Editor:
BERNARD E. JONES

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

Wireless Magazine

The Best Shillingsworth in Radio

Vol. XV :: APRIL, 1932 :: No. 87

Research Consultant:
W. JAMES

Assistant Editor:
D. SISSON RELPH

Published by BERNARD JONES PUBLICATIONS, LTD., publishers of "Wireless Magazine" and "Amateur Wireless." Editorial and Advertisement Offices: 58-61 Fetter Lane, London, E.C.4. Telephone: City 3733, 3744. Telegrams: "Beejapee, Fleet, London." Subscription: Great Britain and abroad, 15s. 6d. a year, post free (Canada only, 13s. 6d.). Contributions are invited and will be promptly considered. Next issue published on Thursday, April 21.

The Editor's Shop Window

THE best contributors and the finest features in radio journalism! Briefly and definitely that is what I claim, and you can judge of its truth for yourselves. I can hear you saying "Sez you"! Well, turn over the pages of this issue and confirm or confute my contention that there is not another shillingsworth in radio journalism that can touch "Wireless Magazine" for value and brightness.

Our already important circle of contributors is increased this month by the addition of my old friend, Percy W. Harris, who has joined "Wireless Magazine" and "Amateur Wireless."

You will find two articles from his pen—a chat which he calls "In My Lab Arm Chair," and an article under the title of "Portabilities," in which he gives his ideas on portables and prepares the way for a home-constructor portable which he will describe in our pages next month.

W. James is represented this month by a most useful little article in which he explains how the amateur can match his own coils for use in a ganged receiver, the method being simple and using only a reacting set and a milliameter.

In this issue we are presenting the Ideal Home Super, which, compared with the original Super 60, gives more punch and better quality, the selectivity being very much as before. A member of my staff has spent many evenings with the set and tells me that nearly every station can be heard clear of interference.

There is no doubt that the set can receive a couple of scores of stations at full loud-speaker strength and at such selectivity that London Regional can be separated from Muhlacker on the medium waves and Daventry National from Zeesen on the long waves. We present this set with complete confidence that it will pick up a large number of stations to your satisfaction no matter in which locality you are living.

We have a fascinating article, "The Valve: Yesterday and To-day" in this issue. The text is interesting, but the illustrations are remarkable. You are shown pictorially what a long, long way we have come from the first working valve of Lee de Forest, one of America's outstanding inventors, with whom I remember spending a happy morning in his "talkie" studio in New York.

In a sense we get away from radio in an article by J. H. Reyner on "Electric Clocks." Mr. Reyner has become an enthusiast on the subject and is this month explaining their advantages and methods of operation. I am quite sure that everybody whose house is supplied by synchronised A.C. mains will one of these days have the new type of electric clock and I can assure you that the proposition is worth looking into.

On the subject of "New Ideas in Tuning," P. K. Turner continues his explanation of a method that is receiving very marked attention at the present time—needle-point selectivity with a tone corrector to compensate for side-band cutting, and, further, he is applying in practical form his "economy push-pull" system in the design and construction of a battery gramo-player, a remarkably fine amplifier for those who have no mains and wish to have great power and purity.

Two sets—a little "Family Two," for the local station and the chief continentals, and the A.C. Quadradyne, built in response to a large number of requests—will please particular sections of my readers.

I wish particularly to mention an article written at my own suggestion by an old contributor, Dr. E. H. Chapman, who has for years made a special study of the problem of locating mineral deposits by means of wireless waves. His article, "Prospecting by Radio," is a very modest but informing talk by one who, as a matter of fact, knows more about the subject than probably anybody else in this country.

B. E. J.

FOR THE CONSTRUCTOR

GRAMO-RADIO SECTION

TECHNICAL FEATURES

Contents

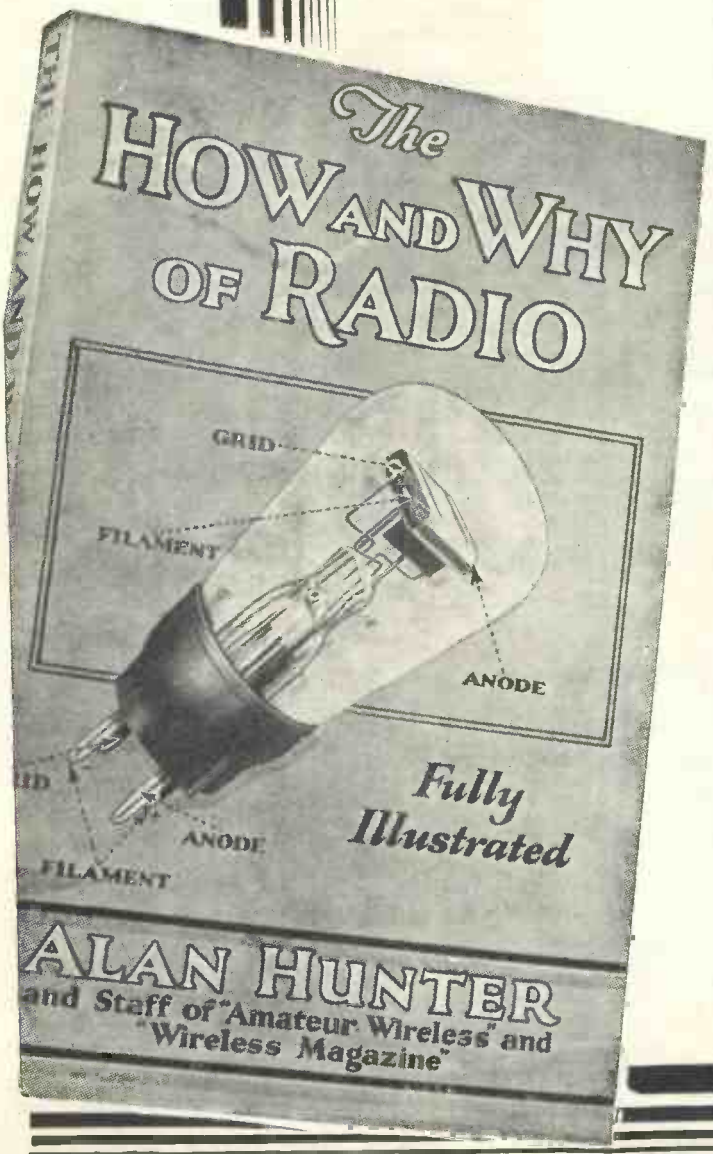
GENERAL ARTICLES

A BATTERY-OPERATED GRAMO-PLAYER: See page 317

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

EXPRESSLY WRITTEN FOR THE BEGINNER

2/6 NETT



"The How and Why of Radio" by Alan Hunter, has been expressly written for beginners.

It provides a clear conception of the general theory and practices of wireless reception in simple, non-technical terms, and contains over ninety clearly defined illustrations. It has been mainly compiled from the series of articles in AMATEUR WIRELESS:—"The How and Why of Radio"—which proved so popular during the past twelve months.

Get this indispensable Book NOW. Of all Newsagents and Booksellers, or **2/9** post free,

from

"AMATEUR WIRELESS,"

58/61 Fetter Lane, London, E.C.4

'Phone: City 3733

DUBILIER

The choice for the

IDEAL HOME SUPER RECEIVER

SPECIAL NON-INDUCTIVE
Type 9200

Once again the *Wireless Magazine* chooses condensers on which they rely—Dubilier. Builders of the Ideal Home Super receiver described in this issue will be wise if they follow the designer's specification. Here are the condensers he has chosen.

One Dubilier .0002 mf. Type 670—Price 1/-

One Dubilier .001 mf. Type 670—Price 1/3

One Dubilier .005 mf. Type 670—Price 1/6

One Dubilier .01 mf. Special Non-Inductive Type 9200—Price 2/-

Here again Dubilier Condensers are selected for their unfailing reliability. Don't take risks by departing from the specified make. When buying your parts insist on:—

One Dubilier .0001 mf. Type 670—Price 1/-

One Dubilier .0002 mf. Type 670—Price 1/-

—and for

THE FAMILY TWO

Type 670

BUT—BE SURE THEY ARE DUBILIER

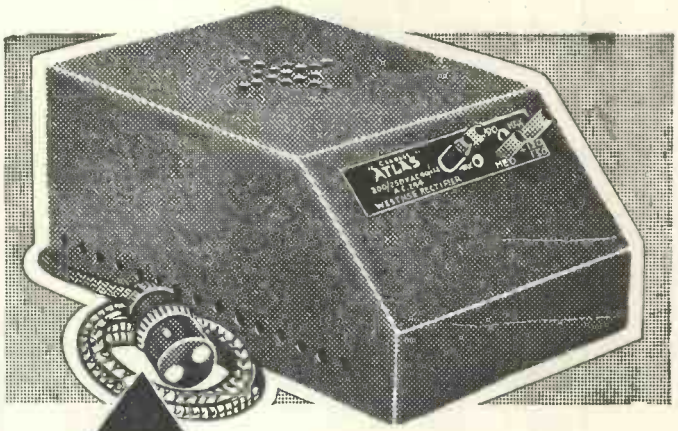
CONDENSERS

DUBILIER CONDENSER CO. (1925), LTD.

DUCON WORKS, VICTORIA ROAD, N. ACTON, LONDON, W.3

SPECIFIED

by the designers of the "IDEAL HOME SUPER"



10/- DOWN AND BALANCE IN EASY MONTHLY PAYMENTS

MODEL A.C. 244

CASH PRICE

59/6

ONCE again "ATLAS" is the expert's choice, being specified exclusively by the designers of the "Ideal Home Super" described in this number. This Model A.C.244 is the last word in efficiency of design and operation and will continue to give a perfect H.T. supply for many sets and many years to come.

The unit provides three H.T. tappings, with five intermediate positions, to give fine voltage adjustments, and supplies 20 m/A. at 120 volts.

A corresponding model, A.K.260, provides, in addition, a trickle charger for 2-, 4-, and 6-volt L.T. accumulators. Cash price 90/-.

Both models incorporate Westinghouse rectifiers and are fully guaranteed for 12 months.

Insist on "ATLAS" Mains Units, winners of the Olympia Ballots in 1930 and 1931.

CLARKE'S "ATLAS"

MAINS UNITS

H. CLARKE & Co., (M/CR) Ltd., Old Trafford, Manchester
Phones: Trafford Park 1744-5-6. Southern Offices: Bush House, W.C.2. Phone: Temple Bar 7130. Glasgow Office: 24 Oswald Street, Glasgow. Phone: Central 5119.

POST THIS COUPON NOW

H. CLARKE & CO., (M/CR) LTD. Eastnor St., Old Trafford, Manchester. Please send me FREE copy of "Power from the Mains," giving full details of "ATLAS" Units and how to use Model A.C. 244 with the "Ideal Home Super."

NAME _____

33/4 ADDRESS (in capitals) _____

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	50,000	35	.1	.7	1.1	1.1	1.5
Lissen ..	H2	50,000	45	.1	.9	2.0	1.0	1.5
Cossor ..	210RC	50,000	40	.1	.8	.5	1.5	1.5
Tungsram	R208	50,000	35	.1	1.0	1.0	1.5	1.5
Six-Sixty	210RC	45,400	50	.1	1.1	1.0	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	1.0	—	1.5
Osram ..	H2	35,000	35	.1	1.0	1.0	—	1.5
Dario ..	Detector	30,000	30	.1	1.0	1.0	—	1.5
Six-Sixty	210HF	25,000	19	.1	.75	1.0	3.0	4.5
Tungsram	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	.1	1.1	.75	1.5	3.0
Lissen ..	HL2	21,000	32	.1	1.5	3.0	1.0	1.5
Mazda ..	HL2	21,000	32	.1	1.5	—	—	—
Dario ..	Super H.F.	20,000	32	.1	1.6	2.0	—	1.5
Lissen ..	HL210	20,000	20	.1	1.0	2.2	1.5	4.5
Mazda ..	HL210	18,500	26	.1	1.4	3.0	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	1.0	1.5	3.0
Tungsram	L210	16,000	16	.1	1.0	2.5	3.0	6.0
Cossor ..	210HF	15,800	24	.1	1.5	2.25	1.5	3.0
Mullard..	PM1HL	14,000	28	.1	2.0	1.2	1.5	3.0
Cossor ..	210Det	13,000	15	.1	1.15	2.5	1.5	3.0
Six-Sixty	210LF	12,500	10.6	.1	.85	2.5	4.5	7.5
Mullard..	PM1LF	12,000	11	.1	.9	2.6	4.5	7.5
Six-Sixty	210D	10,600	17	.1	1.6	2.0	3.0	7.5
Cossor ..	210LF	10,000	14	.1	1.4	3.0	3.0	4.5
Lissen ..	L210	10,000	12	.1	1.2	3.0	3.0	7.5
Lissen ..	L2	10,000	20	.1	2.0	3.0	1.5	3.0
Marconi	L2/b	10,000	15.5	.1	1.55	4.0	1.5	3.0
Mullard..	PM2DX	10,000	17	.1	1.7	2.0	3.0	6.0
Mazda ..	L210	10,000	17	.1	1.7	5.0	2.5	4.5
Mazda ..	L2	10,000	19	.1	1.9	3.0	—	3.0
Tungsram	LG210	10,000	10	.1	1.0	4.0	6.0	9.0
Tungsram	PD220	10,000	17	.2	1.7	4.0	4.5	7.5
Dario ..	Universal	8,000	10	.1	1.25	3.5	—	4.5
Dario ..	Super Det.	7,500	15	.15	2.0	3.5	3.0	4.5
Six-Sixty	220P	4,800	7.2	.2	1.5	5.0	7.5	12.0
Mullard..	PM2	4,400	7.5	.2	1.7	5.0	7.5	12.0
Lissen ..	P220	4,000	7	.2	1.75	5.0	7.5	15.0
Cossor ..	220P	4,000	8	.2	2.0	6.0	4.5	9.0
Cossor ..	215P	4,000	9	.15	2.25	5.0	4.5	7.5
Cossor ..	220Pa	4,000	16	.2	4.0	5.5	3.0	4.5
Marconi	LP2	3,900	15	.2	3.85	6.0	3.0	4.5
Osram ..	LP2	3,900	15	.2	3.85	6.0	3.0	4.5
Mazda ..	P220	3,700	12.5	.2	3.4	11.0	3.0	6.0
Six-Sixty	220PA	3,700	13	.2	3.5	6.0	3.0	6.0
Mullard..	PM2A	3,600	12.5	.2	3.5	6.5	3.0	6.0
Lissen ..	LP2	3,500	12.0	.2	3.4	8.0	6.0	7.0
Tungsram	P215	3,300	5	.2	1.5	12.0	9.0	12.0
Dario ..	Super P'r	3,000	6	.18	2.0	8.5	12.0	15.0
Marconi	P240	2,500	4	.4	1.6	12.0	15.0	24.0
Osram ..	P240	2,500	4	.4	1.6	11.0	16.0	24.0
Tungsram	SP230	2,500	5	.3	2.0	15.0	15.0	23.0
Dario ..	Hyper P'r	2,400	7	.3	3.0	14.0	12.0	18.0
Tungsram	P220	2,200	6.6	.2	3.0	5.0	9.0	12.0
Marconi	P2	2,150	7.5	.2	3.5	12.0	6.0	10.5
Osram ..	P2	2,150	7.5	.2	3.5	10.0	7.5	10.5
Six-Sixty	220SP	2,060	7	.2	3.4	13.5	7.5	15.0
Mullard..	PM202	2,000	7.0	.2	3.5	14.0	7.5	15.0
Mazda ..	P240	1,900	7	.4	3.7	18.0	6.0	13.5
Mullard..	PM252	1,900	7	.4	3.7	14.0	6.0	12.0
Six-Sixty	240SP	1,900	6.6	.4	3.5	14.0	6.0	13.5
Mazda ..	P220A	1,850	6.5	.2	3.5	13.0	9.0	15.0
Marconi	P2/b	1,850	6.5	.2	3.5	15.0	—	—
Lissen ..	PX240	1,800	4	.4	2.5	14.0	12.5	22.5
Cossor ..	230XP	1,500	4.5	.3	3.0	15.0	10.5	18.0
Lissen ..	P220A	1,700	6.0	.2	3.5	12.0	9.0	15.0
Lissen ..	P240A	1,000	5.0	.4	5.0	20.0	15.0	20.0
2-volt Double-grid Valves								
Tungsram	DG210	5,000	5.0	.1	1.0	1.0	—	—
Marconi	DG2	3,750	4.5	.2	1.2	—	—	—
Osram ..	DG2	3,750	4.5	.2	1.2	—	—	—
Cossor ..	210DG	3,400	2.7	.1	.8	—	—	—
Six-Sixty	210DG	—	—	.1	.8	—	—	—
Mullard..	PM1DG	—	—	.1	.8	—	—	—
2-volt Screen-grid Valves								
Tungsram	S210	430,000	300	.12	.8	—	—	—
Mazda ..	215SG	400,000	450	.15	1.1	—	—	—
Mazda ..	S215B	333,000	500	.15	1.5	2.0	—	—
Cossor ..	215SG	300,000	330	.15	1.1	1.25	.9	.9
Lissen ..	SG215	300,000	300	.15	1.0	—	—	1.5
Six-Sixty	215SG	220,000	190	.15	.87	2.0	—	—
Cossor ..	220SG	200,000	320	.2	1.6	1.5	.9	.9
Dario ..	SG	200,000	200	.15	1.0	3.0	—	—
Osram ..	S22	200,000	350	.2	1.75	3.0	—	—
Marconi	S22	200,000	350	.2	1.75	2.5	.9	1.5
Marconi	S21	200,000	220	.1	1.1	3.0	.5	.9
Osram ..	S21	200,000	220	.1	1.1	3.0	—	—
Mullard..	PM12	180,000	200	.15	1.1	—	—	—
Mazda ..	S215A	—	800	.15	1.1	—	—	—
Variable-mu 2-volt Screen-grid Valve								
Cossor ..	220VSG	110,000	—	.2	1.6	—	—	—

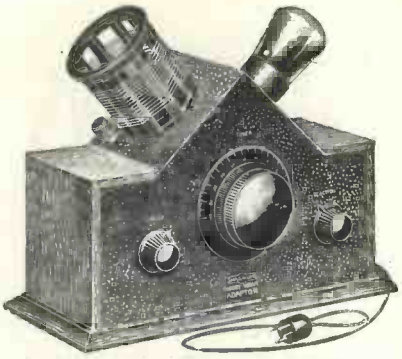
Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
2-volt Pentode Valves								
Lissen ..	PT225	64,000	90	.25	1.4	7.0	3.0	6.0
Six-Sixty	230PP	64,000	80	.3	1.25	10.0	6.0	12.0
Mullard..	PM22	—	—	.3	1.3	12.0	6.0	10.0
Marconi	PT240	55,000	90	.4	1.65	9.0	6.0	9.0
Tungsram	PP230	33,000	50	.3	1.5	10.0	9.0	16.0
Lissen ..	PT240	22,500	45	.4	2.25	12.5	7.5	10.5
Lissen ..	PT220A	22,500	45	.2	2.5	15.0	7.5	9.0
Cossor ..	230PT	—	—	.3	2.0	13.0	15.0	15.0
Mazda ..	220Pen.	—	—	.2	2.5	—	—	—
Mazda ..	220A Pen.	—	—	—	2.5	—	—	—
Cossor ..	230HPT	—	—	.3	1.8	6.5	7.5	7.5
Osram ..	PT2	—	—	.2	2.5	5.0	3.0	4.5
Marconi	PT2	—	—	.2	2.5	5.0	3.0	4.5
Mazda ..	Pen.230	—	—	.3	1.5	—	—	—
4-volt Three-electrode Valves								
Dario ..	Resiston	60,000	30	.075	.5	.25	—	1.5
Marconi	H410	60,000	40	.1	.66	.5	—	1.5
Osram ..	H410	60,000	40	.1	.66	.35	—	1.5
Six-Sixty	4075RC	58,000	37	.075	.64	.55	1.0	1.5
Mullard..	PM3A	55,000	38	.075	.66	.3	1.5	1.5
Cossor ..	410RC	50,000	40	.1	.8	.6	.5	1.5
Lissen ..	H410	40,000	36	.1	.9	1.6	1.0	1.5
Marconi	HL410	30,000	25	.1	.83	1.0	2.0	3.0
Dario ..	Super H.F.	21,000	25	.075	1.2	2.0	—	1.5
Lissen ..	HLD410	21,000	25	.1	1.2	2.5	1.5	3.0
Osram ..	HL410	20,800	25	.1	1.2	1.25	1.5	3.0
Cossor ..	410HF	20,000	22	.1	1.1	1.0	1.5	3.0
Tungsram	R406	18,000	25	.06	1.4	3.5	2.0	3.5
Tungsram	HR406	17,000	25	.065	1.5	1.5	1.5	3.0
Tungsram	HR410	17,000	25	.1	1.5	1.5	1.5	3.0
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
Cossor ..	410LF	10,000	17	.1	1.7	2.5	1.5	4.5
Dario ..	Universal	10,000	10	.075	1.0	3.0	—	4.5
Tungsram	LD408	8,500	17	.085	2.0	3.5	3.0	4.5
Lissen ..	L410	8,500	15	.1	1.8	3.5	1.5	4.5
Marconi	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
Dario ..	Super Det.	7,500	15	.075	2.0	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
Tungsram	LD410	7,000	16.5	.1	2.3	4.5	4.5	7.5
Marconi	P410	5,000	7.5	.1	1.5	6.0	6.0	10.5
Osram ..	P410	5,000	7.5	.1	1.5	6.0	6.0	10.5
Dario ..	Super P'r	4,500	9	.1	2.0	7.0	—	15.0
Six-Sixty	410P	4,100	7.8	.1	1.9	7.5	7.5	12.0
Cossor ..	410P	4,000	8	.1	2.0	8.0	4.5	9.0
Mullard..	PM4	4,000	8	.1	2.0	7.5	5.0	8.0
Lissen ..	P410	4,000	8	.1	2.0	7.0	6.0	9.0
Tungsram	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
Dario ..	Hyper P'r	2,200	5	.15	2.3	15.0	12.0	18.0
Mullard..	PM254	2,150	6.5	.2	3.0	9.0	9.0	15.0
Six-Sixty	420SP	2,150	6.5	.2	3.0	10.0	8.0	15.0
Marconi	P415	2,080	5.0	.15	2.4	14.0	9.0	16.5
Osram ..	P415	2,080	5	.15	2.4	14.0	9.0	16.5
Cossor ..	425XP	2,000	7	.25	3.5	13.0	6.0	12.0
Tungsram	P430	2,000	5	.3	2.5	25	10.0	15.0
Mazda ..	P425	1,950	3.5	.25	1.8	26.0	14.0	26.0
Tungsram	P414	1,700	5	.15	3.0	12.0	9.0	18.0
Lissen ..	P425	1,600	4.5	.25	2.8	28.0	12.0	20.0
Cossor ..	415XP	1,500	4.5	.15	3.0	15.0	9.0	18.0
Tungsram	P4100	1,400	7	1.0	5.0	35 (at 400 v.)	—	25 (at 400 v.)
Cossor ..	4XP	1,200	4.8	.6	4.0	35.0	9.0	23 (at 200 v.)
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								
Tungsram	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	1.5
Marconi	S410	200,000	180	.1	.9	3.5	1.5	1.5
Osram ..	S410	200,000	180	.1	.9	3.5	—	—
Lissen ..	SG410	200,000	180	.1	.9	—	—	—
4-volt Pentode Valves								
Marconi	PT425	50,000	100	.25	2.0	8.0	4.7	7.5
Osram ..	PT425	50,000	100	.25	2.0	8.0	4.0	7.5
Marconi	PT4	50,000	110	1.0	2.2	—	—	—
Osram ..	PT4	50,000	110	1.0	2.2	—	—	—
Tungsram	PP416	50,000	100	.15	2.0	8.0	4.5	7.0
Lissen ..	PT425	35,000	80	.25	2.25	15.0	6.0	9.0
Osram ..	MPT4	33,000	100	1.0	3.0	—	—	—
Tungsram	PP415	33,000	60	.15	1.8	10.0	6.0	10.0
Mullard..	PM24	—	—	.15	1.75	16.0	6.0	12.0
Six-Sixty	415PP	27,000	60	.15	2.2	15.0	6.0	10.5
Six-Sixty	SS/Pen.SP	—	—	.275	2.0	—	—	—
Mullard..	PM24A	25,000	50	.275	2.0	15.0	6.0	21.0
Tungsram	PP430	24,000	60	.3	2.5	15.0	—	16.0
Tungsram	PP4100	20,000	60	1.0	3.0	20.0	—	20.0
Cossor ..	415PT	—	—	.15	2.0	13.0	15.0	15.0

(Continued on page 262)

VALVES TO USE IN YOUR SET—Continued from page 260

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
4-volt Pentode Valves—Continued								
Mazda ..	425Pen.	—	—	.25	2.0	14.0	14.0	—
Mullard..	PM24C	—	—	1.0	3.0	—	—	—
6-volt Three-electrode Valves								
Mazda ..	H1607	90,000	40	.07	.45	1.0	.8	1.5
Mazda ..	H610	66,000	40	.1	.6	1.0	—	—
Marconi	H1610	60,000	40	.1	.66	.35	1.5	1.5
Osram ..	H1610	60,000	40	.1	.7	.35	—	3.0
Six-Sixty	6075RC	58,000	42	.075	.7	.5	1.0	1.5
Cossor ..	610RC	50,000	40	.1	.8	.75	—	1.5
Mullard..	PM5B	49,000	40	.075	.85	.5	1.5	1.5
Lissen ..	H610	40,000	36	.1	.9	1.0	1.0	1.5
Marconi	HL610	30,000	30	.1	1.0	1.0	1.5	1.5
Osram ..	HL610	30,000	30	.1	1.0	1.0	1.5	1.5
Osram ..	LS5B	25,000	20	.8	.8	—	—	—
Lissen ..	HLD610	21,000	25	.1	1.2	2.5	1.5	3.0
Cossor ..	610HF	20,000	20	.1	1.0	1.75	1.5	3.0
Mazda ..	HL610	20,000	20	.07	1.0	1.8	1.5	3.0
Mullard..	PM5D	20,000	26	.075	1.3	1.0	1.5	3.0
Six-Sixty	607HF	15,200	17	.075	1.1	2.0	2.0	4.0
Tungsram	HR607	15,000	30	.07	2.0	2.0	1.5	3.0
Mullard..	PM5X	14,700	17.5	.075	1.2	1.6	3.0	4.5
Six-Sixty	610D	9,250	18.5	.1	2.0	2.0	3.0	4.0
Mullard..	PM6D	9,000	18	.1	2.0	2.0	3.0	4.5
Tungsram	LG607	9,000	16.5	.07	1.8	3.5	3.0	4.5
Lissen ..	L610	8,000	16	.1	2.0	2.0	3.0	4.5
Cossor ..	610LF	7,500	15	.1	2.0	3.4	1.5	4.5
Marconi	L610	7,500	15	.1	2.0	3.0	2.0	4.0
Osram ..	L610	7,500	15	.1	2.0	3.5	1.5	4.5
Osram ..	LS5	6,000	5	.8	.8	—	—	—
Mullard..	PM6	3,550	8	.1	2.25	7.0	6.0	9.0
Cossor ..	610P	3,500	8	.1	2.28	8.0	3.0	7.5
Marconi	P610	3,500	8	.1	2.28	6.0	6.0	9.0
Osram ..	P610	3,500	8	.1	2.28	7.0	6.0	9.0
Six-Sixty	610P	3,400	7.8	.1	2.3	8.0	6.0	9.0
Tungsram	P615	3,300	10	.15	3.0	10.0	4.5	7.5
Lissen ..	P610	3,200	8	.1	2.5	6.0	6.0	9.0
Marconi	LS5A	2,750	2.5	.8	.9	—	—	—
Osram ..	LS5A	2,750	2.5	.8	.9	—	—	—
Cossor ..	625P	2,500	7	.25	2.8	13.0	3.0	12.0 (at 200v.)
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 (at 250v.)
Osram ..	P625	2,400	6	.25	2.5	11.0	6.0	12.0
Tungsram	SP614	2,300	6	.15	2.6	17.0	6.0	18.0
Cossor ..	610XP	2,000	5	.1	2.5	15.0	7.5	15.0
Mullard..	PM256	1,850	6	.25	3.25	8.0	9.0	27.0 (at 250v.)
Six-Sixty	625SP	1,780	5.8	.25	3.25	8.0	10.0	15.0
Marconi	P625A	1,600	3.7	.25	2.3	20.0	13.5	36.0 (at 200v.)
Mazda ..	P625A	1,600	4	.25	2.5	27.0	10.0	20.0
Osram ..	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	20.0	12.0	22.5
Cossor ..	620T	1,400	3.2	2.0	2.3	—	—	—
Mullard..	PM256A	1,400	3.6	.25	2.6	20.0	12.0	33.0 (at 200v.)
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 (at 200v.)
Osram ..	LS6A	1,300	3.0	2.0	2.3	—	—	—
Marconi	DA60	835	2.5	4.0	3.0	—	—	—
Osram ..	DA60	835	2.5	4.0	3.0	—	—	—
6-volt Screen-grid Valves								
Six-Sixty	SS6075SG	210,000	190	.075	.9	—	—	—
Cossor ..	610SG	200,000	200	.1	1.0	—	1.5	1.5
Mullard..	PM16	200,000	200	.075	1.0	—	—	—
Osram ..	S610	200,000	210	.1	1.05	4.0	1.5	—
Marconi	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 (at 250v.)
Osram ..	PT625	42,000	80	.25	1.85	10.0	6.0	10.5
Tungsram	PP610	40,000	60	.1	1.6	10.0	6.0	10.0
Six-Sixty	SS617PP	28,500	54	.17	1.9	15.0	8.0	14.0
Mullard..	PM26	—	—	.17	2.0	15.0	9.0	15.0
Lissen	PT625	24,000	60	.25	2.5	14.0	7.5	10.0
Cossor ..	615PT	—	—	.15	2.0	17.0	6.9	7.5
A.C. Three-electrode Mains Valves								
Mullard..	904V	21,000	75	1.0	3.6	3.0	.75	1.0
Dario ..	Sup. H.F.	20,000	40	1.0	2.0	4.5	—	1.5
Cossor ..	41MRC	19,500	50	1.0	2.6	2.0	—	1.5
Cossor ..	41MH	18,000	72	1.0	4.0	2.0	1.0	1.5
Six-Sixty	4DX.AC	17,700	85	1.0	4.8	3.0	1.0	1.5
Tungsram	AR495	17,000	85	1.0	5.0	4.0	1.5	1.5
Tungsram	AR4100	16,000	33	1.0	2.0	2.5	1.5	3.0
Cossor ..	41MHF	14,500	41	1.0	2.8	2.5	—	2.0
Mazda ..	AC/HL	13,500	35	1.0	3.0	4.5	1.5	3.0
Tungsram	AR4101	13,300	40	1.0	3.0	2.5	1.5	3.0
Six-Sixty	4GP.AC	12,000	36	1.0	3.0	2.0	2.0	3.0
Lissen ..	AC/HL	11,700	35	1.0	3.0	5.0	1.5	3.0
Cossor ..	41MHL	11,500	52	1.0	4.5	3.0	1.2	2.0

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								
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
Osram ..	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 (at 200v.)
Osram ..	MHL4	8,000	20	1.0	2.5	5.0	3.0	6.0 (at 200v.)
Tungsram	AG4100	8,000	16	1.0	2.0	5.0	4.0	6.0
Cossor ..	41MLF	7,900	15	1.0	1.9	4.5	4.5	6.0
Dario ..	Super Dst.	7,500	15	1.0	2.0	6.0	3.0	4.5
Tungsram	AG495	6,250	25	1.0	4.0	4.0	3.0	4.5
Six-Sixty	4L.AC	5,000	10	1.0	3.2	5.0	4.5	7.0
Mullard..	164V	4,850	16	1.0	3.3	5.0	4.5	6.5
Six-Sixty	SS4PAC	3,000	10	1.0	3.3	10.0	5.9	8.0
Mazda ..	PP3/425	2,900	2.9	1.25	1.0	—	—	100 (at 400v.)
Osram ..	ML4	2,860	12	1.0	4.2	12.0	5.0	8.0
Mullard..	104V	2,850	10	1.0	3.5	11.0	5.0	8.5
Marconi	ML4	2,800	12	1.0	2.5	13.0	4.0	6.0
Mazda ..	AC/P	2,650	10	1.0	3.75	14.0	6.0	12.0
Cossor ..	41MP	2,500	18.7	1.0	7.5	10.0	3.0	6.0
Tungsram	AP495	2,500	10	1.0	4.0	20.0	9.0	12.5
Dario ..	Mag. P'r	2,200	8.5	.3	3.8	15.0	15.0	24.0
Mullard..	AC064	2,000	6	1.0	3.0	15.0	9.0	14.01
Tungsram	P430	2,000	5	.3	2.5	20.0	—	—
Cossor ..	41MXP	1,500	11.2	1.0	7.5	23.0	6.0	9.0
Mazda ..	PP5/400	1,500	9	2.0	6.0	—	—	32.0 (at 400v.)
Mazda ..	AC/P1	1,450	5.4	1.0	3.7	—	—	—
Six-Sixty	HV4/1	1,450	6.3	1.0	3.0	15.0	9.0	14.0
Tungsram	P4100	1,400	7	1.0	5.0	35.0 (at 400v)	—	35.0 (at 400v.)
Mullard..	AC044	1,150	4	.7	3.5	17.0	14.0	23.0
Tungsram	P460	1,100	4	.6	3.5	30.0	14.0	22.0
A.C. Double-grid Valves								
Cossor ..	41MDG	40,000	10	1.0	.25	—	—	—
Tungsram	DG4100	5,000	5	1.0	1.0	3.0	—	—
A.C. Screen-grid Mains Valves								
Dario ..	ACSG	1,000,000	1,000	1.0	1.5	—	—	—
Six-Sixty	4SGAC	1,000,000	1,000	1.0	1.0	1.5	—	—
Mullard..	SV4	909,000	1,000	1.0	1.1	—	—	—
Mazda ..	AC/SG	800,000	1,200	1.0	3.0	5.0	.5	.5
Tungsram	AS494	667,000	1,000	1.0	1.5	1.5	.5	.5
Mazda ..	ACS2	600,000	3,000	1.0	5.0	—	—	—
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	1.5
Osram ..	MS4	500,000	550	1.0	1.1	2.2	—	—
Six-Sixty	4XSGAC	485,000	1,600	1.0	3.3	—	—	—
Six-Sixty	4YSGAC	—	900	1.0	3.5	—	—	—
Mullard..	S4VA	430,000	1,500	1.0	3.5	1.7	—	—
Tungsram	AS495	428,000	1,500	1.0	3.5	1.0	.5	1.0
Cossor ..	41MSG	400,000	1,000	1.0	2.5	2.0	—	1.5
Marconi	MS4B	350,000	1,120	1.0	3.2	3.2	1.0	1.0
Osram ..	MS4B	350,000	1,120	1.0	3.2	3.2	1.0	1.0
Six-Sixty	SS4MMAC	300,000	900	—	3.0	—	4.0	—
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
Tungsram	AS4100	180,000	250	1.0	1.5	4.0	1.5	1.5
A.C. Pentode Valves								
Osram ..	PT4	50,000	110	1.0	2.2	—	—	—
Marconi	MPT4	33,000	100	1.0	3.0	—	—	—
Osram ..	MPT4	33,000	100	1.0	3.0	—	—	—
Six-Sixty	SS4PAC	—	—	1.0	3.0	—	—	—
Cossor ..	MS.Pen.A	—	—	1.0	4.0	9.0	2.5	2.5
Mazda ..	AC/Pen.	—	—	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	—	—	—
Osram ..	DH	10,800	40	.25	3.7	—	—	2.0
Mazda ..	DC3HL	10,000	37	.1	3.7	—	—	—
Marconi	DL	2,660	12	.25	4.3	—	—	—
Osram ..	DL	2,660	12	.25	4.3	10.0	4.0	7.0
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	—	—	—
Osram ..	DS	450,000	500	.25	1.1	—	—	3.0
Osram ..	DSB	350,000	1,120	.25	3.2	—	—	1.5
Marconi	DSB	350,000	1,120	.25	3.2	—	—	—
Mazda ..	DCSG	—	1,000	.5	2.75	—	—	—
D.C. Pentode Mains Valves								
Marconi	DPT	30,000	90	.25	3.0	—	—	—
Osram ..	DPT	30,000	90	.25	3.0	—	—	6.0
Mazda ..	DCPen.	—	—	.5	3.5	—	—	—
Mazda ..	DC2Pen.	—	—	.1	3.5	—	—	—



SHORT WAVES on A.C. MAINS or BATTERY SETS

An entirely new design of amazing efficiency

This Adaptor enables you to enjoy Short Wave Reception whether your set is A.C. Mains or Battery Operated. It is supplied complete with one special Short Wave Coil 40/80 metres, Cord and Plug. No extras whatsoever are required. Can be attached to your set in a few seconds. Write now for full particulars and our free trial offer.

Price complete **39/6**

Extra coil if required 20/40 metres **3/-**

We specialize in the "Economy Radiogram" and all "Wireless Magazine" Sets. Ready wired and tested.

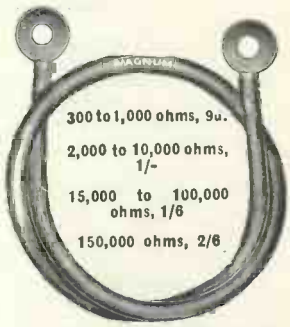
Comprehensive lists on application

MAGNUM FADER

Specified for the "Economy Radiogram.

Price **10/-**

MAGNUM



SPAGHETTI RESISTANCES

Set of 5 Magnum Spaghetti Resistances as specified for the "IDEAL HOME SUPER" 7/-

Set of 8 Magnum Spaghetti Resistances for the "A.C. QUADRADYNE" 11/-

BURNE-JONES & CO., LTD.

"MAGNUM" HOUSE, 296 BOROUGH HIGH STREET, LONDON, S.E.1

Telephone: Hop 6257 and 6258

Scottish Agent - - Mr. Ross Wallace, 54 Gordon Street, Glasgow, C.1

ENGINEERS!

ARE YOU EARNING LESS THAN £10 PER WEEK?

If so, you cannot afford to carry on without reading our 200 page Hand-book. The book explains clearly and definitely many ways of carving out a successful career. Among other things it explains the services of our unique Appointments Department, outlines Home-Study Courses in all branches of CIVIL, MECHANICAL, ELECTRICAL, MOTOR, AERO, WIRELESS, "TALKIE," ENG., etc. and gives details of B.Sc., A.M.I.C.E., I.E.E., A.M.I.Mech.E., A.M.I.A.E., G.P.O., MATRIC., and all Exams.

We alone Guarantee—"NO PASS - NO FEE"

Whether you be an "old hand" or a budding apprentice, get this book to-day—*FREE AND POST FREE.*

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
283, SHAKESPEARE HOUSE, OXFORD STREET, LONDON.

Economy Radio Gram

GENTS' (TANGENT) EWEBEC COILS

WERE SPECIFIED

PRICES:

Wound Coils complete per pair 8/10

Bare Blank formers only per pair 2/6

GENT & Co. LTD.
Established 1872

Faraday Works
LEICESTER

LONDON—47 VICTORIA STREET, S.W.1

The finest value obtainable in CABINET CRAFTSMANSHIP!

SPECIAL MODEL for THE "A.C. QUADRADYNE"

Every Smith Cabinet is distinctive in design, solidly constructed of the finest materials and polished by hand! Fifteen years specialisation in Radio Cabinets is behind every one. Choose a Smith Cabinet for long service, quality—appearance and economy of price!

Among the wide range of Smith's Cabinets there is just the one to suit YOUR purpose and pocket! Prices range from £1 15s. to £5 17s. 6d. in Oak, Mahogany, and Walnut. Both Pedestal and Table models supplied.

"CHESTER SUPER"

Select walnut veneer front, top and sides, hand-carved corners with solid side panels polished a rich two-tone shade walnut, satin finish with oxidised fittings. Fluted and turned legs with openings at back of Cabinet. The fret is backed with black and gold silk. Height, 36 in.; width 22½ in.; depth, 17 in.; baffle board, 19 in. by 13 in.; set board, 19½ in. by 12 in. WALNUT, £5 12s. 6d. Mahogany, £5 7s. 6d. OAK, £5.

Smith's Cabinets LTD

19/20, HERTFORD ROAD, LONDON, N.1 Telephone: Clissold 3725.

EVERY SMITH-CRAFTED CABINET IS HAND-POLISHED

It helps us if you mention "Wireless Magazine"

WORLD'S BROADCAST STATIONS

The following list contains details of more than 300 broadcasting stations all over the world. Spaces are left for recording your dial readings. The list is corrected at the last moment of going to press each month

Wave-length	Name of Station	Dial Readings	Country
13.95	Boundbrook W3XAL		United States
14.47	Buenos Aires LSY		Argentine
14.65	Malabar PMB		Java
14.83	Nauen DGW		Germany
15.03	Montegrande LSG		Argentine
15.14	Deal Beach WM1		United States
15.198	Aranjuez EAQ		Spain
15.3	Nauen DFA		Germany
15.33	Saigon FZS		Indo-China
15.5	Sydney VK2ME		New South Wales
15.5	Nancy		France
15.51	Deal Beach WNC		United States
15.93	Bandoeng PLE		Java
16.3	Kootwijk PCK		Holland
16.57	Chicago W9XAA		United States
16.8	Malabar PLF		Java
16.85	Kootwijk PCV		Holland
16.9	Bangkok HSJ		Siam
18.41	Kootwijk PCL		Holland
18.5	Saigon FZR		Indo-China
19.0	Barcelona		Spain
19.56	Schenectady W2XAD		United States
19.68	Pontoise FYA		France
19.72	East Pittsburgh W8XK		United States
19.84	Rome (Vatican) HVJ		Italy
20.5	Chapultepec XDA		Mexico
21.5	Bucharest CV1		Roumania
23.8	Rabat		Morocco
24	Funchal CT3AQ		Madeira
24.98	Saigon FZR		Indo-China
25.16	Moscow (Popoff) RW50		U.S.S.R.
25.2	Pontoise FYA		France
25.25	East Pittsburgh W8XK		United States
25.27	Calcutta VUC		India
25.4	Rome (Prato Smeraldo) 2RO		Italy
25.465	Saigon (Chi-Hoa)		Indo-China
25.5	Chapultepec XDA		Mexico
25.53	Chelmsford 5SW		Great Britain
25.6	Caracas		Venezuela
25.63	Pontoise FYA		France
26.7	S.S. *Elettra* 1BXX		—
27.3	Wellington		New Zealand
28.2	Bandoeng PLR		Java
28.9	Nauen		Germany
28.98	Buenos Aires LSX		Argentine
29.04	Ruysselede		Belgium
29.5	Bangkok HS2PJ		Siam
30	Belgrade		Yugoslavia
30.57	Buenos Aires LSOR		Argentine
31.1	Maracay YVQ		Venezuela
31.28	Sydney VK2ME		New South Wales
31.28	Melbourne VK3ME		Victoria
31.3	Philadelphia W3XAU		United States
31.35	Springfield W1XAZ		United States
31.35	Poznan SR1		Poland
31.38	Zeesen DJA		Germany
31.48	Schenectady W2XAF		United States
31.51	Skamlebaek OXY		Denmark
31.55	Melbourne VK3ME		Victoria
31.75	Rio de Janeiro		Brazil
31.86	Bandoeng PLE		Java
32	Dakar		French West Africa
32.26	Rabat		Morocco
34.5	Bogota HKF		Colombia
34.68	Long Island W2XV		United States
35	Dakar		French W. Africa
36.92	Bandoeng PLW		Java
38.07	Tokio J1AA		Japan
39.4	Nuevo Laredo X26A		Mexico
39.7	Bogota HKF		Colombia
39.8	Rio Bamba		Ecuador
40	Doeberitz DOA		Germany
41	Bangkok HSP2		Siam
41.6	Las Palmas EAR58		Canary Isles
41.7	Singapore US1AB		Singapore
42.3	Stuttgart D4XAA		Germany
42.8	Rugles F8BP		France
42.9	Lisbon CTTAA		Portugal
43	Madrid EAR100		Spain
43.6	Koethen D4AFF		Germany
43.75	Paris (Vitus)		France
44.9	Nauen DGK		Germany
45	Constantine FM8KR		Tunis
45.38	Moscow		U.S.S.R.
46.69	Boundbrook W3XL		United States
46.72	Minsk RW62		U.S.S.R.
47	Quito HC1DR		Ecuador
48	Casablanca CN8MC		Morocco
48.35	Bogota HKC		Colombia
48.59	Halifax		Nova Scotia
48.85	Winnipeg VE9CL		Canada
48.86	East Pittsburgh W8XK		United States
49.02	Richmond Hill W2XE		United States
49.05	Saigon F31CD		Indo-China
49.18	Boundbrook W3XAL		United States
49.22	Bowmanville VE9GW		Canada
49.34	Chicago W9XAA		United States
49.4	Johannesburg ZTJ		South Africa
49.43	Vancouver VE9CS		British Columbia
49.5	Nairobi 7LO		Kenya Colony
49.5	Philadelphia W3XAU		United States
49.83	Chicago W9XF		United States
49.96	Montreal VE9DR		Canada
49.96	Tegucigalpa HRB		Honduras
50	Moscow RV59		U.S.S.R.
50	Barcelona EAJ25		Spain
50	Caracas YV2BC		Venezuela
50.1	Eindhoven		Holland
50.26	Rome (Vatican) HVJ		Italy
51.22	Chapultepec XDA		Mexico
58	Prague OK1MPT		Czechoslovakia
62.5	Long Island W2XV		United States
70.2	Khabarovsk RV15		U.S.S.R.
80	Rome (Prato Smeraldo) 3RO		Italy
92.3	Doeberitz		Germany
198.5	Riga		Latvia
206	Antwerp		Belgium
214.2	Warsaw (No. 2)		Poland
216	Liége		Belgium
	Chatelineau		Belgium
	Brussels (Conférence)		Belgium
217	Königsberg		Germany
217.5	Flensburg		Germany
218.7	Salzburg		Austria
220.3	Beziers		France
222	Fécamp		France
224.4	Cork		Irish Free State
227.4	Cologne		Germany
	Münster		Germany
	Aachen		Germany
230	Malmö		Sweden
232.2	Kiel		Germany
234.4	Lodz		Poland
235.91	Kristianssand		Norway
237.4	Bordeaux-Sud-Ouest		France
239	Binche		Belgium
239.4	Nürnberg		Germany
240.2	Stavanger		Norway
242	Belfast		Ireland
244.7	Basle		Switzerland
	Cassel		Germany
245.9	Linz		Austria
246	Berne		Switzerland
247.7	Trieste		Italy
249.6	Prague (No. 2)		Czechoslovakia
250.6	Juan-les-Pins		France
251	Barcelona EAJ15		Spain
252.9	Gleiwitz		Germany
255.1	Toulouse PTT		France
257	Hörby		Sweden
259	Radio Cointe		Belgium
259.3	Leipzig		Germany
261.5	London National		Great Britain
263.8	Moravska Ostrava		Czechoslovakia
265.4	Lille		France
266.5	Valencia		Spain
269.8	Bremen		Germany
272	Rennes		France
273.6	Turin		Italy
276.5	Heilsberg		Germany

(Continued on page 268)

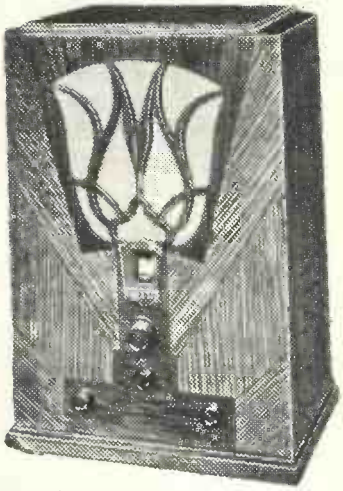
WORLD'S BROADCAST STATIONS—

Cont. from page 266

Wave-length	Name of Station	Dial Readings	Country
279.3	Bratislava		Czechoslovakia
281.6	Copenhagen		Denmark
282.5	Lisbon CTIAA		Portugal
283	Berlin		Germany
	Magdeburg		Germany
	Stettin		Germany
283.6	Brussels SBR		Belgium
285	Montpelier		France
285.2	Innsbruck		Austria
286	Radio Lyons		France
	Aberdeen		Great Britain
	Bournemouth		" "
	Dundee		" "
288.5	Edinburgh		" "
	Newcastle		" "
	Plymouth		" "
	Swansea		" "
291	Viipuri		Finland
293	Limoges PTT		France
	Kosice		Czechoslovakia
296.1	Tallinn		Esthonia
298.2	Huizen		Holland
299.5	Radio Iderza		Holland
301.5	North National		Great Britain
304.9	Bordeaux PTT		France
306.8	Falun		Sweden
307	Zagreb		Yugoslavia
309.9	Cardiff		Great Britain
311.9	Natan Vitus (Paris)		France
312.2	Genoa		Italy
312.8	Cracow		Poland
315	Marseilles		France
	Naples		Italy
318.8	Sofia		Bulgaria
	Dresden		Germany
321.9	Göteborg		Sweden
325	Breslau		Germany
327.5	Grenoble		France
328.2	Poste Parisien		France
331.5	Milan		Italy
334.4	Poznan		Poland
338.2	Brussels No. 2		Belgium
341.7	Brno		Czechoslovakia
345.2	Strasbourg		France
352.1	Barcelona EAJ1		Spain
	Graz		Austria
355.9	London Regional		Great Britain
360.6	Mühlacker		Germany
363.4	Algiers		North Africa
365.4	Bergen		Norway
367.6	Frederikstaad		Norway
	Helsinki		Finland
368.1	Seville		Spain
	Bolzano		Italy
369.4	Radio LL, Paris		France
372	Hamburg		Germany
376.4	Glasgow		Great Britain
378	Moscow Regional		U.S.S.R.
380.7	Lvov		Poland
384.4	Radio Toulouse		France
389.6	Frankfurt		Germany
390	Archangel		U.S.S.R.
394	Bucharest		Roumania
398.9	Midland Regional		Great Britain
403	Söttens		Switzerland
409.8	Katowice		Poland
413	Dublin		Irish Free State
416	Radio Maroc		North Africa
419.5	Berlin		Germany
423	Madrid EAJ7		Spain
424.3	Moscow (Stalin)		U.S.S.R.
431	Belgrade		Yugoslavia
435.4	Stockholm		Sweden
441	Rome		Italy
447.1	Paris PTT		France
453.2	Danzig		Danzig
	Klagenfurt		Austria
453.2	Porsgrund		Norway
	San Sebastian		Spain
459	Beromuenster		Switzerland
465.8	Tartu		Estonia
466	Lyons PTT		France
472.4	Langenberg		Germany
480	North Regional		Great Britain
488.6	Prague (Leiblitz)		Czechoslovakia
495	Trondheim		Norway
500.8	Florence		Italy
509.3	Brussels No. 1		Belgium
518.2	Vienna		Austria
525	Riga		Latvia
526.3	Palermo		Italy
532.9	Munich		Germany
541.5	Sundsvall		Sweden
550	Budapest		Hungary
555.6	Tampere		Finland
556	Hanover		Germany
559.7	Kaiserslautern		Germany
	Augsburg		Germany
565	Hamar		Norway
563	Wilno		Poland
569.3	Freiburg		Germany
574.7	Ljubljana		Yugoslavia
720	Moscow PTT		U.S.S.R.
777.5	Ostersund		Sweden
937.5	Kharkov		U.S.S.R.
1,000.	Leningrad		U.S.S.R.
1,053	Kootwijk		Holland
1,071.4	Scheveningen-Haven		Holland
1,075	Tiflis		U.S.S.R.
1,083	Oslo		Norway
1,117.3	Moscow (Popoff)		U.S.S.R.
1,153	Kalundborg		Denmark
1,175	Reykjavik		Iceland
1,204.8	Istanbul		Turkey
1,237	Vienna (Testing)		Austria
1,241.6	Boden		Sweden
1,284	Moscow (Trades Union)		U.S.S.R.
1,348.3	Motala		Sweden
1,380	Novosibirsk		U.S.S.R.
1,411.8	Warsaw		Poland
1,445.7	Paris (Eiffel Tower)		France
1,481	Moscow (Komintern)		U.S.S.R.
1,538	Ankara		Turkey
1,554.4	Daventry National		Great Britain
1,600	Irkutsk		U.S.S.R.
1,634.9	Königswusterhausen		Germany
1,744	Radio Paris		France
1,796	Lahti		Finland
1,875	Hilversum		Holland
1,935	Kaunas		Lithuania
2,525	Königswusterhausen		Germany
2,900	Königswusterhausen		Germany

BUY LOTUS
in the MODERN WAY

DON'T deny yourself the pleasure of this faultless reception just because times are hard and you would have to dip into savings to pay cash. Do as all sensible people now do and BUY OUT OF INCOME in the easy Lotus way.



Approx **6/11** per week

for 12 months

INSTALLED IN THE LONDON AREA FREE

DON'T WAIT
Send for details

Will Day
LIMITED

Telephone; Gerrard 4476

19, Lisle Street, Leicester Square, London, W.C.2.

ESSENTIAL FOR A GOOD RADIOGRAM

The Ideal Cabinet for the "Economy Radiogram," "1932 Super Sixty," "Everybody's Radiogram."

This new Vibranti Cabinet is of pleasing design. Whilst we cannot show you in an advertisement the actual finish, we guarantee that it is carried out by experts of the highest order and is second to none.

PRICES :

Cabinet fitted with Collaro double-spring motor,
£3 . 12 . 6

Cabinet fitted with Collaro single-spring motor,
£3 . 4 . 0

Cabinet only,
£2 . 5 . 0

Finished in oak, mahogany, or walnut. Motorboard drilled for above motors if requested.

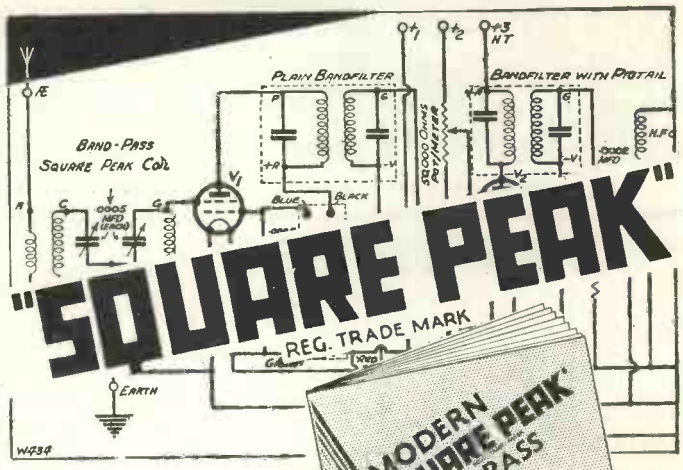
All carriage paid.

Inside dimensions :
Height, 37 in.; width, 19 in.; depth, 16 in.

Takes baseboard up to 19 in. by 15 in.

Panel opening, 13½ in. by 6¾ in., or can be cut to your own measurements.

VIBRANTI - PRODUCTS CO.,
308 Euston Rd., London, N.W.1



"SQUARE PEAK"
REG. TRADE MARK

Secure the wonderful improvements of "Square Peak" Band-pass tuning! The new FREE "Square Peak" circuit booklet shows you how to build modern band-pass receivers — S.G. sets, simple Detector sets and super-hets.

"SQUARE PEAK"— Britain's unbeatable band-pass coils give band-pass tuning at its best. Complete with universal mounting bracket 15/- each.

Varley

Advert. of Oliver Pell Control, Ltd.

SECURE YOUR FREE COPY BY USING THIS COUPON NOW

To Messrs. VARLEY, Kingsway House, 103 Kingsway, London, W.C.2

Please send me, free and post free, the "Square Peak" circuit booklet entitled MODERN "SQUARE PEAK" BAND-PASS CIRCUITS FOR EVERY REQUIREMENT.

Date.....

NAME .....

ADDRESS .....

.....

W.M.

GUIDE TO THE WORLD'S BROADCASTERS

Specially Compiled for "Wireless Magazine" by JAY COOTE

31.38 Metres — *Power: 8 Kw.*

ZEESEN
(*Germany*)

9,560 Kilocycles

Distance from London: 588 miles.

Standard Time: Central European (G.M.T. plus one hour, that is, coincides with B.S.T.).

Announcer: Man.

Call: "Achtung! Achtung! Hier der Deutsche Weltrundfunksender auf Welle einunddreisizig komma achtundreiszig" (if own broadcast). The call varies according to station relayed; see below.

Interval Signal: Metronome (120 beats per minute) if relaying Berlin; otherwise, signal of studio providing programme.

Times of Transmission: Relays Berlin and other German studios from G.M.T. 13.00 onwards. Usually closes down at 23.30 with German good-night greetings and *Deutschlandslied* (National Anthem; melody: Haydn's Hymn *Austria*).

Tests are also being carried out occasionally on 19.72 metres (15,210 kilocycles).

42.9 Metres — *Power: 2 Kw.*

LISBON (CT1AA)
(*Portugal*)

6,991 Kilocycles

Distance from London: 975 miles.

Standard Time: Greenwich Mean Time.

Announcer: Man. All announcements are made in Portuguese, Spanish, English, French and (sometimes) in German.

Call: "Estacao Radio Lisboa": (in English) "This is the Portuguese amateur radio station CT1AA at Lisbon."

Times of Transmission: G.M.T. 22.00 to 24.00 (Fridays only). Transmissions are also carried out by this station on Mondays, Wednesdays and Saturdays on 282.25 metres between G.M.T. 21.20 and 23.20.

Closes down with the playing of the Portuguese National Anthem.

49.96 Metres — *Power: 2.5 Kw.*

TEGUCIGALPA (HRB)
(*Honduras*)

6,005 Kilocycles

Distance from London: 4,270 miles.

Standard Time: Greenwich Mean Time less 6 hours.

Announcer: Man. All announcements are made in both the Spanish and English languages.

Interval Signal: Cuckoo call (thrice).

Call: "This is radio station HRB, Tegucigalpa, Honduras," also repeated in Spanish.

Times of Transmission: Daily (except Sundays) 24.00 to 05.00 G.M.T., concerts; news bulletin supplied by the *el Cronista* daily paper; relay of performances by the Municipal Band.

50 Metres — *Power: 60 Kw.*

MOSCOW (RV59)
(*U.S.S.R.*)

6,000 Kilocycles

Distance from London: 1,555 miles.
Standard Time: Greenwich Mean Time plus three hours.
Announcers: Man and woman.
Call: The call and announcements are made in various languages according to the countries to which the transmission is destined, for example (in English) "Hallo! This is the Moscow station of the Trades' Council of the Soviet Union calling! Workers of the World, unite": (in French) "Attention, c'est Moscou qui parle. La grande station du Conseil Central des Syndicats professionels de l'URSS, longueur d'onde 1,304 metres (230 kilocycles) avec relai sur onde courte de 50 metres (6,000 kilocycles)," etc., etc.
Times of Transmission: At various times during the day relays are made of broadcasts from Moscow (T.U.) and other transmitters. International broadcasts are carried out daily from 19.00 or 20.00 G.M.T. onwards. Opens with *L'Internationale* (gramophone record). G.M.T. 20.59, relay of carillon of Kremlin bells and midnight time signal. Closes down as Moscow (T.U.); "Dass Veedanja (twice) spakoiny notchi; vashi antenni" (Good-bye, good-night; earth your aerials.)

(*Revised*)

222 Metres — *Power: 5 Kw.*

FÉCAMP
(*France*)

1,351 Kilocycles

Distance from London: 114 miles.
Standard Time: Greenwich Mean Time (France adopts B.S.T.).
Announcers: Man and woman.
Call: "Ici poste de Radio Normandie à Fécamp." As many concerts are destined to British listeners, announcements are also made in the English language: "This is Radio Normandie calling."
Opening Signal: Vocal gramophone record: "Nos Vieux Pommiers."
Interval Signal: (Irregular) high-pitched bell.
Main Transmissions: G.M.T. 12.00, concert and news bulletin (week-days, exc. Mon.); 18.00, relay of chimes and time signal from old Benedictine Monastery (Fécamp); 19.30, concert; 21.30 relay of broadcasts from Le Havre, Rouen, le Tréport, etc. On Sundays, sponsored concerts are transmitted from midnight (Saturday) until 3.0 a.m., then from 18.01 until 3.0 a.m. (Mon.). Closes down with the usual French "Bonsoir" greetings followed by folk song, *Ma Normandie.*

255 Metres — *Power: 7 Kw.*

TOULOUSE (PTT)
(*France*)

1,175 Kilocycles

Distance from London: 552 miles.

Standard Time: Greenwich Mean Time (France adopts B.S.T.).

Announcer: Man.

Call: "Allo! Allo! Ici le poste de radiodiffusion des PTT de Toulouse-Pyrénées"; between items "Ici Toulouse-Pyrénées" (*phon.*: Pee-ren-ay).

Main Transmissions: Relays Ecôle Supérieure (Paris PTT); Bordeaux-Lafayette, Lyons and Marseilles PTT. When own programme: 20.30 G.M.T.

Closes down as other French PTT stations (q.v.) with good-night greetings followed by *La Marseillaise* or local march *La Toulousaine.*

291 Metres — *Power: 13.2 Kw.*

VIIPURI
(*Finland*)

1,031 Kilocylces

Distance from London: 1,270 miles.

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

Announcers: Man and woman.

Call (in Finnish): "Huomio! Huomio! taala suomen Yleisradio Helsinki-Lahti"; (in Swedish) "Giv akt! Giv akt! Har Finlandsrundradio Helsingfors-Lahti."

Standard Daily Transmissions: Relays Helsinki and Lahti (q.v.). Good-night: "God Natt" (twice).

424.3 Metres — *Power: 2 Kw.*

MADRID (Radio España)
(*Spain*)

707 Kilocycles

Distance from London: 802 miles.

Standard Time: Greenwich Mean Time (Spain does not adopt B.S.T.).

Announcer: Man.

Language used: Spanish only.

Call: "Aqui Estaçion Radio España."

Daily Transmissions: G.M.T. 17.00-19.00, concert and news; on Mondays programme is extended until midnight.

Good-night: "Buenas Noches, Senores. hasta mañana" (until to-morrow).

In Tune with the Trade

SEND TO US FOR THESE CATALOGUES!

Here we review the newest booklets and folders issued by six 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 ½d. stamp, to "Catalogue Service," WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. *Valid till April* 30

MAKING A "GOOD-LOOKER"

I WONDER if your set errs on the side of not being a good-looker. So many outfits on which, in my private life I have to pass friendly comment are good in performance but so ugly in contour that if I suffered from a sensitive asthetic sense I should positively writhe.

Nowadays cabinet prices are so low that it seems a shame to spoil a good set by an unlovely cabinet.

One of the many concerns making good cabinets, the Woodcrafts Co., have sent in an illustrated booklet giving dozens of styles of console set and radiogram cabinets, which you can buy complete or which can be supplied in kits of parts, ready for assembly. Easy!

At least, you will think so after reading through the new Woodcrafts booklet. **252**

◆ ◆ ◆

TRIX MAINS PARTS

I SEE that the Trix people are developing a wide range of mains parts, chiefly power transformers and chokes. A new leaflet which this concern has been good enough to send me and which you can get free through my catalogue service gives details of five new mains transformers and three chokes.

The transformers give various outputs for high-tension and low-tension supplies and one type has three low-tension outputs. Two 30-henry chokes and one 20-henry choke are available, carrying working currents of from 30 to 60 milli-amperes.

The prices of all these new parts are very reasonable and before building up any mains apparatus you would do well to get particulars of these new Trix parts. **253**

◆ ◆ ◆

CHOOSING A "MIKE"

YOU folk who use your sets for occasional public-address work, for home gramophone recording and for party "stunts" often find the need for a microphone.

Claude Lyons, Ltd., market some good "mikes." A four-page folder has just come to hand describing several microphones for all kinds of radio purposes. Some of them are ambitious double-button jobs costing £20 and suitable for high-quality broadcasts.

Others, such as the Baby-Mike, cost only just over £2 and are quite suitable for gramophone recording and small public-address work. The folder also gives particulars of condenser microphones, microphone amplifiers, transformers, volume controls and other useful accessories, all in the same line of business, as it were. **254**

◆ ◆ ◆

MOTOR LOUD-SPEAKERS

IF you want technical details of a really good permanent-magnet moving-coil loud-speaker, the British-made Motor, then write for a free folder, obtainable through my catalogue service. The new P.M. type is available in two types, one with a power transformer giving two tappings and one with a pentode type 30.1 ratio transformer.

The loud-speaker is of normal construction with a large permanent magnet of cobalt steel. It is a neat job. The cone diameter is 8 in. and the overall dimensions of the loud-speaker are 10¾ in. in diameter by 5 in. in depth.

The price is only £3 10s. and if you feel that a loud-speaker of this type is what you want for your new set then get the folder giving details of it. **255**

A TRANSPORTABLE RADIOGRAM

CLIMAX have produced a transportable type of radiogram which strikes me as being a distinct novelty. It consists of a mains-driven transportable set with a modern screen-grid, detector and pentode output circuit and integral moving-coil loud-speaker. The top of the console opens, disclosing the electric gramophone equipment.

The console cabinet measures only 20 in. high by 15 in. wide by 12 in. deep. So you see, it is a kind of set which will stand on an *escritoire* (or, vulgarly speaking, table) in the corner of the room and not be obtrusive.

It has all the essentials—single-knob tuning, trimmer adjustment from the front, illuminated dial, radio and gramophone volume controls, and so on.

Climax Radio Electric, Ltd., issue an illustrated folder describing this new radio gramophone. **256**

◆ ◆ ◆

NEW IGRANIC LOUD-SPEAKER

I SHOULDN'T be a bit surprised if an acquaintance of yours has not, by now, one of the new Igranic permanent-magnet loud-speakers; in which case you will need me to tell you about it technically.

In case it hasn't come your way, though, I recommend Sheet No. 6746 from Igranic, which tells the whole story about this interesting newcomer. It can be obtained with or without an input transformer, and a number of types are available for matching up the ordinary power valves or pentodes.

The permanent magnet, of rather unusually large dimensions, is of the conventional star shape and the whole construction of the job strikes me as being soundly arranged.

A 10-in. diameter cone is provided, mounted in a cast aluminium frame. You will agree that a high-quality instrument of this description for only £2 (without input transformer) is good value. **257**

Would you like to hear in your home the Luxury of the Ultra-Modern Columbia RADIO-GRAPHOPHONE

Read what this delighted owner says:—

"Last November I purchased one of your Model 602 O C Radio-Graphophones and feel it is only right to let you know of my complete satisfaction with it. (I have been using a moving coil speaker the last four years, latterly fed from L.S.5 A's with 400 volts on their plates, so you will appreciate that my opinion is not that of a converted 'coupon-set' user.)

"This is the first commercial set I have purchased and before doing so I made a point of hearing as many makes as possible; the Columbia was outstanding in performance and since then I have had no reason to regret my choice" . . . . and we invite YOU to hear it in YOUR home.

MODEL 602

32 GNS.

or from £2 14s. monthly.

A single knob turns the tuning scale, marked in station wave-lengths. Ultra selective 3 valve circuit (2 screen-grid), band pass tuning, moving coil speaker, electric gramophone motor, for A.C. or D.C. mains.

Use the Coupon below for FREE TRIAL in your own home

A superb upright model in which brilliance of gramophone reproduction is combined with powerful and selective radio reception. Built for the man who likes the best in music, but at a price much below that hitherto asked for such an instrument. Its simple and efficient control ensures the certainty of perfect music . . . . . This model can also be heard in your own home. For A.C. and D.C. mains.

MODEL 603

40 GNS.

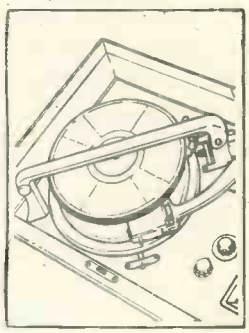
or from £3 8s. monthly.

The New Automatic Record-Changer

This model is identical with 603 but is fitted with the new Automatic Record-changer by which 8 records can be played without attention—an hour's gramophone entertainment with only one change of records. For A.C. only.

Model 604 - 47 gns.

or from £3 19s. 6d. monthly.



(a) *I should like to hear Model ..... playing in my home without cost or obligation to myself.

(b) *I should like a Catalogue of Columbia Radio-Graphophones and/or Columbia Radio

*Cross out if not required.

Name .....

Address .....

.....

Cut this out and post it in an unsealed envelope bearing a ½d. stamp to Columbia, 101, Clerkenwell Road, London, E.C.1.

ALL-BRITISH **Columbia**

Backed by Columbia National Service

Five other Radio models from £5

When you send your order don't forget to say you "saw it in the W.M."

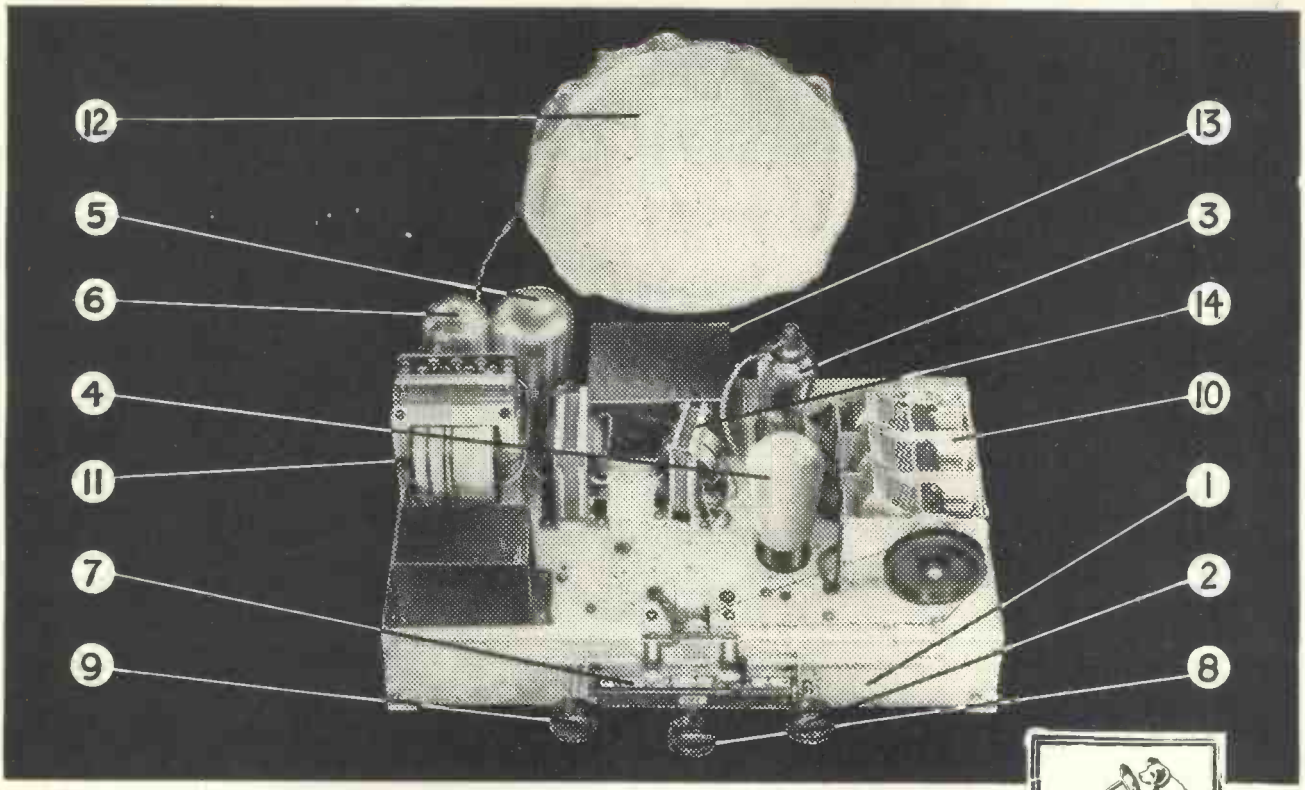
A FREE COPY OF THE WIRELESS MAGAZINE

THE interest and pleasure which you derive from the "Wireless Magazine" will be greatly enhanced if you can discuss its monthly articles with a friend who is also familiar with its contents.

In order that anyone you know who is interested in wireless but is not yet a reader of "Wireless Magazine" may become acquainted with it, a complimentary copy will be sent to him gratis and post free, if you will kindly complete the attached coupon, or if you do not wish to mutilate your copy, send your request on a postcard.

THE "WIRELESS MAGAZINE" IS "THE BEST SHILLINGSWORTH IN RADIO." Tells you every month all you want to know about recent progress in Radio Design. Look out for the May issue on Thursday, April 21.

POST THIS COUPON NOW



Precision Engineering— not at one point— but at every point!

The above photograph of the chassis and loudspeaker removed from the walnut cabinet of the "His Master's Voice" Model 435 shows the clean layout and sturdy construction of the radio-receiver that has been described in the technical press as "one of the most outstanding triumphs of the British Radio Industry."

(1) Cadmium plated chassis.

(2) Combined "On — Off" and wavelength switch, automatically presenting appropriate scale.

(3) Screened-grid high frequency valve making all worth-while stations audible.

(4) Leaky-grid detector valve, ensuring superb quality of reproduction.

(5) Super power pentode output valve.

(6) Rectifier valve enabling receiver to be operated direct from electricity mains —no batteries.

(7) Four separate illuminated scales showing "off," "medium waves," "long waves" and "gramophone."

(8) Single tuning knob moving pointer across wavelength scale.

(9) Combined volume control for radio and gramophone pick-up.

(10) Three ganged condenser and band-pass filter circuits provide knife-edged tuning from a single knob.

(11) Specially designed mains transformer enables instrument to operate from different voltage ranges by a single plug and socket system.

(12) New type permanent magnet moving-coil loudspeaker, housed in a dust-proof cover to keep fine gap clear of dust.

(13) Additional loudspeaker, remote volume control and gramophone pick-up sockets.

(14) Intervalve transformer may be swivelled into position, securing the minimum of hum.

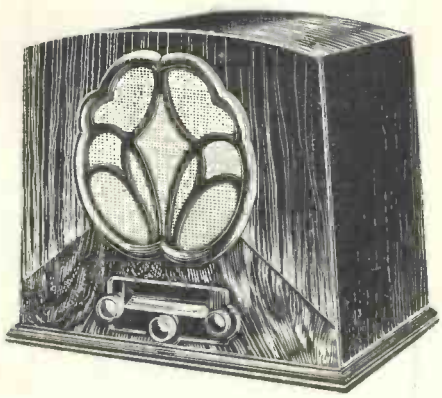
His Master's Voice

"His Master's Voice," Model 435, three-valve radio-receiver — Band-pass tuning — single dial control — incorporating moving-coil loudspeaker. 1½ to 2 watts output. Mains aerial in A.C. Model.

Voltage ranges and consumption — A.C.: 95-164, 190-260 volts, 50-100 cycles; 35 watts. D.C.: 190-250 volts; 60 watts.

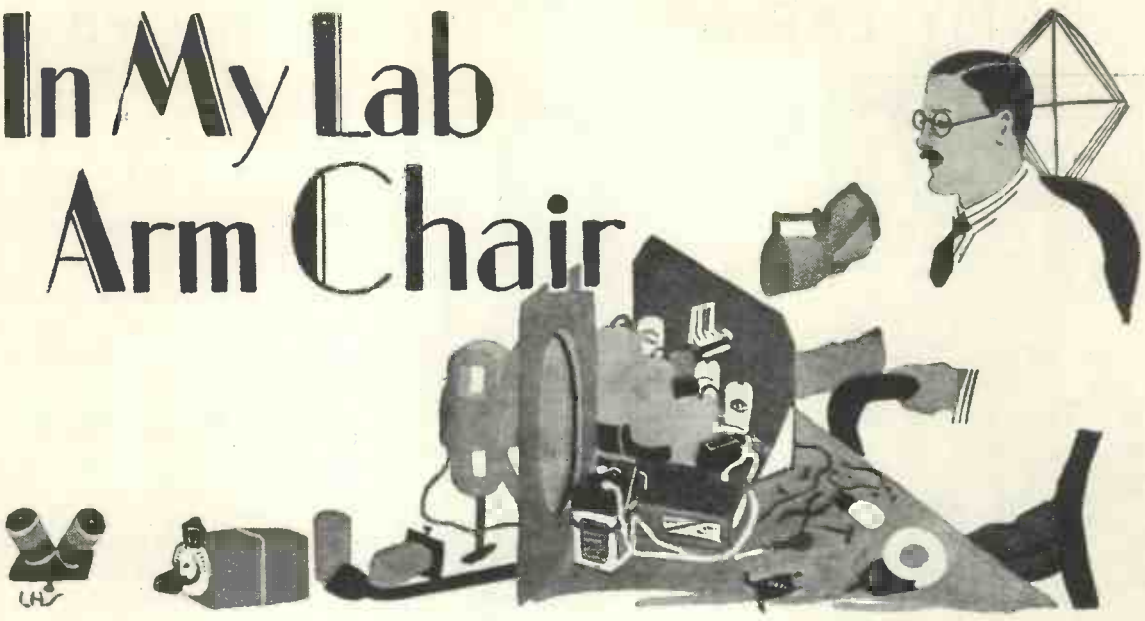
PRICE 20 GNS

or on Easy Hire Purchase Terms



The Gramophone Co. Ltd. London, W.1.

In My Lab Arm Chair



We have pleasure in presenting this month two contributions from the pen of PERCY W. HARRIS, the well-known radio journalist and designer, who will in future write regularly for "W.M." Mr. Harris has only recently come back to this country after a year spent in the United States; below he discusses some of the changes he found on his return. His second article appears on page 325 of this issue

IT does everybody good to get away from their accustomed haunts for a little time and then to return and get a fresh viewpoint. I felt quite a thrill on opening the door of my laboratory after returning from America. It seemed good to be in it again, but many of the things with which I had been so familiar before seemed slightly strange. My valve rack, for example!

American Valves

Working in the United States for a year had made me accustomed to the American valves, which have different bases, different characteristics and a different general make-up. Glancing over the British valves I picked up two or three and looked at them critically. "Are they better or worse than the American valves?" I asked myself. Just what are the real differences?

To judge differences you must, of course, make comparisons, and here I had brought home to me very forcibly the enormous variety of valves made in this country. Do we really need them all?

Here are two-, four-, and six-volt valves, low-frequency valves of several different types, important differences in what is supposed to be the same type of valve made by different manufacturers, different physical dimensions, different markings, different names—all to what end?

We have standardised valve bases long ago, and the British valve has evolved itself from a varied ancestry just as the modern Englishman has Norman, Saxon, and other blood in his veins.

The first valve I bought after the War was French and the next a British copy of the French. Even the present pin arrangement originated in France and there was no important difference in the make-up of the inside of the valve as far as appearance was concerned (although there were several electrical differences) until we copied the flat plate from the Americans. From this source, too, we took the idea of the very "hard" vacuum.

Before the American quantity production of radio sets could be undertaken it was necessary to standardise valves, not only as to the bases, but also as to the electrical characteristics. Nowadays, if you buy a seven-, eight-, or nine-valve American set it will be clearly marked as to what types of valves are to be inserted and into which sockets. There are a number of competing valve makers, but they make valves with closely similar electrical characteristics, so that, as I just said, if you buy one of these sets you can get equally good results with several different makes of valves.

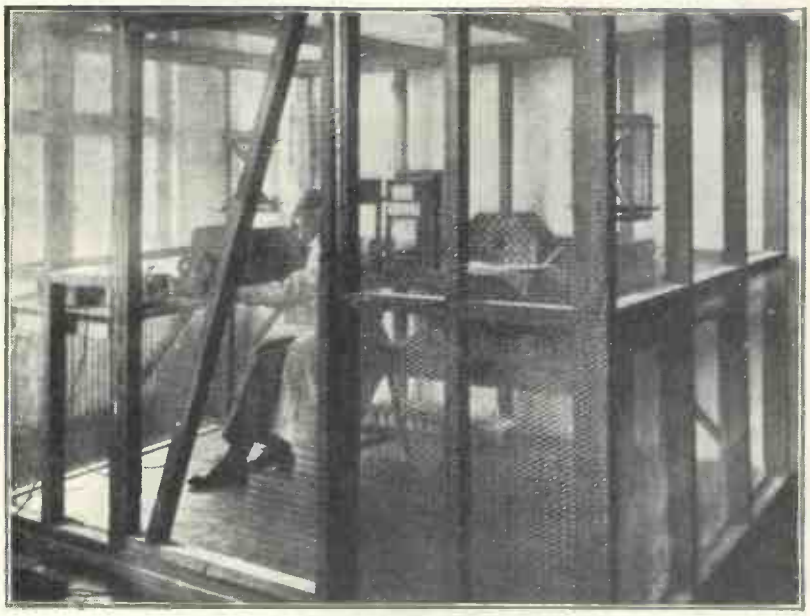
Characteristic Differences

In England if such multi-valve sets were made I doubt very much whether a change from one make to another would be successful, owing to important differences in characteristics.

The British valve, from the point

Percy W. Harris, M.INST.RAD.E., *Now Contributes Exclusively and Regularly to "Wireless Magazine" and "Amateur Wireless." He Returns Fresh to Radio Journalism After Two Years' "Holiday" and Has Many Interesting Schemes In Hand for Britain's Two Leading Radio Periodicals*

IN MY LAB ARM CHAIR—Continued



IN A WIRE CAGE—BUT NOT AT THE ZOO!
Engineers in a German laboratory work in a wire cage—called a Faraday cage—to shield them from outside interference when testing sensitive receivers. An aerial is pushed out between the meshes when distant reception is required

of view of efficiency, is very much better than the American, if you consider electrical efficiency and the possible gain per stage. In many cases you can get as good a signal with three British valves as with five American, but—this is a very important but, too—their very high efficiency can sometimes be a drawback in commercial design.

American Designers

The American designer works on a comparatively low gain per stage, knowing that with modern conditions a number of tuned circuits are necessary, so he prefers to make a receiver with several low-gain stages to give a certain overall magnification, rather than obtain the same magnification with fewer valves and therefore fewer stages.

The lower the gain per stage, the more latitude there is in design, values not being so critical. In this country, owing to the method of charging a royalty not, as I consider it should be charged—on the net selling price of the receiver—but on the number of valve sockets, design is considerably hampered.

Royalty System

In America the manufacturer pays his royalty as a percentage on the price at which he sells the set (excluding the cabinet work). He therefore has a direct incentive to get good results at a low cost; over here a manufacturer who can, by careful design and ingenious construction, bring out a five-valve set to sell wholesale at, say, fifteen guineas, pays a higher royalty than the manufacturer who, with less ingenuity in design, gives only a three-valve set for the same money.

Put in another way, the cheaper a manufacturer makes a set in this country, the higher the proportion of royalty to his cost of manufacture, which seems to me to be all wrong.

I was interested, too, on returning home to find how in my absence the popularity of the moving-coil loud-speaker had increased and how excellent these reproducers had become. Prices, too, are highly attractive.

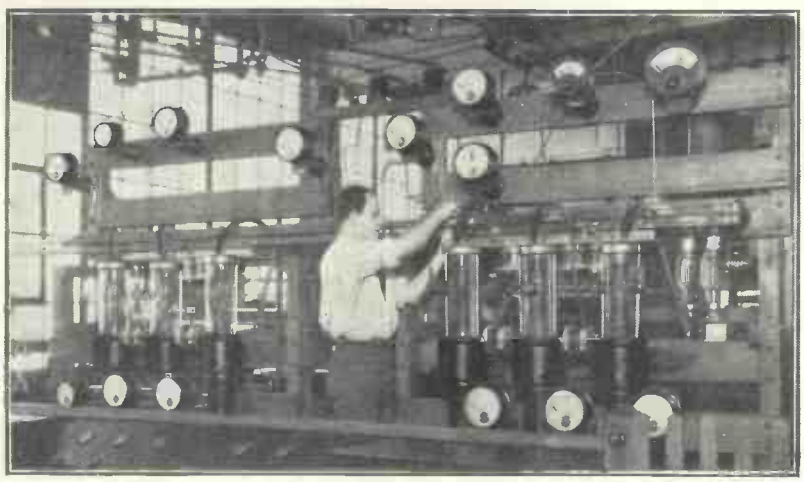
Loud-speaker of the Future

When I first described the modern moving-coil type of loud-speaker as the result of the demonstrations which Rice and Kellogg gave me in the Schenectady laboratories in 1925, I felt convinced that here indeed was the loud-speaker of the future.

For a time all attention seemed concentrated on the bass notes, as here, for the first time, was a loud-speaker which would give a genuine bass. The trouble was, of course, that, although many of the earlier moving-coil makers did not recognise it, much of the bass which had been thought to be true was nothing but a peak or boom in the lower register.

Discrimination

It sounded, however, so natural compared with the thin tinny reproduction to which we were accustomed that it passed muster as the real thing. It took a year or two for the discriminating experimenter to realise that, in many cases, he had obtained bass at the sacrifice of " top," but the human ear is so accommodating that even now many people do not recognise an absence of vital high frequencies in some sets.



ONE OF AMERICA'S GIANT TRANSMITTERS
An interesting view of the high-power station at Schenectady, in the United States. British listeners can pick up its transmissions on wavelengths of 19.56 metres (W2XAD) and 31.48 metres (W2XAF

INTERESTING LOUD-SPEAKER PROBLEMS

Since transformer makers first "boomed" the response curve of their transformers, implying thereby that receivers built with their instruments would give uniform reproduction up to 6,000 or 7,000 cycles, we have come to look upon curves as vital indications of quality.

This is true enough provided we remember all the other factors in a receiver, which reminds me that to measure the performance of a complete radio receiver (including the loud-speaker) is still one of the most difficult things in the art.

Our Ears

Most overall response curves of receivers are measured at the loud-speaker terminals, whereas the test that really matters is how will it sound to our ears, and this, of course, includes a test of the loud-speaker.

Have you ever realised how difficult it is to decide on what you really want to know about a set? Let us presume you have a complete transportable receiver. You want the reproduction to sound as much as possible like the real thing; you want, in fact, such an illusion of reality that on shutting your eyes you could easily imagine you are in the concert hall or wherever the original sound is coming from.

Now, sound reproduction is largely dependent on conditions. If your room is heavily draped in a certain way the walls and carpets may absorb certain frequencies and not others. Put the set in a barrack room and an entirely different set of conditions exists. Even moving it from one room to another may make it sound different.

What volume do you want the set to work at? The human ear is a very peculiar instrument. Take, for example, the reproduction of the human voice. If it is reproduced accurately at the normal intensity then doubling the intensity will give an illusion of too much low-note reproduction, for the response curve of the ear—if I can call it such—is different for different intensities.

Varying Intensity

At a certain level of strength you may hear all sounds as of equal intensity. Double all these intensities and you will hear some louder than others.

Introducing Percy W. Harris!

PERCY WOOTTON HARRIS, *who now contributes radio articles exclusively to "Wireless Magazine" and "Amateur Wireless," has grown up with radio. In* 1910 *he joined the Marconi Company as a wireless operator, later becoming chief telegraphist to His Highness the Khedive of Egypt on board the royal yacht, "Mahroussa." During the war he organised special training courses. Afterwards he became managing editor of the "Wireless World"; he later edited "Conquest" and, following the foundation of "Amateur Wireless," in* 1922, *Mr. Percy Harris joined the Radio Press, Ltd., where he rapidly made a name through his work on the simplification of home-constructor sets. In* 1929 *Mr. Harris forsook radio journalism for a time and joined Dr. James Robinson in development work on the Stenode receiver. He spent much time in the United States in the capacity of president of the Stenode Corporation of America. Towards the end of last year he resigned from his Stenode activities and returned to England. He will now return to radio journalism and continue his previous successes through the medium of "Wireless Magazine" and "Amateur Wireless." As far as radio is concerned, he will design and write exclusively for these two periodicals.*

GETTING READY FOR NEW STATIONS

German engineers making measurements with a portable transmitter to determine the best location for a new station. During 1932 five new German broadcasting stations will be put in operation—Leipzig, 150 kw.; Breslau, 75 kw.; Hamburg, 75 kw.; Munich 75 kw.; and Frankfort, 25 kw.

A WIRELESS CROSS-WORD PUZZLE

WITH FOURTEEN SPLENDID PRIZES

HERE is an opportunity for you to pass a pleasant quarter of an hour solving a cross-word puzzle with wireless clues and at the same time to win a useful prize.

There are no difficult rules to be observed and the closing date is not until April 21. The prizes offered are all of real value to the radio enthusiast ; they are presented by courtesy of the respective manufacturers. Here is the list :—

1.—**Cossor Empire Melody Maker Kit (value, £6 15s.).**
2.—**Set of Lewcos coils and low-frequency transformer for the Ideal Home Super (value, £2 12s.).**
3.—**Two Guineas worth of T.C.C. fixed condensers.**
4.—**Exide Low-tension accumulator (value, £2).**
5 to 10.—**A Telsen 3 Kit (value, £1 19s. 6d.), that is six kits in all.**
11.—**Blue Spot type 100U inductor loud-speaker (value, £1 19s. 6d.).**
12.—**Set of Colvern coils for the Quadradyne (value, £1 17s. 6d.).**
13.—**Two Jackson variable condensers for the Ideal Home Super (value, £1 13s. 6d.).**
14.—**Drydex high-tension battery (value, £1 4s.).**

Following are the simple rules to be observed:—

(1) *All entries must be made on the form on this page and must bear the sender's name and address. More than one entry can be made, but each must be on a form cut from* "Wireless Magazine" *and should be sent in a separate envelope.*

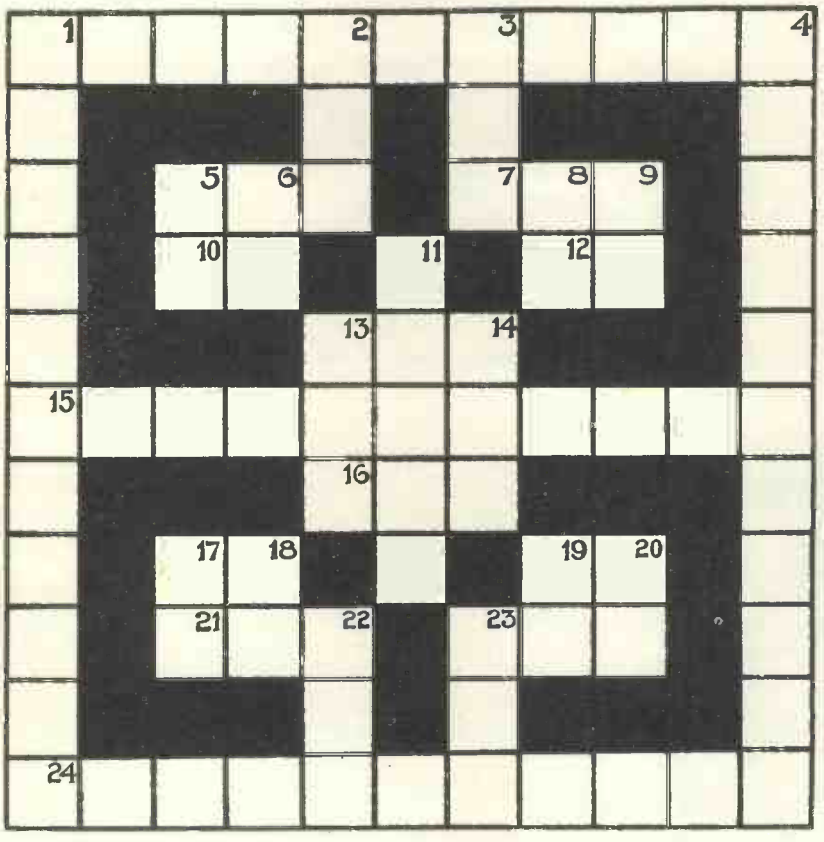
(2) *Entries must be addressed to* "Wireless Magazine" *Cross Words, 58-61 Fetter Lane, London, E.C.4, and sent so that they arrive not later than the first post on April 21. Entries received before that date will not be opened until the morning of April 21. All envelopes will be thoroughly mixed before being opened.*

(3) *No correspondence can be entered into and in any contingency the Editor's decision must be taken as final, and as legally binding.*

(4) *The first prize will be awarded to the sender of the first correct solution to be opened; the second prize to the sender of the second correct solution opened; and so on. In the event of no competitor sending an entirely correct solution the first prize will be awarded to the sender of the solution with the fewest mistakes, and so on.*

(5) *No employees of Bernard Jones Publications, Ltd., are eligible to compete.*

CUT OUT ROUND DOTTED LINE



NAME.....

ADDRESS.....

.....

Send to "Wireless Magazine" Cross Words, 58/61 Fetter Lane, London, E.C.4 by April 21, 1932

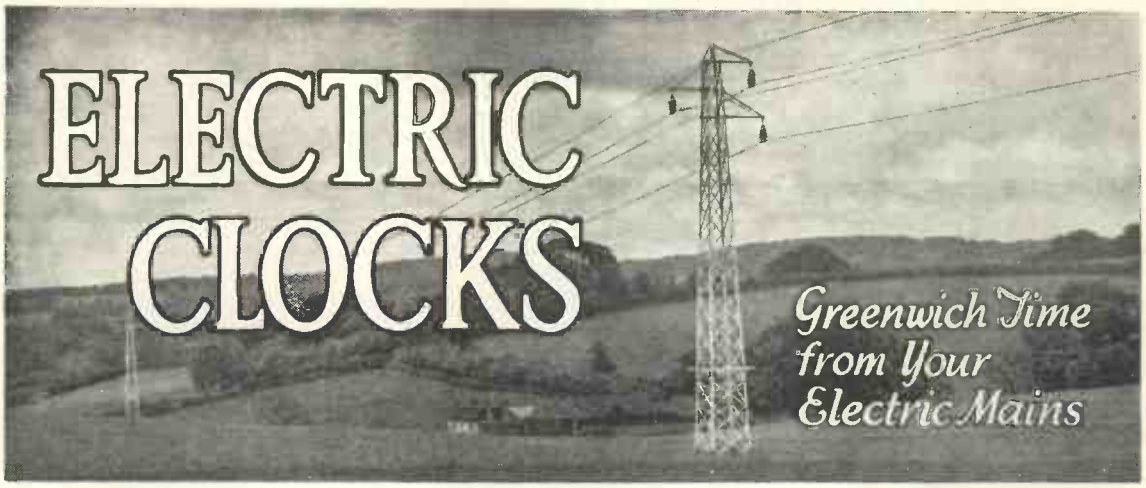
CLUES

Across

1. Coupling component
5. Double-wound silk (abbrev.)
7. Morse prefix announcing shipping radiotelegram
10. Amateur nationality prefix for Portugal
12. Standard abbreviation meaning "word after"
13. Short for "disconnection"
15. State in U.S. Amateur Radio 5th District
16. Single-cotton covered (abbrev.)
17. Transformer marking
19. Peruvian amateurs' nationality prefix
21. Standard wire gauge (abbrev.)
23. French for "wireless" (abbrev.)
24. Reaction

Down

1. Sender
2. Distress signal
3. Electrical unit
4. Sometimes occurs with oscillation
5. Direct current (abbrev.)
6. Wireless telegraphy (abbrev.)
8. Short wave (abbrev.)
9. Morse abbreviation meaning "Go ahead"
11. Used in television
13. Same as No. 13 across
14. Wire used for coils (abbrev.)
17. Transformer marking
18. Primary winding (initials)
19. Found in company with No. 17 down
20. Audio frequency (abbrev.)
22. Wireless licensing authority (initials)
23. Analogy-word for letter T



Their Convenience Explained by J. H. REYNER, B.Sc., A.I.M.E.E.

I REMEMBER walking into a friend's office some time ago and seeing on his table a small attractively finished clock, having a large seconds hand which was steadily rotating. There was no jerk in the motion at all and this easy, unhurried rotation fascinated me to such an extent that my attention wandered several times.

I gathered upon inquiry that it was an electric clock operating from the supply mains. It was not long before I had one myself.

Time from the Mains

What is this "time from the mains," as it is called? Actually it is a by-product of the Grid Scheme, whereby the whole of Great Britain is being linked up into one vast network for the supply and distribution of electricity. Alternating current is used for the power supply, and as a necessary corollary direct-current supply is tending to disappear, being replaced with alternating current at 230 volts and 50 cycles.

The term "50 cycles" refers to the number of alternations per second. The current flows first in one direction and then in the other in a smooth and rythmic manner fifty times a second. We can make use of these alternations in the current to produce certain special effects which a steady current would be unable to do. One of these effects is that of driving a suitably constructed motor, and it is a development of this principle which is utilised in these electric clocks.

Let us consider a very simple motor drawing its energy from an alternating-current supply. Fig. 1a shows a small bar magnet pivoted about its centre and capable of rotation.

Placed in proximity to this rotor are two electromagnets, so arranged that when current passes through them one is a north pole and the other is a south pole. In Fig. 1a the rotor has its north pole slightly to the left of the top electromagnet.

Suppose a current is passed through the winding in such a direction that the top magnet becomes of south polarity. Opposite magnetic poles attract one another. Consequently the north pole of the rotor will be attracted to the top electromagnet.

In the same way the bottom pole will be of north polarity and will, therefore, attract the south pole of the rotor. Both these two effects will cause the magnet to rotate into the position shown in Fig. 1b.

CLOCK AND LOUD-SPEAKER
The Baker electric clock is incorporated in a moving-coil loud-speaker cabinet

The rotor, however, will have acquired a certain momentum in getting up speed and it will, therefore, continue to rotate. If we switch off the current until the magnet has swung past the mid position and then switch it on in the opposite direction, we shall obtain the condition of affairs in Fig. 1c.

The north pole of the rotor is now approaching the bottom pole, and as we have reversed the direction of the current this pole is now a south pole instead of a north pole, as previously. It therefore continues to attract the magnet and maintains the rotation.

Effect of A.C.

Now in an alternating-current supply we do not switch off the current and reverse it suddenly, but we gradually reduce the current from its maximum value and then cause it to flow in the opposite direction.

It will be clear that this produces the same effect, and consequently the rotor will revolve continuously at a steady speed controlled entirely by the supply frequency.

Obviously if the current changed direction a little more frequently the rotor would have to revolve slightly faster in order to keep up and vice versa. Therefore we say that the rotor rotates in *synchronism* with the supply and the device is termed a *synchronous* motor.

Now if the supply frequency is 50 cycles per second, our rotor must make 50 revolutions per second, that is, 3,000 revolutions per minute. In some forms of electric clock the rotor actually does revolve at this speed.

On the other hand, some clock

ELECTRIC CLOCKS—Continued

EDISWAN-SANGAMO MODEL 406b
Consumption : .75 watt. Speed : 166 r.p.m.
Non-starting. Seconds disc (£2 5s. 6d.)

makers prefer to operate at a lower speed. This is done by using more poles on the motor. If, for example, we used two pairs of poles instead of just the one pair shown in Fig. 1, and still arranged each pole to be alternately north and south as shown in Fig. 2, then the armature would only have to rotate a quarter of a revolution at each change in direction of the current instead of half a revolution as before.

Therefore, its synchronous speed would be 1,500 per minute, instead of 3,000, and by using a large number of poles, say twenty, we could reduce the speed of rotation to 150 revolutions per minute.

Control System

Now the frequency of the modern A.C. supply is kept constant within very close limits by comparison with Greenwich time. For this purpose a large dial is used; over this two hands rotate.

The first of these is controlled by a master clock automatically corrected by time signals from Greenwich at periodic intervals. The other hand is controlled by a small motor of the type just described, driven by the electric supply and therefore controlled by the frequency. If the frequency is correct these two hands will rotate together, while if it is slightly high, the frequency hand will gain on the standard hand and vice versa.

Due to the very fine governing of the turbines of a modern power station the variation is exceedingly small, and it is only necessary for the control engineer periodically to glance at the clock and to make sure that the hands are not more than a few seconds out of step.

If the variation is more than this a very slight alteration to the speed of the generator will bring the frequency back to its correct figure.

SYNCLOCK, BOLNEY MODEL
Consumption : 2 watts. Speed : 3,000 r.p.m.
Self-starting. Tell-tale indicator (£2 2s.)

Each of these hands drives two clock dials through suitable gearing, giving standard time and frequency time side by side, which constitutes a further check.

It follows, therefore, that any other clock connected to the supply system will always maintain correct Greenwich time. It is not true to say that it will never vary from strict Greenwich time. It may be several seconds out at any particular instant, but if it gains a few seconds at one time in the day it will lose a corresponding amount at some other period of the day, as already explained.

T.M.C. MODEL 99
Consumption ; 2 watts. Speed ; 187·5 r.p.m.
Non-starting. Tell-tale indicator (£2 10s.)

It only remains to discuss one or two actual types of clock. In the first place all these synchronous clocks absorb very little current, usually something of the order of 1 watt, which means that they will run for about a thousand hours for the price of 1 unit, so that the cost of running them is negligible.

Easy to Use

Also, owing to the very small consumption, they may quite easily be connected to the same plug as any existing device.

Incidentally, the simple type of synchronous motor already described is not self-starting and, therefore, the clock must be set in motion by some suitable mechanism, which has the effect of giving the motor a small initial spin, after which it pulls into synchronism.

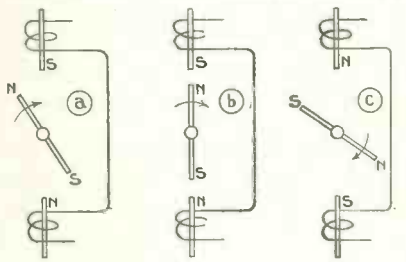


Fig. 1.—Action of polepieces on armature

A typical example of the low-speed, non-starting type of clock is shown in Fig. 3. This drawing illustrates quite clearly the various polepieces situated round the periphery of a drum. Inside the drum are the coils, which make these polepieces alternately north and south. The armature is in the form of a light bar magnet, the ends of which are bent over and sweep past the polepieces with just a small clearance.

Starting the Clock

This particular mechanism is that employed in the Sangamo clock, marketed by the Edison Swan people. It is started by lifting a lever and allowing it to drop. This spins the rotor, through gearing, at a rate which is just a little faster than the normal synchronous speed. As the armature slows down, it pulls into step and it continues to rotate at the correct speed.

The hands are driven through simple trains of gears, there being no

CORRECT TIME FROM THE MAINS

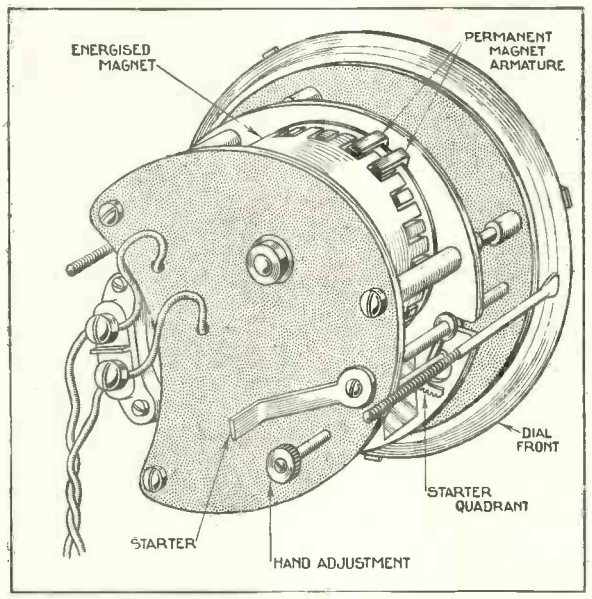


Fig. 3.—Typical example of the low-speed, non-starting type of electric clock—the Ediswan-Sangamo model

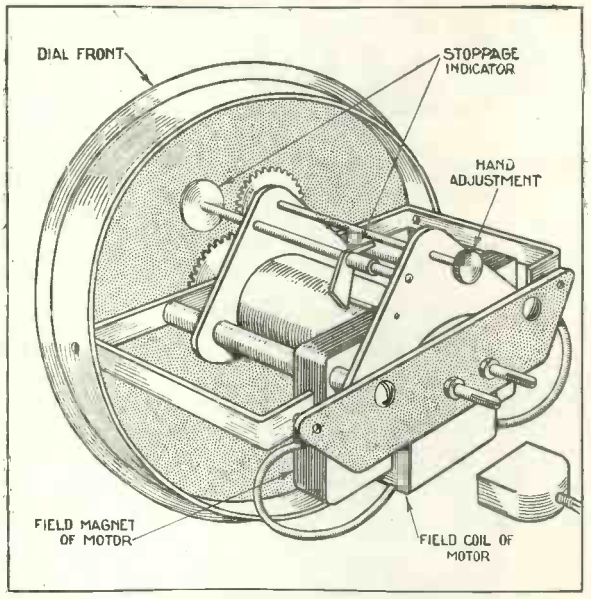


Fig. 4.—An example of the high-speed, self-starting type of electric clock—the Synclock

escapement or spring mechanism and, indeed, there is practically nothing to go wrong. On the front is a disc which rotates once every minute and indicates that the clock is functioning correctly, while the minute and hour hands are set through a lever at the back in the ordinary way.

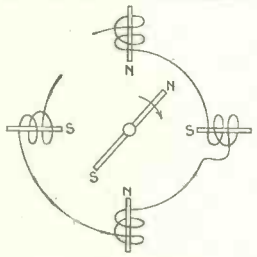


Fig. 2.—Effect of using two pairs of poles

Further examples of this type of clock are made by Smith's and Baker's. The starting of the Smith clock is ingenious. In order to set the hands it is necessary to push in a small knob at the back of the clock and then rotate it until the hands read the correct time. The act of releasing this knob automatically starts the mechanism through a small cam device, so that there is nothing further to do.

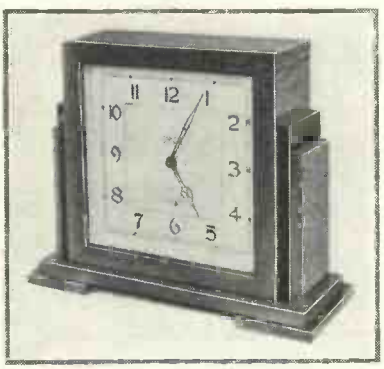
Working Backwards

The Baker clock is started by spinning a knob at the back, but care must be taken to spin this in the right direction, as otherwise the clock will work backwards!

We now come to consider the high-speed type of clock, of which the only example at the time of writing is the Synclock, made by Everett, Edgcumbe & Co., Ltd. Here a simple two-pole arrangement is used, as indicated in Fig. 1, the speed of revolution thus being 3,000 revolutions per minute (Fig. 4.)

The rotor operates in a permanent oil bath and is totally enclosed, an extra train of gears being inserted to reduce the speed suitably for driving the clock spindle. It is claimed that this system is preferable, since the clearance between the rotor and the polepieces is very much less, due to the smaller torque required at the higher speed, and greater reliability is claimed for this reason.

This particular clock is also different from the others in that it is self-starting. Instead of using a small bar magnet the rotor is made in the form of a small disc, ridged across a diameter to form a bar. When the current is switched on this begins to rotate as if it were a small induction motor, and then immediately pulls into step a synchronous motor as already described.



SMITH'S CLIFTON MODEL
Consumption: 1 watt. Speed: 200 r.p.m. Non-starting. Seconds disc (£3 5s.)

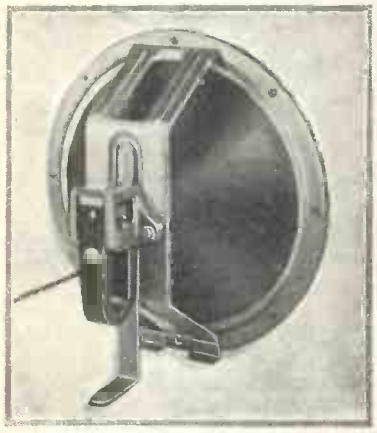
If the supply is interrupted with this type of clock, it will stop, but will restart when the supply comes on again. In order to show that the time is no longer correct, a tell-tale device is provided, which shows a red disc behind the clock face. When the hands are set to the correct time this tell-tale is cleared, leaving a white disc, so that as long as the white disc is visible one may be sure that the time indicated is correct.

SYNCHRONOME MODEL AC/0103
Consumption: .5 watt. Speed; 200 r.p.m. Non-starting (£1 15s.)

These are only a few of the clocks available. There is no doubt that the electric-clock market will grow, and we shall, no doubt, see considerable ingenuity expended in their production.

TESTS OF NEW APPARATUS

Blue Spot Inductor Loud-speaker :: Igranic Transformer :: T.C.C. Electrolytic Condenser
Silver Ghost Inductor Loud-speaker :: Atlastat Volume Control :: Ferranti Moving-coil Loud-speakers :: Epoch Moving-coil Loud-speaker



A WELL-MADE INDUCTOR
This is the Blue Spot type 100U inductor loud-speaker; it is as good as many moving-coil reproducers

BLUE SPOT INDUCTOR LOUD-SPEAKER

APPARATUS: Inductor loud-speaker, type 100U.
PRICE: £1 19s. 6d.
MAKERS: British Blue Spot Co., Ltd.

AN interesting loud-speaker which we have tested this month is the Blue Spot inductor type 100U. This type of loud-speaker has recently become very popular as excellent results can be obtained quite simply, in fact in some circumstances these loud-speakers give definitely better results than much more expensive moving-coil instruments.

The loud-speaker employs, as field magnet, a large U-shaped permanent magnet. The polepieces, which are solid, are screwed to the ends so that a small air-gap is left between them. They are specially shaped to concentrate the flux into the gap. The armature, and the operating coil through which it passes, are mounted between the arms of the magnet in such a way that the free end of the armature is positioned just below the centre of the air gap.

The diaphragm is of a special paper type, 9 in. in diameter, and is suspended by means of a fabric surround from a metal ring, which is itself spot-welded to the back of the chassis, the whole forming a very rigid arrangement. The whole of the chassis and the diaphragm supporting ring are copper-plated, giving the assembly a well-finished appearance.

On test the loud-speaker was quite up to the standard to be expected from a Blue Spot production. The frequency response was fairly uniform from 3,500 cycles down to 100 cycles, while an appreciable response was obtained as low as 50 cycles.

The sensitivity was such that it should give satisfactory service with any normal super-power valve. The loud-speaker is, however, at its best with inputs of half a watt or more. The whole construction is good.

◆ ◆ ◆

IGRANIC TRANSFORMER

APPARATUS: Low-frequency transformer, Parvo type.
PRICE: 7s. 6d.
MAKERS: Igranic Electric Co., Ltd.

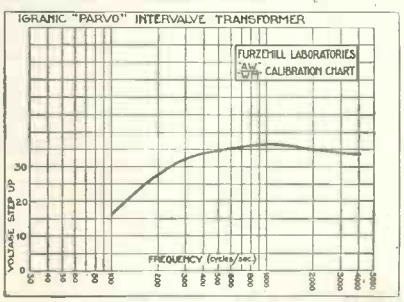
THE Igranic Parvo intervalve transformer belongs to the class of midget transformers which has comparatively recently appeared on the market. It has been designed for use in parallel-feed circuits particularly, but it may be used in the usual directly-coupled circuits if the steady anode current is kept down to 3 milliamperes maximum.

Laminations of a special high-permeability iron are used for the core, thus enabling a good primary inductance to be obtained even when carrying direct current.

MIDGET TRANSFORMER
Although very small, the Igranic Parvo transformer gives excellent reproduction. It will interest constructors of portable sets

The component is housed a brown moulded-bakelite case.

A test was conducted with the object of determining the effective step-up to be expected from a stage using the transformer. The direct-coupled circuit was employed with an L210 type valve, the steady anode current being 2 milliamperes. The results obtained are plotted in the accompanying curve, from which it will be seen that the overall amplification obtained is some thirty times over the greater part of the audio-frequency range.



RESULTS ON TEST
This curve shows the performance of the Igranic Parvo transformer on test

The actual effective step-up ratio of the transformer itself is obtained at any point by dividing the amplification as read from the curve by 15.6, the amplification factor of the valve.

The performance of the transformer is quite satisfactory.

The primary inductance with no D.C. in the winding was approximately 75 henries, while with 2 milliamperes D.C. this fell to 18 henries, these figures being obtained with .25 milliampere A.C. in circuit.

The overall dimensions are $2\frac{7}{8}$ in. by $1\frac{1}{8}$ in. by $1\frac{5}{8}$ in.

◆ ◆ ◆

T.C.C. ELECTROLYTIC CONDENSER

APPARATUS: 10-microfarad electrolytic condenser, type 601.
PRICE: 10s.
MAKERS: Telegraph Condenser Co., Ltd.

THE use of electrolytic condensers has recently become

much more general due, probably, to a much better appreciation of the methods of construction and use of these rather special components.

One of the great points in favour of the electrolytic condenser is that relatively high capacities can be obtained in very small containers, this being more particularly so with

WITH AQUEOUS ELECTROLYTE
This T.C.C. electrolytic condenser has a capacity of 8 microfarads, in spite of its small size

the low-voltage type, it being possible to obtain 20 or more microfarads in the same space which would normally be required for a .001-microfarad mica condenser.

The T.C.C. electrolytic condenser which we have tested this month is a good example of modern practice. It is rated at 10 microfarads, 400 volts. The electrolyte and the positive pole are contained in a copper can about 1½ in. in diameter and 4 in. long, this forming the negative pole of the condenser.

An aqueous electrolyte is used, and thus the condenser should be mounted in a vertical position.

These condensers are self-healing in the event of a breakdown due to a momentary voltage overload; thus they are practically indestructible from the electrical point of view. On test the measured capacity was just over 10 microfarads and the condenser stood up to full voltage quite satisfactorily; in fact it did not break down until a figure of 450 volts was reached.

The steady leakage current was less than 1 milliampere at full volts. The initial leakage current is somewhat higher than this, the condenser taking a few minutes to settle down.

SILVER GHOST INDUCTOR LOUD-SPEAKER

APPARATUS: Inductor loud-speaker.
PRICE: £3 10s.
MAKERS: S. A. Lamplugh, Ltd.

LAMPLUGH'S were among the first to make this type of loud-speaker in this country, and their model is guaranteed to be of entirely British manufacture.

A paper diaphragm, approximately 10 in. in diameter and 3½ in. deep, is suspended by means of a leather surround from a metal chassis of very rigid construction. On the back of the chassis is bolted the unit, which employs two large U-shaped permanent magnets, the laminated pole-pieces being held between them.

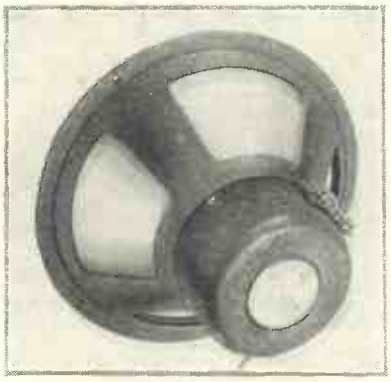
The armature, which is held on very flexible non-magnetic supports, is free to develop large amplitudes, thus allowing adequate bass reproduction.

The operating coils are tapped to enable the loud-speaker to be matched to the valve supplying the power. The unit is provided with a dust cover which is crackle-finished in black; the chassis has a similar finish in a pleasing shade of green.

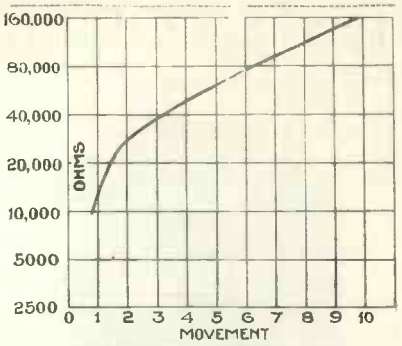
Tested on our standard amplifier, the reproducer gave very good results, the response being excellent up to 3,500 cycles, but appearing to fall off somewhat after this figure. At the other end of the frequency scale, however, the response was well maintained, as is usual with this type of loud-speaker.

The sensitivity was also very good, and the instrument should give good service with small or large power amplifiers.

In spite of the cut-off in the region of 3,500 cycles, the reproduction of speech was not at all unnatural, and the overall results on all classes of signal were very pleasing. The loud-speaker can be thoroughly recommended.



ENCLOSED MAGNET SYSTEM
The Lamplugh Silver Ghost inductor loud-speaker has a dust cover over the magnet mechanism

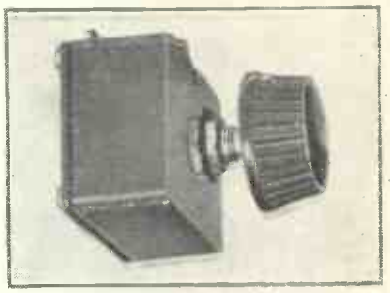


VARIATION OF RESISTANCE
This curve shows the variation in resistance of the Atlastat as the knob is turned

ATLASTAT VOLUME CONTROL

APPARATUS: Atlastat volume-control potentiometer, 100,000 ohms (2 watts).
PRICE: 8s. 6d.
MAKERS: H. Clarke & Co. (Micr), Ltd.

THIS component is completely housed in a black moulded bakelite case and arranged for one-hole fixing. The resistance element is in two sections mounted



FOR CONTROLLING VOLUME
The Atlastat volume control incorporates a graded resistance element, the effect of which is seen from the above curve

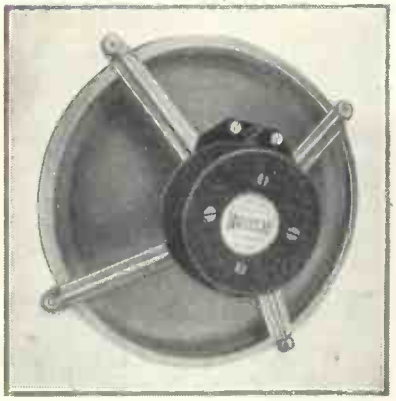
side by side, each section being composed of small rectangular pieces of brass clamped together with washers of resistance material between each piece.

The moving contact is so arranged that it passes first over one side of the resistance element and then over the other. The contact itself is spring controlled and gives a firm, but at the same time smooth, movement.

The element is graded and in order to obtain the approximate law between movement and resistance a rough scale was fixed to the control and the resistance measured at various points. The curve with this report shows resistance plotted against movement, and it will be seen that the law is approximately logarithmic.

The control is convenient to use, giving a very even reduction in volume from the maximum to the minimum. The maximum resistance was approximately 153,000 ohms, and the minimum 4,000 ohms.

TESTS OF NEW APPARATUS—Continued



A POT-TYPE MAGNET
The Ferranti model M3 moving-coil loud-speaker has a pot-type permanent magnet

FERRANTI MOVING-COIL LOUD-SPEAKERS

APPARATUS: (a) Permanent-magnet moving-coil loud-speaker, type M3 and (b) type M1.
PRICE: (a) £2 15s., (b) £7 10s.
MAKERS: Ferranti, Ltd.

AN interesting permanent-magnet moving-coil loud-speaker is the Ferranti type M3. This employs a small pot-type magnet, on the front of which is bolted a light

GOOD UP TO 6,000 CYCLES
Good response up to 6,000 cycles is obtained from the Ferranti model M1 moving-coil loud-speaker

metal framework which carries the fabric diaphragm.

A small moving coil is employed, this being only ¾ in. in diameter. It is of the low-resistance type, requiring an input transformer. The impedance of the coil is of the order of 30 or 40 ohms, which value should be used when deciding on the ratio of the input transformer.

On test good results were obtained for so small a loud-speaker. There is a very good upper-frequency response but this falls off somewhat below 150 cycles, this being probably due to the fact that the diaphragm is a little stiff. The sensitivity was, if anything, slightly below standard, but nevertheless it should give good results with all small receivers.

Larger Model

Model M1 is very sturdily made. A large pot magnet is employed, this being given a caelmium finish to prevent it from rusting. The diaphragm is suspended from the frame by means of a sectionalised leather surround.

It is constructed of paper and has a diameter of approximately 6 in. Due to the use of a very rigid centring device, the outer surround is actually more an extension of the baffle than a suspension.

The moving coil has a diameter of approximately 1½ in., and is of the same low-resistance type, requiring an input transformer. The impedance of the coil is approximately 40 ohms up to 6,000 cycles, after which it rises somewhat.

On test the sensitivity of the loud-speaker was found to be quite up to standard. The power-handling capacity was also good, it being able to handle far more power than is normally required for domestic purposes. The frequency response is good, extending at least up to 6,000 cycles. The output at this frequency is, of course, not as great as over the 500-to-3,000 cycle band, but it is, however, quite appreciable. At the other end of the scale a good response was obtained down to 50 cycles.

◆ ◆ ◆

EPOCH MOVING-COIL REPRODUCER

APPARATUS: Permanent-magnet moving-coil loud-speaker, type A2.
PRICE: £3 16s. 6d.
MAKERS: Epoch Radio Manufacturing Co., Ltd.

THE Epoch model A2 belongs to the class of lightweight moving-coil loud-speakers which have become very popular in the last year.

The magnet employed is of the familiar cross type, copper-plated to prevent rust and totally enclosed in the framework. The white paper diaphragm has a diameter of approximately 7 in., and is suspended from the framework by means of a white leather surround.

The moving coil is ¾ in. in diameter, and is of the low-resistance type. A suitable input transformer is mounted on the back, this being designed to give a reasonable degree of matching with normal types of power valve.

An interesting point which is common to all Epoch loud-speakers is that the diaphragm assembly is interchangeable, a comprehensive range being available; it is thus possible for the user to obtain the best possible arrangement for his particular circumstances.

SPECIAL NOTE

Manufacturers are invited to send apparatus to "Wireless Magazine" for test and report in these pages. Only those instruments that reach a certain standard of merit will be reviewed, however. "Wireless Magazine" reserves the right to test to destruction if necessary.

Readers who would like to see reports on any special components are also invited to communicate with the Editor. As far as possible their needs will be met

On test the loud-speaker gave very pleasant results, and is quite sensitive, being at the same time able to handle a good power input. The quality of reproduction was very brilliant, but this was not obtained at the expense of the bass, which was well maintained. The overall results on all kinds of signal were good.

CROSS-TYPE MAGNETS
The Epoch type A2 permanent-magnet loud-speaker has the familiar cross-type magnet

The IDEAL HOME SUPER

A set that will bring all Europe to your fireside—and give you record reproduction when radio reception palls. Simple to build, and can be used by every member of the family.

EXACTLY a year ago W. James described in these pages the construction of his Super 60 receiver —the set that made the super-het really popular.

During the past year improved components and valves have been developed. As a result we are able to present in these pages a new five-valve super-het that has a performance even better than the original Super 60. The new set has certain improvements and will attract as much interest as its predecessor.

No Tricks in Operation

The Ideal Home Super is what its name implies—an ideal super-het for use in the home by every member of the family. There are no tricks in its operation and almost anywhere in the British Isles it will pick up scores of stations at good strength.

The selectivity of the set is extremely good; anybody who has not previously used a super-het will be amazed at the way in which loud stations can be tuned out in a degree or two on the dials. Tests have proved conclusively that Mühlacker can be separated from London Regional and Zeesen from Daventry National—and nobody can possibly want better selectivity than that.

Not only is the selectivity of the highest standard; the operator will have no fault to find with the station-getting properties of the Ideal Home Super. In one evening's test over fifty programmes from all over Europe were picked up. There is no question that during the course of a few evenings as many as eighty different transmitters could be received without difficulty.

Playing Records

We can say quite definitely that this set is even more powerful than the original Super 60, and the quality of reproduction leaves nothing to be desired. When the reception of a multitude of radio transmissions palls—then a pick-up can be connected to two sockets provided on the baseboard and a selection of gramophone records played.

Completely self-contained with its loud-speaker and all its batteries the Ideal Home Super, both from the point of view of results and ease of control, is the ideal super-het for the family!

What the Set Is and How to Build It at Home

QUITE apart from the improved valves and components that have been used in the construction of the Ideal Home Super, much of the success of the set depends on its unusual circuit.

Five valves are employed, and they are arranged in the following sequence : (1) combined first detector and oscillator, (2) screen-grid intermediate-frequency amplifier, (3) second detector, (4) low-frequency stage, and (5) power valve.

HOW THE CONTROLS ARE ARRANGED

This photograph of the Ideal Home Super shows clearly how the controls are arranged. Every member of the family can operate this receiver without difficulty

The band-pass aerial tuner and intermediate stage give all the selectivity that is needed and the two low-frequency amplifying stages ensure adequate strength from scores of broadcast stations.

Tuning Arrangements

A two-gang .0005-microfarad variable condenser is used for tuning the band-pass circuit, while the single .0005-microfarad condenser tunes the oscillator circuit. Both these condensers are shielded in the original set.

There is no need to tune the intermediate stage, for the coil is already adjusted by the makers to the right wavelength and will remain constant.

The second leaky-grid detector is sensitive to even the weakest signals and these are brought up to full loud-speaker strength by the two low-frequency amplifying valves, which have a magnification of the order of 900.

This set is rather sensitive as regards valves: particularly is this so with the double-grid valve used as combined first detector and oscillator. The results cannot be guaranteed with other valves than those indicated in the list of parts (see Page Four).

Apart from the valves and the coils, the set is not critical. Any good condensers, fixed or variable, will be satisfactory. The high-frequency choke must, however, be of the type that will choke well at wavelengths above 2,500 metres.

The low-frequency transformer should preferably be of a type with a slightly rising characteristic in order to compensate for any cut-off of the top notes caused by the great selectivity.

Ample stabilising resistances and by-pass condensers are provided, and there will be no trouble with the set going "up the loop." Although designed primarily for operation from batteries, the set can be worked from a mains high-tension unit if desired.

The actual construction will present no difficulties even to the beginner. On Pages Four and Five of this supplement is reproduced a half-scale layout and wiring diagram of the Ideal Home Super. This shows clearly the positions of all the parts and the dimensions of the holes to be drilled in the ebonite panel.

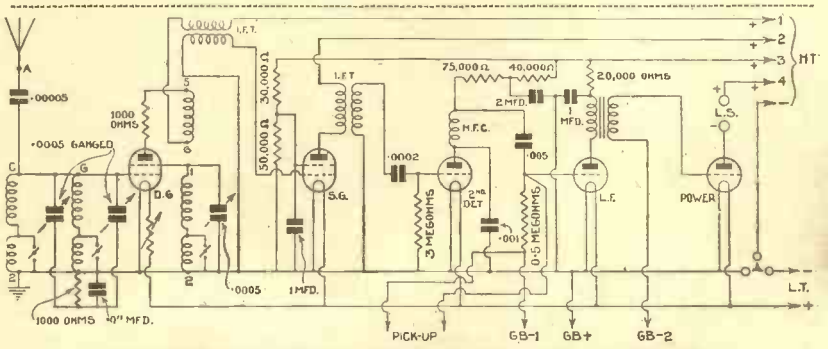
Those who prefer one can obtain a full-size blueprint of the set for half price, that is 9d. post free, by using the coupon that appears on page 368 by April 30. Address your application to "Wireless Magazine" Blueprint Dept., 58-61 Fetter Lane, London, E.C.4. and ask for No. WM280.

Self-contained Outfit

There is room in the cabinet for all the necessary batteries and the loud-speaker as well as the set. The result is that the Ideal Home Super is a compact and, except for the aerial and earth, completely self-contained set. There are no straggling external leads to spoil the appearance.

The cost of building the bare set is only £6 15s., while the valves cost an extra £3 7s. 6d. The price of the complete outfit, with loud-speaker and cabinet, but without batteries, is £12. Very moderate considering the splendid results that are assured to all who build it!

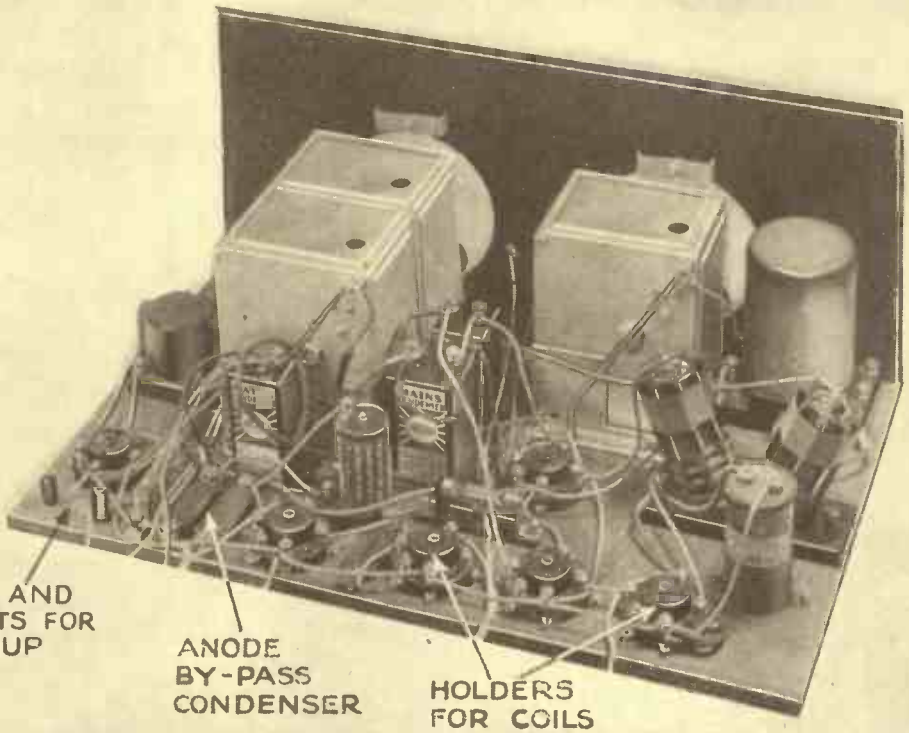
London readers who would like to see the Ideal Home Super before beginning can do so by going to Selfridge's Somerset Street windows, where the original model will be on view during the currency of this issue.



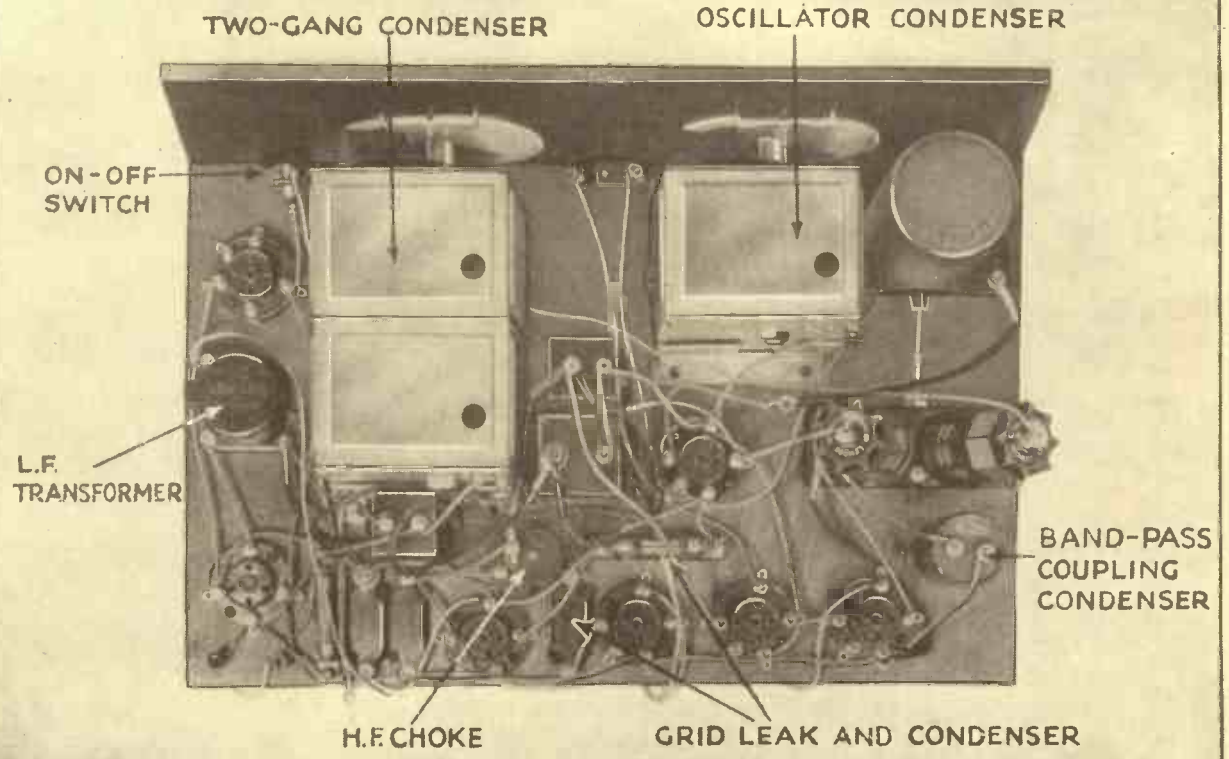
STRAIGHTFORWARD CIRCUIT THAT GIVES GREAT PUNCH

Five valves are used in the Ideal Home Super. They all amplify the signals received and result in tremendous magnification. Scores of stations can be heard on the loud-speaker

EASY TO BUILD—AND IT PULLS IN THE STATIONS!



There are no constructional snags about the Ideal Home Super, which is straightforward in every respect. You will be amazed at the results it gives



This plan view shows clearly the positions of all the parts in the set. A half-scale layout and wiring diagram appears on Pages Four and Five of this supplement

*H*alf-scale *L*ayout and *W*iring *G*uide of the *I*deal *H*ome *S*uper

FOLLOWING is a list of the parts needed for the construction of the Ideal Home Super. All the components are standard:

CHOKE, HIGH-FREQUENCY
1—Wearite super-het, type HFS, 6s. 6d.

COILS
1—Lewcos band-pass filter, type BPF, 12s.
1—Lewcos oscillator, type TOS, 8s. 6d.
1—Lewcos super-het intermediate with pigtail, type IFTP, 10s. 6d. (or Wearite OT2, Igranic).
1—Lewcos super-het intermediate without pigtail, type IFT, 10s. 6d. (or Wearite OT1, Igranic).

CONDENSERS, FIXED
1—Dubilier .0002-microfarad, type 670, 1s. (or T.C.C., Lissen).
1—Dubilier .001-microfarad, type 670, 1s. 3d. (or T.C.C., Lissen).
1—Dubilier .005-microfarad, type 670, 1s. 6d. (or T.C.C., Lissen).
1—Dubilier .01-microfarad, non-inductive type, 2s. (or T.C.C.).
2—Formo 1-microfarad, 5s. (or Dubilier, T.C.C.).
1—Formo 2-microfarad, 3s. 3d. (or Dubilier, T.C.C.)

CONDENSERS, VARIABLE
1—Jackson .0005-microfarad two-gang, type R2, with disc drive, £1 1s. (or Utility, Polar).
1—Jackson .0005-microfarad, type R1, with disc drive, 12s. 6d. (or Utility, Polar).

EBONITE
1—Permcol 16 in. by 8 in. panel, 4s. 7d. (or Becol, Red Triangle).

HOLDERS, GRID-LEAK
2—Readi-Rad, 1s. (or Bulgin, Telsen).

HOLDERS, VALVE
7—Lotus four-five pin, type VH/31, 5s. 10d. (or W.B., Clix).

PLUGS AND TERMINALS
8—Belling Lee wander plugs, marked: H.T.+4, H.T.+3, H.T.+2, H.T.+1, H.T.—, G.B.+, G.B.—1, G.B.—2, 1s. 4d. (or Clix, Eelex).
2—Belling Lee spade terminals, marked: L.T.+, L.T.—, 4d. (or Clix, Eelex).
2—Clix wood-screw sockets and plugs for pick-up, 8d.

RESISTANCES, FIXED
2—Magnum 1,000-ohm spaghetti, 2s. (or Lewcos, Bulgin).
1—Magnum 20,000-ohm spaghetti, 1s. 6d. (or Lewcos, Bulgin).
1—Magnum 30,000-ohm spaghetti, 1s. 6d. (or Lewcos, Bulgin).
1—Magnum 40,000-ohm spaghetti, 1s. 6d. (or Lewcos, Bulgin).
1—Magnum 50,000-ohm spaghetti, 1s. 6d. (or Lewcos, Bulgin).
1—Magnum 75,000-ohm spaghetti, 1s. 6d. (or Lewcos, Bulgin).
1—Dubilier .5-megohm grid leak, 1s. 9d. (or Telsen, Lissen).
1—Dubilier 3-megohm grid leak, 1s. 9d. (or Telsen, Lissen).

RESISTANCE, VARIABLE
1—Wearite 15-ohm rheostat, type Q4, 1s. 6d.

SUNDRIES
Tinned-copper wire for connecting (Lewcos).
Lengths of oiled-cotton sleeving (Lewcos).
Length of rubber-covered flex (Lewcos).

SWITCH
1—Bulgin three-point, S39 type, 1s. 3d. (or W.B., Lissen).

TRANSFORMER, LOW-FREQUENCY
1—Lewcos, type LFT6, 10s. (or R.I. Hypermite, Ferranti AF8).

ACCESSORIES.

BATTERIES
1—Fuller 120-volt high-tension, type F24, 10s. 9d. (or Siemens, Pertrix).
1—Fuller 9-volt grid-bias, type F21, 1s. (or Siemens, Pertrix).
1—Smith 2-volt accumulator, type RGC11, 14s. 6d. (or Exide, C.A.V.).

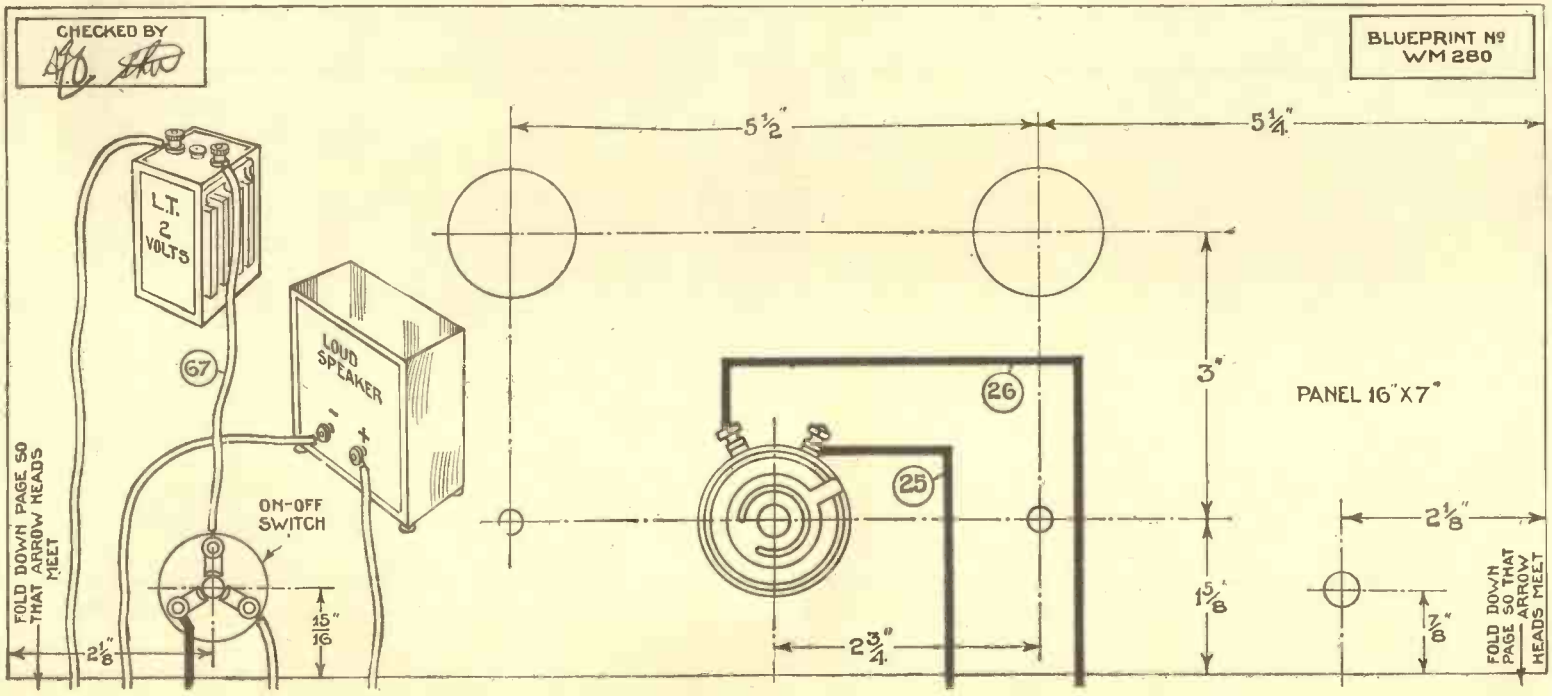
CABINET
1—Peto Scott table consolette, £1 7s. 6d

LOUD-SPEAKER
1—Ormond loud-speaker unit and small chassis, 17s. 6d.

MAINS UNIT (in place of high-tension battery)
1—Atlas, type AC244, £2 19s. 6d. (or Climax, Echo).

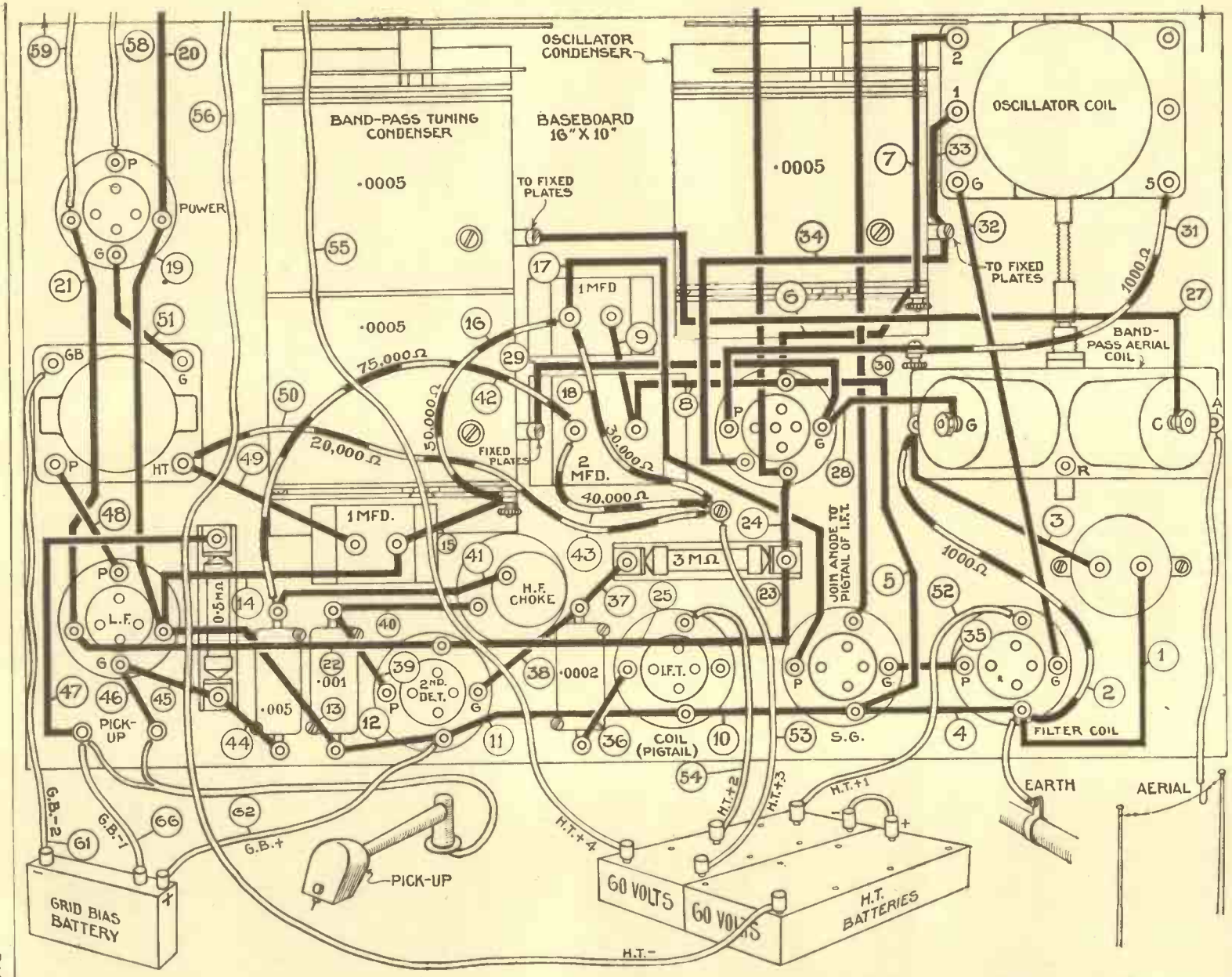
VALVES
1—Osram DG2, £1.
1—Osram S21, £1.
2—Osram HL2, 17s.
1—Osram LP2, 10s. 6d.

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower.



HERE is a list of the lengths of oiled-cotton sleeving needed for the connecting leads. In each case the wires should be cut an inch longer to allow ½ in. at each end for screwing under terminal heads, etc.:

Wire No.	*Length*
1	4 in.
2	1,000 spaghetti
3	3½ in.
4	2 in.
5	5 in.
6	4½ in.
7	5 in.
8	3 in.
9	1½ in.
10	2 in.
11	3 in.



A Set That Brings All Europe to Your Home!

12	..	1¼ in.
13	..	3 in.
14	..	3⅜ in.
15	..	2½ in.
16		50,000-ohm spaghetti
17	..	6 in.
18		30,000-ohm spaghetti
19	..	5½ in.
20	..	2½ in.
21	..	5½ in.
22	..	5½ in.
23	..	5 in.
24	..	1 in.
25	..	7 in.
26	..	9 in.
27	..	9 in.
28	..	3½ in.
29	..	5 in.
30	..	3 in.
31		1,000-ohm spaghetti
32	..	7 in.
33	..	1½ in.
34	..	6 in.
35	..	1 in.
36	..	1 in.
37	..	1 in.
38	..	1½ in.
39	..	1 in.
40	..	2 in.
41	..	3 in.
42		75,000-ohm spaghetti
43		40,000-ohm spaghetti
44	..	1 in.
45	..	1¾ in.
46	..	1 in.
47	..	5 in.
48	..	1½ in.
49	..	3½ in.
50		20,000-ohm spaghetti
51	..	1½ in.
52	Flex to suit	
53	,,	
54	,,	
55	,,	
56	,,	
57	,,	
58	,,	
59	,,	
60	,,	
61	,,	
62	,,	
63	,,	
64	,,	
65	,,	
66	,,	
67	,,	

Operating the Set for Good Results

WHEN the construction of the Ideal Home Super has been completed it is advisable to try it out before putting it in the cabinet. Connect the batteries up (the best voltages will be clear from the wiring diagram on Pages Four and Five) and insert the valves in their holders.

Switching on

Switch the set on by pulling out the knob on the right of the panel. Then pull out the knob of the wave-change switch on the left to adjust the set for medium-wave reception (it is pushed in for the long waves).

Slowly turn the knobs of the two variable condensers until the local station is picked up. Next, unscrew the black knobs of the two trimming condensers at the top of the two-gang model. When this is done it may be necessary to readjust the setting of the right-hand condenser knob to keep the local station at good strength.

Spread of the "Local"

Now rotate the right-hand knob and note the spread of the "local." It may be found that it comes in at two adjacent places on the dial. This means that "double humping" is taking place and that the band-pass circuit is not adjusted properly.

It will be found that by screwing up the trimming condenser nearest the panel this effect will be removed. The two dial readings for the local station will converge, and there will be only one point where the station is heard.

Next, tune in a station towards the top of the medium waveband. It may be necessary to readjust the trimming condenser again to get the best results. When the band-pass action is not taking place properly the signal strength will be poor and the stations will not come in cleanly.

Those who have a milliammeter will find this very useful when ganging up the band-pass circuits. Disconnect the 75,000-ohm resistance numbered 42 and insert the milli-ammeter in this lead. Note the readings when a fairly weak station is picked up. When the trimming condensers are adjusted the readings will alter for a given station.

The trimmers should be so adjusted that the greatest dip is obtained for any given transmission. The greater the dip of the pointer the greater will be the strength of reception.

Although the best voltages for most valves will be those indicated on the wiring diagram it is worth while trying different values. All valves are not exactly alike even when of the same make and any slight variations can be made good by readjustment of the anode voltages.

Volume is controlled by the knob in the centre of the panel. This is actually a filament rheostat in the filament circuit of the screen-grid valve.

Adjusting Volume

With some valves it produces a slight time lag, and this should be taken into account when adjusting the volume. The advantage of this type of volume control is that it is cheap and extremely reliable.

When it is desired to reproduce gramophone records a pick-up is plugged into the two sockets provided for the purpose on the baseboard. There is no gramophone volume control in the set so a volume control must be fitted externally across the pick-up.

While records are being played the radio volume control should be turned as far as possible to the left: this will switch off the screen-grid valve and radio signals will not break through.

The Ideal Home Super has been tested extensively in south-east London by a member of the "Wireless Magazine" Technical Staff. The log reproduced on this page shows what stations were picked up during the course of a single evening at the dials. There is no doubt that if the log were extended over a week something like eighty transmissions could be recorded.

The point to be noted about this particular test is that all the stations heard were picked up while the London National and Regional transmitters were working. All the stations were heard clear of interference and at good loud-speaker strength.

Dial Readings

With a set of this type, which gives such very selective tuning, it is most desirable to keep a list of dial readings of the stations received.

It will be noted that the dial readings keep pretty well in step over both the medium and long wavebands. The left-hand column gives the readings for the oscillator condenser (on the left of the panel) and the right-hand column gives the readings for the band-pass gang condenser (on the right of the panel).

ONE NIGHT'S LOG ON THE IDEAL HOME SUPER

LONG-WAVE STATIONS

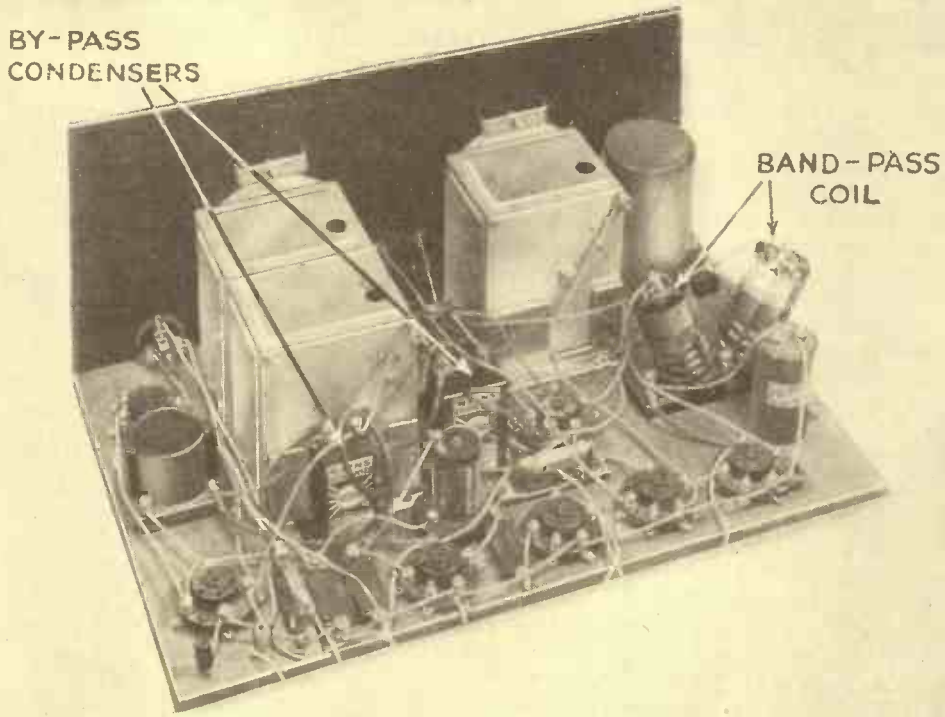
	Dial Readings			Dial Readings	
Leningrad	70	62	Eiffel Tower	110	118
Oslo	76	68	Daventry National	119	135
Kalundborg	83	78	Konigswusterhausen	125	140
Motala	100	100	Radio Paris	130	150
Warsaw	107	114	Hilversum	137	165

MEDIUM-WAVE STATIONS

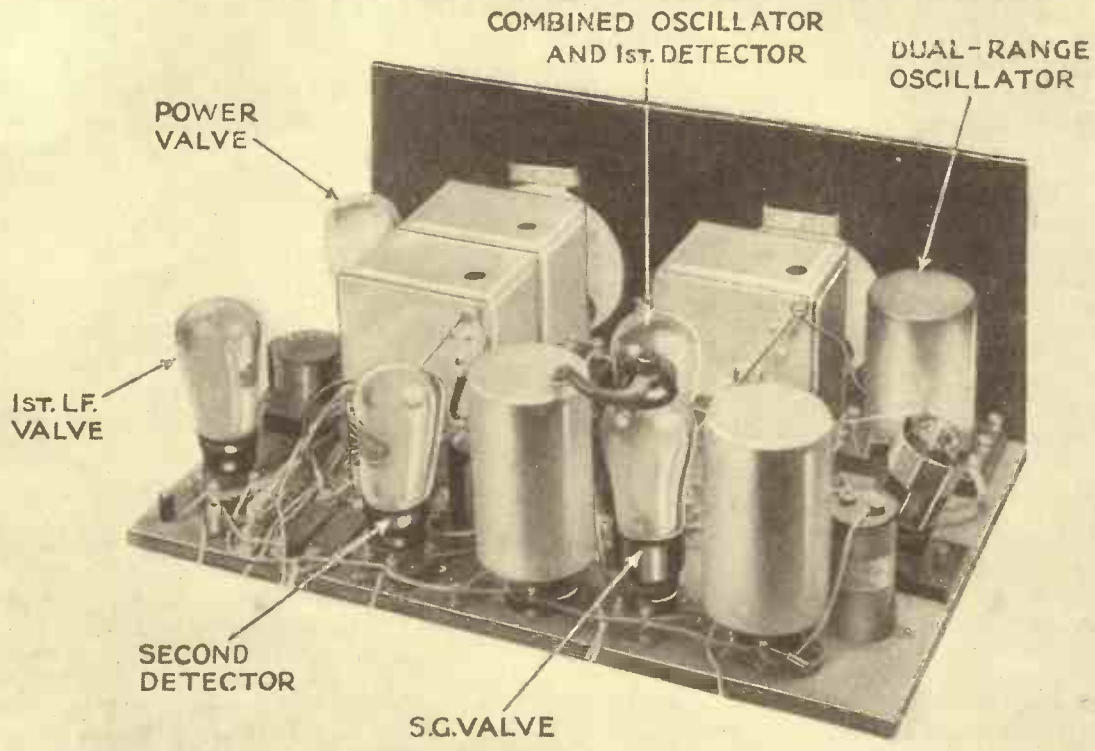
Trieste	30	44	Muhlacker	99	106
Leipsig	38	55	Hamburg	103	109
London National	40	50	Lvov	106	113
Lille	46	57	Toulouse	108	115
Turin	50	60	Bucharest	111	116
Heilsberg	53	62	Midland Regional	113	117
Bratislava	55	63	Sottens	115	118
British Relays	61	68	Katowice	117	119
Viipuri	62	70	Dublin	119	121
Hilversum	67	74	Rabat	121	123
North National	69	76	Stockholm	125	128
Bordeaux	71	78	Rome	127	131
Genoa	75	81	Paris	130	133
Goteborg	80	86	Beromuenster	133	136
Milan	85	89	Langenberg	147	140
Brussels	88	91	North Regional	140	142
Brno	90	98	Prague	142	145
Strasbourg	92	100	Brussels	147	150
London Regional	97	104	Vienna	149	153
			Budapest	159	163

All these stations were picked up without interference and at good strength in south-east London.

A SUPER-HET WITH TWO LOW-FREQUENCY STAGES



Another view of the Ideal Home Super that shows the simple nature of the layout. Anybody can build the set without difficulty. A full-size blueprint is available for 9d.



Here is the set completely wired and all ready for use. When placed in its cabinet it is self-contained, except for the aerial and earth, which, of course, are connected externally

"W.M." Super-het Successes

Nine Reports from Our Readers

The following nine reports from readers living in Kent, London, Lancashire, Nottingham and Scotland will convince even the most sceptical of the amazing results that can be obtained from a modern super-het receiver. With the Ideal Home Super you will be assured of better results than any other type of set can give you. When you have built your model we shall be glad to hear from you. Will you drop us a line?

SUPER 60
(March, 1931)

Chatham (Kent).—I feel I must let you know how I appreciate a set like this. Both selectivity and tone are all that can be desired. I have only been using it for a few days, but I have logged seventy-two stations, of which forty-five have been identified. These are all at loud-speaker strength and good at that. It is certainly the best set I have come across.

Folkestone (Kent).—We have been running it for eighteen weeks and it has never failed us once. It is just like anybody singing, speaking, or playing in the room. Needless to say, we are proud of our Super 60.

Hanwell (London, W.7).—Ten months of the Super 60, to which I have added push-pull output and gramo-radio switching (with the aid of your excellent query staff), and I have not regretted a minute of it. A total of seventy-two stations can be listened to with the acme of comfort. Quality on the majority of stations and on the pick-up is excellent.

◆ ◆ ◆

A.C. SUPER 60
(June, 1931)

Grange Park (London, N.1).—I have recently completed this astounding receiver and must admit that its performance is beyond all expectations. I live five miles from the twin transmitters at Brookman's Park but, even so, I can separate the adjacent stations in each case. In three months I have logged all the worth-while stations on the long and medium wavebands. I have also had twenty-three ultra short-wave, including eleven American stations. Moreover, the quality of reproduction cannot but please the most critical ear, and the selectivity is really uncanny.

I am quite convinced that the A.C. Super 60 is better than any commercial set on the market in the same class.

◆ ◆ ◆

SUPER SENIOR
(October, 1931)

Gargunnock (Scotland).—I am more than delighted with the results obtained; in fact, this set opens up a new era in wireless. Giving a list of the stations received would be a sheer waste of time. Every station broadcasting on the long or medium waves rolls in either in daylight or when it is dark. The selectivity is simply astounding, a hair breadth separating any two stations. No two stations can be heard together on any part of the dial.

London, N.W.9.—I built this set two months ago and, after cursing various minor defects, I have a set that leaves nothing to be desired. I can tune in every station between Budapest and Horby on the loud-speaker. The tuning range on the medium waveband is from 253 to 566 metres and on the long waveband from 1,083 to 1,935 metres. I have logged seventy stations, forty of which provide excellent loud-speaker reception. My only grouse is the inability to separate Graz and Barcelona from London Regional—this station occupies three degrees on the dial—which is only four miles distant. Mühlacker is easily separated.

A SUPER-HET DE-LUXE
This is W. James' Super Senior in the Camco Lincoln cabinet. Read the reports about it that appear above

Olton (Warwick).—I am writing to say how pleased I am with the Super Senior. My log for one night is not a bad one ; it numbers seventy-three stations. On the long waves Huizen, Radio Paris, Konigswusterhausen, Daventry, Eiffel Tower, and Warsaw come through in daylight very well. I built the Super 60 last August, thinking I should have the finest possible set going, but this one beats it all ways.

◆ ◆ ◆

1932 SUPER 60
(January, 1932)

Bootle (Lancs).—Thank you for the 1932 Super 60. What a set ! Punch, power and purity! The old super is not in the same street. On the 1932 model forty-nine stations were all heard clear and strong on the first test. The "gram" side, well it's the "goods!"

Chilwell (Notts).—When Mr. James brought out his great set, the Super 60, I built it and was more than satisfied with the results obtained. Then came his improvement with the double-grid valve and what seemed impossible was achieved, viz., still an improvement. I thought this would be the end, but no, the 1932 Super 60 arrived. I decided to alter my set, though I must admit I was rather doubtful whether the results would be better. I am pleased to say that the alteration was fully justified. The first station received on my new set during the afternoon was, to my surprise, Prague. The volume was so great that I thought it was North Regional, but a turn of the oscillator knob soon undeceived me.

Life of Accumulators :: Hospital Radio :: At Home with P. K. T. :: "American Replicas" Linen Diaphragms :: A Useful Radio Book :: Scottish Broadcasting :: Increasing Efficiency :: Baseboard-chassis Construction :: Radio-gramophone Cabinets :: New Valves for Old Sets

Life of Accumulators

PRESENT-DAY listeners have a lot to be thankful for. When I started radio about ten years ago parts were expensive and did not last long. I remember that my first accumulator gave up the ghost after about a year's use.

Now I have just scrapped another battery, but this had been in use for four years and had, moreover, been sadly misused. By which I mean that for months (at various periods during the four years) it had been left standing without any charge. I have always been surprised that it lasted as long as it did. I expected to have to scrap it a good many months ago.

I shed no tears now that it has been relegated to the dustbin: I have had more out of it than I ever expected to get.

◆ ◆ ◆

Hospital Radio

As "Wireless Magazine" goes to press in sections at weekly intervals I find myself writing these notes four days after the publication of the March issue.

So far I have had only two letters from readers on the subject of hospital radio, so for the present nothing more can be done.

It would be a waste of everybody's time if sufficient volunteers are not forthcoming to make the scheme a success. Better not to start at all than to get only half way.

◆ ◆ ◆

At Home with P. K. T.

I have followed in Whitaker-Wilson's footsteps and paid a visit to Mr. P. K. Turner, with whom I had a four hours' spell of really good radio. The secret of Mr. Turner's success, apart from using plenty of power, is a moving-coil loud-speaker of his own design. With this he is able to get an octave higher and lower than any other moving-coil reproducer yet produced.

I was interested to learn that Mr. Turner is taking steps to put this model on the market. I am sure that if it did become available it would sell very well among those who really do want reception above the average.

This loud-speaker reproduces well all frequencies up to about 9,000 cycles, which is some going. You may judge what a stickler Mr. Turner is for quality when I tell you that he will not listen to gramophone records at all because they cut off at about 4,500 cycles!

"The stuff is not on the records to begin with," says P. K. Turner, "so why try to get good results when it is impossible through the very nature of records?"

I am glad that my ear is not too sensitive to the higher and lower musical frequencies for I enjoy playing records through a good amplifier and loud-speaker and should not like to think that I was completely wasting my time by so doing!

◆ ◆ ◆

"American Replicas"

Glancing through *Wireless Weekly*, an Australian radio journal, I was interested to see an advertisement of Cossor's dealing with valves called "American Replicas." Apparently these are special types designed for use in American sets; I suppose they are intended for replacement purposes.

Five types are listed—a screen-grid, general-purpose, power amplifier, power and a full-wave rectifier. The first four have impedances of 400,000, 8,000, 2,200 and 1,900 ohms respectively, with slopes of 1.1, 1.5, 1.5, and 3. The filament voltages are 2.5 volts, except for the power-amplifier and rectifier types, which have 5-volt filaments.

As far as I know these valves are not sold in the British Isles. It is good to know that at least one manufacturer is making capital out of American sets.

RADIO MEDLEY—Continued

HAVE YOU HEARD HIM?

J. F. Roberts is a well-known actor and broadcaster whom you have probably heard over the radio

Linen Diaphragms

I was surprised to learn the other day from the manufacturer who was the first to produce them in large quantities that linen-diaphragm loud-speakers are now almost obsolete, by which he meant that he is not making any more.

This news surprised me, as I am sure it must surprise many other listeners. The quality obtained from a loud-speaker of this type is to me much preferable to the results obtained from many balanced-armature reproducers I have heard. What I like, I suppose, is the lack of top-note response, which makes the reproduction seem mellow.

What is more, the linen-diaphragm type of loud-speaker is so simple to use. It does not need frequent adjustment and provided it is kept in a dry room it does not seem to deteriorate at all.

Three years ago some friends got one on my recommendation and it is still giving good service—and is likely to for many years to come.

◆ ◆ ◆

A Useful Radio Book

Last month I mentioned a book published by Ferranti's under the title "The True Road to Radio." Now I have had an opportunity of reading a copy and can thoroughly recommend it to anybody who wants something fairly advanced but easily readable.

The book is intended for the more enlightened amateur and, as far as I can see, every aspect of modern technique is discussed. There must be very few builders of sets who could not learn something of value from this book.

Do not run away with the idea that this book is simply an ambitious catalogue for Ferranti products. Some of them are mentioned, but only to emphasise a particular point of design. The author is Albert Hall, A.R.C.Sc., M.I.R.E., Wh.Ex. Both he and his firm are to be congratulated on filling a gap in radio literature.

How to Get It

From letters I have received from "Wireless Magazine" readers on the subject of radio textbooks I have no doubt that "The True Road to Radio" will meet the needs of many. The price is only 5s., post free, and the book contains 244 pages; it is bound in stiff covers and measures 8 in. by 10½ in.—really good value for the money.

It can be obtained from Ferranti, Ltd., at Hollinwood, Lancs., or Bush House, Aldwych, London, W.C.2; from any branch of W. H. Smith & Sons; from any newsagent; and from some radio dealers.

◆ ◆ ◆

Scottish Broadcasting

Last month I referred to the remarks made by a Scottish correspondent, who complained that not enough Scottish material was broadcast. A few days later I was interested to see some letters on this subject in the *Daily Telegraph*.

One writer complained that the B.B.C. was too Scottish and remarked: "The director is Scottish; the announcers are Scotsmen whose native speech has been overlaid with the 'Oxford accent,' resulting in a diction which is as unlike the King's English as it could well be; and even a preponderance of the artists is also Scottish."

This seems to dispose of the grouses made by Mr. J. B. Mackay. Moreover, I cannot refrain from quoting another letter that appeared in the *Daily Telegraph*. Here it is: "Like all important undertakings, the B.B.C. find it essential to have the most able men in control, and there lies the answer to the query why Scots are in preponderance"!

Increasing Efficiency

A few days ago I was helping some people to install a simple two-valve set in their home. When the aerial and earth had been connected, the set was switched on. The results were somewhat disappointing, the London National and Regional stations being received only at weak strength.

It seemed as if a three-valver were needed in that particular locality to give really good volume, but before recommending the addition of another valve I had a look at the low-frequency transformer.

It was of a popular type, costing about five shillings. I suggested that

AT THE SAVOY

Conductor of the Savoy Orpheans Band at the Savoy Hotel—Howard Jacobs

before making drastic alterations to the set it would be as well to try the effect of a better transformer.

The next day I lent my friends a much better transformer of the thirty-shilling type. The results were improved enormously when this was put in and now my friends are quite satisfied with the strength of the two London transmissions, which is all they want.

The moral of this story is that when you are in doubt as to whether an extra valve should be added to improve the performance of a receiver it is much the best plan first of all to try some better components in the existing circuit. As this

CONDUCTED BY BM/PRESS

experience proves, it is often the quality of the parts in a set, and not the number of valves, that really matters.

◆ ◆ ◆

Baseboard-chassis Construction

I am interested to learn from the "Wireless Magazine" Technical Staff that the Quadradyne has been a success and that many models have been built. I was interested in this set just as much for its form of construction as for its circuit.

I have always felt that there were too many snags with the complete metal-chassis type of construction as far as the amateur is concerned. My chief objection to it is the difficulty of using alternative parts. Most of us who build sets have a number of spare components on hand and some of them can usually be worked into a new design.

Making A Mess

The trouble with a metal chassis is that all the holes are drilled and if you want to use a component of different dimensions from that included in the original design it is no easy matter to drill new holes. Moreover, the result of so doing is likely to be a mess.

In the case of the baseboard-chassis form of construction adopted by "Wireless Magazine," this difficulty does not arise. It is a simple matter to drill the foil and baseboard to accommodate any component it is desired to use, even if this differs in shape and size from the part utilised in the original model.

◆ ◆ ◆

Radio-gramophone Cabinets

I had an idea for a new type of radio-gramophone cabinet the other day; I pass it on as it may interest others.

The objection to the usual type, as far as I am concerned, is that it is necessary to get up out of one's chair at the end of every record to put a new disc on and change the needle. This could be avoided if a drawer were provided right at the bottom of the cabinet, almost at floor level.

This drawer would accommodate the motor, turntable and pick-up, and would be pulled out, of course, for record reproduction. The records and needles could then be changed without getting up from one's seat.

The more I think about this scheme the more I like it; I must see if any of my cabinet-making friends are equally enthusiastic. It is true that if a clockwork motor were used the winding handle would have to come out of the front, but I do not see any great disadvantage in that.

More Cabinet Reflections

Recent experience with console and radio-gramophone type cabinets leads me to the conviction that they should be made larger than they are at present. Most cabinets nowadays have fronts that are too narrow and insufficient depth between the top of the baseboard and the motor board.

The first snag is that the controls on the set must be grouped close together in the centre and the baseboard must not be too wide. Secondly, it is extremely difficult in many cases to arrange the set so that the valves do not foul the motor when the set is pushed into position.

No doubt many constructors have come up against these snags, which would be avoided if cabinets were made three or four inches wider and deeper than they are at present. The tendency seems to be for sets to get larger—the average man uses more valves now than he did a few years ago and it seems likely that in the future even more valves will be utilised.

Our cabinet manufacturers should watch this tendency.

One cabinet maker I was talking with a few weeks ago is developing his designs in the other direction. His opinion is that receivers are tending to get smaller, but I am sure he is mistaken.

New Valves for Old Sets

Did you notice the recent Cossor advertisement based on a letter from a reader of "Wireless Magazine" who built the Empire Five in 1928 ? This listener found that his old set was greatly improved by the substitution of new valves in place of the old ones.

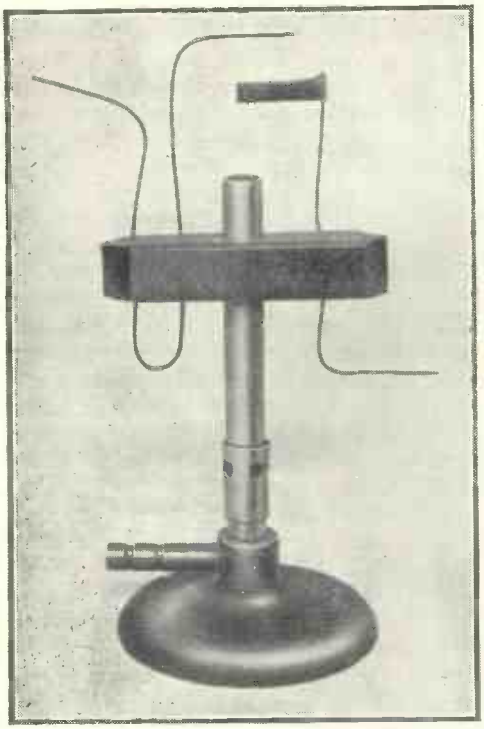
This is a hint that many users of old sets might take advantage of with pleasing results. After a time one feels, I know, that one's set ought to be re-built, but in many cases the set can be improved out of all knowledge by the use of new valves. If you have an old set that has seen its best days you may find it worth while proceeding on these lines before deciding to scrap it altogether and build an entirely new receiver.

The life of the modern valve can certainly be measured in terms of years rather than of months, but still they do go off after prolonged use. The decrease of efficiency is so slow and gradual, however, that it is very often not noticed until new valves are installed. BM/PRESS

*London, W.C.*1.

RADIO RHYMES

The Bass-Baritone, sings songs of the foam;
("Unfurl the top-s'il, we're sailing for home.")
A life on the ocean wave, sings he,
Is far better than a life at sea!



NOT MUCH LIKE A VALVE!

Fig. 1.—The De Forest gas-flame detector, forerunner of the present-day detector valve

The Valve

YESTERDAY AND TO-DAY

This article by GORDON S. MITCHELL is written from the American point of view, but every word will be of interest to British listeners. It is remarkable because of the very fine illustrations that accompany it

WIRELESS communication and the great industry which has grown up as a result of the application of wireless to entertainment is definitely a result of the perfection of the valve.

Without the three-electrode valve there would be no broadcasting stations disseminating amusement and instruction—no short-wave communication across entire continents—the wireless industry would consist of a relatively small communication business between ship and shore, and from ship to ship. In a last and final analysis it is the valve which is responsible for the present state of wireless.

De Forest

It was in 1904 that the valve was first conceived in the mind of Dr. Lee De Forest. In his capacity as an Associate Editor of the *Western Electrician*, Dr. De Forest conducted numerous experiments with electrical apparatus, being particularly interested in spark-coil phenomena.

One evening he noticed that each time a spark jumped the gap on the large coil, a nearby Welsbach mantle flickered. The thought occurred to Dr. De Forest that the Hertzian or wireless waves might be responsible for the flicker by exerting some then unknown influence upon particles of heated gas in the mantle.

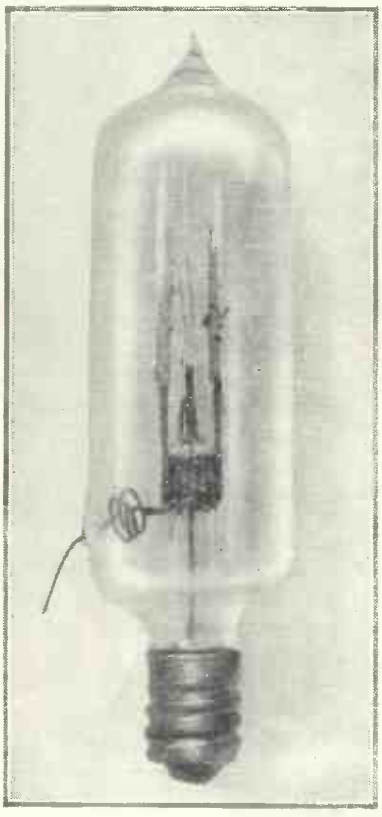
Realising the need for an efficient wireless detector which might replace the crude coherer, he embarked upon the experiments which were destined to revolutionise communication.

The first gaseous detector consisted of an ordinary Bunsen burner in the blue flame of which there were placed two electrodes, one a piece of platinum wire and the other a small trough containing common table salt (NaCl.)

The aerial was connected to one electrode, the earth to the other. A pair of headphones and a battery were then shunted across the detector. Fair results were obtained with this arrangement.

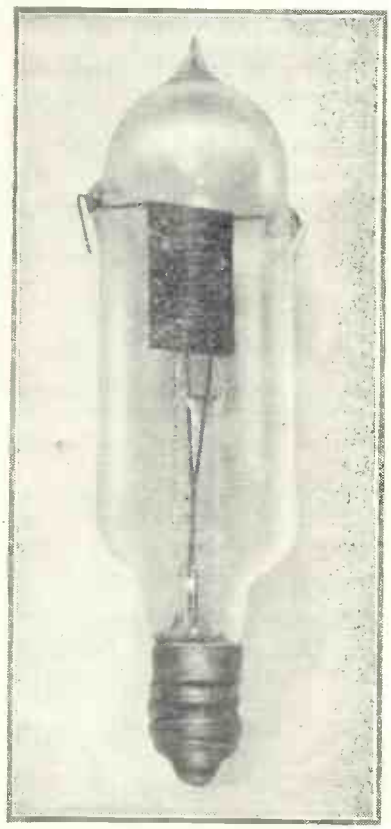
However, it was realised that this particular form of detector would prove to be entirely useless in marine wireless (which was the principal field using this means of communication at that time) due to the lack of illuminating gas on shipboard.

Continuing along this line of thought, Dr. De Forest conceived the idea of placing two electrodes inside a glass bulb containing a gaseous element, one of the electrodes to be a filament which might be heated by passing a current through it.



A RELIC OF EARLY DAYS

Fig. 2.—First vacuum-tube detector with the control electrode in the form of a plate



WITH THE GRID ADDED

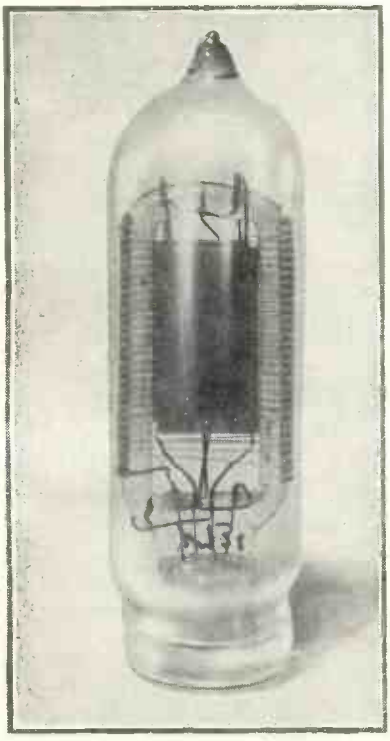
Fig. 3.—Tubular audion valve with grid. This was the first valve with the control electrode in the form of a grid

This device, when built up, operated satisfactorily, but in a search for a more efficient signal detector a third element was tried out, first as a metallic band around the outside of the glass bulb and later as a plate inside the bulb and very close to the two electrodes.

Birth of the "Grid"

This third element finally emerged as a zigzag length of wire which, for want of a better name, was known as a "grid." This three-electrode valve was developed by the summer of 1906, at which time efforts were started to complete arrangements for the manufacture of the device.

Dr De Forest first attempted to interest the large lamp manufacturers, but met with antipathy at every turn. He did finally succeed in interesting a man by the name of McCandless, who was then engaged in the manufacture of miniature



A TRANSMITTING "BOTTLE"

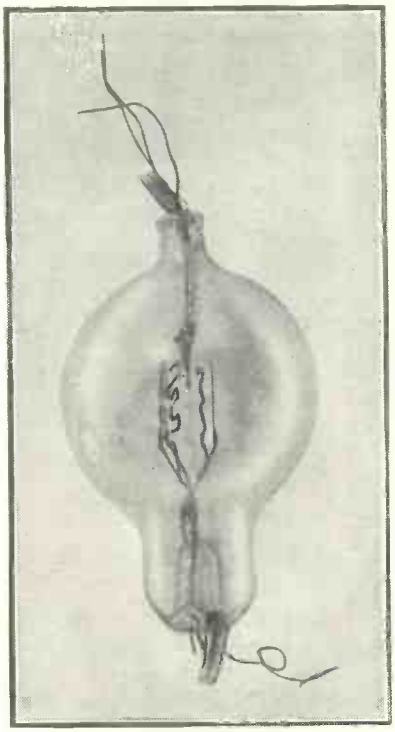
Fig. 4.—One of the earliest transmitting audion valves. This valve has the grid completely surrounding the filament—the first to be so constructed

electric-light globes at a small plant in Park Place, New York City.

The facilities of this plant were easily turned over to the manufacture of the "audion" bulbs (as they were known then) and McCandless's men, all skilled glass blowers, were put to work upon the new device.

The audion bulb as it was first put on the market was intended for the use of wireless experimenters as a detector. It was supplied in conjunction with a small wooden cabinet which contained flashlight batteries for high-tension supply, and terminals and switches for the necessary connections to the circuit.

One of the early advertisements of the company stated that "the audion detector is operated by



A DEVELOPMENT OF 1912

Fig. 5.—One of the original valves of 1912 hand made and of fragile construction. It was non-uniform in operation and short lived

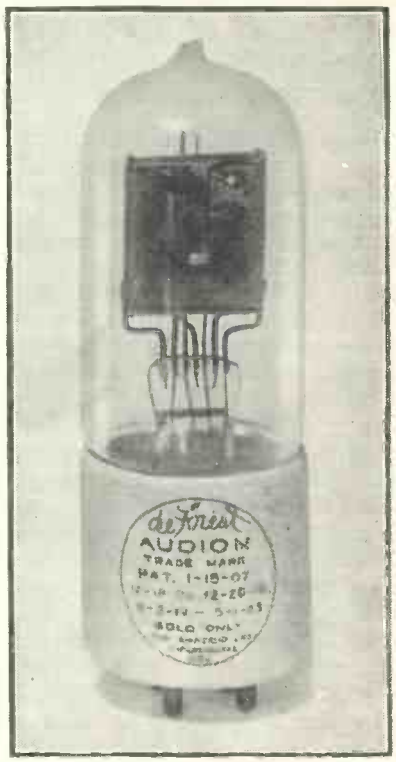
heated gases, employs a local battery, and is complete with switches, batteries, rheostats, and the necessary connections," and further states that "it is pronounced by experts to be the very best detector obtainable anywhere."

The first valves were built with tantulum filaments, of a double loop construction, with three pigtail leads in order that one or the other loop might be used. When one loop burned out, the other might be placed in circuit, resulting in a double length life for the valves—short-lived enough at best.

The valves were extremely gaseous, and plate voltage had to be adjusted delicately to the most critical value. If this plate voltage were increased beyond the critical value the valve interior would suddenly glow with a purple light and signals would become indistinguishable.

BEFORE BROADCASTING

Fig. 6.—The UT2 valve developed just prior to the broadcasting era for the use of the United States Navy. This valve had the first welded grid

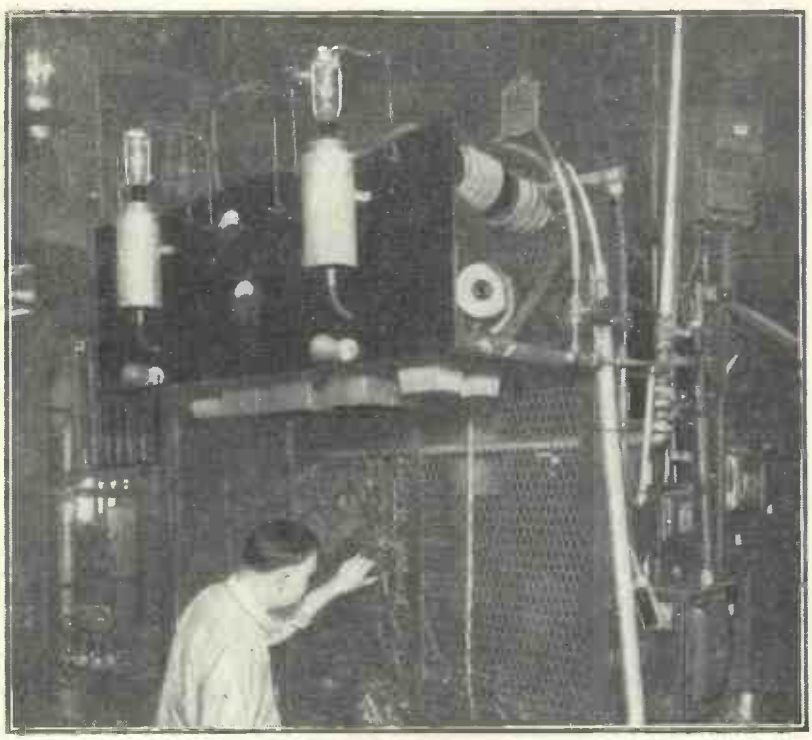


EARLY BROADCASTING DAYS

Fig. 7.—The valve of 1924, used extensively in American battery-operated sets of the period

THE VALVE

(*Continued*)



DE FOREST TRANSMITTING VALVES

Fig. 8.—Photograph showing the large De Forest water-cooled transmitting valves. (See the upper left part of the picture)

In addition to its use in wireless receivers, the audion after a time was applied to telephone transmission. Early in 1915 the first transcontinental telephone service was inaugurated using De Forest valve amplifiers. This line was operated between San Francisco, California, and New York City.

During the latter part of the same year successful contact was established by wireless between Arlington, Virginia, and the Eiffel Tower in Paris, France, and still later between Arlington and Pearl Harbour, in the Hawaiian Islands. The three-electrode valve as such had been recognised and its value to wireless communication had been acknowledged.

Army and Navy Use

In 1917 the American Telephone and Telegraph Company entered into an agreement with Dr. De Forest whereby enough valves might be manufactured for the use of the army and navy for wireless communication during the World War.

Until the advent of broadcasting, valves could be manufactured under laboratory conditions, that is, by glass blowers and on existing lamp-making machinery, piecemeal and with little regard to cost. (Relatively high selling prices made strict economies in manufacture unnecessary at that time.)

With the advent of broadcasting the manufacture of valves became an important industry. Where it had formerly been necessary to supply a few thousand valves per year, there suddenly arose a demand for millions.

The shortage of valves and the insistent cry from all parts of the world for them made the development of automatic machinery necessary. The old hand methods of assembly were replaced. With increased production there came also an increased delicacy of construction. Elements were closely spaced, much more closely than would have been possible under hand methods of assembly.

By degrees the supply of valves caught up with the demand, and efforts which had been heretofore expended in attempting to alleviate the shortage were expended in the development of better manufacturing equipment.

IN USE TO-DAY

Fig. 9.—One of the latest American screen-grid valves. Note the contrast in construction compared with early valves

ANOTHER AMERICAN EXAMPLE

Fig. 10.—Another typical American screen-grid valve as used in present-day sets

The "New Economy" Sets on Test

NEW ECONOMY TWO

(January, 1932)

Birmingham (Warwick).—I am getting such unprecedented results with the New Economy Two that I feel I must write and let you know. I have never had such results on two valves before, and my experience with wireless began with the old Birmingham station when it first started transmitting from the G.E.C. works at Witton. I have logged eighteen stations on the medium waves, all on the loud-speaker. The long waves are as good as the medium.

Leicester (Leicester).—I have completed the New Economy Two and am getting fine results. I have received, so far, the following stations on the loud-speaker :—

BRITISH

Daventry National	Midland Regional
London National	North Regional
London Regional	

FOREIGN

Heilsberg	Bergen
San Sebastian	Stockholm
Beromuenster	Rome
Prague	

Most of the foreign stations were received while the British stations were working. Many thanks for this fine circuit. Truly an economy!

Newton Abbot (Devon).—I am more than satisfied with the results. I have received London National, Midland Regional, North Regional, Radio Paris and Mühlacker all at medium loud-speaker strength. On headphones I have received Eiffel Tower, Toulouse and four other foreign stations. I think the reception wonderful considering the locality.

Rochester (Kent).—I have had this set for three days. The aerial is 66 ft. long and 40 ft. high. Using this aerial I have logged the following stations : London Regional, London National, Midland Regional, North Regional, Paris, Mühlacker, Grenoble, Lvov, Toulouse, Turin, Nürnberg, Strasbourg, Naples and others I have not yet identified. I find that the New Economy Two has a wonderful range. Everybody in the house is astounded at its performance.

◆ ◆ ◆

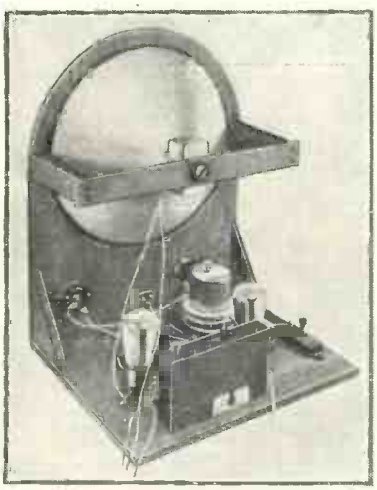
NEW ECONOMY THREE

(December, 1931)

Elworth (Cheshire).—I have built the New Economy Three and am amazed at the results. The set is not praised half enough. On the long waves the results are very good indeed. Radio Paris, Huizen, Berlin, Moscow and others not yet identified come in at extraordinary strength. I use no reaction, yet I have to turn the dial off the station or the signal is too loud.

Manchester (Lancs).—You ask for reports on the New Economy Three. Here is my log using an aerial 70 ft. long :—

Trieste	Graz
Berlin	Midland Regional
Heilsberg	Hamburg
Milan	Toulouse
North National	Söttens
Strasbourg	North Regional
Barcelona	



THE NEW ECONOMY TWO

A full-size blueprint of this set can be obtained for 1s. post free (No. WM265); a blueprint of the New Economy Three (No. WM263) costs the same

I have also received Radio Paris, Daventry, Eiffel Tower, Warsaw and several other long-wave stations. I think the success of the set depends on the adjustment of the preset condenser, which must be altered to separate the stations.

Slaithwaite (Yorks).—I live in the centre of Slaithwaite within a mile of the Moorside Edge twin transmitters. Last month I built the New Economy Three and with it I can separate the two stations with about 5 ft. of wire for an aerial.

The New Economy Two and the New Economy Three were described in the January 1932 and December 1931 issues of "Wireless Magazine" respectively. The cost of construction—complete in each case with valves, batteries and loud-speaker—is £3 5s. and £5. Both sets have proved to be extremely popular, as these ten reports from readers in various parts of the country testify so clearly.

Sheerness (Kent).—This set is undoubtedly the best and cheapest three-valve screen-grid set I have ever constructed.

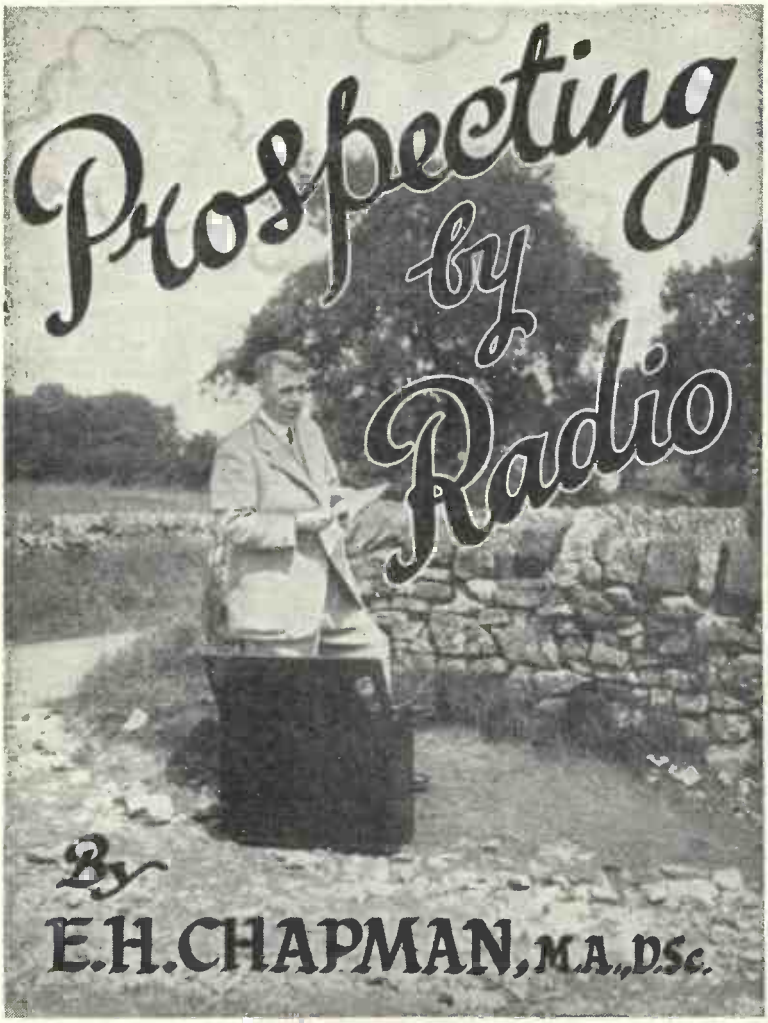
On both long and medium wavebands no difficulty is experienced in cutting out interfering stations.

Streatham (London, S.W.).—I must congratulate you on designing so efficient a set for the price. I am running it off a small indoor aerial about 4½ ft. long, hung from the ceiling. Both London stations come in at good volume and also several foreigners, notably Hilversum, Heilsberg and Mühlacker. The selectivity of the set is excellent. Previously I had been using a somewhat old portable set and was considerably troubled with interference from Mühlacker on the London Regional programme. The New Economy Three cuts out Mühlacker easily.

Tottenham (London, N.15).—It is with great pleasure that I write regarding the performance of the New Economy Three. It brings in several foreign stations, many without interference, at simply beautiful tone.

Prospecting by Radio

By E. H. CHAPMAN, M.A., D.Sc.



EXPERIMENTING IN STAFFORDSHIRE

The writer of this article with his mineral-locating apparatus. It takes the place of the "flying circuit" of the old equipotential method of electrical prospecting

A VERY considerable amount has been written on this particular subject from time to time, and a careful reading of all that has been published cannot fail to reveal one important point—namely, the absence of definite and proved results. Even allowing for the natural reticence of the miner or treasure hunter to give away the secret of his success to his competitors, this absence of results is difficult to understand.

A Typical Story

Let us consider a typical story of the application of wireless to the finding of buried treasure. Most such stories are very similar. This one will suffice.

If you will turn to the Morgans in your encyclopædia, you will doubtless find there an account of one Sir Henry Morgan, a Welsh buccaneer. This Sir Henry Morgan took part in many daring exploits against the Spaniards in Panama and Cuba in the latter half of the sixteenth century. One of his exploits, in 1671, was directed against the city of Old Panama. The city was captured by Morgan, but the treasure yielded by the city was far less than Morgan had been led to expect.

In after years a legend grew that the citizens of Old Panama had had warning of Morgan's attack and that they had had time to bury their treasures somewhere in the city. The most persistent legend was that the priests of the cathedral dug an underground passage and hid in this passage not only the treasures of their church, but also the treasures of wealthy families.

These priests, so said the legend, were killed in Morgan's raid, and the secret of the underground passage died with them.

No Success Recorded

Many attempts have been made to unearth the buried treasure of Old Panama. One attempt, made a few years ago, involved the use of wireless apparatus familiar to wireless experimenters. Although picturesque descriptions of this attempt, and of the apparatus used, were given in wireless periodicals at the time, no authentic information of the success of the attempt seems to have been given.

It seems unlikely that the success of this attempt would have escaped the world's press, particularly that of the New World.

In an article in *Amateur Wireless* reference was made recently to a type of signalling used in the war and known as earth-current communication, and it was stated that almost the same type of apparatus is employed in electrical prospecting and treasure hunting to-day.

The history of this earth-current method of prospecting is most interesting. Two Englishmen, Daft and Williams, were the pioneers in this particular method and they patented their apparatus in 1902. Daft and Williams passed the secondary current from an induction coil into the ground by means of two iron-rod electrodes fixed several hundred yards apart.

The area round these two electrodes was explored by means of what was called a "flying circuit," consisting of two metal probes thrust into the ground and an ordinary telephone. The metal probes of the "flying circuit" were placed from five to ten yards apart.

Minimum Sound

For its results the method of Daft and Williams depended on the fact that, when the two probes of the "flying circuit" were placed in the ground at two points having the same electrical potential, a minimum amount of sound was heard in the telephones. Hence it was possible to

draw "equipotential lines" on a map of the area explored.

The presence of ore bodies was revealed by the distortion of these equipotential lines, good conductors underground being indicated by a bending outwards of the equipotential lines.

Improved Gear

In 1912 the apparatus of Daft and Williams was improved by the use of a direct-current generator in place of the induction coil, and by the adoption of a "flying circuit" embodying two non-polarising electrodes in series with a potentiometer. The main difficulty, however, in applying this apparatus, was the existence of natural currents in the earth.

These natural earth currents caused errors to be made in the direction of the equipotential lines, and wrong conclusions as to ore deposits were possible in consequence.

TREASURE HUNTING
Taking a reading with the author's "flying circuit" over land in Derbyshire

Further improvements in this equipotential-line method of electrical prospecting were made in 1918 by two Swedish investigators, Lundberg and Nathorst. For their source of current Lundberg and Nathorst used a small portable A.C. generator driven by a petrol motor.

A point of great interest to wireless experimenters is that Lundberg and Nathorst used a valve amplifier in their flying circuit. With this amplifier it proved possible to work with the two fixed ground electrodes two miles apart, and to take the flying circuit as far as half a mile away from the line joining the two ground electrodes.

Before this amplifier was introdduced the ground electrodes were placed three or four hundred yards apart, and the survey was limited to points within two or three hundred yards on either side of the line joining the two fixed electrodes.

PORTABILITY OF THE PROSPECTING APPARATUS
This photograph shows the portability of the author's "flying circuit" for electrical prospecting. Work has been done over lead ore in Derbyshire and over iron ore in Cumberland

Lundberg and Nathorst made a great improvement in the equipotential-line method by using, instead of the two original point electrodes, two line electrodes. These line electrodes, placed parallel along the ground, took the form of a long wire earthed at frequent intervals by earthing pegs.

With this electrode system, the equipotential lines run parallel to the electrode lines, and it is therefore an easy matter to recognise distortion in these equipotential lines.

Although successful results have been claimed for the modern equipotential method of electrical prospecting in Europe, Africa, and America, it will be readily understood that the method suffers from one serious defect, and that is that the currents employed cannot be expected to penetrate properly to any great depth in the earth's crust.

Now it comes within the knowledge of the majority of those who use receiving sets that the strength of signals received depends not only on the type of earth connection employed, but also on the nature of the ground into which that earth connection is fixed.

Hence it will not come as a surprise to listeners to be told that there is a method of electrical prospecting which depends on measurements made of earth resistivity.

The earliest attempts to locate ore bodies by the resistivity method were made by measurements of the resistance between two electrodes placed in the ground. It was thought that when an ore deposit lay underneath the line joining the electrodes, there would be a drop in resistance. Little progress was made, however, with the resistivity method until the four-electrode system came into use.

Resistivity of the Earth

In this system there are four electrodes placed in a straight line at equal intervals. Between the two end electrodes a current is passed, and the potential difference between the two inner electrodes is measured. From the known value of the current and the measured potential difference between the two inner electrodes, a value of the resistivity of the earth is determined.

This value is taken to be the average resistivity of the earth to a depth equal to the distance between two successive electrodes in the four-electrode system. Thus, if the four

PROSPECTING BY RADIO—Continued

electrodes were placed in line at intervals of 200 ft., the value of the resistivity measured would be taken to be the average resistivity of the earth underneath the electrode system to a depth of 200 ft.

Within 10 Feet

By varying the distance between successive electrodes, average values of earth resistivity to varying depths can be determined. Abrupt changes of this average resistivity with depth are taken to mean changes of a geological nature of the earth's crust. By this resistivity method, it is claimed, the depths of ore bodies can be determined to within 10 ft.

Listeners will be interested to learn that the batteries used in the resistivity method of electrical prospecting are the familiar high-tension batteries of the wireless receiver.

So far we have dealt with methods of electrical prospecting which are related in some way or other to wireless as we know it. We now come to those methods of electrical prospecting in which wireless itself is actually used.

Perhaps the first attempt to make use of wireless waves in the location of mineral deposits was one based on the idea that wireless waves would be reflected by a good conductor such as a metallic ore body.

Failure in the Field

Although several experimenters proved that it was possible to detect reflected rays from various minerals in the laboratory, the method proved a failure in the field, even when a directional transmitter and a directional receiver were used.

In another early attempt to use wireless waves, the transmitter was placed in one shaft or on one level of a mine, and the receiver was placed in a different shaft or on a different level of the mine. The idea was to locate a good conductor by its "blind-spot" effect, as we should call it to-day, but the result was failure.

Although there were possibly sound theoretical reasons behind these early attempts to use wireless waves in prospecting, failure was due, no doubt, to the fact that they have far less penetrative power through rocks and soil than these early experimenters thought.

One of the most picturesque of early methods of using wireless in prospecting was that in which a transmitting aerial, suspended from aeroplanes or airships, was dragged over the ground. When the transmitting aerial passed over a good conductor a change in the wavelength of the transmission was caused, and thus the presence of an ore body or other good conductor was revealed.

In modern electromagnetic methods of prospecting, a definite attempt is made to induce currents in any relatively good conducting ore bodies there may be in the area explored. Sometimes a low-frequency alternating field is created in the area over which a survey is being made, and sometimes a high-frequency alternating field is created.

These alternating magnetic fields induce alternating currents in a conductor, and these induced currents in turn produce another magnetic field which is out of phase with the original alternating field.

Thus distortions in the original alternating field are produced, and the presence of ore bodies may be determined by a careful study of these distortions.

One of the best-known of the methods using a low-frequency alternating field was invented by German engineers as a result of their experience of earth telephony during the war. The low-frequency alternating current is passed into the ground by means of two point electrodes placed a hundred yards apart.

High-frequency alternating-field induction methods correspond more closely to wireless practice than do low-frequency alternating-field methods. At the transmitting end of the high-frequency apparatus there is a radiating system which usually takes the form of a rectangular frame, or a circular loop aerial.

The search, or receiving coil of the receiver is generally a circular loop aerial which can be rotated about a horizontal as well as about a vertical axis. The receiver is taken from point to point over the area to be surveyed and observations are made of the strength of signals received from the transmitter.

Adjusting the Loop

At each point of the survey the receiving loop is turned round its vertical axis and tilted about its horizontal axis until a position is found in which signal strength is a minimum.

Careful measurements are then made of the "dip" and "strike" angles of the search coil in the minimum position. From these "dip" and "strike" readings deductions are made as to the presence of ore bodies.

We have now dealt briefly with the most important of the methods of electrical prospecting used to-day. Can we, as wireless experimenters, add to present knowledge of wireless prospecting?

Some months ago a perfectly serious proposition was put to me to design and construct wireless apparatus by means of which King John's treasure could be located in the Wash. What would be the method of approach to such an investigation supposing one felt inclined to undertake it?

Errors in Reading

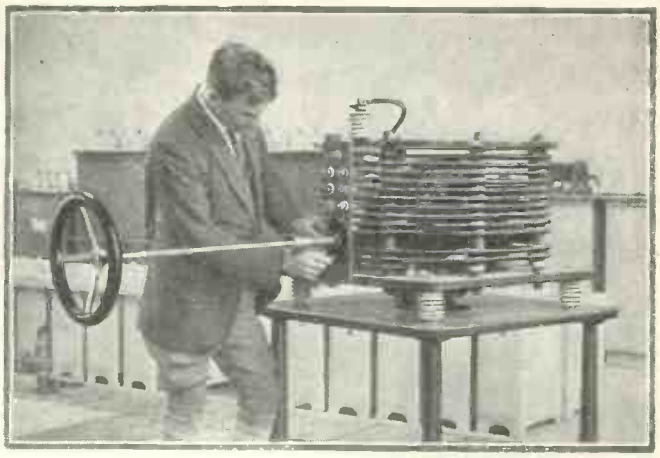
We know that, in direction-finding work, a mass of metal on the ground or in the ground may cause big errors in the readings taken of the bearings of distant transmitting stations.

Could this direction-finding phenomenon be used as the basis for a new method of wireless prospecting?

For the past three years I have carried out a very large amount of experimental work on the location of mineral deposits. Most of the work has been done in Derbyshire over lead, and in Cumberland over iron ore. From the experience of this work I would say that the location of mineral deposits by means of wireless and other scientific apparatus is a problem of the most intense difficulty and one which demands an infinite amount of care in the work and of patience in waiting for proved results.

CHANGES at DAVENTRY

Great changes are to be made at Daventry in the near future. Listeners need feel no alarm, however, for they will increase the efficiency of the service. Both 5XX and the Midland Regional transmitters are to be moved.



ONE OF THE DAVENTRY TUNING COILS
This photograph of an engineer adjusting a tuning coil was taken when the B.B.C.'s long-wave transmitter was first put into operation

EVER since broadcasting began in this country Daventry has been internationally famous as the site of the B.B.C.'s one and only high-power long-wave station. In the near future Daventry's fame will spread to the ends of the earth, because it has been chosen as the site for Empire broadcasting.

Two Short-wave Stations

Standard Telephones & Cables, Ltd., have already secured the contract to build two short-wave stations at Daventry. The power of each is to be 20 kilowatts (Copenhagen rating). At the moment the apparatus is being made and assembled at Hendon and New Southgate, London. It should be completed by the autumn of the present year and the B.B.C. hopes to be testing the two stations before Christmas.

A considerable amount of ground will be needed for the aerial systems connected to these two Empire stations. No less than seventeen different aerials will be used. Their wavelengths will vary between 14 and 50 metres.

As the Empire stations are to conduct a twenty-four hour service, different wavelengths are required for different periods of the day and night. Hence the need for so many aerials and for the use of the two transmitters to give the whole of the Empire something approaching a continuous programme.

It is understood that the Empire stations will be run from the ordinary corporation supply at Daventry. There will be no need for special power plant, such as the giant Diesel engines used at the regional stations.

Although the power needed at the input of the Empire transmitters is considerably greater than the radiated aerial power of 20 kilowatts this can be quite easily handled by the Daventry supply.

Coinciding with the news of Empire broadcasting from Daventry comes the B.B.C.'s decision to move the Midland Regional station from Daventry to some site nearer Birmingham. At the Broad Street headquarters of the Midland Regional station a new large concert studio and three small studios are being built, and these will be connected to the re-designed Midland Regional transmitter.

The reason for moving Midland Regional is not, as has been stated in some quarters, to reduce the present sixty-mile landline connection between the studios and the transmitter, but to give Birmingham and Midland Regional listeners generally a stronger signal.

Daventry is not an ideal site for a purely regional transmitter for the Midlands, and that is the main reason for the contemplated change.

The long-wave Daventry station, known as 5XX, is now getting old, and, besides, its 30-kilowatt power is not considered enough for a country-wide transmission of the National programme. The design and power of 5XX ill compare with such stations as Warsaw No. 1 and other new European stations.

Rebuilding 5XX

The B.B.C. has decided to rebuild 5XX and to provide it with a power of 100 kilowatts, Copenhagen rating. With such a high power the exact site is not of first importance, since the signals would, in any case, cover the whole country quite easily.

For convenience, therefore, the B.B.C. has almost definitely decided to rebuild Daventry 5XX on the same site as the new Midland Regional station, that is somewhere between Daventry and Birmingham.

The new 5XX, with its 100-kilowatt aerial power, will, of course, have a tremendous daylight range. The B.B.C. expects that it will be well heard, even on simple sets, from Land's End to John o' Groats. Continental listeners, anxious to keep in touch with England, will also rejoice in the strong signals from the new 5XX, which will then vie with Radio Paris and other high-power long-wavers.

The great service area of 5XX will be of special value when the regional scheme matures. It is almost certain that even five high-power medium-wave Nationals will not adequately cover the country with the National programme, especially as West and Scottish Nationals will have their service areas limited through synchronisation on 288.5 metres.

Great Service Area

It will thus be seen that while Daventry will shortly achieve new fame as the site of Empire broadcasting, it will at the same time lose its importance in the domestic broadcasting scheme.

When the new site is chosen it is probable that a small and at present unknown village will suddenly achieve an international significance. Will its name form the subject of yet another pronunciation controversy?

Alan Hunter.

POWER or SUPER-POWER VALVES?

BATTERY SUPER-POWER VALVE
This photograph shows the electrode arrangement of a Mullard PM202 super-power valve for battery operation

ONE of the problems which new listeners find themselves called upon to solve is the decision as to whether they shall use a "power" valve or a "super-power" valve in the output stage of their receiver.

Those not highly versed in technicalities may imagine that the question can be settled once and for all by applying the simple formula: for medium volume use a power valve and for big volume use a super-power valve.

Other Important Factors

But the answer is not quite so simple as that. The choice of output valve is affected by several other factors such as, for instance, the strength of the audio-frequency signals provided by the previous stages of the receiver, and the amount of high-tension power available.

If, for example, the early stages of a set produce only sufficient signal strength to "load" a valve of the "power" type, not only will no increase in volume be obtained by substituting a super-power valve but, owing to the lower amplification factor possessed by most super-power valves, the volume will probably be smaller, although possibly the quality of reproduction may be improved somewhat.

Again, a super-power valve operates at a definitely higher anode current than a power valve, and unless the high-tension supply is of generous rating, battery renewals will be required at distressingly frequent intervals and the quality of reproduction will suffer, due to the valve being "starved."

The important bearing which signal strength has upon this question can be demonstrated by comparing the characteristic curves of two typical valves, one of the power and the other of the super-power class.

Fig. 1 shows the grid-volts/anode-current curves for such a pair of valves. Note, please, that these are the "dynamic" curves—not the "static" curves as published by valve manufacturers. These dynamic curves indicate the performance of the valves under working conditions; that is to say, with excited grid and with a theoretically perfect loud-speaker connected in the anode circuit.

By the way, the dynamic curves can be quite easily prepared from the anode-volts/anode-current curves now generally supplied by valve makers—but that is another story.

However, it must be taken for granted for the moment that these two curves do represent something like practical working conditions. The lower curve is for a typical power valve, the mean anode current of which, at the normal grid bias of 6 volts, is 8 milliamperes, while the upper curve is for a super-power valve taking a mean anode current of 14 milliamperes at a grid bias of about 13 volts.

Now, suppose an audio-frequency signal having a peak value of 6 volts is applied to the grid of the power valve. This is indicated at A, and the corresponding audio-frequency variations in the anode current will be as shown at A_1.

It will be observed that the "upper" and "lower" half waves of A_1 are not quite identical, the "lower" half being somewhat flattened. This means that some distortion is present, and is due to the fact that the grid-volts/anode-current graph is not a straight line, but has a bend at the lower end. Were the graph more approximately straight, as shown by the dotted line at D, the two halves of the resultant anode current variation would be identical as shown at D, and no distortion would be introduced.

Too many listeners fail to realise the advantages of using super-power valves in the output stages of their receivers. This simple article by JOHN COLLINDALE explains their merits in terms that can be understood by everybody who owns a radio set and will do much to clear up obscure points. Almost any set can be improved by the use of a larger power valve. Are you at present getting the best possible results?

However, the distortion in this case is not serious, and is within the limits for tolerably good reproduction.

It will be understood, then, that the amount of power available in the anode circuit of the power type valve, for operating the loud-speaker, will be proportional to the value of the alternating current A_1.

Anode Current

Now, let us apply a similar signal of 6 volts peak value to the super-power valve as at B. The resultant alternating, or "output," component of the anode current will now be as at B_1.

B_1 is obviously smaller than A_1, and this is due to the amplification factor of the super-power valve being lower than that of the power valve. But it will be noted that the two

halves of the wave are identical—there is no distortion.

Thus, by substituting a super-power valve for a power valve, but applying only the same grid swing, we have actually *reduced* the volume of sound slightly, but have obtained improved reproduction. This has been achieved, however, only at the expense of increased high-tension consumption, for the mean anode current is now 14 milliamperes as against 8.

Maximum Signal

Now, the 6 volts peak value grid swing is the maximum signal which can be applied to our power valve without causing serious distortion, and it is when larger grid swings have to be handled that the super-power valve shows to best advantage.

For instance, the super-power valve used for the example in Fig. 1 can handle a grid swing of 13 volts peak value without distortion being introduced. This is indicated at c, and a very large A.C. output component of the anode current is obtained as at c_1, indicating a very substantial volume of sound.

Finally, as a practical example of the output and signal handling capacities of power and super-power valves, it will be interesting to compare two valves of the same make. I have selected for this comparison two 2-volt valves from the Mullard range: the PM2A power valve and the PM202 super-power valve.

COMPARISONS BETWEEN POWER AND SUPER-POWER VALVES

Characteristics	PM2A	PM202
Filament voltage.....	2.0 volts	2.0 volts
Filament current.....	.2 ampere	.2 ampere
Maximum anode voltage..	150 volts	150 volts
Impedance	3,600 ohms	2,000 ohms
Amplification factor.....	12.5	7.0
Mutual conductance	3.5 mA/-volt	3.5 mA/-volt

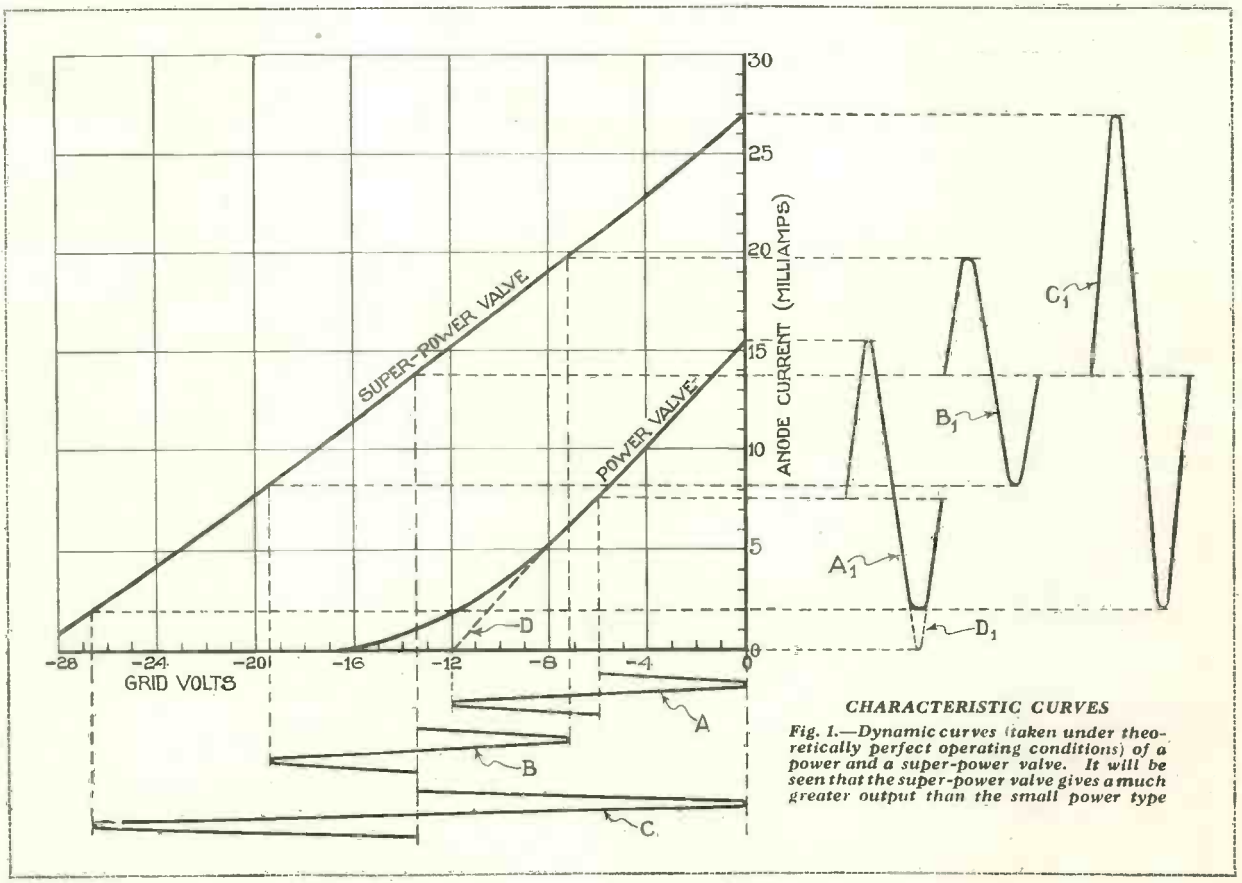
The published operating data and characteristics of these two valves are given in parallel columns above.

With a grid signal having a peak value of 6 volts, the PM2A will give an undistorted output of about 200 milliwatts, the average anode current being 8 milliamperes. The super-power PM202, on the other hand, when the same signal is applied under normal bias conditions, will give an output of only 175 milliwatts approximately because its amplification factor is only 7 as against 12.5 for the power type.

Moreover, the super-power valve takes 14 milliamperes anode current as against 8 milliamperes. The PM202, however, can accept larger grid swings than the PM2A, up to a maximum of about 13 volts peak value. Under these conditions it will give an output of approximately 350 milliwatts.

Guiding Rule

The guiding rule in choosing an output valve, therefore, for economy in high-tension consumption, combined with good volume from weak signals, is to use a modern "power" valve. But for quality reproduction of powerful signals use a valve of the super-power class.

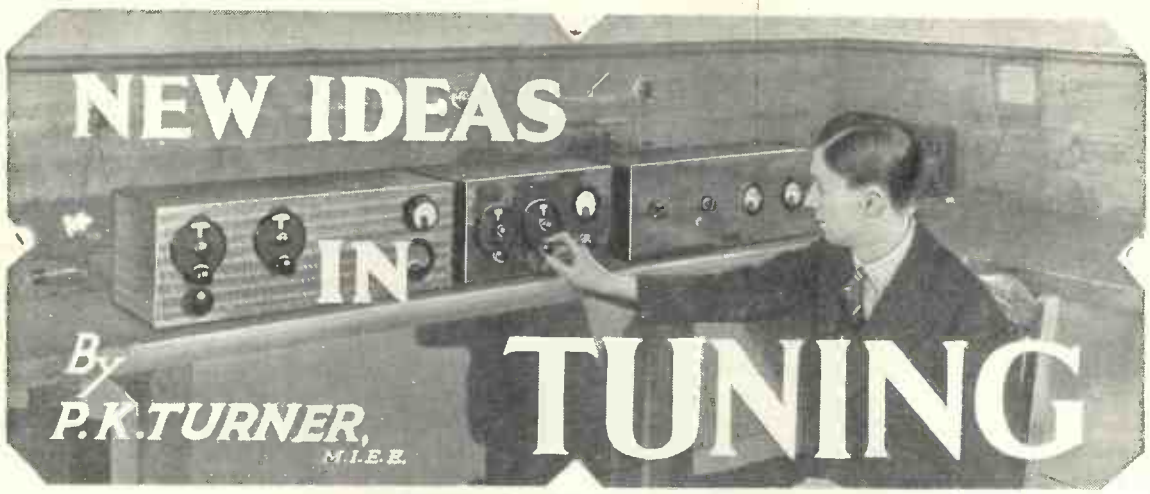


CHARACTERISTIC CURVES

Fig. 1.—Dynamic curves (taken under theoretically perfect operating conditions) of a power and a super-power valve. It will be seen that the super-power valve gives a much greater output than the small power type

NEW IDEAS IN TUNING

By P. K. TURNER, M.I.E.E.



A RECEIVER WITH ULTRA SELECTIVITY
This illustration shows one of the original quartz-crystal Stenode receivers demonstrated to the Press about two years ago

Continuing the series begun in January, the author shows the refinements necessary to put into practice the theory explained in his first article.

IN my last article on this subject*, I explained the general principle of the "new idea." I will repeat it in a few words as a reminder. Instead of trying to make a receiver accept a "band width" including the carrier and the sidebands caused by modulation up to say 5,000 cycles, and reject everything outside this band, we tune on one single circuit, made so sharp by reaction that it cuts the sidebands very badly; and we then correct this "cut-off" by a special form of audio-frequency coupling.

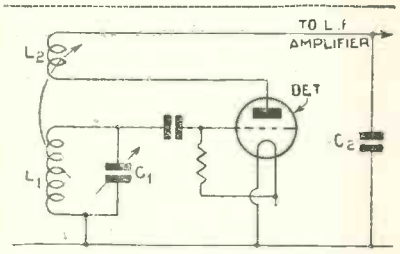


Fig. 1.—The simplest reaction circuit: a failure, as it oscillates before reaching a high enough "reaction mag."

Where It Scores

The advantages of this scheme were found to be:

(1) Much less interference from the *modulation* of stations on neighbouring wavelengths.

(2) Much less distortion in the act of detection.

The first and most obvious circuit for reaction is that of Fig. 1, varying the reaction by moving the coil; but this fails. The trouble with it is that before one can push the reaction far enough, the set bursts into oscillation. To judge how far one has pushed the reaction, we measure the "reaction magnification."

This is the ratio of the high-frequency resistance of the circuit without reaction to its apparent resistance with reaction; when by reaction we reduce the high-frequency resistance to zero the reaction mag. is infinite, and at the same moment the set oscillates. But with ordinary circuits we can't reduce the high-frequency resistance to zero.

As we gradually increase the amount of reaction the resistance comes down all right; but when we have reduced it to somewhere about 1/50th of its normal value there is a click, and oscillation sets in. Also there is usually "backlash"; the reaction adjustment has to be reduced quite a lot before the oscillation stops.

The investigation into why this happened was a long and rather difficult one. But eventually it was found that most of the trouble was due to the feedback current not being dead in phase with the incoming one. In Fig. 1 there is a certain current set up in the tuned circuit by the incoming signal, which is shown as the "signal current" in Fig. 2.

As a result of the reaction, another current is "fed back" into this circuit from the anode circuit, and, as shown in Fig. 2, this was not exactly in step with the signal current.

As a matter of fact, I myself knew of this trouble three or four years ago. But it was not important then. For in an ordinary receiver, the reaction mag. is not pushed as high as 50, because it would cut the sidebands too much. Now that we propose to correct for sideband cut, things are different, so means had to be sought whereby we could get the feedback current exactly in step with the signal current.

Tuned Reaction Circuit

It was found that the trouble was the *reactance* (that is, the effect of inductance or capacity) in the anode circuit—in Fig. 1, the inductance of the reaction coil and the capacity of the by-pass condenser. The reaction mag. cannot exceed the ratio of the anode impedance of the valve to the reaction of L_2 and C_2. Obviously, if this coil and condenser are tuned to the incoming signal, the reactance of the two will be zero; for this is the definition of being tuned. So we next tried the circuit of Fig. 3, both circuits being tuned to the signal.

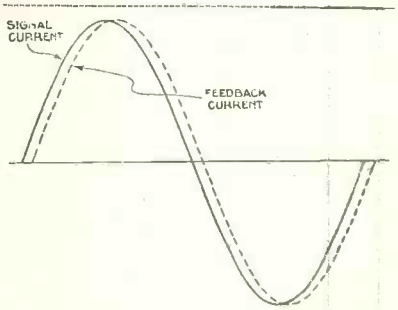


Fig. 2.—Why the simplest circuit fails: the current produced by reaction is not in step with the signal current

This gave a great improvement, and the reaction mag. could be pushed up to several hundred. But

* See "Wireless Magazine" for January, page 682

it was still not good enough, so a further investigation was carried out. The trouble was traced to the feed-back through the internal capacity of the valve itself.

Internal Feedback

It was known that if the reaction circuit L_2C_2 offered no impedance at all to radio-frequency currents, there could not be any such feedback through the valve, because the anode would be short-circuited to the filament (for high-frequency currents), which means that there could be no radio-frequency voltage at the anode, and hence nothing to force any feed-back current through the internal capacity of the valve. So we had expected that tuning the reaction circuit would avoid this trouble.

But, even if L_2C_2 is accurately tuned, there is still its high-frequency *resistance* between anode and filament, so that the impedance here is not quite zero, and there was just enough feedback through the valve to take the fine edge off the smoothness and perfection of the reaction. We cured this by the old method of "neutralising" as used in high-frequency amplifiers before the invention of the screened valve.

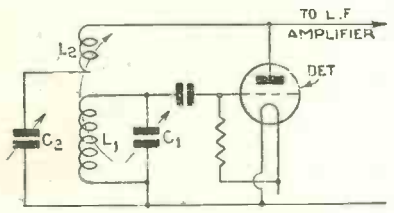


Fig. 3.—If L_2 and C_2 are tuned to match L and C, this circuit gives much better results, but still is not quite good enough

Neutralisation

An alternative, of course, would have been to *use* a screened valve; but unfortunately the screened valve as available at present is not a very good detector (especially where reaction is to be used), so I preferred neutralising. This made the circuit like Fig. 4.

Here the feedback through the valve is exactly compensated or neutralised by the feedback to the opposite end of the tuned circuit through C_4, which is made equal to the internal capacity of the valve. Of course, C_1 and C_3 could have been replaced by one tuning condenser connected right across both coils; but as modern ganged condensers all seem to have one set of plates earthed, we used two condensers as shown. L_1 and L_3 should be exactly equal.

With this circuit, we were able to push up the reaction mag. to well over 1,000, so we were now able to think about the rest of the receiver.

The first thing we found was that the valve damped the tuned circuit too heavily, for the reaction had raised the dynamic resistance to an enormous value. So the lead to the grid was taken some way down the coil—actually, only about one-third the way up from the earthy point in the middle. The neutralising lead was taken to a corresponding point on the lower half of the coil.

Next it was found that when this tuned circuit was used as the anode circuit of a screened valve, that valve again damped it too much; so its connection also was tapped down. The same point as the grid will do, but we found that for the valves we used the best point of all was rather higher up—say about half-way.

Another matter that gave us food for thought was the type of valve to use as detector. When a strong signal comes along, it produces the usual grid-rectifier effect of dropping the anode current. That means that the anode impedance of the valve goes up a little, so that it calls for more reaction coupling to get the same reaction mag.; but that in turn increases the effective strength of the signal, and gives more drop of anode current, and so on.

So we decided to make the valve characteristic artificially less curved, and so to make the anode impedance less dependent on the amount of anode current. To do this, one just puts in a fairly high resistance (several times the anode impedance) in the anode circuit right next to the anode, so that it behaves just as if the anode impedance of the valve had been increased.

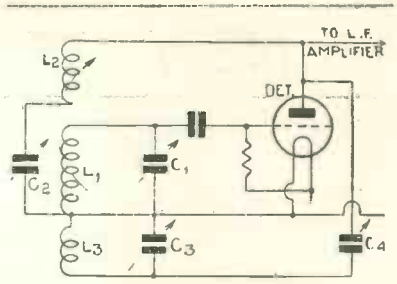


Fig. 4.—By "neutralising" with a centre-tapped coil and the condenser C_4, we can get thousandfold magnification due to reaction

But as this has the effect of increasing the effective anode impedance without altering the magnification of the valve, it is just like using a poorer, old-fashioned valve of lower mutual conductance. So we decided to use a semi-power valve of very high mutual conductance to start with—such a valve as the Mullard PM2A, with a magnification of 12.5 and impedance of 3,600 ohms, giving a conductance of 3.5 milliamperes per volt.

Reaction Coil

If we put 9,000 ohms in the anode circuit of this, it behaves like a valve of 12,600 ohms impedance with a magnification of 12.5, or still a conductance of 1 milliampere per volt. This is still quite a good valve, and the effect of change of anode current on impedance is much reduced.

Next, we considered the actual components in the reaction circuit. We found that with a good valve, as just described, we needed so little coupling between the reaction and tuned coils that it was simpler to use only a few turns on the actual coupling coil, and to make use of a separate coil to bring the total inductance of L_2 up to match L_1 so that they

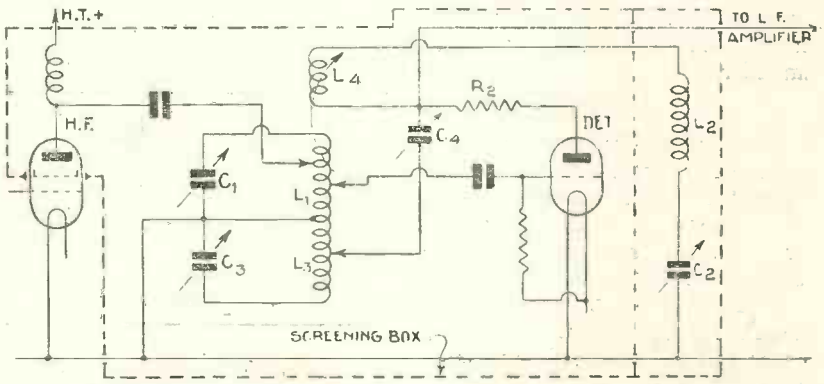


Fig. 5.—The complete "ultra-reaction" circuit. Screening as shown is essential

NEW IDEAS IN TUNING—Continued

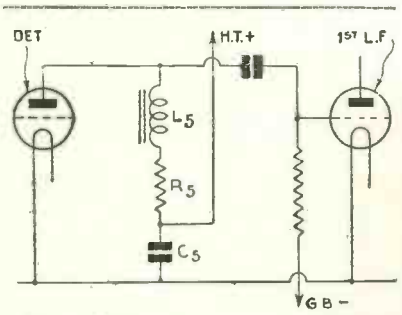


Fig. 6.—Simplest correction circuit, to restore the high notes lost by ultra-reaction

could both be tuned by similar condensers all ganged.

And then, of course, this extra coil had to be screened from L_1, so that there was no reaction coupling except where we wanted it—between the tuned coil and the small movable coil.

So that now the circuit, from the anode of the screened-grid high-frequency amplifier to that of the detector, is like Fig. 5.

Just one point before we consider the audio-frequency amplifier and its

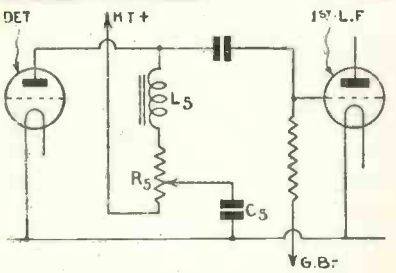


Fig. 7.—To get tone control, the resistance in the correction circuit is made variable and connected thus

correcting circuit: owing to the very low impedance to radio-frequency currents of the L_4 L_2 C_2 circuit between anode and earth, we need no further by-pass condenser here, nor even the usual high-frequency choke in the lead to the audio-frequency amplifier.

Correcting

Now for the correction circuit. I explained in my earlier article that if we use the intervalve coupling shown in Fig. 6 we get perfect correction for all audio frequencies if three conditions are fulfilled, these being:

(1) The ratio R_5/L_5 must be half the ratio R_1/L_1, where L_1 is the tuning coil and R_1 its effective high-frequency resistance.

(2) The coupling choke must not be too large. Its reactance, which is 6.28 times the inductance multiplied by the audio frequency, should always be less than about a third of the anode impedance of the valve, even when the audio frequency is at its highest.

(3) The by-pass condenser C_5 must be large enough to have negligible effect.

Now the first difficulty in getting this right is that R_1 is the *effective* high-frequency resistance of the tuned circuit, and this depends entirely on how far we push the reaction. As this is a difficult matter to find out, what we do is to make R_5 variable, and use it as a tone control; the larger it is, the more bass we get, and vice versa.

But if we simply made R_5 a variable in Fig. 6, we should get into another trouble. Altering it would affect the anode current and hence the reaction adjustment. So we use a potentiometer for this resistance, and connect it as in Fig. 7, so that the whole resistance is always in the D.C. anode-supply circuit, though only a part is in use as intervalve coupling.

As to the actual value of the choke and resistance, we find that if we adhere strictly to note (2) above, the choke is only about .2 henry, and the voltage passed on to the grid of the first low-frequency valve is very small, calling for a lot of low-frequency amplification afterwards. With this system we always have to face using one more stage of low-frequency than we should normally, but we don't want to use *two* more if we can avoid it. So we substitute a step-up transformer for the choke.

Seeing that the secondary inductance of a good intervalve transformer is usually well over 1,000 henries, and that the ratio of secondary to primary inductance is the square of the turns ratio, we might at first

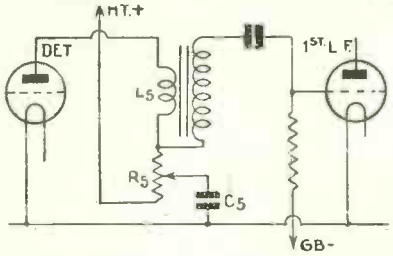


Fig. 8.—To get more output from the correction circuit, we substitute a special transformer for the choke shown in Fig. 7

sight expect to get a turns ratio equal to the square root of 1,000/.2, or about 70/1. But this is unfortunately a fallacy.

In order to get the correcting effect, L_5 must behave as a pure inductance, and the primary of a *loaded* transformer does not do so; from the primary point of view it behaves as a resistance. So we must keep our secondary so small that the resistance of the grid leak and the next valve is only a negligibly small load on it. In practice, we can get about 5 to 1;

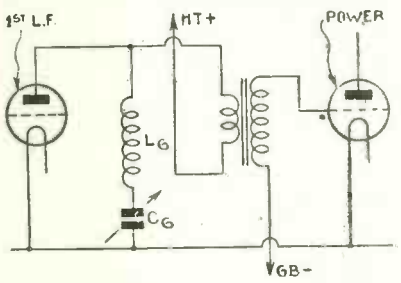


Fig. 9.—The "whistle-killer"—useful in any receiver and necessary in this system if the loud-speaker reproduces as high as 9,000 cycles

and we push up the primary a little.

So that the circuit now looks like Fig. 8, where the transformer is a special one of 4/1 or 5/1 ratio, with a primary of say .5 henry. The resistance will then be, say, a 500-ohm potentiometer; it will be noted that although the coupling is now by transformer, R_5 is still part of it.

Lastly, before we consider the whole circuit, we may as well think how to get rid of the heterodyne whistle from the "next-door" station, although the means of doing so is not really part of this special circuit: I use it on ordinary sets, because I have a loud-speaker that works so well at 9,000 cycles that the whistle is a nuisance. The simplest way is to arrange the anode circuit of the first low-frequency valve as in Fig. 9.

The Whistle-killer

Here L_6 is an air-core choke and C_6 a semi-variable condenser, and the two are tuned to 9,000 cycles. In actual practice, it is best to make the choke of such a value that it calls for about .004 microfarad to tune it, and the condenser consists of a fixed .003 microfarad with a semi-variable .001 microfarad across it. I will give details of a suitable coil later.

A SPECIAL ARTICLE BY P. K. TURNER, M.I.E.E.

We are now in a position to consider the circuit as a whole, and Fig. 10 is a schematic diagram of it. I should like to make it clear that Fig. 10 is not intended to be so complete as to allow anyone to build a complete set from it without thought. It is just intended as a guide for those who are used to filling in the details themselves. I leave to such readers the details as far as they are similar to those of ordinary sets; but I will give short notes on the less ordinary components.

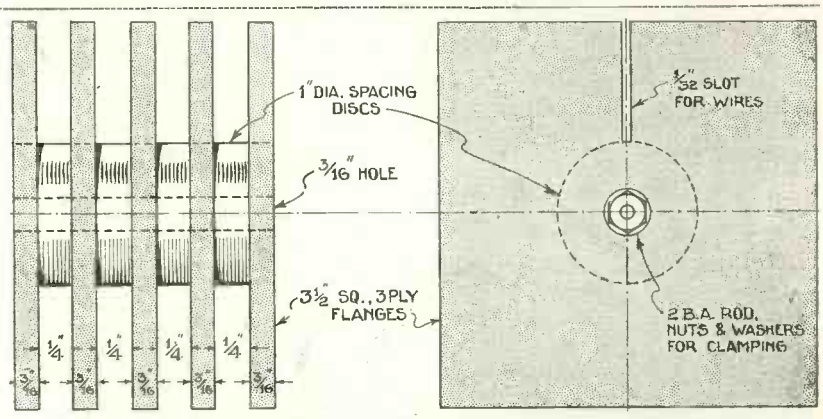


Fig. 11.—Coil for "whistle-killer." The flanges are of ordinary three-ply and the "cores" of broom-handle or ebonite rod. Remember the saw-cuts in the flanges to let wire through from one section to the next. Assemble on a length of 2B.A. screwed rod, and wind 550 turns of No. 30 gauge d.s.c. in each slot

Suitable Components

V_1. Any screened valve. Owing to the probability of frequent oscillation when searching, it is not right to use this circuit without a screened valve first, to avoid interfering with others.

V_2. For choice a semi-power valve, such as PM2A for batteries, or 164V for A.C.

V_3. Any reasonable low-frequency amplifier such as PM2DX for batteries or 354V for A.C.

V_4. Power valve as for any other set.

L_1-L_3. A centre-tapped coil, with swinging reaction coil. Turns of the main coil to be adjusted so that the tuning condensers gang with the aerial tuner. Grid and neutralising taps about one-third from the centre-point; anode tap about half-way.

L_4. Say half the diameter of the tuning coil, and with about ten turns. Must have a slow-motion dial for fine adjustment.

L_2. Slightly less than one-half of the tuning coil. Adjust the turns till C_2 gangs with the other condensers. I hope later on to give further detailed instructions on setting up a set of this kind.

L_5. Special transformer, as described. An output transformer of the right ratio, if such can be found, will probably have somewhere about the right inductance; it must be turned wrong way round, with the secondary in the anode circuit.

L_6. Make a former like Fig. 11, and put 550 turns of No. 30 gauge D.S.C. wire in each slot, making 2,200 turns in all.

C_1, C_2, C_3. *These must be ganged*, so that the reaction circuit is kept tuned. The condensers for tuning the aerial or any previous H.F. stages may be ganged with them or not as desired.

C_{1a}. Necessary for getting exact tuning—the sharpness of this circuit is extraordinary, and it distorts badly if not tuned dead right. This condenser should be a small variable of not more than .00005 microfarad capacity with a slow-motion dial.

C_4. A "neutralising" condenser, of maximum value about 10-20 micro-microfarads. Control should not be on the panel, but should come through the screening so that it can be set with he screen in position.

I have stated above that sets of this kind should begin with a screened valve, to avoid the risk of annoying one's neighbours by oscillation. This is, of course, not necessary if one works with a frame aerial. In this case, L_1 L_3 L_4 itself becomes the frame.

As a general rule, I prefer open-aerial sets; but when first experimenting with a new system like this there is a good deal to be said for starting off with a frame. If you do this it is useful to remember that bringing an earthed aerial within, say, 2 ft. of the frame gives a great increase of signals.

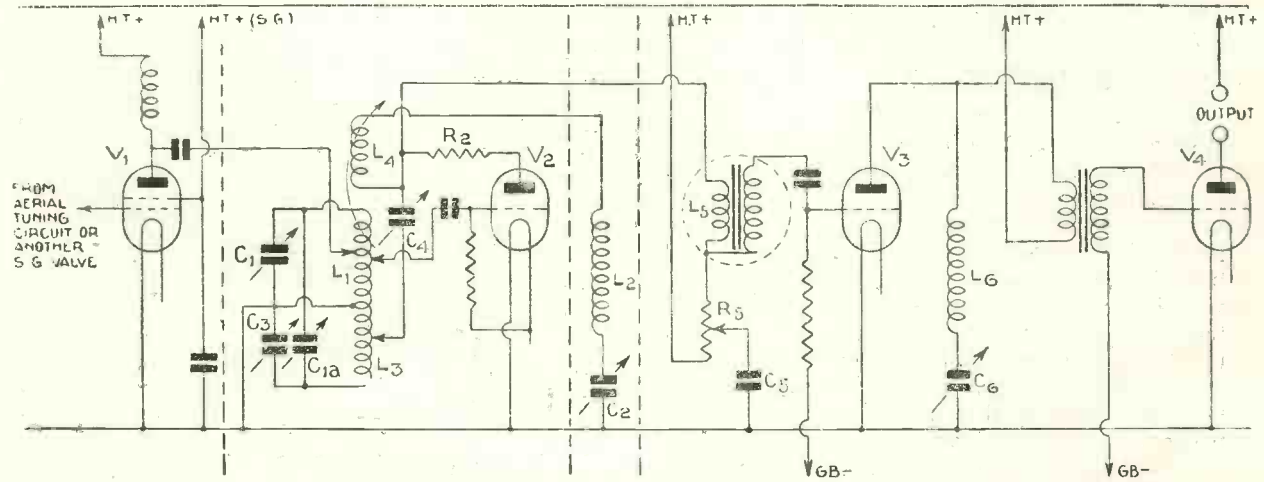
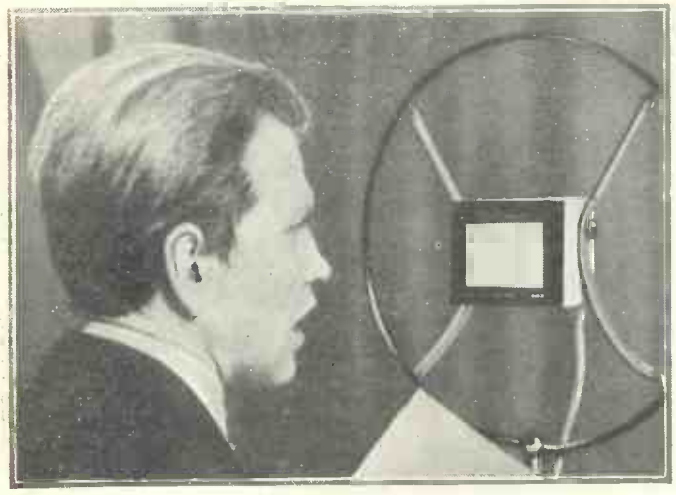


Fig. 10.—Complete ultra-reaction circuit, as far as it differs from any ordinary receiver. Notes on the various components are given in the text above



HE LOOKS EARNEST. DOESN'T HE?
A good photographic study of an announcer at the Moscow studio. The microphone is similar to those used by the B.B.C.

Can't We Have Some Human Announcers?

Every listener will agree with RUSSELL HEATLEY'S suggestion for humanising the B.B.C. announcers. What a difference it would make if we only knew their names!

WITHIN limits, I yield to no one in my admiration for the average B.B.C. announcer.

A man who with an equal nonchalance attacks the names of villages in Wales and polysyllabic Chinese villages of weird and wonderful construction deserves a better fate than to be the recipient of those proposals of marriage which are supposed to come from infatuated spinsters who have fallen in love with his voice!

Without Emotion !

And imagine having to announce an increase in the income tax without a trace of emotion when you have a drawerful of unpaid bills at home, and the said increase means that your summer holiday for this year is doomed!

The announcer is worthy of the admiration earned by every public servant who carries on his official duties efficiently in the face of great difficulties.

Vaguely Dissatisfied

And yet——

Why am I, and why are you, nevertheless dissatisfied in a vague, ill-defined sort of way with the announcers as we know them at present ? Why, with all their ruthless efficiency, do we sometimes feel that their function might become a far more satisfying and important part of the broadcasting programmes?

It was while listening to the news the other evening that something happened which provided me with a valuable clue. I forget exactly what topic dominated the ether at that moment. It was something fairly serious; military developments in the Far East, or something of that sort. Everybody in the room was listening with gloomy expressions, and then, suddenly, without warning, it happened.

The announcer made a mistake.

It was a bad mistake, and the announcer was suitably confused. Immediately he corrected himself, apologising profusely. But the curious feature of the whole episode was this. The mistake cheered everybody up considerably. For a moment the announcer interrupted his sequence of carefully modulated, well-chosen words, and became human.

For a short moment he dropped his "official" voice, and spoke naturally. Furthermore, I swear that even when he resumed his official discourse there was a good-humoured note running through his words which was not there before.

The effect of his slip on the listeners around me was equally pronounced. Each relaxed his grim expression, smiled amiably, and became alive. That slip of the tongue created a bond of human sympathy between listener and announcer which was not there before.

We were no longer listening to an official voice; we were listening to a weak human being like ourselves; to a person instead of to an impersonal creature.

In this connection I remember another incident which was the brightest spot in an evening's listening.

Humanised Radio

An extremely eminent person had been holding forth to the microphone and at the end of his discourse he turned to the announcer and in an audible whisper asked: "Was that all right ?" This question, and the official's reassuring reply, both of which should have been unheard, humanised radio that evening for at least one family of listeners!

Which leads me to my theory as to the cause of our dissatisfaction with announcers. We feel that in many

A GERMAN ANNOUNCER AT WORK
Another study of an announcer, this time in Germany. The Reisz type of microphone seems to be in general use among European broadcasters

respects they are altogether admirable. But we feel also that they are too aloof, too impersonal, too Olympian. Not only this—they strike us as being hampered by a censorship from above.

How often does one have the feeling that if only the powers that be would let the announcer have his head, let him show some kind of emphasis according to his own personal feelings, that radio would regain much that it loses through the absence of a visual spectacle ?

"Matey" Pioneers

The pioneer announcers in the early days of radio were what can perhaps best be described as "matey." They chatted to us in an informal sort of way as two men converse in a 'bus. They were allowed to be themselves, and as a result their baldest announcement became invested with an interest and a warm humanity which is unknown to-day.

That is why old stagers among radio enthusiasts sigh sentimentally for the old days, and why the return of Rex Palmer to the Radio Paris microphone caused nation-wide interest.

Then again, the announcer nowadays labours under the dreadful burden of anonymity. We don't know who he is from Adam, and the result is that we don't very much care.

This question of giving an announcer a name is important because giving him a name gives him something that the listener can hold on to. An anonymous announcer is a stranger; a named announcer quickly becomes a friend.

For an announcer to be known to us, however distantly, is half the battle as far as he is concerned, because we send out invisible grappling hooks of interest towards anyone with whom we are even slightly acquainted.

A Known Quality

With an unnamed stranger, on the wireless or in everyday life, we have no clue to personality, and our attitude is negative, reserved, neutral. But a named stranger speedily becomes a known quantity, a known personality, a friend.

Mr. Christopher Stone and the man who reads the weather forecast are both announcers. The former is one of the most popular of broadcasters; the latter is the merest cipher.

Why ?

Because Mr. Christopher Stone has a charming personality and is given license to express it, within reasonable limits. The news announcer is allowed only to be a talking machine who dare not show even the slightest tremor of interest in Flatfoot winning the 3.30 even if he has backed it for £5 at a hundred to one!

But if Mr. Stone likes a gramophone record he is at liberty to say so, and if he does not, he can convey his personal dislike without offending anybody.

HOW THEY DO IT IN AMERICA

Here you see a news editor broadcasting as the news comes through on the tape machines. They seem to have got the human element all right!

In what direction, therefore, lies the road to better and brighter announcers ?

Primarily, they should be given names—aliases, if the policy of the B.B.C. so dictates. Anything is preferable to a cold, mechanical anonymity.

Then they should certainly be given more rope. They should be left more to their own devices, allowed to infuse everything with a touch of their own personality. Human nature abhors the vacuum of perfect neutrality.

How much more we should have enjoyed the election results if they had been announced in turn by men of pronounced National and Labour sympathies with full liberty to express their respective glee or discomfiture!

And, finally, we could do with a greater variety of type among announcers. One feels at present that they all graduated from Oxford or Cambridge, and that if one were allowed to glimpse their minds, it would be the university mind which would be revealed.

From All Parts

Why not announcers, free and untrammelled, from the suburbs, from the East End, from Scotland or from Wales ?

Let the B.B.C. pursue its laudable policy of transmitting only pure English, but an acceptable variety of pure English can be found among the people of any town in the Kingdom even if it is enriched with local idiosyncrasies of pronunciation.

Proof Against "Cheapness"

Only by a careful consideration of points such as these can we hope to get "human" announcers. There would be no need of any safeguards against "cheap" announcing such as comes from some of the American stations; the constitution and proverbial good taste of the B.B.C. would be proof against that.

THE FAMILY TWO

The "W.M." Technical Staff describes the construction of a simple set ideal for family use. It is not expensive to build and the cost of battery replacements is low.

MANY people can get quite satisfactory reception of the local and a number of Continental stations with a simple two-valve receiver. This is especially the case if a fair-sized aerial can be erected and an efficient earth connection obtained.

Family Needs

In the design of the Family Two the "Wireless Magazine" Technical Staff had in mind the needs of the average family that does not demand great variety in its radio programmes and to whom the cost of installation and of upkeep is a matter for some consideration.

The result is a straightforward receiver that is simple to build and not at all expensive—either in first cost or in maintenance. Only standard parts are used in the construction of the set and all of them are stocked by the average radio dealer. There should therefore be no difficulty at all about getting supplies.

The heaviest maintenance expense of keeping the average receiver in operation is the replacement of high-tension batteries. The two valves used in this set are particularly economical in this respect for they do not take more than 6 or 7 milliamperes, which means that good service can be obtained from a standard-capacity battery.

Not the least interesting feature of the Family Two is its small size. The front panel measures only 9 in. long by 6 in. high and the baseboard is only 7 in. wide. This compactness does not mean that the efficiency of the set is affected in any way : indeed, the compact layout results in short leads between the various parts and, as it is well known, this is a point in favour of good results.

Results on Test

That the set is capable of giving a satisfactory performance is evident from the test report that appears on this page. In one evening's test, lasting about an hour, four stations were received at good strength on the long waves and ten medium-wave stations were picked up. This is a good performance for a two-valve set, especially when it is borne in mind that an adequate degree of selectivity is also obtained : there is no difficulty in separating the local stations even on a comparatively large aerial.

As all the parts used in the construction of the set are standard, many readers will be able to use up some of the odd components they already have on their shelves. If this is the case, the Family Two can be assembled at very small cost.

Straightforward Circuit

There are no tricks about the circuit and therefore there is nothing to go wrong. The combination consists of a leaky-grid detector followed by a transformer-coupled power valve. The tuning coil is of the usual dual-range type, but has the additional advantage of being provided with a selectivity control. This

WHAT YOU CAN EXPECT FROM THE FAMILY TWO

THIS set has been given a thorough test in South London using an outdoor aerial 60 ft. long. Selectivity is adequate. The two local stations can be easily separated with a wide margin to spare if care is taken to adjust the selectivity knob fitted on the top of the dual-range coil.

On the medium waveband nearly a dozen stations were received on the loud-speaker during half an hour. On the long waveband, Radio Paris at good strength was received clear of Daventry National.

Running costs will be very low. Using the specified valves with a 100-volt high-tension battery, the anode current was 6 milliamperes. An ordinary standard-capacity battery is all that is needed.

Below is the list of stations received during the test. The dial readings will, of course, vary with different models of the set. They will, however, act as a guide of where the various stations are likely to be found.

LONG-WAVE STATIONS

Eiffel Tower..	69	Radio Paris ..	85
Daventry Nat.	75	Hilversum....	92

MEDIUM-WAVE STATIONS

Trieste	37	Midland Reg.	78
London Nat. .	41	Rome.....	86
Huizen	53	Beromuenster	89
North National	55	Langenberg ..	91
London Reg. .	70	North Regional	93

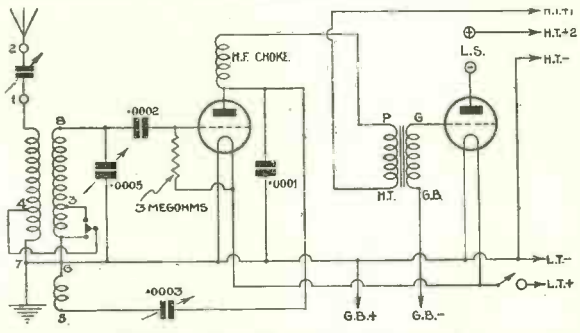
takes the form of a preset condenser mounted in the top of the coil. Once adjusted for any particular aerial conditions, of course, it can be left untouched.

This feature should be borne in mind when the cost of the set is being considered. The price of the coil includes this preset condenser, which would cost 1s. 6d. if bought separately.

Detector Efficiency

In a set of this type a great deal depends on the efficiency of the detector valve. For this reason precautions are taken to get the best out of this stage. The anode circuit is supplied with a separate battery lead so that the best voltage for any particular valve can be tapped off from the high-tension battery. Normal values of grid leak and condenser are utilised, namely 3 megohms and .0002 microfarad.

Detector efficiency is still further improved by the insertion of a .0001-microfarad by-pass condenser between the anode and one side of the filament. This by-passes the high-frequency impulses developed in the detector-anode circuit and helps to prevent them from passing through into the transformer circuit, where they would be liable to cause trouble. Such a by-pass condenser should be used in every set unless other precautions are taken to prevent the passage of high-frequency currents past the detector.



SIMPLE CIRCUIT WITH NO TRICKS

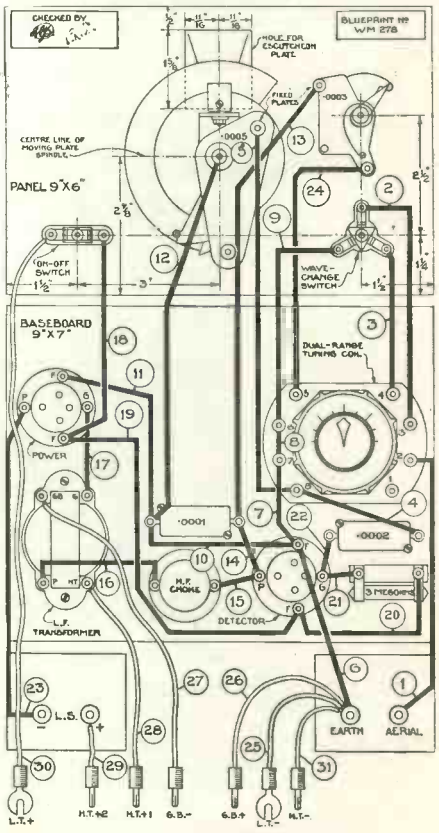
There is nothing complicated about the circuit of the Family Two, which has a leaky-grid detector followed by a transformer-coupled power valve

Reaction Control

High-frequency currents are, of course, blocked to some extent by the high-frequency choke in the anode circuit also. In series with the choke is the reaction winding. This is coupled to the grid winding and allows high-frequency energy from the anode circuit to be passed back through the valve, a procedure which, of course, results in increased amplification. The actual amount of feedback is controlled by the .0003-microfarad variable condenser.

Leaving the detector, we come to the low-frequency stage, which consists of the low-frequency transformer and the power valve. The amplification obtained here depends on the ratio of the transformer and the amplification factor of the power valve. In this particular instance the transformer has a step-up ratio of 1 to 5, which means that theoretically the transformer magnifies the signals five times. It must be borne in mind, however, that the actual amplification obtained will depend to some extent on the primary inductance of the transformer, which should be as high as possible. For this reason only a transformer of reliable manufacture should be used. A poor transformer with a ratio of 1 to 5 will give no louder signals than a good instrument with a ratio of only 1 to 3, or 1 to 3.5.

The question of the choice of a suitable power valve is bound up



LAYOUT AND WIRING DIAGRAM

A full-size blueprint can be obtained for half price that is, 6d., post free, if the coupon on the last page is used by April 30. Ask for No. WM278. Wire up in the numerical order indicated

COMPONENTS NEEDED FOR THE FAMILY TWO

CHOKE, HIGH-FREQUENCY
1—R.I. Quad-astatic, 3s. 6d. (or Keystone, Wearite).

COIL
1—Telsen dual-range aerial coil with selectivity adjustment, 7s. 6d.

CONDENSERS, FIXED
1—Dubilier .0001-microfarad, type 670, 1s. (or T.C.C., Trix).
1—Dubilier .0002-microfarad, type 670, 1s. (or T.C.C., Trix).

CONDENSERS, VARIABLE
1—Lotus .0005-microfarad, type KC5, 3s. 6d. (or Jackson, Polar).
1—Magnum .0003-microfarad reaction, 2s. 6d. (or Telsen, Polar).

DIAL, SLOW-MOTION
1—Lotus disc drive, type DS10, 5s. (or Jackson Polar).

EBONITE
1—Permcol 9 in. by 6 in. panel, 2s. 5d. (or Becol, Red Triangle).

HOLDER, GRID-LEAK
1—Telsen, 6d. (or Bulgin, Readi-Rad).

HOLDERS, VALVE
2—Telsen four-pin, 6d. (or W.B., Lotus).

PLUGS AND TERMINALS
5—Belling-Lee wander plugs, marked: H.T.+2, H.T.+1, H.T.—, G.B.+, G.B.—, 10d. (or Clix, Eelex).
2—Belling-Lee spade terminals marked:—L.T.+, L.T.—, 4d. (or Clix, Eelex).
4—Belling-Lee terminals, marked: Aerial, Earth, L.S.+, L.S.—, 1s. (or Clix, Eelex).

RESISTANCES, FIXED
1—Telsen 3-megohm grid leak, 9d. (or Dubilier, Watmel).

SUNDRIES
Glazite insulated wire for connecting (Lewcos).
2—Sovereign terminal blocks, 1s. (or Belling-Lee, Junit).
Length of rubber-covered flex (Lewcos).

SWITCHES
1—Telsen on-off, 1s. (or Readi-Rad, Bulgin).
1—Telsen three-point, 1s. 3d. (or Readi-Rad, Bulgin).

TRANSFORMER, LOW-FREQUENCY
1—Igranic Midget, ratio 1 to 5, 10s. 6d. (or Telsen Ace, Ferranti AF8).

ACCESSORIES

BATTERIES
1—Full O'Power 108-volt high-tension, type H2, 12s. 6d. (or Lissen, Pertrix).
1—Full O'Power 9-volt grid-bias, 1s. 3d. (or Lissen, Pertrix).
1—C.A.V. 2-volt accumulator, type 2AG5, 8s. 6d. (or Exide, Lissen).

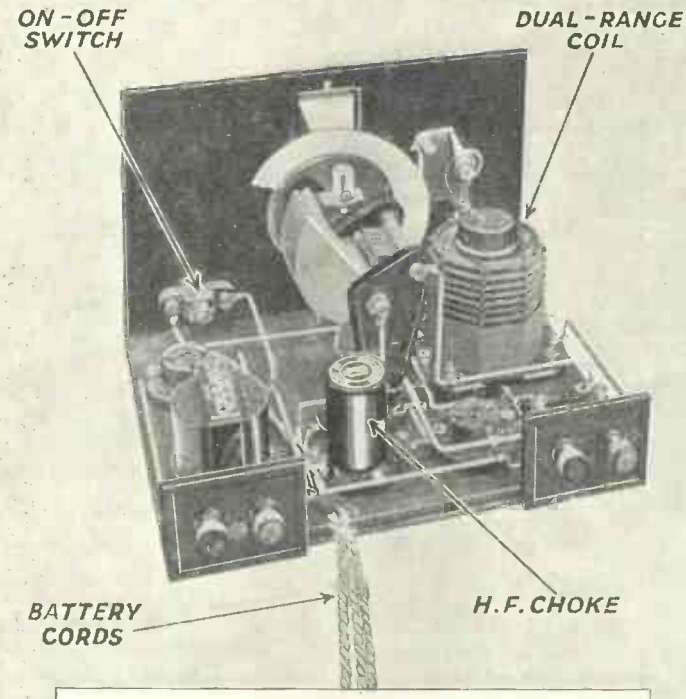
CABINET
1—Camco American type, 11s. 6d.

LOUD-SPEAKER
1—Tunewell plaque, £2 2s.

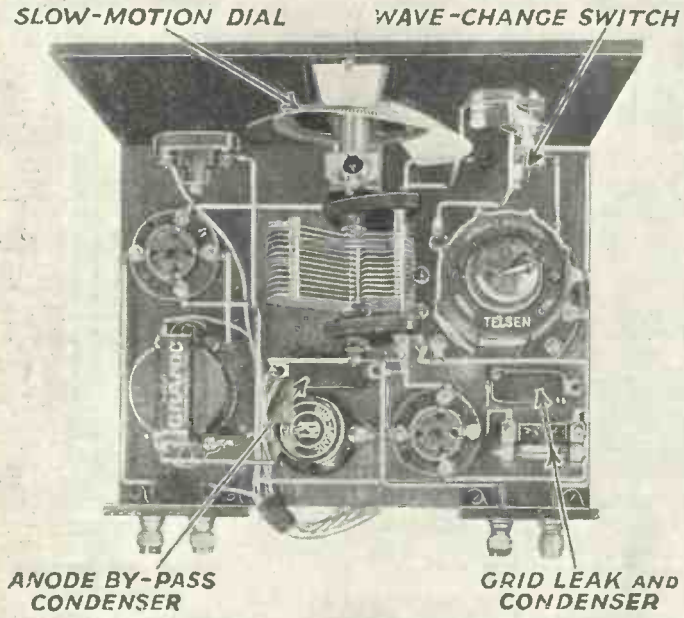
VALVES
1—Mazda HL2, 8s. 6d. (Osram HL2, Cossor 210HL).
1—Mazda P220, 10s. 6d. (Osram LP2, Cossor 220P).

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 FAMILY TWO—Continued



Only standard parts are used in the construction of the Family Two, so there should be no trouble about getting supplies



This special plan view shows the simple layout of the set, the building of which is within the capabilities of any beginner in radio

with the total anode-current consumption that can be taken economically from the source of supply. As a standard-capacity battery will give only 7 milliamperes economically, the power valve used in this set should not take more than 4 or 5 milliamperes, for the detector will account for 1 or 2 milliamperes.

Practical Points

So much for theoretical considerations; let us now consider some practical points about the construction. The layout of the panel will be clear from the photograph of the front of the set that appears in the heading on page 308. The main tuning dial is arranged in the centre, with the reaction control on the left.

In the bottom left-hand corner is the wave-change switch; this is pulled out for medium-wave reception and pushed in for the long waves. In the right-hand corner of the panel is the on-off switch. This is pulled out to switch the set on and pushed in to switch off.

The dial is provided with a holder for a light behind the panel. This will be found a great convenience if the set is to be placed in a dark corner of a room and it also provides an indication of when the set is switched on. The light is obtained from an ordinary flashlamp bulb; it is wired in parallel with the valve filaments and therefore is automatically switched on when the set is put in operation. The bulb must, of course, have the same voltage filament as the valves.

Blueprint Available

Regarding the construction of the set, there is little that need be said. In these pages is reproduced a quarter-scale layout and wiring diagram. If desired, a full-size blueprint can be obtained for half price (that is, 6d., post free), if the coupon on the last page is used by April 30. Ask for No. WM278, and address your application to "Wireless Magazine" Blueprint Dept., 58-61 Fetter Lane, London, E.C.4.

It should be specially noted that both on the blueprint and on the quarter-scale reproduction that appears on page 309 each lead is numbered. These numbers indicate the best and most convenient order of making the connections. They save time and trouble and avoid the

Cheap to Build and—

SMALL IN SIZE BUT GREAT IN RESULTS

possibility of making mistakes. It is recommended that the numbers should be crossed through as the connections are completed; there will then be no possibility of making a mistake.

The connections are best made with tinned-copper wire threaded through lengths of insulating sleeving cut into the right lengths. Alternatively, ordinary insulated wire can be used. This is a matter of individual choice.

Testing Out

When the construction of the set has been completed, it will be convenient to test it out before it is fitted into the cabinet. Suitable valves are indicated in the list of parts included in these pages but, if desired, any other valves of equivalent impedances can be used: readers are referred to the tables that appear in the front part of this issue.

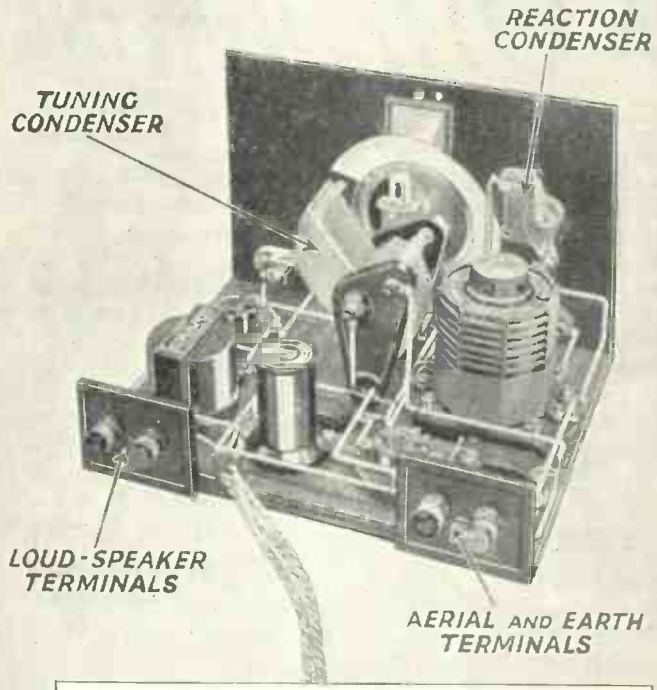
When the set has been connected to the necessary batteries and the voltage tappings adjusted to the right points, the set is put into operation by pulling out the knob of the switch mounted on the right of the front panel.

It is usually best to begin the preliminary adjustments on the medium waveband, unless the set is to be used within a few miles of Daventry, when it can be adjusted for long-wave reception. Remember that the knob of the wave-change switch on the left of the panel is pulled out for medium-wave reception and pushed in for long-wave working.

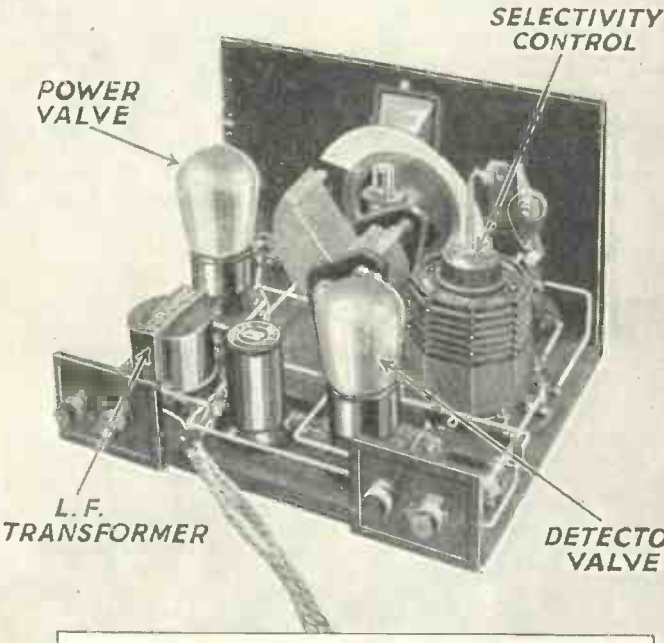
In any case, the receiver should be adjusted for reception of the local station. This is done by turning the main tuning dial slowly after the wave-change switch has been put in the right position. The reaction control should be turned to the right only to increase the strength of weak foreign stations.

Adjusting Selectivity

The knob on the top of the tuning coil should be adjusted to give the required degree of selectivity to enable the local stations to be separated without difficulty. Here it is necessary to make a compromise between selectivity and sensitivity, for it is an unfortunate fact, but one that is nevertheless true, that as the selectivity is increased so the sensitivity is decreased.



Selectivity can be controlled by the knob on the top of the dual-range coil, a great advantage now that the ether is so congested



An ordinary standard-capacity high-tension battery will supply the current needed for the valves in the Family Two; it is cheap to run therefore

—*Economical to Run*

AN OLD HAND'S SUPER-HET

In the construction of sets for description in "Wireless Magazine" we have to use the latest components to be put on the market. We cannot assume that prospective constructors have many of the parts already in hand—although, in fact, that is often the case. In these notes a keen constructor tells how he built an A.C. super-het from parts already on his junk shelf

WE have had, since last May, a succession of super-het sets. I built one of W. James' all-mains super-hets with all the specified components. It was a very good, but costly, set. So I decided to see where I could substitute old components, or modify the circuit in various ways with the object of cheapening the set for the old hand.

I straightway scrapped the frame aerial and substituted a two-way coil holder. With both coils tuned, and very loosely coupled, the set was improved enormously. The next step was to take out one of the intermediate stages, as the set had become far too powerful for use in an ordinary room. This stage has not been put back, and one of the intermediate coils now reposes on my junk shelf.

The next thing I found out was that the *separate* oscillator valve need not be a mains valve, any old 4-volt valve taking .25 ampere on the filament worked without hum.

An ordinary six-pin high-frequency transformer makes a very efficient oscillator coil. No. 6 terminal corresponds with the white connector, No. 5 the red, No. 4 the black, No. 1 the blue, and No. 2 the green. If the coil does not work as above, reverse connections No. 5 and No. 4 as all these six-pin coils are not wound in the same way.

For those who do not object to coil-changing, these six-pin coils (in their cases) are very good.

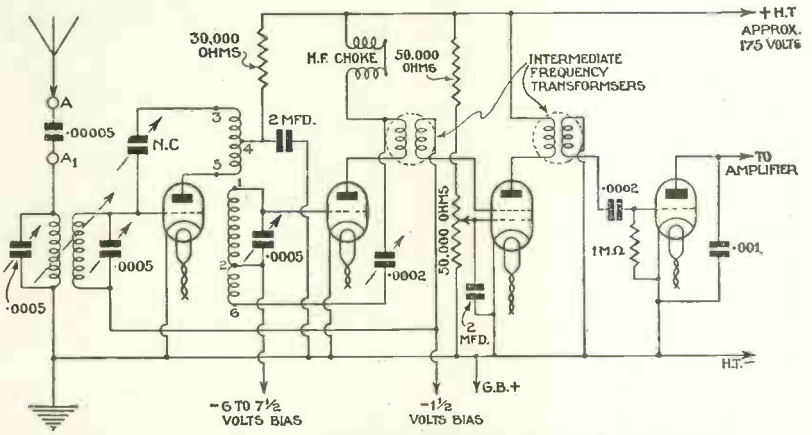
With a high-frequency valve preceding the first detector there is no need for a separate oscillator valve.

I give here the circuit of the "super" I am at present using. The only super-het components required are two intermediate coils, one with the pigtail connection for the screen-grid valve, and one without. The set is selective, powerful, and stable, with only one low-frequency stage required.

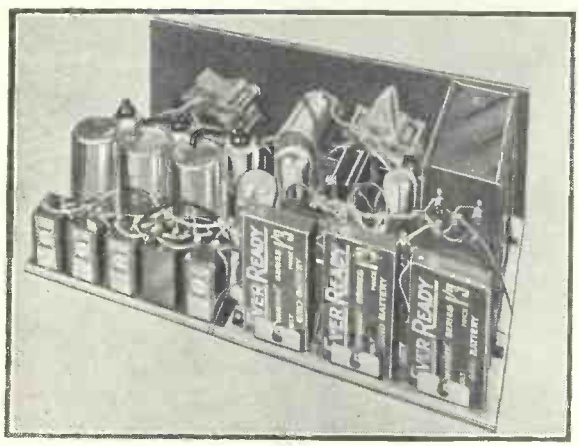
The decoupling may seem scanty, but it is efficient provided the low-frequency stage is thoroughly decoupled. There is not a vestige of A.C. hum in the set using a moving-coil loud-speaker.

I use Mullard 354 valves as high-frequency amplifier, combined first detector oscillator, and second detector, and a Mullard screen-grid in the intermediate stage.

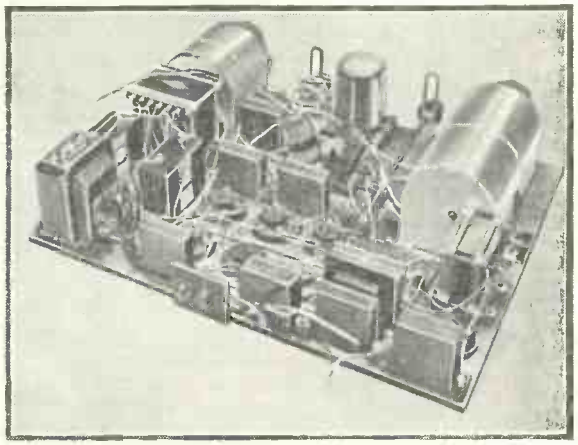
John Colley.



AN EXPERIMENTAL SUPER-HET CIRCUIT FOR THE OLD HAND
A four-valve super-het circuit for mains operation that will interest experimenters who have a collection of old apparatus on their hands



THE A.C. SUPER 60 IN 1931
W. James' first A.C. model of the Super 60 used batteries for grid bias and was a frame-aerial set



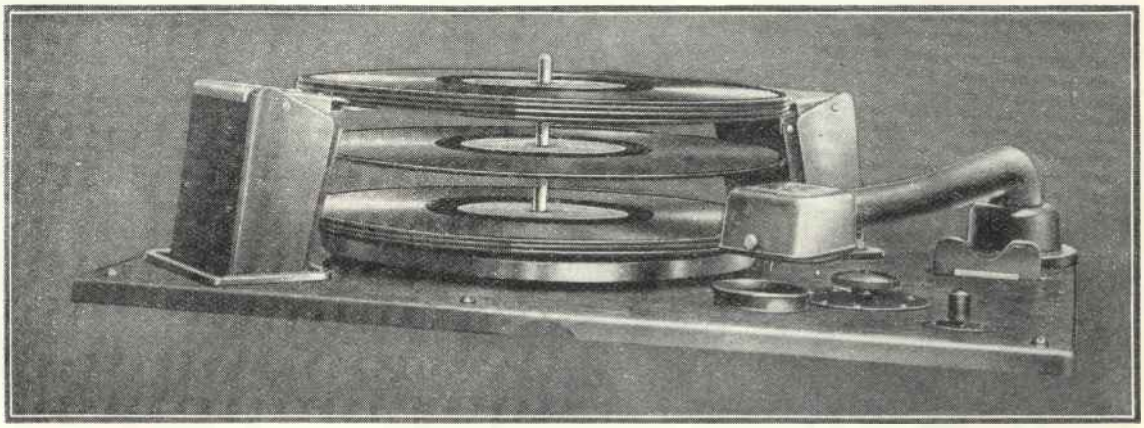
—AND THE LATEST 1932 MODEL
This is the latest A.C. edition. It uses no batteries at all and incorporates a band-pass aerial tuner

"Wireless Magazine" GRAMO-RADIO SECTION

A Special Section for Those Interested in Radio-gramophone Technique

The Future of Recorded Music

By R. BIBRA



ONE OF THE LATEST DEVELOPMENTS—A TYPICAL AUTOMATIC RECORD CHANGER
This is the device fitted to a number of H.M.V. models this season. The illustration is specially arranged to show a record falling down into position on the turntable

DURING the past few years great improvements have been effected in the production of efficient radio receivers and this development has introduced gramophone records to many who previously did not fully realise the enjoyment to be obtained from them.

Pick-up Operation

The operation of an electromagnetic pick-up in conjunction with a radio receiver is a simple matter and the natural development of the electrical reproduction of records was the commercial production of the instrument that combined the two forms of home entertainment—the radio gramophone.

But when a radio gramophone has been in use for a short time the owner realises that, whilst he can listen to numerous radio programmes by merely turning a knob, it is necessary to get up from his armchair every four or five minutes to change the records.

The gramophone companies have devised two methods to mitigate this nuisance—the automatic changing mechanism and the record player.

In the case of the former a special mechanism is provided to play a number of records consecutively; one type plays up to ten 10-in. or 12-in. records (unmixed) and only takes eight seconds to change each record.

The disadvantage of existing types of automatic changer is that they play only one side at a time but this drawback has been overcome so far as symphonies, operas, etc., are concerned by special couplings of the sets of records. That is, in the case of an opera recorded on ten discs, parts 1 and 11 are on the first record, parts 2 and 12 on the second, and so on.

This means that only one change is necessary during the playing of the complete work. It does not, however, solve the question when the items consist of two parts, one on each side of a single disc.

The record player is a small cabinet incorporating a turntable and motor, pick-up, and volume control. It is connected to a radio receiver or amplifier by a length of flex and thus records may be played from an armchair whilst the music is heard from another part of the room.

Longer Playing

"Is it possible to make records play longer than at present?" is the question being discussed extensively at the present time, and I propose to review the future of recorded music so that readers will have a clear perception of the difficulties that have to be overcome in introducing new systems of recording.

THE FUTURE OF RECORDED MUSIC—Cont.

There are three more or less practical ways in which sound can be recorded. (1) On the disc: that is in the way the present gramophone record is made; (2) magnetically, as in the case of the Blattnerphone; (3) photographically: as an example of this there is the modern talkie film.

Disc Recording

Let us first consider disc recording. Although the standard of reproduction has considerably improved in quality during the last ten years, practically the same processes of record manufacture hold sway at the present time as were used before the war.

The only improvements of note are the introduction of electrical recording in 1925 and the non-scratch record in 1923. These improvements have raised the status of the gramophone from that of a mere reproducer of a performance to practically a re-creator of it. We can safely presume that the limit of perfection has been reached.

The chief reason why this method of recording is supreme is because duplicates of a performance can be made so easily. It is possible to press over 3,000 records from each matrix or die and practically an infinite number of matrices can be made from the original master record.

As already pointed out, the disadvantage of the present type of gramophone record is the short playing time and we immediately ask whether it would be possible for this to be increased. It is not practicable to enlarge the diameter of the record, as it would be too bulky and the size of the reproducing instrument would have to be increased.

Lower Volume

By recording the music at lower volume than at present, it is possible to obtain a longer track on each disc by placing the grooves closer together, but there is a limit to this as, if the track becomes very fine in width, the composition of the record will not allow good reproduction.

Lateral recording is employed at the present time by all makers of gramophone records, that is, the sound is cut in the form of a wavy line on the original wax. Experiments are taking place, and demonstrations have been given in America, of disc recording using the old hill-and-dale method, but it seems that the quality of reproduction when using this method is not very good.

In hill-and-dale recording the cutter does not trace a wavy line on the way but indents it, the width of the track remaining constant. It will thus be seen that if hill-and-dale recording with good quality results were practicable, it would be possible to record a considerably longer track on the standard size of disc.

The other method by which the length of playing time can be increased is to slow down the speed of the record. Present-day recording is carried out with the wax making seventy-eight revolutions per minute and experiments are now taking place to determine whether it would be commercial to issue discs recorded at 33⅓ revolutions per minute.

The playing time of a 10-in. record would thus be increased to nearly nine minutes and it would be possible to record a complete symphony on two 12-in. records instead of on six as at present.

This method at first sight appears to be the most simple means of improving the entertainment value of recorded music, for it seems necessary only to supply special motors to revolve the records at a slow speed or playing desks incorporating these motors and pick-up to use in conjunction with the standard radio gramophone; but although records of this type have recently been introduced in America, there are many snags yet to be overcome.

Recording Difficulties

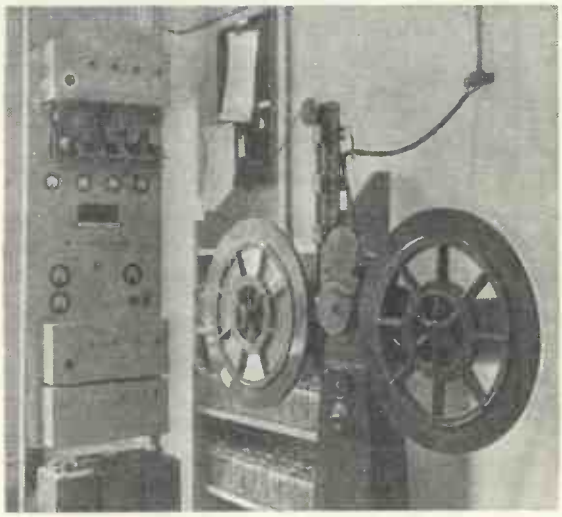
Records playing for over quarter of an a hour a side will be difficult to record; if a mistake were made towards the end of a record, it would be necessary to re-record the complete side. Whereas at the present time the recording of one side occupies four minutes, a long-playing record would occupy up to eighteen.

The long-playing records issued in America, besides being recorded at a slow speed, have been made with a longer track than the standard discs. This probably accounts in great part for the inferior quality which these records are reported to have.

Another of the difficulties that American engineers have encountered is that of a suitable motor for using in connection with the long-playing records. It is obvious that the ordinary spring motor is out of the question and the new discs can therefore only be enjoyed by those who have an electricity supply.

Constant Speed

When a record is revolving slowly it is of the utmost importance that the speed should be constant—a variation of one revolution per minute is imperceptible to the ordinary listener when hearing standard records at 78 revolutions per minute, but a variation of half a revolution per minute is very



RECORDING ON STEEL TAPE
This photograph shows the Blattnerphone outfit used by the B.B.C. Music is recorded on a steel tape, as explained in this article

WILL FILM REPLACE THE DISC?

disturbing when it occurs with slow-speed records.

We have already seen that a complete symphony could be recorded on two long-playing records, but if all records are to play for at least nine minutes, it would mean that six dance tunes would have to be recorded on a single disc.

Trouble with Dance Items

Although the long-playing record would be beneficial to lovers of classical music, it is doubtful whether the dance enthusiast would gain much by the change, for it would mean he would have to buy a record containing six dance tunes whether he wished to hear them all or not.

The possibilities of magnetic recording have received the attention of experts for years, but the first real commercial example of this system appeared recently in the form of the Blattnerphone.

The principle of this instrument is that sound waves are recorded magnetically on a thin steel tape, the actual process being that the sound waves are converted by a microphone into electric vibrations and these are conducted into the coils of electromagnets.

Steel tape $\frac{1}{4}$ in. wide and three-thousandths of an inch thick is unwound from one large drum, passed through the magnets at a speed of about 4 ft. per second, and wound up on another drum. The electrical vibrations are recorded as magnetic variations on the tape.

Immediate Reproduction

The great advantage of this system is that the sounds can be immediately reproduced by the tape being passed through another electromagnet, the different magnetic values of the recorded steel tape giving rise to small electrical impulses which are amplified and reproduced through a loud-speaker.

Another advantage of this system of recording is that the record can be immediately obliterated by running the tape through a suitable electromagnet and the tape can then be used again for recording a different programme.

Although it is possible to use a length of tape sufficient to record a two- or three-hour programme with the Blattnerphone drums, sufficient tape for a twenty-minute programme is quite large in size. It is claimed that the steel records last indefinitely and can be reproduced any number of times without signs of wear.

SAMPLE OF FILM MADE BY PATHÉ PICTURES
Part of a sound film, showing H.M.V. disc recording in progress. On the left the R.C.A. type of variable-area sound track can be seen

The Blattnerphone is economical to use when it has once been purchased, for no material is destroyed during recording—the same tape can be used time after time.

This instrument has recently been used extensively by the B.B.C., but although it is practical as far as they are concerned, there seems little likelihood of it being of any use to the man-in-the-street for there is no known method of duplicating the records in quantities.

The only way in which a duplication of any record can be made is for the record to be re-recorded, which is, of course, a lengthy process.

The quality of reproduction from steel tape is quite good, but it is doubtful whether quite as large a range of frequencies can be recorded on tape as can be engraved on a wax disc, although research is being made to improve the quality of reproduction from the former instrument.

Photographic recording is the third system to receive our attention and for many reasons it is the one that is likely to be of the greatest interest to us in the future. But as far as the gramophone is concerned, it is improbable that it will be in the *immediate* future.

When we speak of photographic recording we mean that the sound, after it has been converted into electrical impulses and passed through an amplifier, is registered on a film or similar base in the form of variable degrees of light and shade or a variable degree of area. It is this principle of recording that has made the sound-on-film talking picture possible.

Talkies in 1907

Although the sound-on-film system has only been in use for the last three years, it is an extraordinary fact that a patent specification that covered every fundamental point of modern talking-film recording was filed at the British Patent Office in 1907 by Eugene Lauste.

He had for years been working to combine the crude cinematograph of the early twentieth-century with the still cruder experiments of a German scientist—Herr Ruhmer, who had succeeded in photographing sound vibrations on a strip of film.

I have already explained that sound is converted into electrical impulses by the microphone and that these currents are then passed through an amplifier as in the other

THE FUTURE OF RECORDED MUSIC—Cont.

methods of recording, after which they are passed to the apparatus controlling the amount of light falling on the film.

There are various methods of throwing a pin point or thin slot of light on the film and if we examine the two examples reproduced here we shall have learned the principles in general.

Two Methods

The two principal methods of photographic recording are variable density and variable area. The former depends on the fact that the sound is photographed on the film in lines of various density, that is, shades of light or darkness.

The Western Electric Company is one of the firms that use this method of recording and they employ a loop of wire situated in a magnetic field. The two sides of this wire quiver in sympathy with the current from the microphone and allow a ray of light from a lamp (which is placed behind it) to fall on the surface of the film.

The variable-area method of recording is used by a number of firms, the most well known being the Radio Corporation of America. In the case of this system the sound is registered on the film at a constant density, but varying in area.

The R.C.A. recorder is, to a certain extent, on the same principle as the Western Electric, but in the R.C.A. instrument a very small mirror is mounted in the loop of wire near the magnet; a ray of light is focused on the mirror; and when this moves backwards and forwards across a slit a zigzag of light falls on the film.

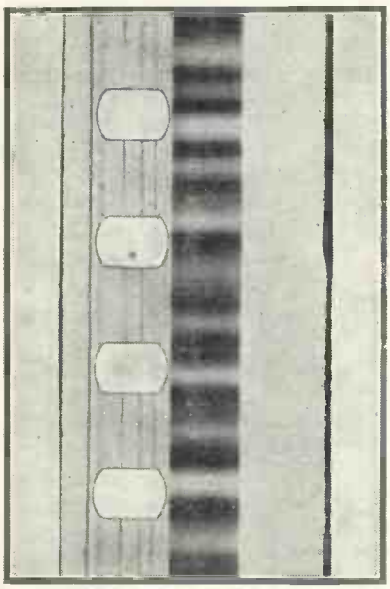
Photoelectric Cells

Before discussing the pros and cons of each system, we must fully appreciate the method of reproduction. The heart of the sound-film reproducer is the photoelectric cell, which has the property of passing minute currents of electricity directly proportional to the amount of light falling on it.

All that is necessary, then, to reproduce our sound film is to place a lamp on one side of the film and focus a ray of light on the sound track, and whether this be variable-area or variable-density recorded, it will allow only a fraction of this ray of light to fall on the photoelectric cell.

This beam will be continuously changing according to the photographic impression on the film. The current from the photoelectric cell is then amplified and made audible through loud-speakers.

The variable-area method of recording has a few advantages over the variable-density method. An important consideration is the loss of efficiency that might occur during the duplication of the sound track, that is, a slightly under- or over-exposed positive print will materially effect the reproduction in the case of variable-density recording, but these defects will not



ANOTHER SOUND TRACK
This is a sample of the variable-density method of recording sound

be noticeable when variable-area recording is employed.

It is also claimed that it is possible to record with the variable-area method a much wider band of frequencies than by the variable-den ity process.

Now that we have a working understanding of sound-on-film recording, we can consider this method applied to the gramophone in the home.

By using the modern talkie film it is possible to record a continuous programme lasting twenty-two minutes on approximately 2,000 ft. of film, but the width of the sound-track occupies only about an eighth of the available area of the film. It would therefore be possible to record at least seven separate selections on one strip of 35-mm. film. This represents a total playing time of over two hours—154 minutes to be precise.

Flies in the Ointment

At first it appears that film is the ideal medium for gramophone recording, but there are two flies in the ointment.

First the question of cost arises —standard inflammable positive film costs at least a 1d. per foot raw stock. That means 2,000 ft. would cost over £8 for the film alone, to which must be added recording f es, royalties, processing and overh ad expenses, etc., which make it evident that the cost of film records for the home is at present prohibitive.

Secondly, there is the difficulty of duplication. It takes considerably longer to print a positive film fro n a negative than it does to pr ss a disc record from a metal matrix.

Conclusions

In conclusion we can summarise the future of gramophone recording for providing records for the man-in-the-street by saying that :

(1) Disc recording is likely to be employed for the commercial gramophone records for a considerable time. Long-playing records are a possibility, but a few years are likely to pass before they are in general use.

(2) There does not appear to be much future for magnetic recording unless some new and cheap method of duplication is found.

(3) Photographic recording presents the most interesting possibilities, but it is doubtful if these will be realised unless a satisfactory base cheaper than film can be discovered, and duplicates can also be quickly made.

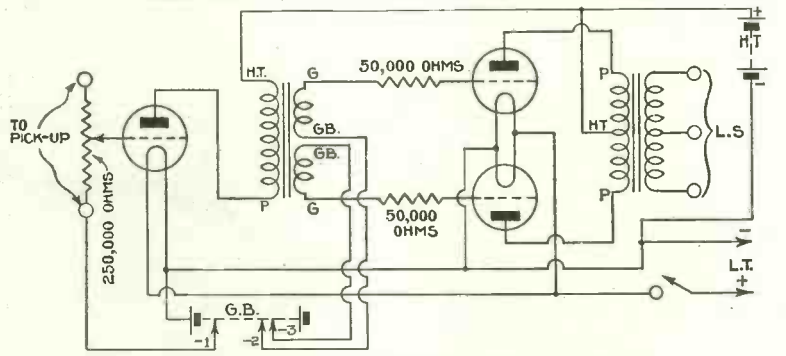
Enough has been said, however, to indicate that developments will be made in the future and that the disc of to-day is not the final achievement of the recording engineer.

The ECONOMY GRAMOPHONE AMPLIFIER

Here is a practical application of the "Economy Push-pull" system described on page 36 of the February issue. This unit gives great power and purity with low running costs

SPECIALLY DESIGNED FOR "W. M." BY P. K. TURNER, M.I.E.E.

IN "Wireless Magazine" for February I discussed the best way of getting a reasonable output power from a set using dry batteries for high-tension supply. I showed then how very little of the power we pay for ever gets to the loud-speaker, and described a method of adjusting the well-known "push-pull" circuit which increased four-fold the proportion of power used to power wasted.



PURITY WITH LOW BATTERY CONSUMPTION

The circuit is quite simple and straightforward, as this diagram shows. Great output is obtained with low high-tension consumption

Practical Example

As a first practical example for "Wireless Magazine" readers of the use of this arrangement, I have designed a simple gramophone amplifier. This is suitable for any pick-up of normal output, the one actually used being the H.M.V. model 11.

For this, the 250,000-ohm volume control specified in the list of components gives good results; but if another pick-up is substituted, it may be advisable to change the resistance of the volume control, bearing in mind that in general a lowering of the resistance of the volume control tends to give less "top" in the reproduction, and *vice versa*.

With regard to the choice of valve, any valve of about 8,000 to 15,000 ohms impedance with a mu of 15 to 30 will do for the first stage, one of the most suitable being the Mazda L2. The grid bias should be as in the following table :—

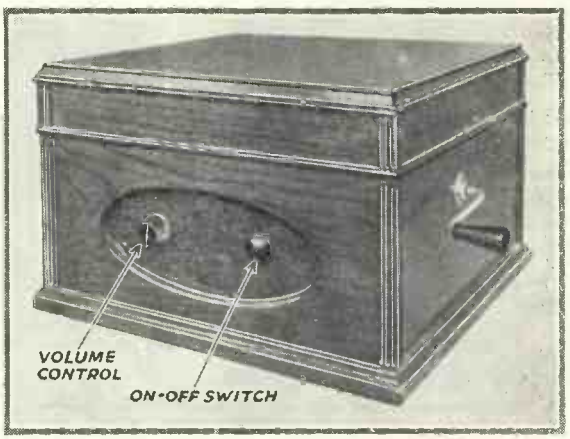
High-tension Voltage		
120 volts	150 volts	170 volts
3 volts	4½ volts	4½-6 volts

If a milliammeter is used, as suggested below, for adjusting the last stage, it can also be used with advantage for this valve, the bias being adjusted to give as near as possible 2 milliamperes.

Transformers

It is not advisable to substitute other transformers for those specified.

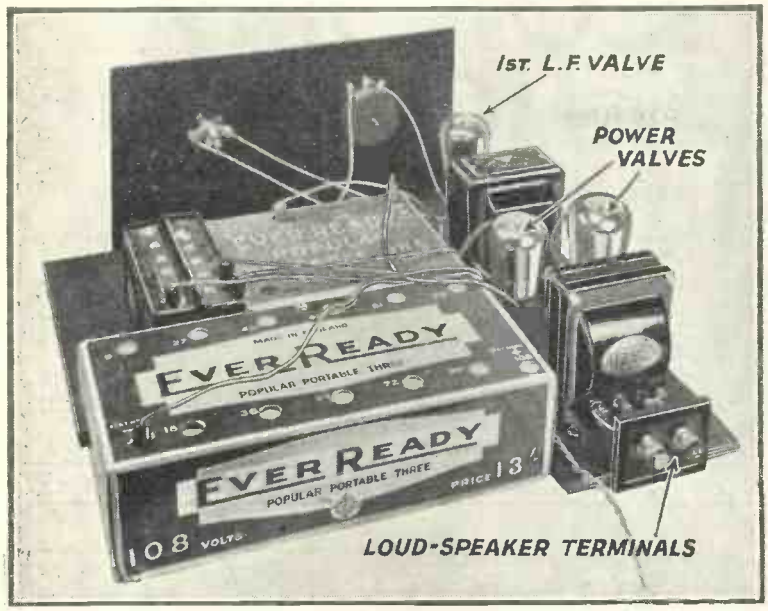
The first one has been chosen because it combines a fairly high ratio with separate secondary windings, thus allowing different bias for the two push-pull valves if required.



SIMPLE TO BUILD—AND TO USE

Any member of the household can use the Economy Gramophone Amplifier without difficulty. Volume is controlled from the front

ECONOMY GRAMOPHONE AMPLIFIER—Cont.



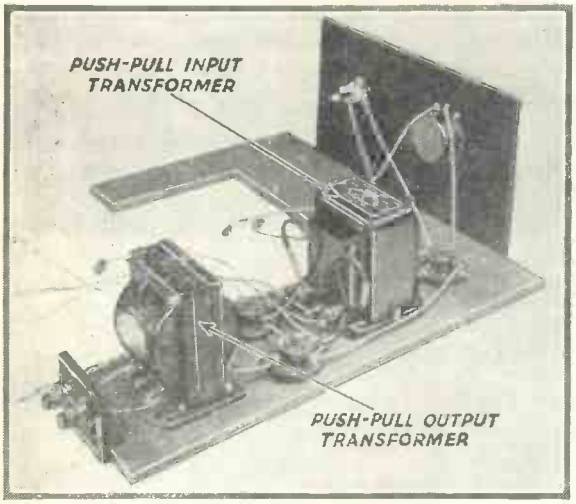
ASSEMBLY COMPLETED AND UNIT READY FOR USE

The high-tension and grid-bias batteries are housed in the cabinet with the amplifier. The low-tension accumulator can be placed on the floor out of the way

The second has the advantage of offering three different ratios (1-1, 1.6-1, and 2.7-1), one of which is likely to suit any ordinary "high-resistance" loud-speaker.

Simple Wiring of the Unit

The wiring is so simple as to call for practically no comment. The only point needing attention is to see that the two short leads from the output transformer secondary to the output terminals are not *too* short, for it may be necessary to shift them about till it is found which of the three output ratios gives the best results. The two spaghetti resistors are almost always necessary to stop high-frequency oscillations



THERE IS NOTHING TO GO WRONG

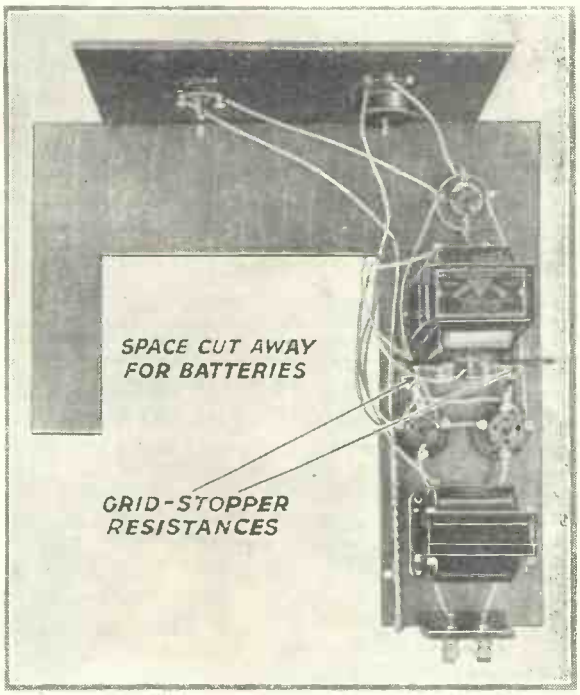
Another photograph which shows the simple construction of the Economy Gramophone Amplifier; it will appeal to thousands of homes

between the two valves of the last stage.

Now as to the "setting up" of the amplifier, that is, getting it nicely adjusted as regards high-tension voltage, bias, etc. It is a peculiarity of this push-pull arrangement that the undistorted output power available has little to do with the rating of the valves for use in ordinary circuits : it depends entirely on the high-tension voltage for all ordinary cases, and increases very rapidly as the voltage goes up.

High-tension Voltage

The table in the previous article showed this, for the output power was 530 milliwatts for 120 volts, 1,000 milliwatts for 150 volts, and 1,360 milliwatts for 170 volts. It is therefore for the constructor to decide what high tension he will use. There is room in the cabinet for a 108-volt and a 63-volt Ever-



ANYONE CAN BUILD IT IN AN HOUR OR TWO

This is the plan view of the Economy Gramophone Amplifier. The baseboard is cut away so that the batteries can be fitted in the cabinet

Ready battery, and these two together give about 170 volts when new, with a long life before dropping to 150 volts.

I would, however, stress the importance of using as high a high-tension voltage as can possibly be afforded. I showed in the last article what a great

FINE QUALITY WITH LOW CONSUMPTION

saving this economy push-pull effects and it is really essential, if good quality is desired, to sacrifice a little of that saving to get *better* results than would normally be given by a small amplifier such as this.

We can, it is true, get the same power with this system from a 120-volt battery lasting seven months as we could get with one valve from a 170-volt battery lasting three months. But it is infinitely better to keep the 170-volt battery, or at least 150 volts.

Don't forget that with this system, unlike the usual one, whenever you want to economise you can do it simply by turning down the volume control; for with economy push-pull the high-tension power consumed is not fixed, but varies with the actual loudness of the music.

Correct Grid Bias

But whatever high tension is finally adopted, the most important point is the correct adjustment of the grid bias. There is no doubt that there is only one way to make sure of this. A milliammeter should be inserted in each high-tension lead in turn, and the bias on each PM202 valve adjusted till the current is correct.

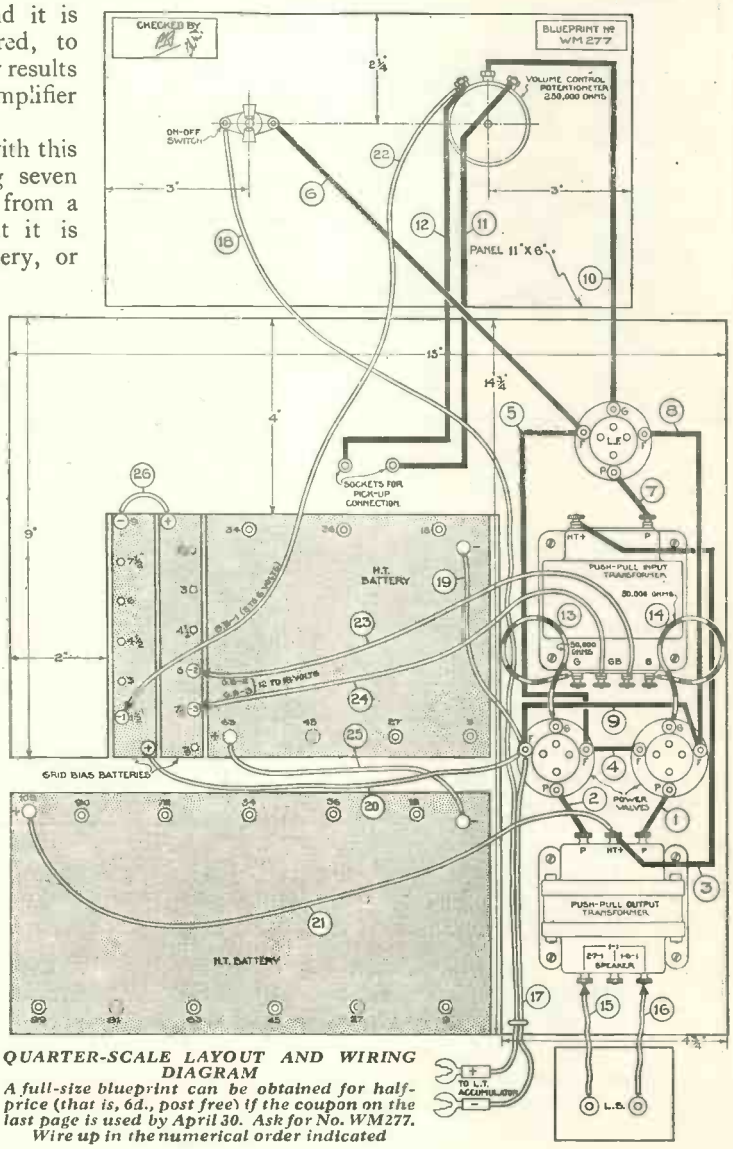
If the current is either too high or too low, there will be some distortion. For 120 volts of high tension it should be 3 milliamperes for each valve, for 140 to 150 volts about 3½ milliamperes, and for 150 to 170 volts about 4 milliamperes or a little less.

If a milliammeter is definitely not available, the best thing is to bias both valves alike; to 18 volts for 120 high tension, 15 volts for 135 to 150 high tension, or 12 volts for 120 to 130 high tension. But one cannot guarantee that the amplifier will then be distortionless.

With some types of pick-up, there may be signs of instability in the amplifier. It is not likely, but if it should be so the cure is to run a wire to earth from the negative terminal of the filament battery.

A COMPACT OUTFIT

This photograph shows the compact nature of the assembly, which gives great volume with low running costs



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

A full-size blueprint can be obtained for half-price (that is, 6d., post free) if the coupon on the last page is used by April 30. Ask for No. WM277. Wire up in the numerical order indicated

One last point, for those who have been accustomed to judging the performance of their last stage by observing a milliammeter. It is usual to regard it as a sign of overloading and distortion if the pointer moves more than a very little on loud notes. With this set the meter is always on the move by the very nature of the arrangement. The current per valve, which is 3-4 milliamperes during silence, may rise 10 milliamperes.

The only reliable indicator of overloading is a delicate meter in one of the grid-bias leads of the last valves. A fairly low-reading voltmeter of the high-resistance type (1,000 ohms per volt) will do very well: it is inserted in series in one of the grid-bias leads, and should remain at zero. If there is overloading it will give small kicks on loud notes.

(*For list of parts, see next page*)

A New Record-filing Cabinet

JUST WHAT YOU NEED

The new Smith's record-filing cabinet. It holds over 300 discs and the shelves are covered with felt so that the records will not slip

CONSIDERABLE interest has been taken in the recent notes that appeared in these pages dealing with the problem of record storage. Now "Wireless Magazine" has been able to persuade a cabinet maker to produce a record-filing cabinet at a really low price.

Space for 300 Records

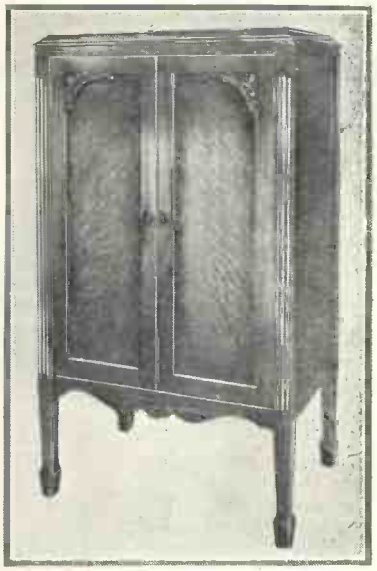
The photographs show the new design, which will hold over 300 records. The top shelf is arranged to accommodate 10-in. records, while 12-in. records are kept on the bottom shelf.

The cabinet illustrated is well made and finished, the shelves being provided with a layer of felt so that the discs will not slip sideways.

In oak the price is £3 7s. 6d. A little later models will be available in mahogany and walnut at slightly higher prices. Further details can be obtained from the makers, Smith's Cabinets, Ltd., of 18-20 Hertford Road, London, N.1.

WELL MADE AND FINISHED

For the price, the cabinet is very well made and finished. It can be recommended to those who want a useful storage cabinet



MADE OF OAK

Other models will be available in walnut and mahogany a little later. The prices will, of course, be slightly higher

COMPONENTS NEEDED FOR THE ECONOMY GRAMOPHONE AMPLIFIER

(*See pages 317, 318 and 319*)

HOLDERS, VALVE

3—Telsen, 1s. 6d. (or W.B., Bulgin).

PLUGS AND TERMINALS

10—Clix wander plugs, marked H.T.+, H.T.—, G.B.+, G.B.—1, G.B.—2, G.B.—3, 2 red, 2 black, 1s. 8d., (or Belling-Lee, Eelex).
2—Clix terminals, marked L.S. (2), 4d. (or Belling-Lee, Eelex).
2—Clix spade terminals, marked L.T.+, L.T.—, 4d. (or Belling-Lee, Eelex).
2—Clix wood-screw sockets and plugs for pick-up, 8d.

RESISTANCES, FIXED

2—Bulgin 50,000-ohm spaghetti, 3s. 6d. (or Lewcos, Magnum).

RESISTANCE, VARIABLE

1—Varley 250,000-ohm potentiometer, type CP141, 6s. 6d. (or Wearite, R.I.).

SUNDRIES

Tinned-copper wire for connecting (Lewcos).
Lengths of oiled-cotton sleeving (Lewcos).
1—Sovereign terminal block, 6d. (or Belling-Lee, Junit).

SWITCH

1—Gripso, marked "On" and "Off," 1s. 6d.

TRANSFORMERS, PUSH-PULL

1—Varley push-pull input, type DP6, £1 5s.
1—Ferranti push-pull output, type OPM1c, £1 6s. 6d.

ACCESSORIES

BATTERIES

1—Ever Ready 108-volt, type Port. 3, 13s.
1—Ever Ready 63-volt, type Port. 1, 7s. 6d.
2—Ever Ready 9-volt grid-bias, Winner type, 2s.
1—Ever Ready 2-volt accumulator, type 2228, 8s. 6d.

CABINET

1—Kabilock Utility cabinet, in oak, £2 10s. 6d.

GRAMOPHONE MOTOR

1—Collaro single spring, type A30, 19s.

PICK-UP

1—H.M.V. No. 11 pick-up unit, £2 2s.
1—Limit tonearm, 15s. 6d.

VALVES

1—Mazda L2, 8s. 6d.
2—Mullard PM202, £1 7s.

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower

A Record Catalogue

EVERY gramophone lover should have a copy of the 1932 edition of the "His Master's Voice Catalogue of Records," a 432-page reference book full of useful and interesting information.

Besides a main alphabetical list of nearly 5,000 double-sided records, there are lists of special discs, a pronunciation guide to difficult names and a biographical section. There is an elaborate system of cross-indexing.

Gramo-radio enthusiasts will be specially interested in a three-page list of records recommended as a foundation for a library.

Applications for copies of this fine production should be addressed to The Gramophone Co., Ltd., 363-367 Oxford Street, W.1.

Choosing Your Records

Here are the reviews of the latest record releases by WHITAKER-WILSON, the "W.M." Music Critic. Outstanding discs are indicated by an asterisk (*) against the title

Binnie Hale, the musical comedy actress, is here seen with her Columbia radio gramophone

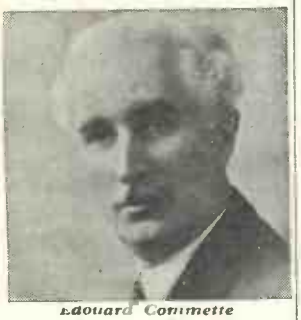
ORGAN MUSIC

(*a*) **For the Sake of the Days Gone By,** (*b*) **Who Am I?** Harry Davidson, 1s. 6d.
WIN 5445

Two quite good cinema organ solos (Commodore Theatre organ). I have heard worse and, perhaps, better. Still, it should be popular.

(*a*) **Sonata No. 6, Allegro Molto,** (*b*) **Wedding March,** Edouard Commette, 4s.
COL DX320

This is quite a good record. The Sonata comes out well. Playing it myself, I listened to



Edouard Commette

it with considerable interest. The slow notes on the pedal part are those of the Chorale upon which the movement is built. If you want memories of your wedding, try the other side!

(*a*) **Wedding of the Parades,** (*b*) **Parade of the Weddings,** organ solo, Terance Casey, 2s. 6d. **COL DB741**

This is rather an interesting medley and is, moreover, effectively rendered. Lovers of cinema-organ solos will not be disappointed in it by any means. There is an orchestra also.

CHAMBER MUSIC

★(*a*) **Adagio,** (*b*) **Traumerei,** Lener String Quartet, 2s. 6d.
COL DB717

The Adagio is beautiful. I play it on the organ in its original form, and when listening to it in this novel but *very pleasant* form, I came to the conclusion that it was a perfect piece of chamber music. Buy it on my recommendation. *Traümerei* (Schumann), on the other side, is equally delightful though very different in character. I am delighted with this record.

LIGHT ORCHESTRAL MUSIC

★**Daly's Theatre Waltz Memories** (d.s), Charles Prentice and his Orch., 4s.
COL DX319

Merry Widow, Cingalee, Gipsy Love and other attractions make this a delightful light music record. I think this will appeal to many. At all events, it has my hearty recommendation.

★**Faust** (d.s.), Albert Sandler and his Orch., 2s. 6d.
COL DB716

Apart from the excellence of Sandler's playing, which is undoubted, I think this sort of record is calculated to further appreciation of opera in the general sense. It is most attractive; one finds one's favourite melodies delightfully presented. One of the best records of its type to which I have ever listened.

(*a*) **Granny's Photo Album,** (*b*) **Speak to Me of Love,** Commodore Grand Orch., 1s. 6d. **WIN 5443**

This is distinctly good in material and well produced at that. Ask to hear it.

(*a*) **Humoreske,** (*b*) **Poem,** Viennese Salon Orch., 1s. 6d.
BRDCST 3154A

A good light orchestral record. *Humoreske,* especially, is well rendered.

(*a*) **La Petite Madelon,** (*b*) **Lenorita,** Gipsy Accordion Band, 1s. 1d. **PIC 890**

For those who like these accordion bands I sincerely recommend this because it is very well done.

(*a*) **Mighty Lak' a Rose,** (*b*) **Rosary,** Marek Weber and his Orch., 2s. 6d.
H.M.V. B3897

A very good arrangement of both. Of course, they are hackneyed; even so, Marek Weber has contrived to infuse new life into both. Well worth having.

★**Peer Gynt Suite** (d.s.), State Opera Orch., Berlin, 2s.
BRDCST 5265A

Well produced. Ask for this if you have no record of Grieg's *Peer Gynt.* You will not be disappointed.

What's Next? (d.s.), Sydney Baynes and his Radio Orch., 1s. 6d. **WIN 5449**

Old tunes chiefly, all muddled up together. Very irritating to listen to. Sorry! I can't say anything better than that.

LIGHT INSTRUMENTAL SOLOS

★(*a*) **Lucia Di Lammermoor,** (*b*) **Poet and Peasant,** Eddie Peabody, 2s. 6d.
COL DB719

Very *clever* to play such works on a banjo. I do not know that I enjoyed it, but I marvelled at it.

LIGHT SONGS AND BALLADS

★(*a*) **Because,** (*b*) **Selection of Haydn Wood Songs,** British Male Octet, 1s. 6d.
BRDCST 3153B

All well known, but have new life in them. The B.M.O. is distinctly good. Ask to hear it.

★(*a*) **Bloom is on the Rye,** (*b*) **Bonnie Mary of Argyle,** Heddle Nash, ten., 2s. 6d.
COL DB720

Heddle Nash's voice is *perfect* for recording. He ought to make records all his life! Ask for this. The piano, though, sounds tinny. Oh, dear! Has Columbia

Sydney Baynes (see review on left)

no decent instrument? *Why* spoil a perfectly delightful record?

★(*a*) **Boots!** (*b*) **Smuggler's Song,** Joseph Farrington, bass, with orch., 1s. 1d.
PIC 892

Well worth having. He has a distinctive style about him. Jolly songs, too!

(*a*) **Bow Bells—Mona Lisa,** (*b*) **Bow Bells—You're Blase,** Binnie Hale, com., with orch., 2s. 6d.
COL DB743

Quite entertaining. There is nothing amusing, though Binnie Hale is a comedienne; the songs are light, melodious, and really slightly on the serious side, (*b*) especially. I was rather attracted.

Congress Dances (d.s.), soloists, chorus, and orch., 1s. 6d.
BRDCST 3150A

This is worth having. The only grumble I have is that I missed so many *words.* Was there something wrong with the recording? Otherwise, good.

★(*a*) **Close Your Eyes,** (*b*) **If I Didn't Have You,** Three Ginx, 1s. 6d. **WIN 5450**

Splendid. I always enjoy them; this is as good as I have heard. Their diction is absolutely perfect. *Buy it.*

★**Eleven More Months and Ten More Days** (d.s.), The Masqueraders, 2s. 6d.
COL CB402

This is very jolly and thoroughly entertaining. The humour is rather obvious, but the *whole* production is obvious. None the worse for that; ask to hear it. I think you will be amused.

(*a*) **Granny's Old Arm-chair,** (*b*) **Little Brown Jug,** Frank Crumit, 2s. 6d.
H.M.V. B4059

I thought I should *hate* to hear (*b*), but there is an atmos-

CHOOSING YOUR RECORDS—Continued

A famous combination noted for its excellent playing of chamber music, the Lener String Quartet (see review under Chamber Music on page 321)

phere about it that I found very attractive. I rather fancy H.M.V. have a "best-seller" here!

(*a*) **Guilty,** (*b*) **This is the Missus,** Stanelli and Edgar, 1s. 6d. **WIN 5452**
The voice is not good. Candidly, I think this below Winner's very high standard. *Who let it through?*

★(*a*) **Hold My Hand—Hold My Hand,** (*b*) **Hold My Hand—Turn on the Music,** Jessie Matthews and Sonnie Hale, with Gaiety Theatre Chorus, 2s. 6d. **COL DB760**
Very smartly got up. The soloists have a precision—the chorus, too—that is typical of Gaiety productions. This should be popular.

★(*a*) **I Apologise,** (*b*) **You Try Somebody Else,** Kate Smith, com., 2s. 6d. **COL DB734**
Well produced and likely to appeal widely. I think there is a distinct atmosphere about her singing, not from the vocal point of view, perhaps, but from the rendering of the songs. I found both sides very attractive and recommend the record.

★(*a*) **I Don't Know Why (I Just Do)** (f.), (*b*) **Love Letters in the Sand** (f.), Sam Browne with orch., 1s. **RAD 1599**
The second is quite appealing; moreover, there is some distinctly good writing in it. It is pleasant to a reviewer to listen to well-written light music!

(*a*) **I Wanna be Loved by You,** (*b*) **I Wouldn't Change You for the World,** Peggy Cochrane and Patrick York, 1s. 6d. **BRDCST 3152B**
They sing well together. Not a record for everyone, but I think it is well worth hearing.

(*a*) **Kiss Me "Good Night,"** (*b*) **Life's Desire,** Jenny Howard with orch., 1s. 6d. **WIN 5446**
She does them in her characteristic style which, I believe, is very acceptable to many. I should like her better if she had singing lessons. She sadly needs them.

★(*a*) **Narrative,** (*b*) **Rogue Song,** Lawrence Tibbett, bar., 4s. **H.M.V. DA1101**
This may be a little on the expensive side, but it is well worth it. Good songs, both, and a splendid rendition. I sincerely recommend it.

(*a*) **Sentenced for Life,** (*b*) **Sweet and Lovely,** John Macklin with orch., 1s. **RAD 1596**
He makes a poor job of (*b*) which, I imagine, must be one of the successes of the season. Worth getting if you have no other edition of it.

(*a*) **Take Away the Moon,** (*b*) **You Used to Belong to Me,** Ian Burns, ten., 1s. 1d. **PIC 891**
Quite a good voice. Better than the songs, in my opinion. However, if you know and like the songs, buy this edition because of the voice.

MILITARY BAND MUSIC

★(*a*) **Fire Star,** (*b*) **Merry Hunting Day,** Black Dyke Mills Band, 1s. **RAD 1552**
A good military band record. The cornet soloist is really brilliant. Both sides are good. A *very* cheap record.

★**Silver Trumpets** (d.s.), H.M. Grenadier Guards, 2s. 6d. **COL DB714**
Worth hearing. A good title for it. The trumpets are very silvery in tone. A very good military band record.

I do not know what to say about the first side; the other is quite entertaining. It is the sort of record to buy, hear a time or two, and give away. You must hear it and judge.

(*a*) **Hallelujah, I'm a Bum!** (*b*) **I Don't Work for a Living,** Monte Hunter, 1s. **BRDCST 812A**
This is rather beyond me—(*a*) especially. He has an entertaining style about him. I am afraid I must leave you to be the judge.

★**He Played His Ukulele as the Ship Went Down** (d.s.), The Masqueraders, 2s. 6d. **COL CB416**
The diction in this record is a model of what diction should be.

ABBREVIATIONS USED IN THESE PAGES

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

(*a*) and (*b*) indicate the titles of each side of a record.

NOVELTY RECORDS

(*a*) **Actual Step Dancing,** (*b*) **Impressions of Bird Life,** Five Sherry Bros., 1s. **BRDCST 813A**
This is certainly a novelty; It is a novel production in many ways, thoroughly entertaining, and original. I was very amused at some of it. Buy it on my recommendation; I assure you that you will not be disappointed.

Lawrence Tibbet, a splendid baritone, whose latest record is reviewed at the top of the second column on this page

HUMOROUS RECORDS

Barnacle Bill, the Sailor (d.s.), Bobbie Comber, com., 1s. **BRDCST 811A**
It is much the same as its predecessors. It is, of course, a bit suggestive; but you know that already if you have heard the other!

(*a*) **Ban and 'Liza at the Dentist's,** (*b*) **Engaging a Housekeeper,** Ben Osborne and Nellie Perryer, 1s. 6d. **WIN 5453**
There is some good writing in this. I think it wants revising here and there, but it is quite amusing.

Day at the Races (d.s.), George Mozart, 1s. 6d. **WIN 5448**
Quite good. He is in very good form. Some parts are really funny, and the whole production is a good imitation of what one hears on a race course.

(*a*) **He Played His Ukulele as the Ship Went Down,** (*b*) **Meet Me To-night in the**

READ THESE REVIEWS BEFORE BUYING

Cowshed, Fred and Leslie Gilbert, coms., 1s. 6d. **BRDCST 3151B**
Quite a good edition of both. Evidently popular works.

More Rhymes (d.s.), George Buck, 1s. 6d. **WIN 5441**
Still more of them as vulgar as usual. What more can you want? Think of all the smoke-room limericks you know; you will find them with their final lines obliterated. *And I hope you enjoy the experience!*

★**Old Sam (No. 2)** (d.s.), Stanley Holloway, 4s. **COL DX321**
This has been broadcast. If you heard it done by Stanley Holloway I am sure you will get it in a more permanent form. If you have not heard it, you have missed something very amusing. Therefore, get it, either way!

Sandy, the Zoo-keeper (d.s.), Sandy Powell, com., 1s. **BRDCST 810A**
Quite characteristic and certainly amusing in places. I think Sandy has a following; those who "collect" him should add this to the library.

DANCE MUSIC

★(*a*) **By the Fireside** (f.), **Sunshine and Roses** (f.), Harry Roy and his R.K. Olians, 1s. **BRDCST 814A**
Two good moderate-paced fox-trots. The first is the better of the two constructionally, but both make good dance numbers.

★(*a*) **By the Fireside** (slow f.), (*b*) **Put Your Little Arms Around Me** (f.), Ray Noble and his New Mayfair Orch., 2s. 6d. **H.M.V. B6131**
This is very good, especially from the point of view of the singing. I recommend it also from the dance stand-point. One of the best dance records I have recently heard.

★(*a*) **Cuban Love Song** (w.), (*b*) **It's Great to be in Love** (f.), Jack Harris and his Grosvenor House Band, 1s. 6d. **BRDCST 3156A**
Yes—worth having, both sides very attractively played.

★(*a*) **Dancing in the Dark** (f.), (*b*) **Have You Forgotten?** (slow f.), Savoy Hotel Orpheans, 2s. 6d. **COL CB407**
If you want a good slow fox-trot buy this; (*b*) is really good. The singer is good and enunciates his words perfectly. A very good record.

★(*a*) **Dancing in the Dark** (f.), (*b*) **One More Kiss and then Good-Night** (f.), Ambrose and his Orch., 2s. 6d. **H.M.V. B6123**
A very sound dance record. The recording is first-rate, and the general rendition very good from the dancing point of view. (*b*) is a very good tune in my opinion. Ask for this; it is cheap at the price.

(*a*) **Desert Lover,** (f.) (*b*) **Just a Blue-eyed Blonde** (f.), Sid Phillips and his Melodians, 1s. **RAD 1590**
An attractive little disc from the dance point of view. On a powerful machine it could be used in a large hall.

Sid Phillips

★(*a*) **Do the New York** (f.), Victor Arden—Phil Ohman and their Orch., (*b*) **I'm Sorry, Dear** (f.), Lofner-Harris, St. Francis Hotel Orch., 2s. 6d. **H.M.V. B6128**
These are two quick fox-trots, (*a*) especially. (*a*) is a very jolly tune with an entertaining lyric. I think it will be a big success.

Jenny Howard, the popular comedienne who is recording for Edison Bell *review on page 322, col. 1*

Here is Jessie Matthews and Sonnie Hale recording excerpts from "Hold My Hand" *(review on page 322, col. 1)*

(*a*) **Faded Summer Love** (slow f.), (*b*) **That's Why Darkies Were Born** (slow f.), Jack Harris and his Grosvenor House Band, 1s. 6d. **BRDCST 3155B**
Two good slow fox-trots if you want any! I like both sides very much.

(*a*) **Home** (slow f.), (*b*) **One More Kiss — Then Good Night** (f.), Harvard Dance Club Aces, 1s. 6d. **BRDCST 3157B**
(*a*) is a very good *slow* fox-trot. I like to isolate these because there are not too many of them. I recommend the record on account of this side alone.

(*a*) **Kiss Me Again** (w.), (*b*) **That's My Desire** (f.), Scala Concert Orch., 1s. **RAD 1595**
Rather sickly on the matter of the sentiment, but the tunes are quite attractive. It is rather difficult to be certain of one's ground in recommending a record of this kind, but I think, if the words do not put you off, you may like it.

(*a*) **Kiss Me Good-Night, Not Good-bye** (w.), (*b*) **My Mystery Girl** (w.), Bidgood's Good Boys, 1s. **BRDCST 815B**
My Mystery Girl is quite attractive—more so than the other to my way of thinking. Both are good for dancing.

(*a*) **Kiss Me Good Night, Not Good-bye** (w.), (*b*) **Meet Me To-night in the Cowshed** (f.), Jack Leon and his Band, 1s. 1d. **PIC 986**
The second title seems a trifle plebeian, but both are well done.

(*a*) **Longer That You Linger in Virginia** (f.), (*b*) **Over the Blue** (f.), Murray's Melody Makers, 1s. **RAD 1592**
Rather distinctive in type. I think I would rather listen than dance to it; all the same, it is not unrhythmical. I think it is worth asking for.

(*a*) **Magic of a Waltz with You** (w.), Jack Leon and his Band, (*b*) **Oh Mo'nah** (f.), Cunard Dance Band, 1s. 1d. **PIC 895**
Very jolly and good to dance to. Ask for it.

More Rhymes (d.s.), White Star Syncopators, 1s. 1d. **PIC 893**
See what I wrote about the other. (See "Humorous Records") Just the same. Can we stop them now, please?

Old Timers (d.s.), Jack Leon and his Band, 1s. 1d. **PIC 889**
The title gives you a clue to this type of record. Rather pleasant; some of the counter-themes played against the voice are exceedingly attractive. I enjoyed it.

★**Once Aboard the Lugger** (d.s.), White Star Syncopators, 1s. 1d. **PIC 894**
I like these people. They play well. I *hate* the singer, though. *Very coarse tone.*

★(*a*) **Naw, I Don't Wanna be Rich,** (*b*) **Oh! Mo'nah!** Monte Hunter, 1s. **BRDCST 802A**
Very good darky songs. There is a good atmosphere about them that is distinctly attractive. To be recommended.

★(*a*) **Nobody's Sweetheart Now** (f.), (*b*) **Yo-dle O-dle** (com. f.), Radio Rhythm Boys, 1s. **RAD 1581**
A very good dance record. The R.R.B's are generally good, but not often better than here.

★(*a*) **Over the Blue** (f.), (*b*) **'Neath the Spell of Monte Carlo** (tango), Sydney Baynes and his Dance Band, 1s. 6d. **WIN 5418**
I like the tone of this band; I always have liked it. On that account alone I recommend the record.

Pick-up Damping and Featherweighting

To the Editor, "Wireless Magazine."

SIR,—I have been greatly interested in the articles and correspondence on featherweighting. It seems to me, however, that both Capt. Barnett and Mr. Gauss (especially Capt. Barnett) are inclined to spoil their respective cases by exaggeration.

My own experience has been very similar to that of Mr. Gemmell. Like him, I use a Marconiphone pick-up, for I consider it gives the best response of any on the market, but its weight (which I make nearly 6 oz. on the record) certainly seems excessive.

Experimental Results

After many experiments I found the most satisfactory arrangement was to have a weight of about 2 oz. on the record. I cannot say that this gave any improvement in tonal quality, but it certainly had no adverse effect, while the saving in record wear, judging from the wearing down of the needle point, was remarkable.

Using the full weight of the pick-up, nearly all steel needles had developed a shoulder by the time they had got to the end of a 12-in. record (one side), and it is when a needle shoulders that the tone of the reproduction goes.

With the reduced weight a Columbia Talkie needle would play both sides of a full 12-in. disc without developing this objectionable feature.

A Curious Point

One rather curious point emerged. It was that when the weight was cut down to much less than 2 oz., not only did the quality suffer, *but the surface noises were much worse.*

H. Wild.

Warwick Park, Tunbridge Wells.

◆ ◆ ◆

To the Editor, "Wireless Magazine."

Sir,—Apropos Mr. Bonavia-Hunt's article in "Wireless Magazine" for March. He states that the damping medium in a pick-up should increase the restraining force on the armature, with increased displacement of the armature.

Although this is usual with most good pick-ups on the market, he seems to forget that this procedure must introduce amplitude distortion and probably harmonic or frequency-doubling distortion, unless the suspension, etc., is very carefully designed, especially where the armature is mounted in a narrow gap to increase sensitivity.

While we have discarded the moving-iron loud-speaker in favour of a moving coil for quality reproduction, we still cling to moving-iron pick-ups.

I have seen and heard reproducing an experimental moving-coil pick-up and am convinced that this type of instrument can be as much in front of balanced- or differential-iron armature pick-ups as the moving coil is in front of moving-iron loud-speakers.

Re "featherweighting," it is obvious that if the weight of the needle on the record can be reduced (within limits) by means of balance or counterweights we shall have an improvement as regards record wear and possibly better reproduction of transients and high tones, due to less frictional damping on the needle.

Other Methods

But it puzzles me why so much time and trouble is expended on wax or composition disc sound recording, when we have available the celluloid visual records as used in "talkies" and the paper strip recording, both systems having enormous advantages over the conventional system for electrical reproduction, but I presume the gramophone companies have too much capital invested in the manufacture of the disc records.

By the way, I have yet to hear gramophone reproduction anything like up to the high standard of radio reproduction.

H. Dix.

Reading.

Amazing Radio-gramophone Cabinet Value

THOSE who are in the market for a radio-gramophone cabinet will be interested in an offer being made by Pickett's, of Bexleyheath. This firm is selling the Master Grand Super cabinet, normally £5, for £3 5s. Photographs appear below.

This cabinet is finished in rich brown oak and is provided with a vignette; this will take a 21 in. by 7 in. or 18 in. by 7 in. panel. Included in the design is a "pianotone" baffle. The back is removable and covered with silk to prevent box resonance.

This cabinet is attractive in appearance, the "cathedral" front being backed with old-gold silk. Each cabinet is hand polished.

VALUE FOR MONEY

Pickett's are offering this full-sized radio-gramophone cabinet for £3 5s. It is excellent value for the money

This cabinet is, of course, only one of a wide range made by Pickett's. Readers who are on the point of building radio gramophones should certainly take steps to find out what this firm has to offer. Full details of other cabinets can be obtained from Pickett's Wireless Cabinets, of Albion Road, Bexleyheath.

We have one of these cabinets in our laboratory and can recommend it as a sound investment. For the price, it is extremely well made and should give complete satisfaction in every respect. Nowadays when so many people are converting their sets into complete radio gramophones there should be a big demand for this cabinet.

Portabilities

Discussed by PERCY HARRIS, M.Inst.Rad.E.

TURNING PORTABLES OUT BY THE SCORE!

Making final tests of Portadyne receivers before they are sent out to dealers. This factory produces hundreds of portable sets every week

PORTABLE wireless receivers are at once the lure and the bane of the set designer. To the uninitiated it seems a comparatively simple matter, particularly with modern high-efficiency valves, to design a neat self-contained receiver with batteries, loud-speaker, and frame aerial complete, capable of bringing in a dozen or more stations at good strength.

Meeting Snags

On the other hand, the mention of portable receivers conjures up in the mind of the expert set designer thoughts of self-oscillation, grunts and growls, motor-boating, threshold howl, and bad quality.

Not that all, or indeed any one, of these defects is necessarily associated with the finished model. Indeed, the set will be quite free from all of them when he has done his work properly, but he knows that in starting afresh with a new design he is certain to meet the majority of them at some time or another.

If you look back over the history of portables in this country you will find that the very earliest practicable models depended entirely for their success upon the critical setting of reaction control in a circuit which consisted essentially of a tuned frame aerial feeding straight on to a detector valve, with one or more stages of low-frequency amplification. High-frequency valves were not then used.

One of the most amazing portables I ever tried had but a single valve in what is known as the Ultraudion circuit, the frame aerial being connected not, as is usually the case, between the grid and filament of the valve, but between the grid and plate in such a way as to be sufficiently regenerative to make the set oscillate continuously.

As, obviously, reception could not be carried on in this condition, a variable grid leak was fitted, and as the variation in its value varied the damping, so it could be set to keep the receiver just off oscillation.

In these circumstances the effective damping of the frame aerial was always negligible and the received signals were enormously amplified by the reaction effects obtained. Loud-speaker reception was obtainable on this single-valver with a frame aerial not more than 18 in. square, some 15 miles from the London station, which in those days was of considerably less power than now.

One could not call the loud-speaker reception good enough for a large room, but it was quite good enough for two or three people sitting round the table or, as was the case when I tried it, for good reception in a railway compartment.

The quality, of course, judged by modern standards, was poor and directly one attempted to put any appreciable low-frequency magnification on the set it became hopelessly unstable.

It soon became evident when I first began experimenting with portable sets that it is better both from the point of view of quality and stability to sacrifice some of the efficiency of the detector circuit and make up with low-frequency amplification.

Lost Sleep

I remember how blithely I embarked upon the design of my first portable and how much sleep I lost before it could be duplicated with all the copies giving the same results.

This, by the way, is the true test of good portable design. It is a comparatively simple matter to make in the laboratory a portable which will give magnificent results due to some particular arrangement of parts, opposing or assisting magnetic fields, critical resistances, and

A Percy Harris Portable Next Month!

PORTABILITIES—Continued

the like, but many sets, admirable on the test bench, fail completely as commercial products for the simple reason that no matter how slavishly the original design is copied there is still sufficient difference between individual components themselves completely to upset this critical working.

Tremendous Boom

A year or two ago, when there was a tremendous boom in the five-valve suit-case type of portable selling round about the 16-guinea mark, many manufacturers without previous experience embarked upon the perilous seas of radio manufacture on the strength of a single model produced by some keen designer.

All went well for a month or two, then in twos and threes, and sometimes in whole dozen lots, receivers came back wholesale from the dealers who had purchased them, simply because immediately their customers tried to work them their defects became apparent.

The chief troubles in a portable set are due to the peculiar conditions governing the design. I have frequently explained how necessary it is correctly to space the various parts, so as to avoid unwanted interaction, but when you come to design a portable set working with a frame aerial you are bound to place your component parts right in the middle of the field of the aerial.

If you use really efficient high-frequency amplification the fields of some of your coils and the frame aerial can easily interact to give continuous oscillation.

Again, without proper filtering and design, high-frequency currents will pass into the low-frequency stages, be magnified there, get into the loud-speaker (which, again, is in the middle of the frame aerial), and be radiated from its leads back to the frame and so on, once more producing that pernicious "chain" effect.

High-frequency currents getting into the low-frequency stages are the cause of a great deal of trouble which is not often recognised as such. Low-frequency valves should carry low-frequency currents only, and if at the same time they are carrying high-frequency currents the working characteristics can be completely upset and will give what sounds like a heavy overloading effect on even a small low-frequency gain.

On quite a number of sets I have tried, super-audible oscillations have occurred in the low-frequency end, bringing about a complete wrecking of quality, for which the owner has blamed valves and low-frequency transformers, and perhaps the loud-speaker.

Another trouble in a portable set is that normally no earth connection is used. An earth connection almost invariably brings about a big gain in stability in any receiver.

We have to-day two kinds of so-called portables: the type in which the receiver is genuinely self-contained, including the aerial, and the other type to which, before it will function, earth and aerial connection have to be made. Such a receiver is much easier to design, owing to the stabilising effect of the direct earth connection employed.

AN AMERICAN ARMY PORTABLE

Radio field equipment as used by the United States army. The army and navy recently held joint manoeuvres in attack and defence of the Hawaiian Islands

In portable receivers with a small frame aerial only, the whole instrument needs to be as efficient as possible. This can be helped by designing the frame-aerial windings so as to have a low high-frequency resistance and by arranging them in such a way that the presence of the unused long-wave winding does not have a serious damping effect on the medium-wave portion.

It is useless to take great pains in designing your set if the long-wave portion of your frame, when out of use, is acting as a large low-resistance short-circuited turn absorbing nine-tenths of your energy.

Use of Reaction

Reaction, properly used and smoothly applied, can add enormously to the efficiency of a portable. Many of the early portables using one or two stages of high-frequency magnification in front of the detector got remarkably little gain from these stages, which often served merely to produce smoother reaction than otherwise could have been obtained.

Nowadays, with screen-grid valves, a single screen-grid stage with a tuned circuit can be made to give more high-frequency magnification than can be used with perfect stability.

Such a set to be really efficient must have most careful screening.

A good way of overcoming many difficult points in a design when simplicity is needed is to arrange the high-frequency gain to be so high that the set is fundamentally unstable and then arrange a variable damping so as to bring the receiver down to the point of stability.

I grant you that a receiver made in this way would seem to "dodge" some of the more intricate points of design, but, from the point of view of simplicity and saving cost, a good deal can be said for it.

Although I have designed many portable receivers, the problem still fascinates me and for some little while I have been working on a design which I hope to present to readers at an early date. It will not pass out of my laboratory, however, until I feel sure that it does not belong to the "freak" class, giving marvellous results in some circumstances, but not in others.

After all, unless the design of a portable is both reliable and efficient, it is useless.

Matching Your Coils

FOR USE IN GANGED CIRCUITS

Now that so many modern receivers have ganged tuning circuits the amateur is often unable to make his own coils because he has no facilities for matching the windings. In this article W. JAMES describes a simple method that can be employed by any constructor; the only apparatus needed is a straightforward reacting set and a milliammeter. If these instructions are carefully followed the constructor will have no trouble about matching his own coils.

MANY receivers have a two- or three-gang adjustable condenser for tuning the coils. These coils are generally of the two-range type, one for the medium band of wavelengths and the other for the long waves.

They are often shielded when there are only two circuits; with two tuning coils complete screening is not necessary, however, and it is, in fact, possible to make quite a good set using unscreened coils.

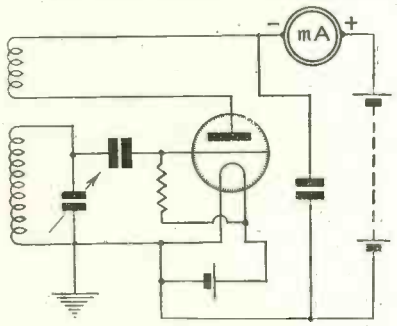


Fig. 1.—Simple single-valve reaction circuit with milliammeter

With three or more circuits good shielding is usually needed, and it is the custom to fit the coils into copper or aluminium pots. Sometimes one of the coils or a pair of coils in a filter circuit is not shielded and the others in the set are completely screened.

Now, the inductive values of the coils connected to a gang condenser having identical sections must be equal. Correct ganging of the circuits is then obtained when the trimming condensers are adjusted to make the value of the fixed capacities in the different circuits alike.

The user usually adjusts the trimmers, and the circuit then tunes accurately, so long as the inductances of the coils are equal and the sections of the gang condenser are alike.

Most gang tuning condensers are well enough made and adjusted by the makers to be satisfactory with ordinary coils. There are some cheap condensers that are not accurate enough for use with good coils, but in practice it is usually found that ganging troubles are due to the coils not matching with sufficient accuracy.

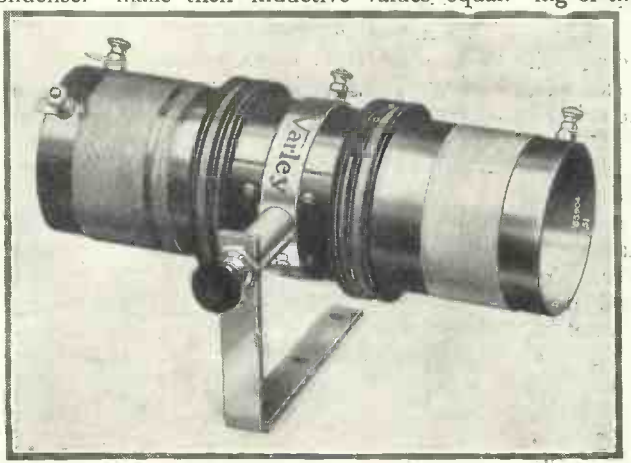
The coils used in a set are usually of the same physical dimensions. It is not enough to measure the diameter of the former with a rule and to count the turns.

The inductance of the coils may be far from equal owing to slight differences in the diameters of the coils, the sizes of wires, the length of the windings, and the relative position of the medium- and long-wave parts. There is also the effect of the screens to be taken into account.

Inductance varies with the square of the diameter and number of turns per inch. If the dimension could be measured accurately enough and the windings checked for turns, length and position, the accuracy of the coils could be estimated. But this is not a practical way of testing coils.

There are easy methods by means of which the coils can be compared with considerable accuracy and it is easy enough to adjust them to a standard value.

Let us first suppose that we have two unscreened coils and wish to make their inductive values equal.



A BAND-PASS COIL FOR SELECTIVITY
The Varley Square Peak coil was used in the "Wireless Magazine" Ether Marshal and Everybody's Radiogram with great success

Fit up a single-valve reacting circuit as in Fig. 1 or use the detector circuit of a set if the coil is not screened. Join in the anode-circuit supply to the valve a milliammeter. You will notice that the reading of the meter will decrease a little from the normal when the circuit is made to oscillate gently. The current might be 4 milliamperes and fall to 3 milliamperes when the circuit oscillates.

Increase in Reaction

As the reaction is increased the oscillations strengthen and the reading of the meter will decrease. It is best to adjust the reaction so that the circuit is just oscillating, when the current will be a little below the normal value.

Connect a variable condenser to the coil to be tested and place the coil near the coil that is joined to the oscillating valve. Use as short wires as possible and tune the oscillator to near the top of its wavelength range.

If now the coil being tested is brought into tune with the oscillating circuit, the needle of the milliammeter will move up; that

MATCHING YOUR COILS—Continued

is, the current will increase and you may actually stop the circuit from oscillating.

But for the best results the coil to be tested should be placed no nearer the oscillator than necessary for a movement of the needle to be observed when the circuits are in tune.

Sharp Tuning

The tuning of the coil being tested will be fairly sharp, and when the best position for this coil has been found the leads should be reduced to the minimum length.

Having found the reading of the tuning condenser that places the coil being tested in tune with the oscillator—that is, at the point where there

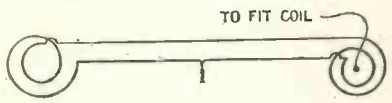


Fig. 2.—Looped wire for coupling coils together

is a movement of the needle of the meter—take away the coil and connect the second one.

Place this coil in the same position as the first one and see that the connecting wires are arranged as they were before.

Now adjust the condenser across the coil, leaving the oscillating circuit alone, and note the reading at which the circuits are brought into tune. If the reading with the second coil connected is exactly the same as that when the first coil was joined, then the coils are alike.

Difference in Readings

There may be a difference in the readings, however. The reading with one coil may be, for example, 90 degrees and with the second coil 88 degrees. Then the second coil has too much inductance.

The inductance can be reduced in several ways, but the easiest may be to space the end turns a little or to remove one turn of wire. Try spacing the turns first, and if it seems that the reduction will not be obtained without stretching the wires, then take off a turn. Test again and adjust the coil until the reading of the tuning condenser is the same for both coils. The coils are then matched.

The chief point to note is that the coil being tested must not be too near the oscillator. Arrange the circuit so that the needle of the meter moves *back a little* when the test circuit is brought into tune with the oscillator, as this is the most sensitive condition.

When a shielded coil and one that is to be used without a shield are to be tested a slightly different arrangement is needed, but the principle of the method is the same.

Coupling is effected, however, with a loop of wire. For this, take a length of insulated wire and make a loop of a couple of turns at each end as shown in Fig. 2, and connect the ends of the wires. The loops should fit over the coils; thus, make one fit over the *earth* end of the oscillating coil and place the other loop over the coil in the shield.

There will be a hole in the screen through which the pair of wires can be passed and the cover can be fitted when the loop is in position.

Tune the coil to be tested as before. It will have nice short leads, because the coil is standing by the side of the tuning condenser. Note the reading of the condenser at which the circuit is in tune with the oscillator. Now connect the second coil of each of the coils just tested. Place the loop over it as before and note the reading of the condenser.

If necessary, adjust the inductances as described above. During this test you can note the effect of the metal shield, for if the shielded coil is tuned with the shield removed *less* capacity will be needed to bring it into tune with the oscillator, showing that the inductance of the circuit is greater when the shield is removed.

When testing two-range coils it is necessary first to connect the coils as they will be used; that is, with the long-wave part in parallel with the medium-wave part or else short-circuited. Having adjusted the

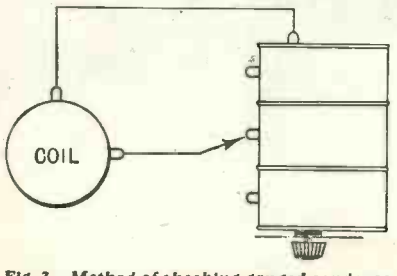


Fig. 3.—Method of checking ganged condenser for accuracy of matching

medium-wave coils, alter the oscillating circuit, making it oscillate near the top of the long-wave range. Now carry out tests on the coils adjusted to their long-wave conditions.

The long-wave coils may have to be adjusted, as the medium-wave ones, but probably this will not affect the accuracy of the coils on the medium waves. They should be checked again, however, in case a difference has been made.

Good Accuracy

I have tested and adjusted a number of coils in the way described, and accuracy good enough for excellent gang tuning is obtained. While discussing this subject it is as well to mention that gang-tuning condensers can be checked for similar test.

Connect an unshielded coil to one section of the gang condenser being tested and couple it to the oscillator by placing the coil near the coil of the oscillator.

Fix it in position and arrange the lead from the coil that will be taken to the different sections where it will be most direct and well spaced from the other lead that connects to the earth side of the condenser (Fig. 3). Now set the oscillator at a fairly low value and take the lead to the first section.

Unscrew the terminal and adjust the condenser to bring it into tune with the oscillator. Note the reading.

Now shift the lead to the second section and with the trimmer unscrewed tune the circuit as before. If the reading of the dial of the condenser is as with the first section, then these sections match. Now try the next section, and so on.

Higher Wavelength

Increase the wavelength of the oscillator a little and go over the sections of the gang condenser once more.

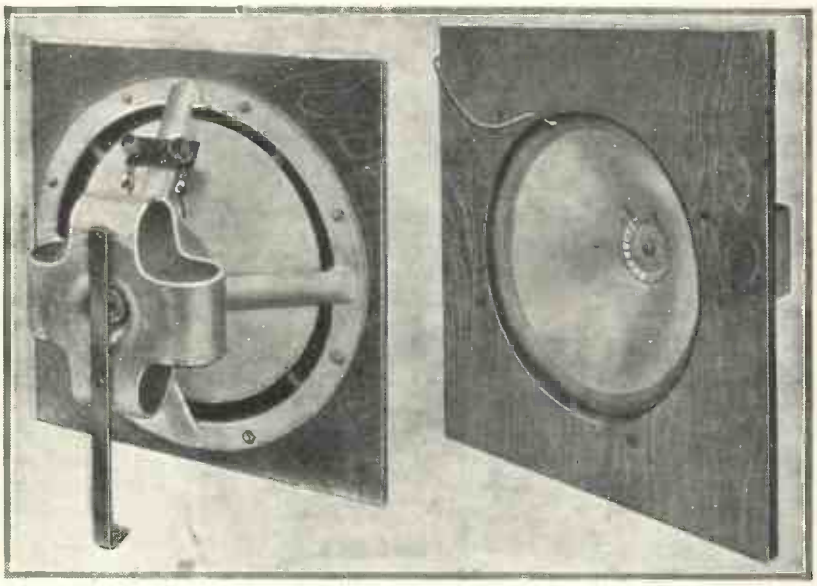
Do not adjust the trimmers, although it might have been necessary to adjust them during the first test to place all sections in tune at the same reading of the dial when the oscillator was set at a low wavelength. If any serious error is detected, the condenser had better be returned to the makers for checking.

Most condensers have split end vanes for adjusting the capacities of the sections, but it is better to leave this job to the makers.

When Moving Coils BLAST

HOW TO CURE THEM

A PARTICULARLY annoying feature of many home-constructed amplifiers used in conjunction with moving-coil loud-speakers is that they blast on certain musical notes. This is most noticeable on gramophone reproduction and appears as though the moving coil or the cone diaphragm of the loud-speaker were loose.



In fact, the rattle is so pronounced that it is difficult to convince oneself that the loud-speaker itself is not at fault. Amplifier resonance at a definite musical frequency can be cured by the insertion of a specially tuned filter circuit, but this is somewhat difficult to construct and so an easier method discovered recently by the writer may prove of interest.

It will usually be found that blasting occurs with pianoforte recording and appears to have a frequency round about 1,000 cycles. To get good reproduction the volume has to be cut down to such an extent that the objectionable noise of the needle becomes only too apparent.

Frequency of Rattle

It is sometimes suggested that the exact frequency of rattle may be determined by striking the appropriate note on the piano but the writer, being little of a musician, has found no success with it. Another method is to run through a test record having a frequency ranging from 6,000 cycles to about 100 cycles. Sometimes this shows where the peaks occur, but even then ear resonance makes it somewhat unreliable.

A definite cure can in most cases be effected by placing condensers in parallel across the output transformer on the secondary side or, what amounts to the same thing, across the speech coil of the dynamic loud-speaker. The value of these condensers will naturally vary according to the extent of the blasting, the output valve characteristics and the design of the amplifier itself.

But in most cases it will be found that something between 4 microfarads and 8 microfarads is most suitable. To those having a knowledge of amplifier theory these values will seem extraordinarily high and the present writer was told by an expert that 8 microfarads across the speech coil of a loud-speaker would cut the volume down to an enormous extent.

In practice, however, this is by no means the case and the volume does not appear to suffer at all. It may be stated that this cure was effected with no fewer than five entirely different types of low-frequency amplifier and in each case the volume did not appear to suffer at all and the response at 6,000 cycles was hardly affected.

As a matter of fact, the discovery of this method was made when attempting to correct a fault on an American amplifier using a push-pull output which was rated at 4.5 watts. A particular note, which appeared to be round about 800 cycles, caused rattle, but a constant-note record indicated that there was no pronounced resonance at this part of the scale.

Somewhat in shame it must be admitted that the writer dissected the loud-speaker at least a dozen times and tried three different types of pick-up before he became convinced that the amplifier was at fault.

An inductance-capacity filter was made up to reduce the level at 800 cycles and this straddled across the loud-speaker produced no noticeable result whatsoever. Almost in desperation, a 1-microfarad condenser followed by a 4 was placed across the loud-speaker terminals, when an improvement resulted.

Another 4 microfarads, making a total of 8 microfarads in parallel, completely cured the trouble, enabling the volume control to be turned to a maximum without rattle. Recommendations to a number of friends suffering from the same complaint effected immediate cures.

Tone Unaffected

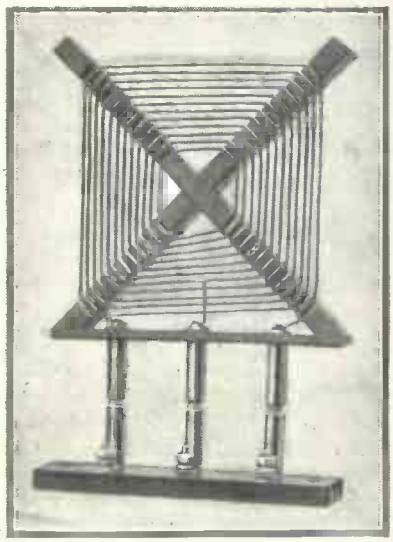
Incidentally, it was found that the tone of the amplifier was not affected in the least. From the commercial point of view the method would not be adopted since the cost of the condensers would be prohibitive; doubtless it would be cheaper to make correction at an earlier stage in the amplification, but this necessitates so much trial and error in the first place that it is far better for the amateur to work at the loud-speaker end.

R. H. Ure

News of the Short Waves

DURING the past few months quite an appreciable amount of new short-wave apparatus has appeared on the market and the ranks of short-wave manufacturers are growing month by month.

Some of the new apparatus is very interesting and worth a close examination by the short-wave experimenter. Whilst a number of multi-wave receivers have been brought



SHORT-WAVE FRAME
This Wearite short-wave coil is for use with the original Super 60 receiver

out—these combining long-, medium-, and short-wave tuners in one unit—the most popular arrangement at the present time is most certainly the single-valve short-wave adaptor or converter, used in conjunction with any type of ordinary broadcast receiver.

Single-valve Tuners

The simple single-valve tuner, used in conjunction with the low-frequency amplifying apparatus in the receiver, appears to find the most favour. The short-wave super-heterodyne converter is at its best when used with multi-valve receivers employing a number of high-frequency amplifiers and consequently does not find much favour with the class of listeners who still prefer to use the "plain" detector and low-frequency type of receiver.

We do not, as a rule, use more than a maximum of two valves in our short-wave adaptors, and yet I think the prize for sheer size alone must be given to a certain American short-wave converter which uses no less than five valves in the adaptor alone. This, in conjunction with the American's average seven- or eight-valve broadcast receiver, should certainly give what the advertisers call "hefty wallop"!

Such lavishness in the matter of valves strikes us as being rather wasteful, no doubt, but there is certainly no doubt in the fact that a really powerful amplifier, whether at signal or audio frequency, is very helpful in short-wave reception.

The receivers used by the Americans at their end of the trans-atlantic telephone service are interesting in this respect. Two screen-grid signal-frequency amplifiers are used ahead of the first detector, followed by no less than six intermediate-frequency amplifiers, a second detector and one low-frequency stage.

An automatic volume control arrangement is also used, this involving the use of several more valves. Even a receiver of this type is at the mercy of atmospheric conditions.

Well, to return to the new short-wave products—perhaps the most striking thing is the way in which plug-in coils have gone out of fashion. Plug-in coils have always more or less been very popular in short-wave receivers, owing to the ease with which the various wave-bands could be covered in small sections at a time, thus simplifying tuning.

However, the demand nowadays is for something better and so we have come to automatic tuners, complete with switching arrangements. The tuning range of this type of tuner is necessarily somewhat restricted and most of the tuners on the market to-day do not go above 80 metres.

At the same time there is, of course, very little of interest to be heard above 80 metres, and the most interesting parts of the short-wave bands are therefore adequately covered.

We shall next have to start turning our attention to ultra-short wave adaptors, in order to pick up the signals from the new B.B.C. 7-metre transmitter. No doubt the super-heterodyne type of adaptor, used in conjunction with a powerful intermediate-frequency amplifier, will be the most popular arrangement here, in order to obtain sufficient signal strength.

◆ ◆ ◆

Conditions Improving

At the time of writing, there are signs that transatlantic short-wave conditions are improving. Conditions during the winter months have been extremely bad and if the improvement actually does materialise, the effect will be a duplication of atmospheric conditions at this time last year.

Towards the end of February and the beginning of March conditions on the lower waves, particularly around 20 metres, improved considerably and remained very good on the whole through the summer until the end of August, when conditions went rather bad again.

◆ ◆ ◆

Station CT1AA at Lisbon, Portugal, has recently been heard transmitting on a new wavelength (31.25 metres) and on this wave he has usually presented a much stronger signal than on his old wavelength of 42.9 metres.

Mander Barnett.

Microphones

To the Editor, "Wireless Magazine."

SIR,—As a reader of two years' standing, allow me to express my appreciation of your including Capt. H. J. Round's article on microphones in the current issue of the "Wireless Magazine."

I have repeatedly deplored the lack of such contributions in the technical press, even though readers interested in microphones must be in the minority. Nevertheless I really hope that the above is but the forerunner to many.

R. J. Powell.

Penydaren, Merthyr Tydfil.

The A.C. QUADRADYNE

A COMPLETE A.C. RADIO GRAMOPHONE

Specially designed by the "W.M." Technical Staff in response to many hundreds of inquiries—a companion to the battery - operated Quadradyne, which has been such a great success.

SINCE the publication of details of the Quadradyne in the February issue of "Wireless Magazine" hundreds of readers have asked for an A.C. version, so this month we give details of an all-electric screen-grid four-valver built on similar lines to the original Quadradyne.

In some cases different components have been used in the A.C. set; this has been done to show that the performance of the battery version does not depend entirely on the particular parts employed. The circuit is simple and quite straightforward, and any good components will give satisfactory results.

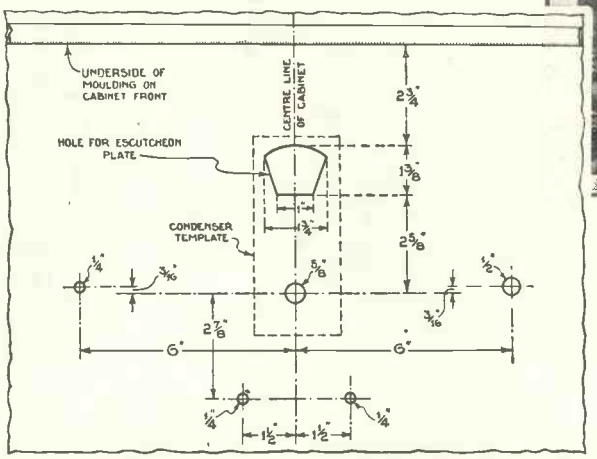
Baseboard-Chassis

This set is assembled on the same type of baseboard-chassis as used for the original Quadradyne. It has most of the advantages of the all-metal form of construction without any of the disadvantages. Alternative parts can easily be accommodated by making the fixing holes in different positions, but to avoid confusion no alternatives are shown in the list of parts.

As in the battery set, this A.C. version has two screen-grid high-frequency stages, a detector and a power valve. High-tension and low-tension supplies are obtained from a complete mains unit of the type used in the original A.C. Super 60. For this reason *the A.C. Quadradyne is no more difficult or dangerous to build than the battery model.* The mains unit is no more likely to give shocks than is a 200-volt high-tension battery.

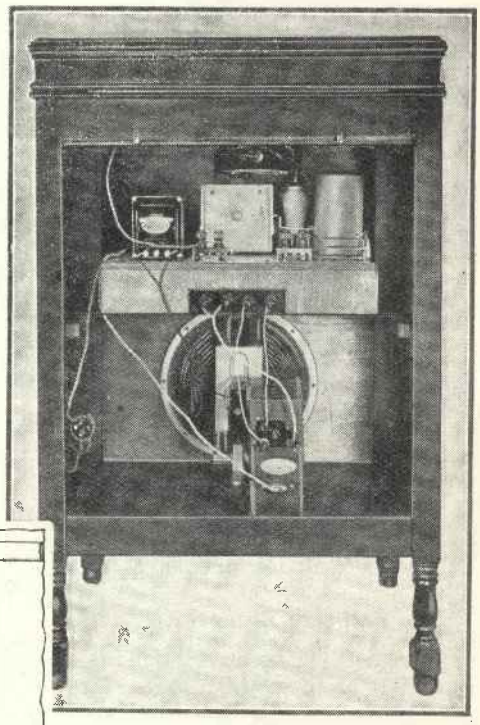
The metallised screen-grid valves are both of the variable-mu type and the quality of reproduction is therefore maintained at a high standard even when the local stations are being received at great strength.

Operation of the A.C. Quadradyne is not at all difficult. It will be seen from the photograph in the heading on this page that there are only five controls on the set. The three in line across the middle are (1) the wave-change switch, turned to the left for medium waves; (2) the main tuning control that actuates the four-gang condenser; and (3) the mains on-off switch.



DRILLING FOR FRONT OF CABINET

This diagram shows how the front of the cabinet has to be drilled to accommodate the spindles of the control components



ALL READY FOR USE

Back view of the A.C. Quadradyne showing the set, loud-speaker and mains unit in position all ready for use

The two knobs below these are for controlling radio (left) and gramophone (right) volume. The latter is coupled to the gramo-radio switch and therefore cannot be used for controlling volume when radio signals are being picked up. For

THE A.C. QUADRADYNE—Continued

COMPONENTS NEEDED FOR THE A.C. QUADRADYNE COMPLETE RADIO-GRAMOPHONE MODEL

CHOKES, HIGH-FREQUENCY
2—Kinva screened, standard type, 5s. 6d.
1—Watmel, type DX3, 4s.

COILS
1—Colvern coil assembly (1 pair KBLC ganged with 2 KGC's), £1 17s. 6d.

CONDENSERS, FIXED
1—T.C.C. .00005-microfarad, type 34, 1s. 6d.
1—T.C.C. .0001-microfarad, type 34, 1s. 6d.
1—T.C.C. .0002-microfarad, type 34, 1s. 6d.
1—T.C.C. .0003-microfarad, type 34, 1s. 6d.
1—T.C.C. .001-microfarad, type SP, 2s. 10d.
1—T.C.C. .05-microfarad, non-inductive type, 1s. 9d.
8—T.C.C. 1-microfarad, type 50, 8s. 6d.
4—T.C.C. 2-microfarad, type 50, 15s. 4d.

CONDENSERS, VARIABLE
1—Utility .0005-microfarad four-gang, type W306/4 with disc drive, £2 5s.

HOLDERS, VALVE
4—W.B. five-pin, sub-baseboard type, 5s.

MAINS UNIT
1—Regentone, type S60, £4 15s.

RESISTANCES, FIXED
1—Magnum 500-ohm spaghetti, 9d.
1—Magnum 1,000-ohm spaghetti, 9d.
1—Magnum 10,000-ohm spa hetti, 1s.
2—Magnum 20,000-ohm spaghetti, 3s.
1—Magnum 30,000-ohm spaghetti, 1s. 6d.
1—Magnum 40,000-ohm spaghetti, 1s. 6d.
1—Magnum 50,000-ohm spaghetti, 1s. 6d.
1—Dubilier 1-megohm grid leak, 1s. 9d.

RESISTANCES, VARIABLE
1—Wearite 50,000-ohm, type Q35, 4s.
1—Wearite .25-megohm potentiometer and single-pole change-over switch, types Q21 and G24, 6s. 9d.

SUNDRIES
Glazite insulated wire for connecting.
Lengths of rubber-covered flex (Lewcos).
2—Belling-Lee terminal blocks, 1s. 4d.
1—Sheet of No. 32 or 34 gauge aluminium foil, 16 in. by 13 in.
1—Ebonite terminal strip, 6½in. by 1½in.
1—Bulgin twin fuse-holder and mains connector, type F15, 4s.
1—Bulgin needle cup, type AK1, 2s. 6d.
2—Belling-Lee anode connectors, 1s.
1 ft. of shielded cable

SWITCH
1—Bulgin on-off, mains type S86, 2s. 9d.

TERMINALS
8—Belling-Lee terminals, type B, marked: Aerial, Earth, Pick-up (2), L.T.A.C. (2), H.T.+, H.T.—, 4s.

TRANSFORMER, LOW-FREQUENCY
1—R.I. Hypermu, £1 1s.

TRANSFORMER, OUTPUT
1—Ferranti, type OPMI, £1 2s. 6d.

ACCESSORIES

CABINET
1—Smith type Kenneth radio-gramophone, in walnut, £3 19s. 6d.
1—Smith baseboard assembly, 3s.

GRAMOPHONE MOTOR
1—B.T.H. Synchro-Blue, £1 19s. 6d.

LOUD-SPEAKER
1—Blue Spot inductor, type 100U, £1 19s. 6d.

METER
1—Bulgin 0-5 milliameter, £1 10s.

PICK-UP
1—B.T.H. Senior with arm, £2 5s.

VALVES
2—Osram metallised VMS4, £2 5s.
1—Mazda AC/HL, 15s.
1—Mazda AC/Pen, £1 5s.

gramophone use the knob of this control is pulled out. When the knob is pushed in the gramo-radio switch cuts the pick-up right out of circuit.

As described in these pages, the set is a complete mains-operated radio gramophone. Anybody who builds it will have a constant source of musical entertainment—either from radio programmes or records. The set has been thoroughly tested by the "Wireless Magazine" Technical Staff and no difficulty should arise in its construction or operation.

Full-size Blueprint

Every detail necessary for building the set is given in these pages. If desired, however, 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 April 30. Ask for No. WM279 and address your inquiry to "Wireless Magazine" Blueprint Dept., 58-61 Fetter Lane, London, E.C.4.

If the blueprint is carefully followed, there should be no difficulty about the construction of the A.C. Quadradyne. If alternative parts are to be used, of course, the holes in the baseboard through which the connecting leads pass will have to be drilled in different positions.

When wiring up the blueprint should be rigidly followed. Each wire is numbered separately and should be put in position in the order thus indicated. As each connection is completed the corresponding numbers on the blueprint should be crossed through with a pencil; then there will be no chance of missing a wire or placing it in the wrong position.

Ganging the Set

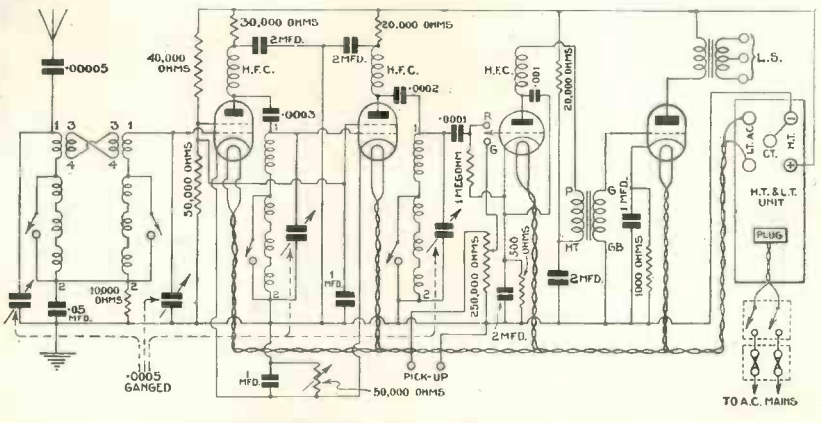
Ganging of the set is best accomplished with the aid of a milliammeter in the anode circuit of the detector valve. A meter reading from 0 to 5 milliamperes should be connected in circuit temporarily while the set is being ganged. Disconnect one end of the flexible resistance that forms lead No. 43 and connect the milliammeter in series with it.

The trimming condensers on the four-gang condenser should then be adjusted until the milliammeter shows the greatest deflection for any given station. If the set is ganged towards the top end of the medium waveband, the adjustment should hold good for any other part of the medium- or long-wave scale.

Once the set has been ganged there is only the one tuning knob to be operated to bring in dozens of stations from all over Europe. This, combined with the fact that gramophone records can be played whenever desired by the turn of another knob, makes the A.C. Quadradyne ideal for general use by the family. The performance is as good as that of most commercial radio gramophones costing very much more.

Mains Unit Output

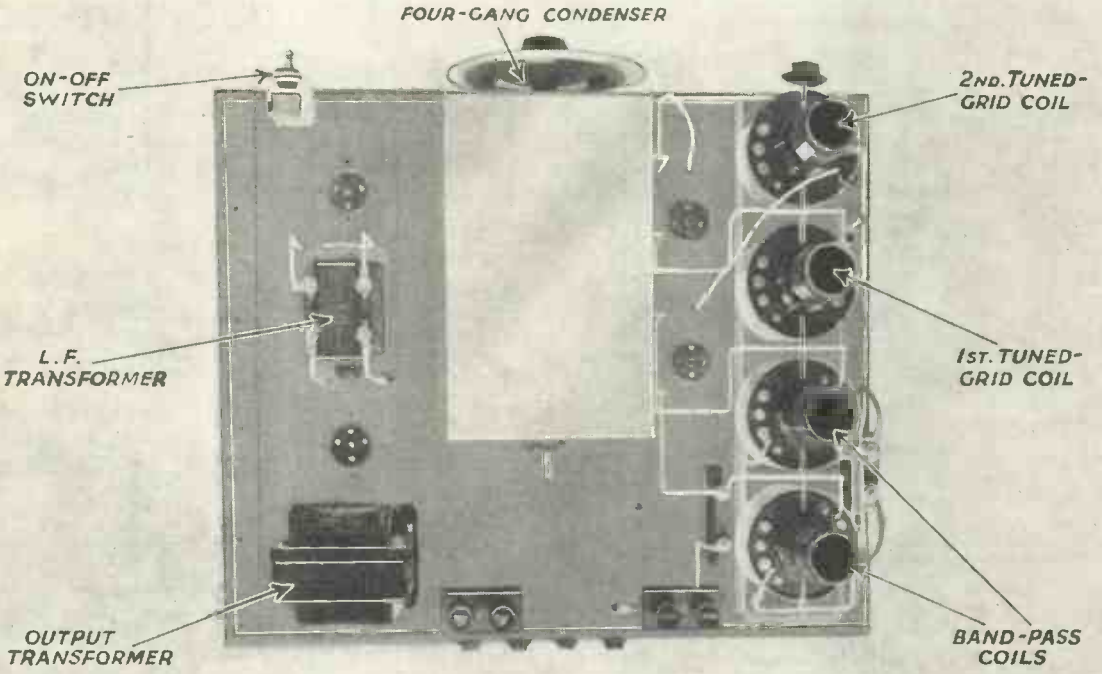
Some readers will notice that the mains unit is rated to give a low-tension output of 6 amperes and may wonder whether the valve heaters will be overrun. In practice this



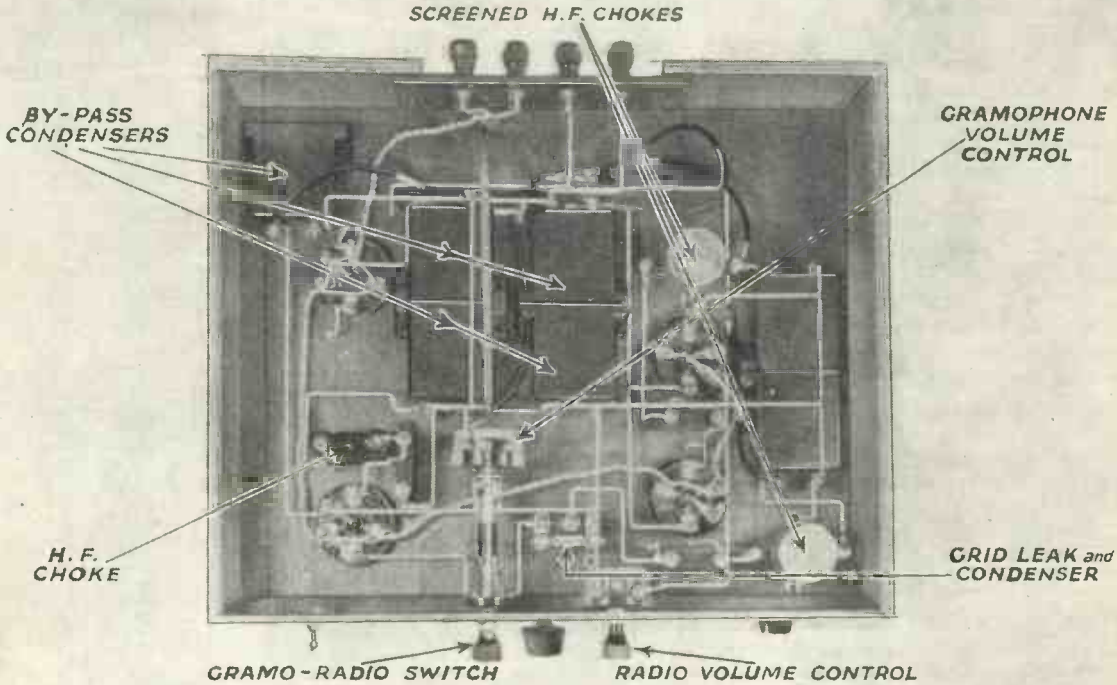
TWO SCREEN-GRID STAGES FOR POWER AND SELECTIVITY

The combination used in the A.C. Quadradyne is two variable-mu valves followed by a detector and a power valve. All the power is taken from the mains and the four tuned circuits give a high degree of selectivity

A GOOD SET THAT LOOKS GOOD!

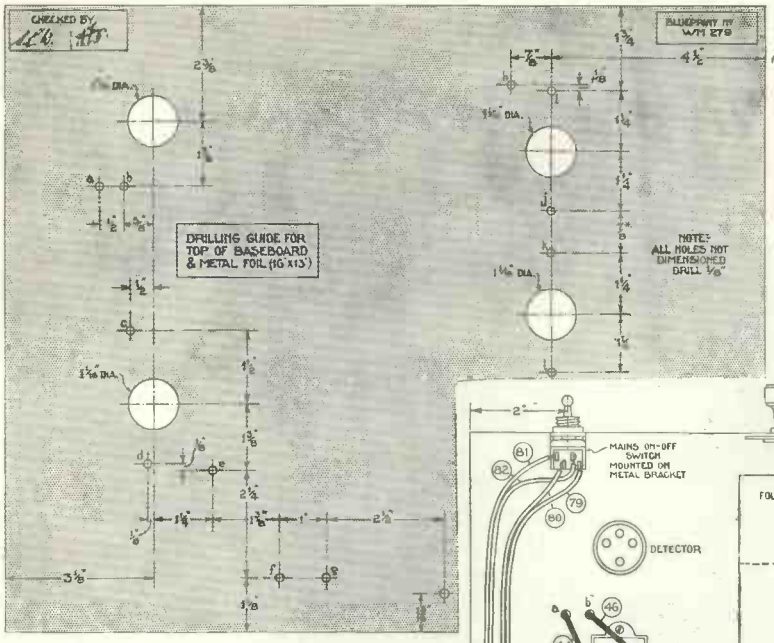


This view shows the clean appearance of the top of the baseboard-chassis, which is covered with aluminium foil. The positions and sizes of the holes to be drilled are indicated on page 334.



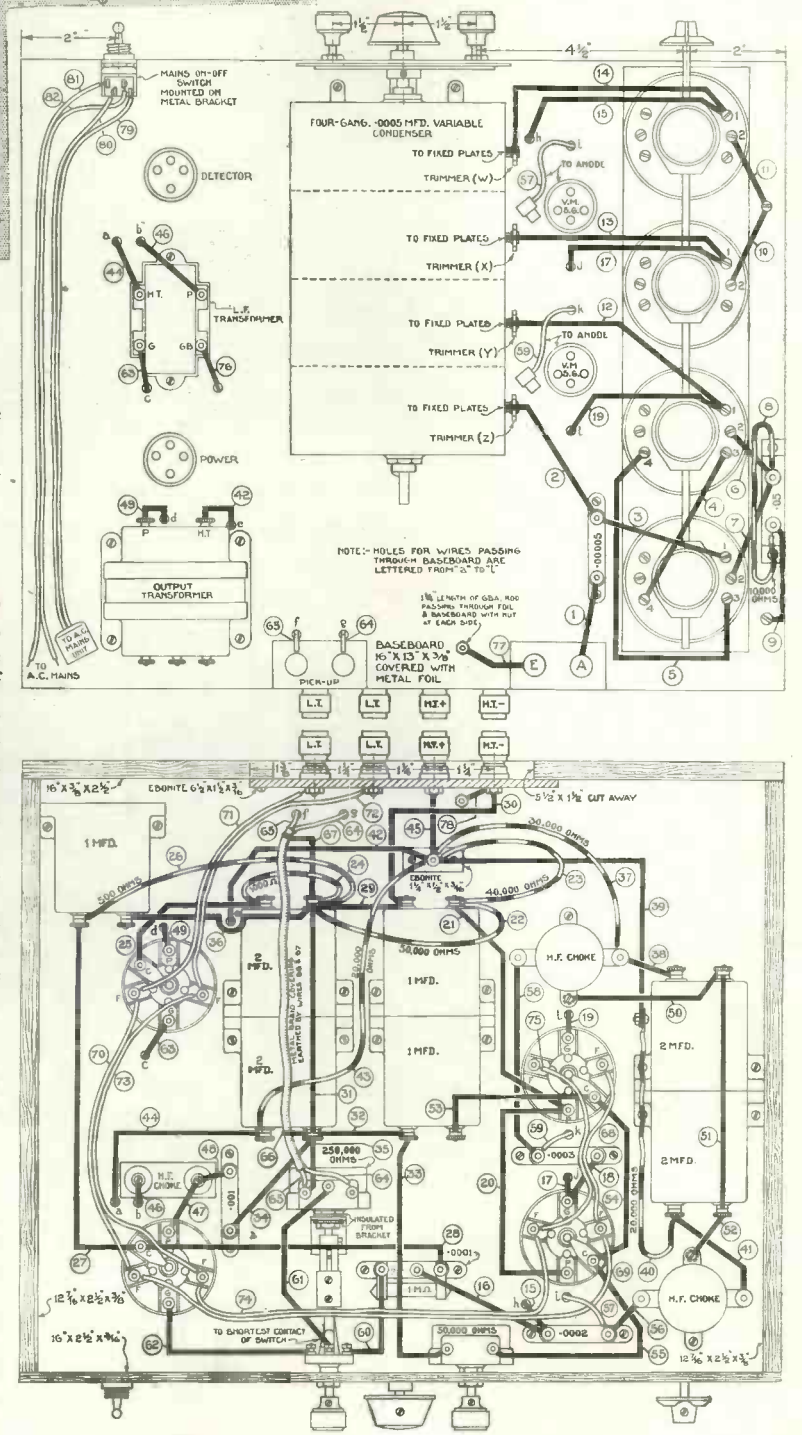
Most of the parts are mounted on the underside of the special baseboard chassis. This results in a very neat assembly which is also electrically efficient because the leads are kept short.

THE A.C. QUADRADYNE Continued



LAYOUT AND WIRING DIAGRAM

These drilling, layout and wiring diagrams are reproduced at quarter scale. 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 April 30. Ask for No. WM269



does not occur for the voltage across the heaters does not rise above about 4.1 volts. This is not a serious overload and will not give cause to any trouble.

Fitting Set in Cabinet

Before the set is fitted into the cabinet, holes must be drilled in the front to accommodate the spindles of the various controls; a hole is also needed for the condenser escutcheon. The positions of these holes are indicated by the diagram reproduced on page 331, but if the cabinet is obtained direct from the makers it will already have these holes drilled.

The motorboard must also be drilled and cut to accommodate the motor and pick-up. There will be little difficulty in this part of the construction, however.

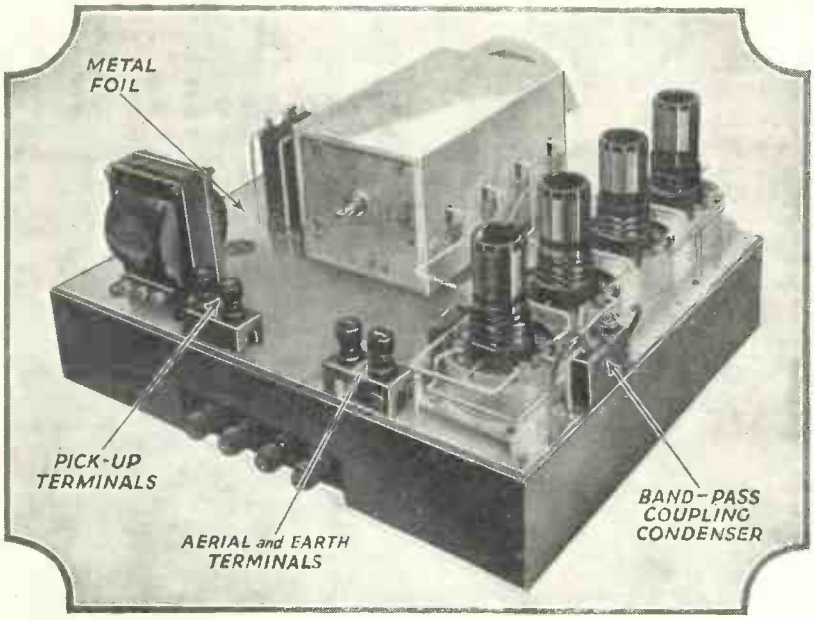
When completely assembled the set is quite shockproof. A combined mains plug and fuse is fixed in the back of the cabinet in such a way that the back cannot be removed until the mains plug is withdrawn from its socket. Where there are children about, therefore, the set can be left unattended without any fear of an accident happening.

Surprising Selectivity

Those who have not previously used a set with four tuned circuits and two screen-grid stages will be surprised at the selectivity and sensitivity of this combination. Wherever the set is used there should be no difficulty in picking up twenty or thirty foreign stations at really good loud-speaker strength. The quality moreover, will be a revelation to many.

The A.C. Quadradyne is offered to readers of "Wireless Magazine" as being a really satisfactory and useful mains set that will give complete satisfaction in service for a long time. Record

COMPLETE RADIO-GRAM



FOUR COILS FOR ULTRA SELECTIVITY

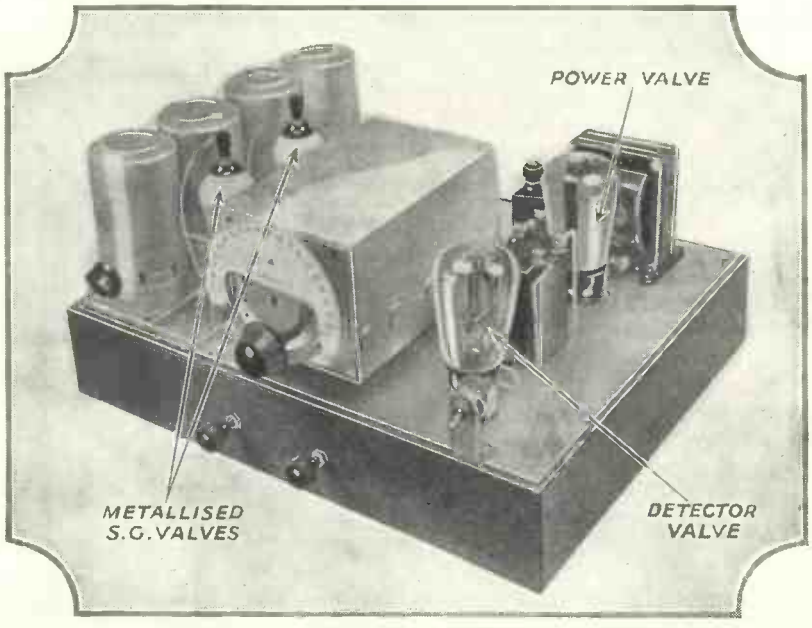
This view shows the four coils of the A.C. Quadradyne with their covers removed. Ganging is not difficult if a milliammeter is used

reproduction is excellent and the set will give ample choice of radio entertainment

The Editor will be glad to have reports on the performance of the set after readers have had it in use for a few weeks.

Skilled amateurs who do not need a four-valve receiver will have little difficulty in building a good three-valver on the basis of the Quadradyne. If one of the screen-grid stages is cut out the resulting set will still retain a high degree of selectivity and will be sufficiently sensitive to pick up a very large number of stations.

A three-gang condenser would be needed and only three tuning coils would be used, of course. Apart from this there would be no alternative in the components of the set, except that some would be omitted.



ASSEMBLY COMPLETED AND VALVES IN POSITION

Another view of the A.C. Quadradyne completely assembled and with the four valves in position. The mains unit employs a metal rectifier

THE A-P-A

To the Editor, "Wireless Magazine."

SIR,—There are just one or two matters arising out of your March issue to which I should like to draw your readers' attention.

First, in the article I wrote describing my A-P-A, I made a small error. On page 214, third column, when describing a modification of the amplifier by omitting the high-tension supply for the set, I said, ". . . leads Nos. 8 and 10 in the wiring diagram are left out." This should have been "leads Nos. 14 and 10."

What Quality Means

Second, in this article, "What Quality Means," Whitaker-Wilson says some very kind things about my set and myself, but is inclined to disagree when I say that as one gets older one's hearing tends to fail on the very high notes—above, say, 10,000 cycles. This statement of mine was very general, as one might say that a man gets grey-haired in old age; and it is *generally* true, although it is perfectly possible for some lucky individuals to retain or even improve their keenness of hearing, as he has.

Third, in his "Radio Medley," BM/PRESS raises the question of resonance in loud-speaker cabinets and quotes a correspondent who mentions the case of string instruments. The piano sounding-board is another case, of course.

Fallacious Argument

I should like to say, with all the weight of a fairly long experience in these matters, that this argument is entirely fallacious. The stringed instruments are given a sounding-board because a vibrating string by itself cannot set in motion enough air to give a loud note, and one of the most difficult parts of the art of building such instruments is to make a sounding-board that will reinforce *all* the notes, that is, one that has *no* "resonances" at special frequencies.

The loud-speaker cone *can* produce an amply loud note without reinforcement. The object of the baffle is not to reinforce, but to prevent interference between the sound waves from the back and the front of the cone.

P. K. Turner.

Windsor, Berks.

Katherine Goodson has played with every great European and American orchestra and under every famous conductor, from Richter to Wood. She was heard recently

Music of the Month

A feature by T. F. HENN that will keep you in touch with the B.B.C.'s musical broadcasts. This month our contributor has something to say about "ear-splitting" modern music

ARE you thrilled by the announcement: "Now you will hear a recital of gramophone records"? All the wireless fans I have asked agree with me that there is something thrilling about a record recital broadcast.

Missing Frequencies

Severe wireless technicians will scoff at the suggestion that we should have more of them, because they worry about the fact that the extreme top and bottom frequencies are missing.

Brushing the technical people aside, I believe that the real reason for the universal enjoyment of record broadcasts is the element of surprise and the change from the usual run of studio programmes.

Fresh artists, orchestras, and novelties combine to make a record recital one of the most interesting of broadcast features. In suggesting to the B.B.C. that we should have more of them, I am sure I am voicing the wishes of the majority of listeners.

While on the subject of recitals, I wonder if you have made it a regular habit to listen to the excellent classical recitals which are frequently broadcast. I am sure the B.B.C. does not give enough publicity to this side of their programmes. Individual performances by some of the best-known pianists and singers are among the boons afforded by radio.

Helen Perkin is noted for her excellent playing in piano concertos. She was recently heard with the B.B.C. Orchestra

A pupil of Wilhelm Bachaus and Professor Egeon Petri, Lucy Pierce has been heard in piano recitals from B.B.C. studios

On April 7, Albert Sammonds, the famous violinist, and William Murdoch, the Australian pianist, are to give a joint recital in the National programme. A special note should be made of this recital.

Sammonds is recognised as the finest solo player among present-day English violinists. He is entirely self-taught, except for a dozen lessons he had when quite young.

(*Continued on page* 338)

One of the best known of provincial violinists, Lionel Kalkman is frequently heard in concerts from North Regional

Sir Frederick Cowen, a famous British composer, recently celebrated his eightieth birthday. A special programme of his works was broadcast

MUSIC OF THE MONTH—Continued from page 336.

A pianist who has been heard in studio recitals, Michael Mullinar. He is also well known for his playing of the harpsichord

Solomon, another pianist of note, will be heard in a recital on Good Friday afternoon. He has had a romantic career. Born in the East End of London, Solomon made his debut when only eight years old by playing a Tchaikowsky concerto with the Queen's Hall Orchestra under the famous conductor, Muller-Reuter.

On the same afternoon the Royal Air Force Band, conducted by Flight-Lieut. R. P. O'Donnell, is making another of its rare appearances.

This conductor, who only recently took charge of the band, is the brother of the popular conductor of the Wireless Military Band, B. Walton O'Donnell.

Annual Parsifal Relay

There is the annual relay of the Parsifal concert from the Queen's Hall on Good Friday evening. The excerpts from this opera which will be broadcast may seem dull to many listeners. I wish I could persuade those who dislike the "highbrow stuff" to give it a fair trial.

Let me remind you that dance tunes come and go—the same tune is never heard for much more than a month—whereas classical music still carries on, century after century.

Special Haydn Programmes

You need no better example than Haydn's music. The musical world is having a bicentenary festival of his works during the first week in April. Special programmes are being arranged by the B.B.C. to commemorate the birth of this famous composer, who was born on March 31, 1732.

The Sunday orchestral concert on April 3, conducted by Dr. Adrian Boult, will be devoted entirely to the works of Haydn and during the following week recitals of his music will be given by Helen Perkin, pianist,

Millicent Cooper, soprano, has had wide experience of classical concert work. She was heard quite recently from the Birmingham studio

Hilda Blake, soprano, has made a study of folk songs. Her latest broadcast was in a programme of West Country songs from Cardiff

and the International and Kolisch String Quartets.

Series "D" of the B.B.C. Symphony concerts at the Queen's Hall begins on April 6 and continues every Wednesday until May 4. Almost every phase of classical orchestral music is covered by these concerts.

The entire programme on April 6 will be devoted to Bach's B minor Mass. The National Chorus are taking part and the soloists will be Elsie Suddaby, Margaret Balfour, Frank Titterton, and Keith Falkner. The work will be conducted by Adrian Boult.

This, no doubt, will be a first-rate performance. If you are keen on the immortal Bach, a note should certainly be made of the date.

Everybody's tastes are catered for in the concert on April 13, which will be conducted by Sir Henry Wood. It is impossible to pick out any

(*Continued on page* 340)

The latest addition to outside broadcasts by cinema orchestras is that of the New Victoria Cinema, Bradford. Here you see a photograph of Haydn Heard, the popular leader and conductor of the orchestra

ANNOUNCING

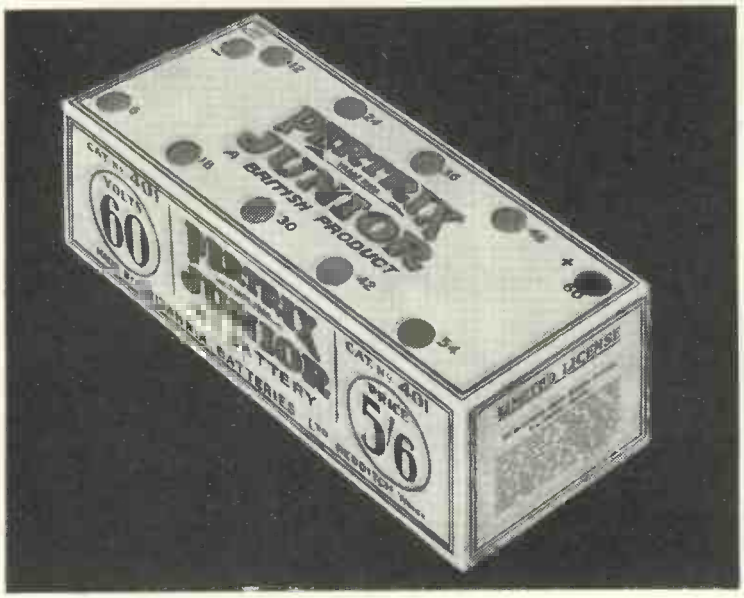
PERTRIX
TRADE MARK
JUNIOR

Now, to meet an incessant demand, we introduce the Pertrix JUNIOR a non-sal-ammoniac battery, at a popular price.

At its price there is no other battery to equal it, no other battery which will give the life or possess the same capacity.

All the skill and the high quality material that goes into making the most expensive Pertrix batteries goes also into making the Pertrix JUNIOR.

Made at Redditch by Britannia Batteries, Limited.



For those whose requirements are met by a cheaper battery, we make the JUNIOR. Worthy to bear the Pertrix name. Of its kind and at its price by far the best.

5/6
60 VOLTS

100 volts **9/-** 120 volts **11/-**

Advt. of Britannia Batteries Limited, 233, Shaftesbury Avenue, London W.C.2. Telephone : Temple Bar 7971

CVS—10

Mention of the "Wireless Magazine" will ensure prompt attention

MUSIC OF THE MONTH—Continued from page 338.

Charles Gellion, a tenor, was recently heard in a Midland Regional concert. He has the happy knack of choosing songs that appeal to all tastes

one item as the main work of the evening. Each is as good as the others. Every listener should enjoy Weber's delightful overture, *Oberon*, Elgar's *Symphony No. 1 in A Flat*, and the orchestral transcription of Bach's *Toccata and Fugue in D Minor*. This transcription is by Nicholas Klenovsky, the Russian composer and conductor.

If you are keen on this work after hearing it, ask to hear the Philadelphia Symphony Orchestra's rendering on H.M.V. record D1428. Besides being a masterpiece of that famous American orchestra, it is a fine test record for gramo-radio enthusiasts.

Dull Spot

The only dull spot in the April 13 concert, it seems to me, will be the *Concerto No. 3 in C for Pianoforte and Orchestra* by Prokokiev. The composer will be at the piano.

Listeners may remember the relay of a violin concerto by this composer, with Szigeti as the soloist, from the Queen's Hall recently. I was disappointed in this work. Szigeti's technique was very fine, but the work did not give this famous violinist a chance to show what he can do.

I have, until recently, been interested in contemporary modern music. Some of the latest "stuff" we have heard is certainly not helping towards furthering its popularity with the average listener. My loud-speaker will not reproduce it; my ears cannot stand the ear-splitting noises. It cannot in fairness to good music be called anything else but noise. If I am old-fashioned in the musical sense, I hope I stay such.

Bruno Walter, the distinguished German conductor, will take charge on April 20 and on April 27 Suggia will also appear. At the time of going to press no details are yet available of the 'cello concerto to be played on the latter date.

A famous English tenor, John Coates, recently gave a special recital. He is well known all over the world, especially in America and the Continent, for his operatic roles

A musical event of the greatest importance will take place on May 20, when Sir Thomas Beecham conducts a performance of Delius' *The Village Romeo and Juliet*. It is a long time ahead, but it is well worth looking forward to. There is no conductor better fitted for the task of conducting Delius' works than Sir Thomas Beecham. If it had not been for Beecham it is certain that the works of this blind English composer would not be so popular as they are to-day.

Sir Thomas and the B.B.C.

It is a pity that there has been a rift between the B.B.C. and Sir Thomas. I understand that Beecham thinks the B.B.C. uses its big Symphony Orchestra far too much and that the orchestra does not make sufficient appearances in public.

Let us hope that this broadcast may mean the beginning of closer relations between Sir Thomas and the B.B.C. Readers will be interested to learn that Delius, who lives at Grez-sur-Loing, in France, listens to broadcasts of his music on a powerful wireless receiver.

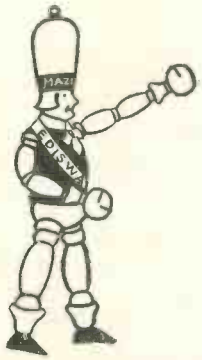
Many will be interested to know that the Glasgow Orpheus Choir is to be heard in a relay from the Queen's Hall on April 9. As usual, it will be conducted by Sir Hugh Robertson. The Glasgow Orpheus Choir was one of the first to insist that its members should be dressed with some uniformity.

The B.B.C., it is stated, got the idea of dressing the ladies of the National Chorus in their present lurid colours from this Glasgow choir.

An artist with a fine baritone voice, George Taylor is frequently heard in the concerts with Pattison's Salon Orchestra rom Midland Regional

HL2

METALISED



LOOK FOR "EDDY" IN YOUR DEALER'S WINDOW

Further evidence of the supremacy of the new range of 2-volt Mazda valves is here in the metalised H.L.2. Extreme sensitivity joins with absolute stability, and its high amplification coupled with a comparatively low impedance renders it particularly efficient as a leaky grid detector or intermediate L.F. amplifier. The steep slope of the H.L.2 also makes it suitable for use as an anode bend detector.

Mazda valves are 100% British made and designed by British engineers.

THE AMAZING MAZDA THE BRITISH VALVES

EDISWAN RADIO

ANOTHER BIC ACHIEVEMENT IN THE NEW MAZDA 2-VOLT RANGE

MAZDA 2-VOLT RANGE

H.210	8/6	P.240	13/6
★H.2	8/6	PEN.230	20/0
HL.210	8/6	PEN.220	20/0
★HL.2	8/6	PEN.220A	20/0
★L·2	8/6	S.G.215	20/0
P.220	10/6	★S.215A	20/0
P.220A	13/6	★S.215B	20/0

★ METALISED

THE EDISON SWAN ELECTRIC CO. LTD.
RADIO DIVISION:
155 CHARING CROSS ROAD, LONDON, W.C.2

V.144

WE TEST BEFORE YOU BUY

By the "W.M." Set Selection Bureau

A special section for those who prefer to buy complete rather than build for themselves

LAST month we gave resumés of nineteen complete receivers that have been tested since September. Here we give brief details of seven kit sets that have been tested during the past six months. All of them can be thoroughly recommended from actual test experiences:

£1 19s. 6d., Telsen Three.—Kit set for home construction. Price does not include valves or cabinet. Detector followed by two low-frequency stages.

£3 15s., Meteor Three.—Kit set for the home constructor. It covers short, medium, and long waves and can also be used for the reproduction of gramophone records. Detector followed by two low-frequency stages.

£6 6s., Zonophone Three-valve Kit Set.—Neat set for home construction. Detector followed by two resistance-coupled low-frequency stages. Kit includes cabinet and cone loud-speaker. Provision for fitting a pick-up.

£6 15s., Cossor Empire Melody Maker.—Three-valve kit set. The combination is a screen-grid high-frequency stage, followed by a detector and a transformer-coupled power valve.

£6 17s. 6d., Eddystone Kilodyne Four.—Four-valve short-wave kit for home construction. Screen-grid high-frequency stage, detector, low-frequency amplifier and pentode output. Price does not include valves.

£6 17s. 6d., Six-Sixty Chassikit.—Three-valve kit set with a screen-grid high-frequency stage and pentode output. There is a wide choice of cabinets.

£7 2s. 6d., Mullard 1932 Three-valver.—Kit set for home construction. There is a screen-grid stage followed by a detector and a pentode. Price includes cabinet.

* * *

Every set maker seems to have concentrated this season on the console type of set, with everything in the cabinet except the aerial and earth. Unfortunately, the effort to produce an "all-in" set at a reasonable price has often meant the inclusion of somewhat second-rate loud-speakers.

Discriminating Buyers

This fact has not escaped the notice of discriminating set buyers, and those with existing loud-speakers of good quality are loth to buy a set that will obviously give reproduction inferior to that of the loud-speaker on hand.

To overcome this difficulty such set buyers have looked in vain for a table-cabinet set of the type so common last year, but now almost entirely abandoned.

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.

So far we have come across only three good all-electric sets for use with external loud-speakers, by which we mean sets that do not contain a loud-speaker, for of course most of the consoles can be used with an additional loud-speaker.

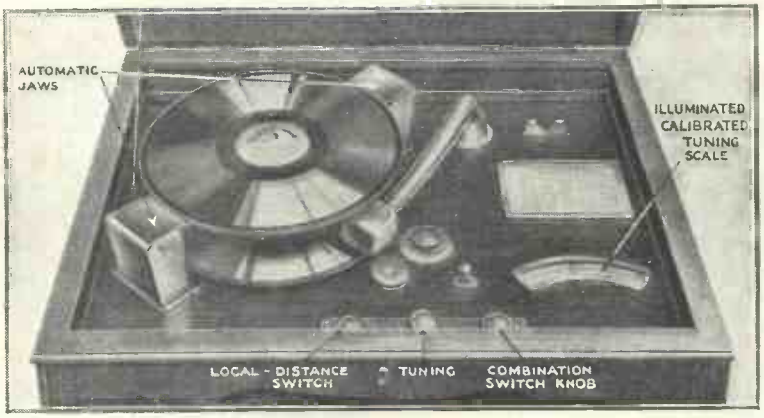
Choice of Loud-speaker

While appreciating the set makers' difficulties, we sympathise even more with our prospective set-buying readers.

Why not consoles with a choice of loud-speaker?

(See also page 340

H.M.V. Model 531 Radio Gramophone



EVERY REFINEMENT INCORPORATED.

Here you see a view of the motorboard of the H.M.V. model 531. Every modern refinement is incorporated in the design, even to an automatic record changer

THIS is the "ace" set in the season's range of H.M.V. products. We find difficulty in picking out special points to mention—there are so many. Probably most readers will be interested to see how the super-het system, popularised so much by this magazine, is made use of in commercial practice.

THE INSTRUMENT IN BRIEF

MAKER: The Gramophone Company, Ltd.
PRICE: £73 10s.
VALVE COMBINATION: Six-valve super-het with separate three-valve power amplifier.
POWER SUPPLY: A.C. mains: 100 to 160 volts, and 200 to 260 volts. For periodicities between 50 and 100 cycles.
POWER CONSUMPTION: 100 watts, with gramophone in operation.
TYPE: De-luxe radio gramophone, with super-het for great range and super selectivity, with power amplifier for great volume—taking up to six external loud-speakers—and automatic record-changing mechanism.
FINISH: Attractive walnut cabinet.
REMARKS: De-luxe set in every way. Represents the ultimate in radio-gramophone design. In a class by itself.

The six-valve super-het circuit comprises a pre-detector screen-grid valve used as a high-frequency amplifier, a first detector (also a screen-grid valve), an oscillator valve, two screen-grid intermediate valves, and lastly the second detector (low-impedance three-electrode type).

Four-gang Condenser

In addition to the fixed-tuned circuits of the intermediate amplifiers, there are four variable-tuned circuits, and these are controlled by a four-gang condenser. The great achievement lies in the one-knob control of this complicated super-het sequence, including the oscillator condenser, which is usually a separate control.

Following the six-valve super-het, but separately built, is the power amplifier, comprising an input valve and two super-power valves in push-pull. The enormous output of over 4 watts is obtained from these valves, enough to load fully the large moving-coil loud-speaker.

Some idea of the great reserve of power may be gained from the fact that up to six external loud-speakers can be connected up without appreciable loss of volume.

Due to the circuit, the number of stations that can be tuned in is limited only by atmospheric conditions. In South-west London, with an aerial comprising 10 ft. of wire, we have heard over eighty stations.

The selectivity is phenomenal. Mühlacker can be obtained at tremendous volume perfectly clear of the London station. So, indeed, can any station it is desired to log. The only stipulation in reception is that the wanted station shall be clear of heterodynes.

Control is as simple as you could want. The wavelength-calibrated dial, which is, of course, illuminated when the set is switched on, is a great help in tuning. The subsidiary controls, particularly the volume-control knob mounted on the front of the cabinet, work well.

We have already described the automatic-record-changing mechanism whereby eight 10-in. or 12-in. records can be played at one loading.

A good point is that during the changing operation a switch cuts out the pick-up, thus avoiding the reproduction of the sound of the pick-up being lowered on to the record.

There is a record-changing button, which may be operated at any time during the playing of a record. And an index switch to determine the number of records to be played, or the number of repeats of any given record.

Amazing Power Output

We were greatly impressed with the amazingly powerful output. Even with the volume control turned full on there was not the slightest sign of overloading.

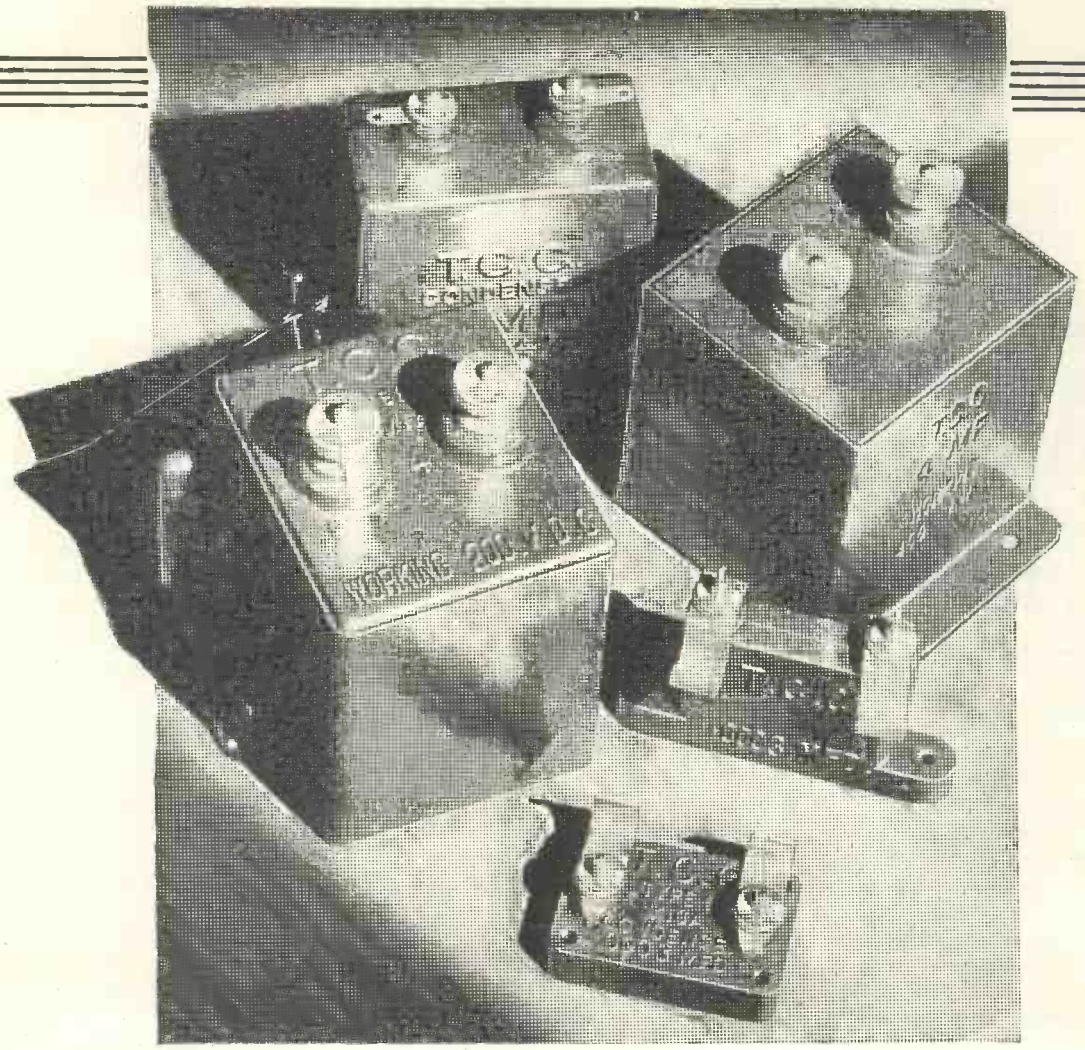
To prevent overloading when tuning in the local stations a local-distance switch is fitted, to cut dow high-frequency amplification.

From a purely user point of view there are dozens of attractive features. Here is a radio gramophone that should meet the most exacting reception requirements, that should please the most fastidious ear.

HANDSOME APPEARANCE

The set is housed in a handsome walnut cabinet. Only two small controls are fitted to the front of the cabinet.

See also page 346.



The Author of the A.C. QUADRADYNE Specifies T.C.C. . . .

Below is given the actual specification of the condensers which the designer of the A.C. Quadradyne advised you to use—condensers that he knows will do their job accurately and in such a manner that you will get those results which he intended you to get. Adhere strictly to his recommendations, and use condensers backed by the unique experience of a quarter of a century's condenser making. Use T.C.C., and be sure.

		s.	d.
1	T.C.C. .00005-microfarad, type 34	1	6
1	T.C.C. .001-microfarad, type SP.	2	10
1	T.C.C. .0001-microfarad, type 34	1	6
1	T.C.C. .0002-microfarad, type 34	1	6
1	T.C.C. .0003-microfarad, type 34	1	6
1	T. C. C. .05-microfarad, non-inductive type ...	1	9
3	T.C.C. 1-microfarad, type 50	8	6
4	T.C.C. 2-microfarad type, 50	15	4

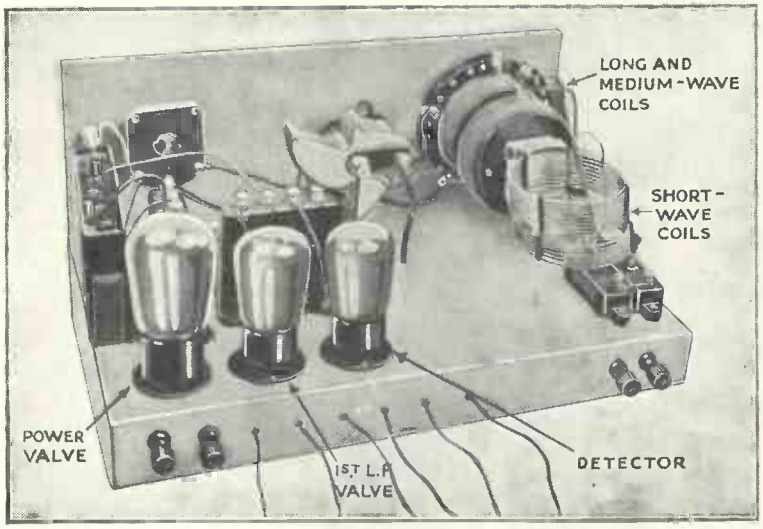
T.C.C.

ALL-BRITISH CONDENSERS

THE TELEGRAPH CONDENSER Co., Ltd.
Wales Farm Road · N. Acton W.3

♡ 9833

Formo Triple-wave Three (Kit Set)



EASY TO BUILD: RECEIVES ON ALL WAVELENGTHS

The Formo kit set is built up on a metal chassis. On the extreme right is seen the triple-range coil which covers short, medium and long wavebands

AMONG kit sets for all-wave tuning, the Formo Triple-wave Three is very satisfactory, in spite of its extremely low cost.

Designed on the metal-chassis system, the Formo kit has the simplest possible three-valve circuit, comprising a leaky-grid detector and two transformer-coupled low-frequency amplifying valves. The detector is preceded by a triple-wave tuning unit, which is most ingeniously designed.

Tuning and Reaction

Tuning is done by means of a Formo .0005-microfarad variable condenser and reaction is controlled by means of a Formo differential condenser.

On first looking at the circuit diagram we were struck by the extreme simplicity of the low-frequency arrangement, and we must confess that we wondered about its stability. There are no decoupling components, but in spite of this there is absolutely no trace of instability when the set is used with a high-tension battery of 120 volts.

This is probably due to the fact that the high-frequency current in the anode circuit of the detector is well diverted from the low-frequency side by means of a high-frequency choke in series with the primary of the first transformer. This choke works in conjunction with the differential reaction condenser, giving a constant anode by-pass for high-frequency currents irrespective of the reaction setting.

Another reason for the stability can be traced to the fact that separate high-tension supplies are available for each valve.

The detector has a .00025-microfarad grid condenser and a 2-megohm grid leak. The tuning circuit preceding this valve is, as already mentioned, ingenious.

The triple-wave tuning coil works in conjunction with a multi-point switch, which gives a panel control of wave changing. Short waves between 15 and 50 metres or 50 and 100 metres; medium from 250 to 550 metres; and long waves from 1,000 to 2,000 metres, are all embraced by this coil.

The wide wavelength range, with its simple panel selection switch, is achieved by mounting two Atlas short-wave coils in sockets at the end of a Formo dual-range coil. The fields of the dual-range coil and the two short-wave coils are at right angles.

NUTSHELL SPECIFICATION

MAKER: Arthur Preen and Co., Ltd.
PRICE: £3 5s. for kit of parts (without valves).
VALVE COMBINATION: Detector and two stages of low-frequency amplification.
POWER SUPPLY: Batteries.
POWER CONSUMPTION: 10 to 12 milliamperes with small power valve.
TYPE: Metal-chassis kit set for all-wave tuning.
FINISH: Black finish to the front of metal panel.
REMARKS: Very cheap kit set employing a special tuning-coil assembly that provides long-, medium-, and short-wave reception. Panel switch control for the wave-changing

Constructors should be delighted with the extreme simplicity of the metal-chassis construction.

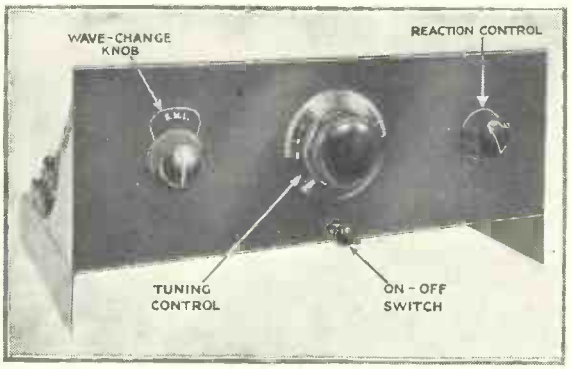
Mounted conveniently near the aerial and earth terminals are two Formodensers, connected in series with the aerial and the coil. One comes into action on the short waves and the other is for the medium and long waves.

Reduced Capacity

As the coil switch brings into circuit the Atlas short-wave coils, it also brings in an extra fixed condenser in series with the .0005-microfarad tuning condenser, thus reducing the maximum tuning capacity to .00015 microfarad.

Control, as might be expected, was found to be very simple.

The Formodenser in the aerial circuit exerted a considerable influence on the selectivity. In addition to the London Regional at 56 degrees, the National at 34 degrees, Midland Regional at 66 degrees and North Regional at 84 degrees, we were able to get eight foreign stations.



SIMPLE TO OPERATE

The beginner will have no difficulty in working this set. The switch on the left is turned to the left for the ultra-short waveband, the centre position for the medium waves and to the right for the long waveband

See also page 348

CONSULT THIS CHART

Portable Set.	Battery.	Volts. H.T.	Volts. G.B.	Price.
Aeonic - - -	Popular 108 G.B. -	108		14/-
Beethoven - -	" " " -	"		14/-
Columbia - - -	" " " -	"		14/-
Burgoyne - - -	W 972 - - -	90	9	10/-
Kolster Brandes Pup -	Portable 12 - -	97.5	7.5	12/-
do. Kobra-	W.1150 - -	126.5	10.5	20/-
do. Scr. 4 -	W.1031 - -	108	9	20/-
Marconiphone (53 & 55)	Portable 17 - -	108		13/-
McMichael - -	W.1148 - -	126		16/6
do. (Super Range)	Portable 18 - -	120		15/-
Mullard - - -	W.1112 - -	120		14/6
National - - -	W.966 - - -	126		21/-
Pye (Twin Triple) -	Portable 19 - -	126		15/-
do. Q - -	W.1134 - -	123	3	17/6
do. (Old Models)	W.812 - - -	108		21/-
Umello - - -	W.1139 - -	99		11/6

Here is the EVER READY chart showing some well-known portable sets, and their appropriate EVER READY batteries. The complete chart of 238 sets will be sent free on application to the address below.

BEFORE YOU CHOOSE YOUR NEXT BATTERY

EVER READY make batteries of exactly the right size, shape and voltage, for every wireless set—suitcase, cabinet portable, transportable or table model. The Ever Ready Company publish a list giving details of batteries and accumulators for 238 well-known portable sets. In addition there are 50 standard sizes and voltages of EVER READY H.T. and G.B. batteries made specially to give the most economical service for the million users of low-power sets or the experimenters' multi-valve sets, where size and weight are not of primary importance. Send for free copies. We also give free advice on the installation of our batteries to help you obtain the most satisfactory results for the lowest maintenance cost.

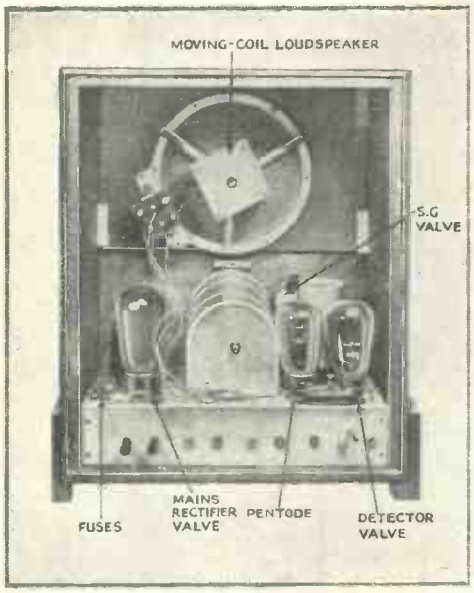
EVER READY—Britain's Best Batteries—are guaranteed to give satisfactory service by the firm which has specialised in manufacturing dry batteries for every purpose, for 30 years.

BATTERIES
THE POWER FOR YOUR SET

THE EVER READY CO. (Gt. Britain) LTD., Hercules Place, Holloway, London, N.7.

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

Wardus A.C. Console Three



NEAT LAY-OUT
An interior view of the Wardus A.C. console. The loud-speaker is of the moving-coil energised type

THIS is a very attractive set, incorporating all the latest technical features in a beautifully figured walnut cabinet. Being a console, this new set is entirely self-contained, except for the aerial and earth. And for those who cannot erect an external aerial the mains can be utilised, for tests show that the three valves will amplify to full loud-speaker strength many of the signals picked up on the mains aerial connection.

Ganged Tuning

An important point about the three-valve circuit is the band-pass aerial tuning. The high-frequency valve is coupled to the detector by the tuned-anode system, and this tuning is ganged with the band-pass aerial tuning, so that although there are three tuned circuits, only one tuning knob has to be operated. A variable-mu screen-grid valve is used, and the detector works on power-grid. The power output valve, a pentode, provides 1,900 milliwatts, corresponding to great volume with a sensitive loud-speaker such as is used in this set. These few details are enough to show how modern is the circuit. No less so is the layout. The iron chassis, which is lead coated and cellulose sprayed, is readily removed from the bottom of the cabinet by undoing only four screws. Adequate screening is available at all points. We were greatly impressed with the chassis design, which is as "clean" as anything examined this season.

The controls have been carefully thought out, as can be seen from a glance at the illustration. Just below the fret of the loud-speaker, which is an energised moving coil, we find the tuning escutcheon, behind which is a dial marked very clearly in degrees from 0 to 180.

When the set is switched on by means of the combined volume control and mains switch knob at the right, this dial is illuminated by a small lamp mounted behind.

Tuning is done by means of the knob below the escutcheon, and reaction is controlled by the knob below this.

The three-position switch on the left, for medium, long, and gramophone, works well, as indeed do all the controls.

With the mains transformer tapping adjusted to 200 volts, we tested this set on the standard aerial in South-west London. We were immediately impressed with the performance. Quality from the moving-coil loud-speaker was pleasing and above the average, showing that the pentode has been well matched.

Quite the most outstanding feature of the test was the great selectivity. Due to the band-pass aerial tuning, we were able to limit the local stations to a very small part of the dial and to separate adjacent foreign stations with rare ease.

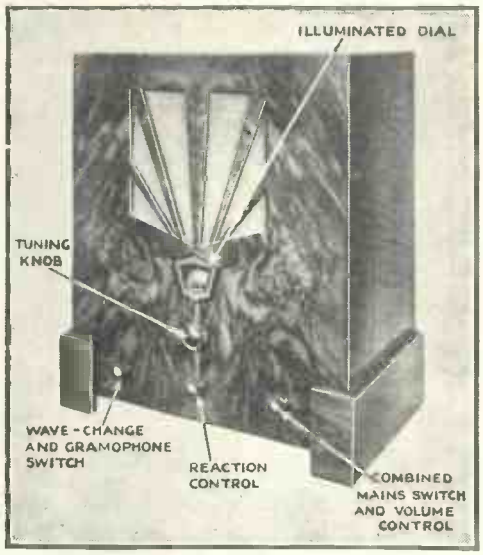
Typical Dial Reading

Some idea of the spacing on the dial imparted by band-passing may be gained from the readings around North Regional. This station came in at full strength at 123 degrees. Below, at 119 degrees, was found Langenberg, absolutely clear of North Regional's side-band twitter. Equally free was Prague above, logged at 127 degrees.

It will be seen that all these stations had a 4-degree dial spread—a characteristic of band-pass tuning. Outside these spread limits the signals fell away.

Without any special effort we were able to log thirty-five stations on the medium-wave band, all within the course of an hour.

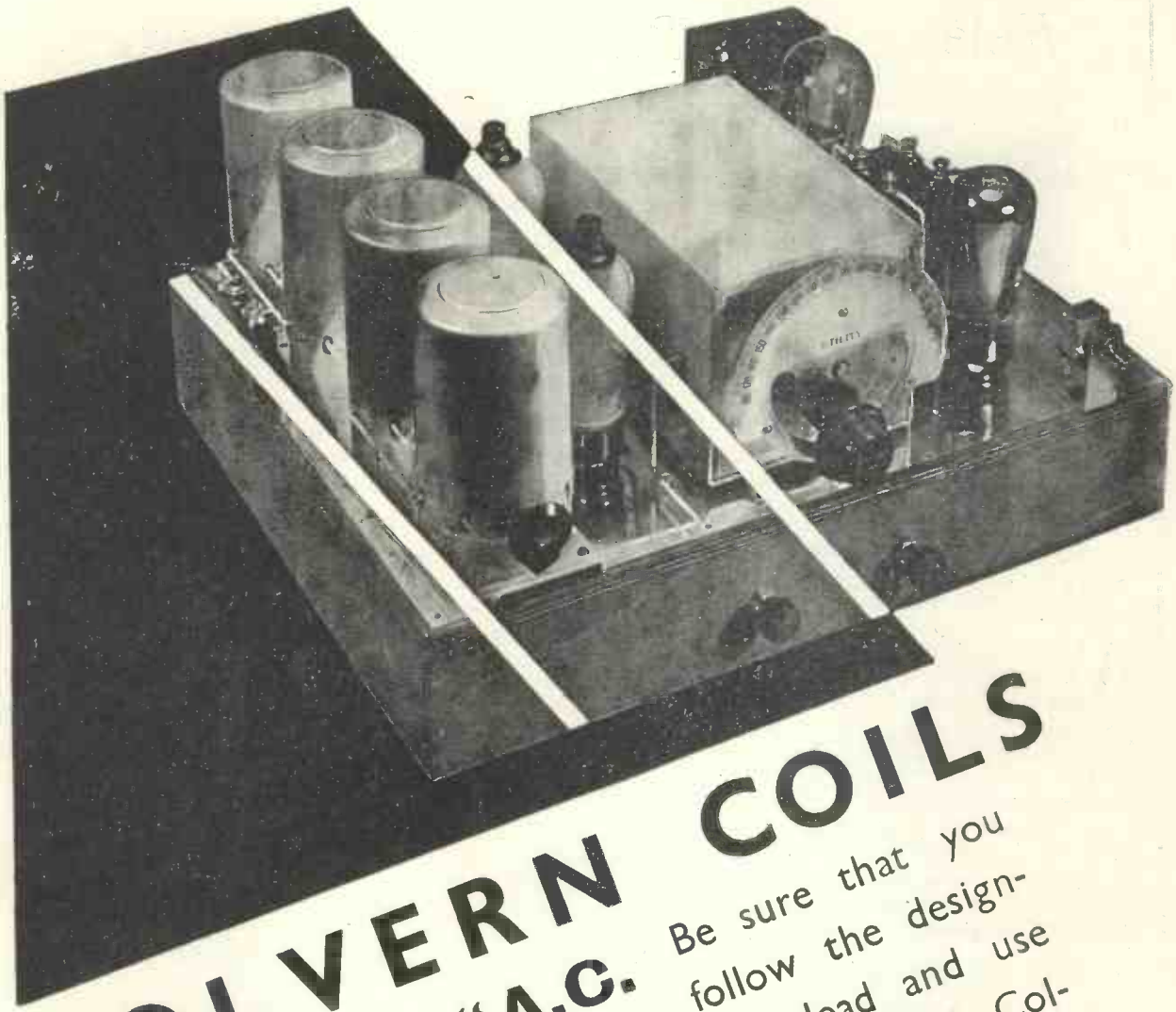
Seven stations were heard at good strength on the long waves, with Daventry at 90 degrees, Radio Paris at 110 degrees, and Eiffel Tower at 70 degrees.



MODERN APPEARANCE
The set is housed in an attractive walnut cabinet. It is for use with A.C. mains only

NUTSHELL SPECIFICATION
MAKERS: Wardus Radio, Ltd.
PRICE: 16 guineas.
VALVE COMBINATION: Screen grid (Mullard MM4V), power-grid detector (Mazda AC/HL), pentode output valve (Mazda AC/PEN), and valve rectifier (Mullard DW3).
POWER SUPPLY: A.C. mains, 200-250 volts (110-volt transformer supplied if required).
POWER CONSUMPTION: 35 watts.
TYPE: Self-contained console set. Provision for mains aerial.
FINISH: Attractive figured walnut cabinet.
REMARKS: A good three-valver, giving a large number of stations at excellent quality on the self-contained loud-speaker.

(See also page 350)



COLVERN COILS FOR THE "A.C. QUADRADYNE"

Be sure that you follow the designers' lead and use the specified Colvern Coils in your "A.C. Quadradyne"

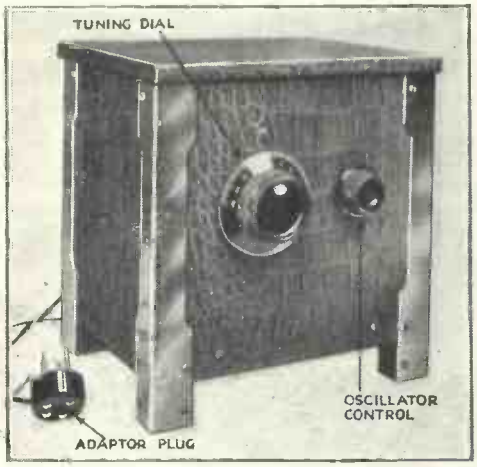
1 pair KGC ganged with 1 pair KBLC

37/6 set

COLVERN LIMITED : MAWNEY'S ROAD : ROMFORD : ESSEX

Advertisers like to know you "saw it in the 'Wireless Magazine'"

Eelex A.C. Short-wave Converter



ADD THIS TO YOUR SET

This Eelex unit converts any A.C. set with one or more stages of high-frequency amplification into a short-wave super-het

ALTHOUGH many short-wave units have been designed for use with battery-operated sets, nothing has so far been done for the owner of a mains-operated set desiring to tune down to the short waves below 100 metres.

Now comes an A.C.-mains model of the Eelex short-wave converter. We have been testing this out with several A.C. sets and results have been quite satisfactory.

Short-wave Super-het

This unit converts an existing broadcast set into a short-wave super-het. The only stipulation is that the broadcast set *must have at least one stage of high-frequency amplification.* With the converter this becomes the long-wave intermediate-frequency amplifier.

The Eelex short-wave converter for A.C. mains is very similar to the battery model, and is just as simple to use. It consists essentially of an oscillator-detector valve with a tapped short-wave tuning coil and short-wave tuning condenser. There is, in addition, a reaction condenser of the bakelite-dielectric type.

Coming from the moving vanes of the variable-condenser is a length of flex terminating in a crocodile clip. This makes contact with the turns on the short-wave coil, and provides a good variation in the wavelength range.

There is another crocodile clip fitted to the end of the flex coming from the aerial lead socket.

There are three leads coming through an insulated bush below the earth socket of the unit. Two of these go to a five-pin adaptor, and the other one is intended to be connected to a suitable point of high tension in the set.

The adaptor serves to tap off the 4-volt A.C. supply of the set, so as to provide the unit valve with filament current.

We were agreeably surprised to find how easily the unit could be connected up. And still more surprised at the entire absence of hum during the reception of short-wave signals. To obtain super-het action tune the broadcast set to a wave-length of about 1,100 metres.

Having attended to this point, the connection of the unit to the A.C. set is really very simple. We have already explained how the low tension is obtained for the A.C. valve by means of the adaptor plug. The high-tension flexible lead can be connected to any suitable point, such as the anode terminal of the screen-grid valve.

With the crocodile clip on the end turn of the short-wave coil, the wavelength range is from 30 to 60 metres. With the clip at the middle of the coil the range is then reduced and tuning goes from 20 to 30 metres. As the clip is moved down the coil the wavelength is reduced. The minimum is 16 metres.

We had no difficulty in obtaining oscillation around the 30-metre mark, where most of the interesting short-wave transmissions are to be found. Having increased the reaction knob until a rushing sound is heard, we were able to tune in short-wave stations at tremendous strength.

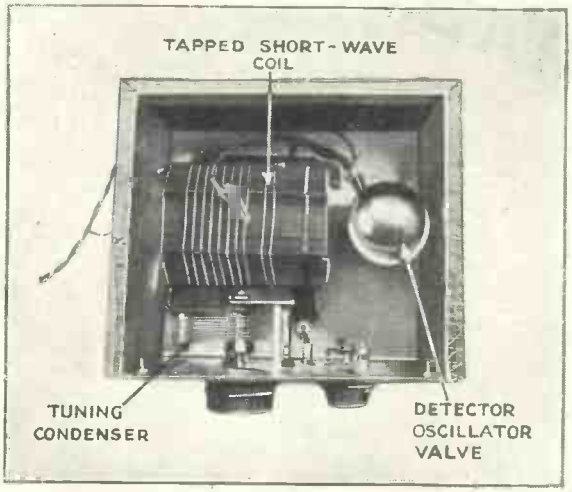
We obtained good results using an Osram MHL4 valve although good results can also be obtained with the Mazda AC/HL or a Mullard 354V.

We found it easy to tune in continuous-wave stations by bringing the detector valve of the set into oscillation. This process also assisted us when searching for weak telephony stations although, of course, the set must not be actually oscillating when listening to telephony.

Extra plug-in coils are available, price 5s. each, for the 60 to 120 metre band and the 120 to 170 metre band.

WHAT THIS UNIT IS.

MAKER: J. J. Eastick and Sons.
PRICE: £3 5s. (excluding valves).
VALVE COMBINATION: Oscillator-detector valve. Recommended types are Marconi or Osram MHL4, Mullard 354V, and Mazda AC/HL.
POWER SUPPLY: A.C. mains. Filament supply is tapped off the set's supply by means of a plug adaptor. High-tension supply for valve in the unit can be obtained from any suitable point in the set.
POWER CONSUMPTION: Valve filament takes 1 ampere from the set's mains transformer secondary. Extra drain on high-tension supply is small—3 to 5 milliamperes.
TYPE: Short-wave unit for converting a broadcast set with at least one stage of high-frequency amplification, into a short-wave super-het.
FINISH: Leatherette covering for the wooden cabinet.
REMARKS: Very satisfactory results with a number of A.C. sets. Very strong signals obtained on short waves.



NEATLY ARRANGED AND WELL MADE

The Eelex short-wave converter is well designed and will interest many A.C. set owners who want to extend their field of reception

Specified for "THE IDEAL HOME Super"

"ORMOND" ENGINEERING COMPANY LTD.
Registered Trade Mark

The ORMOND No 1 Adjustable LOUDSPEAKER UNIT

In performance this Ormond Unit is a recognised triumph. So sensitive that it achieves faithful reproduction over a wide range of frequencies, it is yet capable of handling great volume without a trace of chatter. The unit is easily mounted in either cabinet or chassis, only two screws being required. Cat. No. R/450 **12/6**

For PUNCH POWER & PURITY

The ORMOND Small CHASSIS & CONE

In conjunction with the No. 1 Unit, this chassis and cone offers the constructor the opportunity to build a first-class loud-speaker for a very small outlay.

The chassis, constructed of aluminium ribbed and specially strengthened, is provided with two brass pillars complete with lock nuts, to facilitate assembly of the unit. The cone is of specially-selected material secured to the outer ring; screw holes are provided for securing to baffle-board or cabinet. Diameter 11⅜ in. Cat. No. R/451 **5/-**

THE ORMOND ENGINEERING CO., LTD.
ORMOND HOUSE, ROSEBERY AVENUE, LONDON, E.C.1
Telephone: Clerkenwell 5334-5-6 and 9344-5-6
Telegrams: "Ormondengi, Isling."

BRITISH PRODUCTS OF SUPER QUALITY!

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

RADIO in REVIEW

By MORTON BARR

IT is a matter of common observation that more stations are usually to be found near the zero end of the tuning dial than elsewhere, even when using a square-law condenser, which is, of course, designed to reduce the normal "overcrowding" at this end of the scale.

The reason is that the circuits are naturally more sensitive; that is to say, the set has a longer reach—provided other conditions are favourable—on the medium waves than on the long.

"Alive" on Lower Waves

In fact, the set is more "alive" in every way when the condenser setting is low. For instance, if there is direct back-coupling, the slightest movement of the reaction coil is sufficient to set up oscillation in this position, though the same readjustment would have practically no effect higher up the scale.

This, in itself, is a proof that the circuits on a short-wave setting are abnormally sensitive, whether to an incoming signal or to any other applied impulse.

In tuning a set we usually vary the capacity in the high-frequency circuits and leave the inductance untouched. But although the number of windings is left unaltered, the impedance of the coil changes with the frequency to which the circuit as a whole is tuned.

As the wavelength decreases, the coil impedance increases, and so does the voltage built up across it. A higher voltage is thus applied to the grid of the screen-grid amplifier valve and the set at once functions more efficiently. Unfortunately selectivity does not keep pace with sensitivity, so that, in practice, there is more mutual interference or "overlap" on the short wavelengths than higher up the scale.

The difficulty of securing uniform sensitivity or amplification, though most pronounced on the short waves, occurs also on the medium waves and, in fact, over the entire tuning range. The ideal receiver should, of course, be equally responsive at all wavelengths, and many modern receivers are specially adapted to secure this result.

For instance, in the original Loftin-White circuit the signal energy is transferred from the aerial to the first valve and from one amplifier to the next, through coupling circuits which are partly capacitative and partly inductive, so that as the signal frequency increases the more favourable effect of one is offset by the other and a uniform "overall" amplification results.

Another method is to use an additional input circuit tuned to a frequency slightly higher than the highest signal to be received. For instance, on the 200-to-500 metre band the extra circuit would be tuned to 600 metres. It then helps to transfer energy more efficiently towards the 500-metre mark—because it is then more nearly "resonant"—than it does on the shorter wavelengths. The result is that the natural tendency to greater sensitivity on the short wavelengths is offset and a more constant "overall" effect secured.

Unequal sensitivity arises whenever inductance or capacity occurs in the circuits, because both behave differently at different frequencies. For this reason resistance-coupled amplifiers have an advantage, particularly on the low-frequency side, where it is just as necessary to treat all frequencies alike, if distortion is to be avoided.

◆ ◆ ◆

Motor-car Sets

The fact that 100,000 American cars are now fitted for broadcast reception adds a certain interest to the appearance of a seven-valve set designed for the British market.

Three stages of screen-grid amplification are used, the aerial being mounted under the fabric of the roof. The set itself, housed in a steel casing, is fitted either behind the dashboard or under the bonnet. Tuning and volume control is effected through a flexible cable from either the dashboard or steering column.

The primary problem of cutting out "interference" due to the ignition system of the car has been satisfactorily solved by careful screening, and by inserting resistances in the spark-plug leads. Provided these precautions are taken, the broadcast programmes can be clearly heard while the car is travelling along the road.

The cost of such a set—at present just over £40—is, however, a serious consideration.

Servicing Difficulties

In practice, the radio receiver would probably be supplied as an accessory by the makers of the car, in which case "servicing" may prove another difficulty. Motor engineers can hardly be expected to add expert radio knowledge to their other qualifications, and the maintenance of a seven-valver is no light job. On the other hand, the ordinary wireless retailer will scarcely welcome repair work on a seven-valve set if he is denied his profits on the initial sale.

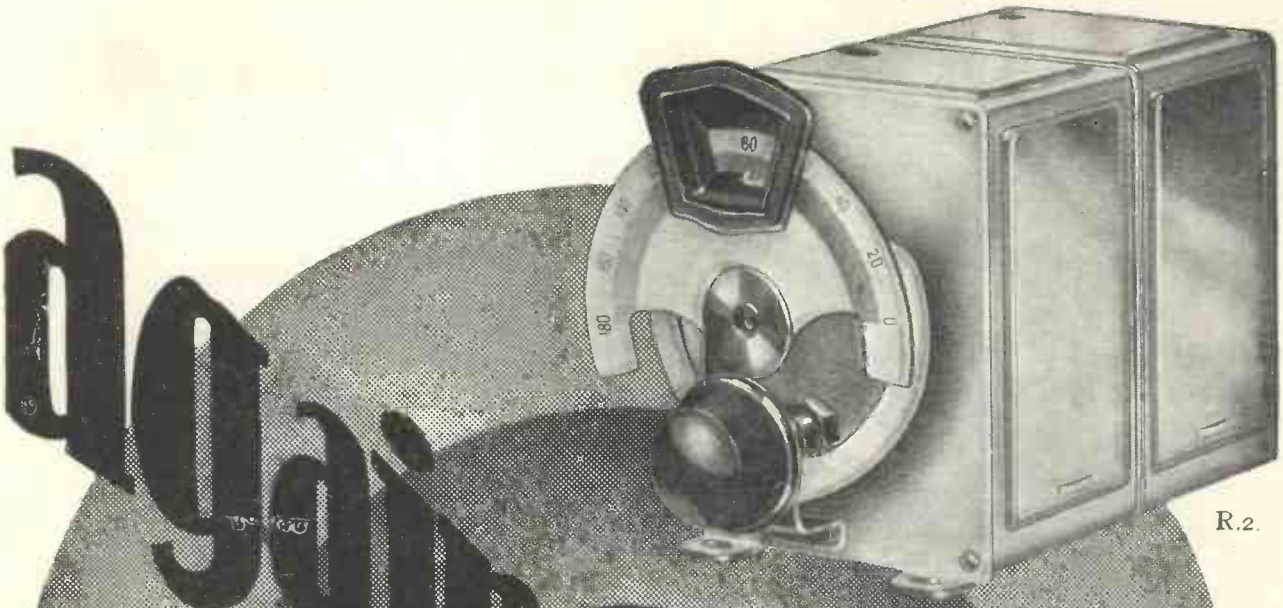
◆ ◆ ◆

For several months the air has been thick with rumours of fresh developments in television, tending to give the impression that it is, at last, ready to enter the popular market. In America anticipation has been even more keenly stimulated, though in neither case do there appear to be any real grounds for optimism.

Mechanical scanning systems appear to be limited to the production of a picture roughly 4 by 3 in., any increase in this size being offset by a corresponding loss in clear definition. Progress has recently been made in scanning by means of cathode rays and similar discharge streams, but these systems are still largely in the experimental stage.

The fact is, television has still a long way to go before it can hope to compete in interest value with ordinary broadcasting.

again



R.2.

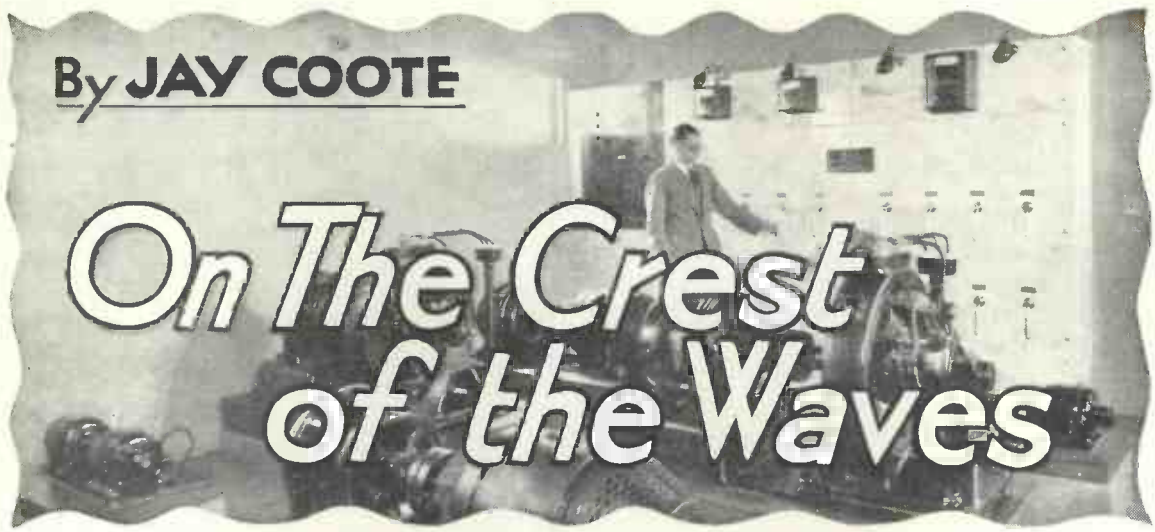
R.1.

and again

J.B. Precision Instruments, chosen for still another Star Circuit—this time the Wireless Magazine "Ideal Home Super."
The J.B. "R" type Gang Condensers specified are the very latest in tuning devices, thoroughly shielded and enclosed with neat clip-on screens to every stage.
There are Trimmers (for adjustment once only) in each stage.
"R" 1, 12/6. "R" 2, 21/-. Complete with Vernier disc drive.

USED AND SPECIFIED in the "IDEAL HOME SUPER"

Advertisement of Jackson Bros., 72 St. Thomas' Street, London, S.E.1. Telephone: Hop. 1837



By JAY COOTE

On The Crest of the Waves

These notes will keep you informed of all the important developments in the European Broadcast field. By reading them each month you will be able to take advantage of all the new stations that come on the ether

AS a tribute to the famous Italian engineer, Signor Mussolini by a recent law has decreed that in future all radio telegrams in Italy shall be called " marconigrams."

◆ ◆ ◆

Two new 250-watt relay stations have been installed at Carlstadt and Norrkoping (Sweden) ; they work on 229 metres. The power of the Malmo transmitter will shortly also be increased.

◆ ◆ ◆

The new Poste Parisien high-power transmitter at Molières, in the vicinity of Limours, has been recently carrying out tests on 329 metres. It is operated by the Compagnie Générale d'Energie éléctrique, of Paris, as a private concern.

◆ ◆ ◆

A powerful short-wave transmitter is in course of construction in Czecho-Slovakia for the purpose of effecting a regular direct exchange of entertainments between Prague and New York. When completed the station will also serve for the daily relay of the capital programmes.

◆ ◆ ◆

The Russian Ministry of Posts and Telegraphs (*Narkompotschtel*) is erecting a radio palace at Moscow to house the thirty-six studios necessary for the feeding of the thirteen broadcasting stations which the Soviet capital will possess when the Five-year Plan has been carried out.

◆ ◆ ◆

In view of the interference caused by the Moscow (Trades' Unions) and Warsaw stations, Sweden contemplates an increase in the power of the Motala transmitter to 100 kilowatts. Work on the necessary alterations has already started and it is hoped to complete them by the end of the summer.

◆ ◆ ◆

Every Sunday morning, at 6 a.m. G.M.T., Hamburg relays a musical concert from some transatlantic liner in port. Owing to its great popularity with German listeners, this broadcast is also taken by Königswusterhausen, Berlin, Breslau, Mühlacker, Frankfurt, Cologne, and their respective relay stations.

◆ ◆ ◆

Work on the 200-kilowatt Luxembourg (Grand Duchy) publicity broadcaster is nearing completion and tests may be expected towards the end of April. It will work on 217.4 metres. As musical transmissions are also contemplated, a large studio capable of accommodating some 700 people has been built.

◆ ◆ ◆

Radio Nimes (France) has ceased work for lack of financial support. A radio service for that region has been provided for in the Ferrié plan for the reorganisation of the French broadcasting system but, in view of the changes in the Cabinet, the inhabitants of that city fear that some considerable delay may occur.

◆ ◆ ◆

Poland appears to possess more radio pirates than any other European country, and owing to this circumstance the Polskie Radio is suffering from financial difficulties. To secure a larger income, the studios have resorted to microphone publicity and advertisements are broadcast at frequent intervals in the course of the programmes.

◆ ◆ ◆

In addition to its extended week-end programmes, Radio Normandie (Fécamp) now broadcasts dance music on most nights from midnight until 1 a.m. British dance bands are greatly appreciated in France and, failing their actual presence in the studio, gramophone records of their performances enjoy more popularity than those of their French confrères.

◆ ◆ ◆

On a recent occasion a concert broadcast in Paris was relayed through the French Colonial short-wave station to LR8, Radio Cine-Paris (Buenos Aires), which re-transmitted it on 260.9 metres (10 kilowatts). Steps are being taken by the French authorities to exchange programmes with this South American studio and to re-broadcast them in France through the same channel.

◆ ◆ ◆

German listeners in East Prussia and Silesia are requesting the Reichsfunk to increase the power of the Heilsberg broadcasting station as in some districts the inhabitants suffer from interference by Polish transmitters. The Heilsberg broadcaster, although only at present using 60 kilowatts, is so constructed that its power can be raised to 150 kilowatts and an increase to 100 kilowatts will shortly be carried out.

(*Continued on page* 356).

ON THE CREST OF THE WAVES

—Continued from page 354

Experiments have been recently undertaken at Riga (Latvia) with a 16-kilowatt transmitter working on 198.5 metres (1,510 kilocycles). Test transmissions are made on Mondays between 2 and 2.30 and between 8.30 to 9.30 p.m. G.M.T. During these periods the 525-metre station is silent. The power of the plant will be eventually increased to 30 kilowatt, with a view to inaugurating an alternative programme service.

◆ ◆ ◆

Parisian radio fans have lodged protests in regard to the power of the Eiffel Tower and Radio Paris broadcasts, which prevent in that city reception of foreign transmissions. Some 1,500 wireless listeners recently petitioned the French Ministry of Posts and Telegraphs with the request that on one weekday these stations should remain silent in order to allow owners of modest receivers to listen to entertainments from abroad.

◆ ◆ ◆

With a view to the establishment of an alternative programme, Budapest runs a second transmitter on 210 metres (1,429 kilocycles); its power is 3 kilowatts. For the present the broadcasts are restricted to two days a week, namely, from 1.45 to 2.15 p.m. on Sundays, and from 6 to 6.30 p.m. on Thursdays, but on most nights, for the benefit of listeners in the capital, Budapest (No. 2) relays the main studio programmes.

◆ ◆ ◆

The Waldorf-Astoria Hotel (New York) has equipped its 2,000 rooms with loud-speakers, from which, as desired, the guests may receive six different programmes. These are fed from a central panel connected to a number of receiving instruments and amplifiers. The hotel is linked up with three city transmitters, to which a relay can be made of any interesting events and re-broadcast for the benefit of the American listening public.

◆ ◆ ◆

In an attempt to beat Professor Piccard's altitude record, two Austrian engineers will shortly make an ascent in a balloon of their own construction. The aeronauts propose to equip it with transmitting apparatus, in order to broadcast details of their flight. Although at the time these notes are penned no date has been definitely fixed for the experiment, there is a possibility that the messages may be transmitted through the Vienna broadcasting station.

◆ ◆ ◆

On July 30 the Columbia Broadcasting Company of America will broadcast a running commentary on the arrival of the international competitors taking part in the Olympic Games, to be held this year at Los Angeles, Cal. The transmission will be relayed to all stations in the Columbia network, as well as to a number of short-wave stations. Arrangements have also been made by Germany to put out the broadcast through Königswusterhausen and other high-power transmitters.

◆ ◆ ◆

Broadcasts from San Sebastian (EAJ8) have been curtailed during the past few months. On Mondays, Wednesdays and Fridays a relay is carried out of the Madrid (EAJ7) programme from 8.15 p.m. until midnight; on other nights the local studio is on the air for short periods with its own entertainments. As the wavelength (453.2 metres; 662 kilocycles) is common to other European transmitters, San Sebastian can only be heard when its colleagues have signed off for the night.

◆ ◆ ◆

Although attempts were made by Radio Normandie (Fécamp) to use two separate wavelengths in the course of the week for its regular and sponsored programmes, the scheme has been abandoned and all transmissions are carried out (for the present!) on 219.9 metres, the channel formerly used by Radio Luxembourg. On Saturdays, for the benefit of British listeners, Fécamp is on the air with a continuous performance from midnight G.M.T. until 3 a.m. on the following Sunday morning.

◆ ◆ ◆

According to the Italian press there is a strong possibility of the establishment of a powerful broadcaster in Albania, as American radio engineers have been visiting suitable sites on the shores of the Adriatic. Although the country cannot afford to subsidise a radio service, the scheme could be supported by an income derived from microphone advertisements. These would be made of international interest by transmitting them in the Serbian, Greek, Italian, French, German, and Hungarian languages.

◆ ◆ ◆

Brussels possesses a new experimental station working on 283.6 metres. The broadcasts are made on weekdays between 11.45 a.m. and 1.15 p.m. and on Sundays from 10.30 a.m. until midday. A woman announcer gives out the following call: "Ici poste d'essai régional à faible puissance (at low power) de la Société Belge Radio-Electrique a Forest-les-Bruxelles." Items in the programmes—usually gramophone records—are announced in both French and Flemish. The power is about 800 watts in the aerial.

◆ ◆ ◆

Further development of the Spanish broadcasting system has been hampered by the lack of funds at the disposal of the programme organisers. Subsidies originally voted by the State and destined to the installation of new stations have been diverted by the Government to more urgent purposes; but Spanish listeners have been assured that a start will shortly be made on the construction of a 60-kilowatt transmitter in the neighbourhood of Madrid and a rumour is current to the effect that the State may take over all existing stations.

◆ ◆ ◆

In Denmark drastic steps are taken to deal with possessors of electrical plant causing interference with the reception of the radio programmes. As soon as the law was passed the authorities were flooded with complaints of all descriptions from listeners and in order to check the flow were compelled to exact a deposit of 10 kronen from any person who notified names and addresses of oscillators troublesome to their neighbours. The money is returned to the complainant when the claim has been justified. A recent census made by the authorities demonstrated that only 10 per cent. of the total number of licence holders now use crystal sets.

Henry Hall and his Boys

By Our B.B.C. Commissioner

NO broadcaster, perhaps, is less to be envied than Henry Hall, the director of the new B.B.C. Dance Orchestra. He follows a man who, apart from his natural gifts as a dance-band leader, has seized every available opportunity of popularising himself and his own dance orchestra.

At the early rehearsals of the new combination, it was felt that a lot of rough edges would need to be knocked off before this could be considered a worthy successor to Jack Payne and his B.B.C. Dance Orchestra.

Equal Footing

But in Henry Hall the B.B.C. has a man who, without any fuss or bother, showed the determination ultimately to place the B.B.C.'s new dance orchestra on an equal footing with the combination which it succeeded, at least, on a footing of equality according to the period in which one is considering them after their first broadcast in comparison with a similar number of appearances by Jack Payne and his B.B.C. Dance Orchestra before the microphone.

Mr. Hall and every member of the orchestra is engaged by the B.B.C. itself. Previously, the B.B.C. merely engaged its dance-band leader and he was responsible for the contracts with the players. The members of the new dance orchestra are drawn from various parts of the country.

Leader of Saxophones

F. Burton Gillis, the leader of the saxophone section, was born at Hastings. He is as amazing in his build (height, 6 ft. 7 in.; weight, 17 st.) as he is in his ability to juggle with the instruments of the saxophone family.

He plays soprano, alto, tenor, baritone, and bass with equal ease, in addition to having a legitimate musical training on the clarinet. His experience includes a long tour in South Africa. Until recently he was the leader of Henry Hall's Gleneagles Hotel Band.

E. Cromar is a Londoner who has an amazing aptitude for the mastery of instruments. He plays the alto saxophone, baritone saxophone, clarinet, violin, and trumpet. He is a great asset to the band by reason of his ability to adapt himself to any kind of musical combination, in order to provide the "colour" which will be a feature of the new B.B.C. Dance Orchestra.

F. Williams is another Londoner and plays the alto and baritone saxophones. He is also a good clarinet player and is one of the finds of the new dance orchestra.

J. Denahey, the tenor saxophone, hails from Londonderry. He has played with innumerable bands in the West-end of London, and his wide experience will be a great asset in his new appointment. Like the other members of the saxophone section, he also plays the clarinet.

Richard Matthews, the oboe player, was born in London. He is the baby of the band, both in age and size. Although he is young, he possesses an amazing purity of tone and displays a natural aptitude for the oboe, which is so rarely found among students to-day. His future is one of the greatest promise.

NEW DANCE-BAND LEADER

Henry Hall, the leader of the B.B.C.'s new dance orchestra. He follows Jack Payne in a difficult job

Cyril Stapleton and J. Hitchenor, both violinists, both born in Nottingham, are both young men drawn straight from college into the B.B.C. Dance Orchestra. Both have had a very fine training and Mr. Hall is confident that listeners will agree with his policy of taking the opportunity of developing talent in the special way required for broadcasting.

Musical Education

The ability displayed by these two musicians shows that the student who has been given a good musical education can adapt himself with much success from the performance of straight music to the rhythmic style.

L. F. Wilson, a Londoner, is the trumpet player, and he may be regarded as one of the finest, if not the finest, in the country. He has played with some of the best bands in the United States, as well as in Great Britain, and he comes from a family famed for their achievements on brass instruments.

W. Mulraney, trombone, hails from Liverpool. He is another member of the orchestra who is distinguished for his build as well as his ability. He has a remarkable technique on the trombone and his tone is particularly suited to the special needs of the microphone. His position is one of much importance in the new band, because the smallness of the brass section demands that each man should be a soloist.

Pianist from Manchester

J. Phillips, the pianist, was born in Manchester, and is an outstanding performer who has been brought down from the north to join the new dance orchestra. While the piano solos of the orchestra will not be characterised by "flowery" playing, they will be noteworthy for originality and style.

Indeed, it is no exaggeration to say that the pianist has a remarkably fine style which is entirely his own. He is a protégé of Mr. Henry Hall, who has a very high opinion of his

(*Continued on page* 360)

HENRY HALL—Continued from page 358

ability as a dance pianist.

Both George Dickinson (Liverpool), who plays the guitar, and T. Farrar (Manchester), who plays string bass, have had a great deal of broadcasting experience. Here, again, two musicians who have had a thorough musical education are brought to the microphone for the performance of dance music.

The drummer is Harry Robbins (Rochester, Kent), a brilliant performer on the xylophone and marimba, who is leaving Jack Hylton to join the new B.B.C. Dance Orchestra. He needs no introduction, for he is known to many thousands of people for the distinction of his past work.

Val Rosing, the vocalist, is another Londoner, and is already well known to listeners. He has had much experience of vaudeville broadcasting and gramophone recording. His perfect technique and English style have been a great factor in the success he has already achieved.

No effort is being spared to make the new B.B.C. Dance Orchestra a success, and special efforts will be put into the task and will, indeed, be needed in view of the standing of the dance orchestra that this new combination succeeds.

In one respect the B.B.C. is showing unusual tolerance. It is determined to give Henry Hall and his men a "square deal" in that it will accept adverse criticism, if any, with a large amount of reserve and with a feeling that the new combination deserves every encouragement until it has settled down to its work.

* * *

Another attempt to sling mud at the B.B.C. has taken place since the explanation published recently in "Wireless Magazine" of the reasons for a number of resignations from the Savoy Hill staff.

This time two or three resignations were announced simultaneously and it was insinuated that they coincided with the discovery of love scandals amongst the staff.

It is considered far more likely that the public prefers to read about broadcasting programmes rather than about the private affairs of the people who prepare them.

The personalities of artists admittedly hold considerable interest; but the employees of the B.B.C. should not, in the main, cut any ice with the public.

The rule of staff anonymity is enforced at Savoy Hill, but a little more latitude is allowed nowadays. Two or three years ago it was contrary to regulations for any official to have his name associated with interviews in the Press on programme features, a regulation which the Director-General himself rigidly observed.

Sir John's Modesty

But while Sir John Reith is still too modest to be interviewed—a modesty which is sometimes construed as aloofness and is a quality which those who really know the Director-General of the B.B.C. are well aware is due to a complete misunderstanding of the man—the staff itself seems to enjoy sharing some of the limelight with the artists whom they have engaged.

To this fact may be attributed a good deal of the interest taken among certain sections of the Press in their doings and members of the staff concerned have only themselves to blame if this interest extends beyond their official work.

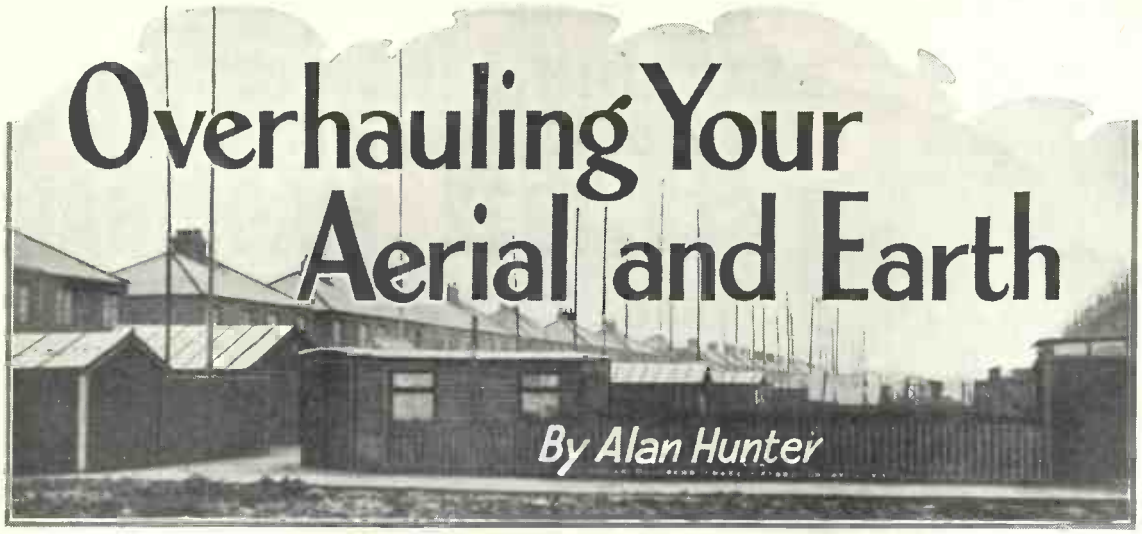
In former days, even the announcers obtained their share of publicity, their names being attached to every programme broadcast. The announcers have now gone to the other extreme and shrink from any mention of themselves in the Press.

The Press has had rather a free run of Savoy Hill, but matters will be tightened up on the removal to Broadcasting House.

Accosting the Staff

It is considered in high quarters that it was always a mistake for the Press officials to be situated at the top of the building, as it gave the opportunity for visitors on their way up to accost any member of the staff with whom at some time or other they may have had an official interview, and in this way complications sometimes ensued.

At Broadcasting House access to the private offices will be well nigh impossible without a definite appointment, and officials who have to deal with strangers, that is, with persons who are not definitely associated with broadcasting, will be installed near the main entrance.



Overhauling Your Aerial and Earth

By Alan Hunter

EVERY aerial and earth system needs a periodical overhaul. At least once a year you should see whether the aerial or the earth, or both, are causing inefficiency in reception. This advice applies especially to the smaller type of set, where there is very little high-frequency amplification before detection.

Summer Efficiency

All sets, whether they have high-frequency amplification or not, require greater aerial efficiency in the summer months now approaching. This is because during the light evenings reception of foreign stations is more difficult than in the winter.

Supposing you have an outdoor aerial, what is most likely to have deteriorated? Well, if the wire is bare copper you will find that the original bright surface has turned almost black. This blackened surface is copper oxide, formed by the chemical action of the atmosphere on the copper.

The outer shell of the aerial wire is no longer copper, which has a high conductivity, but copper oxide, which is a poor conductor.

The significance of this change in the nature of the surface of the aerial wire is best appreciated when you know that wireless waves travel over the surface of the wire and not through the centre. In the course of a year, therefore, a bare-copper aerial wire would appreciably increase its resistance to wireless waves and so the energy actually reaching the set will be decreased.

In general, the best type of wire to use is stranded enamelled wire. This is particularly advisable if you are a town-dweller, for then the atmosphere is more likely to cause oxidisation and corrosion.

Now about the earth. If this is some form of buried earth outside the house the chances are that during six months or a year the connection between the earth lead and the metallic earth spike, tube, or plate has been worn away. The same corroding effects are at work on the earth as on the aerial.

The connection to some earth tubes and plates is made rather haphazardly by twisting the earth lead round a terminal, and in course of time such a contact is bound to become inefficient owing to the oxidisation of the metal surfaces. The surest earth connection is a soldered wire.

The other important point to watch about earths is to keep the soil around the earth connection moist. The resistance of the earth greatly increases as the soil around it becomes dry. A high-resistance earth will cause poor signal strength and often such an earth will make the set unstable, particularly if the earth lead is rather long.

Causes of Inefficiency

Earthing switches and lightning arrestors are common causes of aerial inefficiency. After a time the contacts become corroded and a partial leakage of aerial current to earth takes place. It is a good plan to fit a weatherproof cover to any external aerial-switching devices. Otherwise attention every six months is essential if leakage is to be avoided.

While on the subject of leakage, keep your eye on the far end of the aerial, that is, on the pole or tree to which the aerial wire is hitched. Very often a loss of aerial efficiency is noticed in the spring time and early summer owing to the increase in foliage of nearby trees. This may screen the aerial from incoming signals in certain directions, and the leaves may act as a partial short-circuit as they spread over the end of the aerial wire or insulators.

While overhauling the aerial and earth, which simply boils down to a general clean-up of all the contacts, you might ask yourself whether the present height and length are most suitable for your set and reception requirements.

Signal Strength

The higher the aerial the greater the signal strength, but an aerial that is a very efficient collector of signals is also a good collector of atmospherics and electrical interference.

If you suffer much from local interference, try lowering the aerial. As the height is decreased, so is the signal strength, but not nearly to the same extent as aperiodic or untuned ether vibrations, such as atmospherics and certain noises set up by electrical machinery.

A modern set will bring in all worth-while foreign stations with quite a low aerial—say 15 to 20 ft. high.

For selective tuning the length of aerial should not exceed about 70 ft., unless you are a long way from the nearest station and are using a small set.

Remember that aerial length is measured from the remote point of suspension to the aerial terminal of the set and, therefore, includes the length of wire used for the down lead.

Plug in to Greenwich Time

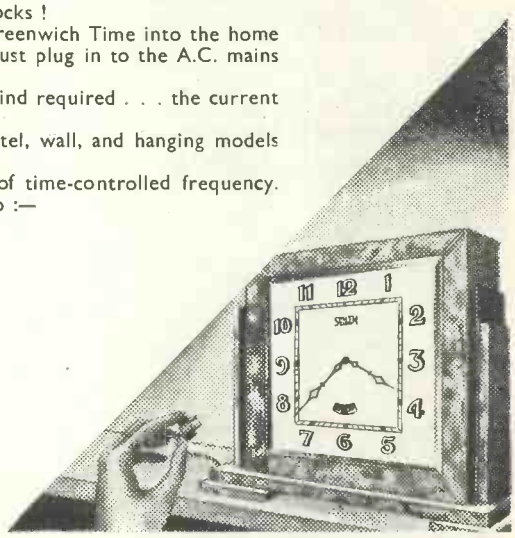
No more missed appointments; no more doubts or worries about the time with these new Smith's Synchronous Clocks!

Once right, they're *always* right, bringing Greenwich Time into the home all day long. No waiting for the time signal—just plug in to the A.C. mains—that's all.

No winding, regulating, or attention of any kind required . . . the current consumed costs but a few pence a year.

Many handsome designs are available in mantel, wall, and hanging models and costing from only 35s.

Available for use wherever A.C. mains are of time-controlled frequency. Write to-day for free illustrated brochure to :—



Smith's synchronous electric clocks

100% BRITISH

Controlling Synchronous Electric Clocks, Ltd.

179/185, Great Portland Street, London, W.1

Telephone—Welbeck 7916

Scientific

PILOT AUTHOR'S KITS

Exact to Specification

Parts supplied for all "W.M." Sets either as complete Kits or separately. Send details of your requirements for quotation by return of post.

CASH C.O.D. H.P.

IMMEDIATE DELIVERY

1932 SUPER 60

(Battery Model)

KIT A Author's Kit, less valves and cabinet. **£7-16-10**

Or 12 monthly payments of 14/5

Valves as specified, £4/7/6. Specified Cabinet, £1/16/-

IDEAL HOME SUPER

These are the actual parts as specified and actually used by the Author

	£	s.	d.
1 16 in. by 8 in. Ebonite Panel		4	7
1 Baseboard		1	6
1 Wearite Super-het H.F. Choke, type HFS		6	6
1 Lewcos Band-pass Filter, type BPF coil		12	0
1 Lewcos Oscillator type TOS Coil.		8	6
1 Lewcos Super-het Intermediate, with pigtail type IFTP coil		10	6
1 Lewcos Super-het Intermediate, without pigtail type IFT		10	6
1 Dubilier .0002-mfd., type 670, Fixed Condenser		1	0
1 Dubilier .001-mfd., type 670, Fixed Condenser		1	3
1 Dubilier .005-mfd., type 670, Fixed Condenser		1	6
1 Dubilier .01-mfd. non-inductive Fixed Condenser		2	0
2 Formo 1-mfd. Fixed Condensers		5	0
1 Formo 2-mfd. Fixed Condenser		3	3
1 J.B. .0005-mfd. Two-gang, type R2, with disc drive	1	1	0
1 J.B. .0005-mfd., type R1, with disc drive		12	6
2 Readi-Rad Grid-leak Holders		1	0
7 Lotus Four-pin Rigid Valve Holders		5	10
8 Belling-Lee Wander Plugs, marked		1	4
2 Belling-Lee Spade Terminals, marked			4
2 Clix Wood Plugs and Sockets for pick-up			8
1 Magnum 2,000-ohm Spaghetti Resistance		1	0
1 Magnum 20,000-ohm Spaghetti Resistance		1	6
1 Magnum 40,000-ohm Spaghetti Resistance		1	6
2 Magnum 50,000-ohm Spaghetti Resistances		3	0
1 Magnum 1,000-ohm Spaghetti Resistance			9
1 Dubilier .5-megohm Fixed Resistance		1	9
1 Dubilier 2-megohm Fixed Resistance		1	9
1 Wearite 15-ohm Rheostat Variable Resistance, type Q4		1	6
Tinned Copper Connecting Wire, Oiled Cotton Sleeving, Rubber-covered flex		2	0
1 Bulgin On-off type S.39 Switch		1	3
1 Lewcos L.F. Transformer, type LFT6		10	0

KIT A Author's Kit, less valves, cabinet, and speaker. CASH OR C.O.D. **£6.16.9**

Or 12 monthly payments of 12/6

KIT B As Kit "A" but with valves. CASH OR C.O.D. **£10-4-3**

Or 12 monthly payments of 18/9

KIT C Author's Kit complete with valves, cabinet, and speaker. CASH OR C.O.D. **£12-9-3**

Or 12 monthly payments of 23/-

Any parts supplied separately. Quotations also given for any "W.M." set. Orders value over 10/- carriage paid. C.O.D. charges paid.

KIT BITS

Selected C.O.D. lines. You pay the postman—we pay post charges

	s.	d.
1 Peto-Scott Consolette Cabinet	1 7	6
1 Set of Lewcos Super-het Coils, comprising types BPF, TOS, IFTP, and IFT	2 1	6
1 J.B. Two-gang .0005 Condenser, type R2, and J.B. .0005 Condenser, type R1, with disc drives	1 13	6
1 Ormond Loud-speaker Unit and small Chassis	17	6
1 Set of Valves	3 7	6

PETO-SCOTT

ESTABLISHED 1919. **Co. Ltd.**

77, CITY ROAD, LONDON, E.C.1: *Telephone: Clerkenwell 9406-7-8*
62, HIGH HOLBORN, LONDON, W.C.1. *Telephone: Chancery 8266*

Messrs. PETO-SCOTT Co. LTD. 77 CITY RD., LONDON, E.C.1

Please send CASH / C.O.D. / H.P.

for which I enclose ..... *d. Cash/H.P. Deposit*

NAME .....

ADDRESS .....

..... W.M. 4/32

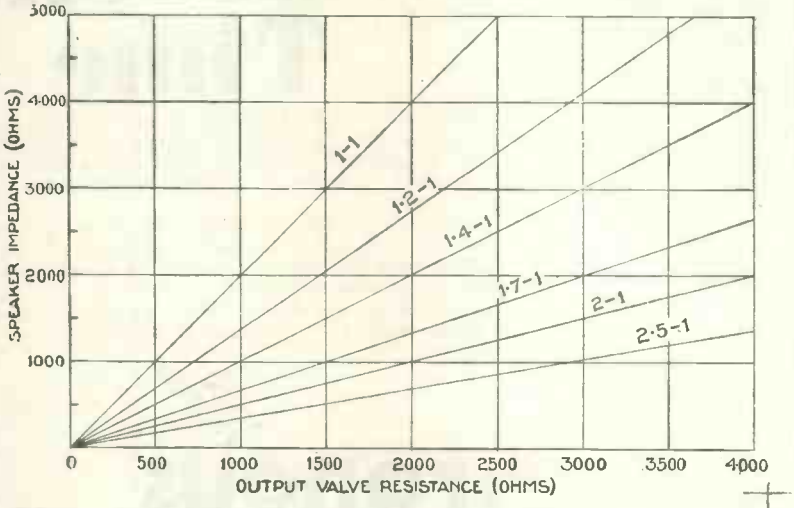
Advertisers like to know whence the business comes—please mention "W.M."

Design Data Sheets

By J. H. Reyner, B. Sc., A.M.I.E.E.

" W.M." Design Data — *No. 45*

OUTPUT TRANSFORMER RATIO



THE ratio of an output transformer required to match the loud-speaker to the valve is determined by a simple calculation.

Firstly, find the optimum load for the particular valve to give maximum undistorted output. Divide this by the impedance of the loud-speaker, and take the square root of the result. This is the best ratio of output transformer, and the nearest standard ratio to this figure should be adopted.

For most power valves the optimum load is approximately twice the valve resistance. The curve herewith is worked out on this assumption and will be of assistance in finding the last output arrangement for any particular set.

" W.M." Design Data — *No. 46*

NON-RADIATING OSCILLATOR

IT is customary in a super-heterodyne circuit to introduce the local oscillation into the grid circuit of the detector valve. This usually restricts the use of the system to a frame aerial as, if an ordinary aerial were connected to the circuit, re-radiation would be caused by the presence of the continuous oscillation in the aerial.

The trouble is not always serious because the aerial circuit is tuned to a different frequency to that of the oscillation. If the aerial circuit is sharply tuned, therefore, the radiation may not be serious, but this is not usually the case and quite a small oscillation in the aerial circuit is capable of causing appreciable interference for some distance around.

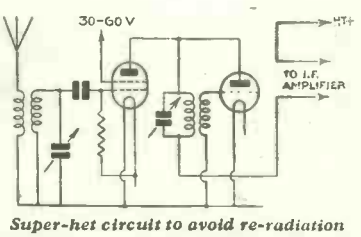
The trouble is even more aggravated on short waves, where the difference in frequency between the local oscillation and the incoming signal is relatively much smaller.

The difficulty may be overcome by using a screen-grid high-frequency stage prior to the first detector, or even by using a band-pass tuner in the aerial circuit, since this tends to restrict the response of the aerial circuit to the oscillator frequency.

The circuit shown with this sheet, however, enables re-radiation to be reduced to a minimum with only a simple arrangement.

The oscillation is not introduced into the grid circuit, but into the anode circuit. A somewhat stronger oscillation is necessary in order to maintain the same signal strength, but otherwise the arrangement is quite satisfactory. It will be seen that the high-tension supply to the first detector valve is obtained through the oscillating circuit, so that the anode voltage varies at a high frequency, and this produces the necessary mixing of the two oscillations.

The first detector must, of course, be a screen-grid valve, so that there shall be no transmission of energy through the valve capacity, and the oscillator circuit should be screened to avoid any direct induction on to the aerial coil.



Super-het circuit to avoid re-radiation

BUILD YOUR NEXT SET FROM A

Each blueprint shows the position of all components and every wire, and makes construction a simple matter. Copies of "Wireless Magazine" and of "Amateur Wireless" containing descriptions of most of these sets can be obtained at 1s. 3d. and 4d., respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

CRYSTAL SETS

6d. each, post free

1931 Crystal Set	AW308

ONE-VALVE SETS

1s. each, post free

Short-wave One-valver (6d.)	AW327
"B.B.C." One	AW280
Easy-to-Build One	AW304

TWO-VALVE SETS

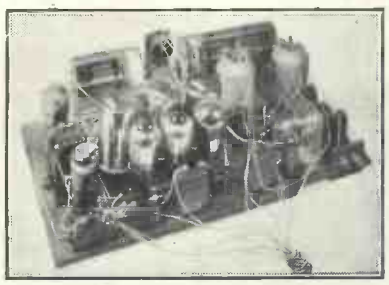
All these 1s. each, post free

Brookman's Two (D, Trans)	WM168

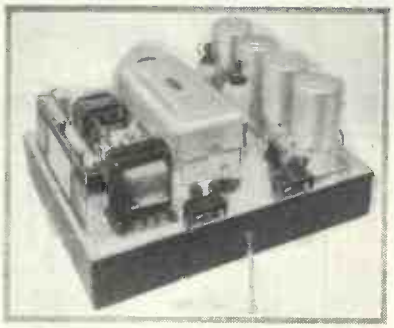
FULL DETAILS IN THIS ISSUE

This is the Ideal Home Super which received over forty stations during a recent test

Five-point Two (D, Trans)	WM220
Aladdin Two (D, Trans)	WM231
Ever-tuned Regional Two (D, Trans)	WM241
Station-finder Two (D, Trans)	WM243
Music-lover's Two (D, Trans)	WM260
New Economy Two (D, Trans)	WM265
★Family Two (D, Trans)	WM278
Hyper-selective Two (D, Pentode)	AW198
British Broadcast Two (D, Trans)	AW215
Easy-tune Two (D, Trans)	AW226
Wavelets Two (D, Trans)	AW229
No Battery Mains (A.C.) Two (D, Trans)	AW230
No Battery Gramo-radio 2 (D, Trans)	AW238
1930 Talisman 2 (D, Trans)	AW239
Easy Tune Short-wave 2 (D, Trans)	AW242
Searcher Two (D, Trans)	AW245
Arrow Two (D, Trans)	AW249



ONE OF THE LATEST "SUPERS"
The Super Senior was W. James' star set for the last Radio Exhibition at Olympia



THE LAST WORD IN FOURS

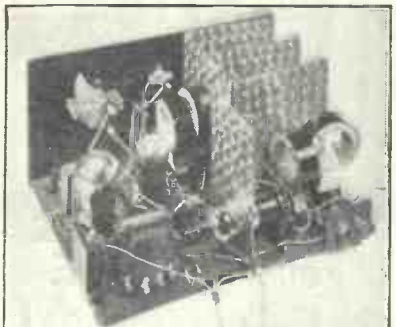
Every modern refinement is incorporated in the Quadradyne. An A.C. version is published in this issue

Forty-five Shilling Two (D, Trans)	AW250
Searcher Short-wave 2 (D, Trans)	AW259
Challenge Two (D, Trans)	AW261
Loftin-White 2 (A.C. Set)	AW263
Everybody's All-in 2 (D, Trans)	AW273
Twenty-shilling Two (D, Trans)	AW274
B.B.C. Selective Two (D, Trans)	AW292
The Room-to-Room 2 (D, Trans)	AW298
Big-volume Two (D, Pentode)	AW309
Two Star 2 (D, Pen)	AW315
The 25/- Two (D, Trans)	AW330
Ten Station Two (D, Trans)	AW336

THREE-VALVE SETS

All these 1s. each, post free

Brookman's Three (SG, D, Trans)	WM161
Celerity Three (SG, D, Trans)	WM173
Music Marshal (D, 2 Trans)	WM190



BAND-PASS ACTION WITH PLUG-IN COILS

The Band-pass Inceptordyne is a three-valve screen-grid set using plug-in coils

¶ **Do you realise that, except for one or two in a range of more than 275, all "Wireless Magazine" blueprints are full-scale drawings? They are not small-scale drawings which, as you know, are useless as patterns and templates.**

¶ **Do you appreciate the fact that they save much time and trouble in construction, as they can be used as panel and baseboard templates for marking the centres for drilling holes and laying out components?**

Gramo-radio D.C. Three (SG, D, Trans)	WM196
Concert Three (D, 2 Trans)	WM199
De-luxe Three (D, RC, Trans)	WM209
Five-point Three (SG, D, Trans)	WM212
Falcon Three (AC Set)	WM217
New Brookman's Three (SG, D, Trans)	WM218
Five-point Short-waver (D, 2 Trans)	WM223
Regional Three (SG, D, Trans)	WM236
Band-pass Inceptordyne (SG, D, Pen.)	WM244
Ether Marshal (SG, D, Trans)	WM247
Five-Advantage Three (D, RC, Trans)	WM257
Everybody's Radiogram (SG, D, Trans)	WM258
Meridian Short-waver (D, RC, Trans)	WM255
Double Band-pass Three (SG, D, Trans)	WM259
Everybody's Radiogram (with Automatic Grid Bias)	WM262
New Economy Three (SG, D, Trans)	WM263
New Plug-in-Coil Three (D, 2 Trans)	WM270
Transportable Three (SG, D, Trans)	WM271
Square-peak Three (SG, D, Trans)	AW293
Universal Short-wave Three (SG, D, Trans)	AW301
Olympian Three (SG, D, Trans)	AW306
Tonality Three (D, RC, Trans)	AW321
35/- Three-valver (D, 2RC)	AW323
Baby Three (D, RC, Trans)	AW324
1932 Ether Searcher (SG, D, Trans)	AW325
World Wide Short-wave Three (D, RC, Trans)	AW332

Send, preferably, a postal order (stamps over sixpence in value unacceptable) to—

New Favourite Three (D, RC, Trans)	AW334
Home Lover's All-electric Three (SG, D, Trans)	AW335
P.W.H. Mascot (D, RC, Trans)	AW337

FOUR-VALVE SETS

All these 1s. 6d. each, post free

Five-point Four (SG, D, RC, Trans)	WM216
Brookman's Three-Plus-One (SG, D, RC, Trans)	WM233
Ether Rover (SG, D, RC, Trans)	WM266
Quadradyne (2SG, D, Trans)	WM273
Double Band-pass Four (SG, D, RC, Trans)	WM274
Economy Radio Gramophone (SG, D, R.C. Trans)	WM276
★A.C. Quadradyne (2 SG, D, Pen)	WM279
The Orchestra Four (D, RC, Push-pull)	AW167
All-Europe Four (2HF, D, Trans)	AW173
Stability Four (HF, D, RC, Trans)	AW182
£3 3s. Four (SG, D, RC, Trans)	AW303
£3 3s. Four (Improved Model)	AW303A
Everybody's Radiogramophone	AW310

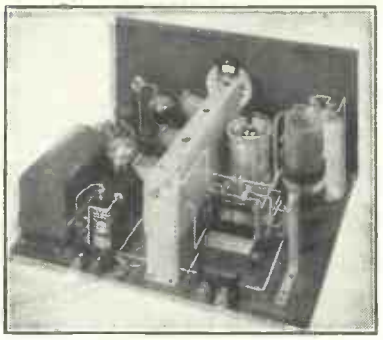
A "W.M." BLUEPRINT AVOIDS

"W.M." *FULL-SIZE* BLUEPRINT

¶ **Further than this, do you know that all the connecting wires are numbered separately, so that they can be assembled easily and automatically?**

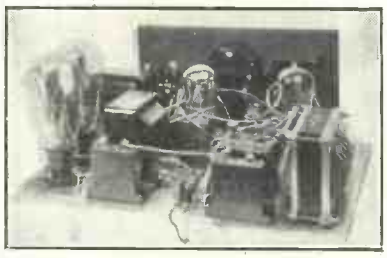
¶ **Remember also that a blueprint of any set constructionally described in "Wireless Magazine" can be obtained for half price during the currency of the issue by using the coupon to be found on the last page.**

¶ **"Wireless Magazine" and "Amateur Wireless" are the only papers that can supply *full-size* blueprints of every set described.**



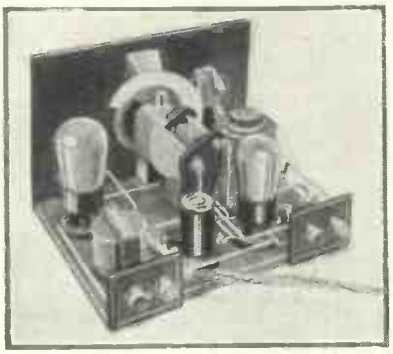
A FINE BAND-PASS SET

One of the most popular "W.M." band-pass sets yet described—the Ether Marshal



FOR THE BEST QUALITY

The D.C. Quality Amplifier takes its anode-current supply from D.C. electric-light mains



A SET FOR THE FAMILY

A cheap and efficient two-valver described in this issue. It can be operated by any novice without difficulty

A blueprint of any one set described in the current issue of "Wireless Magazine" can be obtained for half price up to the date indicated on the coupon (which is to be found on the last page) if this is sent when application is made. These blueprints are marked with an asterisk (★) in this list and are printed in bold type. An extension of time is made in the case of overseas readers.

Four-star Four (SG, D, RC, Trans) .. AW318
The 50/- Four (SG, D, RC, Trans) .. AW331

FIVE-VALVE SETS

All these 1s. 6d. each, post free

Overseas Five (3SG, D, Trans) .. WM191
Regional D.C.5 (SG, D, LF, Push-pull) WM252
★**Ideal Home Super (Super-het)** .. **WM280**
James Quality Five (2SG, D, RC, Trans) AW227
Britain's Super (Super-het) AW311
A.C. Britain's Super (Super-het) .. AW322
Mains section (1/-) .. AW322a
James Short-wave Super-het AW328

SIX-VALVE SETS

All these 1s. 6d. each, post free

Super 60 (Super-het) WM229
A.C. Super 60 (Super-het Radiogram) .. WM239
A.C. Super 60 (Super-het Table Model) WM245
Super 60 (with Wearite Base) WM249
Super 60 (with Lewcos Base) WM251
1932 Super 60 (Super-het) WM269
1932 A.C. Super 60 (Super-het) .. WM272

SEVEN-VALVE SET

1s. 6d., post free

Super Senior (Super-het) WM256

WIRELESS MAGAZINE,
Blueprint Dept.,
58/61 Fetter Lane,
LONDON, E.C.4

PORTABLE SETS

Pedlar Portable (D, 2 Trans) .. WM197 1/-
Super 60 Portable (Super-het) .. WM238 1/6
Home and Garden Three (D, RC, Trans) WM246 1/-
Music Leader (SG, D, RC, Trans) with copy "A.W." AW203 1/-
Merry-maker Portable (D, 2 Trans) AW228 1/-
Sunshine Three (SG, HF, SG, D, Trans) AW235 1/-

AMPLIFIERS

All these 1s. each, post free

Radio-record Amplifier (DC Mains) .. WM183
Selecto Amplifier (HF Unit) WM210
D.C. Fader WM242
Quality Amplifier (D.C.) 1s. 6d. .. WM264
A-P-A (Public Address) WM275
★**Economy Gramophone Amplifier** **WM277**

A.C. Push-pull Amplifier AW291
Add-on H.F. Screened-grid Unit .. AW296
Universal Push-pull Amplifier AW300
"A.W." Record Player (LF, Push-pull) AW319

MISCELLANEOUS

"W.M." Standard A.C. Unit .. WM214 1/
"W.M." Standard D.C. Unit .. WM215 1/-
Loud-speaker Tone Control .. WM234 -/6
"W.M." Linen-diaphragm Loud-speaker WM235 1/-
Two-minute Adaptor for Short Super 60) WM248 1/-
Simple Neon Oscillator WM251 1/-
Plug-in Adaptor WM267 1/-
Super-het Adaptor WM268 1/-
James H.T. and L.T. Charging Unit AW232 1/-

Simple Battery Eliminator for A.C. Mains AW236 1/-
Choke Output Unit AW240 1/-
Simple Tester Unit .. .. .. AW246 -/6
"A.W." Improved Linen-diaphragm Speaker AW248 1/-
Handy L.T. and G.B. Unit for A.C. Mains AW254 1/-
Ohmic Coupled DX Unit .. AW255 1/-
Simple Gramophone Amplifier .. AW257 1/-
Novel Linen Diaphragm Speaker .. AW260 1/-
H.T. Unit for A.C. Mains .. AW262 1/-
Gramophone Tone Control .. AW264 1/-
H.T. Unit and Trickle Charger for D.C. Mains AW272 1/-
2-Watt A.C. Amplifier AW283 1/-
Booster Speaker .. .. .. AW286 -/6
"A.W." Tone Changer .. .. AW288 -/6
"A.W." Selectivity Unit .. .. AW290 6d.
B.B.C. Official Selectivity Unit .. AW294 6d
A.C. Trickle Charger AW305 1/-
Amateur's Linen Speaker .. AW307 1/-

A THREE-VALVE TRANSPORTABLE

The Home and Garden Three is just the thing for the coming summer. It is quite cheap to build

D.C. H.T. Unit AW312 1/-
Output Unit for Pentode Sets .. AW316 1/-
"A.W." Short-wave Adaptor .. AW317 1/-
Short-wave Plug-in Adaptor .. AW326 -/6
Super-het Short-wave Adaptor .. AW329 -/6

ALL RISK OF MISTAKES

BLUEPRINT COUPON

Valid only until April 30, 1932 (or until May 31, 1932 for overseas readers)

FOR ONE BLUEPRINT ONLY

If you want a full-size blueprint for any ONE *of the sets constructionally described in this issue for half price, cut out the above coupon and send it, together with a postal order, to Blueprint Department, WIRELESS MAGAZINE, 58–61 Fetter Lane, London, E.C.4.*

This coupon is valid for a blueprint of any ONE *only of the following sets at the prices indicated :—*

ECONOMY GRAMOPHONE AMPLIFIER (page 317), No. WM277, price 6d., post free.

FAMILY TWO (page 308), No. WM278, price 6d.; post free.

A.C. QUADRADYNE (page 331), No. WM279, price 9d., post free.

IDEAL HOME SUPER (Supplement after page 288), No. WM280, price 9d., post free.

INFORMATION COUPON

Valid only until April 30, 1932 (or until May 31, 1932 or overseas readers)

If you want to ask any questions cut out the above coupon and send it, together with a postal order for 1s. and stamped-addressed envelope, to the Information Bureau, WIRELESS MAGAZINE, 58–61 Fetter Lane, London, E.C.4.

Note that not more than two questions may be asked at a time and that queries should be written on one side of the paper only.

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

THE Varley Square Peak four-valver, a note about which appeared on page 168 of the March issue, incorporate its own moving-coil loud-speaker. The price of the Varley three-valve mains set for A.C. or D.C. mains has been reduced from 24 guineas to 18 guineas.

◆ ◆ ◆

Another important price reduction is in the price of the Marconiphone Super Power Two for A.C. or D.C. mains (also noted on page 168 of the March issue). This is now only 8 guineas instead of £11 10s.

◆ ◆ ◆

In the list of parts for the Double Band-pass Four (page 176 of the March issue) the price of the two British General band-pass tuning coils should read £1 9s.

◆ ◆ ◆

The Whiteley Electrical Radio Co., Ltd., have introduced a new permanent-magnet moving-coil loud-speaker, based on their PM3 model, which sells at £1 15s. or 2 guineas with output transformer. The type number is PM4.

INDEX TO ADVERTISERS

Printed by THE SUN ENGRAVING CO., LTD., London and Watford: Published by BERNARD JONES PUBLICATIONS, LTD., 58/61 Fetter Lane, London, E.C.4. Sole Agents for Africa: CENTRAL NEWS AGENCY LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. April, 1932