Editor:
BERNARD E. JONES

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

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The Best Shillingsworth in Radio

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Research Consultant:
W. JAMES

Assistant Editor:
D. SISSON RELPH

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The Editor's Chat

THE Multi-mag Three, Paul D. Tyers' three-valver described last month, revolutionised accepted ideas of the humble "detector and two low-frequency" combination. The new coil embodied in this set allows reaction being used to the full, and any ill effects which might be so caused are obviated by the use of a special low-frequency amplifier. The Multi-mag Three has attracted considerable attention—as well it ought to—and in this issue we follow up last month's article with some general comments which will interest all readers whether they build the set or not.

Technically, and from the generally informative point of view, we have many features in this issue that are worth the reader's while. I am including this month an up-to-date edition of the Super 60 Portable which earned such outstanding success last year. Everybody's Portable is particularly neat in appearance, and the results are really first rate.

Another set, the Screen-grid Two, has its own note of novelty. It uses the screen-grid valve as a detector. My technical staff has overcome certain difficulties that were in the way of such an obvious development. The set is distinctly good, as you will gather from the test report accompanying the article.

We have an additional mains set this month—our Ideal A.C. Home Super—which we offer as the very best A.C. super-het yet described in the pages of Wireless Magazine, *which is saying something. It is on the rather expensive side and is offered to a section of readers which has asked for a mains super-het receiver complete with gramophone.*

I have visited the completed Broadcasting House since last I wrote an editorial word. I wish that every reader could have a similar experience, in itself a privilege and a treat. Everything about the building is impressive and I am convinced that the provision of such a remarkably fine home, an unsurpassed equipment, and a system and organisation of which the B.B.C. is justly proud must be reflected in better broadcasting.

The Assistant Editor contributes an article giving readers an idea of the arrangement of the new building.

Congratulations to Vice-Admiral C. D. Carpendale (second-in-command to Sir John Reith) whose new Knighthood is announced as I go to press.

Everybody is talking about the short waves. Alan Hunter explains how you can get down to them without altering your set, and you should certainly see what you can do in this direction inasmuch as many short-wave possibilities and developments are likely in the near future.

Percy Harris's "Radio Advertising"—an honest and independent discussion of a thorny subject, in which he draws from his considerable experience in the U.S.A.—should be read in conjunction with another article "Must We Have Licences?"

I find for myself plenty of amusement in Percy Harris's article. He makes a point that has been obvious to a great many people for a long while, namely, that whilst the B.B.C. appears to be set against advertising by radio, it is entirely other people's *advertising it objects to.*

The B.B.C. makes a very considerable income from its publications, and only naturally it systematically uses the broadcast to advertise its wares. It might—and probably would—put up the argument that if it were not for this side income to which its radio advertising so heavily contributes, it would have to press for an increase in the licence fee. That may be so, but the fact remains that the B.B.C. professes to ban radio advertising while as a matter of fact it reaps a substantial but indirect revenue from it.

The article "Must We Have Licences?" shows how other countries compare with our own in the matter of licences and licence fees.

I am hoping you will find this issue as interesting as it is varied, and as bright as it is informative, and in any case, if you have any criticisms to offer, I shall be delighted to hear from you. *B. E. J.*

FOR THE CONSTRUCTOR

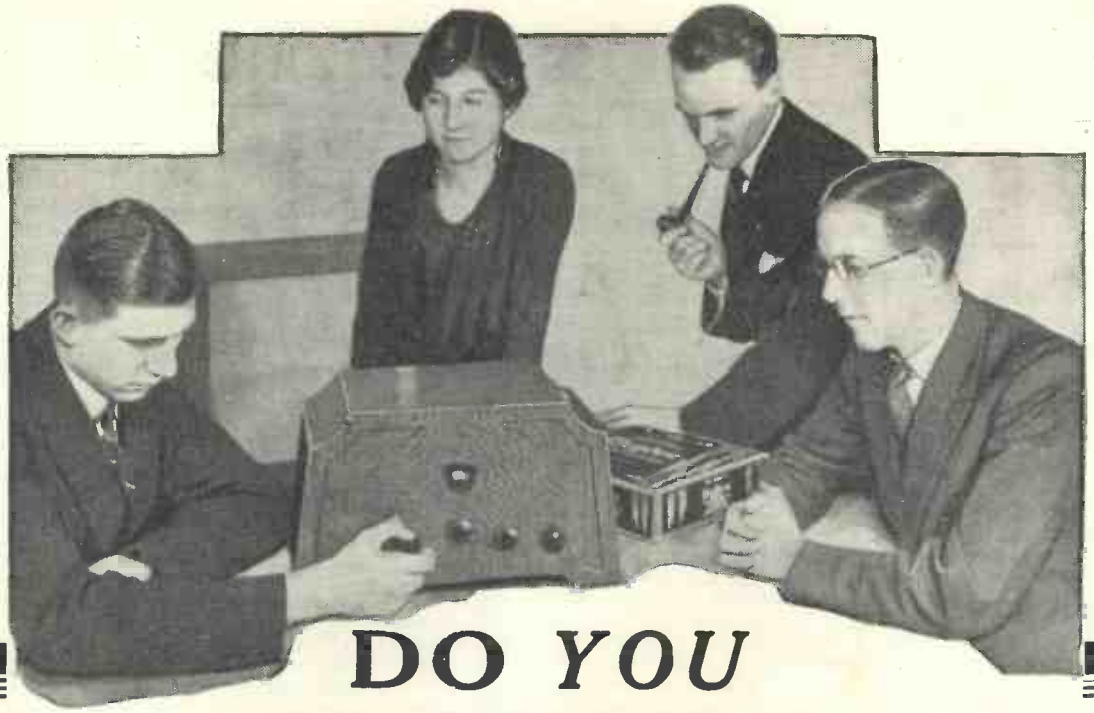
GRAMO-RADIO SECTION

TECHNICAL FEATURES

Contents

GENERAL ARTICLES

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



DO *YOU* REALLY UNDERSTAND HOW YOUR SET WORKS?

Add 50 per cent. to the enjoyment of radio by having a clear understanding of how your set works.

To have a fundamental knowledge of wireless means that should any trouble develop, or improvements or additions be required, you can do them yourself without having to resort to trouble and expense of professional assistance.

AMATEUR WIRELESS will help you to obtain this knowledge for the reason that all technical matters, illustrations and diagrams are explained in simple, everyday language, to be understood by everybody.

In addition, details of many new and original receivers are published for you to build, and exclusive features contributed by the best known names in the industry, combine to make AMATEUR WIRELESS Britain's Leading Radio Weekly.

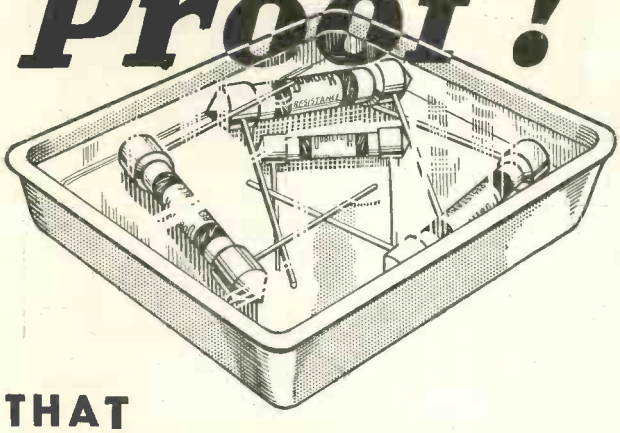
Read "Amateur Wireless" weekly and be up to date in radio.

AMATEUR WIRELESS

ON SALE EVERY THURSDAY, PRICE 3d

There is news in the "Wireless Magazine" advertisements

Proof!



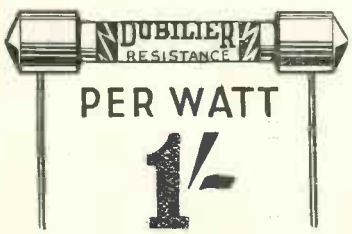
THAT

MOISTURE CANNOT HARM THEM!

Don't run risks of ruining the performance of your Receiver by using ordinary resistances which will set up crackling noises at the faintest suggestion of the presence of moisture . . . use Dubilier Metallized Resistances which cannot be harmed by moisture. Look at the test carried out above . . . that's proof! The Resistances functioned perfectly after having been completely immersed.

Dubilier Metallized Resistances are manufactured under a patent process and are worthy of that great reputation for reliability which goes with all products bearing the name Dubilier.

Whatever your Resistance requirements—ask for Dubilier.



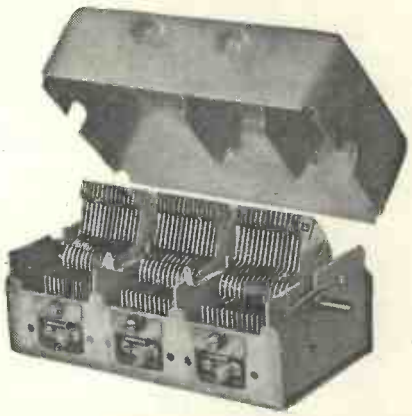
1 watt 1/-, 2 watt 2/-, 3 watt 3/-.

D.8.

DUBILIER Metallized RESISTANCES

DUBILIER CONDENSER CO. (1925) LTD.
Ducon Works, Victoria Road, North Acton, W.3

TWO SUPERLATIVES!



EASYTUNE 60 RECEIVER—RADIOGRAM

British Radiophone Ganged Condensers were specified for both these amazing receivers which promise to be the best sellers for 1932.

By virtue of their sound and accurate construction, British Radiophone Ganged Condensers have revolutionised selectivity. All those stations marked with a query on your chart are now established—out of reach no longer—British Radiophone Ganged Condensers bring them in and separate them with clean-cut clarity.

The Lewcos Coils specified for the "Easytune 60" have been specially produced to match the British Radiophone Condensers in this receiver.

For the "EASYTUNE 60" Receiver and Radiogram BRITISH RADIOPHONE 3-gang Super-heterodyne CONDENSER type 424 ... ... Price 27/-

Dustproof Metal Cover .. Price 3/-

Escutcheon and Disc Drive Assembly Price 5/-

RADIOPHONE GANGED CONDENSERS

THE BRITISH RADIOPHONE LTD., Aldwych House, Aldwych, W.C.2

VALVES TO USE IN YOUR SET

Characteristics of All the Most Important British Types

2-volt Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Filament Current	Mutua. Conductanc.	Anode Curren at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
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	.9	1.5
Osram ..	H210	50,000	35	.1	0.7	1.0	—	—
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
Six-Sixty	210HF	25,000	19	.1	.75	1.0	—	1.5
Osram ..	HL210	23,000	20	.1	.87	1.5	—	1.5
Marconi	HL210	23,000	20	.1	.87	1.5	—	1.5
Mullard..	PM1HF	22,500	18	.1	.8	1.0	1.5	3.0
Cossor ..	210HL	22,000	24	.1	1.1	1.75	1.5	3.0
Lissen ..	HL2	22,000	35	.1	1.6	3.0	1.0	1.5
Mazda ..	HL2	21,000	31	.1	1.5	—	—	—
Lissen ..	HL210	20,000	20	.1	1.0	2.2	1.5	4.5
Mullard..	PM1HL	20,000	28	.1	1.4	1.2	1.5	3.0
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
Cossor ..	210HF	15,800	24	.1	1.5	2.25	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
Osram ..	L210	12,000	11	.1	.92	2.0	3.0	6.0
Marconi	L210	12,000	11	.1	.92	2.0	3.0	6.0
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
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
Osram ..	P215	5,000	7	.15	1.4	6.0	7.5	12.0
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	9	.2	2.25	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
Marconi	P240	2,500	4	.4	1.6	12.0	15.0	24.0
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
Lissen ..	P220A	1,700	6.0	.2	3.5	12.0	9.0	15.0
Lissen ..	PX240	1,500	4.5	.4	3.0	14.0	12.5	22.5
Cossor ..	230XP	1,500	4.5	.3	3.0	15.0	10.5	18.0
Lissen ..	P240A	1,000	5.0	.4	5.0	20.0	15.0	20.0

2-volt Double-grid Valves

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
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	—	—	—
Mullard..	PM1DG	—	—	.1	.8	—	—	—
Six-Sixty	210DG	—	—	.1	.8	—	—	—

2-volt Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
Lissen ..	SG215	900,000	1,000	.15	1.1	—	—	1.5
Mazda ..	215SG	400,000	450	.15	1.1	—	—	—
Cossor ..	215SG	300,000	330	.15	1.1	1.25	.9	.9
Cossor ..	220SG	200,000	320	.2	1.6	1.5	.9	.9
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	.9	1.5
Osram ..	S21	200,000	220	.1	1.1	3.0	—	—
Six-Sixty	215SG	190,000	200	.15	1.05	2.0	—	—
Mullard..	PM12	180,000	200	.15	1.1	—	—	—
Mazda ..	S215A	—	800	.15	1.1	—	—	—

2-volt Variable-mu Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
Lissen ..	SG2V	750,000	—	.15	1.6	—	—	—
Cossor ..	220VSG	110,000	—	.2	1.6	—	—	—

2-volt Pentode Valves

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
Lissen ..	PT225	71,000	100	.25	1.4	7.0	3.0	6.0
Six-Sixty	230PP	64,000	80	.3	1.25	10.0	6.0	12.0
Marconi	PT240	55,000	90	.4	1.65	9.0	6.0	9.0
Lissen ..	PT240	28,000	64	.4	2.3	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
Cossor ..	230HPT	—	—	.3	1.8	6.5	7.5	7.5
Marconi	PT2	—	—	.2	2.5	5.0	3.0	4.5
Mazda ..	220Pen.	—	—	.2	2.5	—	—	—
Mazda ..	220A Pen.	—	—	—	2.5	—	—	—
Mazda ..	Pen.230	—	—	.3	1.5	—	—	—
Mullard..	PM22	—	—	.3	1.3	12.0	6.0	10.0
Osram ..	PT2	—	—	.2	2.5	5.0	3.0	4.5

4-volt Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
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
Lissen ..	HLD410	21,000	25	.1	1.2	2.5	1.5	3.0
Marconi	HL410	20,800	25	.1	1.2	1.25	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
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
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	3.0	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
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
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
Marconi	P425	2,300	4.5	.25	1.95	14.0	9.0	16.5
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
Mazda ..	P425	1,950	3.5	.25	1.8	26.0	14.0	26.0
Lissen ..	P425	1,500	4.5	.25	3.0	28.0	12.0	20.0
Cossor ..	415XP	1,500	4.5	.15	3.0	15.0	9.0	18.0
Cossor ..	4XP	1,200	4.8	.6	4.0	18.0	12.0	24.0 (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

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
Lissen ..	SG410	635,000	700	.1	1.1	—	—	—
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	—	—

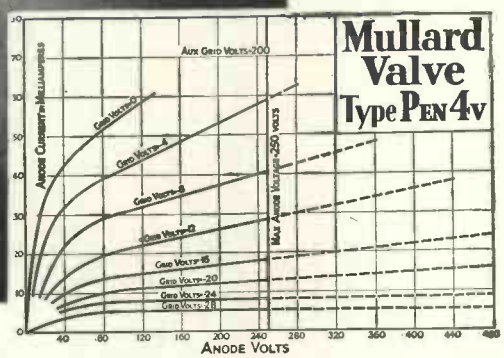
4-volt Pentode Valves

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
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	—	—	—
Lissen ..	PT425	28,000	70	.25	2.5	15.0	6.0	9.0
Six-Sixty	415PP	27,000	60	.15	2.2	15.0	6.0	10.5

(Continued on page 590)

PEN 4V

RIGID UNIT CONSTRUCTION



HERE IS THE OUTPUT VALVE FOR A.C. MAINS SETS

The Pen. 4V is an Indirectly Heated Pentode for use in A.C. all-mains receivers—the valve that will give you three and a half times the output of an ordinary small output valve at only five-sixths of the grid input—that will enable you to operate a moving-coil speaker.

Use the Pen. 4V as output valve in 3-valve and 4-valve receivers having no other low-frequency stages or in 2-valve receivers following the Mullard 904V detector, and note the increased volume.

PRICE 20/-
MADE IN ENGLAND

OPERATING DATA

Heater voltage - 4.0v	Max. auxiliary grid		Grid bias (at auxiliary
Heater current - 1.0A	voltage - - 200 v		grid volts 200)
Max anode voltage 250v	Optimum load 8,000 ohms		—10.0 v

CHARACTERISTICS

(At auxiliary grid volts 200; control grid volts zero)
Mutual conductance - - - - 3.0 mA/V

Mullard
THE·MASTER·VALVE

NOTE:

The following valve specifications are issued by Wireless Magazine designers in this issue.

Multi Mag Three

P.M.1A P.M.2DX P.M.2A

Ideal Home Super

904V MM4V Pen.4V

Advt. The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2. ARKS

VALVES TO USE IN YOUR SET—Continued from page 588

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								
Mullard..	PM24A	25,000	50	.275	2.0	15.0	6.0	21.0
Cossor ..	415PT	—	—	.15	2.0	13.0	15.0	15.0
Mazda ..	425Pen.	—	—	.25	2.0	14.0	14.0	—
Mullard..	PM24C	—	—	1.0	3.0	—	—	—
Mullard..	PM24	—	—	.15	1.75	16.0	6.0	12.0
Six-Sixty	SS/Pen.SP	—	—	.275	2.0	—	—	—
6-volt Three-electrode Valves								
Mazda ..	H607	90,000	40	.07	.45	1.0	.8	1.5
Mazda ..	H610	66,000	40	.1	.6	1.0	—	—
Marconi	H610	60,000	40	.1	.66	.35	1.5	1.5
Osram ..	H610	60,000	40	.1	.66	.35	1.5	1.5
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	22	.1	1.1	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
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
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	3.0	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	6.0	6.0	9.0
Six-Sixty	610P	3,400	7.8	.1	2.3	8.0	6.0	9.0
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	6.0	12.0 (at200v.)
Lissen ..	P625	2,500	7.5	.25	3.0	8.0	7.5	12.0
Marconi	P625	2,400	6	.25	2.5	11.0	7.0	24.0 (at250v.)
Osram ..	P625	2,400	6	.25	2.5	11.0	7.0	26.0 (at250v.)
Cossor ..	610XP	2,000	5	.1	2.5	15.0	9.0	18.0
Mullard..	PM256	1,850	6	.25	3.25	8.0	9.0	27.0 (at250v.)
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 (at200v.)
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 (at200v.)
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 (at200v.)
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	43,000	80	.25	1.85	10.0	6.0	15.0 (at250v.)
Osram ..	PT625	43,000	80	.25	1.85	10.0	6.0	15.0 (at250v.)
Six-Sixty	SS617PP	28,500	54	.17	1.9	15.0	8.0	14.0
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
Mullard..	PM26	—	—	.17	2.0	15.0	9.0	15.0
A.C. Three-electrode Valves								
Mullard..	904V	34,000	75	1.0	2.2	2.0	1.0	1.25
Cossor ..	41MRC	19,500	50	1.0	2.6	2.0	—	1.5
Cossor ..	41MH	18,000	72	1.0	4.0	2.0	—	1.5
Six-Sixty	4DX.AC	17,700	85	1.0	4.8	3.0	1.0	1.5
Cossor ..	41MHF	14,500	41	1.0	2.8	2.5	—	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 Valves—Continued								
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
Mazda ..	AC/HL	11,700	35	1.0	3.0	4.5	1.5	3.0
Cossor ..	41MHL	11,500	52	1.0	4.5	4.0	1.2	2.0
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	MHL4	8,000	20	1.0	2.5	5.0	3.0	6.0 (at200v.)
Osram ..	MHL4	8,000	20	1.0	2.5	5.0	3.0	6.0 (at200v.)
Cossor ..	41MLF	7,900	15	1.0	1.9	4.5	4.5	6.0
Six-Sixty	4L.AC	7,500	15	1.0	2.0	6.0	3.0	4.5
Mullard..	164V	4,850	16	1.0	3.3	5.0	4.5	6.5
Mullard..	104V	3,000	12	1.0	4.0	9.0	6.0	7.0
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 (at400v.)
Osram ..	ML4	2,860	12	1.0	4.2	12.0	5.0	7.0
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
Mullard..	AC064	2,000	6	1.0	3.0	15.0	9.0	14.01
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 (at400v.)
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
Mullard..	AC044	1,150	4	.7	3.5	17.0	14.0	23.0
A.C. Double-grid Valve								
Cossor ..	41MDG	40,000	10	1.0	.25	—	—	—
A.C. Screen-grid Valves								
Six-Sixty	4SGAC	1,000,000	1,000	1.0	1.0	1.5	—	—
Mullard..	S4V	909,000	1,000	1.0	1.1	—	—	—
Mazda ..	AC/SG	800,000	1,200	1.0	3.0	5.0	.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	—	—
Osram ..	VMS4	500,000	550	1.0	—	—	—	—
Six-Sixty	4XSGAC	485,000	1,600	1.0	3.3	—	—	—
Marconi	VMS4	430,000	500	1.0	1.1	—	—	—
Mullard..	S4VA	430,000	1,500	1.0	3.5	1.7	—	—
Cossor ..	41MSG	400,000	1,000	1.0	2.5	2.0	—	1.5
Marconi	MS4B	350,000	1,120	1.0	3.2	3.2	1.0	1.0
Osram ..	MS4B	350,000	1,120	1.0	3.2	3.2	1.0	1.0
Lissen ..	AC/SG	340,000	1,100	1.0	3.25	—	—	—
Lissen ..	AC/SGV	300,000	975	1.0	3.25	—	—	—
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
Cossor ..	MSGLA	200,000	750	1.0	2.5	1.5	—	—
Six-Sixty	4YSGAC	—	9	1.0	3.5	—	—	—
A.C. Pentode Valves								
Marconi	MPT4	33,000	100	1.0	3.0	—	—	—
Osram ..	MPT4	33,000	100	1.0	3.0	—	—	—
Cossor ..	MS.Pen.A	—	—	1.0	4.0	9.0	2.5	2.5
Cossor ..	MP Pen.	—	—	1.0	4.0	—	—	—
Mazda ..	AC/Pen.	—	—	1.0	2.5	—	—	—
Six-Sixty	SS4PAC	—	—	1.0	3.0	—	—	—
Mullard	Pen4V	—	—	1.0	3.6	—	—	—
D.C. Three-electrode 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	—	—	—
Mazda ..	DC3HL	10,000	37	.1	3.7	—	—	—
Marconi	DL	2,660	12	.25	4.5	—	—	—
Osram ..	DL	2,660	12	.25	4.5	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 Valves								
Osram ..	DS	500,000	500	.25	1.1	—	—	3.0
Marconi	DS	450,000	500	.25	1.1	—	—	—
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 Valves								
Marconi	DPT	30,000	90	.25	3.0	—	—	—
Osram ..	DPT	30,000	90	.25	3.0	—	—	10.0
Mazda ..	DCPen.	—	—	.5	3.5	—	—	—
Mazda ..	DC2Pen.	—	—	.1	3.5	—	—	—

Cap. Mfd.	D.C. Voltage	
	WORKING	PEAK
4	440	460
7	460	500
8	440	460

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N.114

GUIDE TO THE WORLD'S BROADCASTERS

Specially Compiled for "Wireless Magazine" by JAY COOTE

30.4 Metres **MADRID (EAQ)** *9,868 Kilocycles*
Power: 20 Kw. *(Spain)*

Distance from London: Approximately 802 miles.

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

Announcer: Man.

Call: "Aqui estaçion Aranjuez; Trans-radio Española" or occasionally "This is the pioneer Spanish short-wave broadcasting station at Madrid."

Daily Programmes: B.S.T. 01.30-03.00, news in English and Spanish destined to listeners in the United States and in South American Republics; B.S.T. 19.00-21.00 (Sat.), special concert for European listeners. Frequently relays Madrid EAJ7.

41 Metres **BANGKOK** *7,320 Kilocycles*
Power: 2.5 Kw. *(Siam)*

Distance from London: Approximately 5,200 miles.

Standard Time: Greenwich Mean Time **plus** 7 hours.

Announcer: Man.

Call: "Radio Bangkok at Phya Thai." Opening announcements in Siamese, French, and English; details of programmes in Siamese and English.

Opening and Interval Signal: Chime of six notes on gong.

Main Daily Programme: B.S.T. 15.00, gramophone records, Siamese music; 15.30, news bulletin in Siamese and English; 15.45, gramophone records (European music); 17.00, close down.

Relays Bangkok main broadcasting station on Mondays (BST: 15.00-17.00).

49.4 Metres **JOHANNESBURG (ZTJ)** *6,072 Kilocycles*
Power: 5 Kw. *(South Africa)*

Distance from London: Approximately 5,600 miles.

Standard Time: Greenwich Mean Time **plus** 2 hours.

Announcer: Man.

Call: "Good evening, ladies and gentlemen. This is Johannesburg calling (or the Johannesburg station of the African Broadcasting Company) on 450 metres, also through Pretoria on 300 metres, and on the short wavelength of 49.4 metres." During intervals: "Johannesburg calling."

Daily Programmes: From B.S.T. 15.00-17.30; on Saturdays from 15.30; on Sundays, from 14.00-16.15.

50 Metres **BARRANQUILLA (HKD)** *6,000 Kilocycles*
Power: 1 Kw. *(Republic of Colombia)*

Distance from London: Approximately 5,400 miles.

Standard Time: Greenwich Mean Time **less** five hours.

Announcer: Man.

Call: "This is the voice of Barranquilla (Colombia), station HKD."

Main Daily Transmissions: B.S.T. 01.45-02.30, relay of open-air concert by State Police Band on Bolivar Square. On Tuesdays, Thursdays, and Saturdays: B.S.T. 02.00, concert, talks, and news; 03.00, studio programme of orchestra and vaudeville artists.

267.6 Metres **VALENCIA** *1,121 Kilocycles*
Power: 8 Kw. *(Spain)*

Distance from London: Approximately 825 miles.

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

Announcer: Man. Spanish language used only.

Call: (Phon.) "Eh-ah-rhota, Oo-nee-own rah-dee-owe Val-enn-cee-ya."

Opening Signal: Hymn to Valencia (gramophone record).

Main Daily Programme: Mostly relays entertainments from Madrid EAJ7 and from Barcelona EAJ1.

Good-night: "Buenos Noches, Señores. Hasta Mañana" (until to-morrow), followed by a few bars of the Song of Riego.

285.9 Metres **MONTPELLIER (PTT)** *1,049.1 Kilocycles*
Power: .8 Kw. *(France)*

Distance from London: Approximately 560 miles.

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

Announcer: Man. French language used only.

Call: "Allo! Allo! Ici poste de radiodiffusion des PTT de Montpellier-Languedoc"; abbreviated, during intervals to "Ici Montpellier PTT."

Main Daily Programme: B.S.T. 12.45, news, time signal, concert; 13.30, dance music; 17.00, news, concert; 20.30, main evening entertainment. Mainly relays broadcasts from Paris PTT.

Closes down as other PTT stations with usual French good-night greetings followed by *La Marseillaise.*

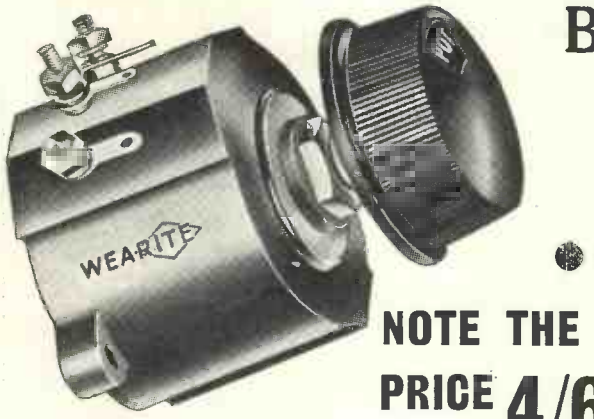
500.8 Metres **FLORENCE (1FI)** *599 Kilocycles*
Power: 20 Kw. *(Italy)*

Distance from London: Approximately 750 miles.
Standard Time: Central European (coincides with B.S.T).
Announcer: Woman. Italian language only used.
Opening Signal: Gramophone record, as Rome (q.v.).
Call: (Phon.) "Eh-yah Radio Alt-ee-tarl-ee-ya" (Alt'Italia).
Interval Signal: Song of nightingale.
Main Daily Programmes: Exchanges broadcasts with Milan, Turin, Trieste and Genoa. B.S.T. 08.15 and 09.40, news; carillon and High Mass relayed from Trieste Cathedral (Sun.); 12.30, concert (Sun.); 13.00, time signal, news; 15.30, dance music; 18.15, news, talks; 21.00, main evening entertainment.
Closes down with usual Italian good-night greetings (see Milan) followed by Royal Anthem and Fascist hymn.
Relays and Associated Studios: Trieste, 247.7 metres (1,211 kilocycles), 10 kw.; Turin, 273.7 metres (1,096 kilocycles), 7 kw.; Genoa, 312.8 metres (959 kilocycles), 10 kw.; Milan, 331.5 metres (905 kilocycles), 7 kw.; Bolzano, 368.1 metres (815 kilocycles), 1 kw.

(Revised)
1,725 Metres **RADIO PARIS** *174 Kilocycles*
Power: 75 Kw. *(Paris-France)*

Distance from London: Approximately 220 miles.
Standard Time: Greenwich Mean Time (France adopts B.S.T.).
Announcer: Man.
Opening Signal: Chimes followed by a time signal similar to the six dot-seconds from Greenwich.
Call: "Allo! Allo! Ici Radio Paris."
Main Daily Programmes: B.S.T. 07.45, gramophone records, news, weather; 08.30 physical exercises; 12.00 (Sun.) sermon and sacred music; 12.30, gramophone records; 13.00, stock exchange and commercial information; 13.00, 14.00 and 18.45 (Sun.) sponsored concerts for British listeners; 19.30, radio circus; 20.30 music hall (Sun.); 20.45, main evening entertainment.
Closes down with good-night greetings ("Bonsoir Mesdames, Bonsoir Mesdemoiselles, Bonsoir Messieurs") followed by *La Marseillaise.*

A NEW VOLUME CONTROL BY WEARITE



NOTE THE PRICE 4/6

Look at the illustration of this latest Wearite product—a real workmanlike job. The Q.V.C. is just another proof of Wearite's intimate knowledge of the constructors' need. Study the following points. Where is there such a volume control—at such a price?

SILENT IN USE due to the special roller contact bearing working on unique principle.

SQUARE LAW ELEMENT assures even control of volume over entire range.

SPACE WOUND WINDING assures free heat dissipation and ability to carry heavy current.

COMPLETELY ENCLOSED ELEMENT with transparent *fireproof* protective cover.

RECESSED INSULATING BUSH permits easy fitment to metal panel.

SPECIAL LUG BRACKETS for baseboard mounting and for ganging

THE Q.V.C. VOLUME CONTROLS are made in the following resistances, with current-carrying capacities as under:

50,000 ohms.	.. ..	10 ma. at 5 watts.
25,000 "	.. ..	15 " " 5 "
10,000 "	.. ..	22 " " 5 "
5,000 "	.. ..	30 " " 5 "
1,000 "	.. ..	70 " " 5 "
600 "	.. ..	90 " " 5 "

Write for full particulars and details of resistances above 50,000 *ohms.*

Should you have *any* special technical query, write to our "Query Dept."—they will find the solution.

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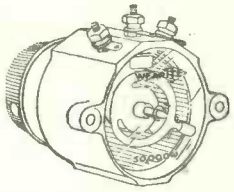


Here is shown the reverse of the Q.V.C. Note the mechanical structure, giving perfect contact with silent operation.

WEARITE COMPONENTS FOR "EVERYBODY'S PORTABLE" and "IDEAL A.C. HOME SUPER"

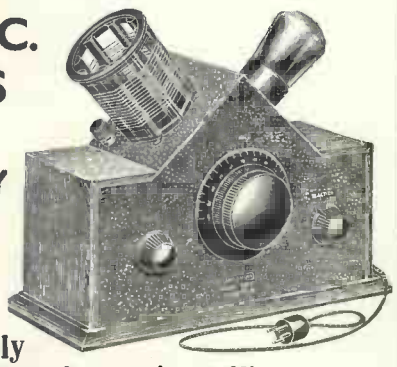
"EVERYBODY'S PORTABLE" One 4-pole Change-over switch with extension and bracket (124/EP) 5/-. Three intermediate coils (OT1) 10/6 each. One NEW Portable Oscillator Coil (03) 4/6. One 50,000 ohm. wire wound resistance (QVC) see illustration 4/6.

"IDEAL A.C. HOME SUPER" One Intermediate coil OT1—10/6. One OT2 ditto 10/6. One H.F. Choke (HFS) 6/6 or the NEW Screened H.F. Choke (HFP) 3/6.

O.T.I
The Wearite O.T.I. Intermediate Coil .. 10/6

4-5

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.

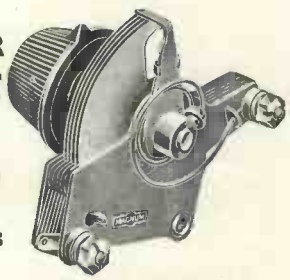
Price complete **39/6**
Extra coil if required 18/40 metres - - - 3/-.

SPECIFIED FOR THE 'MULTI-MAG THREE'

MAGNADENSER .0005

Price **2/6**

COMPLETE WITH KNOB



Solid Dielectric Variable Condensers

with a beautifully smooth movement, free of backlash. The vanes are of brass and a pigtail connection is provided to the rotor. Each condenser is tested at 500 volts, A.C. Recommended for Reaction Control and as Series Aerial Condensers. One hole fixing.

Price (.0001, .0002, .0003, .0005) - **2/6**
Price (.00075) - **3/-**

"THE IDEAL A.C. HOME SUPER"

ONE SET OF MAGNUM SPAGHETTI RESISTANCES AS SPECIFIED - 9/9

We specialize in this receiver and all "Wireless Magazine" Sets, ready wired and tested. Every set is hand made and individually tested by skilled craftsmen, thus ensuring perfect and guaranteed performance.

Comprehensive lists, free on application

BURNE-JONES

& CO., LTD., "Magnum" House, 296 Borough High Street, LONDON, S.E.1

Telephones: Hop 6257 *and* 6258

Scottish Agent: **Mr. Ross Wallace, 54 Gordon St., Glasgow, C.1**

There is news in the "Wireless Magazine" advertisements

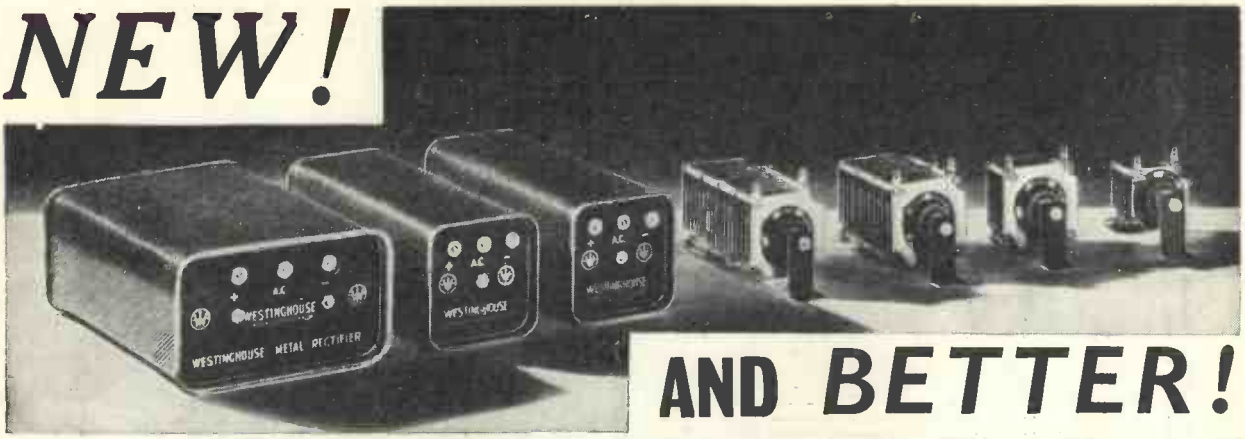
WORLD'S BROADCAST STATIONS

Wave-length	Name of Station	Dial Readings	Country
7.05	Berlin		Germany
13.93	Boundbrook W3XAL		United States
14.27	Buenos Aires LSN		Argentine
14.65	Malabar PMB		Java
14.83	Nauen DGW		Germany
15	Prangins (Radio Nations)		Switzerland
15.07	Monte Grande LSG		Argentine
15.14	Deal Beach WM1		United States
15.198	Aranjuez EAQ		Spain
15.44	Elisabethville OQH		Belgian Congo
15.5	Kootwijk PCP		Holland
15.5	Sydney VK2ME		Australia
15.5	Nancy		France
15.51	Deal Beach WNC		United States
15.576	Rio de Janeiro PPU		Brazil
15.625	Ruysselede (Bruges) ORG		Belgium
15.93	Bandoeng PLE		Java
16.10	Rugby GBU		Great Britain
16.3	Kootwijk PCK		Holland
16.36	Rugby GBS		Great Britain
16.54	Rugby GBW		Great Britain
16.66	Rocky Point (N.Y.) WAJ		United States
16.8	Malabar PLF		Java
16.85	Kootwijk PCV		Holland
17.05	Ships		—
18.41	Kootwijk PCL		Holland
18.5	Rugby GBX		Great Britain
19	Barcelona		Spain
	Prangins (Radio Nations)		Switzerland
19.557	Schenectady W2XAD		United States
19.68	Pontoise FYA		France
19.72	East Pittsburgh W8XK		United States
19.737	Zeesen		Germany
19.94	Rome (Vatican) HVJ		Italy
20.26	Rocky Point WQV		United States
20.49	Deal (N.J.) W2XBJ		United States
21.5	Bucharest CV1		Roumania
21.92	Budapest (Day)		Hungary
23.5	Coltano IAC		Italy
23.28	Radio Maroc (Rabat)		Morocco
23.858	Rabat		Morocco
24	Funchal CT3AQ		Madeira
24.98	Saigon FZR		Indo-China
25.14	Paris FYA		France
25.16	Moscow Popoff RW50		U.S.S.R.
25.24	East Pittsburgh W8XK		United States
25.27	Calcutta VUC		India
25.53	Chelmsford 5SW		Great Britian
25.465	Saigon (Chi-Hoa)		Indo-China
25.6	Valencia		Spain
25.60	Pontoise FYA		France
26.22	DHA Naden		Germany
26.7	S.Y. *Elettra* IBDX		—
27.3	Wellington		New Zealand
28.2	Bandoeng PLR		Java
28.98	Buenos Aires LSX		Argentine
29	DEQ Nauen		Germany
29.04	Ruysselede		Belgium
30	Belgrade		Yugoslavia
30.2	Leopoldville		Belgian Congo
30.4	Madrid EAQ		Spain
30.57	Buenos Aires LQE		Argentine
30.64	Rugby GBW		Great Britain
30.77	Rocky Point WEL		United States
30.94	Buenos Aires LQA		Argentine
31.2	Maracay YV8BC		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
31.38	Schenectady W2XAF		United States
31.51	Skamlebaek OXY		Denmark
31.55	Melbourne VK3ME		Victoria
31.75	Rocky Point WEJ		United States
31.86	Bandoeng		Java
32.26	Rabat		Morocco
32.85	Zurich HB9OC		Switzerland
34.68	Long Island W2XV		United States
34.4	Aranjuez (Madrid)		Spain
34.66	Drummondville VE9AP		Canada
34.68	Long Island W2XV		United States
35	Daker		French W. Africa
35	Prangins (Radio Nations)		Switzerland
36	Norddeich		Germany
36.92	Bandoeng PLW		Java
37.50	Tokio JKBB		Japan
38.65	Kootwijk PDM		Holland
39.7	Bogota HKF		Colombia
39.74	Calgary (Alb.) CKS		Canada

Wave-length	Name of Station	Dial Readings	Country
40.4	Warsaw SP1AX		Poland
40.54	Rock Point WEM		United States
41	Bangkok HSP2		Siam
41.6	Las Palmas EAR58		Canary Isles
41.7	Singapore VSIAB		Singapore
42.3	Stuttgart D4XAA		Germany
42.8	2RO Rome		Italy
42.8	Rugles F8BP		France
42.9	Lisbon CT1AA		Portugal
43	Madrid EAR100		Spain
43.6	Koethen D4AFF		Germany
43.75	Paris (Vitus) F8LH		France
43.83	Budapest (Night)		Hungary
44.9	Nauen DGK		Germany
45	Constantine FM8KR		Tunis
45.38	Moscow		U.S.S.R.
45.5	Bucarest		Rumania
46.18	Elizabethville OQH		Belgian Congo
46.69	Boundbrook W3XL		United States
46.72	Minsk RW62		U.S.S.R.
47	Coltano IAC		Italy
	Quito HCIDR		Ecuador
48	Casablanca CN8MC		Morocco
48.35	Bogota HKC		Colombia
48.5	Brussels ON4FB		Belgium
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
49.32	Navana		Cuba
49.34	Chicago W9XAA		United States
49.4	Johannesburg ZTJ		South Africa
49.4	Vienna VOR2		Austria
49.43	Vancouver VE9CS		British Columbia
49.5	Nairobi 7LO		Kenya Colony
49.5	Philadelphia W3XAU		United States
49.59	Halifax VE9HX		Nova Scotia
49.83	Chicago W9XF		United States
49.96	Montreal VE9DR		Canada
49.96	Teguciglapa HRB		Honduras
50	Bucarest		Roumania
	Moscow RV59		U.S.S.R.
	Caracas YV2BC		Venezuela
50.1	Eindhoven		Holland
50.26	Rome (Vatican) HVJ		Italy
51.22	Chapultepec XAD		Mexico
54.4	Moscow RV38		U.S.S.R.
54.52	New York W2XBH		United States
58	Prague Ok1MPT		Czechoslovakia
58.3	Bandoeng PMY		Java
60	Prangins (Radio Nations)		Switzerland
60.3	Rugby GBC G6RX		Great Britain
61	Radio LL (Paris)		France
62.5	Deal Beach WOO		United States
62.5	Long Island W2XV		United States
65	Budapest		Hungary
67.65	Doeberitz DFK		Germany
70.2	Khabarovsk RV15		U.S.S.R.
82	Paris F8US		France
84	Paris FPC		France
84	Zurich HBOC		Switzerland
88.3	Rugby G6RX		Great Britain
92.31	Doeberitz		Germany
160	Cuxhaven (Elbe-Weser)		Germany
198.5	Riga		Latvia
208.3	Antwerp		Belgium
208.8	Liége		Belgium
210	Budapest		Hungary
211.3	Newcastle		Great Britain
214.2	Warsaw (No. 2)		Poland
214.3	Aberdeen		Great Britain
215.5	Chatelineau		Belgium
	Brussels (Conférence)		Belgium
217	Königsberg		Germany
218.5	Flensburg		Germany
218.7	Salzburg		Austria
219.9	Cassel		Germany
219.9	Beziers		France
221	Binche		Belgium
224.4	Cork		Irish Free State
232	Fécamp		France
232	Malmö		Sweden
232.2	Kiel		Germany
234.9	Lodz		Poland
235.5	Kristianssand		Norway
237.2	Bordeaux-Sud-Ouest		France
238.9	Nurnberg		Germany
240.5	Stavanger		Norway
242	Belfast		Ireland
244.1	Basle		Switzerland

(Continued on page 596)

NEW!



AND BETTER!

As from **JUNE 1st, 1932,** the following **NEW Westinghouse Metal Rectifiers** will be available for constructors' use, **AND THE H.T. 8 WILL BE REDUCED IN PRICE FROM 21/- TO 18/6d.**

L.T.				H.T.			
TYPE	D.C. OUTPUT		PRICE	TYPE	D.C. OUTPUT		PRICE
	VOLTS	AMPS.			VOLTS	mA	
L.T.1	6.0	0.25	**10/6**	H.T.9	300	60	**21/-**
L.T.2	6.0	0.5	**11/-**	H.T.10	200	100	**21/-**
L.T.4	6.0	1.0	**13/-**	H.T.11	500	120	**35/-**
L.T.5	12.0	1.0	**15/-**		400	150	

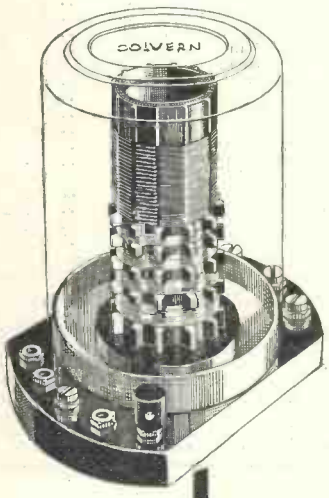
Details of these new units are given in our booklet "The All Metal Way." Send a 3d. stamp for a copy, marking your application "Dept. W.M."

WESTINGHOUSE METAL RECTIFIERS

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO. LTD., 82, York Road, King's Cross, London, N.1.

AN UP-TO-DATE COIL WITH UP-TO-DATE FEATURES

TYPE TD



Type TD, an entirely new Colvern Coil, is designed to give super selectivity on both long and broadcast wave bands. The coil is completely screened giving a very neat appearance and incorporates tapped aerial coupling and reaction, while the four alternative aerial tappings are arranged as sockets with a wander plug.

The first two tappings give aerial couplings similar to those normally employed but with greatly increased selectivity.

Nos. 4 and 5 give a high degree of selectivity with weak aerial coupling—suitable for use in a "swamp" area.

A most important feature of this coil is that there is no break through on the long wave band from B.B.C. stations.

Type TD is specified for the Multi-Mag 3—price 8/6.

COLVERN LIMITED, MAWNEY ROAD, ROMFORD

WORLD'S BROADCAST STATIONS—

Cont. from page 594

Wave-length	Name of Station	Dial Readings	Country
245.9	Linz		Austria
246	Berne		Switzerland
247.7	Trieste		Italy
249.6	Prague (No. 2)		Czechoslovakia
249.6	Juan-les-Pins		France
251	Barcelona EAJ15		Spain
252.9	Gleiwitz		Germany
255.1	Toulouse PTT		France
257	Hörby		Sweden
259.3	Leipzig		Germany
261.6	London National		Great Britain
263.8	Moravska Ostrava		Czechoslovakia
265.4	Lille		France
267.6	Valencia		Spain
269	Liege (Cointe)		Belgium
269.8	Bremen		Germany
272	Rennes		France
273.6	Turin		Italy
276.5	Heilsberg		Germany
279.3	Bratislava		Czechoslovakia
280	Baril		Italy
281.2	Copenhagen		Denmark
282.5	Lisbon CT1AA		Portugal
283	Berlin		Germany
	Magdeburg		Germany
	Stettin		Germany
283.6	Brussels SBR		Belgium
285.2	Innsbruck		Austria
286	Montpelier		France
286.7	Radio Lyons		France
288.5	Bournemouth		Great Britain
	Dundee		Great Britain
	Edinburgh		Great Britain
	Plymouth		Great Britain
	Swansea		Great Britain
291	Viipuri		Finland
293	Kosice		France
293.7	Limoges PTT		Czechoslovakia
296.1	Hilversum		Holland
298.5	Tallinn		Esthonia
301.5	North National		Great Britain
304.9	Bordeaux PTT		France
305.8	Falun		Sweden
307	Zagreb		Yugoslavia
307.4	Radio Vitus		France
309.9	Cardiff		Great Britain
312.2	Genoa		Italy
312.8	Cracow		Poland
315	Marseilles		France
318.8	Naples		Italy
	Sofia		Bulgaria
	Dresden		Germany
321.9	Goteborg		Sweden
325	Breslau		Germany
329.7	Poste Parisien		France
332.2	Milan		Italy
334.4	Poznan		Poland
337.8	Brussels (No. 2)		Belgium
341.7	Brno		Czechoslovakia
345.2	Strashourg		France
348.8	Leningrad		U.S.S.R.
348.9	Barcelona EAJ1		Spain
352.1	Graz		Austria
355.9	London Regional		Great Britain
358	Moscow		U.S.S.R.
360.6	Munlacker		Germany
363.4	Algiers		North Africa
365.4	Bergen		Norway
367.6	Frederikstaad		Norway
368.1	Helsinki		Finland
	Seville		Spain
	Bolzano		Italy
	Kharkov		U.S.S.R.
369.4	Radio LL, Paris		France
372	Hamburg		Germany
376.4	Scottish Regional		Great Britain
378	Moscow Regional		U.S.S.R.
380.7	Lvov		Poland
384.4	Radio Toulouse		France
385	Stalingrad		U.S.S.R.
389.6	Frankfurt		Germany

Wave-length	Name of Station	Dial Readings	Country
389.6	Archangel		U.S.S.R.
394	Bucharest		Roumania
398.9	Midland Regional		Great Britain
403	Söttens		Switzerland
409.8	Katowice		Poland
411	Pokrovsk-Völgo		U.S.S.R.
413	Dublin		Irish Free State
416	Radio Maroc		North Africa
419.5	Berlin		Germany
424.3	Moscow (Stalin)		U.S.S.R.
428	Madrid EAJ7		Spain
430	Belgrade		Yugoslavia
435.4	Stockholm		Sweden
441	Rome		Italy
447.1	Paris PTT		France
449.4	Odessa		U.S.S.R.
453.2	Danzig		Danzig
	Klagenfurt		Austria
	Porsgrund		Norway
456.6	San Sebastian		Spain
459	Beromuenster		Switzerland
465.8	Tartu		Estonia
466	Lyons PTT		France
472.4	Langenberg		Germany
473.2	Sebastopol		U.S.S.R.
480	North Regional		Great Britain
488.6	Prague (Leiblitz)		Czechoslovakia
496	Trondheim		Norway
500.8	Florence		Italy
502.4	Nini Novgorod		U.S.S.R.
509.0	Brussels No. 1		Belgium
517	Vienna		Austria
525	Riga		Latvia
532.9	Munich		Germany
540	Tampere		Finland
541.5	Sundsvall		Sweden
542	Palermo		Italy
550	Budapest		Hungary
559.7	Kaiserslautern		Germany
	Augsberg		Germany
563	Wilno		Poland
566	Hanover		Germany
568.3	Grenoble		France
569.3	Freiburg		Germany
574.7	Ljubljana		Yugoslavia
720	Moscow PTT		U.S.S.R.
777.5	Ostersund		Sweden
824.2	Sverdlousk		U.S.S.R.
849	Rostov (Don)		U.S.S.R.
937.5	Kharkov		U.S.S.R.
968	Alma Ata		U.S.S.R.
1,000	Leningrad		U.S.S.R.
1,032	Kiev		U.S.S.R.
1,071.2	Tiflis		U.S.S.R.
1,071.4	Scheveningen-Haven		Holland
1,083	Oslo		Norway
1,103	Moscow (Popoff)		U.S.S.R.
1,153	Kalundborg		Denmark
1,171.5	Taschent		U.S.S.R.
1,200	Reykjavik		Iceland
1,204.8	Istanbul		Turkey
1,229.5	Boden		Sweden
1,237	Vienna (Testing)		Austria
1,250	Bakou		U.S.S.R.
	Luxemburg		Luxemburg
1,304	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
1,725	Radio Paris		France
1,796	Lahti		Finland
1,875	Huizen		Holland
1,935	Kaunas		Lithuania
2,525	Königswusterhausen		Germany
2,900	Königswusterhausen		Germany

At the end of the article by P. K. Turner on "Setting Your Pick-up," in "Wireless Magazine" for May, there was a "note for experienced readers" on getting the best setting for unusual sizes of record (see page 430).

A printers' error got into the fourth numbered paragraph of this. The formula given should read $Y + \frac{Z}{3}$, and not $X + \frac{Z}{3}$ as printed.

Correspondingly, the fourth paragraph of the example worked out, which followed, should be $Y + Z/3 = 2.45 + .1 = 2.55$ in., and not as printed.

◆ ◆ ◆

A special purchasing club for listeners has been organised by Radialaddin, Ltd. It is called the Radialaddin Club and full details can be obtained from 47-48 Berners Street, London, W.1.

We are asked by Wired Wireless, Ltd., who have branches at 97 Myddleton Road, Wood Green, N.22; 126 St. Albans Avenue, Acton, W.4; and 54 Old Bethnal Green Road, Bethnal Green, E.2, to point out that the photograph that appeared on page 413 of the May issue of "Wireless Magazine" is of their Acton relay exchange and not of the Wood Green exchange as stated in the inscription.

REPRODUCERS OF DISTINCTION

R. & A. Reproducers represent the high-water mark of design, construction, and performance. For sheer beauty of musical reproduction they are supreme, and speech is remarkably life-like. You cannot buy better reproducers at any price, and R. & A. products are guaranteed.

Descriptive Leaflets Free on request.

R&A REPRODUCERS

TYPE "40."—Not equalled for quality of reproduction by any other speaker of its type. As the *Wireless World* so aptly stated: "it stands in a class by itself." Specified by WIRELESS MAGAZINE for the "Easytune 60."

"CHALLENGER" Permanent Magnet M.C. Reproducer.—A high-grade instrument, giving perfect reproduction of speech and music. Remarkably sensitive, and ideal for all types of receiver from a 2-valve to a power amplifier. Complete with 3-ratio transformer to suit all power valves, including Pentodes.

Ask your dealer to demonstrate.

REPRODUCERS & AMPLIFIERS, Ltd.
FREDERICK ST., WOLVERHAMPTON

This OSBORN CABINET

SPECIFIED FOR THE "WIRELESS MAGAZINE" A-P-A RADIO UNIT

MODEL No. 218

A Queen Anne Radio or Radio Gramophone Cabinet, 3 ft. 10 in. high, 2 ft. 2 in. wide, 1 ft. 6 in. deep. Size of baffle board behind fret, 24 in. by 24 in. Metallic fabric for fret front included. Opening at top and back. Cabinet takes panel 2 ft. by 9 in., or smaller. Complete with motor board.

PRICES:

Machined ready to Assemble: Oak, £3 10s.; Mahogany, £3 15s.; Walnut, £4 10s. **Assembled ready to polish.** Oak, £4 10s.; Mahogany, £4 15s.; Walnut, £5 10s. **Assembled and polished** Oak, £5 10s.; Mahogany, £6 5s.; Walnut, £7 5s.

All Models Carriage Paid.

Send 3d. in stamps for New 1932 beautifully illustrated Catalogue.

CHAS. A. OSBORN

DEPT. W.M., The Regent Works, Arlington Street, London, N.1.
Tel.: Clerkenwell 5095. And at **21 ESSEX ROAD, ISLINGTON, N.1** (1 min. from the Agricultural Hall)
Telephone: Clerkenwell 5634.

The new LOTUS S.G.4 PORTABLE

WHEREVER you are . . . at the seaside . . . in the country . . . on the river . . . keep in touch with your favourite Broadcast Artists—Dance Bands—Chamber Music—Vaudeville or Symphony Concert.

"If only we'd got the Wireless here!" how often this was said last year . . . and how *different* the holiday would have been had you had one.

Make certain of a *perfect* holiday this year—enjoy every minute of it—let the LOTUS Portable bridge the gap.

But why a Lotus? Well, simply because this new LOTUS is built with the world-famous LOTUS Components and fitted with a "Celestion" Loud Speaker—"The very Soul of Music"—thus assuring for the LOTUS the most delightful tone . . . the most amazingly realistic reproduction ever achieved in a Portable.

Incidentally, because of its superior performance and purity of reproduction, the "LOTUS" is the ideal instrument for the flat dweller.

12 GNS

This Portable, the latest addition to the famous LOTUS RADIO, may be had on the easiest of easy terms. Write us to-day, or fill in and post the coupon below for particulars, or better still, ask your nearest dealer for a demonstration.

TO LOTUS RADIO LTD., MILL LANE, LIVERPOOL.

Please send me full particulars and complete specification of the LOTUS S.G.4 Portable and details of H.P. Terms.

Name

Address

LOTUS

ADCRAFT

In Tune with the Trade

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Here we review the newest booklets and folders issued by four 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 July 31*

Batteries, for the Users of !

HERE is a useful thing for battery users. Ediswan have published a book with the title "How to Get the Most Out of Your H.T. Battery." The title describes it. It is not strictly a catalogue, although one page out of the whole booklet is devoted to technical details and voltage ranges of Ediswan batteries.

It is a helpful book of hints and tips in using and choosing dry batteries for high tension, showing suitable valve combinations that can be worked economically from each type of battery. Inset in the book is a station log for practically any type of set having up to three tuning controls, and memorandum sheets.

This Ediswan book is certainly the thing for a practical listener. If you want a complete catalogue of batteries, then this can be had free, too. **268**

◆ ◆ ◆

For Set Builders

I HAVE a feeling that set builders will find the new Junit folder of real use. It gives details of small but essential parts, such as terminal mounts, valve holders, push-pull switches, metal set chassis and so on. The larger parts dealt with include Junit mains transformers and chokes, and a number of complete high-tension units.

It is really quite a good idea to have in a folder of this description a brief résumé of the chief parts in the range. Send now for a free copy, for it will serve as a reminder when you start building a new set or altering an old one, and then want details in a hurry of some small part which is listed in the Junit folder. **269**

◆ ◆ ◆

Build Your Own Cabinet

YOU know, the average man who is sufficiently interested to build his own set needn't gib at the job of building his own set cabinet. I have recollections of struggling with plywood and templates in the early days, but now all this is changed. You can buy a complete set of parts for any kind of cabinet, up to a full-size radiogram job and assembly is as simple as Meccano.

Charles Borst & Sons have sent me a sheet giving details of a useful radiogram cabinet which, as a kit of parts in birch, costs only £2 ! There is no cutting to do and very few tools are required. The complete cabinet accommodates your set, loud-speaker, batteries or mains unit, and gramophone equipment.

If you are out to economise, this suggestion is well worth considering. **270**

◆ ◆ ◆

Those 1,999,999!

I'M not quite clear why Tunewell put on the title page of their new book, "You and 1,999,999 others can now afford super radio." Tunewell parts never were expensive. They were always good, and the new gadgets (described in this handy book-cum-folder) seem to me to be outstandingly so.

Link-switched coils, "spaghetti's," switches, leaks, transformers, chokes, mains parts, and so on—there are dozens of them, and full details are given.

Set builders, set improvers, and all radio tinkerers must get a copy of the production, which describes them. I haven't space here to do them justice. **271**

For A.C. Sets on D.C. Mains use

M-L

ROTARY TRANSFORMERS

D.C. to A.C. Types for operating A.C. Receivers and Radio-Gramophones from D.C. supplies. Electrically and mechanically silent in operation. Can be supplied complete with an anti-interference unit and sound-proof cover (as illustrated).

Input: 12 to 220 volts D.C. Output: Up to 200 watts at 230 volts 50 cycles. Also D.C. to D.C. Types for supplying H.T. Current to large Public Address Amplifiers, etc. Input: 12 to 220 volts D.C. Output: 300 volts to 1,000 volts, etc.

Models for Every Requirement !

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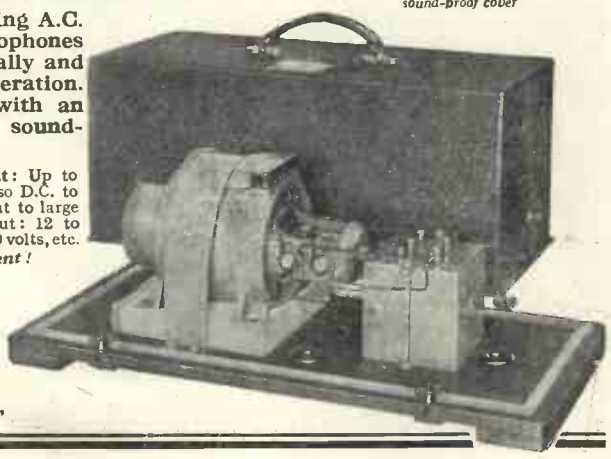

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Specified in this issue for the "MULTI-MAG 3" & "EVERYBODY'S PORTABLE"

IGRANIC MIDGET L.F. TRANSFORMER

The Igranic Midget L.F. Transformer is a masterpiece of scientific research and is the result of highly skilled workmanship executed by Radio experts. For the discriminating set builder it is incomparable in quality and price and is backed by IGRANIC prestige. The technical advisers to this magazine have recommended the use of this particular transformer In the "Multi-Mag 3" and "Everybody's Portable" which is positive proof of its capabilities. It possesses high primary Inductance with absolutely no trace of "drumming." Made in 2 ratios : 3.1 and 5.1. **PRICE 10/6** each, and worth it.

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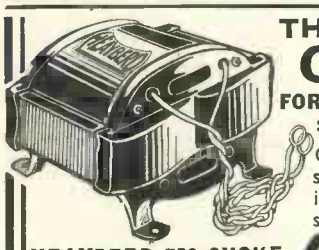

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Inductance	Resistance	Max. Current Cap
30 Henrys.	350 ohms.	100 ma.

PRICE - - - 12/6

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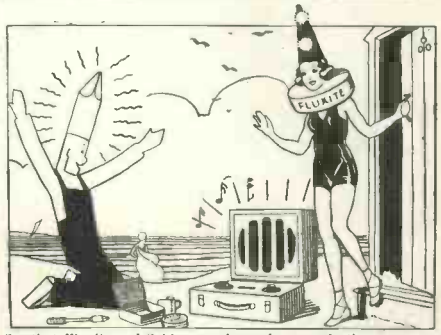

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See that Fluxite and Solder are always by you—in the house, garage, workshop—anywhere where simple, speedy, soldering is needed. They cost so little, but will make scores of everyday articles last years longer! For Pots, Pans, Silver, and Brassware; RADIO; odd jobs in the garage—there's always something useful for Fluxite and Solder to do.

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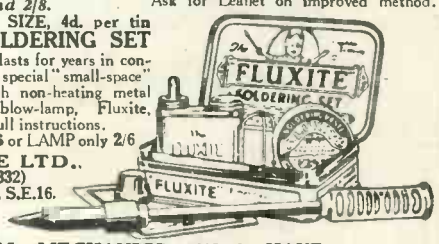
FLUXITE SOLDERING SET
Simple to use and lasts for years in constant use. Contains special "small-space" soldering iron with non-heating metal handle; pocket blow-lamp, Fluxite, Solder, etc.; and full instructions.
COMPLETE, 7/6 or LAMP only 2/6



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IT SIMPLIFIES *ALL* SOLDERING

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"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.

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PRICES OF FORMO MAINS CONDENSERS as specified for the "Ideal A.C. Home Super"—
Four 1 mfd. .. 2/6 each
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Obtainable from all Radio Dealers

Write for complete catalogue—

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LISTEN TO THE WORLD!

The Aerodyne Short-wave Adaptor has been tested by the experts of the "Wireless Magazine" and proved to be thoroughly efficient and do everything we claim for it. Turn to page 632 of this magazine for a brief description and illustration.

The Aerodyne Adaptor can be fitted to your set in two seconds. Simply remove the Detector Valve and insert Adaptor Plug, and you have a perfect Short-wave Radio which will bring in the WORLD'S Main Broadcasting Stations. The Aerodyne Adaptor gives you any wavelength for 15-100 metres.

The Adaptor is *not* a kit but a soundly constructed unit fitted into a handsome oak cabinet, which will greatly add to the appearance of your present set.
Cash price, 35/-, or 15/- down and five monthly instalments of 5/-.

Special Super-het Model (for use with receivers incorporating one or more stages of H.F. amplification), 45/- cash or £1 down and six monthly payments of 5/-.

Send 35/- cash or 15/- deposit for return post delivery or post coupon below for further details to—

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HUSTLER, SIMPSON & WEBB, LTD.,
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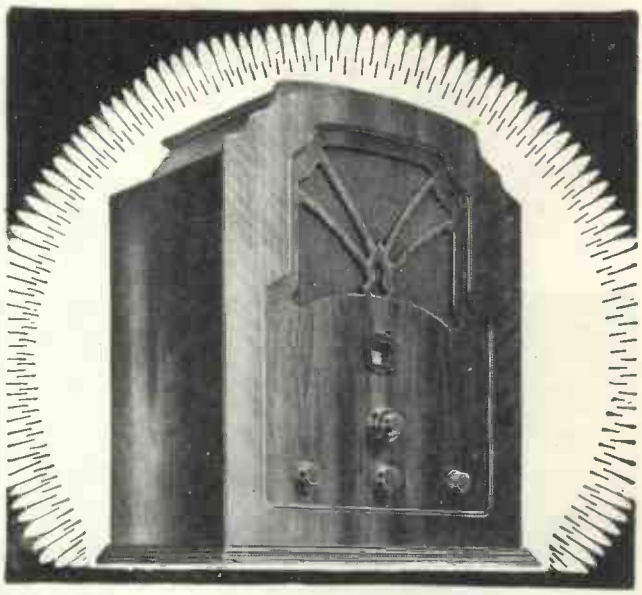
Dear Sir,
Please send me by return of post full details of the Aerodyne Short-wave Adaptor.

Name.....

Address.....

..... *W.M.*



Half an hour with the magnificent new Regentone 3 valve All-Electric Receiver in your own home is more convincing than anything we can say. Let it speak for itself. Ask your local dealer to arrange a demonstration - there's no obligation, of course!

16
GUINEAS

OR 39/6 DOWN, including B.V.A. valves and royalties. For 200/250v. 40/60 cycles. Three valves. For A.C. Mains. Built-in moving coil speaker. Super-selective. Provision for mains aerial, external aerial and gramophone pick-up.

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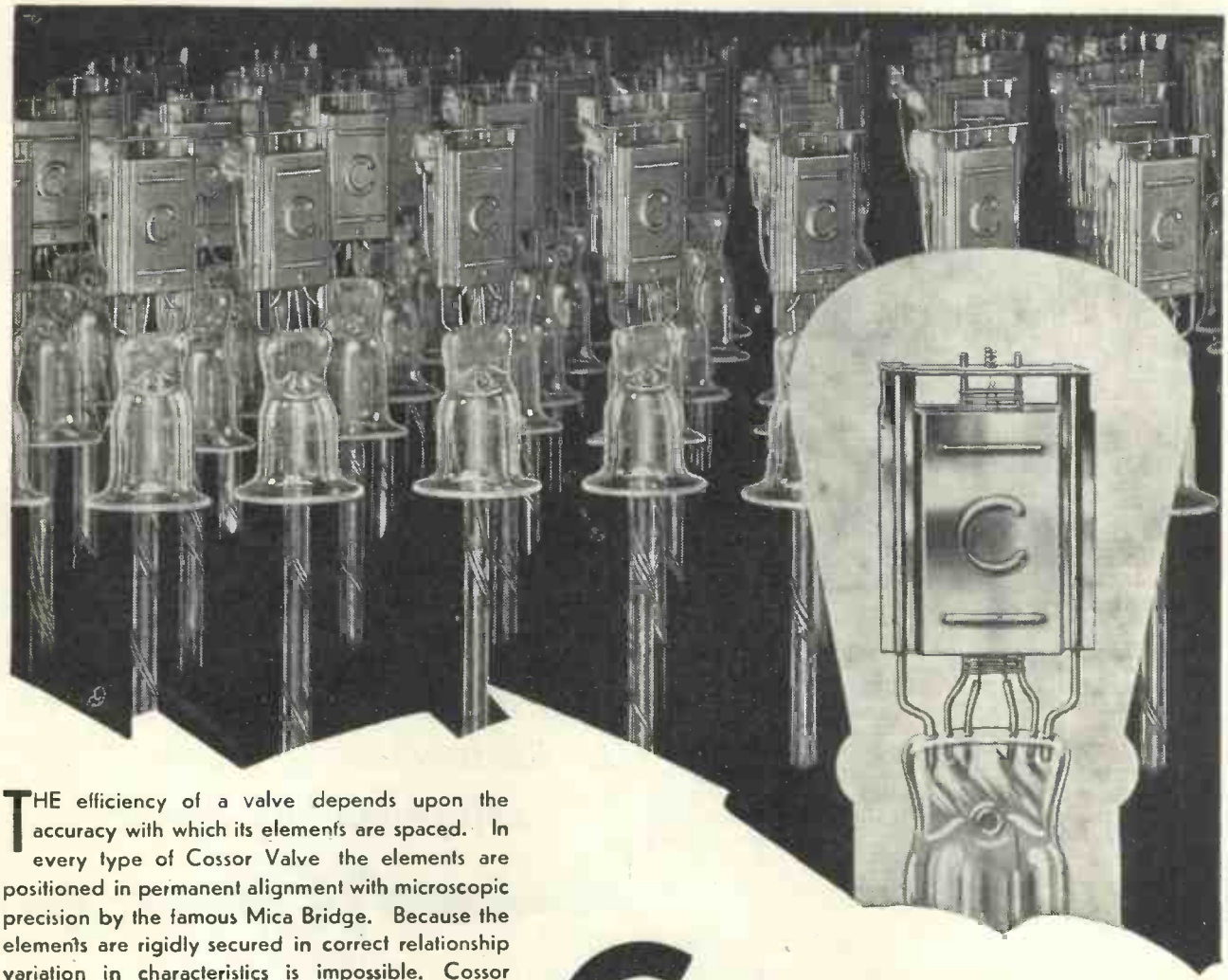

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77 ♡ 479

BROADCASTING HOUSE

Facts and Fancies

By D. SISSON RELPH

BROADCASTING HOUSE, the new headquarters of the British Broadcasting Corporation, is unique among the big buildings of our country. In the whole world there are only three other projects of a similar nature; one is the Funkhaus headquarters of the German national broadcasting organisation in Berlin, another is the huge group of buildings being put up in New York under the name "Radio City." The third is the new "Broadcasting House" in Rome.

Four Years Preparation

It is impossible, after a visit lasting only two hours, to do justice to Broadcasting House. Weeks would be needed to appreciate fully all the wonders that the B.B.C. has at its command. But even a short tour of inspection is enough to make one realise something of the giant scheme of preparation that has been going on behind the scenes for the past four years or more.

Familiar to Londoners

The outside of Broadcasting House has been familiar to Londoners for a good many months. But the exterior gives no clue to the intricacy of the interior design; one simply marvels at the powers of a man who can produce a cohesive whole from such a vast mass of detail as must have been contributed by scores of experts in various departments.

THE ENTRANCE HALL

The entrance hall at Broadcasting House is very finely proportioned. A translation of the Latin inscription appears in the article

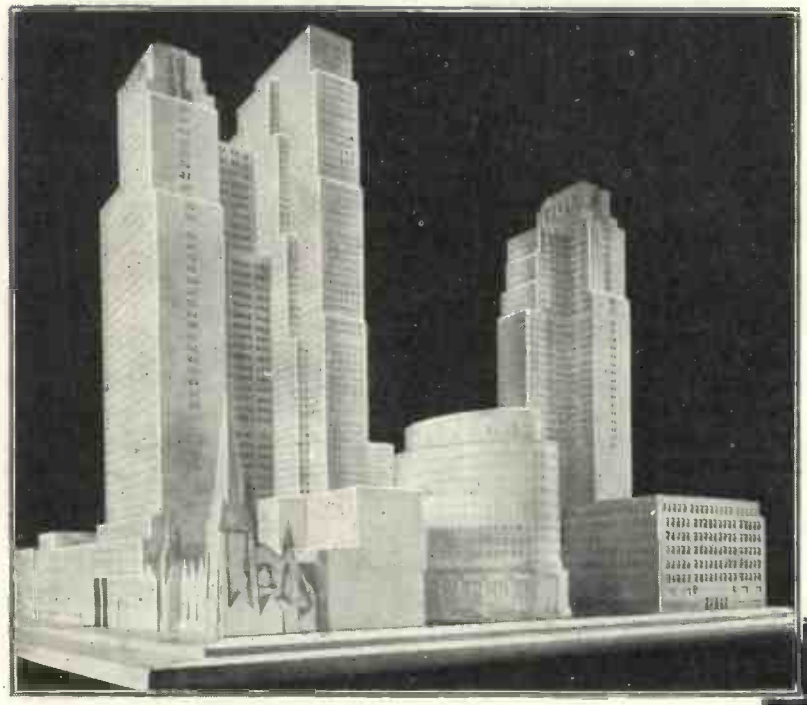
SPECIAL PRESS LISTENING HALL

There are two special listening halls in Broadcasting House for the use of the Press and other privileged visitors. The loud-speaker cabinet is designed on the box-baffle principle *(see notes on page 633)*

Statistics are notoriously dry reading, but I cannot refrain from mentioning that there are no fewer than 2,630,000 bricks in this great building, which has 1,250 stairs, 800 doors and 7,500 panes of glass. No fewer than 130 sub-contractors were involved. The actual cost has not been officially disclosed, but I understand that it is in the neighbourhood of £750,000.

That may seem to be a great deal of money, but there is no question that Great Britain now has a "show place" of the first magnitude in Broadcasting House.

BROADCASTING HOUSE—Continued



A MODEL OF AMERICA'S RADIO CITY

This group of buildings is being erected in the centre of New York. There will be broadcasting and television studios for the National Broadcasting Company, vaudeville and cinema theatres, and possibly an opera house

Throughout the building the decorations are lavish, but by no means ornate. Everything has been done in the best modern style and one cannot help thinking that expense was no object. One has to admit that it is worth it, however, for both architecturally and from the technical point of view Broadcasting House is something of which the B.B.C.—and the British listener—may well be proud.

The Studio Tower

The centre of interest to the listener is, of course, the arrangement of the studios. These, of which there are twenty-two in all, are grouped in a central tower—surrounded by air, as it were, so that they are completely insulated from all external sources of noise.

No Steel Used

Steel-girder construction was not possible in the erection of this tower, for bars of metal, as is well known, act as conductors of sound. The whole of the central portion of Broadcasting House is therefore composed almost entirely of brickwork.

The fact that all the studios are enclosed in a central tower means that they have to be artificially lighted and ventilated. Adequate ventilation gave rise to many problems. Sound can travel in air conduits and unless very special precautions are taken, what is going on in one studio would be heard in adjacent studios.

For this reason a most elaborate ventilating system had to be installed and there are miles of piping to take the air, which is previously washed and cleaned, to the twenty-two studios. Baffles are employed to restrict the passage of sound in the conduits and each studio is perfectly "sound insulated" from the next.

Temperature was another factor that presented a problem. In studios where bands and orchestras are playing the temperature rises uncomfortably unless the air is specially cooled. It was therefore necessary to make arrangements for the proper control of temperature in each studio.

This was done by installing thermostatic controls at strategic points throughout the tower (there is a point in every studio and many more besides) so that the air admitted is automatically heated or cooled by the right amount to maintain the temperature at a constant level. The humidity is also automatically controlled.

Acoustic Problems

The architects were faced with a much more difficult problem than merely providing the necessary number of rooms of the right sizes; there were acoustic considerations to be taken into account.

Modern studios do not make use of drapings on the walls and ceilings to produce the proper reverberation period. They are specially designed in the first place for the particular type of broadcast for which they are intended.

THE CONCERT HALL

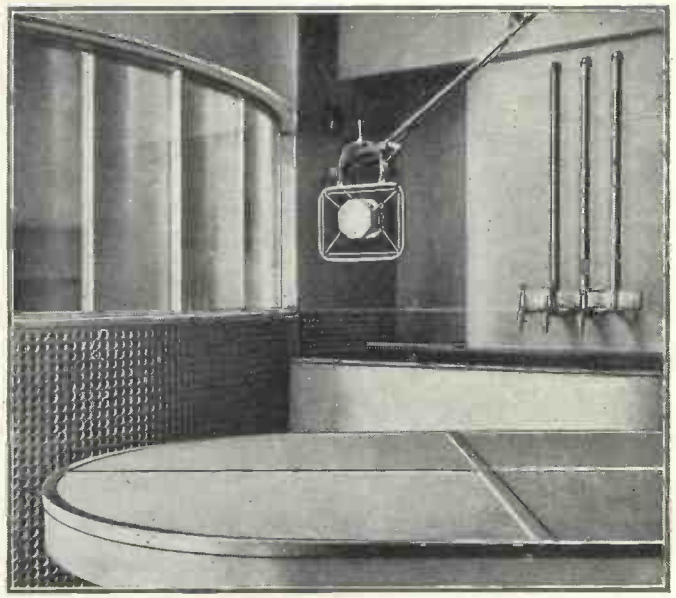
This hall will seat 744 people. The length is 105 ft., the average width 44 ft., and the height 31 ft. It is proposed that the public shall be admitted to certain concerts later

AN ARTICLE BY D. SISSON RELPH

Drapings had the effect, in the old days, of cutting off some of the top notes. In other words, there was usually a slight preponderance of bass. In the new studios this effect has been avoided and the studio "characteristics" are substantially level for all frequencies. The result can be noted by any listener to a programme emanating from Broadcasting House; reception is now more crisp and brilliant than it has been on many occasions in the past.

Studio Reverberation Periods

The reverberation period for a talks studio is lower than that for an orchestra; in other words, there is less echo. Here are some of the figures: for orchestral and band performances, 1.75 seconds; for vaudeville, light musical programmes, orchestral and band music, 1.1 seconds; for octets, chamber music, recitals, dance bands and dramatic productions, .85 second; for the Children's Hour, dance bands, speech in plays and piano music, .6 second; for debates and discussions, .45 second; and for talks, .35 second. There are also six "dead" studios, one being for talks and another for speech and plays.



WHERE THE "EFFECTS" ARE PRODUCED
In the foreground is the revolving table, which comprises six sections. There is one section of wood, one of metal, two of rubber, one of felt and another of a composition resembling granite

In all there are eleven storeys in Broadcasting House, eight being above street level. In the basement is the already famous vaudeville studio (30,000 cubic feet), known as No. BA; there is also No. BB (10,000 cubic feet), for octets, chamber music, recitals and dance bands.

The Big Orchestral Problem

Partly underground, but extending into two floors above, is the great concert hall (125,000 cubic feet), but even this is not big enough to accommodate the largest orchestras which broadcast and there is some speculation as to what the B.B.C. will do when it has to give up the famous No. 10 studio near Waterloo Bridge. This converted warehouse will probably be needed by the L.C.C. for storage purposes if work on the reconstruction of the bridge is started.

On the third floor there are five more studios: No. 3A (10,000 cubic feet) for the Children's Hour and dance bands; Nos. 3B, 3C and 3D (each 1,500 cubic feet), all for talks; and No. 3E (7,000 cubic feet) for religious broadcasts.

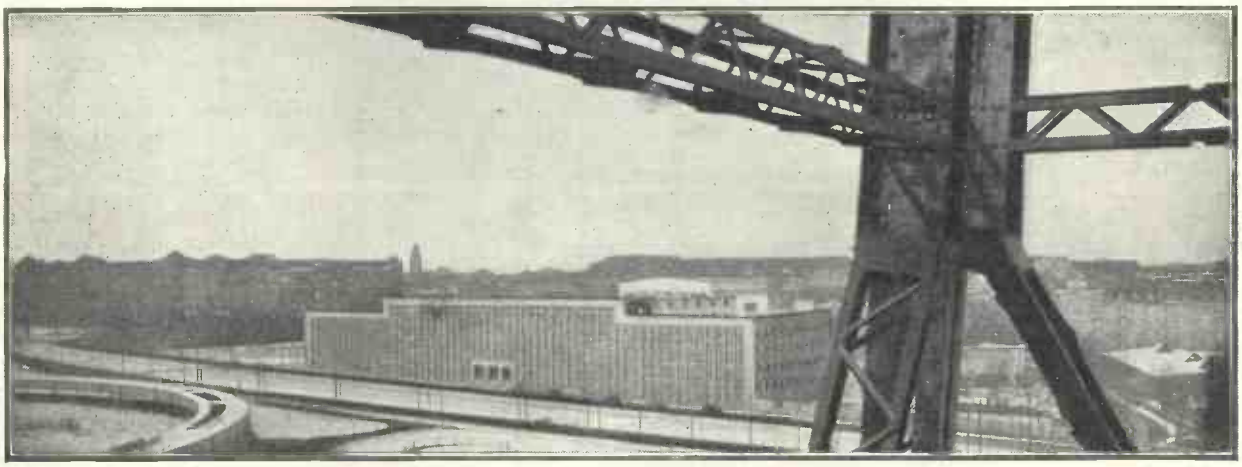
It will be noted that there are no studios on the second floor; this is to prevent any possibility of sound from the lower studios leaking through to those above.

Broadcasting the News Bulletin

Two news rooms, Nos. 4A and 4B (each 670 cubic feet), are arranged on the fourth floor, with a "late news" room in between them so that the announcers can be given "stop press" matter as they are actually broadcasting.

The fifth floor is again a "sound insulating" stage.

On the sixth floor we come to the dramatic suite,



THE CENTRE OF GERMAN BROADCAST ACTIVITIES—THE NEW FUNKHAUS
Germany's "Broadcasting House," the headquarters of the German national broadcasting organisation. The building is crescent-shaped and has been called a "factory of sound"

BROADCASTING HOUSE—Continued

GRAMOPHONE EFFECTS
These six turntables are connected to a mixing unit so that effects from several records can be combined if desired. This gallery overlooks the main effects studio

which will be used for all broadcast plays and suchlike items. The large production studio is No. 6A (10,000 cubic feet), while Nos. 6B and 6C (each 3,200 cubic feet) are both for speech in plays. No. 6D is the main effects studio (8,300 cubic feet) and No. 6E (860 cubic feet) is for gramophone effects.

Effects Studios

More studios belonging to the dramatic suite are arranged on the seventh floor. No. 7A (1,500 cubic feet) and Nos. 7B and 7C (each 3,200 cubic feet) are all for speech in plays, No. 7D (1,400 cubic feet) is a small effects studio and No. 7E (860 cubic feet) is for gramophone effects.

The two studios on the eighth floor are No. 8A (27,000 cubic feet), for orchestral and band music, and No. 8B (2,100 cubic feet), for debates and discussions. No. 8A is unique in being the only studio exposed to daylight.

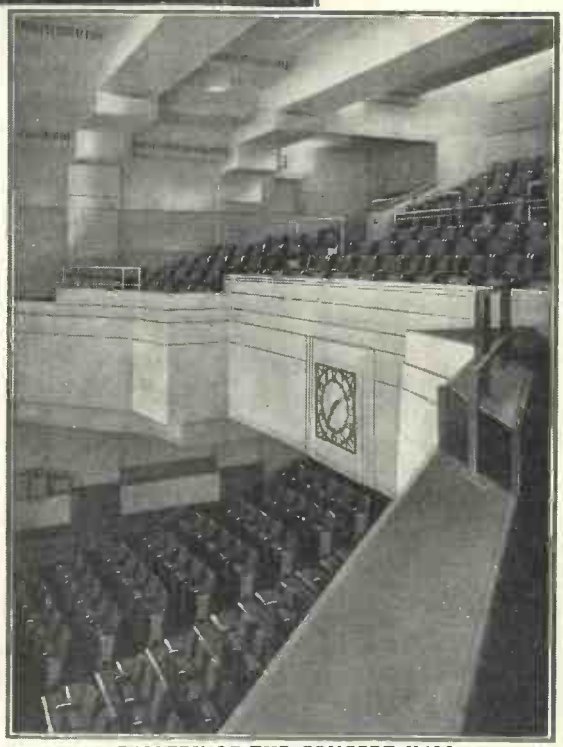
The centre of interest on the eighth floor is, however, the control room. Here the keynote has been reliability of service; everything is arranged in as foolproof a way as possible, so that there is practically no risk of a breakdown occurring. The gear is grouped in two sections, the first being concerned only with rehearsals (which go on nearly all day) and the second group with actual transmissions; this part is equipped with six control desks, the centre of Britain's whole broadcast system.

So much for the general nature of Broadcasting House. I think I cannot do better now than to go into a little more detail regarding the particular features illustrated by the photographs reproduced in these pages.

The entrance hall is of pleasing proportions and is cunningly lit, as can be seen from the photograph on page 603. The translation of the Latin inscription seen near the roof is :—

This Temple of the Arts and Muses is dedicated to Almighty God by the first Governors of Broadcasting in the year 1931, *Sir John Reith being Director-General. It is their prayer that good seed may bring forth a good harvest, that all things hostile to peace or purity may be banished from this house and that the people, inclining their ear to whatsoever things are beautiful and honest and of good report, may tread the path of wisdom and uprightness.*

There are two listening rooms of the type illustrated by the lower photograph on page 603 for the use of the Press and privileged visitors. They are notable for the stage-like background to the receivers. The latter make use of the box-baffle principle, explained in detail on page 633 of this issue.



GALLERY OF THE CONCERT HALL
Another view of the great concert hall at Broadcasting House, fitted up in luxurious style. There is accommodation for 744 people

Public Concerts

Some idea of the decoration of the concert hall can be gained from the illustrations on page 604 and 606, the former showing a view from the side of the stage and the latter a view of the gallery. It is proposed that the public shall be admitted to certain concerts held in this hall, so listeners will have a chance to see something of Broadcasting House in the future.

One of the most interesting things in the new B.B.C. headquarters is the main effects studio, a photograph of which appears on page 605. This is one of the most important sections of the dramatic-productions department; the engineers in charge here can produce almost any noise from that of a fly walking up the wall to an earthquake !

There seems to be only one thing lacking in Broadcasting House—arrangements for television broadcasts. I made inquiries and was assured that almost any studio can be adapted—when the time comes !

Everybody's Portable

COMPARED with an ordinary set employing an outdoor or indoor aerial, most portable receivers suffer because of the limitations imposed on them by the frame aerial. Readers of WIRELESS MAGAZINE know from experience, however, that a simple super-heterodyne set will give excellent results even with a comparatively small frame.

Super 60 Result

We need only remind constructors that the original Super 60 regularly received sixty or more stations with a frame aerial.

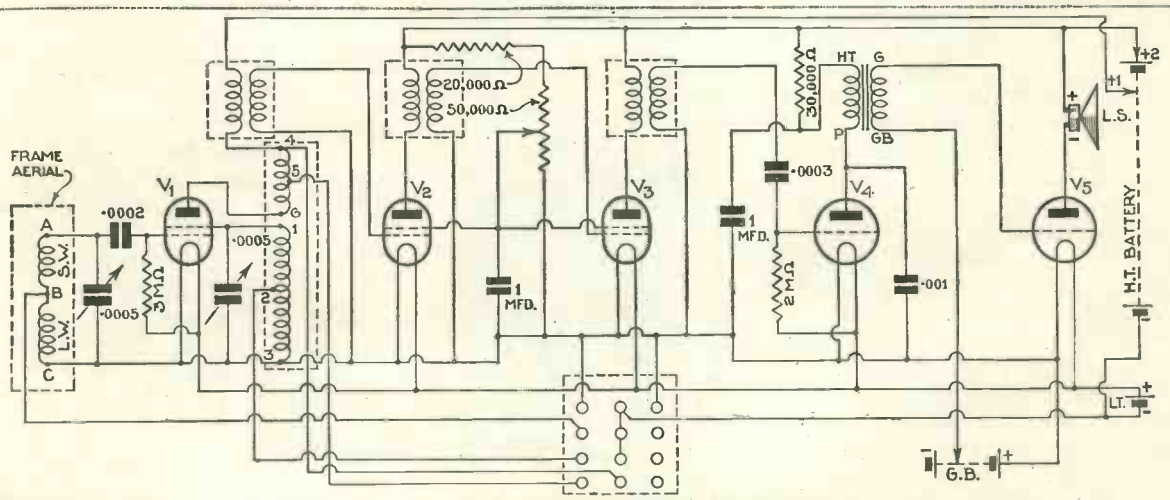
Even as a table set the Super 60 was particularly compact, and it was not long after the original publication of the design that we were inundated with requests for a portable version. The Super 60 Portable was published in May 1931, and met with immediate success.

This year we have again had numerous requests for a really good super-het portable, and here the WIRELESS MAGAZINE Technical Staff presents full constructional details of a new five-valve receiver that is in every way as good as—and perhaps better than—the super-het portable detailed in these pages last year.

Even those constructors who normally have no use for a "portable" will be interested in the design of Everybody's Portable, for it gives all the advantages of a simple super-het receiver in a case complete with aerial, batteries and loud-speaker.

In or Out of Doors

This set is ideal for use indoors or out of doors. In the house it can be carried from room to room without difficulty—a great boon when any member of the family is confined to bed for a day or two. On fine summer evenings the set can be taken out into the garden; it



POWERFUL YET STRAIGHTFORWARD SUPER-HETERODYNE CIRCUIT

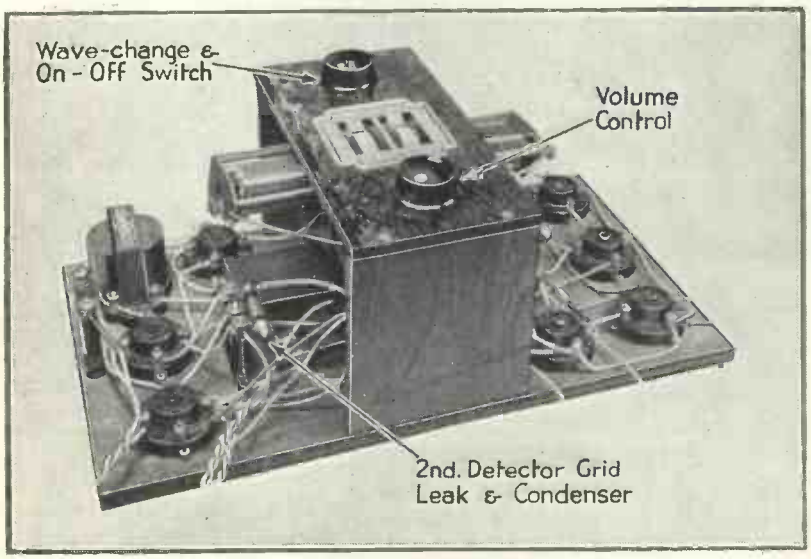
This set has a combined first detector and oscillator (actually a bi-grid valve), two screen-grid intermediate-frequency amplifiers, second detector and power valve

EVERYBODY'S PORTABLE—Continued

can be taken away in the car at weekends; and is, in fact, ready for instant use anywhere and at any time.

Those who are prejudiced regarding the results that can be obtained from a portable receiver are referred to the test report that appears on page 610. That should convince the most sceptical of the merits of modern super-het portable design.

We are able to claim that Everybody's Portable is the neatest and most attractive-looking portable that has yet been described in these pages. Although the blueprint may appear to be somewhat complicated to the beginner, the photographs reproduced in these pages will make it clear that the assembly of the set is, in fact, particularly simple.



SIMPLE ASSEMBLY AND WIRING

It will be evident that the assembly and wiring of Everybody's Portable are particularly straightforward. This is one of the neatest portable designs yet produced

One-knob Difficulties

Because of the difficulties that arise when an attempt is made to gang the tuning of a frame aerial with the tuning of the oscillator circuit, no time was wasted by the WIRELESS MAGAZINE Technical Staff in trying to produce a super-het portable with one-knob tuning.

The problem could be solved by the use of a special oscillator coil, but it was desired to use only standard parts so that constructors can obtain all the necessary components from their dealers without trouble.

Special attention has been given to the question of controls, and in the final model these have been reduced to the simplest form. A dual thumb-operated dial with two separate .0005-microfarad variable condensers is used for tuning the frame-aerial and oscillator circuits. There are two milled discs for each condenser, the outer discs giving coarse tuning for the two circuits and the inner discs giving fine tuning.

In front of these dials, looking from the front of the set, is a combined wave-change and on-off switch. When the knob is turned as far as possible to the left the set is adjusted for medium-wave reception; in the centre position the set is switched off; and when the knob is turned to the right the set is ready for long-wave working.

New Type of Oscillator

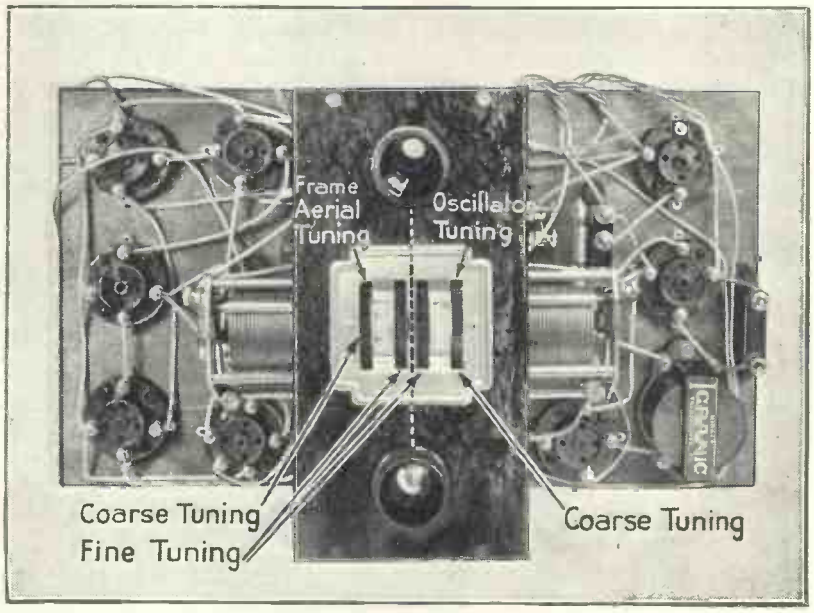
The wave-change switch controls both the dual-wave frame aerial (accommodated in the lid of the cabinet) and the dual-range oscillator (mounted direct on the baseboard). This oscillator, by the way, is a special portable type not previously used in any WIRELESS MAGAZINE sets; this receiver is the first to make use of it. It has obvious advantages in the way of saving space.

Behind the tuning dials is a volume-control potentiometer, which is, of course, turned to the right to increase volume.

Great Range

From these details it will be clear that the set is as simple to operate as the majority of commercial portable receivers, and there is no question that its range is very much greater than that which can be obtained on the average receiver of this class.

The essentials of the circuit used



ATTRACTIVE TUNING CONTROLS

The dual thumb-operated dial on the tuning condensers of Everybody's Portable is most attractive in appearance, as this photograph shows

BRINGS IN SCORES OF STATIONS

for Everybody's Portable will be familiar to most WIRELESS MAGAZINE readers. There is no need here to discuss it in great detail; we will just indicate its main features.

Sequence of the Five Valves

In all, five valves are used, and these are arranged in the following sequence: V_1 is a combined bi-grid (or double-grid) detector and oscillator; V_2 and V_3 are the two screen-grid intermediate-frequency amplifiers; V_4 is the second detector; and V_5 is the power valve.

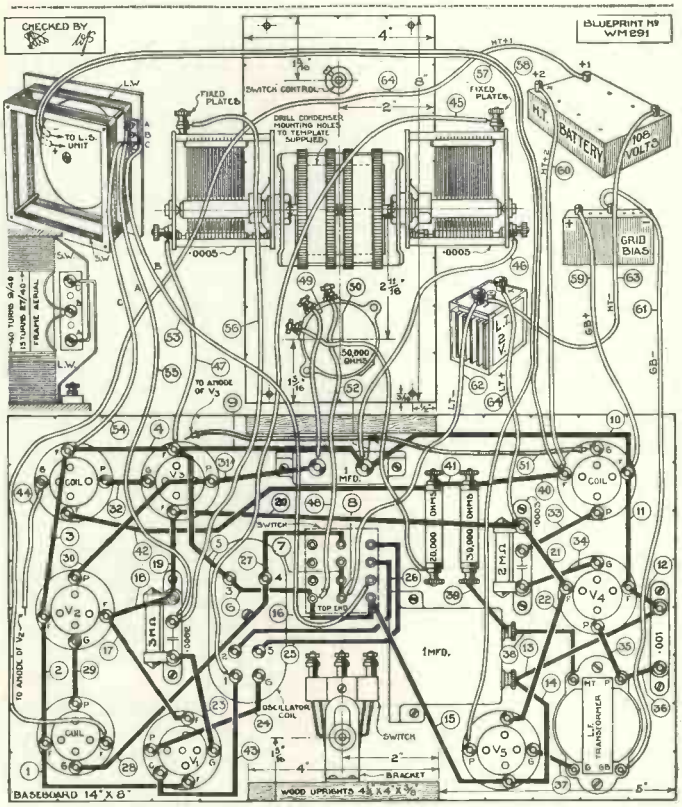
Both the first and second detectors are arranged on the leaky-grid principle for the sake of the extra sensitivity thus obtained. The second detector is, of course, of the standard three-electrode type, as is the power output valve.

For a receiver of the type, it will be seen that the circuit is particularly simple and straightforward. There is very little decoupling, but the set is quite stable in operation.

Screen-grid Voltage Control

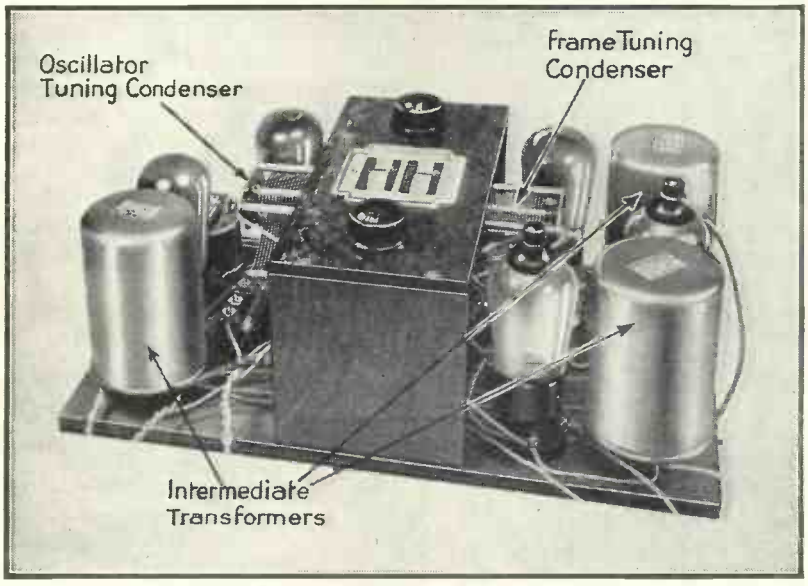
The screen circuits of both screen-grid valves are supplied with voltage from a common potentiometer. There is a 20,000-ohm fixed resistance in series with a 50,000-ohm variable potentiometer. The voltage for the screens is tapped off by means of the potentiometer slider.

Between the potentiometer slider and low-tension negative there is a 1-microfarad condenser. This, in conjunction with the 20,000-ohm fixed resistance and the portion of the potentiometer



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

If desired 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 July 31. Ask for No. WM291. Wire up in the numerical order indicated



THE IDEAL FIVE-VALVE SUPER-HET PORTABLE

The construction of Everybody's Portable is well within the capabilities even of the beginner. All the parts are standard and can be obtained without difficulty

not in use constitutes the decoupling for the two intermediate-frequency amplifiers.

The frame aerial is of the series-parallel type, with three connections, lettered A, B, and C on both circuit and layout diagram. It will be seen that the grid condenser and leak for the first detector have values of .0002 microfarad and 3 megohms respectively. These components are connected to the inner grid of the bi-grid valve, which works as a combined detector and oscillator.

Oscillator Connections

The outer grid of the bi-grid valve is taken to the dual-range oscillator coil, which has connections numbered from 1 to 6 on both circuit and layout diagram. There is nothing special about this oscillator coil except that it is of the unshielded type and occupies very small space. It is also remarkably cheap.

In the anode circuits of the first detector and the two intermediate screen-grid valves are three band-pass filter units, which give the set its amazing selectivity. These coils are tuned by the manufacturers to a frequency of approximately 126 kilocycles. Incoming signals are converted to this frequency in the oscillator circuit

EVERYBODY'S PORTABLE—Continued

Everybody's Portable on Test

PRELIMINARY tests on this set were made in the late afternoon, when a dozen stations were received at good loud-speaker strength. The daylight strength of Poste Parisien and of Brussels No. 1 were really amazing.

Later in the evening the set was given an outdoor test in a public park in South London.

On the way to the appointed place, a vaudeville programme from London Regional was tuned-in at good strength, the lid was closed, and we continued our rather long walk to the accompaniment of comedians and dance music. For a suitcase type of portable the strength of the boxed-in entertainment was very surprising and pleasing.

Having found a secluded spot in the park, Everybody's Portable was put through its paces for a couple of hours. The list of stations accompanying this report tells its own story.

This is a fifty-station portable, although only thirty-four stations were actually *identified* on this particular evening.

Stations which many three-valve sets are not capable of receiving were easily picked up on the set. London and Mühlacker were easily separated—the entertainment value of the latter station was quiet as good as the London stations.

Every station logged was heard as such good strength that even in the open air onlookers could enjoy the programmes quite a distance away. Fécamp, one of the sponsored-programme stations, gave full loud-speaker signals.

On the long waves, the most outstanding feature of the test was the reception of Moscow at full strength, and the ease with which Eiffel Tower and Warsaw could be separated. Without moving the position of the set, results far above the average for portable sets were easily obtained.

Quality was surprisingly pleasing and was certainly better than that given by many commercial portables.

Constructors will find this portable very simple to operate, especially if use is made of the dial readings given below. There should be hardly any difference between your oscillator readings and those of the original "W.M." model.

As a further test, I asked an interested onlooker if he would like to try his hand at tuning. After he had logged ten stations in less than five minutes he remarked: "This set is remarkable."

T.F.H.

Stations Received and Identified

LONG WAVES

Station	Frame Tuning	Oscillator Tuning	Station	Frame Tuning	Oscillator Tuning
Moscow	124	116	Daventry	143	127
Warsaw	130	118	Radio Paris	158	138
Eiffel Tower	133	121	Huizen	172	144

MEDIUM WAVES

Station	Frame Tuning	Oscillator Tuning	Station	Frame Tuning	Oscillator Tuning
Fécamp	16	20	Lvov	117	110
Trieste	42	42	Toulouse	119	111
Prague (No. 2)	44	45	Frankfort	121	113
London National	64	52	Midland Regional	124	117
Heilsberg	76	63	Sottens	126	119
Hilversum	78	72	Katowice	128	120
North National	81	74	Stockholm	133	129
Bordeaux	90	77	Rome	135	131
Poste Parisien	90	88	Beromuenster	147	135
Brussels (No. 2)	96	92	Langenberg	150	139
Strasbourg	100	95	North Regional	154	141
Graz	102	97	Prague	156	143
London Regional	103	100	Florence	160	146
Mühlacker	105	102	Brussels (No. 1)	162	148

and then amplified as a long-wave signal by the intermediate-frequency stages.

All three band-pass filter coils are of the same type as used in last year's Super 60 Portable, so that constructors of the original set will have no difficulty about converting their receivers to the new model.

Second Detector Current

The second detector valve has a grid condenser of .0003 microfarad and a leak of 2 megohms. A decoupling resistance of 30,000 ohms and a condenser of 1 microfarad ensure complete stability of operation at this stage of the circuit. It will also be noticed that a by-pass condenser of .001 microfarad is connected between the anode of the valve and low-tension negative.

As only a small power valve can be used in any portable receiver on account of the limited high-tension current that can be economically and conveniently taken from the battery, the loud-speaker is connected directly in the anode circuit of the power valve, without any choke-output arrangement or an output transformer.

So much for theoretical considerations; now let us turn our attention to some practical details.

In the first place, every detail necessary for the construction of the set is included in these pages, but those who prefer to work from a full-size blueprint can obtain one for half price, that is 9d., post free, if the coupon on the last page of the issue is used by July 31. Address your inquiry to WIRELESS MAGAZINE Blueprint Dept., 58/61 Fetter Lane, London, E.C.4, and ask for No. WM291.

Assembly of Parts

It will be clear from the photographs that the bulk of the parts are mounted directly on the wood baseboard. The only parts to be fitted to the small horizontal ebonite panel are the dual thumb-operated dial with its two .0005-microfarad variable condensers, the 50,000-ohm potentiometer, and the knob of the wave-change switch, which is provided with an extension spindle.

Before the construction is started, the reader should understand the arrangement of the combined wave-change and on-off switch. This is

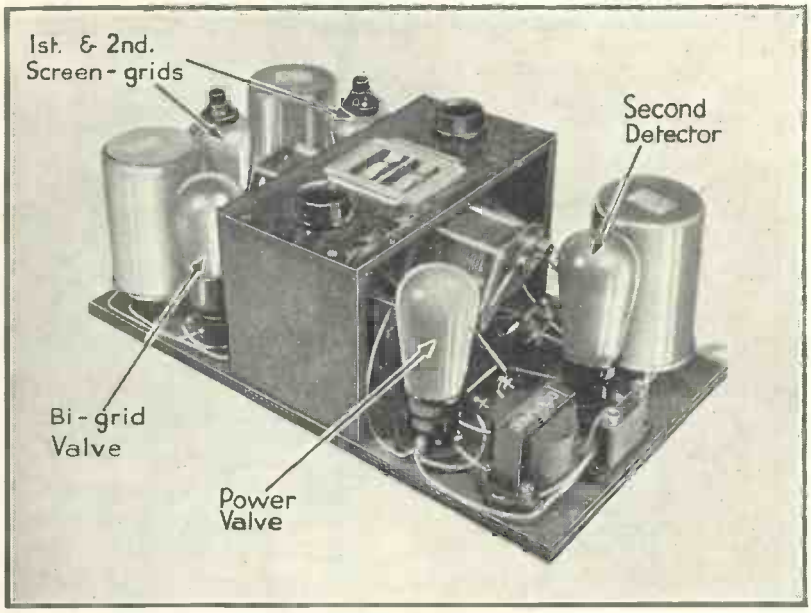
FOR USE IN OR OUT OF DOORS

fixed to one of the two wooden uprights on the baseboard by means of a metal bracket. The connections to this switch are shown in plan view to avoid confusion. (See dotted rectangle in the centre of the baseboard).

Fixing the Resistances

One other point to be noticed is the fixing of the 20,000-ohm and 30,000-ohm resistances. These will be seen on the baseboard immediately behind the 1-microfarad condenser (mounted flat). The resistances can be fixed to the baseboard by means of a piece of wire twisted round a couple of screws placed on each side of them. This method of fixing has not been shown on the blueprint to avoid confusion.

The wiring should be nearly completed before the panel is screwed to the upright wood supports, which should be fixed to the baseboard before the components are put in position.



COMPLETELY ASSEMBLED AND READY FOR PLACING IN CABINET

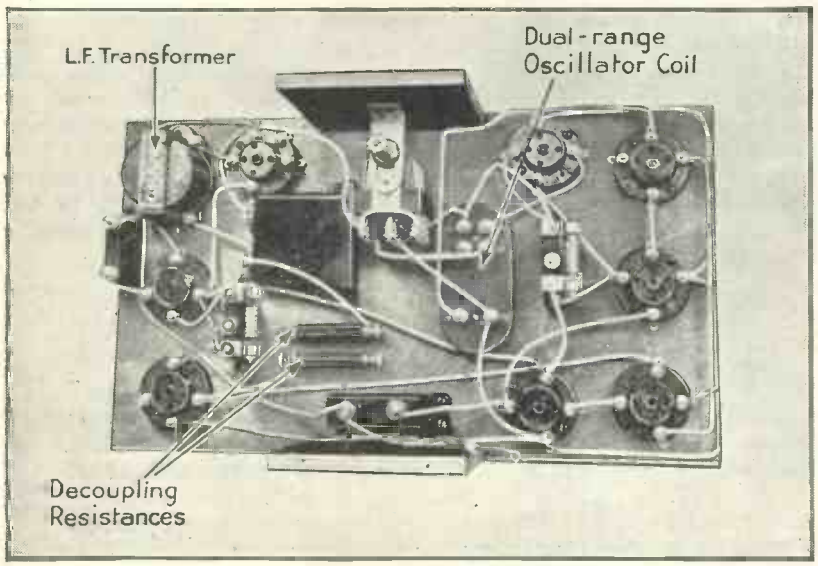
Everybody's Portable completely assembled and wired. This photograph shows the positions of the valves and the intermediate-frequency band-pass filters

Order of Wiring

Wire the leads in the numerical order indicated. It will be convenient to connect the leads to the two variable condensers (Nos. 45, 46, 47 and 48) after the ebonite panel has been screwed in position so as to keep them from wandering about all over the set.

The aerial is wound on the frame supplied with the cabinet. The long-wave section consists of 40 turns of No. 9/40 stranded wire, while the medium-wave winding consists of 15 turns of No. 27/40 stranded wire. The long-wave winding is placed close up to the loud-speaker fret, while the medium-wave winding is started from the back of the framework. The details will be clear from the top left-hand corner of the blueprint.

Particular note should be made of lead No. 51, which is a metal-braided cable. The outer covering is earthed to low-tension negative by the short lead No. 52.



POSITION OF OSCILLATOR COIL AND SWITCH

This view shows the small space occupied by the oscillator coil. The position of the combined wave-change switch and on-off switch is also clear

Suitable Valves

Care should be taken in the choice of valves for Everybody's Portable, not because the circuit is critical, but because in a portable set every valve must pull its full weight for really satisfactory results. Constructors are recommended to use only those types specified in the list of parts on the next page.

It will be noted that the high-tension battery is only of 108 volts, and not the customary 120 volts. We have been unable to find any 120-volt battery that will fit into the space available. Tests have proved, however, that with a maximum voltage of 108 the set is quite satisfactory in operation and will bring in scores of stations.

Unspillable Accumulator

The accumulator used is of the jelly-acid type and is quite unspillable. It has a capacity of 28 ampere-hours, so that, with a total filament consumption of .6 ampere, the accumulator should give a life of 46 hours after each charge.

Those who intend never to take the set out of doors and whose houses

EVERYBODY'S PORTABLE—Continued

COMPONENTS NEEDED FOR EVERYBODY'S PORTABLE

COILS
3—Wearite super-het intermediates, type OT1, £1 11s. 6d.
1—Wearite oscillator, type 03, 4s. 6d.

CONDENSERS, FIXED
1—T.C.C. .0002-microfarad, SP type, 2s. 4d.
1—T.C.C. .0003-microfarad, SP type, 2s. 6d.
1—T.C.C. .001-microfarad, type 33, 1s. 10d. (or Dubilier, Telsen)
2—T.C.C. 1-microfarad, type 50, 5s. 8d. (or Dubilier, Telsen)

CONDENSERS, VARIABLE
1—Ormond dual .0005-microfarad with escutcheon and disc drives, type 417/486, 15s. 6d.

EBONITE
1—Becol 8 in. by 4 in. panel, grained finish, 2s. (or Lissen, Peto-Scott)

HOLDERS, VALVE
8—W.B. four-pin miniature type, 5s. 4d.

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)

RESISTANCES, FIXED
1—Graham Farish 20,000-ohm Ohmite, 1s. 6d.
1—Graham Farish 30,000-ohm Ohmite, 1s. 6d.
1—Dubilier 2-megohm grid leak, 1s. 9d. (or Lissen, Telsen)
1—Dubilier 3-megohm grid leak, 1s. 9d. (or Lissen, Telsen)

RESISTANCE, VARIABLE
1—Wearite 50,000-ohm potentiometer, type QVC, 4s. 6d. (or Colvern)

SUNDRIES
Tinned copper wire for connecting (Lewcos)
Lengths of oiled cotton sleeving
Lengths of rubber-covered flex (Lewcos)
10 in. of metal-braided wire (Lewcos)
2—Pieces of wood, 4 in. by 4¼ in. by ⅜ in.
3—Small terminals for frame aerial.
Box of Lewcos frame-aerial wire, type DMS, 9s.

SWITCH
1—Wearite four-pole change-over with extension spindle and window knob, type I24/EP, 5s.

TRANSFORMER, LOW-FREQUENCY
1—Igranic Midget, ratio 1 to 3, 10s. 6d.

ACCESSORIES

BATTERIES
1—Pertrix 108-volt portable type, 14s.
1—Pertrix 9-volt grid-bias, 1s. 6d.
1—Fuller 2-volt unspillable, type JME9, 14s.

CABINET
1—Camco Everybody's Portable cabinet, with fittings, £2 5s.

LOUD-SPEAKER ASSEMBLY
1—Ormond portable chassis and unit, type Nx60, £1 5s.

MAINS UNIT (In place of high-tension and grid-bias batteries)
1—Tannoy, type P1, £2 19s. 6d.

VALVES
1—Osram DG2, £1
2—Mullard PM12, £1 13s.
1—Osram HL2, 7s.
1—Osram LP2, 8s. 9d.

are supplied with A.C. mains will be interested in the possibilities of using a mains unit for obtaining a supply of high tension.

The particular unit specified in the list of parts has been tested in the set and found to give excellent results. It has the further advantage of also giving grid bias for application to the power valve.

Mounting the Loud-speaker

The loud-speaker is mounted in the lid of the cabinet. It is obtained from the manufacturer as a complete cone chassis with unit and is very easily fixed to the fret supplied with the cabinet.

Those who built the Super 60 Portable last year and wish to convert it to Everybody's Portable can, of course, do so without altering the original frame aerial or loud-speaker.

Special wooden covers are supplied by the cabinet manufacturers to go on each side of the ebonite panel. If these are not used the components and valves will be exposed to dirt and dust. With the wooden side pieces in position the set is particularly neat in appearance.

The operation of the set is not at all difficult, and can be undertaken by any member of the family after a few minutes' practice.

The set is switched on by turning the combined wave-change and on-off switch to the left or right. As already explained, if the knob is turned to the left the set will be adjusted for medium-wave reception, while when it is turned to the right the set will pick up long-wave transmissions. The switch controls both the frame aerial and the dual-range oscillator coil.

Before the knobs of the two main tuning condensers are turned, the volume control should be adjusted for maximum volume by turning the knob to the right.

Dial Readings

The two outer condenser discs should then be turned in unison until a station is picked up, fine tuning being accomplished by the two inner discs, which give very fine control. Approximate readings of both dials for the reception of most of the important European stations will be found from the list included in the test report on page 610.

It should be remembered that the frame aerial has distinct directional properties. Always the front edge of the cabinet should be placed in line with the direction of the station it is desired to receive. This feature is of particular value when interference is experienced between any two stations working on adjacent wavelengths.

Moving the Frame Aerial

By turning the frame aerial round (in this case by turning the whole of the cabinet, which should preferably be mounted on a small turntable) the interfering station can usually be cut out and the desired transmission received without interference. This cannot be done, of course, if the stations are in a direct line.

From the success the Super 60 Portable achieved in a few months last year—and the number of inquiries we have had for a new receiver on similar lines—we have no doubt that Everybody's Portable will soon take its place as the standard home-constructor's portable receiver for 1932.

ANOTHER FINE ISSUE OF "W.M." FOR AUGUST

Many fine features are being prepared for the August issue of "Wireless Magazine," which will be published on Thursday, July 21.

All the regular features for which "W.M." is so well known will be included. Percy W. Harris will continue his "Components As I Know Them" series with an article on transformers. The "Wireless Magazine" Technical Staff has something special up its sleeve in the way of a mains short-wave receiver, a preliminary announcement of which appears on page 662.

Make certain of getting your copy by ordering from your newsagent now.

LOOK OUT FOR IT ON THURSDAY, JULY 21

RADIO ADVERTISING

By PERCY W. HARRIS, M.INST. RAD.E.

Artists taking part in a broadcast sponsored by an American Shoe Manufacturer

AT the various times when British broadcast programmes are criticised—and that means practically always, for it is the Englishman's privilege to grumble—one often hears the remark: "Well, thank goodness, however bad our programmes are, we don't get advertisements of pills and soap shouted at us like they do in America!"

The assumption seems to be that radio advertising must necessarily be bad, or at least distasteful to the listener.

I have recently completed a year's stay in the United States, during which time I have probably listened to radio programmes from more stations and to a greater extent than even the average American. I worked with radio apparatus; my room in the giant hotel where I lived in New York was fitted with a loud-speaker and a four-point switch giving me the choice of four different programmes from leading stations.

In the Studios

I frequently had the privilege of being present in the studios when programmes were being put "on the air."

The result of all this experience is that when I am asked my opinion on radio advertising I am bound to give the same answer as the musical professor gave the mother of one of his pupils when asked what he thought of her daughter's execution—"I am in favour of it."

Radio advertising can be either offensive or inoffensive. Never forget that if it is offensive it defeats its object in two ways. Firstly, the listener will be prejudiced against the product advertised and, secondly, with the variety of alternatives available in America, he will immediately switch over to another programme.

There is also another angle which has an important bearing on the subject. The management of the numerous broadcasting stations in the States are dependent on advertising for revenue. Many of them are admirably managed with a clear understanding both of what the public requires and what will best suit the requirements of the advertiser.

As, with the negligible exception of a few stations which are subsidised for propaganda purposes, the sole revenue to provide programmes comes from advertisers, the owners of the stations know full well that the revenue-earning success of their stations must be measured by the popularity of the programmes. No advertising matter is allowed which is likely to provoke the listener to switch over to another station.

I am now thinking, of course, of the responsible stations which have a reputation to uphold. There are a number of stations, however, which will put anything "on the air" if they are paid for it, and so at times one hears most appallingly crude advertising, such as a long list of special bargains in dollar shirts in all the best fancy patterns to be obtained from So-and-so's Stores No. 3, 491 Fourth Avenue, or the alleged virtues of some special food product.

These extreme cases are frequently quoted over here as if they were typical. The stations indulging in this kind of publicity have an extremely limited clientele of listeners and the advertisers are usually small people who have been persuaded to part with a few hundred dollars to some plausible radio canvasser. They seldom repeat as results are poor.

Two regular items of radio advertising stand out in my mind as excellent and inoffensive programmes having a strong listener interest with very excellent publicity value for their sponsors. Although I questioned listeners extensively to obtain their reaction to radio advertising I never once heard a complaint about either of them, or for that matter about any of the really big features by national advertisers.

Special Time Signals

At certain hours of the day a time signal is given from a number of stations in a form similar to this: "Six o'clock B-U-L-O-V-A, Bulova Watch time." That is all, just the time signal and the spelling out of the name of a nationally known watch.

The advertising value of this is immense, for the time and the name of this watch become intimately associated in the minds of the public. The company, of course, pays heavily for this privilege, knowing full well that if it attempted a long description of the virtues of its watches listeners would resent it and switch over to another station.

The second item I would mention is the most famous of all the comedy teams. Amos 'n Andy. These two

RADIO ADVERTISING—Continued

comedians (who are actually white men, but give a nigger turn) come on every night between 7 and 7.15. In common with millions of listeners I came to appreciate this turn so much that if I happened to be in the vicinity of a radio set about this hour I would always switch on to any station from which it was being broadcast.

Telephone Clue

The popularity of the turn in question can be gauged from the fact that it is reported that from 7 to 7.15 p.m. the normal use of the telephone in the New York area drops heavily, only to rise again to normal as soon as the turn is completed!

Amos 'n Andy is an example of direct advertising judiciously carried out. As the actual advertising is standardised and the time given to it strictly limited, no offence is caused.

The turn opens with the playing by a string quartette of an air which has come to be identified with the programme and enables one to tune in.

The announcer then begins as follows: "Wednesday night, 24th February (or whatever the date happens to be) Amos 'n Andy, brought to you by the Pepsodent Company, makers of Pepsodent tooth paste and Pepsodent antiseptic."

Then follows a very short talk on something to do with the teeth, usually introducing some new and interesting facts without reference to their particular product. This little talk finishes with the slogan "Use Pepsodent twice a day and see your dentist twice a year."

The announcements then briefly summarise what happened on the previous evening, something in this fashion: "Last night, you remember, Andy received a visit from the Kingfish, who pressed Andy to repay his debt. As the scene opens Amos 'n Andy are discussing how they will raise the money. Here they are!"

Amos 'n Andy then do their turn, in which there is not the slightest reference, direct or implied, to the toothpaste product. It is a pure comedy turn done with extreme skill, different each night and arranged so that while each item can stand by itself, it is intimately connected with what preceded it and what will follow. At the end of their turn there is a further brief advertising announcement and the item is concluded.

As the advertising proportion of this item is strictly standardised as to time it is quite a simple matter to avoid, if you want to, the preliminary announcement, but in my experience few people do as the little dental talk frequently interests them.

It is very significant that in 1931 practically every one of the big national advertisers increased their appropriation for broadcasting, which is a clear, cold-blooded proof that people *do* listen and *do* respond to judiciously carried out radio publicity.

The big fees which are paid for "time on the air" are a further indication of success, while competition between national advertisers is such that remarkably fine programmes are sponsored by such firms. Opera singers and big orchestras are commonly broadcast in this way.

Again, a well-known coffee firm puts Maurice Chevalier on the air for a series of Sunday evening programmes and the fact that Chevalier's inimitable singing of "Nobody's Doing It Now!", "You Brought a New Kind of Love to Me," and his other favourites are preceded and followed by a simple statement that "this programme is brought to you by the So-and-so Coffee Company, makers of So-and-so," did not jar upon my nerves half so much as "This week's *Listener* contains a fascinating article on 'Do Worms Steer when Turning?'" or the crude boosting of *World Radio*.

Current Events

For the man who likes to keep abreast of current events there is always the nightly talk by Lowell Thomas sponsored by the *Literary Digest*. This is preceded and followed by a very short note regarding the *Literary Digest* and its special feature, and is certainly admirably done.

It resembles in many ways Mr. Vernon Bartlett's weekly talks on "The Way of the World," except that it deals with events daily instead of weekly. I wonder how many British listeners would really resent hearing the statement (if it were really the case, which it isn't!) that Mr. Vernon Bartlett's talk was brought to us by arrangement with one of our literary weeklies, the talk being followed by about half a minute's statement of the leading articles in the next week's issue?

Certainly they would resent it much less than the frequent advertising of the *Radio Times*, the *Listener*, *World Radio*, and the *B.B.C. Year Book* which takes place in spite of the B.B.C.'s professed antipathy to advertising in any shape or form in its programmes.

America Fed Up

One sometimes hears it said that America is fed up with radio advertising and would welcome the British system. I wonder!

Of course many Americans, probably most of them, would be glad to have the programmes provided *without* the advertising announcements, but I am certain they would not be prepared to sacrifice any quality of the programmes just to lose the advertising. After all, it is entertainment we are all after.

Are *our* programmes really free from advertising?

There is much in the British programmes which is really advertising not paid for. Perhaps you have heard the Filmophone, Decca and H.M.V. broadcasts from Paris on Sunday. That, of course, is radio advertising and is paid for.

Christopher Stone announcing a Decca record from Paris on Sunday is advertising. How then can Christopher Stone announcing a Decca record from the London station on Friday be considered otherwise? In America, if the film critic of a daily newspaper gave a broadcast the paper would have to pay for it heavily! In England it does not.

If advertising by radio is bad, why interleave all the programmes with *Radio Times* advertising? If *World Radio* were an independent paper, would the B.B.C. advertise it?

Does their ownership of it affect the principle at all?

There are many more questions of this kind I could ask. Keith Prowse must not sell concert tickets by radio, but the B.B.C. can and does. It all seems very illogical.

But, then, being illogical is half the fun in life!

News From The Set Makers

NEW McMICHAEL PORTABLE

ONE of the most interesting points about the McMichael Duplex sets is the tuning scale, on which the makers have obviously expended a great deal of thought.

To avoid all possibility of confusion in operation, the pointer is ingeniously fixed to the wave-change switch, so that as you change from one band to the other the pointer is moved from one scale to the other.

The new set is in a figured-walnut cabinet with modern lines, as will be readily appreciated from the picture.

UNUSUAL DESIGN
There are many points of originality about the McMichael Duplex Four, an outstanding battery receiver

Automatic grid-bias is another feature, enabling battery connections to be cut down to a minimum, and avoiding over-biasing.

The price is 17 guineas, all ready for working, and the makers are L. McMichael, Ltd., of Wexham Road, Slough, Bucks.

◆ ◆ ◆

SUPER-HET FOR ALL WAVES

I was recently invited to attend a demonstration of a new all-wave super-het. The new set, which was tested out under rather unfavourable conditions at Hendon, is an all-British production to be marketed soon by the Rothermel Corporation, of 24 Maddox Street, London, W.

There are six valves, as well as a valve rectifier for the mains supply.

Nine-kilocycle separation is the order of selectivity claimed, and from the results obtained at Hendon I should say this is no exaggeration.

The cabinet is free from resonances, being constructed, as I observed, of walnut, and measuring 18 in. high, 15½ in. wide, by 11½ in. deep.

Delivery of the set is not promised until the end of July. I am told that

NEAT SUPER-HET CHASSIS
This is the chassis of the new Rothermel six-valve receiver. It is operated from A.C. mains

a radio-gramophone version is also to be produced, and at a distinctly competitive price.

The set is for A.C. mains, from 100 volts upwards. No D.C. version is indicated.

◆ ◆ ◆

MEET THE NOMAD

The first of the G.E.C.'s new season's sets—the Nomad—has been announced.

Released to the trade on June 6, this new set is a four-valve console for D.C. mains, selling at 23 guineas. The great feature is the use of the new Osram D.C. mains valves.

Two screen-grids precede a power-grid detector, with three stages of high-frequency transformer tuning, giving great selectivity.

ALL-WAVE RECEIVER
This Rothermel six-valve super-het receiver is arranged for the reception of short, medium and long waves

I see the makers have prepared for next season's interference by including a high-note filter in the anode circuit of the last valve.

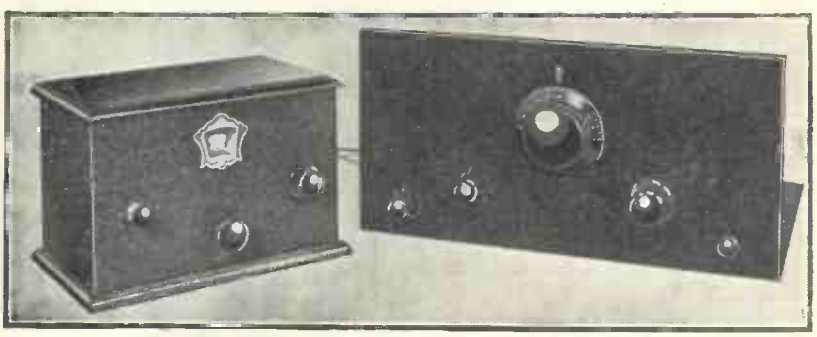
The set is suitable for D.C. mains between 200 and 260 volts, and the average running cost is very moderate, the power consumption being 75 watts (varying according to the supply) representing about 15 hours running per unit.

◆ ◆ ◆

A SELECTIVITY GADGET

Old sets that are unable to cope with modern selectivity problems may be given a new lease of life with the addition of the Pilot band-pass unit, which is a neat and compact tuner, price £1 5s., recently introduced by the Peto Scott Co., Ltd., of 77 City Road, E.C.1.

This band-pass tuner can be added to almost any set having simple aerial tuning, and it covers both medium and long waves. *Vanguard.*



TO INCREASE THE SELECTIVITY OF YOUR SET
This is the Pilot band-pass unit made by Peto Scott's. It can be added to almost any existing receiver

SCOTTISH BROADCASTING

Now that the Scottish regional station at Falkirk is on the ether, steps are being taken to increase the programmes of Scottish interest. Listeners in the north will be interested in this special article by KENNETH ULLYETT

WHEN up in Scotland for the opening of the Falkirk station, I took the opportunity of going along to see the studios in Edinburgh and Glasgow.

There is an immense friendly rivalry between the two cities. It does not take a Sassenach long to find that out ! I can understand Glasgow feeling peeved when, over a year ago, the studio headquarters was moved to the capital.

To see whether the move had been justified, and how the new studio facilities compared with those in London, I walked down Queen Street, Edinburgh, until the familiar letters " B.B.C." called a halt. The old Queen's Hall, towards the east end of Queen Street, has been converted into a fine studio centre. A keen young Scot in national costume conducted me round.

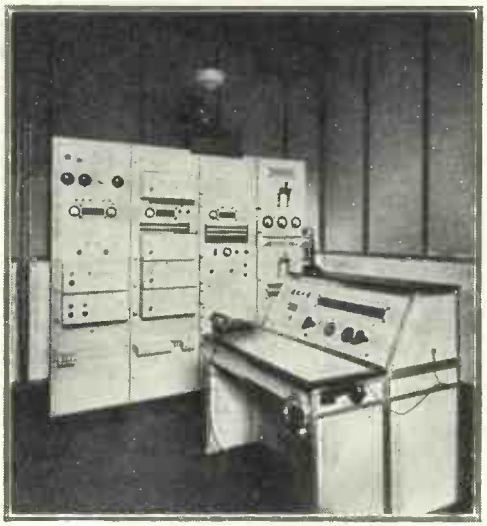
There are three studios, the main one being the concert hall of the old Queen's Hall building. The stage has been left in position, but modified; the walls are covered with a special fabric; and the high domed roof has been treated acoustically.

Clever Lighting

My first impression of this huge studio (it compares favourably with the concert-hall studio in the London Broadcasting House) was from the gallery, where a small audience can sit in comfort and watch artists on the stage. There is clever stage style lighting.

There is a smaller studio, the outstanding effect of which is green and silver. They use it for radio plays and for the Children's Hour. Then there is the small talks studio.

Until the opening of Falkirk, the Edinburgh studios had provided the programmes for the local relay and Glasgow had been comparatively independent, giving its own programmes through its own relay. Regular programme exchanges had been made. Now, said the Edinburgh official, they were refitting the studios at Glasgow so that all six will be used to feed the Falkirk station.



SCOTTISH CONTROL
The control desk and amplifiers at the Scottish regional transmitting station. It is located at Westerglen near Falkirk

On I went to Glasgow, where the genial Mr. Andrews showed me what alterations were intended. I saw the small talks, effects and gramophone studio, the medium-size No. 2 studio, and the large orchestral studio which faces out into the quiet of a Glasgow city square.

The Glasgow station building is right in the most convenient part of the city. The old relay transmitting gear which, on the occasion of my visit, was in the process of being dismantled, was about three-quarters of a mile out.

There are miles and miles of lead-shielded cable connecting the studios to the amplifiers and through to a dramatic control panel, so that Glasgow will be absolutely up to date in its radio-play production.

Six Studios

Falkirk will thus be fed by three studios in Glasgow and three in the capital. With six studios to feed the regional outlet of Falkirk, there is every opportunity of giving Scottish programmes to Scotland.

The Scottish Philharmonic Orchestra will be heard, and there will be further broadcasts from provincial centres in September.

The studio orchestra is one of the most popular in Scotland.

While the general standard of entertainment will be high, the national interest will be strong. Highland *Ceilidhs* and Chaumer concerts from Aberdeen (provided by the peasants of Old Aberdeenshire) will feature in the broadcasts.

THE MAIN STUDIO AT EDINBURGH
In the foreground is the waiting room of the main Edinburgh studio, a converted concert hall. The curtain and stage can be seen through the opening on the right

THE IDEAL A.C. HOME SUPER

Here the "Wireless Magazine" Technical Staff describes the construction and operation of a companion set to the battery-operated Ideal Home Super. Although employing one valve less the A.C. set, which is arranged as a complete radio gramophone, is even more efficient than the battery version

MANY constructors feel that the building of a large A.C. mains set is beyond their capabilities. Why this should be so it is difficult to say; the idea seems to be based on a misconception of the real differences between a battery-operated receiver and an equivalent A.C. version.

Actually, there are only three points of difference between them, and these add very little complication to the construction and operation.

Wiring a Mains Set

In the first place, the batteries have to be replaced by apparatus to take the necessary voltages from the mains. There is nothing difficult about that. It is true that care must be taken with the wiring to avoid short-circuits; the voltage output of the mains gear is higher than that of the average battery used, but it is not so high as to be dangerous provided that reasonable precautions are taken.

The wiring is very slightly complicated by the fact that five-pin holders are needed for most A.C. mains valves. This, however, is a small point and will not deter any keen constructor from building a mains set.

A third point of difference between the normal battery set and an A.C. set is that the latter needs more complete decoupling. That complicates the construction very little, however, for the resistances required simply take the place of ordinary connecting wires and there is no difficulty about connecting up the extra few by-pass condensers that have to be employed.

These notes are intended to reassure the constructor who is dubious about building his own mains receiver, but we know already from requests that have been received for this particular design that several hundreds will be built up without delay.

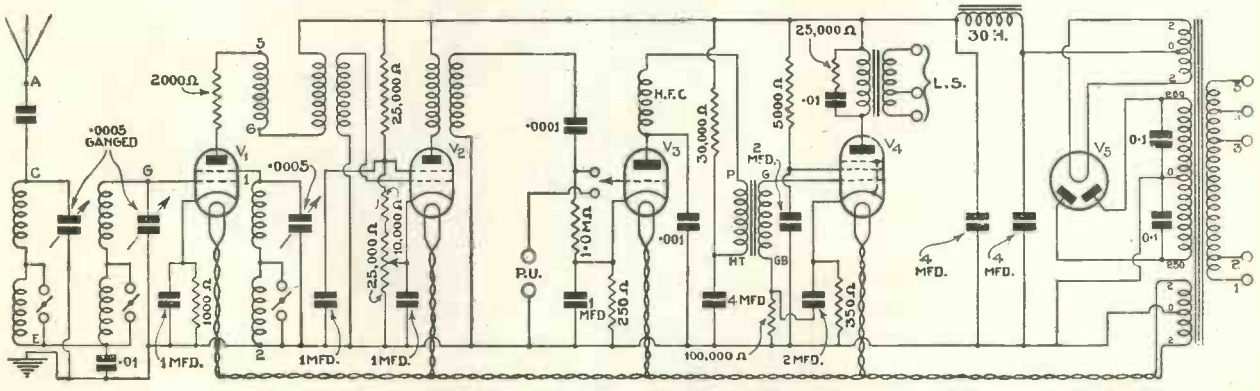
This set is simply an A.C. version of the Ideal Home Super, the five-valve battery super-heterodyne receiver that was fully described in the April issue of "Wireless Magazine."

Minor Modifications

As far as possible the same circuit has been used, but certain minor modifications have been made to ensure that the A.C. version will be absolutely stable in operation.

Broadly, the circuit consists of a bi-grid first detector, an intermediate stage using a variable-mu screen-grid valve, a second detector of the three-electrode type, and a pentode giving an undistorted output of the order of 2 watts.

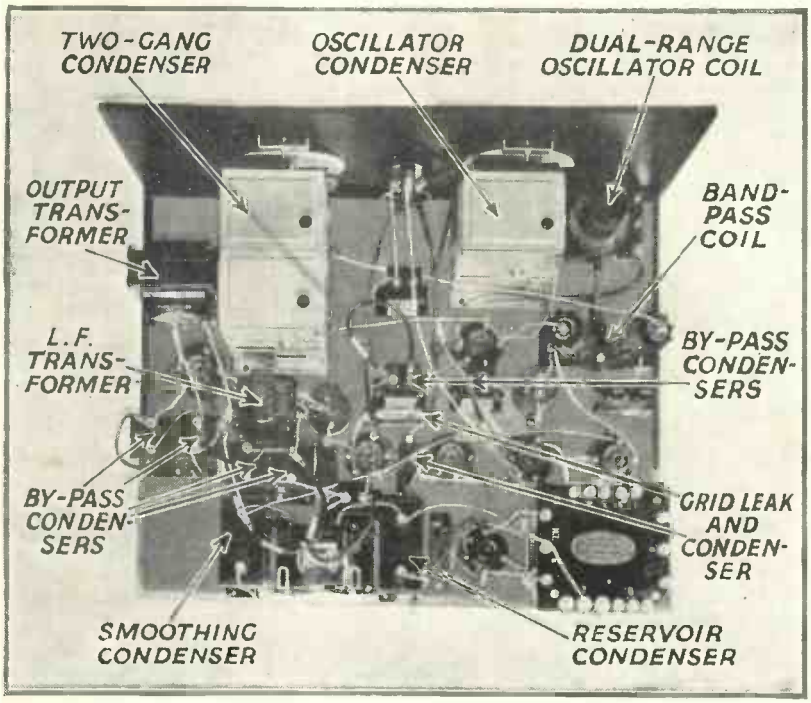
The set as shown in these pages is



CIRCUIT OF A FOUR-VALVE SUPER-HETERODYNE RECEIVER ARRANGED AS A RADIO GRAMOPHONE

The Ideal A.C. Home Super is a companion to the battery-operated Ideal Home Super, but owing to the greater efficiency of mains valves the A.C. version has one less valve than the battery model

THE IDEAL A.C. HOME SUPER—Continued



PLAN VIEW OF THE IDEAL A.C. HOME SUPER
This special photograph shows clearly the disposition of all the parts on both panel and baseboard. The mains unit is an integral part of the design

arranged as a complete radio gramophone, but the gramophone part can easily be omitted if desired.

Owing to the great power output given by the pentode it is necessary to be able to control the volume for both radio and gramophone reproduction.

The easiest and best way of controlling volume on radio is by varying the grid-bias voltage on the variable-mu valve, and that is the method adopted here. Gramophone volume is controlled by means of a potentiometer connected directly across the pick-up.

Simple Controls

Apart from the gramo-radio switch and the gramophone volume control, the controls on the Ideal A.C. Home Super are the same as those used on the battery set. There is a single wave-change switch that actuates both the band-pass aerial input coil and the dual-range oscillator coil. Two tuning condensers are used, one being a two-gang .0005-microfarad model for the band-pass circuit and the other a single .0005-microfarad model for tuning the oscillator circuit. There is also the grid-bias potentiometer for controlling radio volume and a mains on-off switch.

It will therefore be evident that there is nothing difficult about the operation of the receiver; after a little practice any member of the family will be able to bring in scores of stations from all over Europe and play gramophone records whenever desired.

The "Wireless Magazine" favours the building of A.C. sets complete on one baseboard; it will be seen from the illustrations that in this case all the mains apparatus is assembled on the baseboard as an integral part of the receiver. There is no separate mains unit that has to be connected to the set with extra wires.

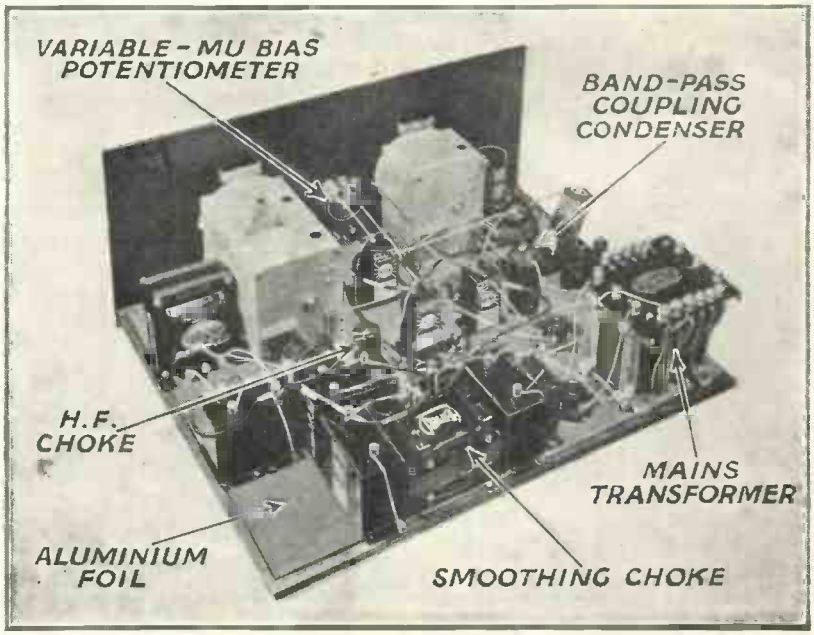
This method has the advantage that the set can be tested as a complete unit before being finally housed in the cabinet. Moreover, should anything ever go wrong the whole set can be pulled out of the cabinet and inspected without difficulty.

High Anode Voltage

A great advantage of an A.C. set over the equivalent battery version is that higher anode voltages can be obtained at very little expense. The expense of running a set from the mains is so low that the difference in cost between a load of 20 milliamperes and a load of 60 milliamperes is negligible.

This means that for a given number of valves the A.C. set is much more efficient than the battery version because there is more power available for running the valves.

A most important point is that a really large power valve can be used without any worry about maintenance cost. It is impossible



A FINE RECEIVER THAT WILL BRING IN SCORES OF STATIONS
The Ideal A.C. Home Super is an elaborate set, but its construction is no unduly complicated. A test report appears on page 620

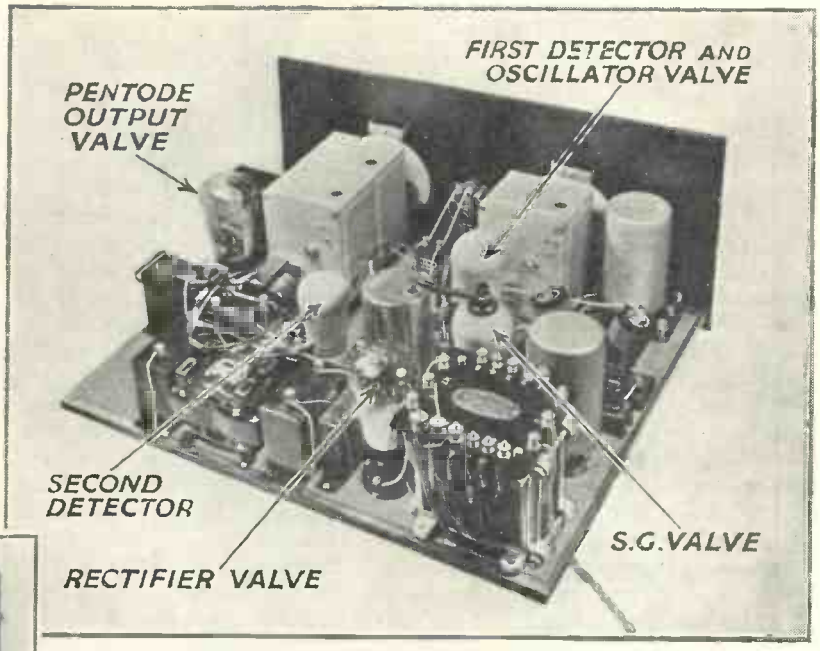
A REALLY GOOD MAINS SUPER-HET

to get anything like 2 watts from a battery set on account of the great cost of suitable batteries.

Not only is the A.C. set more powerful as regards actual loud-speaker output, but it is even more sensitive than the battery set. That much will be clear from the test report included in these pages.

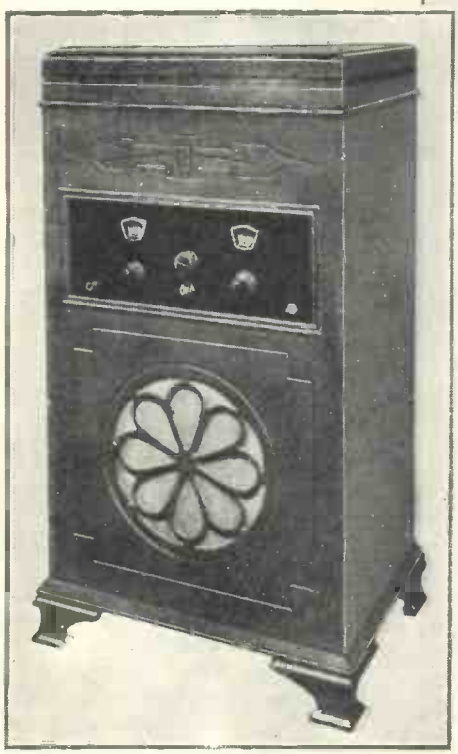
There is no need here to go into the details of the circuit. Very complete decoupling has been provided and extensive tests have shown that there is no mains hum.

The high-tension consumption is about 50 milliamperes at 250 volts; in fact, the mains transformer is so arranged that this voltage can be obtained on the valve anodes after allowing for the voltage drop caused by the automatic grid-bias devices.



COMPLETELY WIRED AND READY TO GO IN CABINET

Here is the Ideal A.C. Home Super ready for putting in its cabinet. A valve is used for rectifying the A.C. mains supply to D.C.



A HANDSOME RECEIVER

This photograph shows the handsome appearance of the finished receiver, which will hold its own with many commercial products costing double the price

It will be noticed that grid bias is applied in this way to the bi-grid first detector, to the second detector (but only when being used as a gramophone amplifier), and to the pentode output valve. The variable-mu screen-grid valve is also supplied with automatic grid bias, but in a slightly different way.

As far as possible the same components have been used in the construction of this set as were employed for the Ideal Home Super. In certain cases, however, modifications have been made.

Owing to the fact that the second detector valve takes an anode current of the order of 5 milliamperes, it has been necessary to use a larger low-frequency transformer to couple this valve to the pentode. The transformer used in the battery set could have been employed if resistance feed had been adopted, but this was avoided owing to the voltage drop that would thus occur.

Provided that the "Wireless Magazine" specification for components is adhered to we believe that no constructor will encounter any snags in the construction or operation of the Ideal A.C. Home Super.

Although all the necessary constructional details are included in these pages, many constructors will prefer to work from a full-size blueprint. These are available to readers at half price, that is 9d., post free, if the coupon on the last page is used by July 31. Address your application to "Wireless Magazine" Blueprint Dept., 58-61 Fetter Lane, London, E.C.4, and ask for No. WM290.

As is the case with every "Wireless Magazine" blueprint, each connecting wire is numbered separately in the best order of assembly. When all the parts have been firmly fixed in their proper positions wiring should be done in conjunction with the blueprint (or the quarter-scale layout and wiring diagram that appears on page 621).

If each number is crossed through with a pencil as soon as the corresponding lead has been put in position there will be no possibility of omitting a wire or making a mistake.

Automatic-bias Resistances

It will be noticed that no alternative valves are specified for this set, and for a very good reason. The resistances for automatic grid bias have been calculated carefully for the particular types of valves employed; if other valves were used the values of these resistances would probably have to be changed and if they were not exactly right the constructor would wonder why he was not getting the best results.

The mains rectifying valve, it should further be noted, has a 2-ampere filament.

When the set has been finally assembled it should preferably be

THE IDEAL A.C. HOME SUPER—Continued

An Independent Test Report on the Ideal A.C. Home Super

YESTERDAY I tried out the Ideal A.C. Home Super in South London—twenty miles from the London Regional transmitters—with a 70-ft. outdoor aerial.

A whole Sunday was devoted to the test to ensure that the set would be tried out under daylight and night conditions.

Sunday morning gave no fewer than eight stations on the long waves and about the same number on the medium waveband. Radio Paris could be easily separated from Zeesen and, on the medium waveband, both the Brussels stations, Langenberg and Hilversum were heard at full loud-speaker strength.

During the evening the set was given a real chance to show what it could do. After half an hour's turning of the two dials it was evident that the chief difficulty was not picking-up stations, but identifying them. There was almost a station on every degree of the dial or, if not one station, there was an assortment of heterodyne whistles denoting that the set was tuned-in to a common wavelength.

This new A.C. set is a veritable key to the ether and is capable of picking up thirty stations at full loud-speaker strength clear of all objectionable interference. It would have been possible to have given with this report a log of seventy or eighty stations, but days would have to be spent in compiling it owing to the difficulty of identifying many of the weaker signals.

For the guidance of readers who build this set I picked out forty of the best-known stations and definitely identified them; they will be found in the log at the end of this report.

The reading given first is for the oscillator condenser—that on the left. All other models of the sets built by readers should have similar readings.

Quite a deal has been written of the extreme selectivity of the super-het. London Regional can be easily separated from its high-power neighbour, Mühlacker, and flawless reception of either station can be obtained.

One of the chief features of this set is its reproduction. The pentode output gives a brilliant tone and, using a moving-coil loud-speaker, the quality was first-rate.

D. St. J.

STATION READINGS ON THE IDEAL A.C. HOME SUPER

LONG WAVES

	Osc.	*Aerial.*
Oslo	84	55
Kalundborg	92	70
Motala	104	89
Warsaw	110	104
Eiffel Tower	115	110
Daventry National	122	119
Zeesen	130	128
Radio Paris	135	138
Huizen	141	145

MEDIUM WAVES

Fécamp	22	22
Trieste	41	42
Leipsig	48	50
London National	50	52
Moravska Ostrava	51	53
Heilsberg	62	64
Hilversum	71	73
North National	73	75
Poste Parisien	87	88
Brussels	91	94
Strasbourg	95	98
London Regional	100	103
Mühlacker	102	105
Algiers	104	106
Lvov	110	112
Toulouse	111	113
Bucharest	115	116
Midland Regional	116	118
Sottens	118	120
Katowice	120	121
Belgrade	127	125
Stockholm	129	128
Rome	131	130
Beromuenster	134	136
Langenberg	137	140
North Regional	139	142
Prague	141	141
Florence	145	146
Brussels	146	148
Vienna	148	151
Budapest	157	162

given a bench test before being placed in its cabinet. For this purpose the pick-up and pick-up volume control (mounted on the motorboard in the finished instrument) should be temporarily wired up alongside the set. There are only three wires to be taken from the "pick-up assembly" to the receiver.

Great care should be taken not to touch the set while it is on the bench and the mains supply is switched on. There is 500 volts across the secondary of the mains transformer—and that fact should not be forgotten!

Switching On

The set is switched on by operating the main switch on the right-hand side of the front panel. The gramo-radio switch (in the centre of the panel) should then be turned to its "radio" position. Next, turn the knob of the screen-grid potentiometer until the set sounds "live." Then adjust the wave-change switch to the medium-wave position (it is usually best to start off on the medium waves when giving a set a preliminary test).

Tuning is accomplished by turning the knobs of the two variable condensers in unison, but it should be noted that their readings will not be the same for any particular station. The readings given in the test log on this page will be an approximate indication of where some of the important transmissions will be found.

Ganging the Circuits

As soon as a station is picked up the two-gang condenser should be adjusted to give the proper band-pass action. This will usually mean that the second trimmer (that remote from the panel) should be screwed well down and the first trimmer should be carefully adjusted so that the station has a slight spread over the dial. The first trimmer will be nearly full out.

When the gang condenser is properly adjusted there will be no suspicion of a station being tuned in at two places on the dial—"double humping" as it is called.

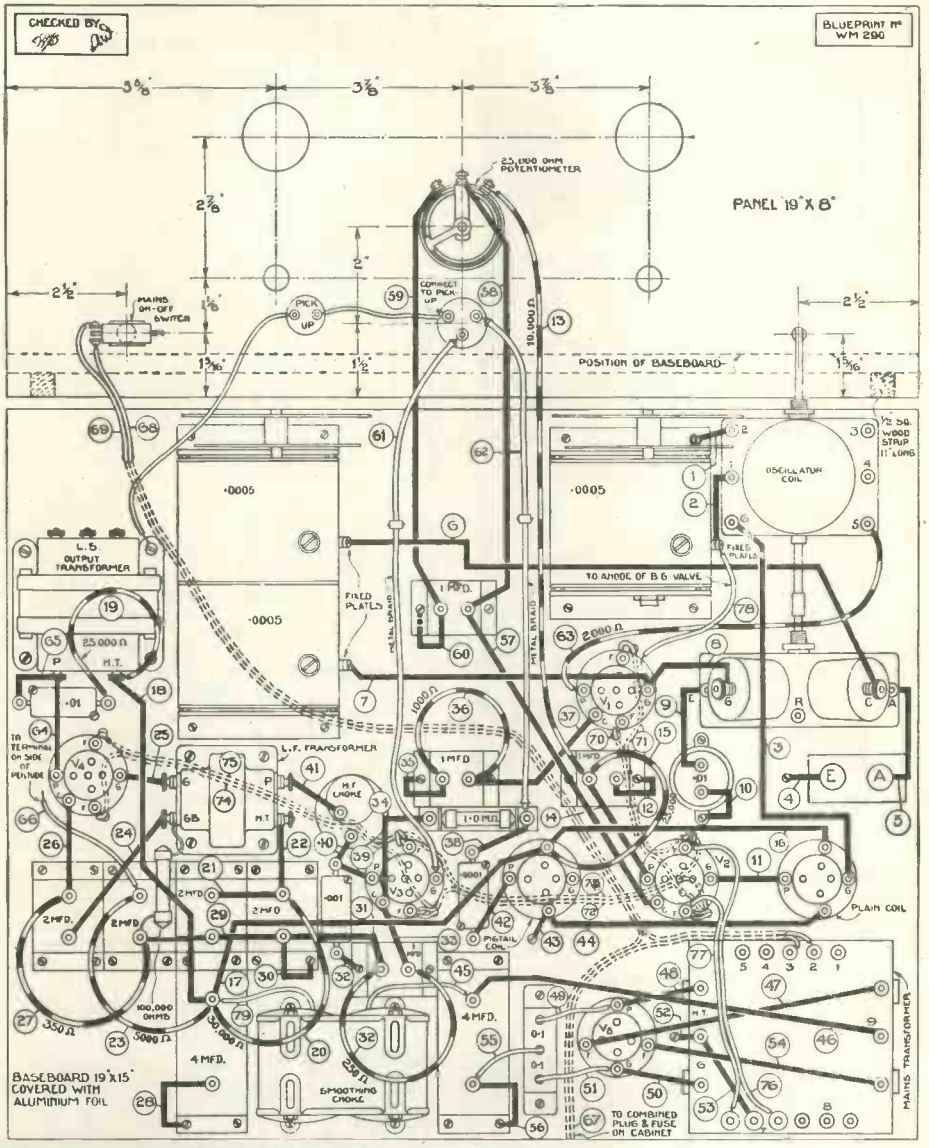
Volume, of course, is controlled by means of the grid-bias potentiometer in the centre of the panel.

When it is desired to reproduce gramophone records electrically the

A COMPLETE SUPER-HET RADIOGRAM

QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

A full-size blueprint can be obtained for half price, that is, 9d., post free, if the coupon on the last page is used by July 31; ask for No. WM290. Connect the wires in the numerical order indicated



gramo-radio switch is turned to its "gramo" position. The switch for starting the electric gramophone motor is alongside the turntable. Volume is controlled by means of the potentiometer mounted on the top of the motorboard.

Very great care was taken in the original design of this set by the "Wireless Magazine" Technical Staff to ensure that constructors will have no trouble with it.

The design of an A.C. receiver needs much greater care than does the design of a battery set if annoying snags are to be avoided. In the Ideal A.C. Home Super we believe that we have produced what the name implies—an ideal mains super-het for the home.

The battery-operated Ideal Home Super has given excellent results. A typical report from a constructor at Clevedon (Somerset) is as follows: "I have built the Ideal Home Super and the results are good. The quality of the set is also good using a permanent-magnet moving-coil loud-speaker. Up to the present I have logged ninety-two stations, eighty-six at real good loud-speaker strength."

We can assure readers that the performance of the A.C. version, although it has one less valve, is actually better than the performance of the battery-operated set and we anticipate receiving from constructors many excellent reports.

Readers are reminded that half a guinea is paid for every photograph of a home-constructed "Wireless Magazine" set published in these pages. Reports from readers who build the Ideal A.C. Home Super will prove of the greatest value to prospective constructors.

TOP VIEW OF THE MOTORBOARD

Here is a view of the gramophone portion of the Ideal A.C. Home Super. An electrically-driven turntable is incorporated, of course. The metal-braided leads (Nos. 61 and 62) are earthed

(See next page for list of parts and additional photographs)

THE IDEAL A.C. HOME SUPER—Continued

COMPLETELY ASSEMBLED IN CABINET

This photograph shows the Ideal A.C. Home Super completely assembled and ready for radio or record reproduction as desired

COMPONENTS NEEDED

CHOKE, HIGH-FREQUENCY
1—Wearite super-het, type HFS, 6s. 6d. (or Lewcos, Varley).

CHOKE, LOW-FREQUENCY
1—Heayberd, type 752, 12s. 6d.

COILS
1—Lewcos band-pass filter, type BPF, 8s. 6d.
1—Set of Lewcos super-het coils: type TOS, 8s. 6d.; type IFTP, 10s. 6d.; type IFT, 10s. 6d.

CONDENSERS, FIXED
1—Dubilier .0001-microfarad, type 670, 1s. (or T.C.C., Lissen).
1—Dubilier .001-microfarad, type 670, 1s. 6d. (or T.C.C., Lissen).
1—Dubilier .01-microfarad, non-inductive type, 2s. (or T.C.C.).
1—Dubilier .01-microfarad, type 670, 2s. (or T.C.C.).
1—Dubilier .2-microfarad centre-tapped, type DE31L, 3s. (or T.C.C.)
4—Formo 1-microfarad, 10s.
4—Formo 2-microfarad, 13s.
2—Formo 4-microfarad, 11s.

CONDENSERS, VARIABLE
1—Jackson .0005-microfarad two-gang, type R2, £1 1s.
1—Jackson .0005-microfarad, type R1, 12s. 6d.

EBONITE
1—Becol 19 in. by 8 in. panel, 7s. 2d. (or Peto-Scott, Lissen).

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

HOLDERS, VALVE
7—Lotus five-pin, type VH/31, 5s. 10d.

RESISTANCES, FIXED
1—Magnum 250-ohm spaghetti, 9d.
1—Magnum 350-ohm spaghetti, 9d.
1—Magnum 1,000-ohm spaghetti, 9d.
1—Magnum 2,000-ohm spaghetti, 1s.
1—Magnum 5,000-ohm spaghetti, 1s.
1—Magnum 10,000-ohm spaghetti, 1s.
2—Magnum 25,000-ohm spaghetti, 3s.
1—Magnum 30,000-ohm spaghetti, 1s. 6d.
1—Dubilier 100,000-ohm metallised, 1s.
1—Dubilier 1-megohm grid leak, 1s. 9d. (or Lissen, Watmel).

RESISTANCE, VARIABLE
1—Colvern 25,000-ohm potentiometer, 5s. 6d. (or Wearite).
1—Varley 250,000-ohm potentiometer, type CP141, 6s. 6d.

SUNDRIES
Tinned-copper wire for connecting.
Lengths of oiled-cotton sleeving.
Length of rubber-covered flex.
Length of shielded connecting wire.
Length of twin flex for mains leads.
1—Mains plug to suit (Bulgin).
1—Sheet of aluminium foil 19 in. by 15 in. (Paroussi).
1—Belling Lee terminal block, with two B type terminals, marked :—Aerial and Earth, 1s. 8d. (or Lissen).
1—Bulgin twin fuse-holder and mains connector, type F15, 4s.
2—Pieces of wood 15 in. by ½-in. sq.

SWITCHES
1—Bulgin on-off, type S80, 1s. 9d.
1—Bulgin rotary change-over, type S86, 2s.

TRANSFORMER, L.F.
1—Lissen Hypernik, 12s. 6d.

TRANSFORMER, MAINS
1—Tunewell, type MV/50, £1 15s.

TRANSFORMER, OUTPUT
1—Ferranti, type OPM1, £1 2s. 6d.

ACCESSORIES

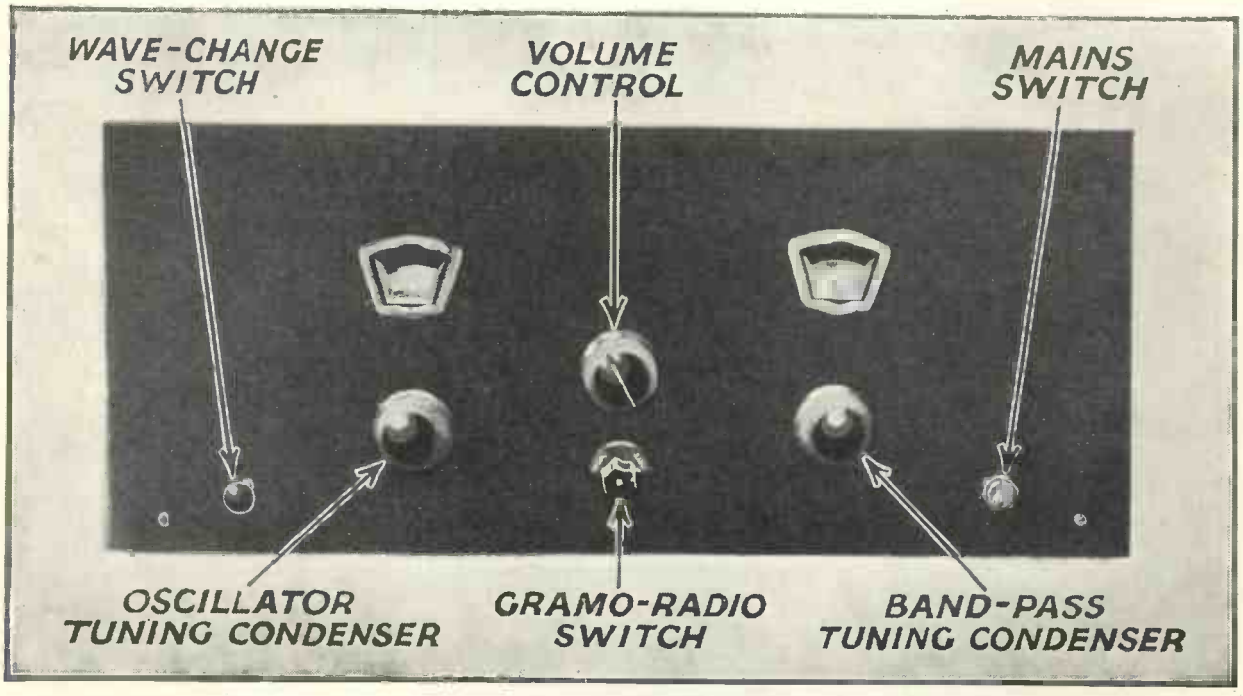
CABINET
1—Camco Junior Waverley radio-gramophone in oak, £5 10s.

GRAMOPHONE MOTOR
1—B.T.H. Synchro-Blue, £1 19s. 6d.

LOUD-SPEAKER
1—Baker super-power permanent-magnet moving-coil, type SP/PM with pentode transformer, £6 6s.

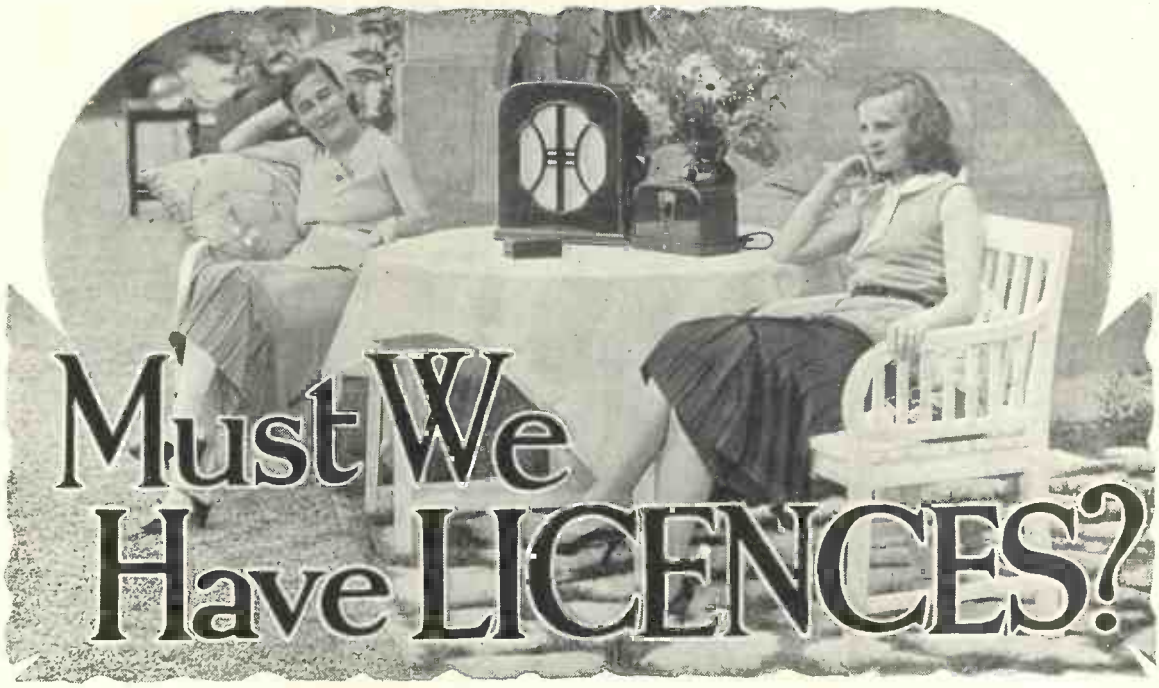
PICK-UP
1—Varley, complete with tonearm, type CP138, £2 2s.

VALVES
1—Cossor 41MDG, 19s.
1—Mullard 904V, 13s. 6d.
1—Mullard MM4V, 19s.
1—Mullard Pen4V, £1.
1—Mazda UU120/350 rectifier, 15s.



CONTROLS THAT ARE EASY TO OPERATE

This front view of the panel of the Ideal A.C. Home Super, showing the controls, is a clear indication that there is nothing complicated about the operation which can be undertaken by any member of the family



Must We Have LICENCES?

The vexed question as to whether or not the institution of a licensing system makes for popular wireless listening is here discussed by a correspondent

A SURPRISING number of ordinary listeners seem to think that although, grumbles at the B.B.C. apart, a ten-shilling licence is good value for the money, a reduction in the fee would mean fewer pirates.

Others maintain that as we are the only people in Europe idiotic enough to pay a licence (*sic !*) we are only getting the sort of programmes we deserve.

There are the confirmed sponsored-programmeites who aver that a licensing system is not productive of the most revenue and that according to all the well-worn arguments advertising sponsored programmes should be more entertaining.

I don't want to dig up the old sponsored programme *pros* and *cons*. On the other hand, the licensing side of the question has never been considered purely on the grounds of its own importance.

Popular Misconception

There is, still, the popular misconception that only in Great Britain are licences issued by a governmental department. Perhaps this is the reason for a certain amount of discontent; the man-in-the-street thinks that anything Governmental must be red-tape tied.

Jugoslavia, the Irish Free State, Estonia, Latvia, Iceland, Finland, Hungary, Austria, Sweden, Denmark, Germany, Norway, Switzerland, Czechoslovakia, Belgium, Poland, Roumania, Lithuania, and Italy all have wireless licences issued by government authority.

Nineteen other countries follow our example, and most licensing systems are similar to our own. If safety is in numbers, then the Post Office licensing system, not designed for broadcasting but adapted from commercial telegraphy to broadcasting conditions, is one of the best; so many European countries have seen fit to copy it.

The International Broadcasting Union has all the figures relating to the number of listeners in each of the countries which has a licensing system. I have just seen the statistics giving the number of licences (not *listeners*, please note) per thousand population at the end of 1930, when the figures were last taken.

Now for a guessing competition.

Which country do you think has the most licences? Germany, with its many high-power stations? Italy, with its Mussolini-controlled S.B. system? France, with its rival government- and state-controlled broadcasters?

No, you are wrong.

Little Denmark, at the end of 1930, had 119.5 licences for every thousand people. If you count five people to the average Danish household, it means that out of every thousand people six hundred are listeners.

The Danish licence costs just over eleven shillings (par value of the pound) and that may seem to be proof that a cheap licence means the most listeners because Germany, which is another big broadcasting country, but with only 56.23 licences per thousand, charges £1 4s. for a permit.

That argument is wrong because, although the German licence costs more than double our own, Germany has not far to go to equal the number of listeners in Great Britain. Our own figure is 77.5 licences per thousand.

Popularising Permits

Mind you, the actual cost of the licence is not the end of the matter, as the authorities in numbers of countries have adopted novel means of popularising radio permits.

Germany is particularly kind to its licensed listeners. If you have had a wireless licence for a certain number of months and become unemployed, a free licence is given for the rest of the period of your misfortune. Blind people, of course, are given free licences. That is a fairly general practice in every

MUST WE HAVE LICENCES?—Continued

THE WIRELESS ZOO

(The Borrower)

The Borrower is often heard,
This magpie is a common bird,
For he Accumulates with zest
Various Parts to grace his nest:
He cadges Triodes from a friend,
Then asks another if he'll lend
A sheet of copper for a Screen,
And "Have you got a Choke, old bean?"
He "borrows" thus all down the street
Until his Wireless Set's complete!

LESLIE M. OYLER.

country where a licensing system is in force.

Possession of a German wireless licence also insures you up to a large sum (a scheme sponsored by the broadcasting authorities) against personal and material damage caused by the set; even by lightning striking the aerial!

Volunteer Corps

A volunteer corps of 7,000 electricians and technically minded amateurs has been banded together to stop interference set up by electrical machines, vacuum cleaners, hair dryers and so on. Every licence holder is entitled to this free service and that is one reason why, in spite of the spreading of A.C. mains in Germany, there is very little interference with radio reception.

Three enterprising countries, Belgium, Roumania and Lithuania, have adopted a scheme whereby sets are taxed by size, just as cars are licensed in this country. It costs more to tax a large set than a small one.

Not Sound Logic

I am not sure that this is sound logic. Except in the case of very large sets which are used most of the time for foreign-station reception, the local programmes received on a large set are just the same as those on a small one. Although the authorities may look on the large-set tax as a luxury duty, it is hardly fair from the wireless point of view.

The Irish Free State officials have a system which I think we might well copy. They charge more for the licence for a set used in a place where collective listening is usually done, public halls and so on, than for a set in a private house. That seems fair.

A fact which emerges from the statistics published by the International Broadcasting Union is that an expensive wireless licence does not seem to deter listeners and that even if a licence is cheap, or if no licence at all is required, that is not a vital incentive to radio reception.

Holland is the most important European country where there is no licence existing. It is usual, though, for regular listeners to subscribe to one or other of the societies which provide programmes. Some of these organisations are run by religious bodies and some by Trades Union people. Because the subscriptions are not solely for wireless, but for the support of these organisations for many other purposes, the money is given willingly and there is no lack of funds.

German Licences

The German licence is more than twice as expensive as our own, and yet Germany is racing neck to neck with us, for the greatest number of listeners. The licence can be paid in instalments in Germany, though, and in the factory areas that seems to be an advantage. It is paid monthly.

The only hole in the otherwise watertight argument that a high licence fee does not deter listeners is the Italian example. The Italian licence fee is high and there are only about 200,000 licences among forty million people!

Charting *the Bed of the Ocean*

IN a report recently published by the United States Coast and Geodetic Survey a method is described by which it is now possible to ascertain simultaneously both the depth of the ocean and the position of a ship at sea.

At a pre-arranged signal a depth charge is exploded in the immediate vicinity of the surveying steamer and the reflected sound from the ocean bed is registered by specially delicate recording instruments. As the velocity of sound through water is known there is no difficulty in working out the depth of the ocean at that given point.

In the same way, working in conjunction with the ship, two shore stations pick up the sound of the exploding depth charge and automatically re-transmit the signal back by wireless.

The exact time of its reception by the surveyors is recorded by the same delicate instrument which registered the explosion.

Time from Ship to Shore

All that is then needed is to calculate the time taken by the sound to cover the distance from ship to the shore microphones, the speed of the radio transmission being considered, for all practical purposes, instantaneous.

By this simple means the surveyors are able to ascertain the distance of the ship from two known shore points and consequently, for charting purposes, their exact position at sea. *Gridda.*

We Test Before You Buy

By the "W.M." Set Selection Bureau

A BUSY SCENE IN A MASS-PRODUCTION FACTORY

Assembling receivers in the well-equipped Kolster-Brandes factory at Sidcup, Kent. Many well-known sets have been produced at this works

Daylight Tests

UNWARY set buyers are apt to be misled about the capabilities of the sets they are considering. For example, we hear of readers buying sets after hearing them working at the radio store during daylight, only to be very disappointed when they are tried out under the infinitely more difficult conditions of night time.

Many a set that appears to be a paragon of all the radio virtues—good quality, good selectivity and complete absence of background—has a very different story to tell when installed in the home.

We are not trying to show what wretches the radio dealers are—far from it! But even a dealer may be excused for trying out his wares under the most favourable conditions, and there is no doubt that daytime reception favours demonstrations.

Better in the Evening

Yet you may still hear a dealer telling an unsuspecting customer that, of course, the set will work much better in the evening—more stations and all that.

Therein lies the snag—there are too many stations on some sets. Only a good set will get a really respectable number of stations free from heterodyne and other interference after dark. On the other hand, almost any set will bring in three or four stations during the afternoon with a remarkably silent background.

Tests of sets for such points as selectivity and freedom from foreign-station interference should never be done during the day, for the field strength of the foreigners is then almost negligible.

Unsuspected Factors

Quality of reproduction depends on many more factors than the average set buyer suspects. It is not merely a question of whether the set and loud-speaker provide an overall frequency response from the bottom note of the organ to the topmost overtone of the piccolo.

True, the frequency response does matter, but there are other points specially to be watched when buying a set.

Look around the demonstration room, and see if it bears the slightest resemblance to the room in which the set is destined to be installed. Probably what sounds perfectly awful in the shop may sound quite pleasant in the home—due to the different acoustical conditions under which the loud-speaker is producing sound.

Sets very often do sound better in the home than in a shop or store due to the greater freedom from background noises, and to the fact that less distortion will be produced when the set is running on the reduced output that will be possible away from the competing noises found in almost every store.

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.

Climax Radio Gramophone

A COMPACT INSTRUMENT
Except for the aerial and earth, the Climax table radiogram is entirely self-contained

HERE is an inexpensive instrument for those wanting satisfactory radio service and all facilities for the reproduction of gramophone records. All the accessories are contained in a neat and attractive cabinet that stands on the table.

The basis of the Climax radio gramophone is a well-tried sequence of three valves, giving a good range of stations when used with a normal aerial, and good volume with radio and record reproduction.

NUTSHELL SPECIFICATION

MAKER: Climax Radio Electric, Ltd.

PRICE: 22 guineas.

VALVE COMBINATION: Screen-grid (Cossor MSG/LA), detector (Cossor 41MH) and pentode (Cossor MP/PEN) with valve rectifier (Cossor 442BU).

POWER SUPPLY: A.C. mains, usual voltages, and periodicities between 40 and 100 cycles.

POWER CONSUMPTION: 35 watts.

TYPE: Self-contained table radio-gramophone, except for aerial and earth.

REMARKS: A cheap instrument, giving good results on radio and having full facilities for record reproduction. The cabinet work is attractive.

The instrument was found easy to install, as the metal back of the cabinet is readily removed to gain access to the valves and mains-voltage panel. With the mains connector lead is supplied a connection with a mains-aerial plug, so that the electric-light conduit can be used as an aerial if no better signal pick-up is available.

Apart from the mains switch and the switch for changing over from gramophone, all the controls are mounted on the front panel. These are rather different from usual, in that the two tuning circuits are controlled by a two-gang tuning condenser with an independent trimmer superimposed on the main tuning knob.

A very flexible degree of selectivity is achieved by the use of a tapped aerial coupling, controlled by a stud switch worked from the panel by a knob just below the tuning control. This selectivity-cum-volume control must be used in conjunction with the reaction control on the right. Wave-changing is done by the knob on the left. Control is altogether simple.

We see from notes made at the time of the test that the tuning trimmer worked easily, enabling the facility of one-knob tuning to be obtained without any loss of sensitivity. Of the eight possible positions for the selectivity switch we found No. 3 from minimum gave the best compromise between selectivity and volume from distant stations.

With our test aerial the London National and Regional stations had only 20-metre "spreads." Sensitivity is good even at the top of the medium waveband, Budapest coming in well. On the long waves Radio Paris was heard loud and clear of Daventry.

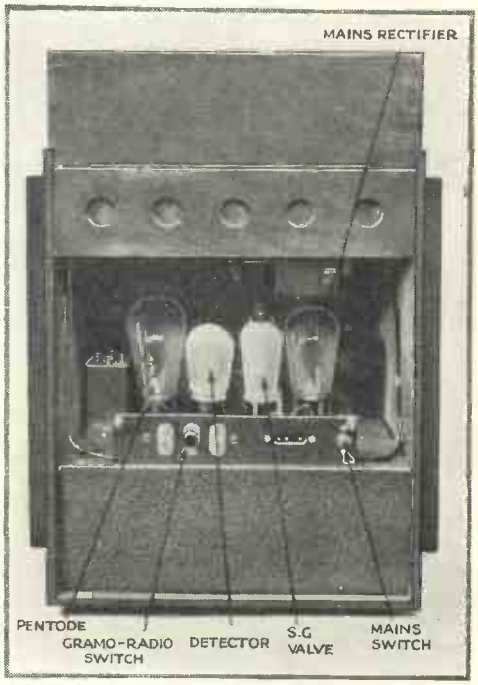
Tuning on the long-wave scale goes down to 800 metres, so it is possible to get the Heston weather reports sent out eight times daily on 830 metres (see page 640). Aircraft traffic on 900 metres was also heard at great strength.

After an evening at the dials we were more than satisfied with the radio performance, which is well up to the standard expected of a three-valver. It is important to note that the selectivity can be made sufficiently good to cut out the locals within a few degrees without reducing the volume of the distant stations below normal strength.

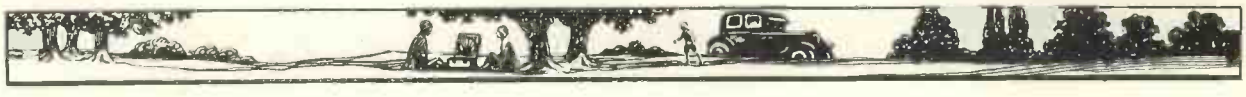
The gramophone side of the Climax instrument works well. The pick-up is conveniently designed, so that it lifts up when you insert a new needle. The pick-up output is adjusted by a volume control mounted in the top of the pick-up arm support.

We found that the self-contained moving-coil loud-speaker gave ample volume during the reproduction of records, the bass being clean cut and needle scratch negligible.

The gramophone motor is fitted with useful accessories, such as an automatic stop and a speed adjuster for the turntable.



AN INTERIOR VIEW
The valves in this set are very accessible. Note the position of the gramo-radio and on-off switches



Portadyne Challenger Portable

MAKING the most of the modern valve, this portable offers all the attractions of being entirely self-contained, without sacrifice in the overall performance.

There are four valves in the set, one being for amplification before detection, another for detection, and two for low-frequency amplification.

BRIEF SPECIFICATION

MAKER: *Portadyne Radio, Ltd.*

PRICE: *£12 17s. 6d.*

VALVE COMBINATION: *Screen-grid (Mazda S215A), detector (Cossor 210HL), low-frequency amplifier (Mazda HL2), and power output (Mullard PM2A).*

POWER SUPPLY: *Self-contained batteries, consisting of a 108-volt high-tension battery of the standard-capacity size, a 2-volt accumulator of 20-ampere-hours capacity, using a jelly electrolyte, and a 4½-volt grid-bias battery.*

POWER CONSUMPTION: *7 milli-omperes total anode current.*

TYPE: *Self-contained battery-operated portable, with upright cabinet of distinctive appearance.*

REMARKS: *An attractive battery set specially suitable for those who cannot erect an aerial and earth system.*

Circuit points of outstanding interest are the use of a swinging coil for reaction and the use of two stages of transformer coupling to maintain a high degree of signal strength.

In other respects the Challenger circuit is conventional, although it should be mentioned that the tuning of the frame aerial is in effect ganged with the intervalve tuning.

At least, the effect is just as simple as with ganging, though there are actually two separate condensers, mounted side by side so that the two thumb-operated drum dials come on each side of a cleverly arranged tuning scale.

This scale is marked in wavelengths, both medium and long. In addition, several of the well-known stations are indicated. A curved diagonal indicator is marked on the main scale, and a similar line appears on the celluloid scale attached to the condenser controlling the frame tuning.

All you have to do to keep the two circuits in tune is to superimpose one diagonal on the other. One of the most attractive tuning ideas yet introduced. And it works!

NEAT APPEARANCE

The Challenger is certainly a good-looking job. A specially designed lid protects the controls

The whole manner of the control is out of the ordinary. Thus the three control knobs are normally hidden beneath a small flap on the top of the walnut cabinet, leaving the whole of the front of the set for the loud-speaker fret.

In addition to the tuning control there are only two other knobs, the range or reaction control on the right and the combined wavelength and battery switch knob on the left.

In spite of the swinging coil, or perhaps because of it, reaction is very smooth in action, there being an entire absence of backlash. This is particularly appreciated when the more distant stations are tuned in.

The first point we noted during the tests was the quality. Up to the limit of the small power valve the reproduction is very satisfactory, but this limit must not be overstepped.

ACCESSIBLE COMPONENTS

A photograph showing the set with the back removed. Batteries and valves can be easily changed

There is enough volume below the distortion point to fill the average living room. And that is all you can expect of any portable. Speech is clear, though there is some high-note clipping. Music sounds quite pleasing, the bass being free from the boom so common in portables.

Easy Station-hunting

We found station-hunting an easy job, thanks to the accuracy of the wavelength markings. The London stations were restricted in "spread." We got Midland Regional quite clear of the London Regional, and there was an appreciable blank space between these two stations.

Provision is made for the connection of an external aerial and earth, but these are seldom needed either on medium or long waves. Such stations as Huizen and Radio Paris on the long waves come in at full strength without any external aerial assistance.

The low anode-current consumption of 7 milliamperes means that the high-tension battery is not overrun, and with average use should last several months.

Lotus Suitcase Portable

CHEAP AND EFFICIENT
At a cost of twelve guineas, the Lotus portable is good value for money. The appearance is quite neat

FOR relatively easy transport the battery-operated portable set, as exemplified by this Lotus model, has real advantages—as distinct from the doubtful uses depicted by some sanguine advertisements.

Though the weight of the set rules it out as a hiker's companion, the general construction lends itself to a less irksome form of transport, as by car or train. The set can, of course, be carried from room to room with ease and even a journey to the garden would certainly not break one's back.

Having made it quite clear that this Lotus portable is no more and no less portable than its species generally, we should hasten to add that its compact design ought to commend the set to all anxious to invest in a self-contained model for battery operation.

Early tests showed how easily the batteries and valves could be inserted in position in the back compartment of the carrying case, which is built along normal lines in having the main part of the installation divided up into three compartments, with the set chassis at the front, the valves next, and the power supply at the back.

In the hinged lid are fitted the loud-speaker and the frame aerials. When this lid is closed there is no indication that the case contains wireless. Strong locks are provided, with keys to prevent anyone using up the batteries when the owner is not about.

On the control panel we find the usual knobs for tuning, reaction, and waveband switching. The tuning is done with two thumb-operated discs, both marked for medium and long wavelengths.

The centre position of the waveband switch is the battery "off" position. The only other control is a series aerial condenser fitted below the loud-speaker fret in the lid. This is to reduce aerial coupling when an external wire is used.

We quickly found that the four-valve circuit, which comprises a screen-grid stage coupled to a detector and two stages of low-frequency amplification, provided a high overall amplification; so much so that the frame aerial had to be turned away from the direction of the locals to cut down the strength.

Both the London stations came in with a good clear tone. We found that the left-hand dial gave the more accurate reading, especially at the lowest wavelengths.

Exceptional selectivity cannot be excepted with two tuned circuits arranged as in this set, but we had no trouble in separating the two locals, though it was impossible to get Midland Regional clear of London Regional.

OPERATION IS SIMPLE
No difficulty should be experienced in operating the set, as the tuning dials are calibrated in wavelengths

The sensitivity is well maintained at the top of the medium waveband, Brussels No. 1 coming in at good strength. We cannot recommend the use of an external aerial with this set, as the selectivity is then too much impaired.

There is an adjustment on the loud-speaker unit, but this did not have to be altered, the quality on both speech and music being very satisfactory for such a limited output.

As the four valve stages take 10 milliamperes from the high-tension battery, this should last two or three months with average use.

The makers have produced a very explicit instruction booklet, which includes the full circuit diagram.

BRIEF SPECIFICATION

MAKER: Lotus Radio, Ltd.
PRICE: £12 12s.
VALVE COMBINATION: Screen-grid (Cossor SG220), detector (Cossor HL210), resistance-coupled low-frequency stage (Mullard PM1HL) and power output (Mullard PM2A). The first two valves are metallised.
POWER SUPPLY: Self-contained batteries consisting of 108-volt high-tension, 2-volt non-spillable accumulator, and 4½-volt grid-bias battery.
POWER CONSUMPTION: The total anode-current consumption, measured during reception, was 10 milliamperes.
TYPE: Suitcase portable, leatherette finish, with carrying handle, and provision for external aerial and earth.
REMARKS: A satisfactory self-contained battery set, giving plenty of volume from the local stations.

Getting Down to the Short Waves

WITHOUT ALTERING YOUR SET

There is undoubtedly a growing interest in short-wave reception—television has been demonstrated on 6 metres and the B.B.C. is proceeding with the erection of its 7-metre transmitter. This article by ALAN HUNTER explains how simple short-wave working really is

IT is now so easy to adapt an ordinary broadcast set for short-wave tuning that the assembly or purchase of a special short-wave receiver is no longer essential. In fact, with so many conflicting reports about short-wave reception most owners of broadcast sets will want to try their luck on the short waves with the minimum of expense.

As will be shown, you can build a simple one-valve unit capable of changing the tuning range of an existing set for a very small outlay. Before deciding what type of unit to build or buy—for there are now many good commercial units—you should understand that there are two alternatives open, depending on the type of set.

If the set is of the detector and low-frequency amplifier type, *without* high-frequency amplification, your best plan is a plug-in adaptor unit which will enable you to make use of the low-frequency amplification of the set in conjunction with the detector valve of the unit.

No additional valve or battery upkeep is involved in this sytem of adapting a broadcast set to short waves; the detector valve of the set is simply removed from its socket and put in the unit. A plug on the unit goes into the detector holder of the set, and so feeds the unit detector with its high and low tension.

To understand the idea, you should remember that, for short-wave tuning, coils with few turns of wire and tuning condensers of low maximum capacity are required. It is not usually possible to adapt the tuning of the set itself and in any case the existing tuning arrangement will be wanted for medium and long-wave reception.

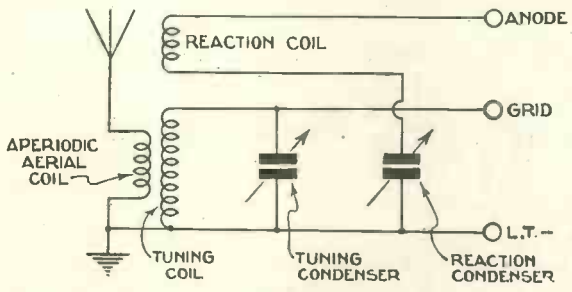


Fig. 1.—Essentials of a circuit for short-wave tuning. Note that there are two tuning coils

So it is necessary to disconnect the present tuning, as by breaking the grid circuit of the detector, and connecting in its place special short-wave tuning. This is just what the plug-in adaptor does.

If you look at Fig. 1 you will see the essentials of short-wave tuning. There is a small untuned aerial coil, in series with the aerial and earth. There is a grid-tuning coil, tuned by a short-wave tuning condenser of not more than .0002-microfarad maximum capacity. And there is a reaction coil coupled to the grid coil, this being in series with a short-wave reaction condenser across the anode circuit of the detector.

Earthed Moving Plates

An important point to note is the earthing of the moving plates of both tuning and reaction condensers. This is achieved by connecting the low-tension negative end of the tuning coil (the grid coil) to the earth side of the aperiodic aerial coil.

Unless this earthing is done the tuning and reaction may be difficult to control.

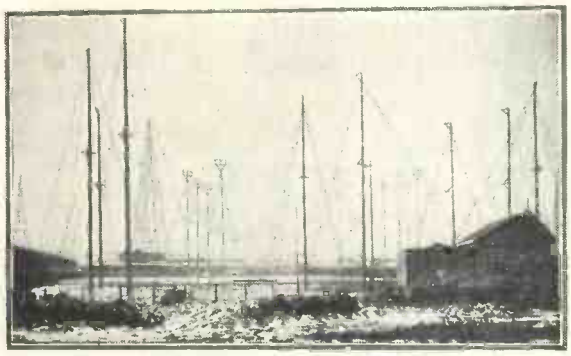
On short waves it is essential to reduce the aerial damping to the minimum, and this can only be done by reducing the degree of coupling between the aerial and the grid-tuning circuit. The aperiodic aerial coil is coupled by a variable amount to the grid coil, so that a compromise can be affected between damping and signal strength.

The closer the coupling, up to a certain

ACROSS THE WORLD ON SHORT WAVES

A party of visitors at the Imperial Communications short-wave beam transmitter at Dorchester. This station is able to send telephony over tremendous distances

GETTING DOWN TO SHORT WAVES—Cont.



FOREST OF SHORT-WAVE AERIALS
Multiple short-wave aerials at the Eindhoven (Holland) experimental short-wave transmitting centre. The station PCJ has been temporarily closed down

point, the greater the signal strength, but when this point is exceeded the damping is so great that you cannot obtain reaction.

Sometimes the aperiodic system of coupling the aerial gives trouble, and no matter how the coupling is adjusted there may be sections of the tuning dial over which no reaction can be obtained. This "blind-spot" action is due to the aperiodic coil coming into tune with the short-wave signal, or with a harmonic of it.

Overcoming Blind Spots

One of the best ways to overcome blind-spot action is to alter the number of turns on the aperiodic coil.

Then there is an entirely different method that is coming into favour. Instead of an aperiodic coil a small variable condenser is used, with the aerial connected to one side and the other side going to the grid end of the grid-tuning coil.

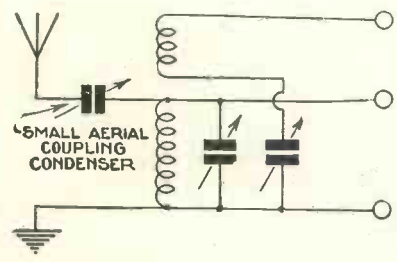


Fig. 2.—Method of coupling aerial with very small capacity condenser

A very small condenser must be used for this system, otherwise the aerial damping cannot be sufficiently reduced, and then reaction will not be obtained. One of the neutralising type of condensers is suitable, with a minimum capacity of not more than 2 micro-microfarads. Fig. 2 shows this arrangement.

Now let us see how the short-wave tuning is connected to a detector valve. Fig. 3 shows a typical short-wave circuit, used as the basis of all short-wave adaptors.

You will see that fairly high values of grid condenser and leak are used. The technique on short waves differs from medium and long waves in that the frequencies are very much higher. Values that are suitable on medium waves are not necessarily satisfactory on short waves—the grid condenser and leak are good examples of this.

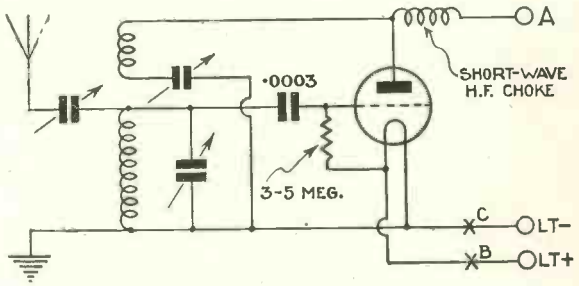


Fig. 3.—Typical short-wave detector circuit, used as the basis of all short-wave adaptors

The grid condenser has a capacity of .0003 microfarad. A smaller capacity may cause loss of signal strength, as some of the high-frequency signal may be dropped across the high impedance of the condenser.

The leak can be anything from 3 megohms upwards. A low value will again result in loss of signal strength.

In the anode circuit of the short-wave detector is a high-frequency choke, which should preferably be one specially designed for short waves. The ordinary chokes are not always satisfactory, as their self-capacity reduces the choking efficiency at high frequencies.

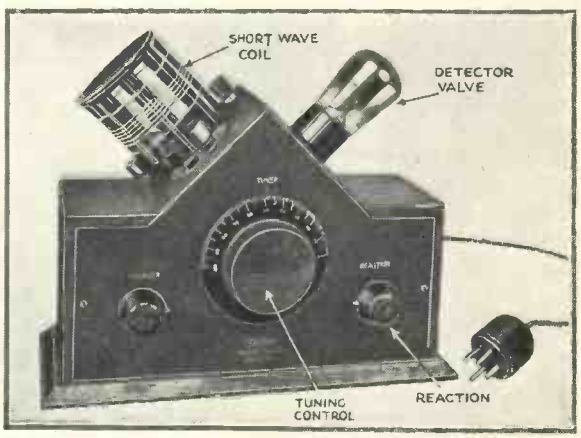
No Anode By-pass Needed

On short waves there is no need for an anode by-pass condenser between the anode and low-tension negative, as even a small reaction capacity will provide sufficient path for the very high frequencies corresponding to the short waves.

You could use the Fig. 3 circuit for the direct reception of short waves on headphones by connecting a pair of these in the anode circuit of the short-wave detector, that is, between the short-wave choke and high-tension battery positive.

Our immediate concern is to make use of this detector circuit in the existing broadcast set. The connecting link is the adaptor plug shown by Fig. 4.

This plug resembles a valve holder in having the usual grid, anode, and filament pins, suitable for insertion in a valve holder. Now suppose we connect the point A of the Fig. 3 diagram, that is the "free" end of the anode choke, to the anode pin of this plug; and suppose we connect the points B and C, that is the filament positive and negative



FOR MAINS OR BATTERY SETS
This Magnum unit converts any standard battery or mains set for short-wave reception. A test report appeared in the June issue o "Wireless Magazine"

HOW EVERY LISTENER CAN DO IT

leads of the Fig. 3 circuit, to the two filament pins of the plug; and finally, note that we leave the grid pin of the plug blank.

Now refer to Fig. 5, which shows just the detector portion of an ordinary broadcast set. If we take out the actual valve in the detector socket and put in the plug with the connections just mentioned, it is easy to see that the anode circuit of the short-wave detector is connected in series with the input of the low-frequency amplifier of the set. And that the filament voltage of the set is conveyed to the filament of the short-wave detector valve *via* the A and B contacts made by the plug.

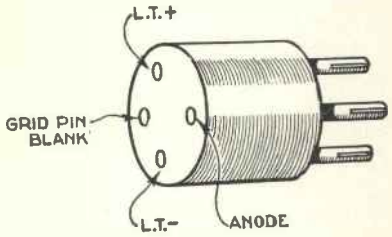


Fig. 4.—Adaptor plug for connecting a short-wave adaptor unit to a standard receiving set

Moreover, the grid circuit of the set is broken by the insertion of the plug, for the point G in the Fig. 5 circuit corresponds to the "blank" pin of the plug. The short-wave detector of the unit is therefore brought into circuit with the low-frequency amplifier of the set—and without any more alteration to the latter than the removal of the detector valve and the insertion of the unit plug.

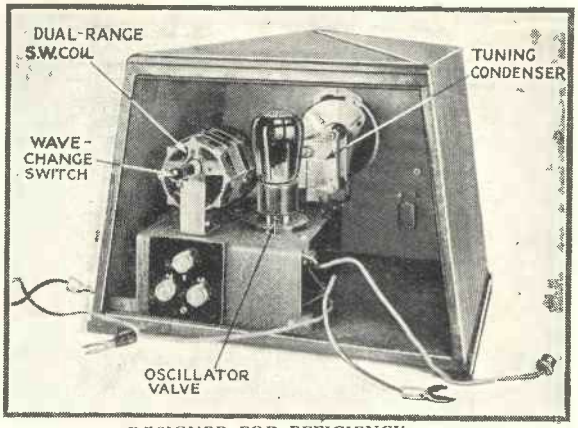
Special Points

One or two points call for comment. If there are any high-frequency valves preceding the detector of the set these will also be cut out by the unit plug, though their filament and anode currents will still be "on", of course.

Another point: when inserting the plug into the detector position you must make sure the low-tension positive lead from the unit makes contact with the low-tension positive side of the filament supply in the set, otherwise the grid leak will be connected to negative, and the moving plates of the tuning and reaction condensers to positive. This will cause reduced signal strength.

The plug-in adaptor type of unit, as already indicated, is most suitable for detector sets without high-frequency amplification.

This is because if you have a set with, say, three valves, comprising a detector and two low-frequency stages, adaptation will provide you with an equivalent three-stage short-waver; but, if your set has a stage of high-frequency amplification, adaptation will turn a three-valver into only a two-valver, since the high-frequency stage cannot be used.



DESIGNED FOR EFFICIENCY

Particularly efficient is the Eddystone short-wave converter; this is only suitable for battery-operated sets. A test report appeared in the February issue of "Wireless Magazine"

There is a much better way of getting down to short waves if you have high-frequency amplification, and this is by means of a super-het adaptor. Again no alteration in the existing set is involved, but an additional valve has to be used, with, of course, a slight increase in the high- and low-tension loads.

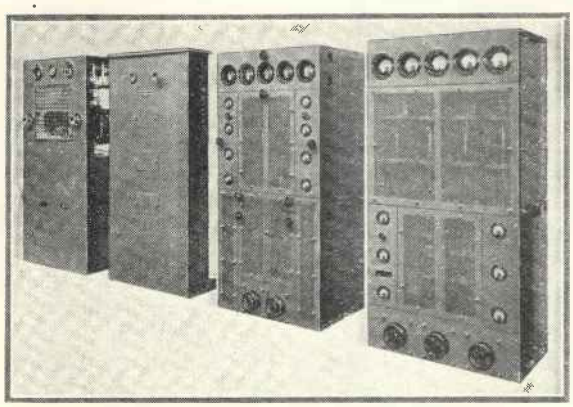
Super-het Action

The action of a super-het unit is such that all the valves of the existing set are utilised, and this gives very powerful short-wave signals without critical tuning or reaction.

The proviso is that the set must have at least one stage of high frequency, and if there are two stages before detection so much the better. Another point is that the set must tune well up to about 1,800 metres, for it is on the long wavelengths that most of the amplification has to be done.

To understand the action of the super-het unit you might refer to Fig. 6, which shows the Fig. 3 circuit slightly modified and connected up to the aerial terminal of the existing set. The modification is in the anode circuit of the short-wave detector.

Instead of a single short-wave choke two chokes are connected in series, a short-wave choke at the anode end and a long-wave choke



COMPLETE SHORT-WAVE TRANSMITTER

This is a Marconi ship-to-shore telephony transmitter. From left to right are the modulator panel, main oscillator panel, and two rectifier panels

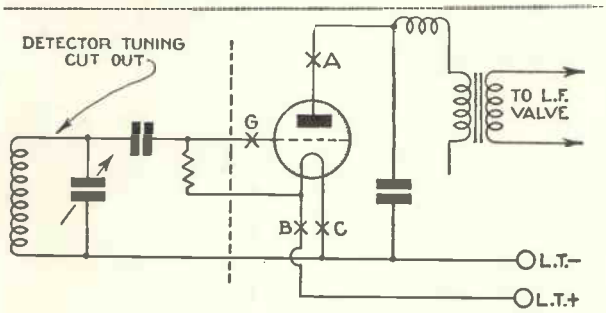
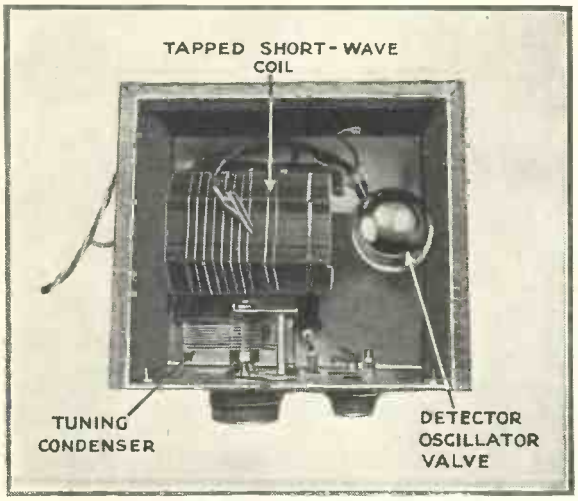


Fig. 5.—Detector portion of an ordinary medium- and long-wave broadcast set showing where the circuit is broken for the addition of a short-wave unit

GETTING DOWN TO SHORT WAVES—Cont.



INEXPENSIVE SHORT-WAVE CONVERTER
The Eelex short-wave converter is very simple in design and not at all expensive. A test report appeared in the April issue of "Wireless Magazine"

at the high-tension positive end.

At the junction between the two chokes is connected a small fixed condenser of, say, .0002 microfarad capacity. The other side of this goes to the aerial terminal of the set.

Now for the action. Short-wave signals are tuned in with the unit detector, with the reaction condenser advanced so that the detector is gently oscillating. Actually, the wavelength of the detector tuning is slightly different from the wavelength of the incoming signal, and the difference between the two produces a long-wave oscillation.

The short-wave choke produces the oscillation by feeding back high-frequency energy into the reaction circuit, but this choke does not impede the locally generated long-wave oscillation caused by the incoming signal beating with the detector oscillation. But the long-wave choke impedes the beat oscillation, which finds an easy path through the coupling condenser.

The long-wave signal now passes through the high-frequency amplifier of the set and is detected by the set's detector in the normal way, finally getting amplified at low frequency by the power valve and any other low-frequency valves.

The great attraction of this system is that all the amplification of the set is utilised, and a further point is that the reaction condenser of the unit, once set to give a gentle state of oscillation, does not have to be altered. So getting short-wave stations is then a one-knob procedure — control of the short-wave tuning condenser.

The tuning of the set must be adjusted to a long wavelength, and usually best results are obtained around 1,800 metres.

As the tuning on the short-wave detector is naturally fairly critical, it is a good plan to make final adjustments by slightly altering the tuning of the set, which is, of course, very much less critical.

One point should be made clear about the operation: when tuning in signals on the unit you imagine you are tuning in dead on the wanted frequency, whereas actually you are slightly mis-tuning in order to create the beat or super-het frequency. But the operation has all the simplicity of normal tuning and involves no *finesse* whatsoever.

As the reaction control is so simple with this type of unit, there is no need to employ a special slow-motion condenser.

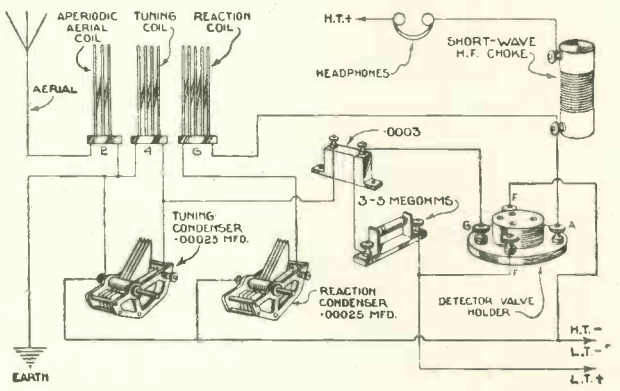


Fig. 7.—Wiring diagram of the short-wave converter indicated in the circuit of Fig. 3. This can be added to almost any existing battery set

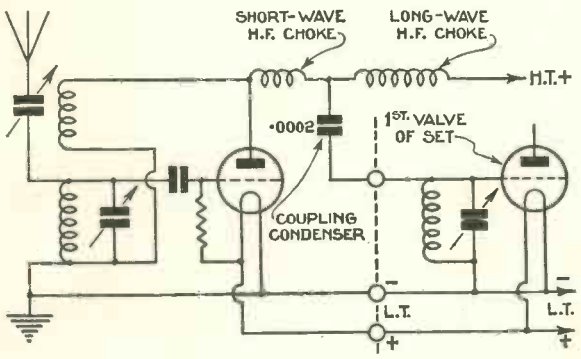
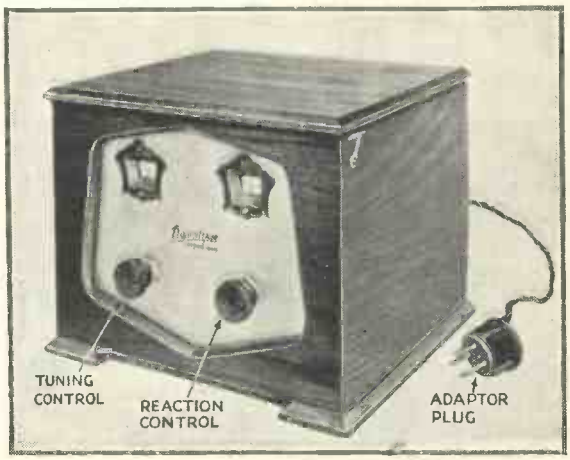


Fig. 6.—Circuit showing the connections for a super-het short-wave converter. This is only suitable for a set with one or more stages of high-frequency amplification



FOR ADDING TO A BATTERY SET
The Aerodyne adaptor is another short-wave unit for adding to an ordinary broadcast receiver. A test report appeared in the May issue of "Wireless Magazine"

RADIO in REVIEW

Box Baffles : : Electrostatic Microphones, Pick-ups and Loud-speakers

By MORTON BARR

IN a sense it is unfortunate that the performance of a moving-coil loud-speaker depends so much on the size of the baffle board. For instance, a baffle less than 2 ft. square is hardly worth using, whilst one 3 ft. square does scant justice to the lower notes.

Of course, a 5-ft. board would be perfect, but it takes up more space than can be spared in an ordinary room, besides being difficult to harmonise with the surrounding furniture.

Approval of the B.B.C.

The new box-baffle which has earned the approval of the B.B.C. comes as a convenient compromise. The general idea is to bend back the outer edges of the baffle board so as to enclose the loud-speaker movement in a hollow casing, open at the back.

This serves the main purpose of preventing sound waves set up at the back of the diaphragm from merging with those coming from the front—and so partly neutralising each other. The advantage of the box-baffle is that although the front face is only 2 ft. square, it gives the same effect as an ordinary baffle twice that size.

To be completely effective a baffle board should also be quite rigid. Otherwise it will pass some of the energy of the sound waves from front to back, and so frustrate its main purpose. One should use hard wood, preferably not less than 1 in. thick, and this is found to be even more rigid when made up in box form than in a single piece. To prevent "resonance" the inside of the box-baffle is lined with slag-wool.

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Condenser Microphone

The B.B.C. appear to have been finally converted to the merits of the condenser type of microphone, as compared with the older carbon instrument, and even with the later Reisz model which works on the moving-coil principle.

The condenser microphone is less sensitive than either of the other types, but possesses the great advantage of doing equal justice to all the notes in the musical range, from high to low. In other words, it is free from natural "resonance" and therefore has no tendency to emphasise certain notes more than others.

Its operation depends upon the fact that the capacity of any condenser changes if the distance between the two plates is altered. Accordingly, by making one plate flexible so that it can move relatively to the other under the influence of applied sound waves, corresponding voltage variations are set up across the two plates, which can be amplified in the ordinary way.

The standard form of instrument consists of a thin aluminium diaphragm, which is very flexible and is usually gold-plated to prevent oxidation. This co-operates with a second or fixed electrode or plate of brass. The normal gap between the two plates is made very small, and a polarising bias of about 200 volts is applied across it.

The aluminium diaphragm vibrates to and fro under the action of the sound waves, and so changes the effective value of the biasing voltage, the resulting voltage "swings" being applied to the grid of an amplifying valve.

In a carbon microphone, the diaphragm must exert sufficient pressure on the carbon particles to alter their electrical resistance.

This means that it must have a certain mass, which in turn imparts an undesirable "resonance" effect, so that some notes are emphasised more than others. The same applies to the Reisz instrument, owing to the inertia of the moving coil.

In the condenser microphone, however, the flexible plate can be made so thin and light that it has no natural frequency of its own, and therefore gives the ideal straight-line frequency response. Although the output is extraordinarily true in the musical sense, it is comparatively weak in volume and must, therefore, be amplified up before it is applied to the modulator.

The condenser microphone has, of course, already been in operation, particularly at the Queen's Hall, but the fact that it is now part of the standard equipment in each of the new studios shows that the B.B.C. intends to give us of their best so far as high quality in transmission is concerned.

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Electrostatic Pick-ups

It is rather surprising that the condenser principle has not been more widely used in the case of gramophone pick-ups, where true musical response is also of the first importance.

In the electrostatic type of pick-up, the movement of the gramophone needle as it passes over the record is made to vibrate one of a pair of condenser plates carrying a fixed biasing voltage. The resulting voltage variations are then applied across the grid and filament of an amplifier valve.

The device is, of course, less sensitive than the magnetic type of pick-up as regards the amount of energy it can deliver in the first instance, but it gives the same "balanced" response in respect of high and low notes as the condenser microphone, and seems to deserve more consideration than it has yet received from this point of view.

Voltage Converted to Sound

Again, in the electrostatic loud-speaker a similar "condenser" effect is used, though in the reverse way, that is, it transforms applied voltages into sound.

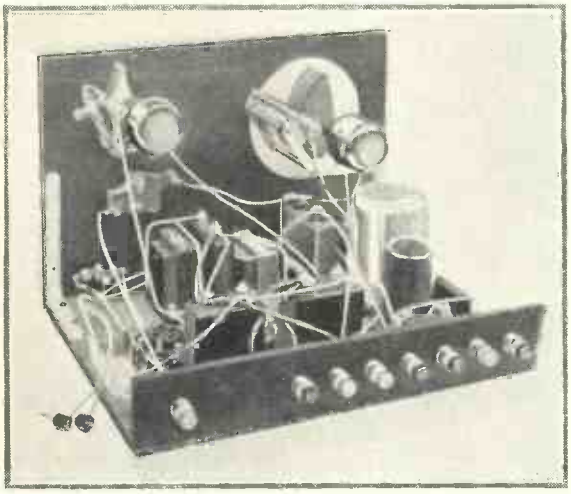
As the initial biasing voltage is increased or decreased by the output from the last low-frequency valve of the set, resulting changes in electrostatic pressure between the condenser plates causes them to vibrate and emit sound waves.

This type of loud-speaker is widely used in Germany, though it has not so far been fully developed here.

The Multi-mag Three

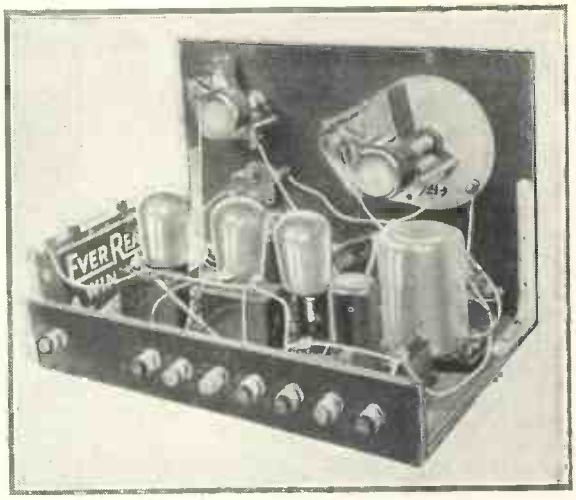
PAUL D. TYERS' AMAZING THREE-VALVER

Fully Described in "Wireless Magazine" for June



SIMPLE TO ASSEMBLE AND WIRE

The construction of the Multi-mag Three is so straightforward as to be well within the capabilities even of the beginner



GETS DOZENS OF FOREIGN STATIONS

Here is the Multi-mag Three all ready for receiving stations all over Europe on the loud-speaker

CONSIDERABLE interest was aroused by the publication in the June issue of "Wireless Magazine" of Paul D. Tyers' new set for constructors, the Multi-mag Three. It is no exaggeration to say that this design revolutionises "detector and two low-frequency" technique.

Principle in Brief

In brief, the "multi-mag" principle is the use of a new type of coil that enables full use to be made of reaction and a low-frequency amplifier designed with a slightly rising characteristic to make up for the high-note cutting which results from the use of considerable reaction.

The coil has a primary winding loose coupled to a secondary winding, which is tuned in the usual way with a .0005-microfarad variable condenser. Tuning is so sharp that this condenser must be provided with a really good slow-motion drive or many stations will be missed.

The loose aerial coupling means that considerable reaction can be applied without radiation taking place from the aerial and causing interference with other listeners in the neighbourhood. The fact that the coil is at the same time selective and sensitive is clear from the log of stations received during a test lasting a couple of evenings.

Unlike many advances made in radio technique the "multi-mag" principle does not complicate the construction or operation of any set that makes use of its properties.

The Multi-mag Three, as will be clear from the photographs and lay-out diagram reproduced here, is particularly simple in construction and the whole assembly is well within the capabilities even of the beginner.

Old Hands

It is not only the beginner who will be interested in building the set, however. Many of those who in the past have scrapped their "detector and two low-frequency" sets in favour of screen-grid receivers will want to try out the Multi-mag Three just to see how it compares with the old type of set without any

LIST OF STATIONS RECEIVED ON THE MULTI-MAG THREE

LONG WAVES		MEDIUM WAVES	
Station	*Dial*	*Station*	*Dial*
Oslo	68	North National	92
Kalundborg	85	Poste Parisien	103
Moscow	106	Milan	105
Motala	113	Brussels	108
Warsaw	123	Brno	110
Eiffel Tower	128	Strasbourg	112
Daventry National	138	London Regional	115
Zeesen	146	Mühlacker	117
Radio Paris	153	Toulouse	125
Hilversum	168	Frankfurt	127
		Midland Regional	131
		Sottens	133
		Moscow	139
		Stockholm	143
		Rome	145
		Beromunster	150
		Langenberg	155
		North Regional	157
		Prague	159
		Florence	163
		Brussels	165
		Vienna	167
Fécamp	48		
Nurnberg	59		
Trieste	65		
Leipsig	71		
London National	73		
Turin	78		
Heilsberg	79		
Bratislava	81		

high-frequency amplification. There is no doubt that they will be astonished at the fine performance put up by this little receiver.

We must emphasise that only the tuning condenser specified should be used. A reduction gearing of the order of 50 to 1 is essential if many stations are to be tuned in. Even the local transmitters have only a small spread on the aerial-tuning dial, and if a coarse drive is used it will be impossible to get any of the foreigners that should come in between the London National and Regional wavelengths.

Picked Transformers

Owing to the fact that the high degree of reaction employed inevitably affects the top-note reproduction it is also desirable that constructors should stick to the specification as far as the two low-frequency transformers are concerned.

These have been specially picked out so that they produce a rising characteristic. This results in the top-note losses due to reaction being made good before signals are passed to the loud-speaker.

Full constructional details of the Multi-mag Three were given in the June issue of "Wireless Magazine." This month we again print the quarter-scale layout, which shows clearly the simple nature of the construction, and the list of parts needed.

Those who desire one can obtain a full-size constructional blueprint of the set for 1s., post free, on application to the "Wireless Magazine" Blueprint Department, 58-61 Fetter Lane, London, E.C.4. Ask for No. WM288.

COMPONENTS NEEDED for the MULTI-MAG THREE

CHOKE, HIGH-FREQUENCY
1—British General, 5s. 6d. (or Lewcos, Readi-Rad).

COIL
1—Colvern, type TD, 8s. 6d.

CONDENSERS, FIXED
1—T.C.C. .0001-microfarad, upright type 34, 1s. 6d. (or Dubilier, Telsen).
1—T.C.C. .0003-microfarad, upright type 34, 1s. 6d. (or Dubilier, Telsen).
1—T.C.C. .25-microfarad, type 50, 2s. 3d. (or Dubilier, Telsen).
2—T.C.C. 1-microfarad, type 50, 5s. 8d. (or Dubilier, Telsen).
1—T.C.C. 2-microfarad, type 50, 3s. 10d. (or Dubilier, Telsen).

CONDENSERS, VARIABLE
1—Ormond .0005-microfarad, type R/207, with slow-motion dial, £1.
1—Ormond .00025-microfarad, type R/307, with slow-motion dial, 11s. 6d. (or Formo).
1—Magnum .0005-microfarad bakelite dielectric, 2s. 6d. (or Polar).

EBONITE
1—Becol 12in. by 8in. panel, 4s. 5d. (or Peto-Scott, Lissen).

FUSE
1—Readi-Rad fuseholder and bulb, 1s. 3d. (or Bulgin, Telsen).

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

HOLDERS, VALVE
3—Lotus with terminals, 1s. 6d. (or W.B., Clix).

PLUGS
3—Belling-Lee wander plugs, marked: G.B.+, G.B.—1, G.B.—2, 6d. (or Clix, Eelex).

RESISTANCES, FIXED
1—Bulgin 20,000-ohm spaghetti, 1s. 3d. (or Lewcos, Magnum).
1—Bulgin 30,000-ohm spaghetti, 1s. 6d. (or Lewcos, Magnum).
1—Bulgin 50,000-ohm spaghetti, 1s. 9d. (or Lewcos, Magnum).
1—Dubilier 50,000-ohm metallised, 1s.
1—Bulgin 100,000-ohm spaghetti, 2s. 6d. (or Lewcos, Magnum).

SUNDRIES
Tinned-copper wire for connecting (Lewcos).
Lengths of oiled-cotton sleeving.
1—Pair of Bulgin panel brackets, type PB4, 1s. 3d.
1—Ebonite terminal strip, 11in. by 2in.

TERMINALS
8—Belling-Lee, marked: Aerial, Earth, L.S.+, L.S.—, H.T.+, H.T.—, L.T.+, L.T.—, 2s. (or Clix, Eelex).

SWITCHES
1—Readi-Rad on-off switch, 10d. (or W.B., Telsen).
1—Readi-Rad three-point wave-change, 1s.6d. (or W.B., Telsen).

TRANSFORMERS, LOW-FREQUENCY
1—Igranic Midget, ratio 1 : 3, 10s. 6d.
1—R.I. Hypermite, ratio 1 : 6, 12s. 6d.

ACCESSORIES

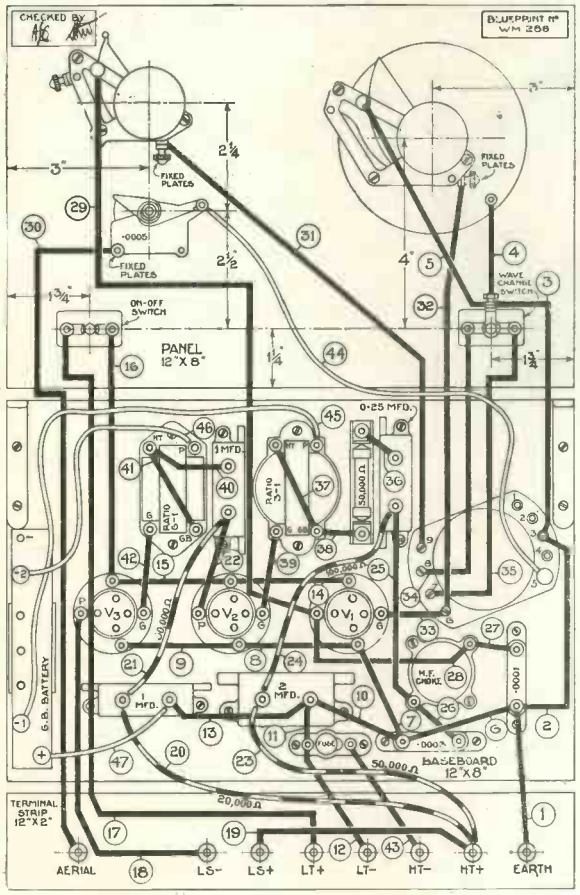
BATTERIES
1—Pertrix 120-volt high-tension, standard type, 15s. 6d. (or Ever-Ready, Siemens).
1—Pertrix 9-volt grid-bias, 1s. 6d. (or Ever-Ready, Siemens).
1—Exide 2-volt accumulator, type WZG2, 12s. (or C.A.V., Tudor).

CABINET
1—Pickett in oak, 15s.
1—Camco Melodee No. 1 loud speaker cabinet, with baffle board, £1 3s. in oak.

LOUD-SPEAKER
1—Rola permanent-magnet moving-coil, type PM1, £2 9s. 6d.

VALVES
1—Mullard PM1A, 7s. (or Six-Sixty 210RC, Osram H2).
1—Mullard PM2DX, 7s. (or Six-Sixty 210D, Osram HL2).
1—Mullard PM2A, 8s. 9d. (or Six-Sixty 220PA, Osram LP2).

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



QUARTER-SCALE LAYOUT

A full-size blueprint (No. WM288) can be obtained for 1s., post free, on application to the "Wireless Magazine" Blueprint Department. When wiring up the set connect the leads in the numerical order indicated

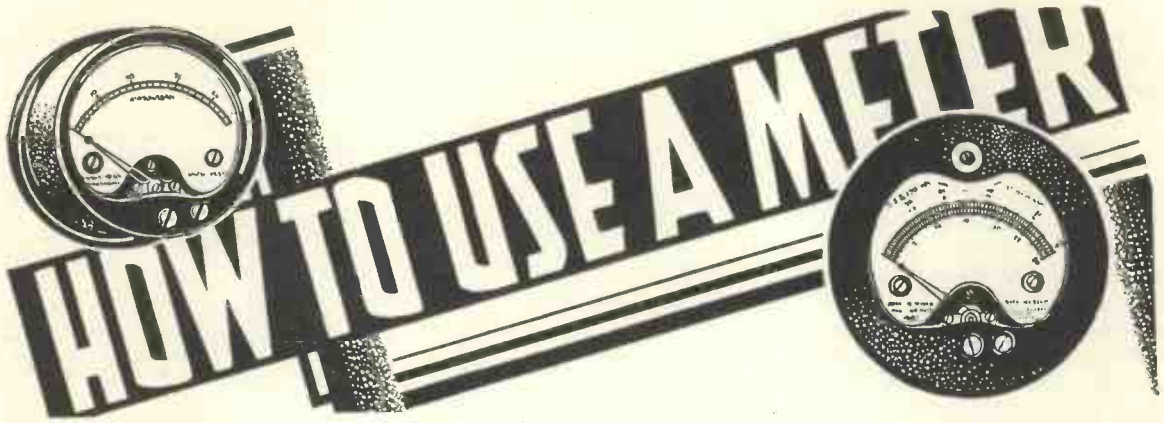
It should, perhaps, be emphasised that the coil used in the Multi-mag Three is of a type specially designed by Paul D. Tyers. This is the first set to use this particular coil, but there is no doubt that it will become so popular that it will be employed in other simple receivers of high performance.

The "Wireless Magazine" is able to claim that the Multi-mag Three is better than any other set using only a detector and two low-frequency stages that has been described in these pages. Constructors will agree with this claim, we are certain.

Reports Invited

For the guidance of prospective constructors we shall be glad to have reports from readers who build the set as to what it will accomplish in their particular districts. Such information is of the greatest help to the "Wireless Magazine" Technical Staff and to readers of this journal generally.

Readers who submit reports on the performance of the Multi-mag Three are reminded that half-a-guinea is paid for every photograph of a "Wireless Magazine" receiver printed in these pages.



In this article J. H. REYNER, B.Sc., A.M.I.E.E., explains what meters are needed for simple receiver tests and how they should be used for taking accurate measurements. Every constructor should read it carefully

THE dashboard of a modern car carries, as a matter of course, four or five meters to indicate whether certain vital portions of the mechanism are working correctly or, in the case of such instruments as the speedometer, to indicate the performance of the car at any particular moment.

Checking Performance

In the case of a radio receiver we have not yet arrived at a state where we consider such constant indications necessary, but the wise man, nevertheless, has in his possession suitable measuring instruments or meters by means of which he can check the performance of his set at periodic intervals.

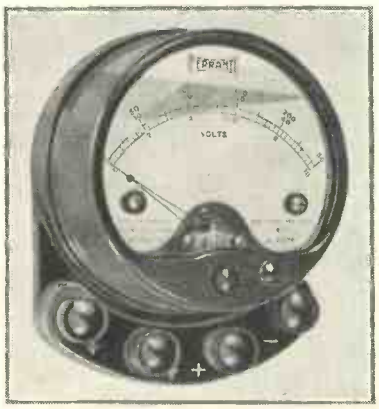
For testing out receivers which have just been constructed, or for locating a fault on a receiver which has developed a trouble, meters are practically indispensable. The purpose of this article is to show, firstly, what meters are commonly used and, secondly, how they must be employed.

First of all, what is a meter? It is a device which indicates the passage of current by the movement of a pointer. The pointer is usually controlled by a light spring, and the effect of the current is to force the pointer to move against the action of this spring. Consequently, the stronger the current the more the movement, and vice versa.

It is, however, clearly necessary to ensure that the power required to operate the meter is very small. Otherwise it will have a considerable effect on the quantity being measured.

This is done by making the movement itself very small and light, and attaching a very fine pointer made of aluminium tube and, of course, endeavouring to construct the most efficient arrangement possible for producing the actual force on the movement.

The moving-coil meter is at once the most sensitive and simplest type. A small coil is pivoted in a strong magnetic field produced by a small permanent magnet, as shown in



THREE VOLTAGE RANGES
This Ferranti D.C. meter has ranges of 0-10, 0-50 and 0-250 volts. It is of the 1,000-ohms-per-volt type and the price is £3 12s.

Fig. 1. If an electric current is passed round the coil it will try to rotate on its axis just as an electric motor will revolve when current is applied.

The rotation is checked by the spring and the pointer actually moves until the force produced by the passage of the current is balanced by the restraining force exerted by the spring.

This form of meter can be made very sensitive, but it will be clear that it is only suitable for use on D.C. because if the direction of the current through the coil is changed then the movement is in the opposite direction.

This form of meter, therefore, must be connected the correct way round in the circuit. Consequently moving-coil meters are marked with + and — on the terminals.

Let us now consider how to use a simple meter of this type. If we have a circuit carrying a current and we wish to know what the current is, we break the circuit at a suitable point and insert the meter. This must be so connected that the current will flow in the correct direction to give a reading on the scale as we have just seen.

One of the simplest examples is the measurement of anode current in a receiver; this is usually done by disconnecting one of the leads from the high-tension battery and inserting the meter therein.

Common Negative Lead

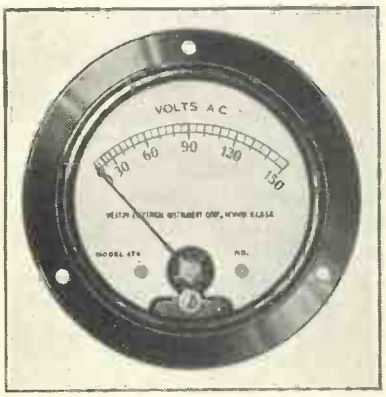
If, as is usual, there are several tappings on the battery, then the only lead which we can choose is the negative lead, since all the currents from the various tappings have to flow back to the battery through this one common lead and, hence, if we insert the meter at this point we shall obtain a reading of the total current.

For this purpose we should use an instrument so constructed as to give a full-scale deflection of, say, 20 milliamperes, and calibrated by means of suitable graduations on the scale so that we can read off any smaller number than this.

The meter would be connected with the negative terminal to the negative pole on the high-tension battery and the current would flow through the meter and cause the pointer to move over, indicating the exact current flowing at the time.

If we required to find the current on any of the tappings, we should insert the milliammeter in the actual lead from that tapping. In this case the positive terminal of the meter will be connected to the tap in order once more to ensure that the current is in the correct direction.

The measurement of the actual anode current flowing in a particular circuit is often useful in checking faults. For this it may be necessary to break into the receiver itself. For



FOR MEASURING A.C.
A Weston type 476 A.C. voltmeter, which has a range of 0-150 volts. The resistance is approximately 15,800 ohms and the price is £2 10s.

example, one may require to know the current in the anode circuit of a screen-grid valve, in order to make sure that this valve is working.

In such a case the connection from the valve anode would be removed, and a milliammeter inserted in this circuit.

Care is necessary here in order to see which is the correct way round.

The anode of the screen-grid valve is at a high positive potential and one might, therefore, assume that the positive terminal of the meter should be connected to this point.

Voltage Drop

A little thought will show that this is not correct, for if the circuit is drawn out it will be seen that the most positive point of the circuit is the high-tension battery, and that the voltage gradually falls through the circuit, through the valve, and back to the battery.

We must, therefore, connect the *negative* terminal of the meter to the anode of the valve, and the positive terminal to the lead from the tuning coil or high-frequency choke.

Basis of Fault Finding

This idea of a gradual fall in voltage through the circuit is a very useful point of view. It is the basis of many methods of fault-finding. A high-tension battery develops a certain voltage, and across the battery we connect various circuits. In each of these circuits there is a gradual fall in voltage right down to the most negative point in the circuit, the negative end of the battery.

We can always check whether a circuit is functioning by finding out whether the successive points in the circuit develop progressively less and less voltage.

Before we can do this we must consider how to measure voltage at all. The meter so far discussed only measures current.

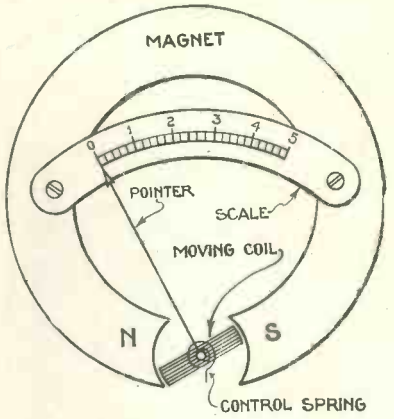
Now we know that if we apply a voltage across a resistance we shall get a certain current, determined by dividing the voltage by the resistance. If we keep the resistance constant and vary the voltage, then the current will vary in direct proportion to the voltage. A voltmeter, therefore, consists of a milliammeter in series with a resistance.

According to the voltage applied across the whole circuit, so the current through the milliammeter will vary, and the instrument is actually calibrated in terms of volts.

It must always be remembered, however, that a voltmeter is merely a milliammeter in series with a suitable resistance, and that it *does take an appreciable current.*

In many cases the voltage in the circuit depends upon the current flowing; hence the connection of a voltmeter across any two points may

HIGH-RESISTANCE VOLTMETER
A high-resistance 0-250 moving-coil D.C. voltmeter made by Sifam. The resistance is 1,000 ohms per volt and the price is £2



HOW THE METER WORKS
Fig. 1.—Essential parts of a moving-coil meter for measuring current or voltage

alter the conditions considerably. In order to minimise any effect of this sort voltmeters are made with as sensitive a movement as possible, so that the current taken shall be very small.

It is very largely a question of expense. A most satisfactory voltmeter for all normal testing is one which gives a full-scale deflection with one milliampere only. Thus, if we want a full-scale deflection with 100 volts, we must put 100,000 ohms in series. Such a meter, therefore, is said to have a resistance of 1,000 ohms per volt. There are some instruments which have an even greater resistance, and there are many which have much less.

For many purposes a meter with a sensitivity of 200 ohms per volt will suffice, although this will take 5 milliamperes for a full-scale deflection, which is often too heavy.

Cheap meters may take as much as 30 milliamperes for a full-scale deflection—probably considerably greater than the total consumption of the set being tested—and the uselessness of attempting to carry out any serious tests with such an instrument is obvious.

Battery Voltages

The voltage on a battery may be measured by merely connecting a voltmeter across its terminals. The voltage at various parts in the circuit may be estimated by the same process. If we wish to know the voltage on the anode of a valve, for instance, we should connect a voltmeter with the negative terminal to the high-tension negative point, and the positive terminal to the anode of the valve.

HOW TO USE A METER—Continued

MULTI-RANGE METER
This Dix-onemeter, with five multipliers, gives the following D.C. ranges: (1) 0.2 milliamperes, (2) 0-100 millivolts, (3) 0-7.5 volts, (4) 0-250 volts, (5) 0-50 milliamperes, and (6) 0-500 milliamperes. The price is £4 19s. 6d.

Incidentally, for testing work of this nature it is very desirable to use devices known as test prods. These consist of long lengths of insulated tube, down the centre of which runs a small copper or brass rod, terminating at a point in the far end.

Making Contact

This enables one to make contact with various points in the circuit, often in somewhat inaccessible positions, while at the same time there is no danger of shock as the user merely grasps the insulated rod. They are particularly useful when dealing with mains receivers.

In a measurement of the type we have just discussed, however, it is necessary to bear in mind the fact that the meter itself takes some current and that, if there is any resistance in the circuit, the voltage indicated may be quite different from that actually applied. A classic example of this is in a resistance-coupled valve.

Effect of Voltage Drop

Suppose we wish to measure the voltage on the anode of the valve shown in Fig. 2. This voltage is less than that of the high-tension battery because of the voltage drop on the resistance in the anode circuit.

Bearing in mind the idea previously put forward regarding a gradual drop in voltage, we can see that current will flow from the high-tension battery through the anode resistance, through the valve itself (which acts as another resistance) and back to the battery.

The voltage, therefore, will be divided in proportion to the relative resistances of the valve and the anode resistance. It is customary to make the anode resistance about twice that of the valve, so that we should obtain approximately one-third of the normal high-tension voltage on the anode of the valve itself.

If we attempt to measure this voltage by connecting a voltmeter between filament and anode of the valve, however, we have upset the conditions. There is now an additional path for the current to return to the battery.

We can, in fact, consider that there are two currents, one flowing through the anode resistance and through the valve, and the second one through the anode resistance and through the voltmeter. The total current drawn from the battery will thus be the normal valve current, which is perhaps 2 milliamperes, and that taken by the voltmeter,

VOLTS, AMPERES AND OHMS
The Avometer (price £8 8s.) gives direct D.C. readings of 1 millivolt to 1,200 volts, .1 milliampere to 12 amperes, and .1 ohm to 1 megohm

which may be from 1 to 5 milliamperes, even with a good quality meter.

In the latter case the current taken by the meter is two and a half times as great as that taken by the valve and consequently the voltage drop on the anode resistance will be so large that nearly all the voltage will be lost on this resistance, and the indication obtained from the voltmeter will be something of the order of 10 volts or so.

In a case like this the most satisfactory method is to insert a milliammeter in series with the anode resistance and measure the actual current flowing. Then by a simple calculation it is possible to estimate the voltage on the valve.

If the anode resistance R is in thousands of ohms, then the voltage is

$$V - iR,$$

where V is the voltage of the high-tension battery and i is the anode current in milliamperes. For example, if R = 20,000 ohms, V = 120 and i = 4 milliamperes, the anode voltage will be $120 - 4 \times 20 = 40$.

Other Difficulties

There are numerous other difficulties which may be experienced if a measurement is taken thoughtlessly. It is not possible to go into these in detail. Generally speaking, though, troubles with milliammeter measurements are few.

If the meter is of reasonably good quality it will absorb a negligible amount of power from the circuit and the meter reading may be considered accurate.

The exception to this is where a very sensitive circuit is used or, alternatively, a poor meter which has an appreciable internal resistance, in which case battery feedback may be set up, since a common resistance in the high-tension circuit has the same effect whether it is inside the battery or outside.

This may produce an oscillation in the set which would cause the current to rise to a very large value and give quite misleading results. It is best to be on the safe side if there is any doubt and shunt the meter with a 2-microfarad condenser.

Voltmeter Current

Voltmeter tests are more difficult because it is always necessary to allow for the current taken by the voltmeter. The best remedy is to use an instrument which has a very high internal resistance (considered as a voltmeter), of at least 1,000 ohms per volt, and even then there are many cases where a check should be made to ascertain that the current taken by the meter is not producing any serious effects.

A SPECIAL ARTICLE BY J. H. REYNER

We have referred to poor-quality meters. The moving-coil meter is somewhat expensive, particularly if it is to be really sensitive. Attempts are often made to use moving-iron meters.

In these the movement of the needle or pointer is controlled by the attraction of a piece of iron by a magnet. Current is passed round a coil of wire and a small pivoted armature is caused to move through an appropriate arc. By suitable design of the mechanism a satisfactory movement can be obtained, but it suffers from the disadvantage that it is by no means as sensitive as the moving-coil type.

Full-scale Deflection

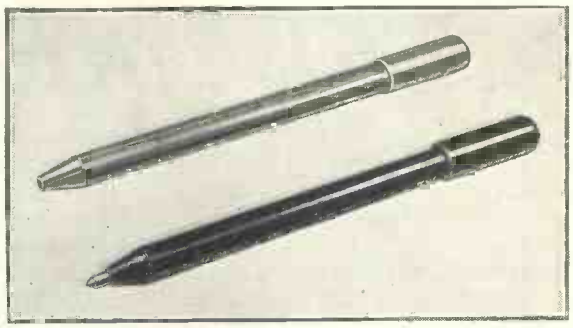
A good-quality moving-iron meter can be made to give a full-scale deflection with 5 to 10 milliamperes, so that even the best commercial instruments are nothing like as good as moving-coil types.

Most of the very cheap instruments on the market are of this type, and are not at all efficient, requiring 20 to 30 milliamperes for their operation. They are quite useless for any serious testing.

Their use is limited to occasional measurements of battery voltages, and then they must only be used sparingly because of the current they take. Moreover, in nine cases out of ten the accuracy is about plus or minus 10 per cent.

Moving-iron meters are particularly useful for alternating-current measurements, since the pull on the armature due to the magnetic effect is not dependent upon the direction of the current. Therefore they can be used for alternating currents, and a number of very good practical testing instruments of this form have been introduced on to the market within the last few years. Generally speaking, the current consumption is from 5 to 10 milliamperes, as already remarked.

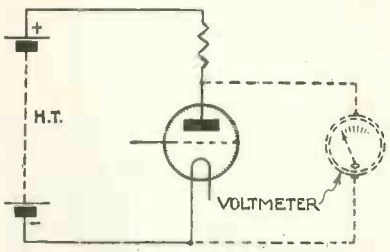
MOVING-COIL VOLTMETER
A single-range D.C. voltmeter made by Bulgin. It reads from 0-250 volts (1,000 ohms per volt) and the price is £2 5s.



TEST PRODS FOR INACCESSIBLE WIRING
For poking about inside a set without fear of shocks the Eelex test prods are ideal. The price is 3s. 6d. a pair

Due allowance must again be made for the current taken by the meter. For example, if one is measuring the voltage on a mains-transformer secondary it is necessary to consider what the normal current delivered by the transformer will be.

In measuring a 4-volt winding, for example, where the current is one or more amperes, the current taken by the meter is negligible, but in a high-tension secondary, where the current is perhaps 20 or 30 milliamperes only at full load, the addition of an extra 10 milliamperes due to the meter will result in the voltage delivered being appreciably lower than it should be.



RESISTANCE-COUPLED VALVE
Fig. 2.—Special care is necessary in measuring the anode voltage on a resistance-coupled valve

This can quite easily be allowed for if the existence of the effect is appreciated.

One method of doing this is as follows :—

The voltage is first measured with no additional load (other than that of the meter). Suppose this comes to 200 volts on a meter with a full-scale deflection of 300, then we know that the meter is taking two-thirds of its full-scale current.

If this happens to be 10 milliamperes, then the meter is taking 6.6 milliamperes when the pointer reads 200 volts. We now put, say, 20 milliamperes load across the secondary, and again measure the voltage. We find that this has fallen to 180. This is the voltage at 26 milliamperes, approximately.

The slight difference in the current taken by the meter may be neglected for all practical purposes. We can now plot a graph showing voltage in one direction and current in the other, and we know that at 6.6 milliamperes the voltage is 200, while at 26 it is 180. By drawing a line through these two points we can determine the voltage at any other current we require.

One may perhaps conclude with a brief review of the general requirements for ordinary testing. A moving-coil milliammeter is the first essential. This should be capable of reading up to 20 or 30 milliamperes for all normal purposes, and if super-power work is to be carried out higher readings than this will be necessary.

Two-range Instrument

It is desirable, however, to have a two-range instrument or an instrument with interchangeable shunts so that for small readings the low range can be used, and for larger readings a suitable adjustment can be made.

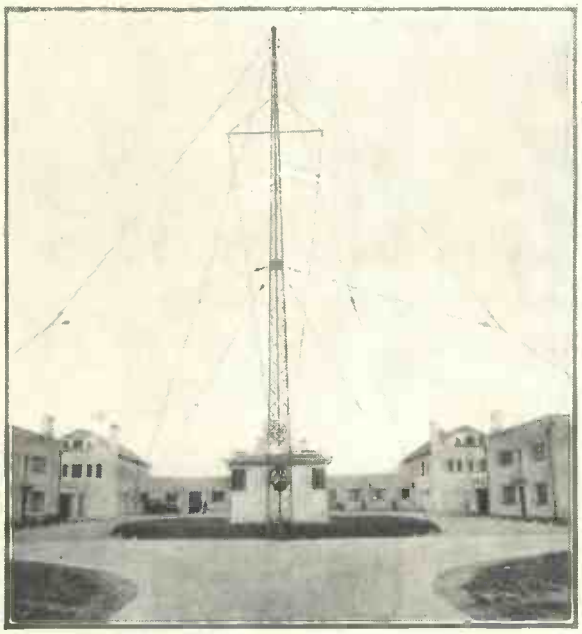
A high-resistance voltmeter reading up to 250 volts with an internal resistance of 1,000 ohms per volt is a very desirable accessory.

Finally, a low-tension voltmeter reading up to 6 or 10 volts is useful. This need not be of such a high sensitivity, but it should, nevertheless, be a moving-coil instrument or a high-grade moving-iron meter.

For A.C. working a moving-iron or rectifier voltmeter of high quality is desirable.

Listen-in For "The Weather"

Broadcast weather bulletins of the greatest assistance to motoring portable-set enthusiasts and picnickers are broadcast from a station under the control of the Automobile Association. A description of the service is given here by KENNETH ULLYETT



SPECIAL STATION FOR WEATHER REPORTS

The aerial mast of the Automobile Association's special station at Heston Airport. It broadcasts weather reports on 833 metres throughout the day

UNLESS you rise early enough on your holidays to hear the Daventry shipping forecast, you cannot make much use of the B.B.C. weather bulletin service until the early evening when, of course, a forecast is given for the following day!

Before Going Out

Before going out of doors on a motoring trip with a portable set, or even on a tramp or picnic, we all of us want to know what the weather will be like during the next few hours and pressure on the B.B.C.'s programme time at present prevents the broadcasting of short-period bulletins.

There is a better suggestion, though. Make use of the aviation weather reports and forecasts given from the Automobile Association wireless station at Heston Airport. I want to introduce you to this broadcast service because I feel that, although it is probably designed for flying people, there is not enough use made of it by outdoor wireless enthusiasts and motorists.

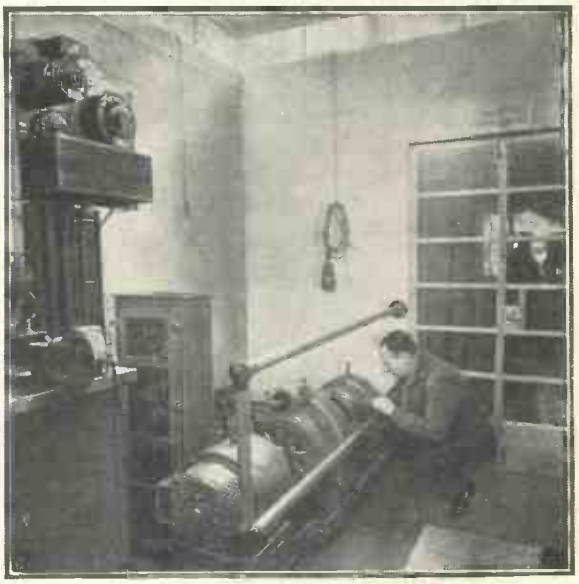
At the invitation of the A.A. and Standard Telephones & Cables, Ltd. (the builders of the station) I have seen the outfit which, nine times a day, gives a complete weather service. A low white building houses the small office, generator room, and the transmitter, the whole being presided over by the genial Mr. Herbert, who does practically everything from dictating the station's correspondence to fondling the generators and broadcasting the bulletins.

The bulletins are given in ordinary language and are broadcast twice. They give the state of the sky, direction and speed of the wind, amount of cloud and so on at dozens of places all over the country—Bedford, Newcastle, Birmingham, Southampton, Felixstowe, Yarmouth and so on. The reports are the result of observations at the Air Ministry meteorological stations grouped along six main air routes.

Likelihood of Rain

The forecasts cover England, Scotland, Wales and Northern Ireland and give information as to the likelihood of rain, hail, snow or sleet, with wind conditions both on land and at 2,000 ft. The reports and forecasts are given so frequently that whether you are going on a long motoring trip or only on a short tramp of a few miles, you can know what weather to expect.

The wavelength used is 833 metres, which you should find fairly easy to get either at the top end of the medium waveband on your set or at the very bottom end of the long waveband.



THE GENERATING PLANT

Although only low power is used at the Heston station, its signals can be heard almost all over the country on a sensitive receiver

The power is not very great, but as every morning listeners in Newcastle and Exeter regularly listen to Heston, it is true to say that on an average sensitive set Heston covers the whole country.

The first broadcast is at 9.30 a.m. in the morning. This gives you a rough idea of the weather, along the

six main air routes, covering most of the country a motorist is likely to explore. At 10.30 a.m. the station comes on again and gives a later edition of the 9.30 a.m. weather report and also a forecast for the next three hours or so. The station then works at half past the hour every hour until 6.30 p.m. except at 2.30.

At 11.30 a.m. it gives weather reports from the south-east, and at 12.30 p.m. reports for the whole country, at 1.30 p.m. a forecast for the rest of the day, at 3.30 p.m. and 4.30 p.m. further bulletins, and at 5.30 p.m. a forecast for the following day.

Reliable Information

The information is absolutely reliable. It is supplied by the Air Ministry and is compiled from the reports of aviators and by wireless from ships in the Atlantic.

Anybody can receive these bulletins. Many garages all over the country receive the information and display it on notice boards for the benefit of passers-by. Selfridges and the Lex garage chain in London display these A.A. bulletins. The broadcasts are given at slow speed, so that you can easily jot down information.

Special forms can be obtained from any A.A. office at very low cost, facilitating easy transcription, as the forms are worded in the order in which the broadcasts are given.

On the occasion of my visit to Heston, the genial Mr. Herbert in charge of the station showed me just how the broadcasts are made.

A little hall leads straight into the transmitting room where the announcer sits, microphone in hand, before the weather bulletin receiver. Along a corridor are the generators which supply all the power except the high-tension and grid-bias feeds for the receiver, and at the end is a small office where the administrative work of the station is carried out and a fairly considerable correspondence dealt with.

By a clever system of keys, Mr. Herbert can change, in less than a couple of seconds, from the weather-bulletin receiver to the broadcasting apparatus, the same aerial being used for both. In front of him he has a metal box set covering practically every wavelength band from 40 metres upwards. On a cone loud-speaker, standing above it, he receives the coded weather reports from the various centres, the names of which are given in the broadcast announcement.

The weather bulletins are typed out and duplicate copies made so that the news can be posted up all over the aerodrome. During the broadcasting day there is hardly a moment to spare for no sooner has one bulletin been broadcast than the receiver must be set going to pick up the news for the next sheets.

Long before the first bulletin is broadcast at 9.30 in the morning, the news is being gathered in from every quarter.

These are transmitted in a figure code, but by long use Mr. Herbert knows instantly the meaning of any one of the hundreds of figure combinations. In a matter of only a few minutes the bulletins are made out, a remote-control switch touched, and the generators start their busy hum. Heston is on the ether !

Summer-time Programme of A.A. Meteorological Broadcasts

0930 hrs. B.S.T. (9.30 a.m.)

i. Forecast for daylight hours.
ii. Observations taken at 0800 hrs. B.S.T. along the five air routes and over the two areas.

1030 hrs. B.S.T. (10.30 a.m.)

Repetition of observations broadcast at 0930 hrs. B.S.T. amended by any subsequent reports received.

1130 hrs. B.S.T. (11.30 a.m.)

Observations taken at 1100 hrs. B.S.T. along the S.E. route and from supplementary stations.

1230 hrs. B.S.T. (12.30 p.m.)

Selected observations from stations along five routes in two areas with supplementary stations when available.

1330 hrs. B.S.T. (1.30 p.m.)

Forecast for period until dusk.

1530 hrs. B.S.T. (3.30 p.m.)

Observations taken at 1400 hrs. along the five routes and in the two areas.

1630 hrs. B.S.T. (4.30 p.m.)

Repetition of 1530 hrs. broadcast amended by any subsequent reports.

1730 hrs. B.S.T. (5.30 p.m.)

Forecast for following day.

1830 hrs. B.S.T. (6.30 p.m.)

Selected observations along the five routes and in the two areas.

BROADCASTING A WEATHER REPORT AND FORECAST

The operator at the A.A. station at Heston transmitting one of the nine weather reports and forecasts sent out daily. The equipment was provided by Standard Telephones and Cables, Ltd.

Components As I Know Them

The Electrolytic Condenser

By PERCY W. HARRIS, M.Inst. Rad.E

In this, the first of a new series of articles, Percy W. Harris will discuss the various component parts of a receiver in a new and intimate way which will help to a better understanding of how every set works.

Readers of "Wireless Magazine" are invited to send their component queries to Mr. Harris, so that answers may be incorporated in future articles. Individual replies will not be sent, but readers are assured that every query will be taken into consideration in planning the future articles.

THE use of erroneous, or at least misleading, names in the radio art has always interested me, "condenser" being one of the outstanding examples. The more one knows about electricity the less easy it is to visualise it as something which can be condensed, and perhaps the wrong impression created by the name has been responsible for many misunderstandings of the true function of the apparatus.

The so-called condenser in wireless is a device for storing energy. One cannot accurately say that it is a device for storing *electricity*; still less can we say it is a device for storing electric current, because current implies motion, and a charged condenser has nothing flowing in it.

State of Strain

What we are really doing is to set up a state of strain inside the condenser which will only be relaxed when the two terminals of the condenser are joined together through an electric circuit, whereupon the relaxation of the strain sets up an electric current in the connecting wires.

The simplest form of condenser consists of two conducting plates with an insulated material between them. This may be air or one of a very large number of liquids, pastes or solids.

When the condenser is charged by being connected to a source of electrical pressure some form of strain is set up in the insulating material between the plates (known as the dielectric) and the amount of strain set up is dependent on the pressure applied to the condenser.

Holding Charge

After the pressure is withdrawn the condenser will hold its charge (that is to say, the strain will remain in the dielectric) until there is some circuit formed between the two terminals.

A high-grade condenser kept free from dust and dry air will retain its charge for a very long time, but if the dielectric has ever so slight a leakage the charge will leak away gradually or rapidly, depending upon the extent of the leak.

Similarly, loss of charge may occur by leakage along the top of the case, between terminals, if the insulation is not of high grade and if a film of dust or dirt or moisture has been deposited thereon.

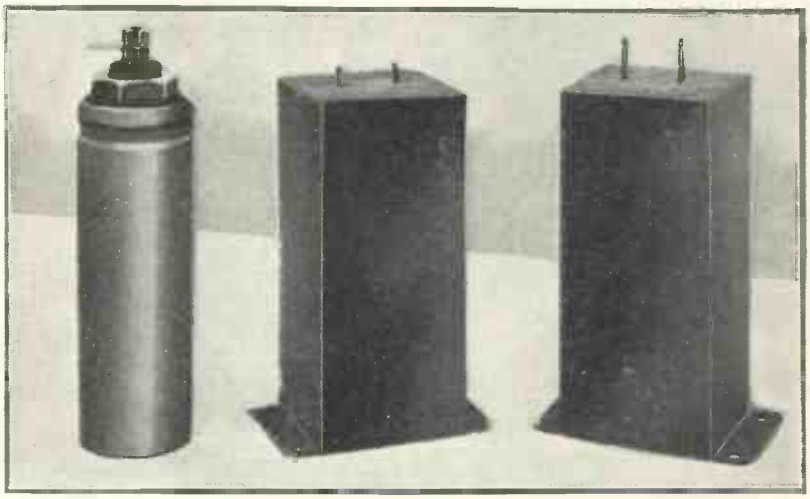
The extent to which we can charge a condenser is dependent upon the insulating powers of the dielectric. If the plates are very close together, after the pressure has reached a certain point there will be a "flash-over" and a spark will pass between the plates, completely discharging the condenser in the process.

For a given separation of plates the pressure required to break down the dielectric will depend on what is known as the "dielectric strength."

The dielectric strength of air is fairly low and that of high-grade mica is very high, so that for a given space between the plates we can increase the pressure, or give a very much higher charge, when mica is used than when air is the dielectric. Paper comes in an intermediate position between mica and air so far as strength is concerned.

Condenser Capacity

The capacity of a condenser depends upon the spacing of the plates and what is known as the "dielectric constant" of the insulating material between them. The closer the plates are put together the higher the capacity or, put in another way, the more energy the condenser will hold for a given voltage; but for a given spacing between plates we can increase the capacity considerably over that given by air by introducing a dielectric of higher dielectric constant.



HOW THE ELECTROLYTIC SAVES SPACE

The 8-microfarad electrolytic condenser on the left is equivalent electrically to the two 4-microfarad condensers seen on the right—a clear indication of the space that is saved. Such condensers should become popular among constructors

Mica, for example, has a very high dielectric constant and picked specimens may have a value as high as eight, which means that for a given spacing and a given voltage a condenser with a high-grade mica dielectric will hold eight times the amount of energy of a similar condenser with air between the plates.

There is one more point in connection with fixed condensers to which I must refer before coming down to the subject of my article, that is, the new electrolytic condensers. This is the matter of losses in the dielectric, which may be either high or low.

Roughly speaking, a condenser with an air dielectric will give back practically all the charge which is put into it, and one with a high-grade mica dielectric will also do the same.

If the dielectric is poor (which is emphatically the case in some moulded compositions), you will not get back anything like the charge you put into it, and if you are using fairly high frequencies (which means that you are charging and discharging the condenser a very large number of times per second), energy losses this way may be very important.

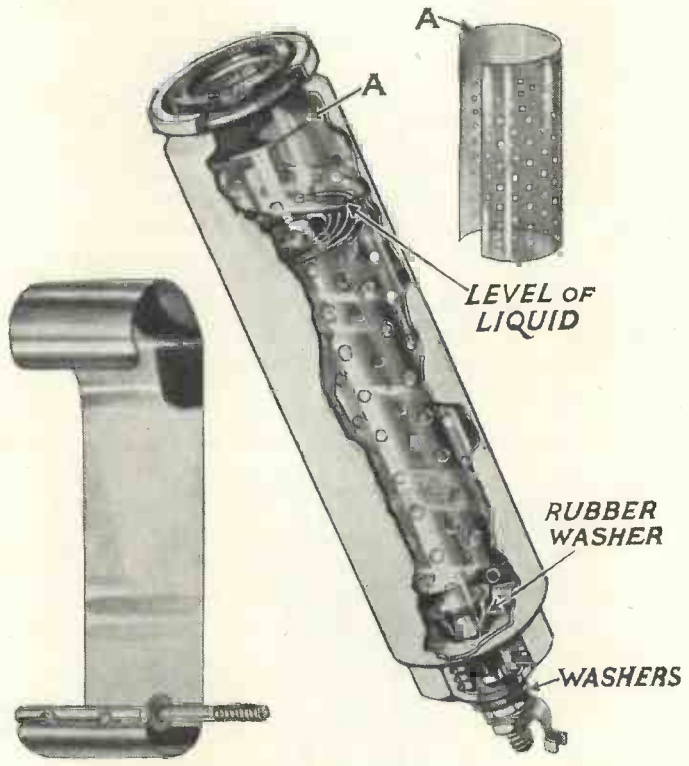
In such cases the energy which you do not get back again is dissipated as heat, and if the condenser is being charged to a high voltage very rapidly (as is the case with radio-frequency transmitting sets), the heat generated in this way may be sufficient to set the whole condenser alight. Even a high-grade ebonite, which is generally satisfactory in radio work, may fall down badly in a high-power transmitting condenser when it is used to insulate the two terminals from one another.

Ebonite Mounting

The condenser may be designed to have an air dielectric, but the terminals have to be supported, and in the first high-power transmitting condensers used these terminals were often supported by a sheet of ebonite with a comparatively small space between them.

This ebonite thus formed the dielectric of the small condenser made by the terminal shanks themselves and the ebonite, and thus were subjected to considerable strain in the charging and discharging. In a number of cases where high-power transmitters were being used for the first time the heat set up was sufficient to melt the ebonite and to cause the whole condenser to collapse.

And now, having cleared away these preliminaries, an understanding of which is necessary before we can talk about electrolytic condensers, we can get down to the real subject of our article.



THE ELECTROLYTIC CONDENSER DISSECTED

This sketch shows how the electrolytic condenser is arranged. The outer aluminium or copper can forms the cathode, as it is in electrical connection with the liquid which forms a film round the central plate, the anode. These condensers can be used only in direct-current circuits

The electrolytic condenser which has come into prominence the last year or two is not strictly a new invention, as its principles have been known for at least seventy-five years, but it is only recently that manufacturing difficulties have been successfully overcome so to make it possible to use these condensers commercially.

Their particular virtues are that they enable a very large capacity to be obtained in a small space and that they are self-healing, that is, if a sudden excess of voltage is applied to them any breakdown caused is only momentary, the rupture healing itself.

Mains Receivers

This is naturally very important in mains-driven receivers where the breakdown of a filter condenser will put the whole set out of commission.

Electrolytic condensers are generally classed as " wet " and " dry," the wet type containing a liquid in a metal canister which is also the negative connection; and the dry type a kind of paste or some form of moistened material.

It will be seen in a few minutes that no dry electrolytic condenser is strictly "bone dry," although the name is justifiable for comparison purposes, just as we talk about " dry cells" which will not work at all if they are really dry, being dependent on the moisture in the paste for their functioning.

We shall understand both the wet and the dry types better if we consider the wet kind first of all. Although, mechanically, they may take many different forms, they practically all consist of a metal container, which is usually in the form of a can to contain the liquid electrolyte, a metal anode and some form of insulated top, often provided with a gas vent, which will allow any gas that forms in the cell to escape, but so devised that the liquid will not leak.

The metal can is often of copper or aluminium (these being the most useful metals for such condensers) and although it is frequently referred to as the cathode it is not truly so, for the liquid inside is the true cathode and the metal can merely serves to make contact with this liquid.

The anode or positive element generally consists of a piece of aluminium and the liquid is often a manufacturers' secret. Often, however, it consists of a solution of borax and boric acid (this substance, by the

THE ELECTROLYTIC CONDENSER—Cont.

way, is generally called boracic acid by the layman) in water.

This liquid is a conductor, as is, of course, the aluminium sheet which forms the anode and as electrical contact is made between the copper or aluminium can and the liquid, the reader may wonder how any condenser can be formed, in view of the fact that all three parts are themselves conductors in contact.

Film on Anode

It is true that, when we switch on, at first the whole device *does* conduct, but after a short time a film forms on the surface of the anode, and as this film forms so the resistance of the condenser goes up until a point is reached when the condenser is almost, but not quite, an insulator, a negligible current still flowing.

Once this film has formed on the surface of the anode (the process is called "forming"), it will remain there almost indefinitely, provided we always use the aluminium sheet as the anode and the metal can, connected to the liquid, as the cathode. (In an ordinary condenser both plates are alike and no special positive and negative connections are needed.)

We have seen in considering the ordinary type of fixed condenser that the capacity depends upon the thickness of the dielectric and, as in the case of the electrolytic condenser the dielectric is formed by this film, which is exceedingly thin, such condensers can have a very large capacity.

The fact that we must always use the aluminium plate of the anode means that such condensers cannot be used in alternating or high-frequency circuits for in such cases each electrode is alternately positive and negative.

For Mains Smoothing

In mains units, however, where the condensers are used for smoothing after rectification it is easy to arrange that the aluminium plate is always positive and it is in such a circuit the electrolytic condensers are chiefly used.

The thickness of the film formed, and therefore the capacity of the condenser, is largely dependent upon the "forming" process and the voltage applied during the forming. An electrolytic condenser formed at a low voltage will have a thin film and a high capacity and, correspondingly, one formed at a high voltage will have a thick film and a lower capacity.

There are all kinds of tricks in the forming process, which may take as long as twenty-four hours or even more. Naturally the full voltage must not be applied at once, but is gradually increased up to the point where the maximum desired is reached. After this it is allowed to remain on for a definite period found by experience in forming.

Electrolytic condensers always have a small leakage, the figure, however, being negligible in the majority of cases where such condensers are of practical use.

If an electrolytic condenser is left for a long period without being used the film may deteriorate slightly and the initial current passing through the condenser when it is switched on may, momentarily, be higher than normal, but after about half a minute it will come down to normal, the film having formed again to the correct degree.

Similarly, if an excess of voltage is temporarily applied and the film breaks down the current momentarily flowing through the condenser at this breakdown will itself form the film once again and in this way such condensers are self-healing.

A COMMERCIAL PRODUCT

An example of electrolytic condenser made by the Telegraph Condenser Co., Ltd. It gives a large capacity in a small space

While the losses in electrolytic condensers are often higher than those of the paper type of high quality, they are not of commercial importance as we are not using them in high-frequency circuits.

Measuring Capacity

The capacity and resistance of electrolytic condensers vary with frequency so that all kinds of different values of capacity can be obtained, depending on the way the capacity is measured, but manufacturers have nowadays standardised their methods of measurement so that when you buy an electrolytic condenser having a capacity of, say, 8 microfarads, it will act in a smoothing circuit in the same way as an 8-microfarad paper condenser.

In this article, naturally, I can only deal with general principles and you can easily imagine for yourself that the manufacturers have had many practical difficulties to overcome before they have been able to produce a satisfactory electrolytic condenser.

The principle of the dry type is identical with that of the wet type, for here we have an aluminium or other special metal anode (sheets of aluminium foil are frequently used), a liquid which is incorporated in a paste or used to saturate some absorbent material, means of making contact with this moistened material, and a formed film upon the anode.

Only for D.C. Circuits

Either the wet or dry type will work perfectly satisfactorily in the conditions for which it is designed, but we must not use either type in alternating-current or high-frequency circuits or in any place where the highest possible insulation is required, owing to the very slight leakage current being always present.

So far as smoothing circuits in mains-driven sets are concerned, this type of condenser is rapidly gaining favour, the compactness and self-healing properties making a strong appeal to the set manufacturer who wishes to give the best possible value in a given space with a minimum of service difficulty.

The SCREEN-GRID TWO

Something New in Two-valve Sets

From its name it might be thought that this set consists of a screen-grid high-frequency amplifier and a detector, but this is not the case. Here the "Wireless Magazine" Technical Staff presents details of a new type of receiver with a screen-grid valve used as detector

SCREEN-GRID valves have for so long been associated in our minds only with high-frequency amplification that it is a little strange to think of them as being suitable for any other purpose : yet, in fact, ever since they were introduced, keen experimenters have wondered whether advantage could not be taken of their high degree of magnification for developing "super" detectors.

Deserves Attention

This aspect of screen-grid valve technique has not previously been given the attention it deserves; now that the price of this type of valve has been reduced there is more reason still for examining its properties as a detector of high-frequency currents.

This problem has been approached by the "Wireless Magazine" Technical Staff. The set described and illustrated in these pages is the practical application of the results of several weeks of experimental work. Those who build the Screen-grid Two will be able to verify for themselves the efficiency of the screen-grid valve as a detector.

There are two characteristics of the screen-grid valve that make it particularly desirable as a detector—at least on paper. In the first place the very low inter-electrode capacity means that little damping would be introduced across the aerial-tuning circuit.

In other words, the damping introduced by a screen-grid detector should be less than one-hundredth of what is experienced when a three-electrode valve is employed.

The second point in favour of the screen-grid valve is its high magnification factor, which should result in considerably increased signal strength. The difficulty is to get a sufficiently high impedance in the anode circuit to take advantage of this high magnification factor.

(Maximum amplification is obtained from a valve when the external anode impedance is greater than the internal anode-filament impedance, which is very high in the case of a screen-grid type.)

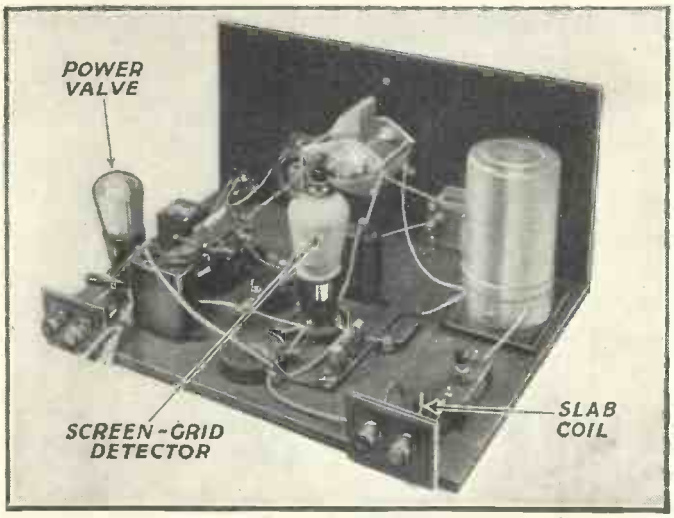
Experiments conducted by the "Wireless Magazine" Technical Staff showed that the anode impedance could take the form of a high-inductance choke; not a high-frequency choke but a low-frequency type, as in the anode circuit of a detector valve we are concerned with low-frequency fluctuations.

Rise in Impedance

The trouble about a very high-inductance choke is that its impedance rises considerably at high frequencies, with the result that the top notes are amplified to a greater extent than the middle and low frequencies, and the reproduction tends to become high pitched—"pentode" quality is obtained, in fact.

It was found, however, that by placing a high resistance in parallel with the choke that a substantially constant impedance was obtained and the overall frequency response was more or less even. This resulted in the quality being pleasing to the ear.

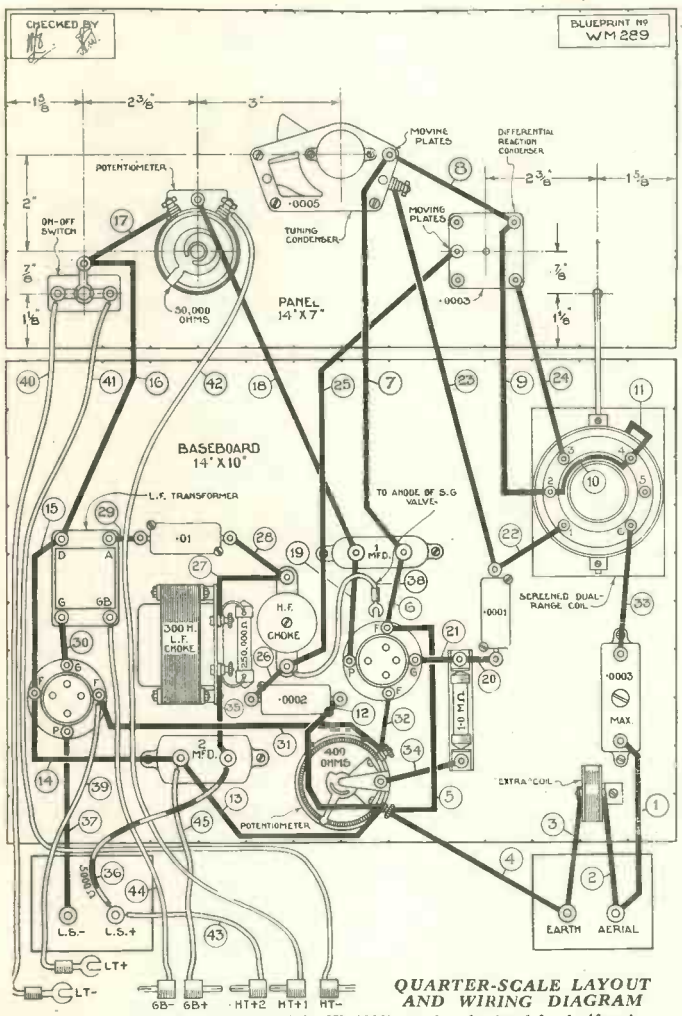
As will be seen from the circuit diagram the



NO SET COULD BE SIMPLER THAN THIS

Although it uses a screen-grid valve as detector, the Screen-grid Two is particularly simple in construction and operation. It gives excellent results and has been thoroughly tested

THE SCREEN-GRID TWO—Continued



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

If desired, a full-size blueprint (No. WM289) can be obtained for half-price (that is, 6d., post free), if the coupon on the last page is used by July 31.

values eventually adopted were 300 henries for the low-frequency choke and 250,000 ohms for the parallel "limiting" resistance. (It should be particularly noted that an ordinary low-inductance choke, as normally used for a choke-output circuit, is of no use in the anode circuit of a screen-grid valve.)

Careful tests have proved that the screen-grid valve used in this way is more efficient than the normal three-electrode type. The magnification obtained is considerably greater and the two-valve set illustrated in these pages is definitely more efficient, and will pick up more stations at good strength, than an equivalent receiver using a three-electrode valve in the detector position.

Apart from the need for special arrangements in the anode circuit, there are two other controls needed to get the best out of a screen-grid detector circuit. In the first place most valves are sensitive to changes of grid-bias voltage and, secondly, the screening-grid voltage is also a critical factor.

Two Potentiometers for Fine Control

For these reasons two extra controls are provided in the Screen-grid Two : one is a grid-bias potentiometer and the second is a potentiometer for controlling the voltage on the screening grid within fine limits. In practice, both controls are adjusted until the best results are obtained from the set.

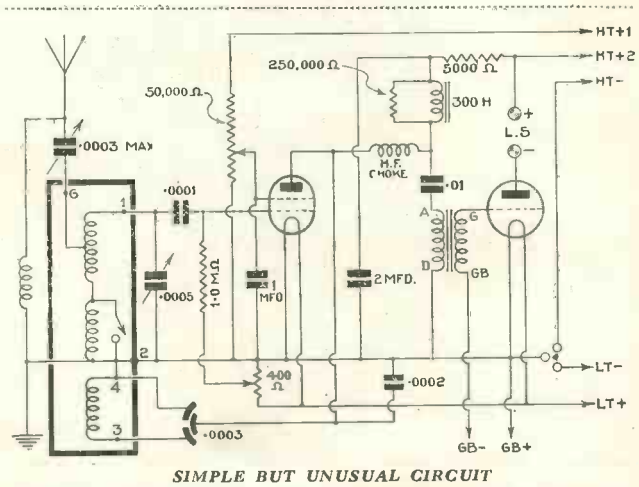
A screen-grid valve working on its own will obviously not give sufficient output to drive a loud-speaker, even when the local station is being received. This set, therefore, incorporates a low-frequency amplifier to magnify the signals sufficiently to operate a loud-speaker. The results that may be expected can best be judged from the test report that follows :—

Good Results on Test

"The most interesting feature of this set shown during recent tests," reports the member of the "Wireless Magazine" Technical Staff who put it through its paces, "was that its overall performance was better than an average two-valve set. Signal strength was greater and quality was exceptionally brilliant.

"With an average two-valver it is usually only possible to receive three or four stations at good loud-speaker strength, but with the Screen-grid Two at least seven or eight can be heard at full strength."

Tests were made about twenty miles from Brookman's Park, using an outdoor aerial 70 ft. long. The anode current was found to be 8 milliamperes.



SIMPLE BUT UNUSUAL CIRCUIT

There are special arrangements in the anode circuit to make the screen-grid valve act as a detector. The power valve is transformer coupled to the detector

The following stations were received on the long waves :

Warsaw	60
Eiffel Tower	64
Daventry	72
Radio Paris	84
Huizen	95

On the medium waves the following stations were picked up :

London National	29
Hilversum	39
North National	40
Poste Parisien	47
London Regional	54
Midland Regional	64
Sottens	66
Rome	74
Beromuenster	78
Langenberg	81

SOMETHING NEW IN TWO-VALVERS

North Regional	82.5
Prague	84
Florence	86
Brussels	88

These results will dispel any doubts the reader may have had in his mind regarding the efficiency of the screen-grid valve as detector; they speak for themselves.

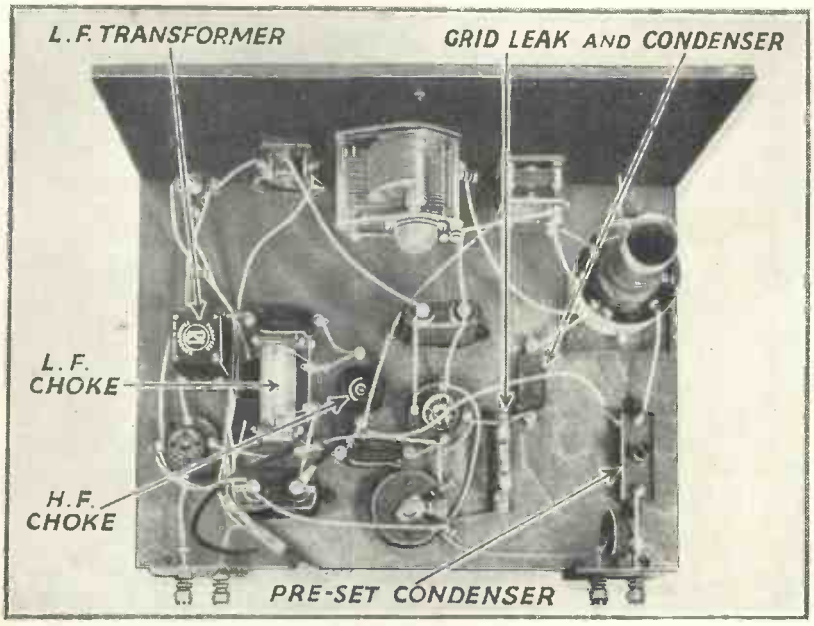
It will be noted that the reaction circuit is somewhat unusual. Besides a .0003-microfarad differential reaction condenser the circuit also includes a constant by-pass capacity of .0002 microfarad.

Smooth Reaction

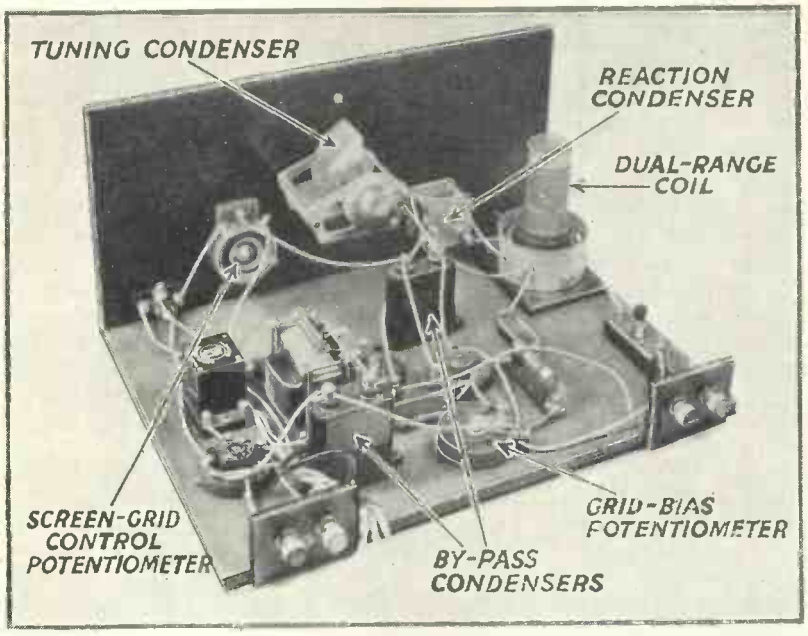
The differential condenser, of course, gives constant high-frequency by-passing between the anode and filament of the valve. Tests showed, however, that smoother reaction, and better results generally, were obtained by increasing the by-pass action as the reaction was advanced. It is for that reason that the extra .0002-microfarad condenser was included.

Looking at the whole circuit in detail, it will be seen that there is nothing unusual about the aerial circuit. This includes the normal series condenser of .0003-microfarad capacity and a dual-range coil. The latter is provided with an external choke with the object of lessening the effect of medium-wave stations breaking through when the set is adjusted for long-wave working.

The grid leak and condenser values in this circuit are 1 megohm and .0001-microfarad respectively. It will also be seen that a 1-microfarad by-pass condenser is provided between the screening grid and the negative side of the filament.



HOW THE PARTS ARE ARRANGED ON PANEL AND BASEBOARD
This special plan view o the Screen-grid Two shows clearly the disposition of all the parts on both panel and baseboard



NO SPECIAL COMPONENTS ARE NEEDED FOR THIS SET
All the parts used in the construction of the Screen-grid Two are standard and can be obtained from dealers without difficulty

Instead of being taken direct to low-tension positive or negative, the grid leak has one end connected to the slider of a 400-ohm potentiometer placed across the low-tension battery so that the bias on the grid can be adjusted within fine limits.

Decoupling Resistance

Besides the low-frequency choke and parallel "limiting" resistance, there are also in the anode circuit of the screen-grid valve a high-frequency choke and a 5,000-ohm decoupling resistance. The high-frequency choke must be of a high-grade type or the reaction will not be as smooth as is desirable. The 5,000-ohm decoupling resistance is, of course, provided with a 2-microfarad by-pass condenser.

The respective connections of the .0003-microfarad differential reaction condenser and the .0002-microfarad fixed by-pass condenser will be clear from the circuit diagram.

Choke-fed Transformer

As the low-frequency transformer is choke fed (which means that the anode current of the screen-grid valve does not pass through its primary winding) it can be of the high-inductance type designed to carry only a very small current. It will be seen that the coupling condenser has a value of .01 microfarad.

THE SCREEN-GRID TWO—Continued

COMPONENTS NEEDED FOR THE SCREEN-GRID TWO

CHOKE, HIGH-FREQUENCY
1—Lewcos, type MC, 2s. 6d. (or Watmel, Tunewell).
CHOKE, LOW-FREQUENCY
1—R.I. high-inductance, type DY26, £1 1s. (or Varley).
COILS
1—Watmel dual-range, type SA1, 8s. 6d.
1—Watmel slab coil, 3s.
CONDENSERS, FIXED
1—Dubilier .0001-microfarad, type 670, 1s. (or T.C.C., Telsen).
1—Dubilier .0002-microfarad, type 670, 1s. (or T.C.C., Telsen).
1—Dubilier .01-microfarad, type 670, 1s. (or T.C.C.).
1—Dubilier 1-microfarad, type BB, 2s. 6d. (or T.C.C., Telsen).
1—Dubilier 2-microfarad, type BB, 3s. 6d. (or T.C.C., Telsen).
CONDENSERS, VARIABLE
1—Polar Ideal, .0005-microfarad, with slow-motion dial, 10s. 6d. (or Jackson, Ormond).
1—Polar .0003-microfarad slow-motion differential, 6s. 6d. (or Jackson).
1—Formo pre-set .0003 - microfarad max., 1s. 3d. (or Igranic, Lewcos).
EBONITE
1—Becol 14 in. by 7 in. panel, 5s. 10d. (or Permcol, Peto-Scott).
HOLDER, GRID-LEAK
1—Readi-Rad, 6d. (or Bulgin, Telsen).
HOLDERS, VALVE
2—Lotus four-pin, with terminals, 2s. (or W.B., Clix).
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—Lewcos 5,000-ohm spaghetti, 1s. (or Varley, Tunewell).
1—Dubilier 250,000-ohm metallised, 1s.
1—Dubilier 1-megohm grid leak, 1s. 9d. (or Telsen, Watmel).
RESISTANCE, VARIABLE
1—Lissen 400-ohm baseboard-mounting potentiometer, type 140, 1s. 6d.
1—Sovereign 50,000-ohm potentiometer, 4s. 6d. (or Varley, Wearite).
SUNDRIES
Tinned-copper wire for connecting.
Lengths of oiled-cotton sleeving (Lewcos).
Length of rubber-covered wire (Lewcos).
2—Sovereign terminal blocks, 1s. (or Belling-Lee, Junit.)
SWITCH
1—Readi-Rad three-point on-off, 1s. 6d. (or Bulgin, W.B.).
TRANSFORMER, LOW-FREQUENCY
1—R.I. Parafeed, 8s. 6d.

ACCESSORIES

BATTERIES
1—Drydex 120-volt high-tension, red triangle type, 11s. (or Ever Ready, Siemens).
1—Drydex 9-volt grid-bias, red triangle type, 1s. (or Ever Ready, Siemens).
1—Exide 2-volt accumulator, type DFG, 8s. 6d. (or C.A.V., Smiths).
CABINET
1—Pickett, in oak, 14s. 9d.
LOUD-SPEAKER
1—Celestion cabinet cone, type D10, in oak, £3.
VALVES
1—Cossor 220VSG, 16s. 6d.
1—Cossor 220P, 8s. 9d. (or Mullard PM2, Mazda P220).

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

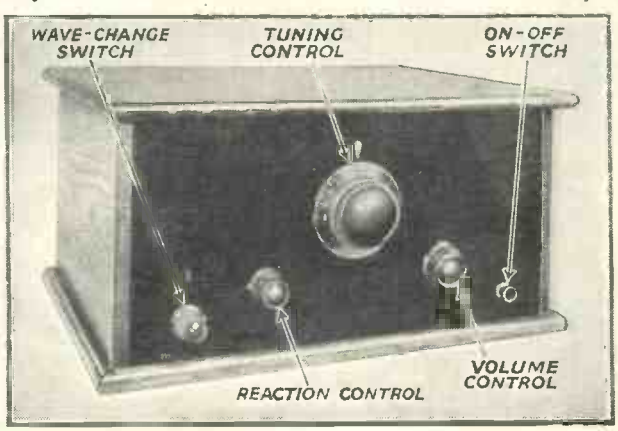
The output to the loud-speaker is taken direct from the anode circuit of the power valve. As the anode current is so small there is no need for a choke-output circuit or an output transformer.

Simple Construction

The actual construction of the set is simplicity itself, as will be evident from the photographs reproduced in these pages. There is plenty of space on the baseboard and the wiring is easy.

As in the case with all "Wireless Magazine" sets, a full-size constructional blueprint is available for the guidance of constructors. (The blueprint is not essential, of course, for all the necessary details are included in these pages.) The blueprint shows the sizes and positions of all the holes to be drilled in the panel, the exact positions of all the components and the best sequence of wiring. It will be noted that each wire is numbered separately in the best and most convenient order of assembly.

Until the end of July readers of "Wireless Magazine" can obtain copies of this blueprint for half price (that is, 6d., post free), by using the coupon that appears on the last page of the issue. Address your application to "Wireless Magazine" Blueprint Dept., 58-61 Fetter Lane, London, E.C.4.



NO OPERATING DIFFICULTIES

The Screen-grid Two is no more difficult to operate than a standard "detector and low-frequency" set, in spite of the fact that it incorporates a screen-grid detector

The construction of the set is quite straight-forward and there is no special point to be noted. The on-off switch is of the three-point type so that the high-tension battery is not discharged through the 50,000-ohm potentiometer when the set is not in use.

Connections of Extra Coil

The extra coil to prevent medium-wave stations breaking through during long-wave reception is connected directly across the aerial and earth terminals of the set.

When the wiring has been finished off, the valves should be placed in their holders and the batteries connected up. A variable-mu screen-grid valve is employed, but the power valve is not, of course, critical in any way.

Apart from the initial adjustment of the grid-bias and screening-grid potentiometers, the operation of the Screen-grid Two is no different from that of any two-valve set with a detector and a single low-frequency stage.

The two special potentiometers should be adjusted in unison until the best signals, combined with smooth reaction are obtained from any particular station.

Controlling Volume

It will be found that the screening-grid potentiometer (mounted on the panel) can be used to some extent as a volume control, but care must be taken in this respect as the valve will go right off its operating characteristic if this control is turned too far round.

Try adjusting the slider of the grid-bias potentiometer in steps, at the same time swinging the knob of the screening-grid potentiometer backwards and forwards. A little experimenting will soon give the best adjustment of the two.

Although the Screen-grid Two gives better results than the average two-valver, it is not intended to bring in scores of foreign stations on the loud-speaker. With a pair of headphones, however, it is an ideal receiver for the man who wants to explore the ether.

"Night Effect" in Direction Finding

BY W. OLIVER

"ANTI-NIGHT EFFECT" DIRECTION-FINDER AT PULHAM

The Marconi direction-finding station at Pulham has four 70-ft. wooden towers inside which are suspended four vertical aerials. Copper feeder tubes are used

THE value of wireless direction-finding as an aid to the navigation of ships and aircraft naturally depends on the accuracy or otherwise of the bearings obtained.

With an ordinary type of D.F. installation results are governed to a considerable extent by the atmospheric and geographic conditions prevailing at the time and place of observation.

Accurate Bearings

Very accurate bearings can be obtained with an ordinary direction-finder if circumstances are favourable—as, for example, in broad daylight over a comparatively short expanse of open sea—but if they are unfavourable a varying degree of error is liable to occur.

If, for instance, the relative positions of the transmitting and receiving stations are such that the signals have to pass alternately over land and sea, or that the path of the signals very nearly follows the coast-line, a more or less serious error may occur in the bearings.

Inaccuracies in wireless bearings taken with an ordinary direction-finder are most liable to occur, however, during the hours of darkness, owing to a phenomenon known as "night effect." Generally speaking, errors due to night effect may be experienced at any time from about an hour before sunset until about an hour after sunrise, and, in fact, are sometimes most pronounced just about the times of sunset and sunrise.

INSIDE THE PULHAM STATION

Marconi-Adcock anti-night effect direction-finding apparatus at Pulham. This works in conjunction with the stations at Croydon and Lympne

Night effect is particularly troublesome over land, especially hilly country, or over land and sea alternately, and on an ordinary type of direction-finder the errors due to it may be considerable.

It is possible, however, to reduce or even entirely eliminate the inaccuracies due to night effect if a special type of direction-finder is used. The Marconi-Adcock "anti-night effect" direction-finder is an example of an installation expressly designed to eliminate the errors which occur in directional reception during the hours of darkness.

A direction-finder of the Marconi-Adcock type is at present in use at the well-known air station at Pulham, Norfolk, which co-operates with Croydon, Lympne, and certain Continental aerodrome stations in the direction-finding service for air liners flying on the cross-Channel routes.

The Pulham installation has given very satisfactory results, the degree of accuracy attained in taking bearings with this special anti-night effect direction-finder being far higher and more uniform around sunset and after dark than is the case with an ordinary D.F. installation, such as the Marconi-Bellini-Tosi type.

An essential feature of the Marconi-Adcock anti-night effect direction-finder is the special aerial system, that installed at Pulham being shown in one of the illustrations. As will be seen from a glance at the photograph, four aerial towers are used. These towers are each 70 feet high, and are located at the corners of a square, the distance diagonally between the towers being one hundred yards.

The aerials are *not* stretched horizontally between the tops of the masts, but take the form of vertical wires suspended within the towers, and connected at their lower extremities to horizontal feeders which run diagonally across the square to the hut in the centre, which houses the direction-finding apparatus.

Metal Tubes for Feeders

The feeders are enclosed within metal feeder tubes mounted on supports a little above the surface of the ground. The feeder tubes are well earthed, and serve to screen the horizontal feeder leads as completely as possible. The set itself is also screened.

Details of the controls, etc., can be seen in the photograph of the direction-finder installed at Pulham. The bearings are read off on the scale, graduated in degrees from 0 to 359, starting from true North, which can be seen in the centre of the photograph, surrounding the pointer-control that the operator is manipulating.

Mike and Morse Key

The microphone, used for passing the results of the bearings in radio telephony to the control station at Croydon, can be seen on the right of the picture, and just below it is the telegraph key used for tapping out morse messages when necessary.

GEP is the call sign used by the Pulham direction-finding station when transmitting in wireless telegraphy, and of course all the D.F. work is carried out on or about the civil aviation wavelength of 900 metres.

HOW THE VALVE IS MADE

BY GORDON S. MITCHELL

This article deals with the manufacture of valves in an American plant, but as the processes employed are similar to those in use over here we have no hesitation in offering this contribution—which includes some remarkable photographs—for the enlightenment of our readers

WITH the development of broadcasting and the consequent greatly increased demand for valves, there arose one important problem which had to be satisfactorily solved before successful commercial manufacture could be embarked upon.

Existing filament materials had proved unsatisfactory for a number of reasons and a new metal, possessing the properties of several separate existing metals, was vitally necessary. Filaments of tungsten, either pure or thoriated, platinum, platinum iridium, or chemically coated metals were being used at the time, and all were proving unsatisfactory for one reason or another.

Standard Material

By 1925 valve manufacturers had established platinum or platinum iridium as a standard filament material. However, on account of the high cost an extremely active search was being made for another filament material.

Dr. E. F. Lowry, working in the Westinghouse Electric Laboratories, built up experimental filaments of several materials, including nickel, nichrome, and various tungsten compounds, but had discarded all for one of two reasons, either unsatisfactory emission or mechanical weakness.

Of the metals which had been tried, Dr. Lowry favoured nickel and determined to carry on further study with a view to applying his knowledge to the development of a nickel filament.

While the nickel filament had proved to be rather weak mechanically, on test a valve containing a nickel filament showed an active life of over 1,500 hours, which compared favourably with any filament material then in use.

A filament of nickel and cobalt, in an 80-20 per cent. proportion, was then built up but discarded on account of the resulting crystalline structure, which made it impossible to draw a wire fine enough in texture to be used for filament purposes.

However, to this compound was added an amount of ferrotitanium, making the proportions 80-20-10, resulting in a filament which proved to be satisfactory in every particular.

Manufactured Cheaply

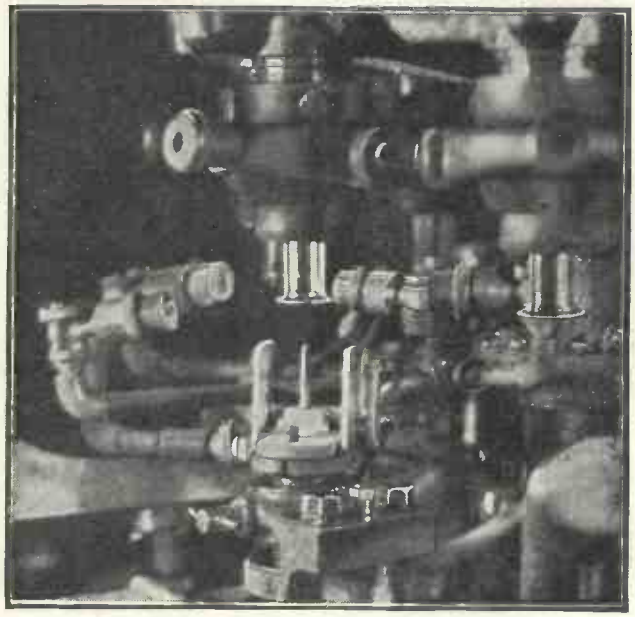
In December of 1926 Dr. Lowry persuaded the Westinghouse Lamp Works to make up fifty commercial valves with the new filament. The new metal was named Konel, and within a year had entirely replaced platinum as filament material. Contrasted with the very high price of platinum, Konel is manufactured very cheaply.

Konel possesses several properties which make it of great industrial value for other than valve use. It is very tough at high temperatures and is harder to forge than tool steel. Where other metals lose their strength when hot, Konel becomes actually stronger with increased temperature. There is no scale deposit formed when Konel is heated, and a wire of the metal possesses a high electrical resistance.

Due to the fact that a filament of Konel burns at 175 degrees lower temperature than did the platinum filament, there is a consequent longer life to a Konel valve than the other.

Platinum still finds extensive use, however, in high-power valves such as are used in transmitting sets, due to its great mechanical strength and rugged character.

In the great valve manufactories to-day, perfection of product and

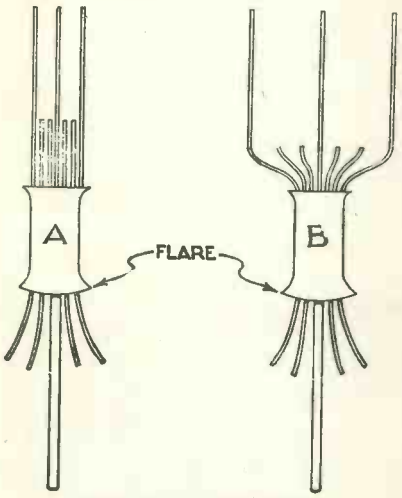


PUTTING A FLARE ON THE GLASS TUBING

Fig. 1.—This machine shapes the molten glass, like butter, into perfect flares

speed of production is the two-fold goal. One of the large R.C.A. valve factories has a production output of 70,000 valves a day—the highest known production of a commercial scientific product. Each of these valves is a precision instrument—some parts being gauged to ten-thousandths of an inch.

In discussing the steps of manufacture, it should be borne in mind that the stages through which each valve goes vary very little on account of type. Various amplifier and detector valves, although certain characteristics differ, pass through essentially the same manufacturing process.



SHAPING THE SUPPORTS
Fig. 3.—Supports and electrode connection leads in stem before (A) and after (B) passing through the shaping machine

For purposes of illustration and in order to present concrete figures, the manufacture of the R.C.A. UY224 valve will be taken as an example. This is an alternating-current valve, such as is found in many American receivers, and corresponds to the Mullard PM1LF medium-impedance three-electrode valve.

Forty-one Steps

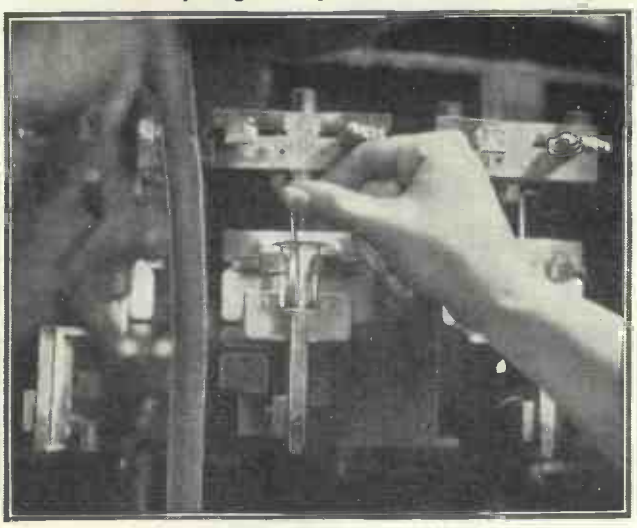
In the UY224 valve manufacture there are forty-one steps, the valve is built up of forty different parts and passes through the hands of 150 persons during the process.

During the passage of raw material through the factory and until it emerges a completed valve, boxed and ready for sale, there are 500 minor inspections and 200 minor tests which must be satisfactorily passed.

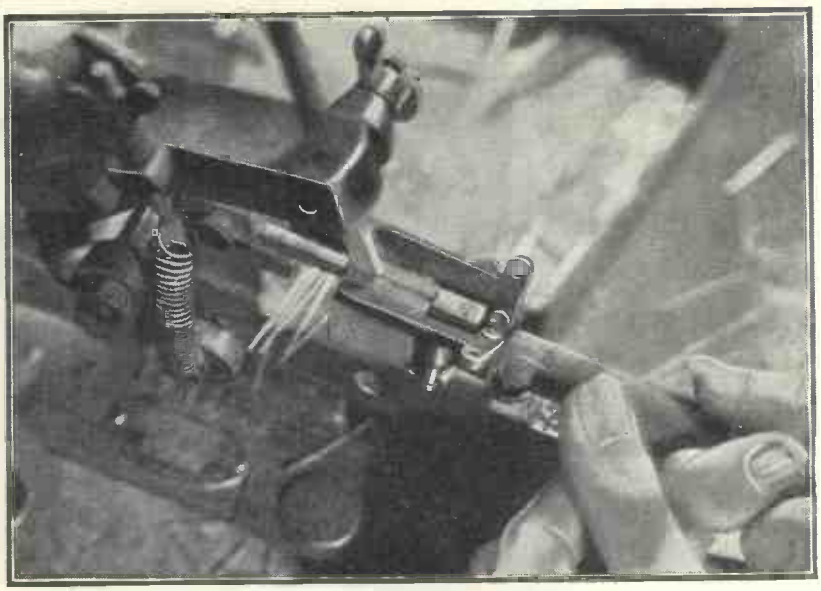
For purposes of exposition, the process of manufacture will be divided up into seven steps, as follows :—

1—Preparation,
2—Assembly of stem,
3—Assembly of control elements,
4—Sealing and evacuation,
5—Basing and seasoning,
6—Testing, and
7—Packing and shipping.

All metal which is used in valve construction is heated in a hydrogen furnace, which operates at an extremely high temperature and instantly brightens up the dullest metal.



ARRANGING THE INSIDE WIRES
Fig. 2.—Placing the mechanical supports and electrical connections into the flare



AN ELECTRIC WELDING MACHINE
Fig. 4.—All internal metal parts of the valve are electrically welded to ensure rigid construction and permanent electrical connection

The first step in the actual manufacture consists of building up the glass flare, which in addition to serving as connecting link through which the wires from the evacuated interior pass into the base of the valve serves as a support for the tube electrodes.

Automatic Cutter

These flares are cut from 4-ft. lengths of glass tubing by the machine shown in Fig. 1. The glass tube is gripped in mechanical jaws and heated intensely at the point where it is to be cut. A rotating cutter drops down as the glass tube swings into place and cuts off a length which is to comprise one flare.

The molten glass is then shaped in this machine with lightning-like rapidity, after which it is inspected and sent to the stem machine. In this machine (Fig. 2) eight wires, which make up the valve interior supports and connections between electrodes and base, are held in place by a clip as the flare is slipped over them.

At the same time a small glass tube is placed in the centre of the assembly (this tube is later used to exhaust the air from the interior of

HOW THE VALVE IS MADE—Continued

ASSEMBLING THE COMPLETE ELECTRODE SYSTEM
Fig. 5.—Here the parts are skilfully assembled on the stems

the valve). A special metallic compound, known as "dumet," is used to fuse the wires to the glass at the point where they pass through the flare.

Heated with Torches

As the flare drops into position over the wires, it is heated with torches. Simultaneously, metallic jaws press in, clamping the glass tightly to the wires and making an airtight weld. The small glass tube passes over an air jet as the flare assembly moves out of the machine, compressed air forcing a hole through the soft molten glass at the pinch. (It is through this opening that the valve interior is evacuated during a later operation.)

This assembly, called the stem, moves into a stem annealer, which consists of a long and heated chamber, the temperature of which gradually decreases towards the farther end as the tube slowly passes through.

Stem-shaping Machine

At the discharge end of the stem annealer, the stem assembly is given a thorough inspection and passed to a shaping machine which bends the connection wires into their proper shapes (Fig. 3).

With the completion of this step, the stem is ready to be fitted with the internal parts of the valve, consisting of anode, cathode, grid, screens and supports. All metal parts are electrically welded in order to ensure good contact and permanent construction. The plate is first mounted and welded to its support, after which the grid and screen are placed in position.

The outer section of the screen consists of a nickel-mesh cylinder, while the inner section is a helical coil of very fine wire. These two sections are connected and held together at the top by a metal disc which adds to the screen effect considerably.

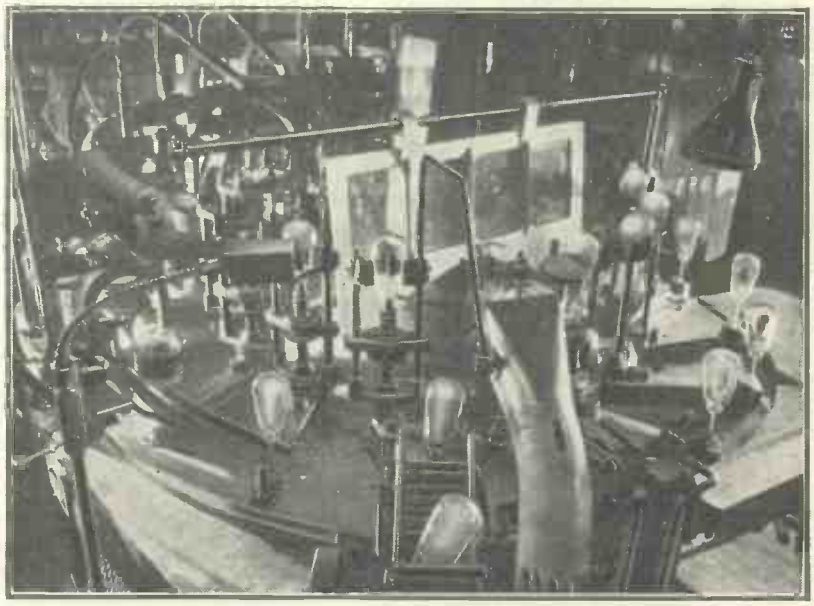
The cathode, which consists of a heater wire enclosed in a coated-metal sleeve (the two being electrically insulated from each other) is next inserted inside the plate and welded into position.

Cathode sleeves are coated with a specially designed spray gun, being held in the jet on a rack. Thickness of the coat and purity of the coating material is carefully maintained at a predetermined standard. After being coated, the sleeves are carefully inspected and then baked.

The grid is next fitted into place between the cathode and the inner section of the screen, being fine wire wound in cylindrical form upon a high-speed precision machine which not only winds and welds the turns, but also counts and gauges the spacing between turns.

Following this operation, a connecting wire is welded to the grid support. (This wire will later pass through the top of the glass bulb to a metal cap.)

A "getter cup" is placed in position upon the grid support inside the valve. This "getter cup" contains a small piece of metallic magnesium, known as the "getter," which vaporises upon being heated, helping to exhaust the valve.



EXHAUSTING THE BULB AND SEALING THE OPENING
Fig. 6.—The "Sealex" machine seals and exhausts the valve—hence the name Sealex

This assembly is known as the mount, and next passes through a rigid inspection and test, notably for short-circuits, after which it is passed to the "Sealex" machine, which seals the glass bulb and mount together after which all air is exhausted from the interior (Fig. 6).

In this machine, the mount is placed upon a rotating support, known as a sealing head, preparatory to the lowering of the glass bulb over

WITH EIGHT SPECIAL ILLUSTRATIONS

the assembly. Intense heat is directed at both the junction of flare and bulb, and at the point on top of the bulb through which the control-grid wire passes.

This sealing head moves slowly, passing the assembly into more and more intense heat regions, during which movement the glass softens under the steady fire of torches. When the two points have been sealed, the valve moves on into another part of the machine, where all excess glass hanging from the flare junction is taken off by an extremely intense flame.

The valve then passes on to the lower portion of the Sealex machine, where exhaust pumps connect to the protruding glass stem in the flare and draw all air from within the valve. Atmosphere is drawn in successive steps of increasing vacuum.

High-Frequency Furnace

During this exhaustion, a large induction coil drops down around the assembly and by means of a powerful high-frequency current heats the interior parts of the valve, freeing from them occluded gases, which are drawn off by the pumps.

At this point in the machine a companion induction coil is automatically placed around the assembly at the level of the getter cup and by its action causes the magnesium to burst into flame. This forms the metallic coating which is characteristic of many valves.

The valve is then automatically sealed and removed to the machine which completes the final step in the actual manufacture—that of placing a base upon the assembly.

Connecting wires are straightened and a base placed in correct position, lined with a cement which seals the glass bulb to the base. Connecting wires are first inserted in the correct pins in the base, and the bulb is placed on a testing machine which determines whether or not the correct connections have been made between valve and base.

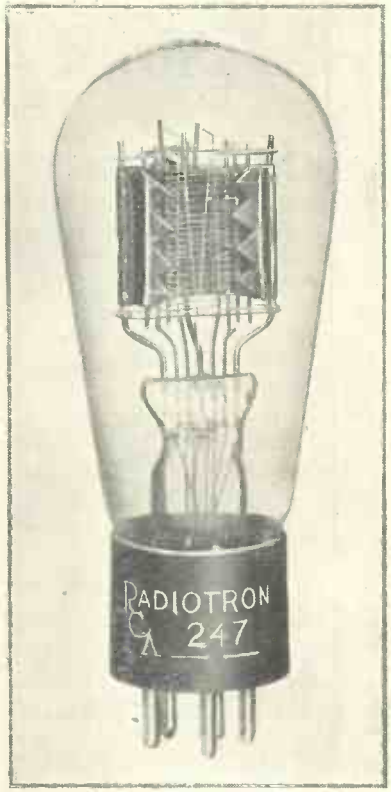
Rotary Furnaces

The valve then goes through a rotary furnace, which fulfils two functions—hardening the cement and fastening the base firmly to the glass of the bulb. On emerging from this furnace the connecting wires are cut off flush with the ends of the pins and soldered in place.

A small metallic cap is placed on the top of the valve, cemented into place and the top of the valve is then baked, after which the control-grid wire is soldered to the cap, much in the same way as was followed in caring for the valve base.

The valve is then ready for a thorough inspection and test for continuity of circuit, workmanship, and so on.

The test passed through at this point is one of the most thorough of the entire process of manufacture. Upon satisfactorily passing this inspection, the valve is placed upon a "seasoning rack" (see Fig. 7) where by means of voltages applied to the electrodes, the valve becomes stabilised.



THE FINISHED PRODUCT
R.C.A. power-amplifier pentode; an A.C. valve

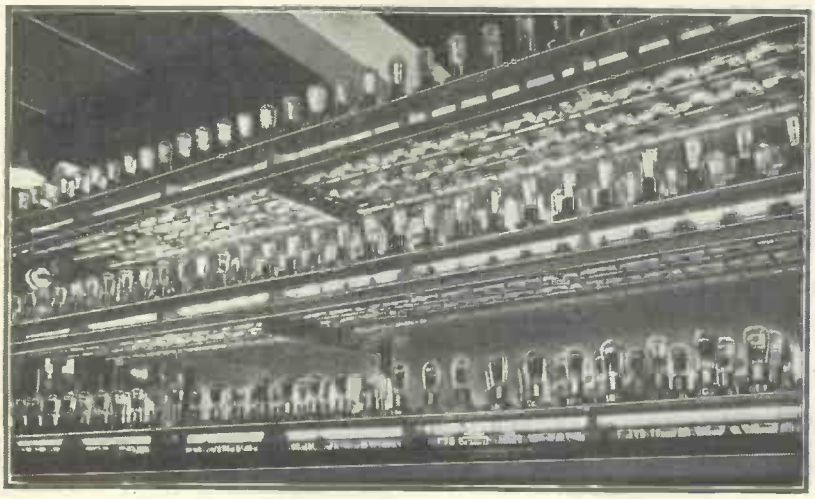
After some time upon this rack the valve again passes through an inspection procedure, where mutual conductance, cathode activity (emission), output, gas leakage, and short-circuits are determined. Additional test may be made on the valve, depending on the type.

Marking the Base

The valve then passes through a base-marking machine which stamps the number and characteristic data upon the base, after which it is finally inspected and wrapped in a corrugated holder preparatory to shipping.

The valve is the product of engineering ingenuity applied to the production of a precision instrument in large commercial quantities. While the first consideration in this manufacture is, of course, quality, after this efficiency and speed of production assume an importance, as can readily be understood.

The present process is the result of an earnest effort to improve both product and method of manufacture, and the valve as it is to-day is a testimonial to the worthiness of that effort.



THOUSANDS OF VALVES BEING "SEASONED"
Fig. 7.—Seasoning racks where valves are "tempered" for stabilisation of characteristics

A Radiogramophone Piano

GRAMOPHONE and wireless have made us passive and purely receptive from a musical point of view and have left no incentive to the training of any but those with quite exceptional talent. This is strikingly seen in the case of the piano which, during the last few years, has lost much of its former popularity.

Now, just as the gramophone was only able to keep its own by combining forces with radio, the piano is now given a chance of reconquering much of the ground it has lost by a wonderful radio-gramo-piano union opening up new possibilities to the classical instrument.

German Inventors

Credit for this invention is due to Prof. W. Nernst, the well-known physicist of the University of Berlin, who had the co-operation of both Siemens & Halske and Bechstein, the piano makers, from whose works the combined instrument is being issued.

Outwardly, the new instrument looks just like an ordinary small-size piano, with keyboard, lyre, and three feet. This is combined with a loud-speaker, which reproduces the electrically amplified sounds.

A three-valve wireless receiver is fitted into the piano, and the loud-speaker is combined with an electrically operated gramophone and electromagnetic pick-up.

The layout of connections is such as to enable the three parts of the instrument to be operated either alternatively or the piano and gramophone together.

The mechanical part of the instrument does not show any marked difference from that of the traditional piano. Strings are set vibrating by special micro-hammers of patented construction. Eighteen microphones have been provided, which are connected up in series.

These convert the mechanical vibrations into electrical vibrations, sent on to the amplifier, five strings converging below each microphone.

The left-hand pedal controls the sound volume from the most delicate spinet-like tone to the full-intensity tone of concert-grands. Potentiometers fitted into the amplifier enable the degree of amplification to be adapted to actual space conditions.

This is how the old dream of controlling the intensity of sounds and chords once struck, which piano makers, pianists, and composers have cherished for centuries, has come true at last.

Any note can be struck in the most delicate *pianissimo* and, by a slight pressure upon the pedal, caused to swell out to the strongest *fortissimo*, while, conversely, any note struck with full intensity can be made to decrease in intensity at any rate desired, not stepwise, as in the case of the organ, but quite gradually as with string instruments or the human voice.

Also, it is of great importance that the duration of sound vibrations should be about three times their duration in the traditional piano. A special lever enables the damping of sounds to be adjusted, thus obtaining long-drawn-out pure string vibrations, resulting in sound effects similar to continuous harmonium tones.

PIANO WITH BUILT-IN RADIO SET
Professor Nernst's radio-gramophone piano, which has a radio installation built into the case

A special switch will start the three-valve receiver of the electrically operated gramophone working. The instrument has been designed to be connected up to any mains.

The spinet tone, which is full of charm and, moreover, capable of modulation, will enable any student to practise for hours without in any way disturbing his or her neighbours.

Another Possibility

Another important possibility is that of fitting a given instrument, according to the actual intensity of sounds, for the requirements of the most modest home, as well as the largest concert hall.

By simply actuating the pedal and a plain lever, the timbres of piano, spinet and harmonium combined in one instrument, and the intensity of notes can be made alternately to rise and fall. The instrument can, at any time, be adjusted to radio reception or used as a gramophone.

Alfred Gradenwitz.

MICROPHONE FOR EVERY FIVE STRINGS
This radio-gramophone piano has a separate microphone for every five strings

IN the doorway a raucous loud-speaker was blaring out the latest jazz atrocity in which the singer informed the public at large that he still had the best part of a year to while away in the calaboose.

The front window of the shop contained a set of battered plug-in coils, two broken switches, a hank of rusty wire, a few frayed and dog's eared showcards and a particularly tired-looking high-tension battery; it could not be a live one as, covered in dust, it had lain in the same spot for many months.

On the facia of the shop the owner had erected a self-constructed signboard :

ALBERT GOODGER.
EVERYTHING IN WIRELESS.
BRING YOUR SETS TO
THE PORTABLE EXPERT.
REPARES WHILE YOU
WAIT.

(In three instances the "S" had been inadvertently reversed).

Hardly a " portable " expert, I thought, as I first got a glimpse of him behind the counter; he was a big man who carried much weight and who, in addition, according to his neighbour who kept the sweet shop, " threw it about a bit." His was the only shop of its kind in the district and the reason for which I had entrusted him with the regular charging of my accumulator.

He was good at charging, he said. As a matter of fact, I had also noticed it; he charged *anything* according to whether he was dealing with a raw beginner or a dyed-in-the-wool fan !

As I entered the shop I switched off the loud-speaker; it was, I know, impertinence on my part, but there are things that cannot be tolerated; and that, Heaven knows, was one of them.

" Not a music lover? " inquired Mr. Goodger, opening the conversation, as I walked to the counter.

" Yes," I replied, and very ungrammatically added " and that's why."

" Curious thing about that there loud-speaker," commented the owner of the Radio Emporium, " I've tinkered about with it for hours until I got it just right, and now . . . Well, there's no pleasing everybody, is there? "

Apparently Mr. Goodger had had a bad day; in fact, so far as I could judge from the state of the counter which constituted his sole work-bench, he had had a series of bad days. On it were littered a number of portables in various stages of dissolution and in true butterfly fashion the expert seemed to have flitted from one to the other without resting on any unit for a measurable period of time.

Personally, I had never availed myself of his technical services, but I gathered that other customers had not been so lucky. When Mr. Goodger undertook " repares " or " over'auled 'em," as he termed it, nothing short of complete disembowelment afforded him any satisfaction.

The unfortunate aspect of the case was that when he reconstructed the eviscerated instruments, at the end of the day's work, he was often three knobs, a couple of fixed condensers, and some odd leads to the good.

There was always " something over " which he failed to fit in and invariably it was that something-over which caused the receiver to emit disturbing squeals and heartrending plops.

Once before, through sheer ill-luck, I had happened to call at the shop when one of these great problems had confronted him, and as is often the case with onlookers, the obvious solution to the puzzle had occurred to me. I had been able to set him right and help him out of his difficulty.

But to-day was an evil day, so it seemed, for clients had expressed dire threats in regard to delayed deliveries, and Mr. Goodger's reputation as a portable expert had suffered a bad reverse.

My purchase of three yards of electric-light flex took but a few minutes, but I scented that I would not get out of the shop so easily. With a muttered grumble, as he handed me the small parcel, he pushed a box towards me. " Look at this 'ere set. 'Eres a five-valve portable, 'ome-made, o' course. Couldn't get me to *build* it for 'em."

I looked and saw a few weather-beaten components he'd together by a cat's cradle of twisted wires. " What would you do with this? " he asked. " Burn it," I answered. Frankly, I could not think of anything else.

" Now, that's just it," said Mr. Goodger; " you've got to 'andle this sort of thing in these 'ard times. Business ain't what it was and people bring me in all kinds of things to put right. This man "—he pointed to the set—" 'e's a good customer; at least 'e was. He bought a valve off me some time ago;" then, in a confidential tone, " 'e 'ad to pay for it in three instalments."

" Well," I said, " if that's the case, I suggest that you rebuild it. Personally I cannot follow a single lead in this mess, but then," I added, " I don't pretend to be an expert."

OUR LOCAL EXPERT—Continued

"Ah," he retorted, "that's where an expert ain't got a dog's chance. This neighbourhood is the limit. Wot I keep in stock they don't want and wot they want I 'aven't got." He turned to his boy. "Now then, lazy, wot are you doing there? Pick up them accumulators, take 'em round and 'urry back for the next lot."

"Wot's the good?" he grumbled. "Wot's the good of being an expert if you ain't got anything decent to expert on? Some of these 'ere sets were made in the year dot, and the chaps wot slung 'em together expect to get Mutlacker and Idleberg on them from morning till night. It's 'eartbreaking; I've 'ad these things in dry dock 'ere for a week or more and they don't look any 'ealthier for it now."

While he was talking I had been playing with the tangle of wires which went to make up the treasured receiver and by a mere accident had found the clue to his latest mystery. "Just try this again," I said, "I think you will find that the set works now."

He switched on, and we heard something of the London Regional programme.

"Well, I'm blest," said Mr. Goodger, "that's a marvel, that is."

"I can't explain," I said, "for lack of time, but it's always useful to connect the valves up to the accumulator. They won't work otherwise; it's a playful little way they have."

Mr. Goodger leant over the counter. "Fancy you spotting that so quickly." He lowered his voice. "'Ere, 'ow would you like to join up with me in this business, sir?"

He beamed all over. "We'd make a go of it. Us two experts could . . ." But what us two "experts" could have achieved will never be made public, for at that moment a little boy entered the shop.

He was small, undoubtedly dirty, and of the wet-nosed variety; he planked a two-volt accumulator down on the counter. "I've poured it all out in Farver's wireless set, and Muvver wants ter know if you'll give us tuppence back on the bottle."

Mr. Goodger threw up his arms.

"Lor lumme!" he gasped, then followed a string of remarks which, even shorn of many extraneous adjectives, fully confirmed his status as an expert—but not of radio.

No, I did not hear all he said. I left him to deal with his latest client; I fled.

Do You Know These Special Signals?

MOST listeners are familiar with the radio signals used by ships and aircraft in distress—namely, the S O S in morse and the call of "Mayday" (derived from "*m'aidez*," French for "help me") in telephony.

In addition to such well-known calls as these, however, there are other special signals, much less widely known, which are used to secure a certain degree of priority for messages that are outside the category of "distress traffic," but are nevertheless vitally important.

"Safety Signal"

The "safety signal" is one of the special calls that is most frequently heard; in fact, it is sent out daily from a number of shipping stations on 600 metres. It consists of the letters "T T T" in morse (— — —) sent with the dashes well separated, and it is usually repeated about ten times.

The safety signal indicates that the station sending it is about to transmit navigational warnings, gale warnings, or similar urgent messages affecting the safety of shipping.

Another special signal is that known as the "urgency signal," which consists of the letters "X X X" in morse. This sign precedes the transmission of some very urgent message, such as an appeal for medical aid or any other matter relating to the safety of a ship or of a person on board, or of some person, ship, etc., within sight of the station sending the message.

Medical and other messages in the urgency class are accorded priority over all wireless communications with the exception of distress traffic.

Aircraft stations, of course, frequently work in telephony, for which the "X X X" signal is unsuitable. Accordingly, they use a special urgency indication consisting of the signal "P A N," which may be sent either in telephony or morse.

This urgency signal would be used by the operator of an aircraft station in notifying the aerodrome authorities that his machine had sustained damage sufficient to compel a forced landing, but not necessitating an appeal for immediate assistance.

Unlike the "S O S," "Mayday," and "T T T" signals, which precede messages broadcast to "C Q" (all stations), the urgency signals "X X X" and "P A N" are usually employed only in calls from a ship or aircraft to a specific coastal or aerodrome station. All other stations, however, on hearing the urgency signal, are required to take care not to interfere with the transmission and reception of the urgent message that follows it.

Traffic Suspended

The morse group — .. — .. — .. — is used as a special signal indicating that the wireless operator on board a British warship or R.A.F. aircraft has a message for transmission to a coast station. On hearing this signal, the coast station that is being called has to suspend all its ordinary traffic for the time being and concentrate on the message from the warship or aircraft.

Moreover, other stations working within range are called upon to suspend any ordinary correspondence that might cause interference with the reception of the naval or air force message. *W. OLIVER.*

Look out for the Next Issue of "WIRELESS MAGAZINE" on Thursday, July 21

"Recording Humour"

Following is a reply from an official of the Gramophone Co., Ltd., to Whitaker-Wilson's article, "Recording Humour," which appeared on page 432 of the May issue of "Wireless Magazine"

To the Editor, "Wireless Mazagine."

SIR,—What does Mr. Whitaker-Wilson expect of gramophone humour? He expects to be made to laugh. So do we all, but the joke which would make *everybody* laugh has yet to be found.

In his somewhat stringent criticisms of gramophone-record humour or, rather, the lack of it, he has put his finger on the most difficult side of record making, but I disagree with Mr. Whitaker-Wilson when he says that sufficient care is not given to the production of amusing records, nor will I admit that it is impossible to produce a record that will retain its humour after many playings.

Point Missed

But my chief charge against Mr. Whitaker-Wilson is that he misses one most important point. It is the manner rather than the matter which makes a record amusing. Mr. Whitaker-Wilson says: "I should require a manuscript of the dialogue . . . I should mark what I considered to be weaknesses and ask for a further opportunity to review when the marks had been attended to."

He adds that after this manuscript had passed his scrutiny he would ask the comedian to "do his stuff."

I am afraid that very few so-called humorous manuscripts would get past Mr. Whitaker-Wilson, for nothing can be more depressing, when read in cold blood, than what Claude Hulbert calls "funny patter."

Has Mr. Whitaker-Wilson ever read the script of a pantomime or of a farce? I have done so hundreds of times, and have been nearer tears than laughter in most cases. Yet this same script, when presented on the stage, can make a house rock with laughter.

Listen, for example, to the actual material used by Jack and Claude Hulbert in their patter to "Jolly Good Company." Yet I consider that to be a most amusing record and I understand the sales justify that view.

Or take Cicely Courtneidge's record, "Laughing Gas," which, quite apart from the infection of the actual laughter on the record, is intensely entertaining.

Yet I very much doubt whether the magazine article which Mr. Whitaker-Wilson mentions as having amused him so much would raise a smile if it were recorded. The humour of the spoken and of the written word have very little in common.

Of course, it all depends whether one wishes to have one's sense of humour merely titillated or whether the test of humour is its ability to make an audience guffaw. Here lies the distinction between wit and humour.

No one will deny that Oscar Wilde's "The Importance of Being Ernest" is witty. So is "The Way of the World," by Congreve, but even in the theatre they do not set the audience in a roar. Instead, all the time there is what I can best express as a delighted "bubbly" feeling and a keen pleasure at the rapier-like interplay of keen phrases.

Simple Humour

But a gramophone record to make one laugh must depend entirely upon its ability to conjure up a mental picture and, therefore, its humour must be essentially simple. I think we can safely leave laughing records out of the argument. The risible nerves merely respond in sympathy to those of the man who is doing the laughing. The most famous laughing record of all, indeed, had no spoken matter in it at all.

No, the whole question boils down to the old recipes for laughter: firstly, pure nonsense and inconsequentialities as typified by the Hulbert style of humour; secondly, the hen-pecked husband jokes as

"RECORDING HUMOUR"—Continued

A UNIVERSAL FAVOURITE

Gracie Fields is a great favourite among both radio and gramophone fans. She recently made the best selling H.M.V. record for two years

admirably put over by John Henry in his record of "The Stocking"; and, third and most successful, the "unsuccessful attempt" humour.

Superb Example

A superb example is "The Village Concert." The efforts of the "Silver Tuba Band" convulse me after repeated hearings. Indeed, most gramophone humour is largely confined to this type. Listen to Will Kings in his His Master's Voice records where as Bertram, the tongue-tied silly ass, he addresses the tenants, or laugh in sympathy with Tom Clare as Cohen on the telephone.

The humour of Gracie Fields is surely a humour of universal appeal. Here, again, it is manner and not matter. "He Forgot to Come Back"—the best selling His Master's Voice record for two years—is a song which in the hands of a lesser artist might not have meant very much, but Gracie Fields infuses into it a tremendous vitality, which she disguises in a mock heart-broken manner with wonderful effect and, although the "funny noises" on the trumpet help to heighten the effect, it is really the inflections of this great artist's voice which make the record so truly funny.

No doubt the smart humour of Ronald Squires and Constance Collier in two scenes from Somerset Maugham's play, "Our Betters," will get many a chuckle, and even in the dance records there is the parody of a B.B.C. announcer and speaker on gardening notes in "In the Bushes at the Bottom of the Garden."

Malapropism can be extremely amusing when put over with real skill. This type of humour has, I must confess, not been sufficiently exploited in gramophone records, though Mabel Constanduros is a past mistress of the art on the air.

Like broadcasting, the gramophone, by being deprived of the power of sight, is limited in its scope, but it is hardly fair of Mr. Whitaker-Wilson to say, just because he thinks unfunny what many other people may enjoy tremendously, that sufficient care is not taken over the production of humorous records.

The amount of material rejected by the recording manager is just as great as that which is rejected by the editor of a humorous journal, and although Mr. Whitaker-Wilson may say that the office of critic where amusing records is concerned is not altogether an easy one to fulfil, he can take it from me that it is far more difficult to produce an amusing gramophone record.

Suggestions Invited

We are constantly trying out new humorists, new material, and new methods, and if anybody has any ideas or suggestions for an uproarious record, which appears equally amusing to every type of listener, he will have achieved something which has hitherto been regarded as beyond the realms of possibility.

M. Kester Hodgson.

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

WHITAKER-WILSON'S REPLY

To the Editor, "Wireless Magazine."

SIR,—May I reply to Mr. Hodgson, whose letter you have allowed me to see? To save space, I have answered several paragraphs in brief, quoting the first three words of each for reference.

Sir,— What does. . . . I expect a high standard; at present it is not high.

In his somewhat. . . . I have gone by results; most have been complete duds.

But my chief. . . . Matter *must* come first; manner helps, but unless the humour will stand an acid test the result is not likely to be good.

Has Mr. . . . No. Argument fallacious here. Stage is not a record. What a comedian can do in a theatre is no test as to what he can do on wireless or a record. Television needed.

Yet I very. . . . The article I had in mind would broadcast and record well with some modifications—play on words, chiefly, of the kind that requires the eye. It was good matter; that is why.

Grotesque

A superb example. . . . Agreed; very funny. Not humorous—grotesque. Not the same thing at all. One laughs at those things a little longer. Still convulsed, is he? He is lucky. I have the record. Three or four times *the* limit. I am envious.

I say again: the average humorous record is rubbish; the dialogue is not examined critically; it *cannot* be or the lines would be better.

I stick to my view; recording humour is risky, in any event, and the *average* humorous record is something of which the gramophone companies ought to be ashamed.

This sounds cryptic; it is not meant to offend.

Whitaker-Wilson.

Choosing Your Records

Here are reviews of the latest releases by WHITAKER-WILSON, the "W.M." Music Critic. Outstanding records are indicated by an asterisk (★) against the title

SACRED MUSIC

(*a*) **Come Unto Him,** (*b*) **Where'er You Walk, Master** Derek Middleton, 2s. 6d.
H.M.V. B4133

A very pure voice. Both solos are too slow in tempo;

Master Derek Middleton

otherwise there is no complaint to make. Those who are attracted by a boy treble should certainly get this.

CLASSICAL ORCHESTRAL MUSIC

★**Falstaff** (Sir Edward Elgar), London Symphony Orchestra conducted by the composer, 6s. each.
H.M.V. DB1621-2-3-4

This is worth while getting, not only for the work—amongst the best Elgar has given us—but for the recording. If you have a good radio gramophone and want to test its powers

Sir Edward Elgar

I suggest you buy these four discs. Every detail is clear and distinct apart from the actual interpretation of the work which, under Elgar himself, is naturally authoritative.

PIANO SOLO

(*a*) **My Heart Ever Faithful** (Bach), (*b*) **Consolation** (Liszt), Mark Hambourg, 2s. 6d. **H.M.V. B4180**

A good record of this player and his well-known tone and touch. The first is an arrangement by C. Scott; the other is one of a set of well-known piano pieces.

Mark Hambourg

CHAMBER MUSIC

★**Concerto No. 1 in G Minor, Op. 26** (d.s.), Master Yehudi Menuhin and the London Symphony Orchestra, 6s.
H.M.V. DB1613

Do you know the Max Bruch violin concerto? If not, you ought to; it is one of the loveliest in existence. I make a suggestion: ask to hear the *slow movement*; you will take that part of it anyway, if not the whole work. The young violinist is decidedly good; indeed the whole production is well up to standard.

LIGHT OPERA

★**Immortal Hour** (d.s.), Queen's Theatre Orch., 4s.
COL DX347

This is really beautiful. Do you know the song "How beautiful are the Lowly Ones"? No? Then buy this; that song is one of the inspirations of this century!

LIGHT ORCHESTRAL MUSIC

★(*a*) **Barn Dance,** (*b*) **Veleta,** Scala Salon Orch., 1s. 6d.
WIN 5485

This welcome revival may wake up pleasant memories. As both works are well played I think the record deserving of honourable mention.

"**Dubarry**" (d.s.), New Light Symphony Orch., 4s.
H.M.V. C2410

I'm a-dreaming, Jeanne, Pantalettes, Summer Night are only part of the bill of fare on this excellent disc. The chief advantage is that the accompaniments are played on a splendid light symphony orchestra. I do know who the singer is, but she is good.

★**March Rhapsody** (d.s.), London Symphony Orch., 4s. **H.M.V. C2411**

By Edward German. A very good performance under the conductorship of Malcolm Sargent. It is the type of work that has always had a wide appeal; I do not remember having heard it on a record before. Certainly to be recommended.

(*a*) **Norwegian Dance,** (*b*) **Marche Grotesque,** Colombo and his Orch., 1s. 6d.
WIN 5487

Here is an attractive little light orchestral record. A good band and pleasant music into the bargain.

(*a*) **Poem** (Liblisch), (*b*) **Sanctuary of the Heart** (**Ketelby**), Commodore Grand Orch. and Organ, 1s. 6d.
WIN 5482

I think this will be popular. The orchestra and organ together produce quite a majestic effect in some passages. Both works are attractive in themselves.

★(*a*) **Speak to Me of Love** (Lenoir), (*b*) **Poem** (Fibich), Tom Jones and his Orch., 2s. 6d. **H.M.V. 4183**

Both sides were recorded at the Grand Hotel, Eastbourne, and are very characteristic of Mr. Jones and his band. So if you appreciate his broadcasts you cannot do better than acquire this record.

SPOKEN RECORD

Theatrical Bazaar (d.s.), Elizabeth Pollock, 2s. 6d.
COL DB795

This is quite entertaining; Miss Pollock's voice records excellently. Every word is amazingly distinct. As a spoken record I think this is one of the best I have heard. The sub-title is "Miss Pollock introduces her friends."

LIGHT SONGS AND BALLADS

(*a*) **Alice, Where Art Thou,** (*b*) **My Sweetheart When a Boy,** Heddle Nash, ten., 2s. 6d. **COL DB792**

He sings both very charmingly and the record must be recommended on that account. Whether the songs are thought enough of in these days to warrant their production is another matter. The recording is good and the words are very distinct.

★(*a*) **Asleep in the Dark,** (*b*) **In Cellar Cool** (**Drinking Song**), Robert Easton, bass, 1s. 6d. **BRDCST 3180**

Robert Easton is a splendid bass. As I write these words he is on the low E flat. It speaks well for the recording that such a note registers satisfactorily. This is worth having.

(*a*) **Little Grey Home in the West,** (*b*) **Two Eyes of Grey,** Hubert Trant, ten., 1s. 6d.
WIN 5488

If you are not sick of either or both these you cannot do better than buy the disc, for both songs are well produced. Surely, though, the day for royalty ballads is past?

Garda Hall

Musical Comedy — Selection (d.s.), Garda Hall and George Baker with Orch., 4s. **H.M.V. C2412**

Tea for Two; *My Hero* (Chocolate Soldier); *Merry Widow Waltz*; *Roll Away Clouds* (Virginia). The singers are good, but the orchestra is a little heavy in places. There is an echo in the hall which adds to the effect considerably. Echo on a record is nearly always attractive.

George Baker

(*a*) **My Sword for The King,** (*b*) **Victor,** Morlais Morgan, 1s. 6d. **WIN 5484**

He is a fine robust baritone and his songs are above the average. To be recommended.

★(*a*) **Watchman, What of the Night?** (*b*) **The Moon Hath Raised Her Lamp Above,** The Male Voice Ensemble, 2s. 6d. **H.M.V. B4175**

This is very attractively done. The voices have recorded really well; the words are also very distinct. I recommend the disc.

CHOOSING YOUR RECORDS—Continued

Wilkie Bard

★**Wilkie Bard — Medley** (d.s.), Wilkie Bard, 2s. 6d.
H.M.V. B4132

This is *well* worth having. *She Cost Me 7/6*; *Truly Rural*; *Let Me Sing*—in fact all his attractive numbers. An excellent medley, attractive in every way.

NOVELTY RECORDS

(*a*) **Echo Waltz,** (*b*) **Lily of Laguna,** Internationale Novelty Quartette, 1s. 6d.
ZONO 6115

A pleasant lunch-time music record. It is worth the money. Incidentally the recording is such that the bass is unusually clear. Quite a novelty record.

(*a*) **Griffin March,** (*b*) **Medley of Old Songs,** Bandmaster Selma Mouth-organ Band, 1s. 6d. **ZONO 6118**

Here is something novel—a mouth-organ band. They make an extraordinary noise, but one that is not unpleasing by any means. A record to try over a few times and then give away!

(*a*) **Imitations of English and Australian Birds,** (*b*) **Imitations of Everyday Sounds,** "Imito," 1s. 6d.
ZONO 6134

The imitations are very good. I prefer the dicky-birds to the everyday sounds, which include a saw-mill, traffic, and some animals. Some of it sounded like hyper-modern music. It is all very cleverly done.

(*a*) **Immortal Waltzes,** (*b*) **Medley of Popular Songs,** International Accordeon Band, 1s. 6d. **ZONO 6124**

And very nice too! *Blue Danube*, *Merry Widow* on one side; *Lily of Laguna*, *Daisy Bell*, etc., on the other. The accordeonists are quite clever, and the whole performance very creditable.

(*a*) **Naila** (w.), (*b*) **Polonaise,** Edith and Kevin Buckley, 4s. **H.M.V. C2397**

Usually a piano and an organ, for some inexplicable reason, do not blend well. Here, far from being ineffective, the two instruments produce a pleasing result. Both works are attractive; a thoroughly good novelty record.

★(*a*) **Simple Aveu,** (*b*) **Sizilietta,** Bohemians, 2s. 6d.
COL DB791

There is something attractive about this; there are vocal effects rendered with considerable artistry; the result is decidedly novel. There is a good deal to be said for orchestral records using human voices as instruments and not necessarily as a medium for the expression of words. I strongly recommend this disc.

HUMOROUS RECORD

Jack Hulbert

★**Modern Colour Poems** (d.s.), Jack and Claude Hulbert, 2s. 6d. **H.M.V. B4182**

This is very characteristic of both of them. You will think you are hearing them broadcast. They are very funny, as usual. The recital of Shakespeare's "Julius Caesar" is good, but the French song is the better of the two. A very good satire: Hulbert's French pronunciation is worth listening to!

Claude Hulbert

ADDITIONAL RECORDS REVIEWED BY CHOPSTICK

PIANO SOLO

★(*a*) **Can't We Talk It Over,** (*b*) **Now That You're Gone,** Carroll Gibbons and His Boy Friends, 2s. 6d.
COL DB805

All members of the Savoy Orpheans, of course. One cannot fail to be thrilled by the fine technique of Gibbons. Appropriate titbits by his friends and a tuneful vocal chorus on (*b*) makes this one of the month's most attractive records.

LIGHT SONGS

★**Cat and the Fiddle Gems** (d.s.), Raymond Newell, Binnie Hale, Jessie Matthews, Jack Plant and the Savoy Orpheans, 4s.
COL DX348

"The Cat and the Fiddle" is a show well worth seeing, but never mind if you cannot spare the time to go. All the favourite tunes of this excellent show are well produced. The record is worth four shillings just to hear Binnie Hale sing "She didn't say 'Yes'" and Carroll Gibbons and partner in the "Piano Duet."

(*a*) **I'm A-gettin' Ready to Go,** (*b*) **Open Up Dem Pearly Gates,** Monte Hunter, 1s.
BRDCST 837B

These items have the advantage of being either a couple of pleasant "hilly-billy" songs or, if preferred, they are very suitable for dancing. Monte Hunter has a lively way of expressing himself but, on the other hand, I do not think the material will have universal appeal.

★(*a*) **Snuggled on Your Shoulder,** (*b*) **You'll Find Out,** Jack and Jill, 1s. 6d.
ZONO 6123

These two artists are great favourites of mine. Their diction is always so clear and their expression always strikes me as being very sincere. I recommend this disc to all who want a cleverly produced record. It would be an excellent interlude in a dance programme.

NOVELTY RECORDS

(*a*) **Back Again to Happy-go-lucky Days,** (*b*) **Auf Wiedersehen, My Dear,** International Accordeon Band, 1s. 6d. **ZONO 6128**

I have been humming (*b*) for the last fortnight and still there is no sign of the epidemic abating. If you haven't heard it, do so soon. It is one of the most catching tunes of the day, but I prefer the rendering of a good dance orchestra. This band is at its best in snappy (*a*).

(*a*) **Goodnight, Vienna,** Len Fillis with Orch., (*b*) **Two White Arms,** Adolphe Menjou, bar., 2s. 6d.
COL DB798

A version of (*a*) that is "something different." Len Fillis plays this popular hit on his hawaiian guitar. It is delightful light music. On (*b*) Adolphe Menjou, the famous film actor, announces that this is the first record he has ever made. *Two White Arms* is the theme song of the film of that name and Menjou sings it very pleasantly. This is really an historic record.

Len Fillis

(*a*) **La Petite Madelon,** (*b*) **Waltz That Has Made You Mine,** Cosmopolitan Accordeon Band, 1s. 6d.
WIN 5483

A good record of its kind. (*a*) is a pleasant tune well played, and is suitable for the old-time dance, the mazurka. (*b*) is a waltz of the quick variety. Readers who make a hobby of collecting accordeon band records should certainly get this. The vocalist's attempt at yodelling on (*b*) is very amusing.

(*a*) **Tree Top Serenade,** (*b*) **Nola,** Carson J. Robison, 1s. 6d. **ZONO 6135**

A severe contrast to the other Robison record, reviewed this month among the dance numbers. On the other disc he shows his skill at making a noise; on this he gives a remarkable demonstration of whistling. I recommend it.

HUMOROUS RECORD

Ain't it Grand to be Blooming Well Dead (d.s.), The Pearly Kings, 1s. 6d. **ZONO 6129**

Here is an instance where poor diction spoils the overall effect. The accompaniment is played by an accordeon band.

DANCE MUSIC

★(*a*) **Auf Wiedersehen, My Dear** (f.), (*b*) **Rain on the Roof** (f.), Savoy Hotel Orpheans, 2s. 6d.
COL CB447

Two favourites played in typical Orpheans style. I specially recommend (*a*) as being one of the most attractive tunes released this month. The Savoy Orpheans are at the top of their form in these numbers. You should at least make a point of hearing it.

(*a*) **Can't We Talk It Over** (slow f.), (*b*) **You're the One,** Savoy Hotel Orpheans, 2s. 6d. **COL CB437**

Delightful! Two numbers specially suited to the style of the Orpheans. Good singing by the vocalist makes the choruses the best part of both records. (*b*) is a six-eight one-step played with the full chorus of saxes and trumpets. The Savoy Orpheans have recovered from the temporary lapse referred to in these columns last month.

Dick Turpin's Ride to York (d.s.), Highwaymen, 1s. 6d.
ZONO 6121

This is a double-sided quick-step played in perfect time. It is well produced with plenty of "pep." Of course, it is a modern Dick Turpin who rides to York. The kiddies will love it.

BY WHITAKER-WILSON AND CHOPSTICK

★(*a*) **Dinah** (f.), (*b*) **Sam and Delilah** (f.), Duke Ellington and His Cotton Club Orch., 2s. 6d. **H.M.V. B6175**

This is played by a famous American negro orchestra, so

Duke Ellington

you know what to expect within a little. Very "hot" rhythm with typical "negro spiritualised refrains." The singers' top notes misfire a little, but that is a mere detail in the melee of modern noise.

★(*a*) **Embraceable You** (f.), (*b*) **I Got Rhythm** (f.), Victor Arden, Phil Ohman and their Orch., 2s. 6d. **H.M.V. B6174**

(*b*) is rhythm with intervals. It is just what one would expect from this Ambrose of American bands. There is no melody, but what does that matter so long as there is rhythm? The pianist is an outstanding instrumentalist.

★(*a*) **Going to the Barn Dance To-night,** (*b*) **I was Born in Old Wyoming,** Carson J. Robison and His Pioneers, 1s. 6d. **ZONO 6136**

Splendid! Carson Robison is the composer of both tunes and, judging by the unusual sounds from this record, I imagine that the chief instruments of the band are mouth-organs and banjos. If you are keen on full-speed quick-stepping, try this record.

(*a*) **Goodnight, Vienna** (tango f.), (*b*) **My Pretty Flowers** (w.), Debroy Somers' Band, 2s. 6d. **COL CB441**

From the show which was made famous in a night by broadcasting; also the film starring Jack Buchanan. (*a*) is the theme song, and here Debroy Somers gives one of the best versions yet released. I imagine, however, that it is a tune which would soon become tiring. (*b*) is a delightful waltz which has some fine saxophone playing in the melody parts. This band has a vocalist, not a "crooner."

(*a*) **Hello, Lola** (f.) Mound City Blue Blowers, (*b*) **If I Could Be With You One Hour To-night** (f.), McKinney's Cotton Pickers, 2s. 6d. **H.M.V. B6168**

The Blue Blowers have some of the best American rhythmic artists, including Colman Hawkins, the famous negro tenor saxophonist, and "Red" McKenzie, who recently signed a contract with Paul Whiteman for three years. Collectors of modern "hot" rhythmic records should certainly acquire this example. (*b*) is also a typical modern rhythmic tune.

ABBREVIATIONS USED IN THESE PAGES

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

(*a*) and (*b*) indicate the titles of each side of a record.

(*a*) **I Lost My Heart in Heidelberg,** (*b*) **Leave Me Alone With My Dreams,** Henry Hall's B.B.C. Dance Orch., 2s. 6d. **COL CB445**

If you have heard (*a*) you will probably agree that it is one of the worst dance numbers of all time. On the other hand, (*b*) is quite worth recommending. A good tuneful chorus sung by Val Rosing and accompanied in the band's usual sweet style are its chief features.

(*a*) **I Lost My Heart in Heidelberg** (f.), (*b*) **The Voice in the Old Village Choir** (w.), The Blue Lyres, 1s. 6d. **ZONO 6126**

The Blue Lyres have made the best of a bad job with the Heidelberg tune. Although I dislike it I must admit that this version is not so strikingly silly as others I have heard this month. On (*b*) there is an organ with the band and the result is splendid. Unfortunately, the time is too fast.

★(*a*) **Old Man Bluebeard** (f.), (*b*) **Riddles** (one-step), Ambrose and his Orch., 2s. 6d. **H.M.V. B6165**

Ambrose at his best. This band is particularly good in comedy numbers: their arrangement of both tunes is the best I have heard. Their introduction of old-time tunes in modern form is quite an art. Sam Browne, the vocalist, is at his best in this type of record. This deserves to be a best seller.

(*a*) **One Hour With You** (f.), (*b*) **What Would You Do** (f.), Rhythmic Eight, 1s. 6d. **ZONO 6172**

Both are numbers from the film "One Hour With You." The Rhythmic Eight is a favourite octet with many, and here they have produced both these popular tunes in their own noisy style. Well-defined rhythm.

★(*a*) **Paradise** (w.), (*b*) **The Voice in the Old Village Choir** (w.), Ambrose and His Orch., 2s. 6d. **H.M.V. 6178**

I am rather lost with (*a*). It is a delightful waltz, yet there is no clear definition of the melody. One might almost call it a Delius style in dance music. (*b*) is played with organ and effects. I can thoroughly recommend both sides as being something away from the usual trend of modern dance music.

★(*a*) **Round the Marble Arch** (one-step), (*b*) **Love, You Funny Thing** (f.), Ambrose and His Orch., 2s. 6d. **H.M.V. B6179**

(*a*) is by the same composer as the great success, *The King's Horses*. All Ambrose's showmanship is brought into play and the effects are most realistic.

Bert Ambrose

One can well imagine thousands of people trotting round the Marble Arch. Ambrose gives a clear definition of love on (*b*): it is funny.

(*a*) **Sailin' on the Robert E. Lee** (f.), (*b*) **With All My Love and Kisses** (f.), Ray Noble and His New Mayfair Dance Orch., 2s. 6d. **H.M.V. B6176**

(*a*) is a comedy number which ranks among the best of Noble's efforts. The pianist and saxophonist have plenty of chances to show off and this they do to the best advantage. As its name suggests, (*b*) is of the soothing type of tune. The time is excellent for slow fox-trotting if you dance; it is also a good record for mere listeners.

(*a*) **Smuggled on Your Shoulder** (f.), Jack Denny and his Orch., (*b*) **Wooden Soldier**

Nat Shilkret

and the China Doll, Nat Shilkret and his Orch., 2s. 6d. **H.M.V. B6164**

A recent addition to H.M.V.'s American bands, Jack Denny and company have produced a snappy tune on (*a*). This is not a "hot" record, but is more inclined to the "sweet" style. I think (*b*) is the better tune. This record is ideal for dancing.

CINEMA ORGAN MUSIC

Beaufort Memories (d.s.), Beaufort Cinema Organ, Birmingham, 1s. 6d. **BRDCST 3181**

"Drink to Me Only," "Londonderry Air," and "The Pilgrim's Chorus" from *Faust* are specimens of Beaufort memories. Reginald New has undoubtedly a fine technique, but here it is a case of the matter which spoils the record. It will appeal to some, but not many.

★(*a*) **Chopsticks,** (*b*) **Old Folks at Home and Abroad,** Kevin Buckley, 2s. 6d. **H.M.V. B4184**

Let me introduce you, on (*a*), to my signature tune! The

Kevin Buckley

basic melody is written around the five black notes by which the kiddies usually make their first introduction to the piano. The composer is Billy Mayerl: so "nuff said." This hit was recorded in the Regent Theatre at Bournemouth.

(*a*) **Flame of Desire,** (*b*) **Three Little Times,** Harry Davidson, 1s. 6d. **WIN 5492**

Harry Davidson is the organist of the Commodore Cinema at Hammersmith, whose orchestra is so popular with radio listeners. The recording is excellent, with some good bass, and the singer on (*a*) has a fine powerful voice that is especially suitable for the job of "drowning the organ."

News of the Short Waves

By MANDER BARNETT

WHEN short-wave reception first came into popularity, one very often heard much concerning the troublesome effects produced by the reception of harmonics of medium- and long-wave broadcasting stations.

During the past few years these effects have diminished—due to the use of suitable filtering apparatus at the transmitting end—but there are still occasional instances of strong reception of some of these harmonics.

Fecamp Transmission

Just recently, while searching above 50 metres, I came across a powerful transmission giving the programme from the Fécamp medium-wave station.

Whether this was definitely a harmonic or a short-wave relay is not quite clear, but it is a significant fact that on that particular evening both the medium- and short-wave transmissions were very badly heterodyned, the short-wave transmission, by the way, being only slightly less powerful than the medium wave.

Harmonics can also be heard quite often around 25 metres, these signals generally originating from the 50-metre group of short-wave stations.

◆ ◆ ◆

If you have not yet heard the new Swiss short-wave transmitter, try for him during the evening at the week-ends. He is very often on the air just above 20 metres, sometimes relaying special programmes for the benefit of the American medium-wave stations.

The quality is sometimes poor, although this is, perhaps, due to the landlines in use between the actual scene of the transmission and the transmitter itself.

◆ ◆ ◆

Newcomers to the short-wave art often seem to be puzzled as to exactly when and where they should use metal shielding in their receivers. Some short-wave receivers make extensive use of metal shielding; others do not.

The answer lies mainly in the type of circuit employed. While no receiver is made any the worse by employing shielding, it is sometimes merely a waste of effort to employ it with certain circuits.

Even a receiver which is entirely shielded in a metal cabinet will not necessarily work well if attention is not paid to other factors.

There is quite a lot to be said in favour of building the short-wave receiver on a metal chassis, for it generally enables short by-passing leads to be made direct to the chassis. However, one still runs the danger of reducing the effectiveness of tuning coils and high-frequency choke coils by mounting them too close to the metal itself.

Height from Baseboard

Plug-in coils will generally be free from this danger, as the height of the socket itself is sufficient to raise the coil from the base by the necessary amount.

If care is given to these points, the metal-built short-wave receiver can be made to give very fine results and the making of a receiver of this type is rather a pleasant change from the usual wood-and-ebonite affair.

Incidentally, the actual metal used will have some effect on the final results. Aluminium is about the best metal to use, and it is very easy to work. At the same time, a good receiver can very often be built up with a cheaper metal.

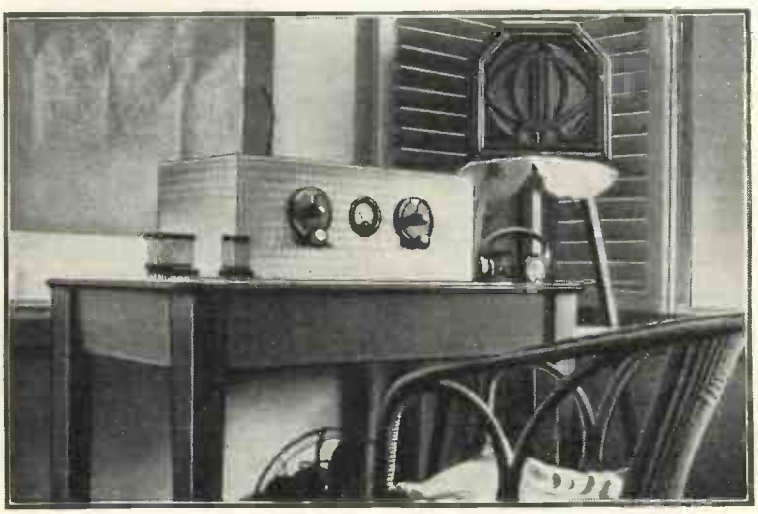
I am at present using a very successful short-wave tuning unit built on a tin-plate chassis and in actual practice there appears to be no detrimental effects whatever from the use of this metal.

◆ ◆ ◆

American Re-broadcasts

Have you listened to some of the recent re-broadcasts from America? It is apparent that the Post Office, like the humble amateur, is not always successful with its short-wave receiving system.

On some occasions the transmissions have been very badly upset by atmospherics and one presumes that the long-wave link is in use on these occasions. When conditions *have* been good, we have had some really excellent re-broadcasts on the short-wave link, free from atmospherics and practically entirely free from fading.



MAINS SHORT-WAVE SET FOR CONSTRUCTORS

"You have done it! Congratulations. The set is the best four-valver I have heard out here." That is what a special correspondent at Accra (Gold Coast Colony) says of a "Wireless Magazine" A.C. short-wave receiver sent out for him to test some three months ago. This receiver is the very thing for overseas listeners and full constructional details will be published in the August issue of "Wireless Magazine," to be published on July 21

SOME TALKS YOU SHOULD HEAR

RECENTLY the B.B.C. announced a new programme of talks. That information may make some readers shudder, but the fact is that all the B.B.C. talks are given by authorities on their particular subjects. Many of the talks are extremely interesting and all of them are informative. In any case, the listener can always switch off if he becomes bored !

Here we are able to give details of some of the more interesting talks to be given at the end of June and during July. It will repay most listeners to hear at least a few of them :—

JUNE

Tuesday, June 28, 10.45 a.m., "The Danish Supper Table," by Mr. P. Federspiel; 8.20 p.m., "Life Among Native Tribes."

Wednesday, June 29, 6.50 p.m., "This Surprising World," by Mr. Gerald Heard; 7.10 p.m., "Idle Thoughts of a Busy Farmer," by Mr. A. G. Street; 7.30 p.m., "Speech in the Modern World," by Mr. A. Lloyd James.

Thursday, June 30, 10.45 a.m., "The Child of the East," by Mrs. Ivo Geikie Cobb; 7.30 p.m., "The Disintegration of the Modern World Order," by Professor Arnold J. Toynbee.

JULY

Friday, July 1, 10.45 a.m., "The Week in Westminster"; 6.50 p.m., "Pinks and Carnations," by Mr. M. C. Allwood; 7.10 p.m., "Music Criticism," by Mr. Ernest Newman; 7.30 p.m., "Biology in the Service of Man," by Sir J. Arthur Thomson.

Saturday, July 2, 10.45 a.m., "On Your Allotment," by Mr. J. W. Cassels; 7.10 p.m., "Topical Talk."

Monday, July 4, 10.45 a.m., "Some Women Worth Reading About," by Miss A. S. Cooke; 6.50 p.m., "New Books," by Mr. Desmond MacCarthy; 7.30 p.m., "Music Old and New," by Mr. Victor Hely-Hutchinson.

Sunday, July 3, 5 p.m., "China in the Melting-pot," by Professor P. M. Roxby.

Tuesday, July 5, 10.45 a.m., "Egg Dishes," by Miss Elizabeth Craig.

Wednesday, July 6, 6.50 p.m., "The Cinema," by Mr. Cedric Belfrage; 7.10 p.m., "Farming Talks," by Sir Daniel Hall.

Thursday, July 7, 10.45 a.m., "National Baby Week," by Dr. Mabel Brodie.

Friday, July 8, 10.45 a.m., "The Week in Westminster"; 6.50 p.m., "Summer Pruning of Fruit Trees," by Mr. A. N. Rawes; 7.10 p.m., "The Theatre," by Mr. James Agate.

Saturday, July 9, 10.45 a.m., "For Poultry Keepers," by Mrs. Wood.

Monday, July 11, 6.50 p.m., "New Books," by Miss V. Sackville-West.

Tuesday, July 12, 10.45 a.m., "Salads," by Mrs. Raymond Swing.

Wednesday, July 13, 6.50 p.m., "This Surprising World," by Mr. Gerald Heard; 7.10 p.m., "Idle Thoughts of a Busy Farmer," by Mr. A. G. Street.

Thursday, July 14, 10.45 a.m., "The Child of the New World," by Mrs. Ivo Geikie Cobb.

Friday, July 15, 10.45 a.m., "The Week in Westminster"; 6.50 p.m., "New Flowers," by Mr. C. H. Middleton; 7.10 p.m., "Music Criticism," by Mr. Ernest Newman.

Saturday, July 16, 10.45 a.m., "Vegetable Preserving," by Mrs. Arthur Webb.

Monday, July 18, 10.45 a.m., "Chartering Unknown Lands," by Miss A. S. Cooke; 6.50 p.m., "New Books," by Mr. Desmond MacCarthy.

Tuesday, July 19, 10.45 a.m., "Suppers Cooked on a Gas-ring," by Mrs. Pease.

Wednesday, July 20, 6.50 p.m., "The Cinema," by Mr. Cedric Belfrage; 7.10 p.m., "Farming Talks," by Sir Daniel Hall.

Thursday, July 21, 10.45 a.m., "The Child of Victorian Days," by Mrs. Ivo Geikie Cobb.

Friday, July 22, 10.45 a.m., "The Week in Westminster"; 6.50 p.m., "Fresh Vegetables for Winter Food," by Mr. C. H. Middleton; 7.10 p.m., "Music Criticism," by Mr. Ernest Newman.

Saturday, July 23, 10.45 a.m., "Pickles and Chutney," by Mrs. Arthur Webb.

Monday, July 25, 6.50 p.m., "New Books," by Miss V. Sackville-West.

Tuesday, July 26, 10.45 a.m., "Making Tinned Foods Interesting," by Miss Helen Simpson.

Wednesday, July 27, 7.10 p.m., "Idle Thoughts of a Busy Farmer," by Mr. A. G. Street.

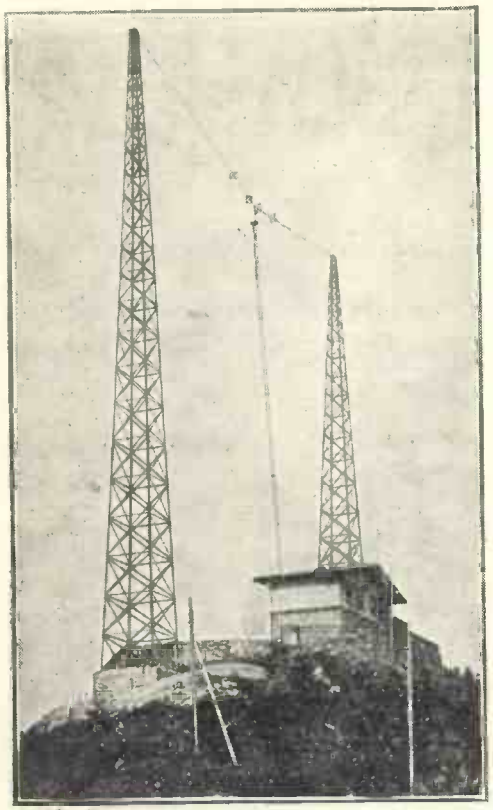
Thursday, July 28, 10.45 a.m., "The Child of the Twentieth Century," by Mrs. Geikie Cobb.

Friday, July 29, 10.45 a.m., "The Week in Westminster"; 6.50 p.m., "Your Garden While You are on Holiday," by Mr. W. Brett; 7.10 p.m., "Music Criticism." by Mr. Ernest Newman.

Saturday, July 30, 10.45 a.m., "On Your Allotment," by Mr. J. W. Cassels.

"ALGIERS CALLING"
Miss Phyllis Gillespie, wearing one of the most elaborate costumes ever seen in cabaret, appears as Radio Algiers in Charles B. Cochran's "Magic Nights," the supper show at the Trocadero

The Voice of SPAIN



BROADCASTING STATION ON A MOUNTAIN TOP

The building and aerial of the San Sebastian station on Mount Igueldo. Its power is .6 kilowatt

ALTHOUGH in the earlier days of broadcasting, Spain, with its "Radio Iberica," "Catalana," and "San Sebastian" calls was a very popular provider of thrills to the wireless fan, to-day that country appears to have withdrawn to the background of the European ether.

Possibly when—or if—the Republican Government carries out the complete reorganisation of the system so long promised to Spanish listeners, a scheme which provides for the erection of high-power transmitters in many important centres, Spanish broadcasts may again appear with more regularity in our logs.

On Favourable Nights

This does not mean, however, that Madrid, Barcelona, and San Sebastian broadcasts are not logged by dwellers in the British Isles; as a matter of fact, on favourable nights transmissions from these cities, as well as those from more distant Valencia, are often well received.

At present, in Spain there are only seven stations in regular operation, namely, Barcelona (2), Madrid (2), San Sebastian, Seville, and Valencia.

Generally speaking, the Spanish announcers give out their calls very frequently; in such instances as San Sebastian and Barcelona (EAJ1) you will hear them repeatedly between items in the programme. In most details the calls do not vary much in form, inasmuch as the letters and numbers always precede the name of the city.

Take, for instance, Madrid; the EAJ7 is given out as (phonetically): "Eh ah ho ta see-ay-tay," followed by "oo-nay-own rah-dee-owe Madrid." Barcelona (EAJ1) is much the same, but the figure "1" is pronounced "oo-noh"; in the case of San Sebastian ("Say-bast-ee-yarn," by the way), EAJ8, "oh-cho" will be the number heard; "quince" (keen-say) for EAJ15 and "sinko" (cinco) for EAJ5, Seville.

In passing, a note should be made that in Castilian Spanish, the letter *c* before *e* or *i* and *z* is pronounced as the English *th*, or, to put it more clearly, it is lisped. Cadiz is therefore heard as "Cadith" and you may pick up a reference to "Barth-ell-own-a."

In addition, in the opening call the site of the transmitter and of the studio may be advertised. The EAJ1 announcer informs you—although not regularly—that the station is "instalada en la cumbre del Monte Tibidabo" (installed at the summit of Mount Tibidabo) and he may add that the studio is at the Hotel Florida.

His San Sebastian colleague makes it clear that his transmitter tops the Monte Igueldo (phonetic: "Ee-geldoh").

Apart from an occasional "pong" on a gong, as a general rule the Spanish stations have not made much use of interval signals; no particular method over and above the call has been adopted to identify any individual station to listeners.

Gaps in the programme are mainly used for the broadcast of publicity puffs, sometimes slightly camouflaged under the cloak of a storyette or anecdote, but more frequently openly and plainly transmitted as a bald advertisement. Radio Barcelona (EAJ1) is possibly the only exception to this rule, as in that studio some attempt is made to temper barefaced publicity by presenting it in a palatable form more acceptable to listeners.

Senor José Torres—an erstwhile announcer, actor, and expert ventriloquist—is responsible for this particular feature. In the course of the programme you may pick up an apparent dialogue between two men—one being of the "silly ass" type. Questions and answers follow in rapid succession and in this guise José Torres introduces in these ventriloquial sketches, with a considerable amount of humour, a number of advertisements for local and other business firms.

As regards opening signals, Madrid is the only station which may be said to possess a distinctive one; it consists of a bugle call taken from Wagner's opera, *Siegfried*, and seems to be played as a one-finger exercise on a piano; Barcelona and San Sebastian, as a rule, are satisfied with chimes or an ordinary time signal.

With the help of these special notes by J. GODCHAUX ABRAHAMS no listener will have any difficulty in recognising the Spanish stations when he hears them. Many of the calls and words frequently used are spelled out phonetically in these pages so that they can be easily identified by the listener who hears them

Valencia starts with a local melody, a hymn dedicated to its own city.

Owing to lack of co-operation between the State and the individual programme organisers, and the fact that only a restricted income is derived from publicity and kindred services, the wireless fare offered by the studios is on the meagre side if comparison is made with other European countries whose broadcasting systems were established at an even later date.

Working Regularly

At the time of going to press, the only stations working regularly in Spain are the following: Madrid (EAJ7), 2 kilowatts, now on 411.5 metres (729 kilocycles); Madrid-Espana (EAJ3), on 427.4 metres (702 kilocycles), 2 kilowatts; Barcelona (EAJ15), 251 metres (1,193 kilocycles), 6 kilowatts; Radio Barcelona (EAJ1), 349 metres (860 kilocycles), 8 kilowatts; Seville (EAJ15) 368.1 metres (815 kilocycles), 1.5 kilowatts; and San Sebastian, 456.6 metres (662 kilocycles), 1 kilowatt.

Madrid (EAJ7), Barcelona (EAJ1), Seville (EAJ15), and San Sebastian (EAJ8) are owned and operated by Union Radio; the other stations are run by independent organisations.

As the capital is fed by two competitive studios, the transmission times have been shared by arrangement, and to an extent, do not clash. Daily (Mondays excepted), EAJ7 is on the air from 10.00 until 21.30, in three sessions, and again from 23.00 until 01.00 B.S.T.

Radio España, on the other hand, comes on the ether at 18.00 and broadcasts until 20.00 B.S.T. daily; on Mondays the transmissions are extended until 1 a.m.

No Mutual Agreement

Apparently the competing Barcelona stations have no mutual agreement governing times, as they operate simultaneously on their respective wavelengths.

San Sebastian and Seville largely rely on relays of the Union Radio programmes from the capital but, in addition, during the day put out local entertainments. The former, without doubt, is the one most frequently heard; on Mondays, Wednesdays, and Fridays it curtails its transmissions to one broadcast, namely, from 20.30 to 22.00 B.S.T.; on other days it works from 23.00-01.00 and it is on these nights that it connects up with Madrid.

In a small degree only are the Spanish programmes comparable to those of other countries; many features have been sadly neglected, as, for instance, news bulletins, relays of interesting outside ceremonies, educational talks, and so on.

Now for a little Spanish.

In the earlier part of the programmes we are almost certain to pick up references to the " Bolsa de Madrid" or "de Barcelona"; these are the Stock Exchange quotations or, if " principales bolsas extranjeras," the main foreign exchanges, also information in respect to situations offered or wanted.

This is given under the heading " Bolsa de Trabajo " (Labour Exchange). When a weather forecast is broadcast you will hear the words, " servicio oficial meteorologico " or " estado general del tiempo " (general state of the weather).

Then follows, as usual, the press bulletin (" noticias de prensa "); " noticias de toda Espana " (Spanish news), or " del extranjero " (from abroad). " Noticias de ultima hora," if given at the end of the evening programme, indicate that they are the late edition topics.

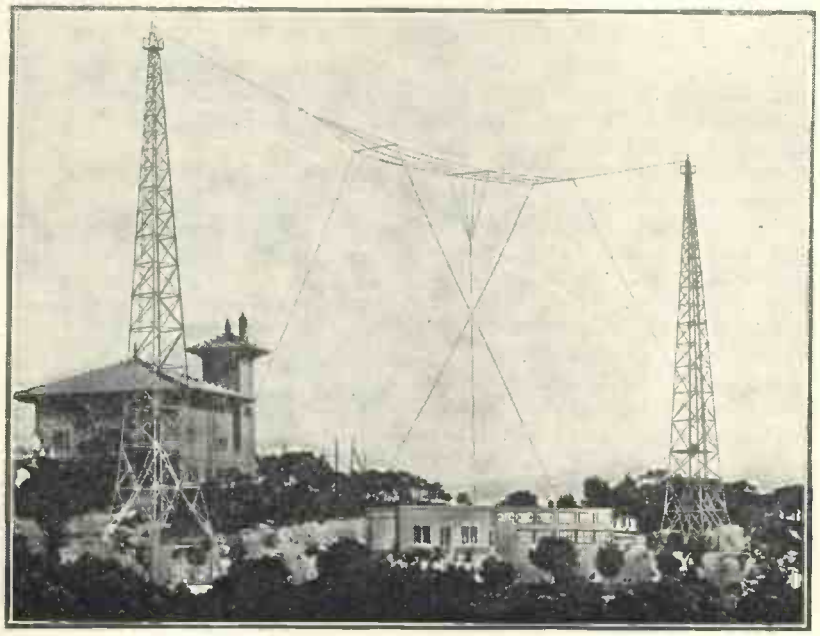
The Spanish listener, in common with his opposite number in other Latin countries, revels in commentaries, criticisms, and personal opinions on the day's happenings, whether they be of social or political interest, and a popular feature of the broadcasts is " La Palabra " or the " Diario hablado " (spoken journal), which has its counterpart in the " Journal Parlé " of France and Belgium.

Six stations are now operating in Spain. Here are brief details about them: Barcelona EAJ15, 251 metres, 6 kilowatts; Radio Barcelona EAJ1, 349 metres, 8 kilowatts; Seville EAJ15, 368.1 metres, 1.5 kw.; Madrid EAJ7, 411.5 metres, 2 kw.; Madrid Espãna, 427.4 metres, 2kw.; and San Sebastian EAJ8, 456.6 metres, 1 kw.

Sporting Broadcasts

Sport also is of interest to the Spanish radio fan and you will notice that most of the terms heard in connection with baseball, football, and other games possess a familiar sound. Although pronounced curiously, you will heard such words as " catchers," " pitchers," " fielders," " goals," " tries," " score "; details are given over the microphone in the usual manner and results of international matches played in other countries are broadcast at the end of all news bulletins.

" Automovilismo " covers all references to events taking place in the motor world, " hipismo " to horse-racing, " reunion pugilistico " to boxing matches, and " athletismo "



ANOTHER MOUNTAIN-TOP BROADCASTING STATION

Another Spanish station that is located on the top of a mountain. This is the Barcelona transmitter EAJ1 on Mount Tibidabo. Its power is 8 kilowatts

THE VOICE OF SPAIN—Continued

includes all the usual athletic sports.

In the Barcelona and Seville programmes more prominence is given than in the other studios to talks on or advance notices regarding bull-fights (" corrida "); they are usually announced as " informaciones taurinas." Do you recall your latin, *taurus*—bull?

Evening Entertainment

The main evening entertainments as a rule start towards 22.00 B.S.T. and often consist of a concert. Such terms used by the announcer as " La Orquesta Filarmonica de Madrid " or " concierto por el sexteto de Radio Barcelona " should require no translation. " Musica ligera " will indicate that light music is to be broadcast and " concierto vocal," or " de cante," a song recital.

But the announcer may also add that the entertainment is given by " la orquesta de la Estaçion," from which you will understand that the station (studio) orchestra is responsible for the musical items.

Gramophone records figure largely in the Spanish broadcasts, especially in the case of provincial studios. Any reference to an " audiçion de discos selectos " (audition of selected records) will put you wise as to what is to follow and on some evenings the announcements will make it clear that it is a listeners' programme (" programa del oyente "), and that the records are being transmitted by request (" discos solicitados) ".

In the matter of talks—styled " conferencias "—" en los intermedos " (in the intervals) we may hear the " informaçiones teatrales y musicales " (theatrical and musical news) or " recetas culinarias " (culinary recipes), a review of the latest books (" revista de libros " or " libros nuevos "), a dissertation on plays such as " revista " (review), " comedia " (comedy), or " zarzuela" (operetta), or the lesser interesting " curso de lingua inglesa " (English lesson).

Broadcast instructional courses are termed " cursos radiados."

On some evenings a few words may be said about the talkies in the " sesion cinematografica " and " aficionados " (amateurs) will be advised to see and hear some of the latest imported "flicks," described as a " magnifica superproduccion " —no translation needed, as we are now familiar with transatlantic adjectives—or a " triunfo de triunfos" (a triumph of triumphs—can you beat it?) at one of the innumerable cinemas.

Madrid, as you may have noticed, carries out relays of concerts from the Hotel Naçional in that city; we are told that it is a " retransmision " (phon.: " ray-trans-mees-ee-own "). Barcelona during the operatic season gives us a " transmision del gran Teatro del Liceo " (Lyceum Theatre), and on many nights to finish up the programmes we hear an " audicion de bailables " (audition of dance music) by gramophone, or are taken over direct to the Excelsior Dancing at Barcelona for the real thing (" musica de baile ").

An Hour Behind

As Spain does not adopt British summer time, her clocks until October 2 remain one hour behind ours.

Most of the stations elect to close down with a time signal and chimes, either relayed or provided by the studio; the Song of Riego, although not generally adopted, is used by Madrid as a final item.

But all Spanish studios sign off with their call-letters followed by a cheery " Buenas Noches, Señores, hasta mañana" (until to-morrow).

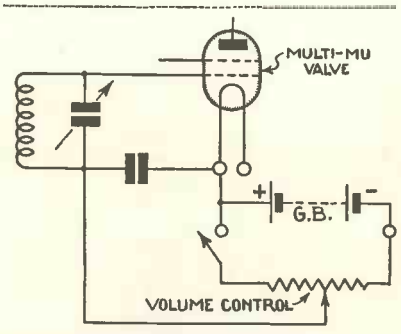
Volume Control with Multi-mu Valves

MANY sets having a screen-grid stage are not provided with a satisfactory volume control. What usually happens is that the local station is picked up at such great strength in comparison with the distant stations that the volume control must be turned well back.

This usually distorts the signals, and we are faced with the result that the very stations to which we listen most, and which we should receive best of all, are distorted.

In many instances a multi-mu screen-grid valve with a grid-bias control will much improve this state of affairs, and it may be worth your while to get one of these valves when the present screen-grid nears the end of its life.

The multi-mu battery valve is easily connected. A potentiometer of about 20,000 ohms is needed as the volume control. It is joined across the grid-bias battery.



SIMPLE CONTROL METHOD

A simple and satisfactory method of controlling volume from a screen-grid valve

If this battery is of 9 volts, the current taken by the potentiometer will be negligible, about .5 milliampere, but a switch ought to be included for breaking the circuit when switching the set off.

The diagram shows the connections. A condenser of about 1 microfarad is needed to shunt the part of the potentiometer which would otherwise be included in the grid circuit.

The potentiometer control is satisfactory in most cases but it is, of course, possible to overload a multi-mu valve in exceptional circumstances.

To avoid this, the aerial should be reduced, or it is easier to insert in the aerial circuit a pre-set condenser having the maximum value of .0003 microfarad. Adjust this condenser, and as its capacity is reduced the strength will usually fall.

A multi-mu valve ought to have as long and useful a life as other types of screen-grid valves. The life of the grid battery may be reduced a little, but in actual fact the drain of .5 milliampere is no disadvantage. A grid battery will supply this amount of current for a lengthy period.

W. James.

A Radio Fan's Causerie :: Conducted by BM/PRESS

Busy Designers

JUST now all the radio designers in the country are scratching their heads and trying to think of new ideas for presentation at the Radio Exhibition, which opens its doors at Olympia on Friday, August 19.

There will be a number of surprises in store for listeners. Many firms will be producing super-het receivers, and I understand that some of them will be priced amazingly low. Several component manufacturers I have met recently have a number of good designs up their sleeves.

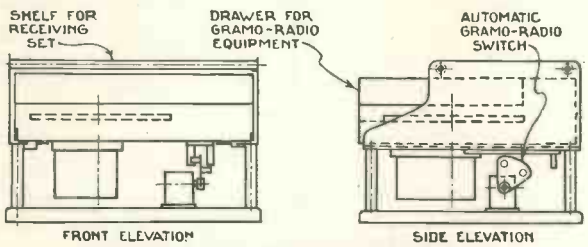
This year, though, a good many of the new sets and components will be announced before the opening of the exhibition. Constructors will do well to watch radio advertisements carefully during the next two months if they want to keep abreast of the latest developments.

◆ ◆ ◆

Radiogram Cabinets

Mr. T. E. Williams, of Manchester, has sent me some interesting blueprints showing designs of unusual radio-gramophone cabinets he has developed. His object has been to save space, and in that I think he has succeeded.

He arranges a shelf to accommodate the receiver and puts the gramophone apparatus (that is, the turntable, motor, and pick-up) in a drawer that is pulled out for use. This method has the advantage that when the gramophone equipment is not being used it does not occupy anything like the space needed for a radio-gramophone cabinet of the usual type.

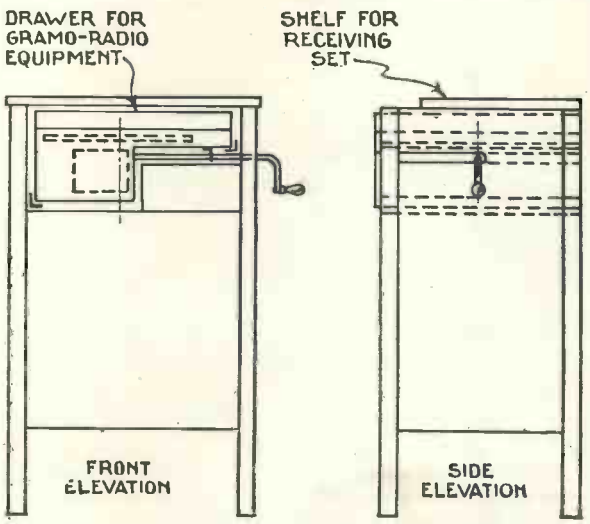


SOMETHING NEW IN TABLE RADIOGRAMS

A compact design by T. E. Williams, covered by Patent No. 338,639. The set is placed on the shelf and the gramophone equipment is accommodated in a drawer

The idea will be better appreciated from the diagrams reproduced on this page; they are taken from the specification of Patent No. 338,639, held by Mr. Williams.

In the table model there is a gramo-radio switch that is operated automatically as the drawer is pulled out, as it must be for the playing of records. Mr. Williams is to be congratulated on his originality.



A SMALL-SPACE UPRIGHT DESIGN

Another design by T. E. Williams, also covered by Patent No. 338,639. When the "gramophone" drawer is pulled out the gramo-radio switch is automatically actuated

◆ ◆ ◆

High-voltage Valves

Last month I referred to the new high-voltage mains valves, which seem likely to revolutionise the construction of mains sets as they obviate the need for a mains transformer, and said that arrangements are being made to go into production with them over here.

I am now asked by the English agent for Ostar valves to point out that no definite arrangement has yet

RADIO MEDLEY—Continued

A SCENE OF RADIO ACTIVITY

Manufacturers are now getting ready for the Radio Exhibition, which opens at Olympia on August 19. Here is a scene in the Portadyne factory

been concluded to manufacture the valves in this country; they are at present being made in Austria, but are available here from Eugen Forbat, c/o Nivalight (1928), Ltd., of 1 Rosebery Avenue, London, E.C.1.

◆ ◆ ◆

From Plane to Train

I cannot help wondering what the recent demonstration of radio telephony between the Flying Scotsman and the "Heracles" really proved. The gear used was standard Marconi apparatus, both installations being practically identical except for the aerial and earth systems and the power supply.

The "Heracles," which is a 42-seater air liner owned by Imperial Airways, used a 200-ft. trailing aerial and the usual wind-driven generator. The aerial in the train was suspended below the roof and power was obtained from a battery-driven rotary transformer.

The experiment was made on a wavelength of 820 metres, but when the 'plane drew about ten miles ahead of the train the tuning was changed to the international aircraft wavelength of 900 metres.

◆ ◆ ◆

A Great Man

I have been most interested in reading a reprint of an address given by Mr. Frank Bailey to the Electrical Power Engineers' Association on the life and work of the late Dr. S. Z. de Ferranti, who died in 1930.

His interests were most diverse and he was undoubtedly a most gifted personality. I have spoken to some of his assistants at Ferranti's and they all say that they suffered a personal loss when he died, so beloved was he by his colleagues.

Cycling was one of Dr. Ferranti's early recreations and he very soon suggested a bevel drive instead of the chain and sprocket; such a machine was put on the market. He made some outstanding contributions to electrical practice. He was a pioneer in electrical power work and also designed steam engines.

◆ ◆ ◆

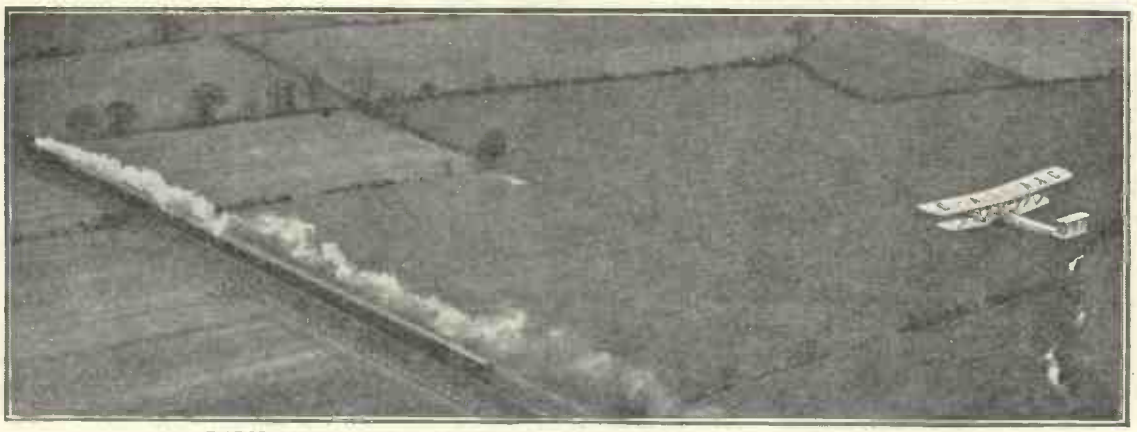
A Voltage Puzzle

Mr. E. W. Anderson, of Ilford, is puzzled over one or two things regarding the Multi-mag Three, described by Paul D. Tyers in the June issue of "Wireless Magazine." Here is one of his problems :—

"The detector valve has a total resistance in the anode lead of 150,000 ohms. The current consumption of this valve is .75 milliampere. According to Ohm's Law this gives a voltage drop of 112.5 volts, leaving 7.5 volts on the plate of the valve, assuming a 120-volt supply. Again, the first low-frequency valve has a total resistance of 50,000 ohms in its anode circuit. With an anode consumption of 2 milliamperes this gives the voltage drop as 100 volts, leaving 20 volts available for the plate. Is this so in actual practice?"

The answer is, of course, that with these values of resistance in the anode circuits the valves do not consume the anode currents quoted. The figures of .75 milliamperes and 2 milliamperes are evidently taken from the "Valves to Use in Your Set" feature that appears in these pages each month, but these currents

(*Continued on page* 670)



RADIO TELEPHONY BETWEEN AN AEROPLANE AND AN EXPRESS TRAIN

On the left is the Flying Scotsman, while the "Heracles" (a 42-seater air liner owned by Imperial Airways) is seen on the right. Communication was at first established on 820 metres and afterwards on 900 metres

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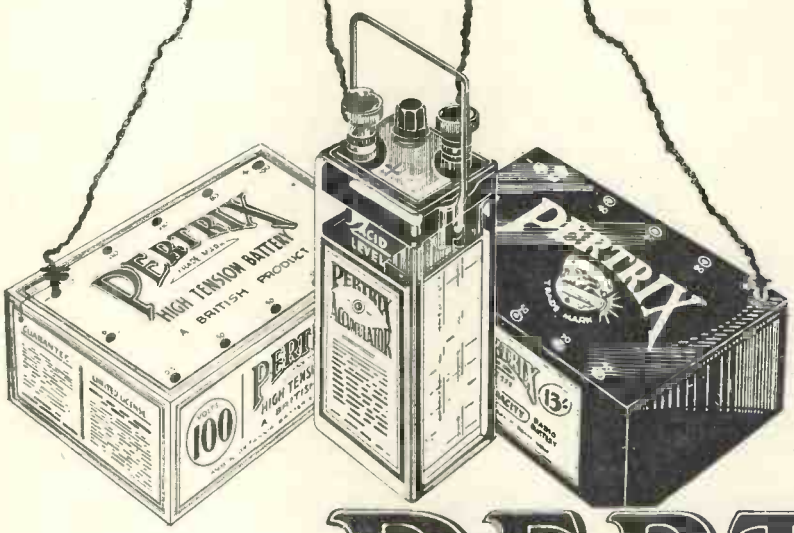

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Stories of the Operas

LOHENGRIN

(Wagner)

CHARACTERS

HENRY THE FOWLER, King of Germany....Bass
LOHENGRIN.....Tenor
ELSA.....Soprano
DUKE GODFREY, Elsa's brother.....Mute
FREDERICK, Count of Brabant...Baritone
ORTRUD, his wife.....Mezzo-soprano
The King's Herald.....Bass
Time: Tenth century. Place: Antwerp

ACT I

A PLAIN OUTSIDE ANTWERP.—*Under an oak sits the King, Ortrud and Frederick. Elsa has been openly accused of murdering her brother, that she might be sole heir and reject Frederick's right to her hand in marriage. She is summoned and appears.*

Ortrud is against her; through causing Elsa's downfall Ortrud hopes (by Frederick's accession to the dukedom) to prevent the spread of Christianity and restore the rights of Odin, a heathen deity. In reply to a question from the King, Elsa says that she will be defended by someone whom heaven will send.

A knight appears; he tells Elsa he will fight for her, but she must never ask his name. Frederick and the knight draw their swords. The knight is the victor, but Frederick is not killed.

ACT II

THE FORTRESS AT ANTWERP: NIGHT.—*Frederick and Ortrud are to be banished and are dejected; she still trusts in her heathenish gods. Frederick, not knowing Ortrud intends to ruin Elsa and restore him, upraids her for their present plight. She unfolds a plot to him. Elsa will never be able to refrain from asking who her champion is. Frederick is to conceal himself in the minster for the marriage of Elsa and the knight, and is to come forth, accusing him of some treachery; above all, he must demand his name. He will refuse it; this will sow the seeds of mistrust in his bride.*

ACT III

THE BRIDAL CHAMBER.—*Elsa begs for her husband's name, saying she will be flattered by his confidence. He has to refuse her. Frederick bursts into the room. Frederick is killed by the knight, who bids Elsa to appear with him before the King. On the banks of the Scheldt they meet the King.*

The knight says that he is Lohengrin, Knight of the Temple of the Holy Grail, but his confession means that he must return to the Temple for ever. The lovers say farewell. A swan is seen floating down the river.

Lohengrin prays by the river side and a white dove descends. Lohengrin looses the chain by which the swan is attached to a boat and, entering it, is drawn away by the dove. The swan changes back to the form of Elsa's brother. Elsa dies in his arms as Lohengrin disappears.

WHITAKER-WILSON.

RADIO MEDLEY

Continued from page 668

are only taken when the valve has 120 volts *applied directly to the anode*.

When a valve is used with a high resistance in the anode circuit the current consumption is very much lower than the normal rating—which is one advantage of using a resistance-coupled amplifier, for the life of the high-tension battery is conserved.

Mr. Anderson—and others—may be assured that Ohm's Law still works!

◆ ◆ ◆

Two Textbooks

A book going into the mathematics of radio has just been published by Methuen & Co., Ltd. The price is 2s. 6d. and the authors are C. W. Oatley, M.A., M.Sc., and O. W. Richardson, F.R.S. This book, called *Wireless Receivers: The Principles of Their design*, is one of Methuen's Monographs on Physical Subjects. It will prove rather heavy going for the ordinary listener, but should meet the needs of many advanced amateurs who want to go into the subject fairly deeply and who are not afraid of figures.

A more general book for the average listener—and especially for the beginner—is Capt. Jack Frost's *The Wireless Manual*, a third edition of which has been published by Sir Isaac Pitman & Sons, Ltd., at 5s. This book does not go into deep technical detail and will give any beginner a practical insight into the essentials of radio practice.

Matched Knobs

I have previously called attention in these notes to the need for sets of matched knobs so that home-constructed sets can be made as attractive in appearance as the commercial job. At last, there are signs that something will be done in this direction.

Yesterday I had a chat about this with a manufacturer whose name is known to every constructor. The chief difficulty about producing sets of matched knobs is the varying diameters of spindles used for components. They still vary from 3/16 to 1/4 in. Why doesn't the Radio Manufacturers' Association get down to this problem and make an effort to obtain standardisation?

◆ ◆ ◆

A Strange Request

A Dundee Correspondent sends me an unusual request. He is a clerk in the jute industry and feels that he would like to get a job in radio. He has been building sets since 1924 and for two seasons has acted as a demonstrator and repairer with a firm of retailers. He would like to know what occupations there are in radio and the wages paid.

I find it difficult to give this reader any advice. There are all sorts of good jobs going in the radio business, but even prolonged amateur experience is very often not of great value. Servicing, for instance, calls for considerable experience if it is to be done quickly and economically.

BM/PRESS.

London, W.C.1.

RADIO MAKES YACHTING MORE ENJOYABLE

A group of happy holidaymakers on the Norfolk Broads listening-in with a McMichael portable receiver. No yacht is complete without listening facilities

Recommended by Wireless Magazine!

B T-H ELECTRIC GRAMOPHONE MOTOR

The ideal motor for the "Ideal A.C. Home Super" illustrated on page . . . of this issue.

Thousands in use. Easy to install. Silent in operation. Runs at constant speed. Low current consumption.

WRITE FOR FREE BOOKLET

The British Thomson-Houston Co. Ltd.
Head Office and Works, Rugby, England.

★★★★★★★★★★★★★★★★★★★★★★★★★★★★ A1204N

Give Your Loudspeaker a Chance!

No ordinary Loudspeaker cabinet is entirely free from resonance or "boominess." It is due to the natural resonance of the air. Fit a Howe Box baffle and obtain flawless reception!

The Howe Box Baffle definitely eliminates all undesirable resonance and supplies the only real solution to this problem.

The B.B.C. Year Book says: "Actually, the results obtained from a Loudspeaker thus treated are . . . superior to those obtained using a flat baffle."

Any Home constructor can fit a Howe Box Baffle. It requires no alteration to your set and no technical knowledge. The Kit contains full instructions and every single item required to construct it. Price, including Royalty, 20s., delivered free.

Don't put up with faulty reproduction any longer. Ask your dealer or post this coupon for full particulars to F. McNeill & Co., Ltd., (Radio Dept. 4,) 16 Lamb's Passage, Bunhill Row, E.C.1.

The Howe Box Baffle Kit

'The Doom of Boom'

Not suitable for Portables

POST THIS FOR FREE BOOKLET
To F. McNEILL & Co. Ltd., Radio Dept. 4
16 Lambs Passage, Bunhill Row, E.C.1
Please send me full details of the Howe Box Baffle Kit
Name.....
Address.....

PILOT AUTHOR KITS
Exact to Specification

As suppliers of Constructors' Kits since 1919, Peto-Scott are now the largest and best-known Radio-by-Mail house in the country specialising in supplying constructors' requirements. We shall be glad to quote on anything Radio you may need, including all sets described in "Wireless Magazine"

IMMEDIATE DELIVERY. CASH—C.O.D.—H.P.

Any parts for Wireless Magazine sets supplied separately. If order value over 10/- sent either Carriage Paid or C.O.D., post charges paid.

EASYTUNE 60

As described in the May issue

KIT "A" Author's kit less valves and cabinet.

CASH or C.O.D. **£6 7 10**

Or 12 monthly payments of 11/9

KIT BITS *Selected C.O.D. lines. Post charges paid on orders over 10/-.*

	£ s. d.
Complete set of Lewcos coils	2 1 6
1 British Radiophone .0005 mfd. variable condenser, 3-gang with cover and disc drive, super het type	1 15 0
1 Lewcos L.F. Transformer, type L.F.T. 6	10 0
5 Valves as specified	2 19 0

IDEAL A.C. HOME SUPER

Described this month

KIT "A" Less Valves, Cabinet, Speaker, Motor and Pick-up.

CASH or C.O.D. **£12 17 11**

or 12 monthly payments of 23/7

KIT BITS *Selected lines. C.O.D. Post charges paid on orders over 10/-.*

	£ s. d.
Set of 5 specified valves	4 6 6
Specified Camco cabinet	5 10 0
Baker super-power permanent magnet moving-coil speaker	6 6 0
Varley pick-up and tone-arm	2 2 0
B.T.H. Synchro-blue electric motor	1 19 6
Set of specified Lewcos coils	1 18 0
Jackson 2-gang condenser (type R/2)	1 1 0
Jackson .0005-mfd. condenser (type R/1) ...	12 6
Heayberd L.F. choke (752)	12 6

PILOT BAND-PASS UNIT

INSTANTLY CONVERTS ANY SET TO BAND-PASS TUNING

Under modern Broadcasting conditions your set must be equipped with this New and amazing selectivity Unit. Then—and only then—will your selectivity problems be completely solved once and for all. Whether your set is Mains or Battery operated, the PILOT BAND-PASS UNIT cuts out programme interference effectively and sharpens tuning to needle-point selectivity. It is simple to attach and can be operated by anyone without technical knowledge.

25/-

It's complete. No valves required, no extras of any kind.

Obtainable from all branches of Curry's Ltd., and all Radio Dealers.

PETO-SCOTT CO. LTD. 77, CITY ROAD, LONDON, E.C.1

FOUNDERS OF CONSTRUCTOR KITS IN 1919

Telephone: Clerkenwell 9406-7-8.

Please send me CASH, C.O.D., or H.P. .....

KIT "A" IDEAL A.C. HOME SUPER KIT "A" EASYTUNE 60 PILOT BAND-PASS UNIT

for which I enclose £.....s.....d. CASH/H.P. deposit

NAME .....

ADDRESS .....

W.M.7/1932

West End Showrooms: 62 High Holborn, London, W.C.1.

An Apology

A new portrait of Miss Mamie Soutter, the popular broadcast comedienne. All her songs are specially written for her

AN unfortunate error was made in the inscription under a photograph of Miss Mamie Soutter published on page 559 of the June issue of "Wireless Magazine." The inscription stated that Mr. Joe Sargent, of Ross and Sargent fame, is Miss Mamie Soutter's husband.

Certainly Miss Soutter *is* married—and very happily married—but not, as we stated, to Mr. Joe Sargent. Her husband is a well-known theatrical producer.

Mr. Joe Sargent's wife is Miss Greta Keller, of whom a photograph appeared on page 560 of the June issue of "Wireless Magazine."

Our information was based on material obtained from what we believed to be a reliable source; we desire to express, to all concerned, our sincere regret at having made the mistake.

Four Years Broadcasting

This month we are able to publish a new portrait of Miss Mamie Soutter, who is one of the most popular broadcast comediennes. She has been broadcasting for about four years; much of her popularity is due to her charm and skill, and to the fact that her material is always original.

In her broadcasting work Miss Soutter never makes use of any published songs; all her numbers, whether for the stage or the broadcasting studio, are specially written for her and she never broadcasts her stage songs.

NOTES AND JOTTINGS

CONSTRUCTORS will be interested in the range of metal rectifiers announced by the Westinghouse Brake and Saxby Signal Co., Ltd., for the coming season. There are a number of new types and one price reduction :

Type LT1; 6 volts, .25 ampere; 10s. 6d.
Type LT2; 6 volts, .5 ampere; 11s.
Type LT4; 6 volts, 1 ampere; 13s.
Type LT5; 12 volts, 1 ampere; 15s.
Type PA1 (photo-electric cell); £2.
Type HT5; 120 volts, 20 milliamperes; 12s. 6d.
Type HT6; 175 volts, 25 milliamperes; 15s.
Type HT7; 200 volts, 30 milliamperes; 17s. 6d.
Type HT8; 250 volts, 60 milliamperes; 18s. 6d. (reduced price).
Type HT9; 300 volts, 60 milliamperes; £1 1s.
Type HT10; 200 volts, 100 milliamperes; £1 1s.
Type HT11; 500 volts, 100 milliamperes or 400 volts, 150 milliamperes; £1 15s.

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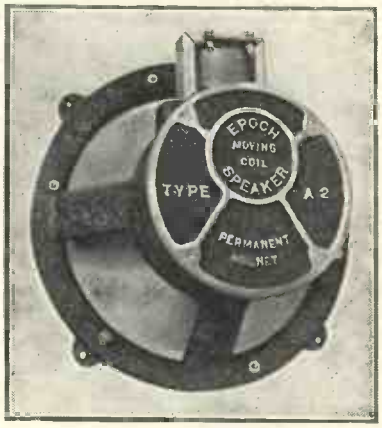
From the Electro Dynamic Construction Co., Ltd., of Devonshire Grove, London, S.E.15, we have received a folder (List No. 126) giving details and prices of rotary transformers for converting D.C. house supplies to A.C



The Epoch type A2 moving-coil loud-speaker is a permanent-magnet model; the price is 3 guineas, complete with input transformer

It is announced by the Loewe Radio Co., Ltd., of Fountayne Road, Tottenham, London, N.15, that the price of the 3NFW multiple A.C. mains valve has been reduced to £1 7s. 6d.

IF—

(*With Apologies to Rudyard Kipling*)

If you can keep your temper, when around you——
The very moment that you have tuned-in——
Your hear loud oscillations, and the sound you
Believed to be a concert in Berlin
Turns into squeaks and howls like cats in terror,
And if you know it is the chap next door
Who causes this, and don't point his error
You're noble to the (laminated) core !

If you can make a set with brain and sinew,
With valves and wires and other what-nots, too,
Employing time and all the skill within you
(And having told your friends what you will do)
You find some vital part you have forgotten,
Just when you thought your bragged-of set was done,
If you don't curse the thing and call it rotten
You'll be a super wireless fan, my son !

LESLIE M. OYLER

A Flying Radio Station

ALTHOUGH a great deal has been written about the radio apparatus carried by the Graf Zeppelin, one interesting feature appears to have been overlooked. This is the transportable short-wave apparatus, capable of sending or receiving radio signals. The short-wave gear is worked entirely independently of the rest of the radio apparatus carried on board the airship.

Reliable Link

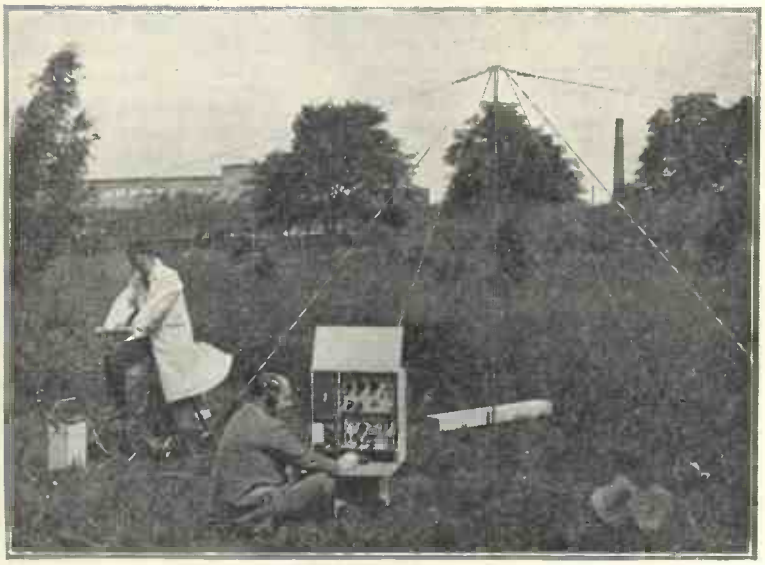
The real purpose of this additional gear is to provide a reliable link with the world in case of an unforeseen or forced landing. Great care had to be taken in the design and construction of the short-wave apparatus in order that it might stand up to all climatic conditions.

Airship apparatus has to be of the lightest weight possible and with this point in mind the short-wave gear was built into light boxes of ash wood. All metal parts are as light as possible without, of course, in any way impairing the electrical efficiency.

ZEPPELIN TRANSMITTER

This unit comprises both a transmitter and receiver. The gear is very compactly assembled

The complete installation is housed in five separate boxes: (1) The transmitter and receiver, (2) aerial installation and portable mast, (3) dynamo operated by a tread-wheel, (4) main batteries, and (5) reserve batteries. The batteries are enclosed in special boxes packed and interlined with peat shavings, which give adequate protection in a temperature as low as 50 degrees centigrade below zero.



TRANSMITTER WITH TREADLE-OPERATED DYNAMO

The operator on the left is seen working the treadle-operated dynamo. This is the emergency gear with which the Graf Zeppelin is equipped

One of the illustrations on this page shows the box containing the transmitter and the receiving set. In the top right-hand corner is seen the receiving set and immediately below it is the short-wave transmitter.

The compartment on the left contains a 100-volt high-tension battery in its specially constructed ash-wood box. Right at bottom can be seen the compartment containing spare valves and components, together with the transmitting key.

The short-wave transmitter works on wavelengths between 26 and 65 metres with an aerial power of 1.5 watts. The transmitter is of the continuous-wave type that can be operated with a master oscillator or quartz-crystal control. Exceptional constant frequency is therefore obtained.

Further, the outfit includes a contrivance for a second operator to "listen-in," thus making doubly sure that the right messages are sent and to provide a check on incoming signals.

Special material is used for the construction of the aerial, which is about 12 yds. long. Plugs and clips are fitted to the end of the wire in order that connections can be made as speedily as possible.

Power for operating the transmitter is generated by a specially designed dynamo, rotated by means of a tread-wheel arrangement. The tread-wheel must, of course, be rotated very evenly to keep the current constant. This is mounted on a collapsible stand of steel rods. The current required to operate the transmitter is 300 volts 14 amperes for the high tension and 7 volts 3 amperes for the filaments of the transmitting valves.

PROTECTED BATTERIES

The batteries are carefully protected against knocks and changes in temperature by a special interlining of peat shavings

E. Postan.

TESTS OF NEW APPARATUS

Ekco A.C. Mains Unit :: Climax Earth Tube :: Goltone High-frequency Choke :: Becker Switch :: Motor Loud-speaker :: Multitone Transformer

EKCO A.C. MAINS UNIT

APPARATUS: A.C. mains unit for high tension and trickle-charging, type K18.
PRICE: £4 12s. 6d.
MAKERS: E. K. Cole & Co., Ltd.

A WELL-MADE A.C. unit is the Ekco model K18. This is one of a series specially designed to fit into portable receiver cabinets,

MAINS UNIT FOR PORTABLE SETS
The Ekco type K18 A.C. mains unit gives high tension and incorporates a trickle charge r for accumulators

and is intended to operate from 200 to 250 volt A.C. supplies. It is suitable for supplying receivers requiring up to 18 milliamperes total high-tension current.

In addition to the high-tension supply, facilities are provided to allow 2-, 4-, or 6-volt accumulators to be trickle-charged.

The circuit of this unit is quite standard, a single-wave rectifier supplying the high-tension circuits, while a bridge-type rectifier is employed for the trickle charger. Westinghouse metal rectifying units are employed throughout.

Three Outputs

Three voltage outputs are provided—a power tap rated at 120 to 150 volts, a general-purpose tap rated at 60 to 80 volts, and a tap suitable for the screening grid of the high-frequency valve. The last two are variable, the former by means of moving a small bridge piece into one of three positions, and the latter simply by moving a plug in one of two positions.

On test the unit was found to be quite satisfactory. With a load of 15 milliamperes the voltage on the power tap was 116 volts; at the same time the general-purpose tap delivered 2 milliamperes with voltages of 86, 60 or 35 volts, and the screening-grid tap 5 milliamperes at 85 or 70 volts.

If the load on the power tap is reduced to 10 milliamperes the output voltage is 138, while the voltages on the other taps with the same loads as before are 108, 80 and 56 volts for the general-purpose tap, and 103 and 89 volts for the screen-grid tap.

The trickle charging rate was just over .2 ampere for 2, 4, or 6 volts.

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CLIMAX EARTH TUBE

APPARATUS: Earth tube.
PRICE: 1s.
MAKERS: Climax Radio Electric, Ltd.

FOR really satisfactory reception under all conditions a thoroughly good earth connection is essential. This is specially so when using all-mains receivers, as a high-resistance earth connection may cause a variety of really annoying troubles which are somewhat difficult to eliminate.

We have received one of the new Climax earth tubes. This tube is some 25 in. long and approximately 1 in. in diameter; thus a very good surface is obtained.

The tube is constructed of galvanised iron, and is formed into a point at the end to facilitate driving into the ground. The tube is pierced at the top and a bolt is provided to enable a good connection to be made.

It is recommended that a soldering tag be used under this bolt, or that the wire should be soldered direct on to the tube, otherwise in time the connection is bound to deteriorate.

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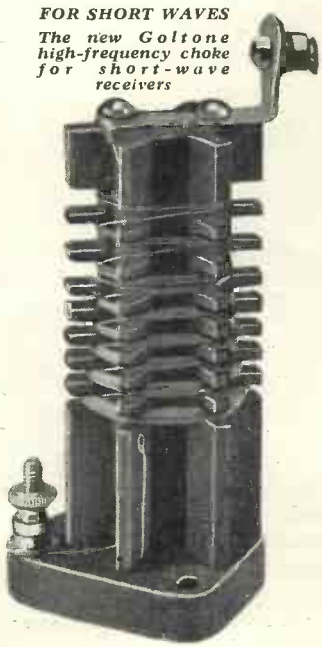
GOLTONE HIGH-FREQUENCY CHOKE

APPARATUS: Short-wave high-frequency choke.
PRICE: 3s.
MAKER: Ward & Goldstone, Ltd.

A SMALL neatly made high-frequency choke specially designed for use on the short waves (from about 10 to 100 metres) is that just placed on the market by Ward and Goldstone, Ltd.

This choke is designed for baseboard mounting or it can be fixed directly into the wiring scheme of the receiver. By means of a special top bracket supplied it is possible, for example, to mount the choke directly on to the terminals of a valve holder, thus facilitating assembly.

FOR SHORT WAVES
The new Goltone high-frequency choke for short-wave receivers



The choke is built up on a small piece of ebonite former and mounted on a small ebonite base. The self-capacity is low as the winding is distributed over eight slots. Our tests showed a uniform choking action, free from resonant peaks, over the range required, indicating a satisfactory performance.

The component should be suitable for use in any type of short-wave receiver and will undoubtedly interest a large number of constructors.

(*Cont. on page* 676)

WATMEL COILS!

Specified for "Wireless World"

1. Super Selective Six. A.C.
2. Super Selective Five. Battery.
3. Super Selective Five. D.C.

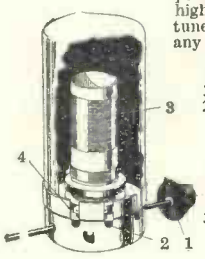
AND NOW— THE "SCREEN-GRID TWO"

1. Watmel Dual-Range Coil Type S.A.1. Price 8/6
2. Slab Coil .. .. Price 8/-

The advantage of using Watmel coils

This range of coils has been specially developed in view of modern broadcasting conditions. A high range of selectivity is assured by using these coils, as they are specially screened to prevent direct pick-up or interaction between the various units.

TYPE S.A.1. Screened aerial tuner with a periodic aerial tapping for high selectivity. This tuner can be adapted for any type of receiver.
Price 8/6



FEATURES:

1. Wave-change switch.
2. All contacts are gold-silver alloy which does not oxidise, therefore resulting in perfect low-resistance contacts and reliable switching.
3. The medium-wave winding is carried on a high grade paxolin tube and wound on silk-covered wire.
4. The screens are aluminium with a spring contact between top and bottom.

FREE circuits

Watmel coils may be adapted to all the popular and leading circuits, such as the **Mullard, Cossor,** etc.

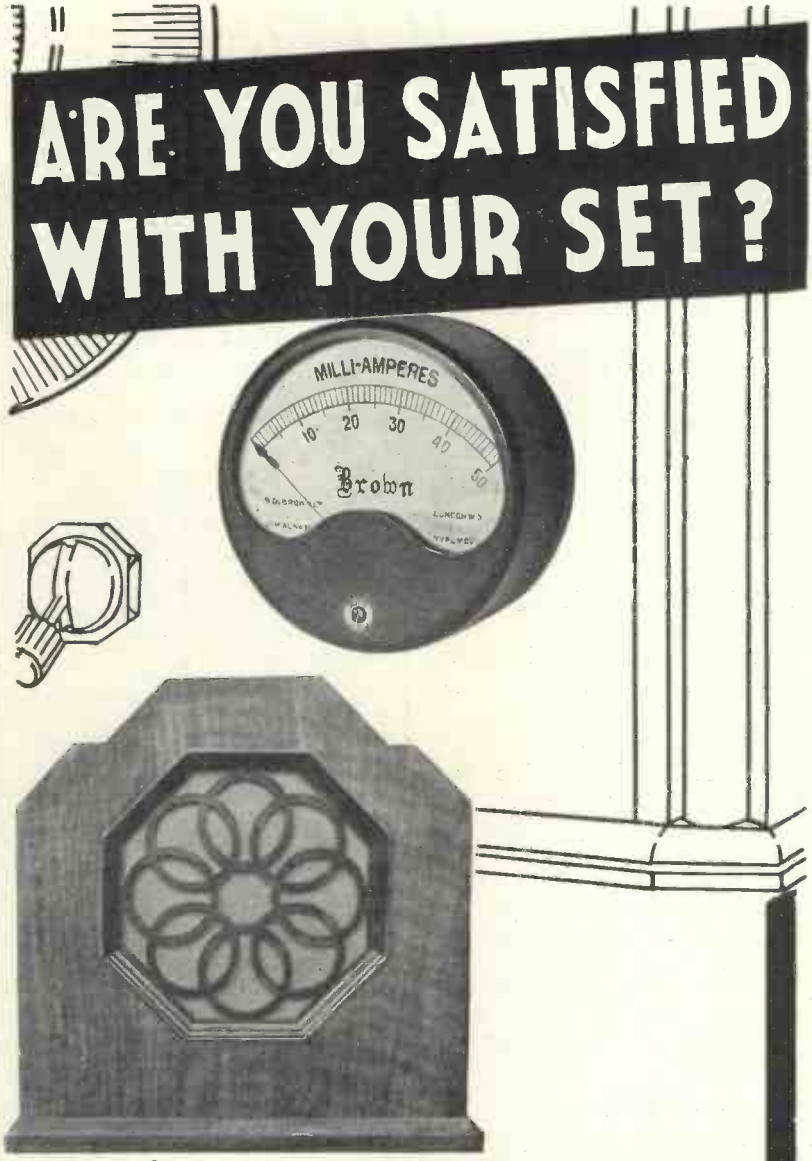
Just drop us a line and we will send you, **Free of all Cost,** our special circuit diagrams. These coils may be adapted to nearly any circuit, and if you have any difficulty, just send us your own circuit diagram and we will advise you **Free of Charge.**

WRITE FOR COMPONENT CATALOGUE.

WatMel COMPONENTS
GET THE BEST OUT OF ANY SET

WATMEL WIRELESS CO., LTD.,
IMPERIAL WORKS, High Street EDGWARE.
Telephone: Edgware 0323. (M.C.65)

ARE YOU SATISFIED WITH YOUR SET?



S·G·Brown MILLIAMMETER

S·G·Brown M.C. SPEAKER

Are you satisfied with your set? If not here are two suggestions that will help to perfect your reception.
First you require a S. G. Brown milliammeter in the output stage to guard against overloading.
Secondly, a S. G. Brown M.C. Speaker is essential if you wish to make the most of your receiver's capabilities.
S. G. Brown Moving-coil Meter, 0-50 milliamps.
We are now producing a full range of high-class meters, write for full particulars.
S. G. Brown Moving-coil Speaker complete in Walnut cabinet as illustrated. **£3 19 6**
S. G. Brown M.C. Unit complete on 12-in. baffle including tapped transformer. **50/-**
No better speaker is available at the price.

Write direct to us if your dealer cannot demonstrate

★S. G. BROWN LIMITED★

WESTERN AV., N. ACTON, LONDON, W.3

TESTS OF NEW APPARATUS—Continued from page 674

DUAL PURPOSE

A Becker switch that can be arranged as a make-and-break or a change-over device

BECKER SWITCH

APPARATUS: Single-pole change-over switch.
PRICE: 1s. 11d.
MAKER: George Becker, Ltd.

QUICK-ACTION switches are becoming very popular for radio sets—more particularly for those of the mains-operated variety. A particularly interesting range of switches is marketed by George Becker, Ltd. A sample which we inspected is illustrated herewith. It will be seen that the body of the switch is of bakelite, the contact springs being housed in channels at the side.

Dual Purpose

The switch may be arranged as a single-pole make-or-break or a single-pole change-over, as required, the familiar toggle action ensuring that the switch must be definitely in one position or the other, since it will not stop at any intermediate point.

The fixing hole required is $\frac{11}{16}$-in. in diameter, and the projection of the switch behind the panel is $\frac{5}{8}$-in.

* * *

MOTOR MOVING-COIL LOUD-SPEAKER

APPARATUS: Permanent-magnet moving-coil loud-speaker, Minor type.
PRICE: £2 5s.
MAKER: Tekade Radio & Electric, Ltd.

THE Motor permanent-magnet loud-speaker is another example of the progress which has been made in the design of this class of reproducer. The sensitivity is quite comparable with many energised models which we have tested, and the response, though a little high-pitched, is quite satisfactory.

The magnet employed is of the type which seems to be becoming popular, being shaped rather like a letter E, the centre leg of the E forming the pole-piece around which the coil is centred.

Our tests indicated that the instrument is suitable for the average receiver. It is supplied on a small baffle ready for fixing behind the grille of a cabinet and would be

MOVING-COIL LOUD-SPEAKER

Another addition to the permanent-magnet field, the new Motor reproducer

very convenient for use in a self-contained receiver.

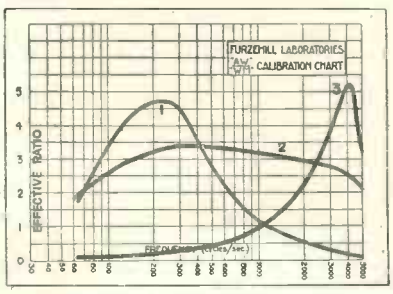
The response is fairly level up to about 800 cycles, after which there is a slight falling off in the sensitivity, followed by a distinct rise which is well maintained up to 6,000 cycles, a useful feature with a set having a tendency to cut off the upper frequencies.

An output transformer is built into the chassis, ratios of 15, 20, and 25 to 1 being obtainable as required.

* * *

MULTITONE TRANSFORMER

APPARATUS: Tone-compensator low-frequency transformer.
PRICE: 17s. 6d.
MAKER: Multitone Electric, Ltd.



MULTITONE RESPONSE CURVE

Curves of the Multitone transformer under various conditions

IT is well known that the characteristics of a low-frequency transformer can be varied considerably by the connection of resistances and condensers across the windings. Multitone Electric, Ltd., have made ingenious use of this fact in the compensated transformer which they have recently placed on the market.

Extra Terminals

This instrument, which is of normal appearance, is provided with two extra terminals across which are connected a high-resistance potentiometer. According to the setting of this potentiometer the characteristic can be varied from one in which the bass is strongly accentuated with very little amplification on the top frequencies to an exactly opposite state of affairs.

VARIABLE CHARACTERISTIC

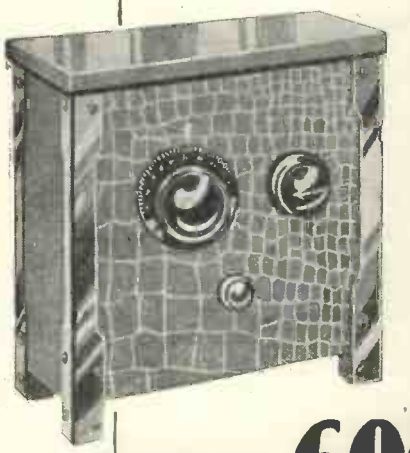
The Multitone low-frequency transformer is so designed that a varying characteristic can be obtained

In intermediate positions the accentuation of either end becomes less marked, and it is possible to obtain a level characteristic. Thus the behaviour of the transformer may be made to suit the requirements of one's set.

The potentiometer should have a value of 2 megohms at least, and it must be such that the contact arm short-circuits completely at either end; otherwise the full range of correction is not obtained. The Multitone people market a special potentiometer for this purpose.

We tested the transformer at the two extreme positions, and at an arbitrary intermediate point. It will be seen that the instrument behaves in the manner claimed and should prove a valuable addition to the low-frequency transformer field.

BRING IN THOSE FOREIGNERS



EELEX SHORT-WAVE CONVERTOR 60/-

Increase the range of your present set by fitting an Eelex Short-Wave Convertor. With this instrument fitted to your set it is possible for stations on the short-wave bands to be tuned in. No complicated adjustments to be made; just connect to the aerial and earth terminals of your present set. PRICE 60/- with valve. All Mains 65/- (without valve). Two Valve 85/- (without valves).

EELEX TESTING PRODS

Invaluable for testing a wireless receiver and eliminating all possibilities of shock, burnt-out valves or damage to other components. With red and black insulated handles. Per Pair 3/6

J. J. EASTICK & SONS

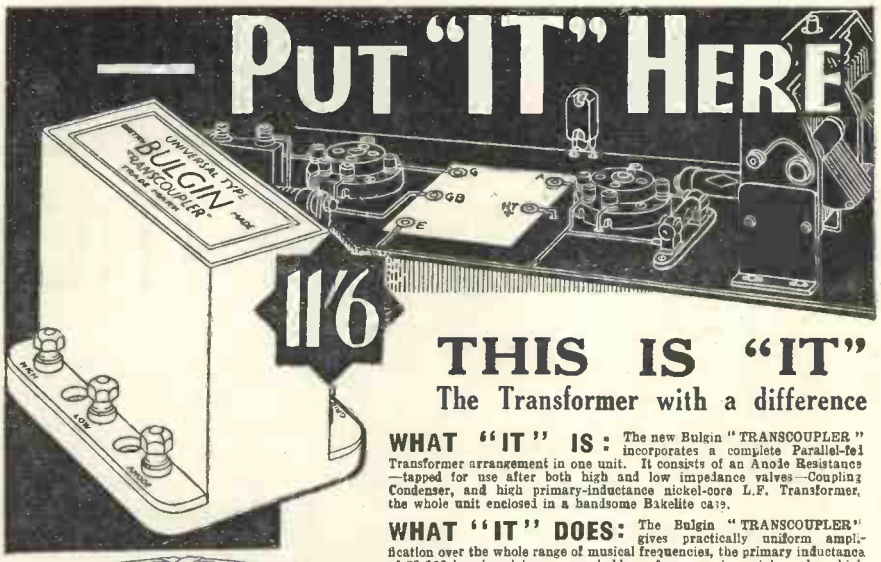
Write for list K10.

J. J. EASTICK & SONS

Eelex House, 118, Bunhill Row, LONDON, E.C.1

'Phone: Metropolitan 0314/5/6

— PUT "IT" HERE



THIS IS "IT"

The Transformer with a difference

WHAT "IT" IS: The new Bulgin "TRANSCOUPLER" incorporates a complete Parallel-fed Transformer arrangement in one unit. It consists of an Anode Resistance—tapped for use after both high and low impedance valves—Coupling Condenser, and high primary-inductance nickel-core L.F. Transformer, the whole unit enclosed in a handsome Bakelite case.

WHAT "IT" DOES: The Bulgin "TRANSCOUPLER" gives practically uniform amplification over the whole range of musical frequencies, the primary inductance of 80-100 henries giving a remarkable performance to match modern high efficiency valves. Substitute a "TRANSCOUPLER" for your present transformer and note the difference.

COMPLETE UNIT 11/6

Send 2d. Postage for 75 pp. Catalogue and new "TRANSCOUPLER" Leaflet.

BULGIN

The Choice of Critics

"TRANSCOUPLER"

A. F. BULGIN & CO. LTD., ABBEY ROAD, BARKING, ESSEX.

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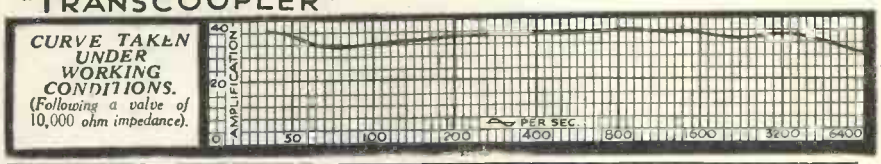

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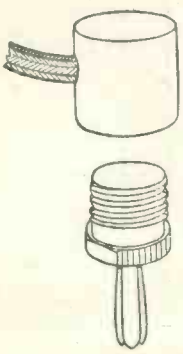

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BROADCAST MUSIC OF THE MONTH

By T. F. Henn

A clever musician, Robert Tredinnick is giving a fine series of gramophone recitals of dance music from Midland Regional

AFTER months of general agitation, columns of hostile press criticism and letters from listeners, the B.B.C. has at last extended the Sunday programmes. I, for one, am very pleased with the type of material which has been chosen for the 12.30 p.m. to 3.0 p.m. session.

Jenny Howard and Percy King are two clever variety artists who have featured in special vaudeville programmes from the London stations

Of course, we have all enjoyed the sponsored concerts from Radio Paris, but I think you will agree that they have become so monotonous that the B.B.C.'s delicate choice for Sunday lunch-time entertainment is to be heartily commended.

New Sunday Concerts

The first half-hour of the new session is to be devoted always to recitals, usually on the organ. The Queen's Hall instrument is very suitable for broadcasting and, as it is only just across the road from Broadcasting House, the transmissions should, technically, be a success. I understand that the B.B.C. intend to make more use of the Queen's Hall than it has done in the past.

Light orchestral music could not be given by a better combination than Joseph Muscant and the Commodore Orchestra, which is going to feature quite a lot in the new programmes. The orchestral relay will be heard from 1.0 p.m. till 2.15 p.m., and the remaining time will be devoted to gramophone recitals of classical orchestral music.

Few details of the programme items are yet available, but one thing is certain—a popular note is to be struck As the B.B.C. has not broadcast lunch-time music previously on Sundays, the usual light character of its make-up cannot imply any change of policy.

On Sunday, July 3, the programme will be a good example of the type which is to be broadcast. The transmission will consist of an organ recital by Dr. Alcock from the Queen's Hall, a relay from the Commodore Cinema, and a recital of Grieg's music on gramophone records.

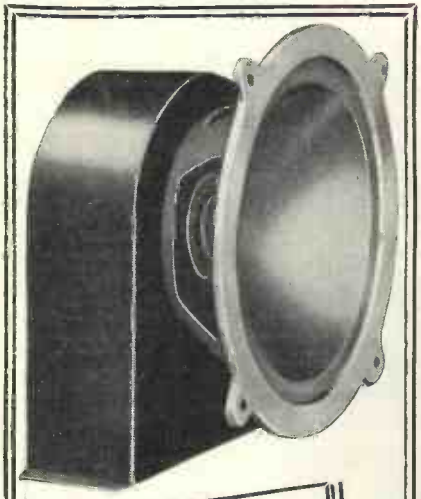
◆ ◆ ◆

Dr. Alcock, by the way, is advising the B.B.C. regarding the organ which is to be built in the concert-hall studio at Broadcasting House. During a recent visit to the building, I managed to slip away from the rest of the party and explore behind the grille at the platform end of the studio.

The space which has been left for accommodating the organ is

(*Continued on page* 680)

Two favourite artists who have made piano duets one of the most popular broadcast features, Ethel Bartlett and Rae Robertson



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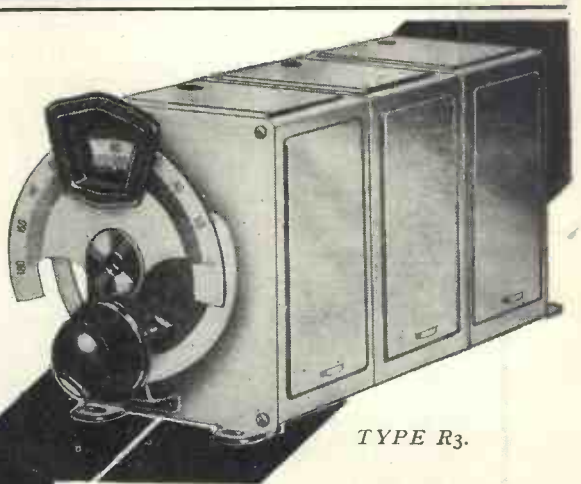

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MUSIC OF THE MONTH—Cont. from page 678

Lilias Mackinnon was one of the earliest classical pianists to broadcast. She was recently heard from London Regional

quite large and extends almost the whole width and height of the studio, but the depth has been cut to very narrow limits, being only 5 ft. or 6 ft. The organ is to be built on the "extension" or "borrowing system," as it is sometimes called, a form of construction vitally necessary if it is going to be of any real use. No matter what type of organ is installed the grille, will in my opinion, have to be made larger.

In brief, the "borrowing" idea makes a rank of pipes do more work than in the ordinary "straight" organ, usually found in our churches.

The average cinema organ is built on the extension system. There are several advantages of the method, the chief being that the organ takes up less space; it usually costs less; and, what is really most important all the pipes can be arranged nearer the front, with the result that the overall tone, especially when the instrument is in an enclosed space as it will be at Broadcasting House, is much brighter and and has better definition.

One point that is very noticeable about the platform of the concert studio is its small size. This platform might, at a squeeze, hold an orchestra of forty musicians but, with the special extension which has been built at the expense of the seating accommodation, it is possible to seat the normal studio orchestra required for symphony concerts, that is seventy-eight players.

It is out of the question for the complete orchestra of 117 players and the National Chorus to rehearse in this studio, but up to the present, No. 10 (the riverside studio) has been used for this purpose. Unfortunately for the B.B.C., No. 10 is not likely to be a broadcasting studio much longer. At last Waterloo Bridge seems likely to be rebuilt, and the wharf studio, which has been the source of many of the best musical broadcasts, may again be used for storage purposes.

Franklyn Bellamy, a well-known actor, has acted and broadcast in many famous plays. He was last heard from London Regional

The B.B.C. has this wharf on a monthly tenancy from the London County Council, and although formal notice to quit has not yet been given, the officials are expecting to have to move out some time in the autumn.

◆ ◆ ◆

In the June issue of WIRELESS MAGAZINE, mention was made of the B.B.C. official who was touring the Continent trying to arrange relays from some of the most famous opera houses there. Now the results of this official's tour are to hand. Listeners are to hear several relays, likely to rival the Covent Garden season that has just finished.

There are three relays planned for July. The first will be on July 1, when an act of Verdi's opera *The Sicilian Vespers* will be relayed from the Berlin State Opera House.

The second will be a relay of the

(*Continued on page* 682)

Here you see Warwick Braithwaite, musical director of Cardiff. He was, until recently, conductor of the National Orchestra of Wales

An author and film producer, Aarian Brunel's plays have been broadcast from radio stations all over the world

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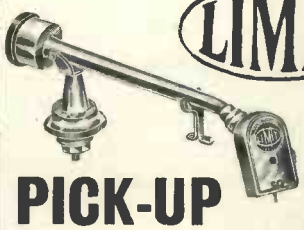

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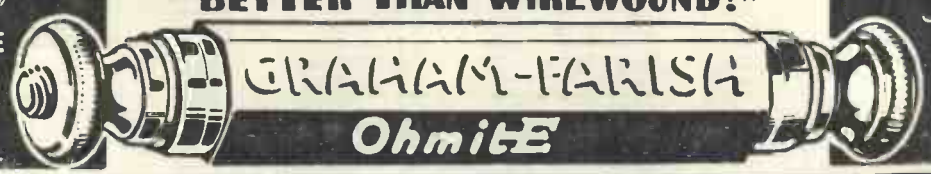

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MUSIC OF THE MONTH—Cont. from page 680

A well-known mezzo-soprano who was heard in the June programmes, Mabel Ferguson. She is popular throughout the country

whole of Weber's opera *Euryanthe* from the Berlin studios, some time in the middle of July, and the last will be an act of Mozart's opera, *Don Giovanni*, from the Munich Opera House on July 27.

Outstanding Event

One of the most outstanding musical events ever broadcast is planned to take place some time in August. Beethoven's little-heard opera *Cosi Fan Tutti* is to be relayed from the Munich studios, Richard Strauss, the composer and conductor, is conducting, and Elizabeth Schumann, the prima donna, is the leading soloist.

The opera will be presented at the Munich Opera House twice before the studio performance to ensure that the broadcast shall be as perfect as possible. This will be a musical treat of the first magnitude, the success of which depends on the engineers controlling the landlines through to this country.

◆ ◆ ◆

John Watt, of "Songs of the Shows" fame, is getting still more ambitious. When I met him at Broadcasting House recently, he told me that he had just finished writing the story of an entirely new idea in radio comedies. This show, which is nameless at present, will be broadcast on June 23 and 25.

This show is going to be the last word in speed. "Its chief feature," John Watt told me, "will be a continuous musical score, running from the start until the finish of the show which, by the way, lasts an hour." Harry S. Pepper is the composer of the music.

Harold Fairhurst, violinist, who has broadcast from Bournemouth, is well known for his excellent technique

Claude Hulbert and Gene Gerrard are the chief characters in a really amusing plot. These well-known artists take the part of reporters in a newspaper office. The proprietor of the paper tells the editor that he is being blackmailed and suggests that a couple of good men should be sent out to recover the letter which the blackmailers are holding over the proprietor. Naturally, in a story of this kind, both the reporters are madly in love with the proprietor's daughter.

The reporters recover the letter and then post it to the wrong person, and an exciting chase follows. I will not give the rest of the plot away, but listen to this show on my recommendation. Mr. Watt says "this show is a film story without pictures, after the style of Rene Claire and 'Le million' films."

Listeners will be glad to hear that another "Songs from the Shows" series will be starting again in the autumn.

Horace Fellows is at present conducting the Buxton Municipal Orchestra which is relayed to North Regional listeners every Tuesday

Scottish listeners, up to the present, have not been treated too well by the B.B.C. programme department, but amends are to be made. There is now in the process of formation a large orchestra which is going to be called the Scottish National Orchestra.

Although the control of this combination is not entirely in the hands of the B.B.C., the latter body is taking an active part in the selection of the personnel. Recently Dr. Boult and Victor Hely-Hutchinson visited Scotland and conducted the preliminary auditions for members of the orchestra.

A brilliant dramatic soprano who has broadcast on many occasions, Josephine Wray. She has sung in several roles at Covent Garden

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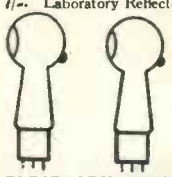

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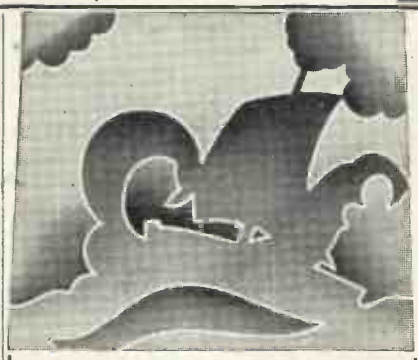

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By Jay Coote

AUSTRIA

THE laying of special landlines between Innsbrück and the Swiss and Bavarian frontiers has now been completed and the Vienna station is thus linked up with these broadcasting systems. Via Switzerland, Austria is also connected with Italy. These recent improvements in landline facilities will permit a wider interchange of European programmes and when desired will make the Rome and Milan entertainments available to British listeners.

◆ ◆ ◆

Work on the Bisamberg high-power transmitter destined to take over the Vienna broadcasts has already begun. It is hoped to complete the new station by Christmas, 1932.

BELGIUM

Experiments are being carried out on the coast with a view to the equipment of the Ostend and Zeebrugge lifeboats with wireless apparatus to enable them to keep in touch with their home ports when giving assistance to ships in distress. Recent tests demonstrated that transmissions made by these boats at sea were easily picked up by the Wandelaer lightship and the port of Ostend within a radius of twenty-five miles.

CANADA

CKWO, Windsor (Ontario), a 5-kilowatt station working on 540 kilocycles (555.5 metres), has been brought into daily operation by linking it up with the Columbia broadcasting system of New York.

CZECHOSLOVAKIA

From May 1 the Prague station for its early-morning transmissions has been using the crowing of a cockerel as an interval signal. Several competitors for this great honour were tested and the call of the winning bird was registered on a gramophone record.

EGYPT

The Khedivial Government has granted a concession to a broadcasting company, authorising it to erect and operate a radio-telephony transmitter at Abu Zabal. It is proposed to relay transmissions from some of the more important foreign stations and to rebroadcast them for the benefit of Egyptian subscribers.

◆ ◆ ◆

At Port Said, the Radio Club of the Isthmus of Suez has now installed a 500-watt transmitter working on 285 metres. Broadcasts are carried out every Monday, Thursday, and Saturday from 10 to 11 a.m., and again from 4 to 6 p.m. B.S.T. On Sundays the station only transmits in the morning hours. The call given out is "Allo! Ici Radio Port Said experimental," but announcements of items are made in the several languages, including English.

FRANCE

During the recent general elections a number of Paris listeners were greatly puzzled by a wireless mystery transmission picked up on about 308 metres. At various intervals it was announced as "Les Ondes Rouges" (The Red Waves). Investigations proved that the broadcasts emanated from a pirate station operated by members of the Communist Party.

◆ ◆ ◆

Radio Vitus (Paris) has organised a radio service for unemployed persons seeking situations or work. A charge of three francs per line is made for such advertisements broadcast and replies from employers may be addressed to the studio. Trade advertisements, however, are charged higher rates.

Grenoble PTT, which moved up to 569 metres following the opening of the new Poste Parisien (Paris), has proved a disappointment to its local listeners and temporary alterations to the plant have been undertaken by the station engineers. According to a report from the French capital, the State may decide to erect a 60-kilowatt station in the neighbourhood of that city. Until Poste Parisien came into being Grenoble had only been promised a 20-kilowatt transmitter in a more or less distant future.

◆ ◆ ◆

Toulouse PTT now possesses a woman announcer (Madame Phalibbot) on its staff. Apart from her usual studio duties, she will be responsible for running commentaries on local events.

◆ ◆ ◆

Many French wireless associations have lodged protests with the authorities in regard to the medical lectures broadcast by some stations during the luncheon hour. In their opinion the subjects chosen are not likely to whet the listener's appetite!

FRENCH INDO-CHINA

The Saigon station has been compelled to appeal to the French Press for financial assistance, as the Governor-General of Indo-China has declared his inability to continue the annual subsidy granted to defray the expenses of a daily programme. Failing pecuniary help Saigon will be forced to suspend its concert transmissions.

GERMANY

With the closing down of the Cologne, Munster, and Aachen stations and the consequent release of the 227.4-metre channel, the Reichsfunk has decided to utilise this wavelength for the Hamburg relays (Bremen, Flensburg, and Kiel). The step was made necessary owing to

(*Continued on page* 686)

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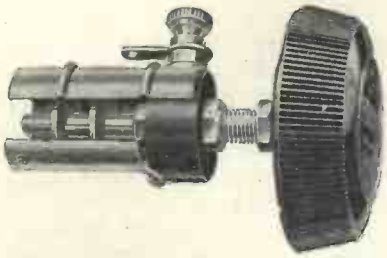

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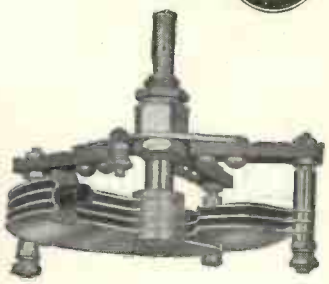

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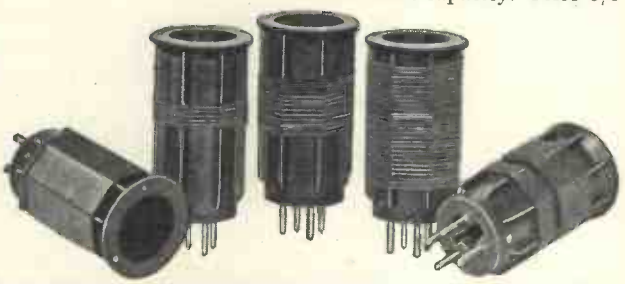

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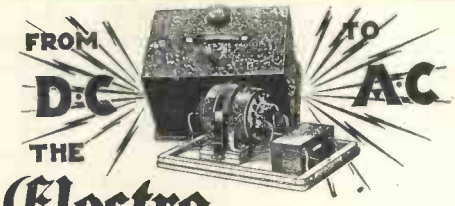

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You will get prompt replies by mentioning "Wireless Magazine"

ON THE CREST OF THE WAVES—

Continued from page 684

the fact that Germany is compelled to give up wavelengths loaned to her by other countries and now claimed by them. The channels in question are 283.6 metres, used by the Berlin relays and required by Portugal; 269.8 metres (Bremen), borrowed from Greece; and 232.2 metres (Kiel), allotted originally to Jugoslavia.

◆ ◆ ◆

According to recent statistics collected by the Reichsfunk in Germany, one out of every four families throughout the country is the possessor of a wireless licence; of these families 47.6 per cent. belong to the working classes.

◆ ◆ ◆

Unfavourable weather conditions have considerably delayed the building of the new Munich high-power station. It is now hoped to get it ready for testing with a provisional aerial system by the end of June. It is hardly likely that the transmitter will be brought into daily use before the end of August.

◆ ◆ ◆

Every Tuesday, at 11 p.m. B.S.T., the Zeesen short-wave station broadcasts details of its programmes for the coming week. This feature has become very popular with foreign listeners, who could not possibly receive the printed programmes in time.

◆ ◆ ◆

Following the example set by the B.B.C., the Breslau studio has attempted on various occasions to broadcast the song of the nightingale from one of the city parks. These transmissions are usually carried out on Fridays at about 10.30 p.m. B.S.T.

GRAND DUCHY OF LUXEMBURG

Notwithstanding contradictory rumours, it is definitely stated that the Junglinster transmitter now nearing completion will be able to radiate 200 kilowatts (aerial), although possibly its full power may not be used at the outset. Full details of the proposed programmes are not available, but it is expected that the station will start up daily at 7 a.m. with a review of the international press in three languages, namely, French, German, and English. The period between midday and 2.30 p.m. will be devoted to a concert by the station orchestra; news will be again transmitted at 5 p.m., with intervals of gramophone records. From 8 to 11 p.m. the studio will provide musical entertainments or will relay dramatic performances from French and German theatres, and from 11 p.m. until midnight listeners may expect a daily broadcast of dance music by well-known Continental bands. For its international publicity transmissions Radio Luxembourg has already engaged the services of a woman announcer who is fluent in five European languages.

GREAT BRITAIN

A number of marine wireless-telegraphy stations on the coasts of the British Isles are to be equipped with telephony transmitters with a view to establishing a commercial service with ships in home waters. Messages transmitted by telephone from ships to these stations will be reforwarded by telegram to their addressees on land. Experimental installations already in use at Wick, Fishguard, and at the Humber coastal stations have proved of considerable assistance, as fishing vessels by this means can keep in close touch with their owners and can receive through these channels weather reports, information concerning market prices, and last-minute instructions for landing their catches.

HUNGARY

Arrangements have been concluded between the Columbia Broadcasting Company of America and the Budapest studio for a regular interchange of wireless programmes. American engineers now visiting the Hungarian capital are also studying the possibility of installing plant for television transmission of plays and films in three or four languages.

ICELAND

In view of the fact that the Reykjavik station only possesses some 7,000 licensed listeners, its income will not permit any payment to be made to State officials contributing to the programmes and broadcasts are limited to a period of three to four hours daily. Steps are being taken to lay a special cable between Reykjavik and Copenhagen in order that the islanders may be given at regular intervals a relay of the Danish wireless entertainments.

IRISH FREE STATE

It is reported that when the new Moydrum (Athlone) high-power transmitter is brought into operation concerts sponsored by American firms may be broadcast.

ITALY

The new transmitter now in course of erection at Milan will be the most powerful of the Italian group of stations, namely, 75 kilowatts. For the sake, however, of economy, there is a possibility that at the start its full power may not be used. The date of its official opening has been fixed for October 28, which coincides with the tenth anniversary of the Fascist organisation.

LATVIA

As the recent test transmissions by the Riga station on 198 metres have proved satisfactory, it has been decided to increase the power of the broadcasting plant to 50 kilowatts. In the meantime, transmissions will continue to be carried out on 525.4 metres. Two relay transmitters to work on a common wavelength are being built at Goldingen and Madona. They will take the capital programmes.

NORWAY

A woman announcer has been specially engaged by the Oslo station for the daily broadcast of the evening news bulletin.

RUSSIA

The city of Leningrad is being extensively equipped with loud-speakers for the broadcast of radio programmes. They are freely distributed to factories, working mens' clubs, and schools, and a number of them have been installed at street corners and in public squares. Within the next few months the Soviet authorities hope to place 30,000 loud-speakers throughout the country.

SPAIN

As its transmissions are very popular with French listeners "over the border," the San Sebastian studio announces the items of its programmes in both Spanish and French.

◆ ◆ ◆

The International Telegraphy and Telephony Conference will open at Madrid on September 3.

◆ ◆ ◆

The Transradio Espanola, through its short-wave transmitter EAQ at Aranjuez (Madrid), broadcasts a news bulletin daily on 30.4 metres, in

(*Continued on page* 688)

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FULL-SIZE BLUEPRINT

CRYSTAL SET

6d. post free

1931 Crystal Set	AW308

ONE-VALVE SETS

1s. each, post free

Short-wave One-valver (6d.)	AW327
Easy-to-Build One	AW304
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TWO-VALVE SETS

All these 1s. each, post free

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
Economy A.C. Two (D, Trans)	WM286
★Screen-grid Two (SG, Trans)	**WM289**
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, Pen)	AW309
Two Star 2 (D, Pen)	AW315
The 25/- Two (D, Trans)	AW330
Ten Station Two (D, Trans)	AW336
Hiker's Two (D, Trans)	AW345
Inexpensive A.C. Two (D, Trans)	AW346

THREE-VALVE SETS

All these 1s. each, post free

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
Meridian Short-waver (D, RC, Trans)	WM255
Five-Advantage Three (D, RC, Trans)	WM257
Everybody's Radiogram (SG, D, Trans)	WM258
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
Multi-Mag Three (D, 2 Trans)	WM288
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
World Wide Short-wave Three (D, RC, Trans)	AW332
New Favourite Three (D, RC, Trans)	AW334
Home Lover's All-electric Three (SG, D, Trans)	AW335
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Home Lover's Battery Three (SG, D, Pen)	AW341

FOUR-VALVE SETS

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Five-point Four (SG, D, RC, Trans)	WM216
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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, RC, Trans)	WM276
A.C. Quadradyne (2 SG, D, Pen)	WM279
★Ideal A.C. Home Super (Super-het)	**WM290**
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 Radio Gramophone	AW310
Four-star Four (SG, D, RC, Trans)	AW318
The 50/- Four (SG, D, RC, Trans)	AW331

FIVE-VALVE SETS

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Regional D.C.5 (SG, D, LF, Push-pull)	WM252
Ideal Home Super (Super-het)	WM280
Easytune 60 (Super-het)	WM284
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
Simple Super (Super-het)	AW340

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

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/-
Town and Country Four (SG, D, RC, Trans)	WM282	1/6
★Everybody's Portable (Super-het)	WM291	1/6
Sunshine Three (SG : HF, SG : D, Trans)	AW235	1/-

AMPLIFIERS

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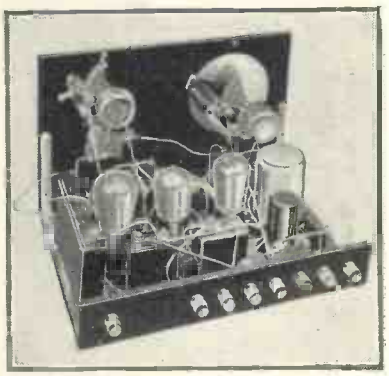
Radio-record Amplifier (DC Mains)	WM183
Selecto Amplifier (HF Unit)	WM210
D.C. Fader	WM242
Quality Amplifier (D.C.) 1s. 6d.	WM264
A-P-A (Public Address)	WM275
A-P-A Radio Unit (SG, D)	WM281
Economy Gramophone Amplifier	WM277
A.C. Push-pull Amplifier	AW291
Add-on H.F. Screened-grid Unit	AW296
Universal Push-pull Amplifier	AW300
"A.W." Record Player (LF, Push-pull)	AW319

A blueprint of any one set described in the current issue of the "Wireless Magazine" can be obtained for half-price up to the date indicated on the coupon (which is always to be found on the last page) if this is sent when application is made. These blueprints are marked with an asterisk (★) in the above list and are printed in bold type. An extension of time will be made in the case of overseas readers.



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Plug-in Adaptor	WM267	1/-
Super-het Adaptor	WM268	1/-
A Simple Mains Unit	WM283	1/-
Short-wave Director (wavemeter)	WM285	6d.
Voltage Regulator	WM287	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/-
"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/-
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
"A.W." Short-wave Adaptor	AW339	1/-

Each blueprint shows the position of each component and every wire and makes construction a simple matter. Copies of "Wireless Magazine" and of "Amateur Wireless" containing descriptions of 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.

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Alterations to blueprints or special designs cannot be undertaken; nor can readers' sets or components be tested.

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ON THE CREST OF THE WAVES

Continued from page 686

both Spanish and English, between 12.30 a.m. and 2 a.m. G.M.T. This transmission is destined to the United States and to listeners dwelling in the South American republics. Every Saturday, between 6 p.m. and 8 p.m. G.M.T. a special concert is transmitted for the benefit of European listeners.

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Following a protest made by licence holders to the effect that they were tired of hearing gramophone records, the Swedish authorities decreed that records may be used by the studios for entertainment purposes, but not for more than six hours per week.

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