matter what voltage you use) and hit B, that is battery upon B. Mr. Reyner did not quite bring that point out.

SEND NO MONEY!

Just ask your question and I'll toss you double or quits as to whether my answer is right.

Note that not more than fifteen questions may be asked at once. Nothing irritates me so much as people asking a lot of questions.

Under no circumstances can I answer questions personally, by telephone, telegram, cable, parcel post, Carter Paterson, television, or heliograph.

You remember the man who drew a bow at a venture and missed the venture and hit Ahab? That was battery upon Ahab according to the English law, which probably differed from the Jewish law. If you set a dog on a man that is battery upon the man; I don't know what it is on the dog. So that in choosing these high-tension batteries you have to exercise the greatest moderation, or you may be some time in getting your

INFORMATION COUPON

Valid only now and then, but longer than that for readers living on the planet Mars.

voltage-discharge, especially if the judge is on a long circuit.

Mr. Reyner himself pointed out that these batteries deliver a high voltage for a number of days. So do be careful.

Also it is well known that internal resistance causes battery feedback, which is a very acute form of dyspepsia. I had an awful go of it some months ago and couldn't get an out-

I NOTICE—

That the new Wufa is priced £3 15s. I hear it is wufanother bob or so, at least.

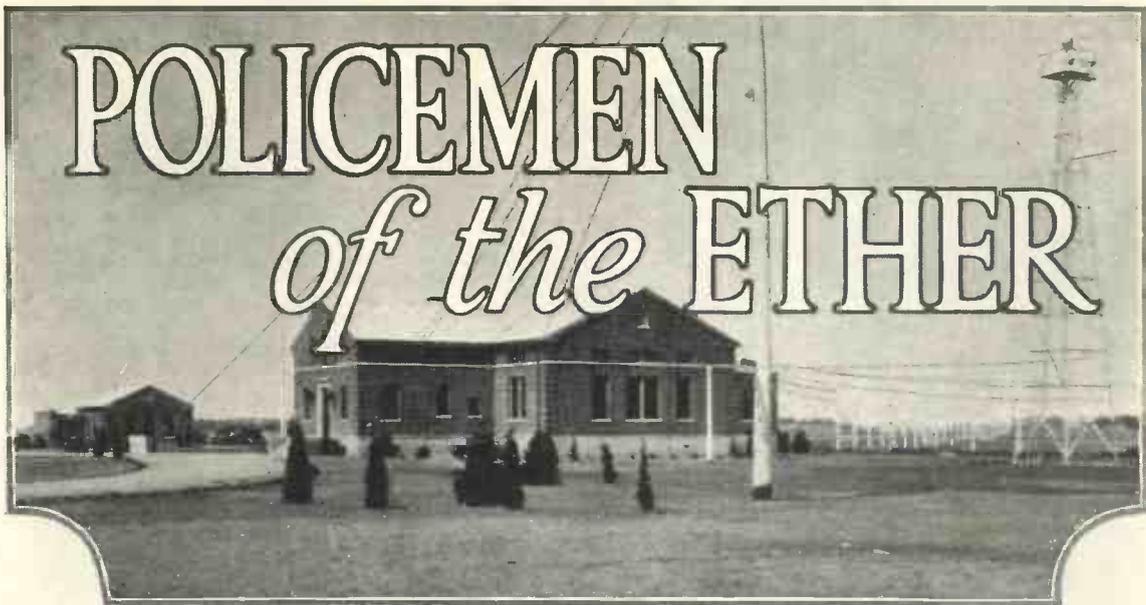
put choke anywhere. Well, try building my set and let me know how you get on.



Mr. W. James thinks an awful lot of his Super 60, his Super Senior, and his Super Junior, but none of these sets comes up to my Infant Super. That really is a set. Nobody has ever thought of designing a set for babies.

All these sets are equipped with a very powerful loud-speaker unit in order to drown any vocal resistance on the part of the baby. Spaghetti resistances can be used, but the spaghetti should be well boiled first and a little milk added. Bakelite casings can be used, but nothing must be over-baked.

A delighted mother writes: "The Infant Super is marvellous. My baby says the valves simple aMazda! That Telsenough, surely?"



AERIALS OF EVERY SIZE AND SHAPE ARE USED HERE
A view of the buildings of the Constant-frequency Monitoring Station belonging to the United States government. It is at Grand Island, Nebraska, U.S.A.

FAR out on the Nebraska prairie, near the geographical centre of the United States, there stands a lonely group of buildings. The plain is flat and dry—remarkable for its lack of any sign of vegetation. These buildings are the only break in the far extending expanse of flat and level country.

Maze of Wires

Anyone visiting this station would detrain at Grand Island, Nebraska, and travel westward about seven miles along a well-paved highway. Turning from the highway through the gate, the first thing which would strike the attention would be the maze of wires strung in every conceivable pattern from a forest of poles which surrounds the buildings.

Inside this group of buildings is housed the "Constant-frequency Monitoring Station" of the United States government, under the management of the Department of Commerce. This station acts as a traffic policeman, attempting to keep all radio stations on the proper transmitting wavelength and thus minimise interference.

The station contains probably the most sensitive radio receivers in the world, at which operators sit throughout the twenty-four hours of the day tuning-in on radio transmitters loca-

ted over the earth's surface. There is hardly a transmitter, either telephone or telegraph, on the entire earth which cannot be heard with the receivers at Grand Island. The station has very appropriately been called America's "Traffic Policeman of the Air."

The station was completed in October of last year, and is situated on land which was donated by the Grand Island Chamber of Commerce to the government. There are no centres of interference in this part of the United States, inasmuch as the nearest broadcasting station is several hundred miles away. The site is exactly equidistant between Boston, Massachusetts and Los Angeles, California by airline. The station with its associated equipment cost slightly in excess of a quarter of a million dollars.

Transmission Frequencies

The measurement of transmission frequencies according to precise engineering standards is the purpose of the "traffic policeman of the air." Receiving sets, with which there are associated frequency-measuring sets, do this work.

There are eleven different aerials for picking up broadcast signals, each of which fulfils a definite function. Four of these are multiple doublets, tuned for picking up short-wave stations throughout the world.

One of these multiple doublets, tuned for the band between 25 and 75 metres, is pointed towards London and is used for picking up signals originating in the Eastern United States and in Europe. The other set, tuned for the band between 65 and 175 metres, is pointed towards Porto Alegre (just north of Rio de Janeiro) and receives the signals from all parts of South America, Central America, the West Indies, and the southern United States.

Round the World First

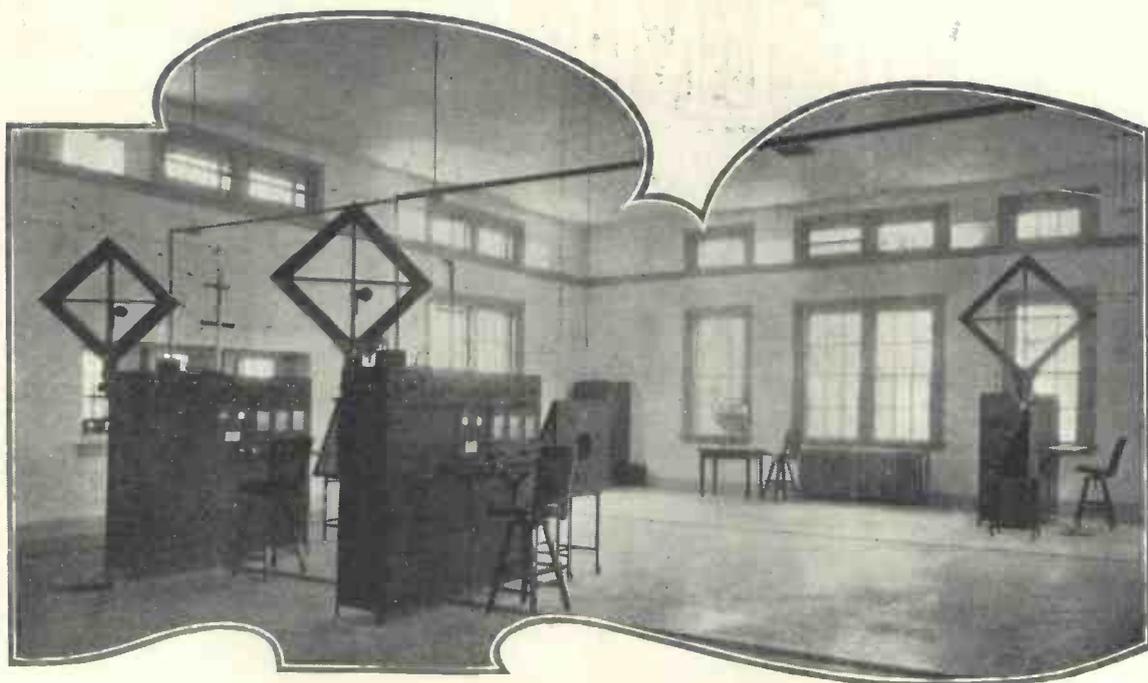
For picking up the Western United States and Asia on these frequencies, the station successfully depends upon round-the-world transmission. Two 200-ft. single doublets cover the band from 100 to 225 metres, and two 150-ft. single doublets cover the band from 40 to 100 metres, although these are not as reliable as the other multiple-type aerials.

There is a so-called general-purpose aerial which simulates as nearly as possible conditions of broadcast reception, and tunes from 200 to 550 metres.

In order to eliminate the possibility of fading, there is a vertical aerial consisting of a 65-ft. brass tube mounted with 8-in. stand-off insulators along one of the cedar poles supporting the general aerial. The

A Special Article by Gordon S. Mitchell

POLICEMEN OF THE ETHER—Continued



FIVE RECEIVERS TO LISTEN ON ALL WAVES FROM 10 TO 30,000 METRES
Interior of the main instrument room, showing two of the special receivers used for checking transmission frequencies. Note the frame aerials on top of the sets

vertical aerial is used for all-round reception as well as for the purpose of augmenting short-wave signals and minimising fading.

The eleventh antenna is a single strand of copper wire, running for 1,440 ft. due east from the building, built for general broadcast reception also, but used for checking the transmitted signals of the radio-beacon stations which serve to guide the airmail and passenger planes over their courses across the country.

Monster Loop Aerial

There is also a monster loop aerial which is the largest loop of its kind so far on record. It consists of two loops 500 ft. long by 40 ft. high, mounted at right angles to each other. It is used for tuning the longest waves, from 3,000 to 30,000 metres.

With the aerial system as outlined it is possible to tune anywhere in the broadcast spectrum between 10 and 30,000 metres. The aerial lines are led into the building and after passing through grounded lightning arrestors are transposed to minimise the possibility of cross-talk interference. From the lightning arrestors they are led into the main instrument room.

Each receiver, as can be seen in the photographs, has an associated loop aerial which can be used in case

of heavy snow or storms which might break down the outside aerial.

The receivers are classed into three general frequency classifications—there being two of the type C which handle the band between 10 and 200 metres; two type B which handle the band between 200 and 3,000 metres; and one type A which receives between 3,000 and 30,000 metres.

The sensitivity of the receivers is pronounced, the A receiver having three stages of tuned radio-frequency amplification, two of untuned radio frequency, a detector and power amplifier; the type B receivers have four stages of tuned radio frequency, a detector (regenerative) and power amplifier; while the type C receivers have three stages of tuned radio frequency using screen-grid valves, a regenerative detector and a power amplifier.

The type C receivers also have two stages of untuned radio-frequency amplification placed ahead of the tuned stages in order to heighten the sensitivity and match the impedance of the receiver to that of the transmission line.

The monitoring procedure carried out at the station is extremely interesting in that it shows the application of scientific methods to industrial progress. A monitor operator sits at

the receiver, with earphones in place, and tunes a station.

The station may be a code wireless station in Harbin, China, or it may be a short-wave telephone station in France. When the signal has been tuned to the satisfaction of the operator, he signals to the men in the measuring booth to determine the transmitting frequency of the station which is being heard. The primary measuring standard is obtained from a clock with a pendulum of invar metal driven by electrical means, and with temperature and vacuum control. The clock is checked twice daily with time signals from the United States Naval Observatory, and is mainly used to ascertain whether or not the 5,000-cycle tuning fork is fast or slow.

Checking the Tuning Fork

The tuning fork is also checked against the standard-frequency transmission emanating from the Bureau of Standards (a government bureau located at Washington, D.C.). The measuring booth also contains secondary standards for use in case trouble develops in the primary.

In case a station has been measured and found to be off frequency (and it is possible to measure within one part in a million, so precise are the mea-

CHECKING UP THE WORLD'S WAVELENGTHS



THE UNITED STATES "POLICEMAN OF THE ETHER"

Another view of the gear used in America for checking the wavelengths of stations all over the world. The engineers believe in using real baffles for their loud-speakers!

suring instruments), the monitoring station telegraphs its findings to the Department of Commerce headquarters in Washington, D.C., which notifies the station in question. Stations are given every opportunity to get back on to the assigned wavelength.

Manner of a Scientist

Although it has been given the name of "traffic policeman of the air" the monitoring station at Grand Island exercises none of the usual prerogatives of a policeman, more often acting in the manner of a gentle and well-meaning scientist.

According to the supervisor, the monitoring station has not yet gone out to receive a transmitting station but that they have been able to tune it in with sufficient clarity at least to determine the call letters.

Stations throughout the entire world have been picked up—the log book assumes the appearance of a voluminous compilation of locations taken from a complete gazetteer of the world.

Certain tricks of operation make it possible to tune-in stations from the far corners of the earth, even though there be interference originating at points much nearer the monitoring station than the desired station.

When queried as to the purpose of the monitoring station—in answer to the direct questions: Why should there be a station such as the Grand Island station? Was the government of the United States justified in spending all of the money which was spent to build a station such as this? What will be the results in international radio communication?—the supervisor replied in characteristic fashion:

"We have international agreements and national assignments covering waveband allocation and wavelength transmissions. These agreements are based on scientific needs. Frequencies are reserved and assigned for the purpose of obtaining the best results with the least amount of interference.

"It is common knowledge how badly congested wavebands have become, both nationally and internationally. We all know how tremendously important to the commerce of nations radio communication has become.

"Off-frequency communication is bad for all concerned—the party using the particular frequency no less than the parties on adjoining frequencies. No one gains from radio interference and everyone stands to lose.

"Nowhere else in the world can accurate checks of frequency be made in accordance with scientific standards."

In conclusion, it might be of interest to recount an example of the possible use to which a station such as the monitoring station might be put in addition to its announced purpose of checking transmission frequency.

Japanese Ceremony

It was desired to place on the air for the education and amusement of the people of the United States the ceremonies attendant to the signing of the naval disarmament agreement in Japan last autumn. The sensitive receivers were tuned to J1AA at Tokyo; the entire Japanese ceremony was received, transferred to the broadcast network lines and broadcast over the entire United States. This is only one example of the many uses other than purely technical to which the station may be put.

Plans are now under way for a greatly increased sensitivity at Grand Island—several hundred acres to be added to the station and many more directive aerials are to be erected. The American "ear" intends to keep pace with the tremendous advances being made in the art of radio communication.



RADIO IS OF VITAL IMPORTANCE TO OUR GREAT TRANSATLANTIC LINERS
One of the most famous liners, the *Majestic*. It is the world's largest ship and is owned by the White Star Line

EVERY listener must be familiar with the gale warnings broadcast from time to time by the Daventry long-wave station of the B.B.C. These broadcast-telephony warnings are, of course, of great value to the crews of small ships equipped with a receiving set, but carrying no skilled operator who can "read" morse.

Storm Warnings

In addition, however, to the warnings broadcast in ordinary speech by the B.B.C., storm warnings in morse are issued whenever necessary by a large number of coastal wireless-telegraphy stations in the British Isles and, in fact, most of the countries of the world which possess any coastline at all.

As these warnings are intended for general reception, the operator of a British coastal station about to transmit a gale warning sends out a preliminary call consisting of the letters CQ ("General call to all stations"), the word "de" (meaning "from"), and the call-sign of the transmitting station, thus:—

"CQ CQ CQ de GNF GNF GNF."

This is followed by the "International Safety Signal," consisting of the letters TTT (— — —) in morse (tapped out rather slowly and deliberately). The "TTT" signal, which is repeated about ten times on full transmitting power, indicates that the message following concerns matters affecting the safety of shipping, etc.

There is usually a pause of one

This article will interest all those who want a change from ordinary broadcast programmes. A very slight knowledge of morse will open up an entirely new radio field to most amateurs.

minute's duration between the preliminary call and the transmission of the actual gale warning. The operator re-opens transmission, after the minute's interval, with the CQ call, the call-sign of his station, and the words "Gale warning." The warnings transmitted from the British coastal stations are issued by the Meteorological Office and are similarly worded to those broadcast from Daventry.

Such well-known stations as Cullercoats (GCC); Fishguard (GRL); Land's End (GLD); Malin Head (GMH); Niton, I.O.W., (GNI); Seaforth, Liverpool (GLV); Valentia (GCK); and Wick (GKR), comprise the list of British coastal transmitters that issue gale warnings by wireless-telegraphy. The wavelength used for the transmission of these warnings is 600 metres (500 kilocycles).

Each of the stations mentioned above transmits a gale warning whenever the wind within about 150 miles radius of the stations is expected to reach or exceed 40 m.p.h. (the velocity known to meteorologists as "Force 8" of the Beaufort Wind Scale).

Any gale warnings which are sent out during the periods when single operators are off duty are repeated at scheduled times in the next watchkeeping period for ships carrying single operators. These times are 8 a.m., 12 noon, 4 p.m., and 8 p.m. (Greenwich Mean Time), in the case of the stations at Land's End, Malin Head, Seaforth, and Wick. The scheduled times for the stations at Cullercoats, Fishguard, Niton, and Valentia are 18 minutes later in each case—that is 8.18, 12.18, etc.

At the first and last of the four scheduled times, the storm warning follows after any navigation warnings, or other urgent notices to mariners, that are transmitted.

From Foreign Stations

Gale warnings from foreign coastal stations, also, are preceded, in most cases, by the "CQ" call and the "TTT" signal. Spanish gale warnings commence with the word "precaución," Italian ones with "avvisi tempesta," German ones with "Funksturm" or "Sturmwarnungen," Norwegian ones with "stormvarsler," and so on.

Some of the foreign stations—notably the Danish ones, some of those in Latvia, and the Spanish transmitter EGC, Madrid—use special numerical codes for the transmission of their storm warnings; but the great majority of the warnings are transmitted *en clair*.

Moreover, a good many of the foreign stations (such as PCH, the

A PILOT WAVE FOR AUTOMATIC TUNING

Dutch station at Scheveningen; YLA, Riga; and a number of Swedish and Finnish transmitters) broadcast their warning messages in English as well as, or even instead of, in the language of their own country.

A number of French coastal stations, as well as FLE, the famous Eiffel Tower transmitter, broadcast storm warnings when necessary. In order to indicate what districts the warnings refer to, the coasts of France have been divided up into areas known as "Bretagne," "Corse," "Gascogne," "Manche," "Océan," "Provence," "Rhône," and "Roussillon"—on somewhat similar lines; to the "Eastern Area, districts Forties, Dogger, and Thames . . ." etc., so familiar to listeners who hear the B.B.C. shipping forecasts.

Twenty-four Hours

The French storm warnings hold good for 24 hours from a time and day which are indicated at the beginning of each message. The names of the areas—Bretagne, Corse, or whatever they may be—that are likely to be affected by the gale are also given, and the direction from which the "tempête" is expected to come.

In Germany, storm warnings for the North Sea area are issued by DAN, the well-known station at Norddeich; DAB, Bremerhaven; and DAC, Cuxhaven. Warnings relating to the Baltic are handled by DBK, Kiel, and DBP, Pillau, while DAS, Swinemünde, handles those affecting the coast between Flensburg and Leba.

The majority of stations issuing gale warnings broadcast them either on the 600-metre wave or on some longer wavelength. Short waves are but little used for the purpose at present; there are, however, a few exceptions to this rule, notable examples being found among the stations in the United States, China, and Russia.

On the Short Waves

In view of the enormous range over which signals can be received from stations working on the short waves below 100 metres it should be possible for short-wave enthusiasts in this country to have the novel experience of hearing a typhoon warning broadcast from a station in China!

Nearly 170 stations are now participating in the service of wireless gale warnings to shipping, this total being distributed among some thirty different nationalities. W. O.

A NEW method of short-wave radio telephony, demonstrated at Trappes, France, is considered one of the most interesting experiments in transmission in recent years.

Experts who gathered at the radio station of Le Matériel Téléphonique witnessed a demonstration recently by which the transmitting station automatically kept the receiving station tuned in.

The method, which is called the single side-band system, is based on the discovery that only a part of the ordinary radio wave is essential for perfect reception, provided the receiver is kept exactly tuned with the transmitting station. The maintaining of this special tuning at 18,000,000 vibrations per second baffled radio research men until recently.

The secret was found in the system of sending out a special wave, called a pilot wave, for the sole purpose of keeping the receiver in tune. Engin-

ers found that the pilot wave could actually keep both ends of the communication in tune.

A radio circuit was established between the Trappes laboratories and the laboratories of the Spanish National Telephone Company at Madrid and the radio men reported that it was satisfactory.

One-sixth Power

The new method is reported to be of great advantage, as it permits a station to operate with as little as one-sixth of the power necessary to transmit and keep in tune under the present systems.

The new system also eliminates much of the distortion now found so troublesome in radio communications. This is made possible by the elimination of the greater part of the radio wave. In addition to this it permits the operation of nearly twice as many radio stations without interference. F. P.

THE NEW SET

*Unpacking the set, a receiver sublime,
(For weeks she had seemed to desire it)
She selected an opportune moment of time
And brought in her spouse to admire it.*

*He gave a brief glance and went out on the lawn,
(He wasn't accustomed to raving)
"More radio stuff!" he exclaimed with a yawn,
"With you, wireless sets are a craving!"*

*And then, with a subtle, peculiar thrill,
Because he had chosen to flout it,
She gave him the radio dealer's huge bill—
Ah, THEN he raved madly about it!*

C. P. P.



Ganging Our Coils

THOSE who have read my views on improving home-constructed sets will guess how I enjoyed a recent conversation with a manufacturer who, in the year of grace, 1931, is making dual-range units in such a way that the switches cannot be coupled together.

With the particular type of coil in question there is some mechanical difficulty in coupling the wave-change switches with one rod, but there is no excuse, in my opinion, for shelving the problem just because the job is difficult.

I said that for a set to have two wave-change switches was going back in technique three years. Personally I should not want to use such a set, but perhaps you do not agree?

I very much doubt whether I really convinced this manufacturer that he should make an early alteration in the design.

A Flat Warning

If you are thinking of leasing a flat in one of the imposing new blocks being put up all over London, take care to investigate the question of radio reception thoroughly.

There is one man in the radio trade who is bitterly disappointed in this respect. He saw a very attractive flat, fitted with an electric refrigerator and a loud-speaker system that gave the choice of the National or Regional programme. Everything seemed to be just as he wanted it, so he signed the lease.

When he was finally installed he plugged a loud-speaker into the

In these notes BM/PRESS discusses practical points of interest to every listener. Readers who have comments to make on any wireless problem are invited to send their views to our contributor for discussion in these pages.

sockets so thoughtfully provided for the purpose and settled down for an enjoyable evening's listening.

After a few minutes there was a noise from the loud-speaker like a bad atmospheric, but he thought nothing of it. A few seconds later, though, there was another nasty interruption, and so it went on.

Just Imagine!

Subsequent investigation showed that every time the gates of the automatic lift were opened an arcing occurred at the switch-points, with a result that can be better imagined than described.

Not only that, but every time the motors on the refrigerators cut in and out automatically there is a different kind of noise.

The trouble is all the more difficult to understand because the loud-speaker installation was put in by a firm very experienced in such matters and also interested in the question of cutting out such electrical interference or "man-made static" as it is called by some people.

In the circumstances the trouble is almost unbelievable, but there it is. Presumably it will be put right in time, but as things are at present lis-

tening is out of the question if you want it for real enjoyment.

The Aerial Problem

What is your opinion on the frame aerial question? Should we encourage its development or do without it as most of us have in the past?

Personally, I am undecided. As a flat-dweller, the frame aerial on my Super 60 saves me the trouble of fixing up an outdoor system but, on the other hand, the frame is hardly the sort of decoration one would choose for a room if one had an entirely free choice in the matter.

On the whole, I think Mr. James has been wise in making his new super-het so that it can be used with a short indoor aerial. One of those can easily be fixed round a picture rail and then the frame problem is solved. However, for a given number of valves in a set the frame will most certainly give better results.

"Straight" Receivers

The latter is all right in the case of the Super Senior, where you have an efficient high-frequency stage, but what about the ordinary run of "straight" receivers that do not utilise the sensitive super-het circuit?

I am also very intrigued by the "sheet-metal" aerial. It gives a high capacity, of course, and that may be an advantage in some cases. I should certainly be very interested to hear from anybody who has compared one of these sheet-metal or "screen" aerials with an ordinary indoor type.

Will somebody send a record of their experiences?

D.C. "Gramo" Motors

A good many months ago I mentioned in these notes that I was still using a clockwork turntable for my grammo-radio experiments because I had been unable to find a satisfactory D.C. motor.

I must now record that the problem has been solved. I have been trying the new Macom universal motor and find that it is quite silent on both D.C. and A.C. mains. Moreover, the price is very reasonable.

One great advantage about this motor from my point of view is that not only can it be used with mains of any voltage, but also if my mains are changed over to A.C., or I should move to a district with an A.C. supply, the machine can still be used without any alteration whatsoever.

You will realise that it is a really good proposition.

Super-het v. Band-pass Sets

I have just had a most interesting argument with a professional designer who is not at all keen about super-hets for home-constructors.

His objections are that the super-het is an inherently "complex" circuit and that it cannot give really good quality of reproduction. He much prefers a straight set with band-pass tuning to give the selectivity that is needed nowadays.

My answer was that with a set of the type of the Super 60 the "complexity" of the circuit is not reflected in the actual construction; indeed, that set was one of the simplest home-constructor jobs ever designed.

Bogey Exposed

The quality bogey has been exposed long ago. I have heard a large number of super-hets during the past nine months and in no case have I been able to find any fault with the reproduction. That experience is borne out by the thousands of listeners using the Super 60; many of their reports have appeared in the pages of WIRELESS MAGAZINE.

The fact is there is no comparison between the simplicity of operation of a super-het and a band-pass receiver. With the latter there is all the trouble of ganging. Moreover, the use of reaction is a great stumbling block to the average listener—and by the average listener I do not mean the average reader of WIRELESS MAGAZINE, who is in most cases an experienced set operator.

In my opinion the popularity of the

Super 60 is due to the fact that it is extremely simple to build and even the most inexperienced knob-twister can get plenty of stations. Practically it is a one-knob set; if the oscillator is tuned carefully it is impossible *not* to get a good bag of stations.

Which would you prefer to use yourself—a super-het or a band-pass receiver?

Nuts and Bolts

Mr. W. E. Harvey, of Clapham, has a grouse—in which I join him—about the lack of standardisation of screws, screw threads and nuts used for radio components. "Cannot the manufacturers get together," he says, "and agree upon a common practice and carry it out effectively?"

Here is a case where the Radio Manufacturers' Association should be able to do useful work, but I really believe that a problem of this nature does not worry the average component maker at all. Usually, you see, he never has to use his own parts—and he does not much like being criticised by other people.

Condenser Spindles

In the case of variable-condenser spindles Mr. Harvey suggests a standard of $\frac{1}{4}$ in. diameter—instead of some $\frac{1}{4}$ in., some $\frac{3}{16}$ in., some $\frac{7}{32}$ in., and some $\frac{17}{64}$ in. The overall tolerance should be not more than $\frac{1}{1,000}$ in. "If in railway locomotive practice it is found possible to work to this standard on journals of $9\frac{1}{2}$ in. diameter, it is reasonable to expect at least such accurate work in radio instruments," he adds.

He further suggests that nuts might with advantage be standardised on a No. 4 or No. 6 B.A. screw and the nut should always be identical in diameter. "Is it beyond the makers to evolve a suitable standard?" My opinion is that they are too lazy to worry about such things!

Solid Dielectrics

What is your feeling about bakelite-dielectric variable condensers? General home-constructor opinion seems to be against them on the score of inefficiency. Nobody will deny that a condenser with air dielectric is the better proposition, but what are the practical considerations?

Quite a number of set manufacturers use bakelite- or paper-dielectric on the grounds of com-

patibility and low cost. It seems to me that those considerations should also be of importance to the home-constructor.

Cost is the most important point, for I do not think that the average amateur particularly likes sets of the "midget" type. The man who builds his own gear likes to have something to show as the result of his labours.

Still, I should be interested to hear from anybody who has tried the solid-dielectric type of variable condenser for ordinary tuning purposes. I think further developments in this direction are inevitable.

Valve Markings

I have been going over my stock of valves. The first thought that struck me was that valve manufacturers must be encouraged to mark the characteristics of the valve on the bulb or on the base in some permanent way.

Even the type number is not indelible in most cases after a year or so. It is most annoying to have a dozen valves of which the type numbers have become indecipherable.

It is almost as annoying to have to look up back copies of WIRELESS MAGAZINE or old valve lists to find the exact characteristics of a valve made a year or fifteen months ago.

It would certainly pay any valve maker to stamp indelibly on the valve its filament voltage and current, its impedance, and its amplification factor. An experimenter who has a stock of valves wants to know more than that a particular one is just an H, HL, L, P or SP type.

I shall do everything I can to get some valve maker to mark *all* the characteristics on his products. Why not write to your favourite valve manufacturers and ask what they are going to do about it?

Portable Radio

The other day I had occasion to carry a "portable" set a distance of several hundred yards. Now I want to ask if there is no possibility of manufacturers producing a set that *can* be carried about.

Probably the original Chummy, put out by WIRELESS MAGAZINE some years ago, had the best type of cabinet. It was heavy, but the case was narrow and the top edge did not cut into the side of one's leg.

Surely there is a need for *really* portable radio?

BM/PRESS



BROADCASTING IN RUSSIA
An exclusive "Wireless Magazine" photograph of Russian women broadcasting lessons—which take up a large part of the programmes

No American Invasion at the B.B.C.!

By Our Special Commissioner

The slump in Hollywood's film output is indicated by the mission upon which "Roxy" was engaged to secure control of the world's entertainment industry. The word of warning to British artistes against tying themselves up

is vital in the interests of the nation should remain British.

By Britons for Britons

The B.B.C.'s move to replace foreign artistes with British artistes wherever possible is another stage in this effort to preserve British supremacy in the "home market." While the B.B.C.'s motto is "Nation shall speak peace unto nation," the definite aim is that the British message, whether in music or speech, shall be delivered from British transmitters by Britons.

Savoy Hill should be congratulated on the way in which it passed through the furnace of political broadcasting a few weeks ago.

Reticence to Admire

When one recalls the acrimonious criticisms which attended the Corporation's early incursions into the field of controversy, when every broadcasting official was suspected of trying to push his own pet policy into the ears of listeners, by giving more microphone time to the representative of a party which he was supposed personally to favour than to the representatives of some other party for which he was supposed in consequence not to have any liking, one cannot but admire the sturdy reticence of broadcasting headquarters over the arrangements for the General Election broadcasts of 1931.

The general impression is that the method of arranging election-speech (Continued on page 596)

LAST October Mr. Samuel L. Rothafel, pronounced "Roxy," was in this country, and at a luncheon in London, at which all the most prominent "showmen" and entertainers were present, he sketched out a plan whereby the world's entertainment would be dominated by America. New York, he said, is to have a Radio City costing £50,000,000, which will centralise the world's entertainment.

Broadcasting and Television

It will include theatres for the production of operas and plays, films, vaudeville, broadcasting and television. "Talkie films," he added, "will be dead in two years."

There was the further significant statement that "Radio City extends a welcome to all students of the entertainment art to come and work side by side with us in this venture."

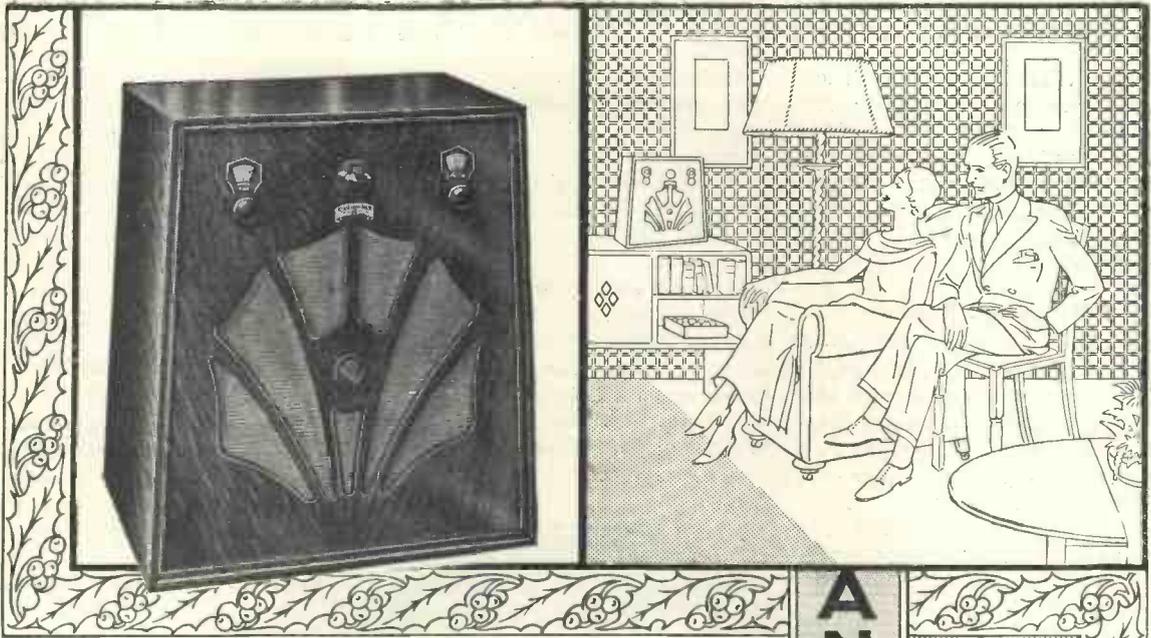
This development in America's bid as the purveyor of world entertainment was anticipated in these notes in the September issue of WIRELESS MAGAZINE.

with an American organisation which is out to exploit them only as far as they are worth exploiting should be repeated with emphasis.

The B.B.C. did not give the American emissary the opportunity of broadcasting his mission to British homes, although all the countries of Europe through which he passed, including Russia, presented him with microphone facilities.

Furthermore, Great Britain is taking the decisive step of increasing the use of Mr. Baird's television, in the hope that this science will develop, under broadcasting auspices, to an extent which will enable this country to be independent of American inventions along similar lines.

So far, therefore, as broadcasting and television are concerned, every step necessary will be taken to safeguard British interests and the brains behind British broadcasting, which are probably some of the best brains in the country, will be directed towards preventing the American attempt to capture a service which it



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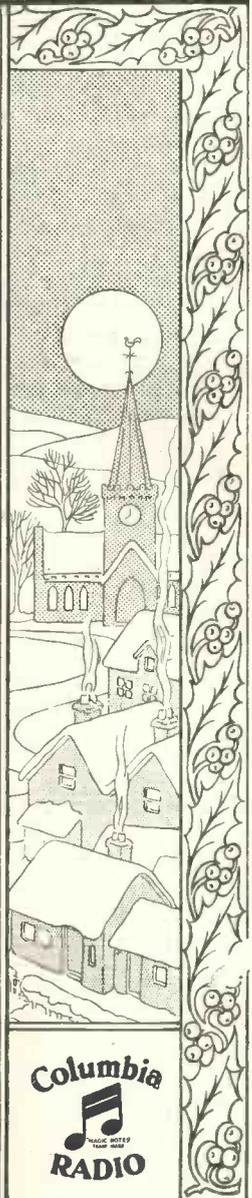
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NO AMERICAN INVASION at the B.B.C.!—Cont. from page 594

broadcasts is for the various political organisations to get together and, either by meeting at a round table or by correspondence, to arrange in a friendly way and with graceful gesture when and at what time their chief ornaments shall scintillate at the microphone.

Joke on the Public

The joke—a poor one at that—is on the public. Is it to be imagined for a moment that the nine parties who ran candidates at the General Election of 1931 were so fraternal that some agreed to give their opponents a two-to-one chance at the microphone, while others agreed to sit back and surrender willingly the opportunity of expounding their (alleged) faith to several million electors? Not a bit of it.

If the secret history of broadcasting's part in the election were revealed, it would probably show Sir John Reith writing to Mr. Ramsay MacDonald to ask if the parties would draw up a schedule of speakers; Mr. MacDonald trying to persuade the parties to prepare a plan; the parties refusing tacitly to do any such thing, knowing full well that the representatives of the party lately in power would get the best of the bargain; and, finally, the B.B.C. itself suggesting a scheme, leaving the politicians the mere task of ratifying it.

No surprise would be occasioned if it were stated officially that the political broadcasts were actually arranged by the B.B.C., with, of course, the concurrence of the political leaders.

Unwanted Responsibility

This is not the procedure preferred by Savoy Hill. The officials there would probably rather leave such a matter entirely to the political leaders and would be greatly relieved if their responsibility were limited to the transmission of the speeches on any future occasion.

This matter is worth the attention of the new Parliament and should take the form of an addendum to the B.B.C. Charter. The officials at Savoy Hill would scarcely object to that course.

Some misconception appears to exist on the subject of wireless-licence lapses. This is not a matter which comes normally within the purview of Savoy Hill, whose task it is to deliver the goods and leave the Post Office to look after the balance sheet.

But as a section of the Press has expressed concern over the formidable figures shown each month of licences which have "lapsed," it might be desirable to explain the position in these notes; especially as the authorities are stated to be showing some uneasiness over the question.



RADIO'S PIONEER "EN FAMILLE"
The Marchese and Marchesa Marconi with their small daughter, Elettra. A happy family group

Every month the returns reveal an average of 200,000 lapsed licences. On the face of it, one might be pardoned for supposing, among other reasons, that the holders had given up wireless, had forgotten to renew their licences, were in the process of changing residences, had taken to piracy, or had gone to a place where wireless activities had ceased to interest.

The real explanation of the lapses is very simple. If a licence is first taken out, say, on any day during the month of December, it expires on November 30 following. It behoves the prospective listener, therefore, to get his licence as near the first day of December as possible, for he

then gets practically a full twelve months' licence value.

But—and here is the point; such a licence lapses on November 30 (or whatever month is given upon it as the date of expiry; November and December being used here merely by way of illustration), and the holder does not "renew" it, but takes out a fresh licence.

Among the Lapses

Every year, therefore, the listener who took out his first licence in December is numbered among the November lapses; if he took out his first licence in October he is shown among the September lapses, and so on.

As the number of licences increases, so the number of lapses will be greater; but the proportion of definite cessations will probably continue to be negligible. Precious few people give up listening once they have started it.

Two things emerge from the harassing problem of wavelength interference which various conferences of the Union Internationale de Radio-diffusion have been trying to tackle from Semmering to Rome.

The first is that the B.B.C. officials are by no means satisfied that all has been done to provide a greater degree of freedom from interference; and the second is that no real solution of the problem is likely to be achieved before the year 1933.

It does not seem feasible now that the B.B.C. can resign from the Union, for the reason that if it did confusion in the ether would become worse.

Easing the Situation

It is regarded at Savoy Hill as a feather in the cap of the Chief Engineer, Mr. Noel Ashbridge, that he was able to present a plan at Rome which might, at any rate, ease the situation for British stations during the winter months.

An 11-kilocycle separation which he was prepared to accept as between the two London and Northern transmitters on the one hand and their nearest Continental neighbours on the other, was not by any means satisfying to him personally.

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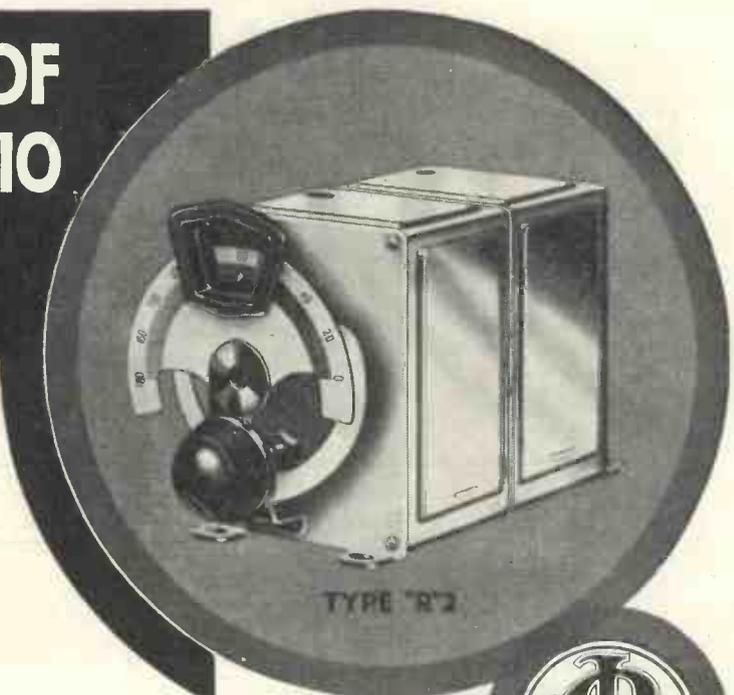
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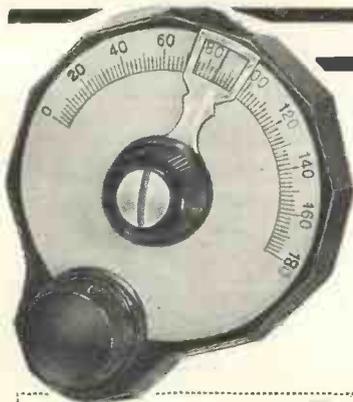


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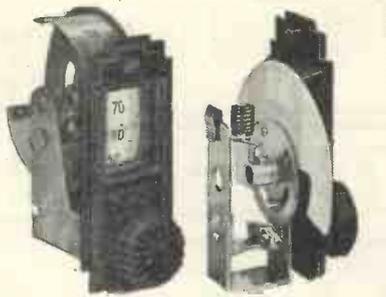
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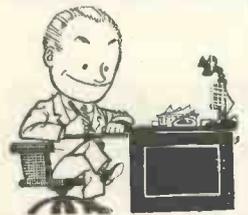
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ZONOPHONE KIT SET

Famed alike for  Radio and Records

Prices shewn do not apply in Irish Free State.

OUR TESTS OF NEW APPARATUS

W.B. Moving-coil Loud-speaker :: Telsen Mansbridge-type Condenser
 Celestion Moving-iron Loud-speaker :: Octron Valves

W.B. MOVING-COIL LOUD-SPEAKER

APPARATUS: Permanent-magnet loud-speaker chassis, type PM3
 PRICE: £2 5s.

MAKER: Whiteley Electrical Radio Co., Ltd.

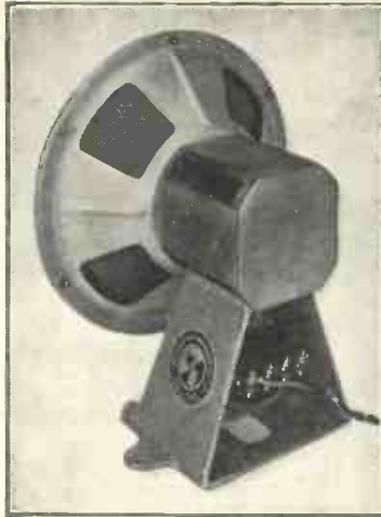
THE W.B. permanent-magnet loud-speaker illustrated herewith is interesting for various reasons. First of all this firm was one of the earliest to put out a permanent-magnet model at all and, indeed, their original type (PM1) is still marketed.

The present model is a popular instrument intended to give good results at a reasonable price, and in order to do this the manufacturers have departed from the customary one-piece cross-type of magnet which has become so universally used. Instead, a built-up formation is used, four rather wide bar magnets being provided to energise the system.

Ample Diaphragm Movement

Judging from the results obtained, the method has proved quite satisfactory, for the sensitivity was well up to the average. The coil suspension is of a rigid type, not liable to be easily disturbed, and yet at the same time allowing ample movement of the diaphragm.

The diaphragm is of rather thin paper



GOOD RESULTS AT LOW COST

This is the latest W.B. permanent-magnet moving-coil chassis. It gives remarkably good results and is fine value for money. The price is £2 5s.

and we expected from preliminary examination to find the reproduction on the papyry side. This, however, was not borne out in practice, the results being very well balanced. Moreover the loud-speaker would handle several watts before showing any signs of distress.

Makers' Fair Claim

All told, the makers' claim—that this loud-speaker gives moving-coil reproduction on any type of receiver capable of working an ordinary cone loud-speaker—is a fair one. The price of the instrument is £2 5s., or £2 12s. 6d. with a built-in output transformer.

TELSEN MANSBRIDGE-TYPE CONDENSER

APPARATUS: Mansbridge-type fixed condenser (2 microfarads), type W77

PRICE: 3s.

MAKER: Telsen Electric, Ltd.

A MOST unassuming and yet most important component in a modern radio receiver is the fixed condenser. This is a component which very often receives little consideration, and yet it should be chosen for its work in an

(Continued on page 604)

... a gift that means much!



The "R.B." Accumulator.

2 volts 45 amp. hours.

Price ... 8/6

Don't you think an accumulator would be an acceptable gift for your wireless enthusiast friends?

The man who gives a "Smith" shows his knowledge, for this accumulator is individually built and designed precisely for its work.

Perfect valve efficiency is the only logical outcome. Many of our users claim that the "Smith" accumulator needs less frequent charging than most, and that's a point to consider.

Whatever the set there's a "Smith" waiting to improve it! May we send you full details in List 'WM.'

(Below).

R37. Jelly Acid type. 2 volts 30 amp. hours.

Suitable for many portables

Price ... 14/-



SMITH'S

RADIO ACCUMULATORS

S. SMITH & SONS (Motor Accessories) LTD., CRICKLEWOOD, LONDON, N.W.2

TELSEN TRANSFORMERS & CHOKES

TELSEN L.F. & OUTPUT TRANSFORMERS

Telsen transformers have achieved fame in the radio world on account of the high standard of their quality and performance. Designed and built on the soundest engineering principles, these robust, full-size transformers will give not only efficient but enduring service.

TELSEN L.F. TRANSFORMERS

- Telsen "Ace" Transformer, Ratios 3-1, 5-1 ... Price 5/6
- Telsen "Radiogrand" Transformer, Ratios 3-1, 5-1 ... Price 8/6
- Telsen "Radiogrand" 7-1 Transformer ... Price 12/6
- Telsen Super Low Ratio Transformer, 1.75-1 ... Price 12/6

TELSEN OUTPUT TRANSFORMERS

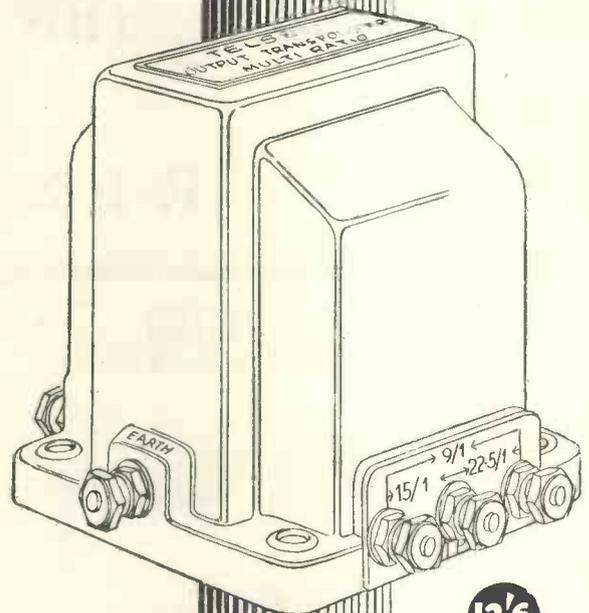
- Telsen Multi-Ratio Output Transformer, giving three Ratios of 9-1, 15-1, 22.5-1 ... Price 12/6
- Telsen Output Transformer, Ratio 1-1 ... Price 12/6
- Telsen Pentode Output Transformer ... Price 12/6

TELSEN L.F. CHOKES

- Telsen L.F. Intervalve Coupling Choke, 40 and 100 henrys Price 5/-
- Telsen Heavy Duty Power Grid L.F. Choke, 40 henrys Price 8/-

TELSEN OUTPUT CHOKES

- Telsen Output Choke (Plain), 20 henrys ... Price 8/-
- Telsen Output Choke (Tapped), 20 henrys ... Price 8/6

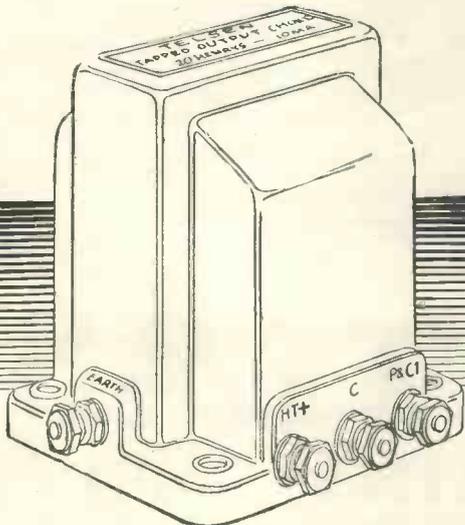


12/6

ACE
5/6
RADIOGRAND
8/6

TELSEN

ALL-BRITISH
RADIO COMPONENTS



8/6

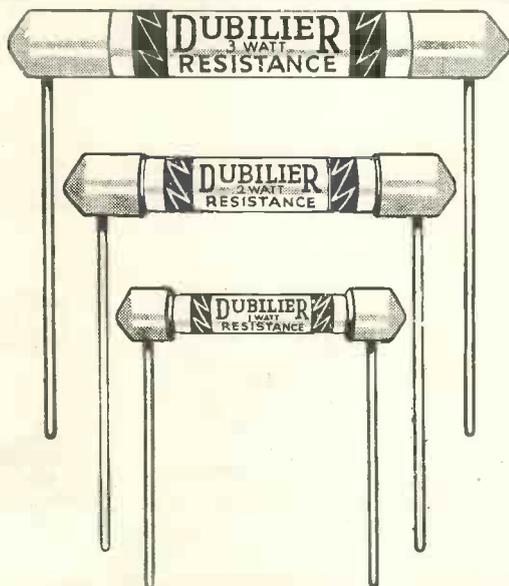


CVS-61

Send for the "Telsen Radio Catalogue" and book of "All-Telsen Circuits" to—The Telsen Electric Co., Ltd., Aston, Birmingham.

There is news in the "Wireless Magazine" advertisements

A NEW RESISTANCE with ALL the BEST FEATURES



PRICES:

1 WATT TYPE	- - -	1/- each
2 WATT TYPE	- - -	2/- each
3 WATT TYPE	- - -	3/- each

This range of resistances caters for every requirement in radio, and fulfils a long-felt want for a really reliable British-made resistance which is manufactured under a patented process embodying all the essential features required at a price within the reach of everyone.

DUBILIER

CONDENSER CO. (1925) LTD.
Ducon Works, Victoria Road,
N. Acton, London, W.3.

VOTED THE FINEST ALL-MAINS UNITS AT OLYMPIA

"ATLAS" WINS BALLOT SECOND YEAR RUNNING

Yet again "ATLAS" Mains Units have carried off the "Wireless World" Olympia Ballot in the face of intense competition. Thousands of experts were unanimous on the unapproachable excellence of design and value of "ATLAS" Mains Units.

Last year's victorious "ATLAS" Model A.C.188 swept all before it, and is still only surpassed by this year's triumphant "ATLAS" Model A.C.290.

Here is proof positive that "ATLAS" are the World's Finest Mains Units, and unequalled for the conversion of Battery Sets to Mains operation.

There are "ATLAS" H.T. Units from 35/- for D.C. and 52/6 for A.C. All-Mains Units from 77/6. Models for every set and every need.

Write to-day for free booklet, "Power from the Mains," giving valuable hints on making your battery set Mains Operated.



Victorious All-Mains Unit for providing H.T., L.T., and G.B. from A.C. mains. Taps 4 G.B.appings are entirely independent of H.T. supply, and a unique switching arrangement isolates the Set when trickle charging. Output 25 ma at 150 volts. Westinghouse rectifiers. 10/- deposit and 9 monthly payments of 15/- each. Cash Price - £6.10.0.

MODEL
A.C. 290

"CLARKE'S" "ATLAS" MAINS UNITS

H. CLARKE & CO. (M/CR) LTD.
Old Trafford, Manchester. Phone: Trafford Park 1744-5-6
Southern Offices: Bush House, London, W.C.2. Phone: Temple Bar 713

All Ready Radio Kits are matched and tested under the supervision of Mr. G. P. Kendall, B.Sc., CHIEF ENGINEER, Ready Radio.

THE ETHER ROVER

	£	s.	d.
1 Ebonite panel, 18 in. by 7 in., drilled to specification	5	9	
1 Waldor cabinet, 18 in. by 7 in. by 10 in.	17	6	
1 Lewcos H.F. choke, type M.C.	2	6	
1 Readl-Rad H.F. choke	4	6	
1 Lewcos band-pass filter, type 51	12	0	
1 Lewcos dual-range coil, type 55	8	6	
1 T.C.C. .0001-mfd. fixed condenser, type 34	1	6	
1 T.C.C. .0002-mfd. fixed condenser, type 34	1	6	
2 T.C.C. .01-mfd. fixed condenser, type 40	3	6	
2 T.C.C. 1-mfd. fixed condenser, type 50	5	8	
2 T.C.C. 2-mfd. fixed condensers	7	8	
1 British Radiophone condenser, .0005 mfd., 3 gang with disc drive	2	3	0
1 Readl-Rad .00015 differential condenser	2	6	
1 Readl-Rad 1-megohm grid leak and holder	1	4	
4 Junit valve holders	2	8	
1 Bulgin 0-2 m.a. moving-coil meter, type M.C.2.	1	10	0
1 Bulgin 0-50 m.a. moving-coil meter, type M.C.8	1	10	0
6 Belling-Lee wander plugs	1	0	
2 Spade terminals	3		
1 Lewcos 10,000-ohm spaghetti resistance	1	0	
4 Lewcos 20,000-ohm spaghetti resistances	4	0	
1 A.E.D. fader	10	6	
1 Packet of Jifilink	2	6	
1 Readl-Rad on-off switch	10		
1 R.I. Hypermu	1	1	0
1 Readl-Rad Instamat output transformer	1	7	6
4 Valves, as specified	2	10	6
1 Valve screen	2	9	
2 Sovereign terminal blocks	1	0	
Flex, screws, etc.	7		
£15 3 6			

MATCHED KITS FOR THE NEW ECONOMY THREE

Kit A Without valves, including screen but less framework **£1.15.0**

Or deposit of 6/6 and 5 monthly payments of 6/6

Kit B With valves, including screen but less framework **£3.14.0**

Or deposit of 7/- and 11 monthly payments of 7/-

Kit C With valves including screen, less framework, together with loud-speaker kit, comprising unit, cone, and chuck **£4.1.0**

Or deposit of 7/9 and 11 monthly payments of 7/9

MATCHED KITS FOR THE ETHER ROVER

Kit A less valves and cabinet **£11.16.0**

Or deposit of 21/9 and 11 monthly payments of 21/9

Kit B with valves less cabinet **£14.6.6**

Or deposit of 26/6 and 11 monthly payments of 26/6

Kit C with valves and cabinet **£15.4.0**

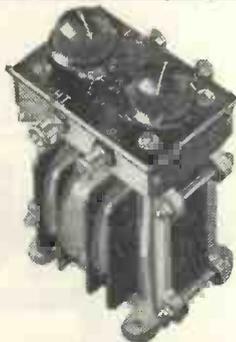
Or deposit of 28/- and 11 monthly payments of 28/-

TO INLAND CUSTOMERS. — Your goods are dispatched post free or carriage paid.

TO OVERSEAS CUSTOMERS. — Everything Radio can be supplied against cash. In case of—

Ready Radio

doubt regarding the value of your order, a deposit of one-third of the approximate value will be accepted and the balance collected by our Agent upon delivery of the goods. All goods are very carefully packed for export and insured, all charges forward.



INSTAMAT OUTPUT TRANSFORMER

SPECIFIED for the ETHER ROVER

Gives you all the benefits of an output transformer of the perfect design with the unique advantage of being able to select, INSTANTLY, the correct ratio necessary for the best quality reproduction.

Instamat.—For all loud-speakers except low-resistance moving coils 1 7 6
Instamat Major.—For low-resistance moving-coil loud-speakers 1 17 6
Be sure to read Kendall's book entitled "10 How's for Modern Radio Constructors." Send four 1½d. stamps now. **A READY REFERENCE TO RADIO** Our new 100-page fully illustrated Catalogue contains details of all modern radio products. You need a copy. Price 1/- post free.

CASH or C.O.D ORDER FORM

To: Ready Radio, Ltd.
Eastnor House,
Blackheath, S.E.3.

To: Ready Radio, Ltd.,
Eastnor House,
Blackheath, S.E.3.

EASY PAYMENT ORDER FORM

Please dispatch to me at once the following goods.....

for which (a) I enclose (b) I will pay on delivery } (Cross out line not applicable) £.....

NAME.....

ADDRESS.....

W.M. 12/31

Please dispatch to me the following goods.....

for which I enclose first deposit of £.....

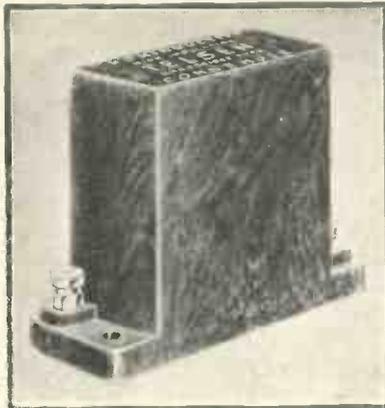
NAME.....

ADDRESS.....

W.M. 12/31

OUR TESTS OF NEW APPARATUS

Continued from page 600



HIGH INSULATION RESISTANCE

The insulation resistance of the Telsen 2-microfarad Mansbridge-type condenser can be taken as infinity

exactly similar way as the rest of the apparatus in the receiver.

One of the most important points to keep in mind when buying a condenser is to be certain that the voltage rating is at least equal to, and preferably greater than, the voltage across which it is required to work. Only too often is this point overlooked with disastrous results to the condenser, and quite often to other apparatus in the receiver.

False Economy

It is false economy of the worst kind to purchase a cheap fixed condenser, or

one that is under-rated for the particular work which it has to perform.

The Telsen 2-microfarad fixed condenser is one that can be recommended when the above points are kept in mind: It is well and neatly made, being housed in a dark brown bakelite casing provided with terminals and lugs at the side for connections and for baseboard mounting.

The Mansbridge type of construction is employed and the plates are connected in such a way that the resultant condenser is non-inductive, a very useful point when dealing with instability in some high-frequency amplifiers.

The measured capacity of the model tested was 1.8 microfarads. This is a little low, but the error is of small significance in the case of a condenser of this capacity, having regard to the type of work which it will probably have to perform.

The insulation resistance was tested at 500 volts both before and after a long run on the full rated voltage, namely 250 volts, but in both cases it proved to be too high for any definite result to be obtained; it may thus be taken to be infinite.

CELESTION MOVING-IRON LOUD-SPEAKER

APPARATUS: Moving-iron loud-speaker chassis, type M12.

PRICE: £1 15s.

MAKER: Celestion, Ltd.

WE were very interested to receive for test one of the Celestion moving-

iron type M12 loud-speaker chassis. This loud-speaker is made and finished with the usual degree of excellence associated with all Celestion products.

It employs a large shallow-angle diaphragm, 12½ in. in diameter, which is constructed of the usual Celestion material reinforced with some cane-like substance which is attached to the diaphragm in the form of a spiral running from the edge to the apex.

Reinforcement is also employed in a radial direction on the back of the diaphragm.

(Continued on page 608)



A CHASSIS WITH A 12½-in. CONE
Many listeners will be interested in this new Celestion model, which has a moving-iron unit provided with three tappings.



NEW PERMANENT MAGNET MOVING COIL SPEAKER AT 45/-

Three-ratio output transformer extra 7/6

Handsome grained oak cabinet illustrated 30/-

This is the speaker that the Editor of "Radio for the Million" has so strongly recommended for use with the V.3. Its Sheffield-made cobalt steel magnet weighs 5 lbs. Gives true and brilliant moving-coil reproduction from any 2 or 3-valve receiver. A great success on sheer merit. Made by the PIONEERS in PERMANENT MAGNET Moving Coil Speakers. Write to-day for FREE art booklet, "Speaking of Speakers."

The PM3 for the V3

Permanent Magnet Moving-coil Speakers having a low resistance winding require a multi-ratio step-down transformer between set and speaker. We supply our three-ratio transformer—at prices stated—with each speaker.

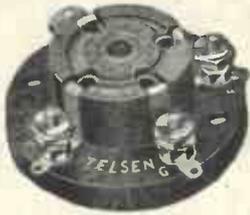
Made by the makers of the famous W.B. Valveholders and Switches.

Whiteley Electrical Radio Co., Ltd., Radio Works, Nottingham Road, Mansfield, Notts.

Irish Free State Distributors: Kelly & Shiel, Ltd., 47, Fleet Street, Dublin.



TELSEN RADIO COMPONENTS



6^d

TELSEN VALVE HOLDERS
(Prov. Pat. No. 20286/30).

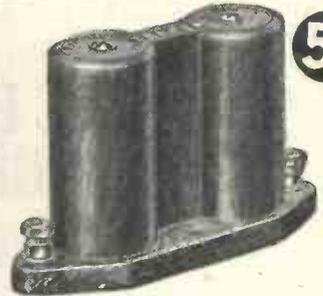
The Telsen four and five-pin valve-holders embody patent metal spring contacts, which are designed to provide the most efficient contact with split and non-split valve legs, and are extended in one piece to form soldering tags. Low capacity and self-locating.
Telsen 4-pin Valve Holder Price 6d.
Telsen 5-pin Valve Holder Price 8d.



From
1/6

TELSEN MANSBRIDGE TYPE CONDENSERS

Made in capacities from .01 to 2.0 mfd. From 1/6
Telsen Fixed Mica Condensers are made in capacities from .0001 to .002 mfd. Price 6d.



5/-

TELSEN BINOCULAR H.F. CHOKE
Hailed unanimously by the leading experts as the perfect H.F. Choke. The Telsen Binocular Choke is called for wherever highest efficiency is desired. Its highest inductance (180,000 micro-henrys) and exceptionally low self-capacity (.000002 mfd.) ensure a very high impedance at all wavelengths, and its excellent efficiency curve is free from parasitic resonances. ... Price 5/-



5/6

TELSEN LOUD-SPEAKER UNIT
The Telsen Loud-speaker Unit is pleasing to the most sensitive ear. The deep notes of the bass, the brilliance of the soprano, and the crispness of diction are clearly reproduced without any distortion. It employs cobalt steel magnets, and the detachable rod which carries the cone is fitted with cone washers and clutch. The entire unit is enclosed in a beautifully moulded bakelite dust cover... Price 5/6

TELSEN

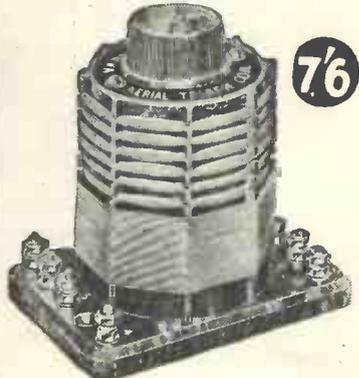
ALL-BRITISH RADIO COMPONENTS

Also include:—

Output Transformers	12/6
H.F. Chokes	...	From	2/-
Output Chokes	...	"	8/-
Power Grid Chokes	...	"	8/-
L.F. Coupling Chokes	...	"	5/-
Slow-motion Dial	...	"	2/6
Fixed Condensers	...	From	6d.
Pre-set Condenser	...	"	1/6
Variable Condenser	...	"	4/6
Spaghetti Resistances	...	From	6d.
Loud-speaker Chassis	...	"	5/6
Fuse Holder	...	"	6d.
Grid-leak Holder	...	"	6d.

Send for the "Telsen Radio Catalogue" and book of "All-Telsen Circuits" to:—

THE TELSEN ELECTRIC CO., LTD.,
Aston, Birmingham.



7/6

TELSEN DUAL-RANGE AERIAL COIL

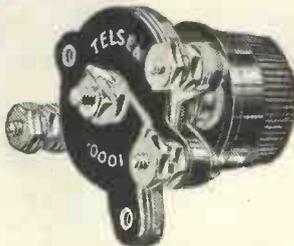
It incorporates a variable series condenser and is suitable for all districts. It has been tested in various parts of the country, and down to distances of five miles from Regional stations, a single tuned circuit will definitely separate the Regional programmes. A reaction winding is provided. ... Price 7/6
Telsen H.F. Transformer and Aerial Coil ... Price 5/6



9^d

TELSEN GRID LEAKS

Telsen Grid Leaks are absolutely silent and non-microphonic, and practically unbreakable. They cannot be burnt out and are unaffected by atmospheric changes. Telsen Grid Leaks are not wire wound, and therefore there are no capacity effects. Their value is not affected by variation in the applied voltage. Made in values from 1/4-5 megohms.
Telsen Grid Leak ... Price 9d.

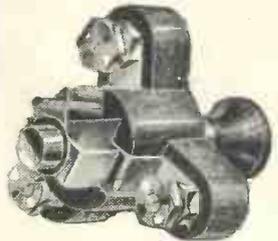


2/-

TELSEN BAKELITE DIELECTRIC CONDENSERS

The moving vanes are keyed on to the spindle and there is a definite stop at each end of the travel. The connection to rotor is made by a phosphor-bronze pigtail so there is no cracking due to rubbing contacts. The connection to the stator vanes is absolutely positive—a very important point. All Telsen Bakelite Condensers are supplied complete with knob.

Differential Condenser—
Capacities of .0003, .00015, .0001 Price 2/-
Reaction Condenser—Capacities .0003, .00015, .0001 Price 2/-
Tuning Condenser—Capacities .0005, .0003 Price 2/-



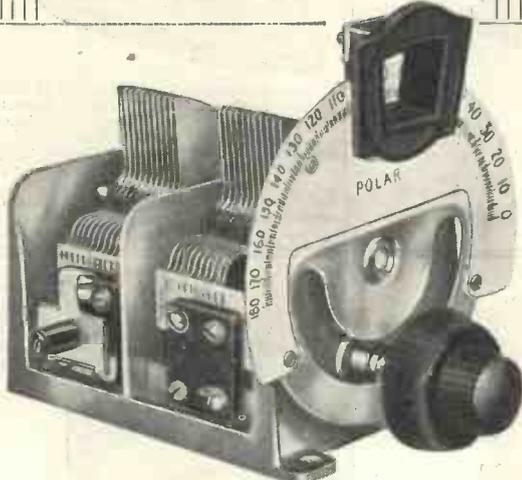
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TELSEN PUSH-PULL SWITCHES
(Prov. Pat. No. 14125/31).

The Telsen Push-pull Switches employ a proper electrical knife switch contact and are soundly constructed on engineering principles. The centre plunger is wedge-shaped, so that as it is pulled out it forces the inner fixed contacts outwards, tightly gripping the moving contacts. There is no fear of cracking with Telsen Push-pull Switches. Their low self-capacity makes them suitable for use in H.F. circuits.

Two-point ... Price 1/-
Three-point ... Price 1/3
Four-point (2-pole) ... Price 1/6

THE CONDENSERS SPECIFIED for the "DOUBLE BAND-PASS THREE"



"THE UNIKNOB"

Fitted with air dielectric trimmer, which is controlled from the front by a knob, concentric with main control. Die-cast frame ensures accurate matching being maintained under all conditions of use. Slow-motion drive. Attractive moulded escutcheon with pilot lamp holder.

.0005 X .0005 21/-

DIFFERENTIAL CONDENSER

Direct Drive. Constructed of highest quality materials. Smooth action gives very accurate control. Insulated spindle. Supplied with knob.

.00015, .0001, .0003 - 3/-
Slow Motion Type - - 6/6



Fully Illustrated 24-page Catalogue Free.

POLAR CONDENSERS



Wingrove & Rogers, Ltd.,
188/189 Strand, London, W.C.2

Polar Works,
Old Swan, Liverpool

It helps us if you mention "Wireless Magazine"

Lanchester MOVING COIL Speakers



COBALT STEEL PERMANENT MAGNET

High Sensitivity
Full Musical Response
Speech Perfect

Designed by F. W. Lanchester (the originator of the Lanchester Car) and produced under his personal supervision.

14
DAYS' FREE TRIAL

BEAUTIFULLY ILLUSTRATED
CATALOGUE

Free & Post Free
WRITE FOR IT

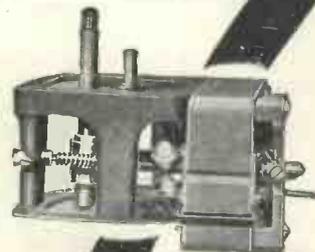
WE SELL DIRECT TO PUBLIC ONLY

Moving-coil Speakers
From £1:10:0 to £3:3:0

Complete In Cabinet
From £2:10:0 to £4:15:0

LANCHESTER'S LABORATORIES
TYSELEY ... LIMITED BIRMINGHAM

MAKE SURE OF COMPLETE SATISFACTION BY FITTING YOUR RADIOGRAMPHONE WITH THE PAILLARD INDUCTION MOTOR



4½" x 3¼" x 2½"

The new Paillard Junior 2-pole asynchronous Induction Motor is made on an entirely new principle (patent applications pending). It gives a perfectly smooth drive without any kind of interference, and has an ample margin of power to play the heaviest recordings. Current consumption about 13 watts. No. 1501 for 100-130 v. No. 1503 for 200-250 v.

Price, complete with 12" Turntable, and combined brake and switch:
With Automatic Brake

NEW 47'6 PAILLARD JUNIOR ELECTRIC INDUCTION MOTOR

HIRE PURCHASE TERMS. Junior motors with automatic brake 5s. 3d. deposit and 11 monthly payments of 4s. 3d.

APOLLOGRAMPHONE CO LTD. (Dept. W.M.)
4-5 Bunhill Row, London, E.C.1

Fully illustrated price lists on application.

WIRELESS USER SPENDS 15/6 —AND SAVES 26/6

**Mr. A. E. Etheridge shows that
Sound Economy is Wise Spending**

*Whatever we could add to
this letter, received from Mr.
A. E. Etheridge of Bromley,
Kent, would be superfluous.*

KENT.
6th Oct. 1931.

Dear Sirs,

After reading the enclosed advert. taken as you will see from the current issue of the Radio Times, I feel I must write and give you my experience of dry H.T. batteries. My set, which was made by the ----- is a 3 valver fitted with ----- valves and I have had same 3 years. During this time I have tried various makes of batteries with the following results.

- 100 volt ----- lasted 4 - 5 months.
- 109 " ----- " (3 successive batteries gave same result)
- 100 " ----- " (3 successive batteries gave same result)
- 100 " ----- " (3 successive batteries gave same result)
- 120 " Pertrix bought on 9/8/1930 and still in use.

Every battery that I have used I have marked with the date of purchase so can swear by the above figures. The net result of my own and Mr. ----- experiences for 14 months trouble free wireless (my battery has three days to go to reach this figure) is a saving to myself of £1.6.6. I have written this letter only with the idea of expressing my appreciation of a real good battery. You can make whatever you may care of it without any obligation to me whatever. I might also add that I am using the same 9 volt Pertrix grid bias battery bought together with the H.T.

Yours faithfully,

(sgd) A. E. Etheridge

This letter may be inspected at our offices in London.

PERTRIX

TRADE MARK
DRY BATTERIES

**THE BATTERIES THAT SAVE
MORE THAN THEY COST**

MADE IN ENGLAND BY BRITANNIA BATTERIES LIMITED.

Advt. of Britannia Batteries Ltd, Britannia House, 233 Shaftesbury Avenue, London, W.C.2. Phone: Temple Bar 7971 (5 lines) Works: Redditch

You will get prompt replies by mentioning "Wireless Magazine"

OUR TESTS OF NEW APPARATUS

Continued from page 604

The diaphragm is suspended from a metal chassis, on the back of which the unit is mounted. This latter is well made and employs a large permanent magnet somewhat elliptical in shape. The pole-pieces are of the laminated type and are in the form of a U, on one arm of which the coil is mounted.

This coil is tapped to give three impedances so that a fair degree of matching may be obtained with the output valve of the amplifier feeding the loud-speaker.

NO UNPLEASANT RESONANCE

On test the loud-speaker gave good results; the sensitivity was quite up to standard and the overall frequency response was excellent from 3,500 down to 100 cycles, there being no unpleasant or pronounced resonances.

In order to obtain the best results from the instrument it is essential that it should be mounted behind a fair-sized baffle board or in some suitable cabinet, this being non-resonant in character.

The overall dimensions are 13 1/2 in. by 5 1/2 in. Retailing at £1 15s., it is good value.

OCTRON VALVES

APPARATUS: (a) Octron type HF2 valve;
(c) Octron type PP2 valve.
PRICE: (a) 5s.; (b) 8s.
MAKER: Octron, Ltd.

A RANGE of British-made valves of which we have tested two samples this month is that made by Octron,

Ltd., of Birmingham. The valves follow conventional design and, as far as can be seen from a visual inspection through the glass bulb, are well and rigidly assembled.

The samples tested were of the two-volt type, a power valve, type PP2, and a high-frequency valve, type HF2. In the former the electrode system is set at an angle, thus allowing a small glass bulb to be used; in the latter case the system is upright.

The maker's published characteristics of these two valves are as follows: Type PP2; amplification factor, 4; mutual conductance, 1.25 milliamperes per volt; impedance, 3,200 ohms. Type HF2; amplification factor, 17.5; mutual conductance, .9 milliamperes per volt; impedance, 20,000 ohms.

RESULTS OF TESTS

A complete test was conducted on these two valves with the following results: Considering the power valve first, the amplification factor, mutual conductance, and impedance were measured at a negative grid bias of 18 volts, and high-tension voltage of 150. The values obtained were ampli-

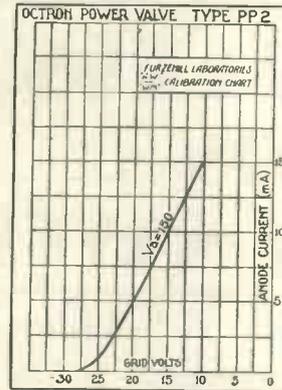
fication factor, 4.6; mutual conductance, 1.13, and impedance, 4,080 ohms.

With a load of 9,000 ohms the maximum power output obtained with 150 volts on the anode was of the order of 150 milliwatts.

H.F. VALVE

In the case of the HF2 valve the figures were measured with a negative grid bias of 2 volts and a high-tension voltage of 150. The values obtained were amplification factor, 16.2; mutual conductance, .8 milliamperes per volt; and impedance, 20,000 ohms.

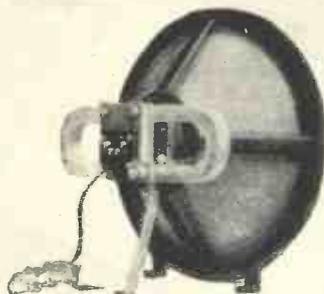
It will be seen that these figures are sensibly in accordance with the makers' rated values, and the valves should give good service. The attached curve shows in the case of the power valve the relation between grid volts and anode current.



OCTRON POWER VALVE
Grid-volts/anode-current curve
for the Octron PP2 power valve,
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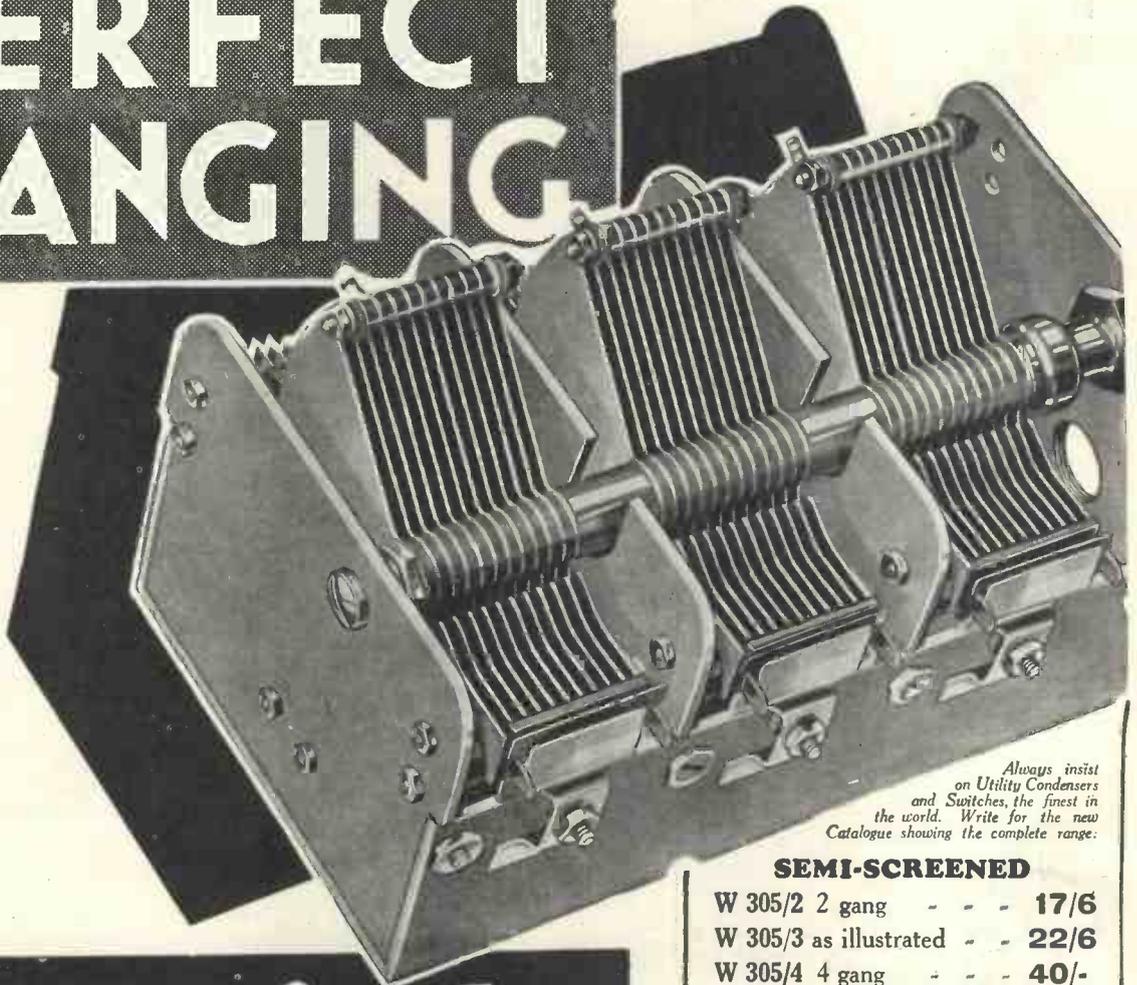
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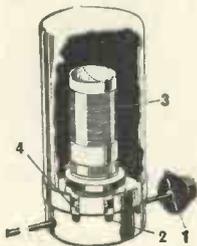
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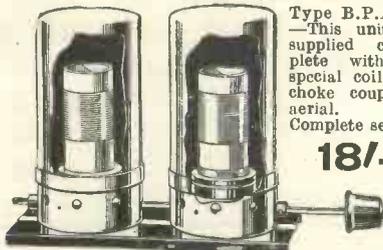
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(M.C.46)

ON the CREST of the WAVES

By JAY COOTE

SIGNORINA JOLANDA SIVIZZA-ROTTINI is the name of the woman announcer whose voice you hear nightly from the Trieste studio. Apart from her native tongue, she is able to speak fluently French, German, and English.

At Basle (Switzerland) the original 500-watt transmitter which now acts as relay for the city is installed in the buildings of the Central railway station.

At Saint-André de Corcy, on the Dombes plateau, Radio Lyons is erecting a new 30-kilowatt station. Later, when further authority has been obtained from the French state, its power is to be doubled.

Hitherto the German broadcasting stations have relayed the Onogo official time signals from Nauen for the benefit of their listeners. In future, however, a simple six-dot system is to be adopted, as the present method is considered too elaborate for the general public.

Hot from Strasbourg

On Sundays, Wednesdays, and Saturdays at 10 p.m., Radio Strasbourg broadcasts dance music played by the Hot Syncopators Band at the Savoy Restaurant in that city.

Statistics show that, whereas in 1929 when the Prague Plan was formulated, there only existed one 50-kilowatt transmitter, by 1932 there will be twenty-seven super stations of greater energy on the air, and the average output will work out at 11 kilowatts as against 3 kilowatts when the original channels were allotted to European countries.

Operatic and dramatic performances transmitted by the Leningrad and Moscow stations on 1,000 and 1,304 metres are relayed from a large studio situated in the Central Telegraph Office of the Soviet capital. The same premises are used for the production of cinematograph sound films. The general public is admitted free to these broadcasts, which are carried out in every way as if intended for theatrical performances. An audience of over one thousand persons can be accommodated in the studio as well as an orchestra and choir of some 450 musicians and singers.

"Corsica Calling"

The island of Corsica will soon possess a high-power broadcasting station owned and operated by the French Posts and Telegraphs administration. A suitable site has not yet been fixed, but it is probable that the transmitter will be erected in the neighbourhood of Ajaccio. When completed, the station will be connected to the French net via Marseilles by a submarine cable.

Daily at 08.45, 09.30, 10.30, 11.30, 12.30, 14.45, 15.30, and 16.30 G.M.T., on a wavelength of 833 metres, the Heston aerodrome, on behalf of the Automobile

Association, broadcasts weather reports supplied by the Air Ministry for the benefit of civil aviation. The call is "Heston Airport."

The new Budapest high-power transmitter (150 kilowatts) is to be built at Lakihegy on the site of the present station. Moreover, relays to take the capital programmes will be installed at Nyiregyhaza (5 kilowatts), Pecsz, Miskolcz, Magyarovar (.5-1 kilowatt), and at another town to be specified later. The five smaller stations will work on a common wavelength of 210 metres.

French Police on the Air

Under the call sign FPC (France Police Centrale), the French Home Office broadcasts official communiqués on both long and short wavelengths. The schedule for these transmissions is as follows: On 1,050 metres at 09.00 G.M.T.; at 11.45 and at 17.15 on 1,140 metres; at 17.00 on 1,200 metres. At 10.00 and 16.00 G.M.T. signals are sent out on 44.75 metres; at 10.15 and 16.15 on 59 metres, and at 10.30 and 16.30 on 84 metres. The power used is 2 kilowatts in the aerial.

At Milan the surgical hospital attached to the University is utilising loud-speakers for the purpose of broadcasting lectures to students direct from the operating theatre. Well-known surgeons and professors in this manner, whilst carrying out delicate operations, can provide a running commentary for the benefit of the students separated from the theatre by a glass partition.

A Little Belgian

"Radio Conférence et Concerts" is the call of a small, privately owned broadcasting station at Brussels (Belgium). Musical concerts on 216 metres are transmitted daily with a power of roughly 150 watts (aerial).

An agreement has been concluded between the French PTT stations and the National Broadcasting Company of America for the interchange of programmes. The first of these relays to France will take place in the course of November. The French transmissions will be made via the Colonial short-wave station at Pontoise.

For the purpose of experiments the German Central Post Office carries out tests every Tuesday and Thursday between 16.00 and 18.00 G.M.T. on 6.75 metres.

Pending the realising of a complete reorganisation of the French broadcasting system, immediate steps are to be taken to increase the power of the Ecole Supérieure (Paris PTT) station. If the new regional plan is adopted the State Posts and Telegraphs will erect a 100-kilowatt transmitter in the vicinity of the capital.



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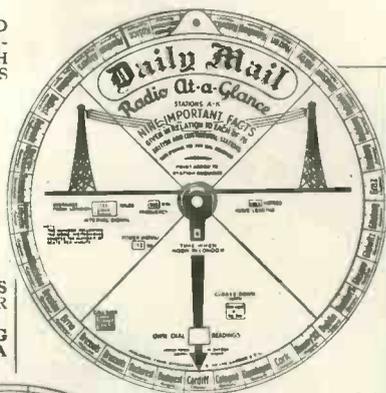
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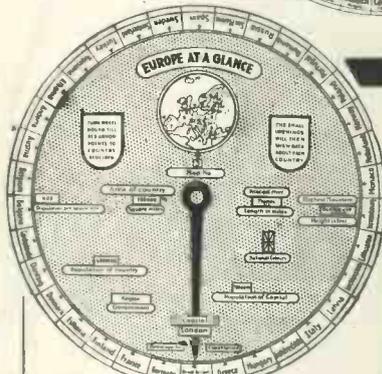
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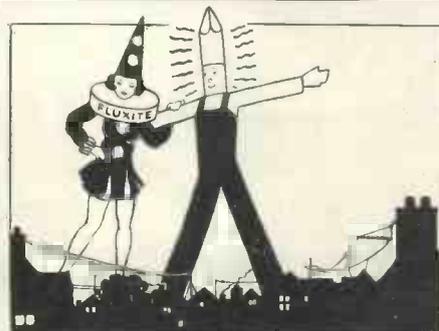
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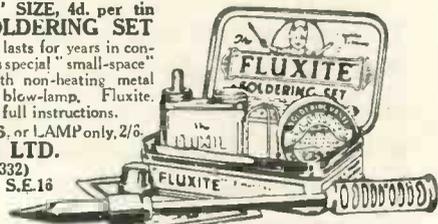
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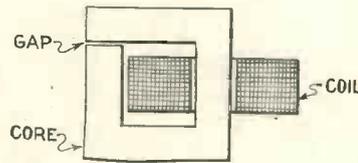
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DESIGN DATA SHEETS By J. H. Reyner, B.Sc., A.M.I.E.E.

"W.M." Design Data

No. 29

SATURATION



Transformer or choke core with air gap

WITH the considerable use of iron and magnetic alloy cores for low-frequency apparatus the question of saturation is now an accepted fact. Its significance is not always appreciated.

If we have a coil of wire it will possess a certain inductance. If we place an iron core through the centre of the coil the inductance will be increased, and if this core is completely closed practically the whole of the magnetic field will flow through the iron circuit and the inductance will be several hundred times greater than it would be without it.

This property enables us to obtain relatively large inductances in a small space, so that intervalve transformers and low-frequency chokes can be constructed economically and in a practical form.

The actual inductance of the coil

clearly depends upon this magnifying effect of the iron. The effect is known as the permeability, which is a measure of the magnetic field (and consequently the inductance), with the iron as compared with the value with an air core.

A choke carrying 5 milliamperes A.C. may have an inductance twice as great as when it is carrying 1 milli-ampere A.C.

The presence of direct current through the winding, on the other hand, causes just the opposite effect. The effective permeability of the iron decreases somewhat rapidly if any steady current is allowed to pass round the coil, or through any other coil on the same core.

This effect is known as "saturation" and the design of chokes and transformers to-day is largely concerned with the minimisation of such variation. One method of overcoming the difficulty is to make the iron core very large.

A more economical method is to assemble the core with a small air gap, as indicated in the diagram, so that the iron circuit is not complete and some of the magnetic field has to pass through the air.

"W.M." Design Data

No. 30

CONDENSER CAPACITIES

A SIMPLE method of checking the capacity of large condensers for ordinary testing purposes is to apply an alternating voltage across the condenser and to measure the current through it. The capacity is then obtained from the expression:

$$\text{Capacity (microfarads)} = \frac{\text{Current (milliamperes)}}{.0063 \times \text{volts} \times \text{frequency}}$$

Thus with a 4-microfarad condenser and 50-cycle mains, a voltage of 4 volts A.C. will cause a current of 5.04 milliamperes to flow. This will give some idea of the order of voltage and current required. With half the condenser capacity, of course, the current will be halved, while increasing or decreasing the voltage causes the current to increase or decrease correspondingly.

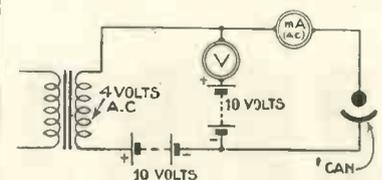
This method is not satisfactory with electrolytic condensers, which have to be so arranged that the can is always negative. If an alternating voltage is applied, therefore, the can becomes alternately positive and negative each half cycle.

To avoid this a balancing scheme must be used such as that shown in the diagram attached. This arranges that there is always a permanent voltage

across the condenser which is greater than the peak value of the alternating voltage, so that even during the negative half-cycles the direction of the voltage on the condenser never reverses, but only fluctuates above and below a given value.

The voltmeter, of course, must be compensated for this steady voltage, since otherwise it would give a permanent reading due to the steady E.M.F. A balancing battery is therefore placed in series with the voltmeter, such that the D.C. voltage is balanced up, leaving the meter only to read the A.C. voltage supplied by the transformer as shown.

The capacity is then measured in accordance with the formula already given.



Circuit for measuring capacity of electrolytic condenser

'SQUARE PEAK'

REGD. TRADE MARK



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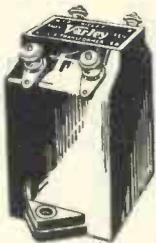
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"I tried out one of your 'Square Peak' Coils recently. Tuning is just razor-edged. Short of super-hets. and things like that, your coil is the best thing I have struck. I had Mühlacker clear of the London Regional last night, a thing I could never get before." Dr. R. W. T.
"SQUARE PEAK" COIL, complete as illustrated. Price 15/-

H.F. INTER-VALVE COIL, for use with above. Price 8/6

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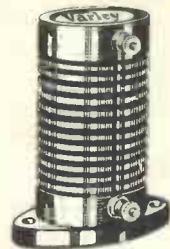
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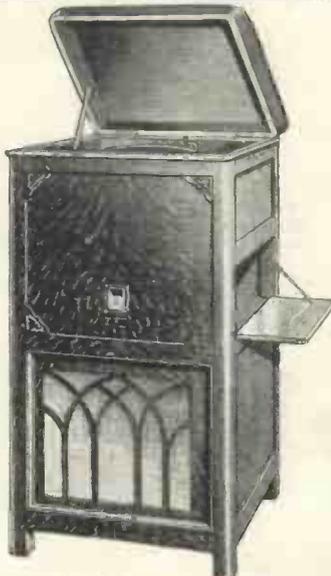
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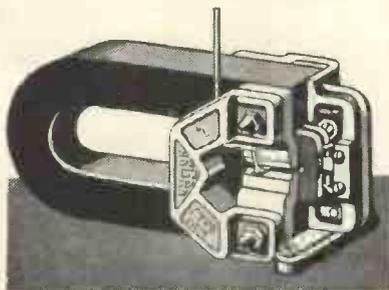
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DESIGN DATA SHEETS—Cont.

"W.M." Design Data

No. 31

ELECTRICAL UNITS

THE measurement of the various quantities used in radio practice is carried out in terms of different units. Each quantity to be measured has some definite unit, and the quantity is stated to be so many of these units. The various units in turn are all correlated so that in using the simple formulae which connects the quantities the correct answer is obtained if all the quantities are in the same unit.

The fundamental definition of the units does not interest us in ordinary radio practice. It is sufficient to know what the units are and how they are related, and in the present sheet we shall discuss the units of current, voltage and resistance.

The unit of current is the ampere, which is a flow of a given number of electrons past a certain point in a given time. Current will not flow in a conductor of its own accord, because there is an electrical friction or resistance to motion and, therefore, a pressure or voltage has to be applied to the circuit.

The units of voltage and resistance are linked up with those of current in terms of the well-known Ohm's Law, which states that the current is equal to the voltage divided by the resistance.

Consequently, increasing the resistance decreases the current and vice versa, while with a given resistance we can obtain more current if we increase the voltage, and so on.

The unit of pressure or voltage is the volt, and the unit of resistance is the ohm, and the relationship between the three quantities may be expressed as follows:—

$$\text{Current (amperes)} = \frac{\text{Voltage (volts)}}{\text{Resistance (ohms)}}$$

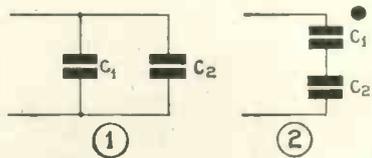
It must be emphasised that this is not a definition, but merely a statement of the relations between the various quantities which is quite sufficient for practical purposes.

In wireless practice we often find it necessary to deal in larger or smaller units. The more general unit of current for radio purposes is the milli-ampere, which is one thousandth part of an ampere. If we have a current in milliamperes and we wish to find the voltage or resistance in the circuit by applying Ohm's Law, we must first convert the current to amperes by dividing it by one thousand. Thus 18 milliamperes is .018 ampere and this is the figure which must be used in working out the formula.

"W.M." Design Data

No. 32

CONDENSERS IN PARALLEL & SERIES



Condensers in (1) parallel and (2) in series

WHERE a particular condenser does not give suitable capacity the total capacity in the circuit may be varied by connecting other condensers in suitable relationship.

The simplest modification possible is that of adding additional capacities in parallel with the original condenser.

The total capacity obtained by such an arrangement is the sum of the capacities of the two individual condensers. Thus if we have a 4-microfarad condenser in parallel with a 2-microfarad the total capacity is 6 microfarads. Any number of condensers may be connected in parallel in this manner, the total capacity being the sum of the various individual capacities.

If the capacity is required to be

reduced the condensers may be placed in series. This means that the end of one condenser is joined to the beginning of another and the two outers are joined across the circuit. In such circumstances the capacity of the series arrangement is less than either of the two individual condensers, the actual capacity being given by the expression:

$$C_s = \frac{C_1 \cdot C_2}{C_1 + C_2}$$

This expression is really another way of saying that the reciprocal of the series capacity is equal to the sum of the reciprocals of the individual capacities. This method of expression is more convenient where more than two capacities are concerned, the expression being:—

$$\frac{1}{C_s} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots \text{ etc.}$$

A series arrangement is often useful for reducing the effective capacity of an aerial. For example, a .001-microfarad condenser in series with an aerial which has a capacity of about .003 microfarad would give us a capacity of .00075 microfarad.

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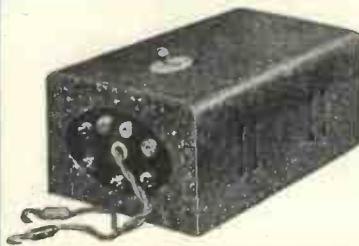
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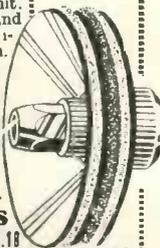
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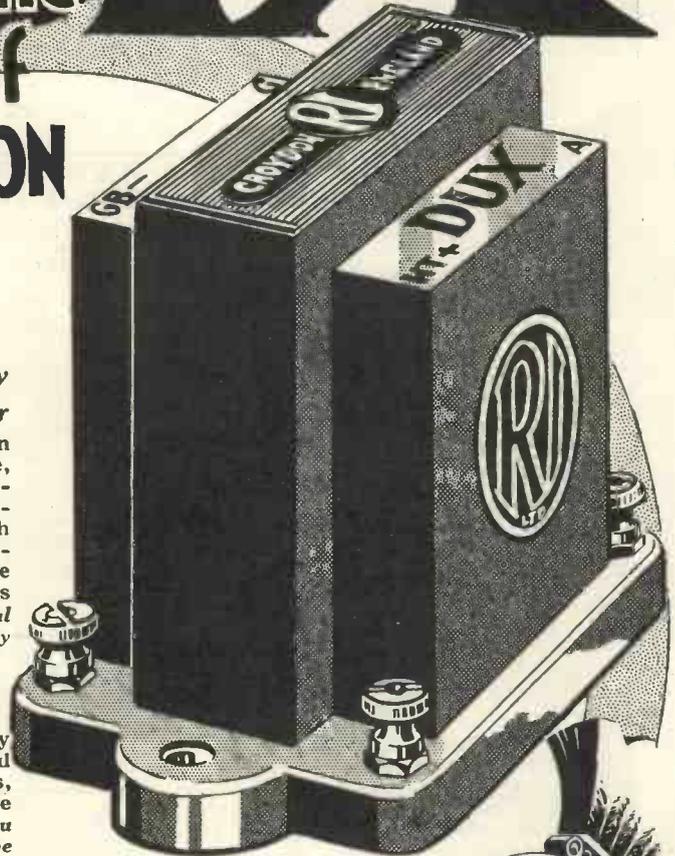
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Under no circumstances can questions be answered personally or by telephone. All inquiries must be made by letter so that every reader gets exactly the same treatment.

Alterations to blueprints or special designs cannot be undertaken; nor can readers' sets or components be tested.

If you want advice on buying a set a stamped-addressed envelope only (without coupon or fee) should be sent to the Set Selection Bureau, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

ODD NOTES

ANOTHER special supplement will be included in the January issue of WIRELESS MAGAZINE. Remember that the publishing date will be Friday, December 18. To make certain of getting a copy, order from your newsagent now.

In the list of wires to be removed from the original version of Everybody's Radiogram to incorporate automatic grid bias (see "Automatic Grid Bias," page 455 of the November issue), add No. 36.

If you have not yet sent us a report on the WIRELESS MAGAZINE set you are now using, please do so. It is a great help to us to know the capabilities of sets in different localities.

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