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Wireless Magazine

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JULY
1933

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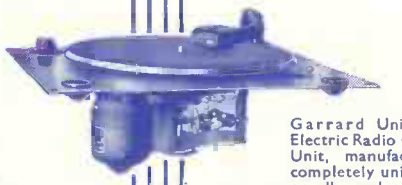

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Many Notable Developments

YOU will find our pages this month both up-to-the minute and vitally interesting. They represent the newest and best in radio. 1933 is, in my opinion, the most wonderful year since broadcasting started, and this month's "Wireless Magazine" gives you an insight into some of the most notable developments made known this year.

Take, for example, the Tyers Iron-core Three. You will remember that Paul D. Tyers designed for us last year the Multi-mag Three and used in it what was then a new type of coil. The set attracted attention, but far less than was its due. It was a history maker! This month Paul D. Tyers is again contributing a battery three; again it is outstanding; again it has an entirely new coil; again the results are remarkably good, as you will see from the special test report accompanying the constructional article.

Then look at the All-metal Four—the very best and newest in A.C. design. It uses the new metal valves; is built up on a metal chassis; it looks out of the ordinary. It is. And don't be misled into thinking that because there is underneath wiring, the set is difficult to build. You will have no constructional troubles at all if you use our full-size blueprint. You can get that blueprint at half-price. The set possesses great sensitivity. The two screen-grid stages see to that. And the iron-cored tuning coils give the selectivity.

There you have the two sets of the month, but if you have D.C. mains you will not miss the D.C. Calibrator—a four-valve radiogram with a somewhat unusual valve arrangement, giving tremendous loud-speaker volume—an output of four watts. You can build this set in confidence that nothing that will be produced in the months to come will put it out of date.

Unfortunately all the new valves of which we have information are not available for public use, and it is an extremely doubtful service to the reader to show him how to build a set based on new valves which he cannot obtain, but as and when these new valves become available, special "Wireless Magazine" designs will incorporate them, and you will find that, as always, we shall keep you in the very forefront of progress.

In the meantime we keep you informed as to what the new valves are and what they can do. Special articles in this issue cover the story of the Catkin valve, the D.D.Pen. and the hexode, the double-diode-triode. There is also an article on the return of the diode.

Percy Harris starts this month a series of articles designed to show readers quite clearly and in an elementary way the possibilities of photo-electric cells. The amateur constructor will readily see that the photo-electric cell offers him a new avenue of construction and experiment; in later articles Percy Harris will explain how simple and inexpensive gear can be rigged up.

For one other feature I must spare a word. Kenneth Ullyett in his article "Motor Car-radio" gets right down to the subject in his first words "Why is it that everybody hasn't a wireless set fitted to his car?" Because some people think that radio reception en route might tend in some way to increase driving risk, and because up to now the only sets available for fitting into cars have been American-built, whilst the British amateur-built designs for car use have left much to be desired.

Kenneth Ullyett shows you that our own manufacturers have realised this state of affairs, and he gives the result of testing one or two standard receivers in cars. You will find Kenneth Ullyett's article suggestive and helpful.

B. E. J.

Contents

A SPECIAL METAL-VALVE SET—See page 564

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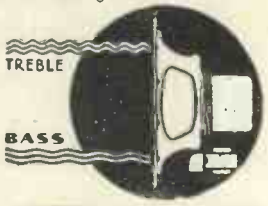

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VALVES TO USE IN YOUR SET

2-volt Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Cossor	210RC	50,000	40	.8	.5
Osram	H210	50,000	35	0.7	1.0
Six-Sixty	210RC	45,400	50	1.1	1.0
Lissen	H2	45,000	50	1.1	2.0
Mazda	H2	45,000	50	1.1	.6
Mullard	PM1A	41,600	50	1.2	.75
Marconi	H2	35,000	35	1.0	1.0
Osram	H2	35,000	35	1.0	1.0
Six-Sixty	210HF	25,000	19	.75	1.0
Osram	HL210	23,000	20	.87	1.5
Mullard	PM1HF	22,500	18	.8	1.0
Cossor	210HL	22,000	24	1.1	1.75
Lissen	HL2	22,000	35	1.6	3.0
Mazda	HL2	21,000	32	1.5	1.5
Marconi	HL210	20,000	24	1.2	2.0
Mullard	PM1HL	20,000	28	1.4	1.2
Six-Sixty	210HL	20,000	18	1.4	1.0
Mazda	HL210	18,500	26	1.4	2.0
Marconi	HL2	18,000	27	1.5	1.0
Osram	HL2	18,000	27	1.5	1.0
Micromesh	HLB1	16,000	24	1.5	2.0
Cossor	210HF	15,800	24	1.5	2.2
Cossor	210Det	13,000	15	1.15	2.5
Six-Sixty	210LF	12,500	10.6	.85	2.5
Mullard	PM1LF	12,000	11	.9	2.6
Osram	L210	12,000	11	.92	2.0
Marconi	L210	12,000	11	.92	2.0
Mullard	PM2DX	12,000	18	1.5	2.0
Six-Sixty	210D	10,000	18	1.6	2.0
Cossor	210LF	10,000	14	1.4	3.0
Lissen	L2	10,000	20	2.0	3.0
Mazda	L2	10,000	19	1.9	3.0
Marconi	P215	5,000	7	1.4	6.0
Osram	P215	5,000	7	1.4	6.0
Six-Sixty	220P	4,800	7.2	1.5	5.0
Mazda	P215	4,400	7.5	1.7	—
Mullard	PM2	4,400	7.5	1.7	5.0
Lissen	P220	4,000	7	1.75	5.0
Cossor	220P	4,000	9	2.25	6.0
Cossor	215P	4,000	9	2.25	5.0
Cossor	220Pa	4,000	16	4.0	5.5
Micromesh	PB1	4,000	16	4.0	5.0
Marconi	LP2	3,900	15	3.85	6.0
Osram	LP2	3,900	15	3.85	6.0
Mazda	P220	3,700	12.5	3.4	5.0
Six-Sixty	220PA	3,700	13	3.5	6.0
Mullard	PM2A	3,600	12.5	3.5	6.5
Lissen	LP2	3,500	12.0	3.5	9.0
Marconi	P2	2,150	7.5	3.5	12.0
Osram	P2	2,150	7.5	3.5	10.0
Six-Sixty	220SP	2,060	7	3.4	13.5
Mullard	PM202	2,000	7	3.5	14.0
Mullard	PM252	1,900	7	3.7	14.0
Six-Sixty	240SP	1,900	6.6	3.5	14.0
Mazda	P220A	1,850	6.5	3.5	11.0
Lissen	P220A	1,700	6	3.5	12.0
Cossor	230XP	1,500	4.5	3.0	14.0
Lissen	PX240	1,500	4.5	3.0	12.0
Cossor	230XP	1,500	4.5	3.0	15.0

2-volt Double-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Marconi	DG2	3,750	4.5	1.2	—
Osram	DG2	3,750	4.5	1.2	—
Cossor	210DG	3,400	2.7	.8	—
Mullard	PM1DG	—	—	.8	—
Six-Sixty	210DG	—	—	.8	—

2-volt Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Lissen	SG215	900,000	1,000	1.1	—
Mazda	S215A	727,000	800	1.1	.8
Mazda	SG215	455,000	500	1.1	1.6
Six-Sixty	218SG	357,000	500	1.4	—
Mazda	S215B	334,000	700	2.1	1.0
Micromesh	5B1	333,000	500	1.5	.5
Mullard	PM12A	330,000	500	1.5	—
Cossor	215SG	300,000	330	1.1	1.25
Osram	S215	300,000	180	0.6	—
Cossor	220SG	200,000	320	1.6	1.5
Osram	S22	200,000	350	1.75	3.0
Marconi	S22	200,000	350	1.75	2.5
Marconi	S21	200,000	220	1.1	3.0
Osram	S21	200,000	220	1.1	3.0
Six-Sixty	215SG	190,000	200	1.05	2.0
Mullard	PM12	180,000	200	1.1	—

2-volt Variable-mu Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Lissen	SG2V	350,000	600	1.7	—
Mazda	S215VM	350,000	700	2.0	—
Cossor	220VSG	110,000	—	1.6	—
Osram	VS2	—	—	1.25	—
Marconi	VS2	—	—	1.25	—
Mullard	PM12V	—	—	.75	—
Six-Sixty	215VSG	—	—	—	—
Six-Sixty	SS218VS6	—	—	1.4	—

2-volt Pentode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Lissen	PT225	71,000	100	1.4	7.0
Six-Sixty	230PP	64,000	80	1.25	10.0
Lissen	PT240	28,000	64	2.3	12.5
Cossor	220PT	—	—	2.5	—
Cossor	220HPT	—	—	2.5	—
Cossor	230-T	—	—	2.0	10.0
Cossor	230HPT	—	—	1.8	8.5
Lissen	PT2A	—	—	2.5	14.0
Marconi	PT2	—	—	2.5	5.0
Mazda	Pen.220A	—	—	2.5	10.0
Mazda	Pen.220	—	—	2.5	5.0
Micromesh	Pen B1	—	—	2.5	4.5
Mullard	PM22A	—	—	2.5	4.0
Mullard	PM22	—	—	1.3	12.0
Osram	PT2	—	—	2.5	5.0
Six-Sixty	220Pen.	—	—	2.5	—

2-volt Class-B Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Mazda	LD220	—	—	—	—
Mullard	PM2B	—	—	—	—
Cossor	210B	—	—	—	—

4-volt Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Marconi	H410	60,000	40	.66	.5
Osram	H410	60,000	40	.66	.35
Lissen	H410	60,000	40	.66	1.0
Six-Sixty	4075RC	58,000	37	.64	.55
Mullard	PM3A	55,000	38	.66	.3
Cossor	410RC	50,000	40	.8	.6
Lissen	HLD410	21,000	25	1.2	2.5
Marconi	HL410	20,800	25	1.2	1.25
Osram	HL410	20,800	25	1.2	1.25
Cossor	410HF	20,000	22	1.1	1.0
Mullard	PM3	13,000	14	1.05	2.0
Six-Sixty	4075HF	12,500	13.5	1.1	3.0
Cossor	410LF	10,000	17	1.7	2.5
Lissen	L410	8,500	15	1.8	3.5
Marconi	L410	8,500	15	1.77	3.0
Osram	L410	8,500	15	1.77	3.0
Mullard	PM4DX	7,500	15	2.0	2.0
Six-Sixty	410D	7,250	14.5	2.0	4.0
Marconi	P410	5,000	7.5	1.5	6.0
Osram	P410	5,000	7.5	1.5	6.0
Six-Sixty	410P	4,100	7.8	1.9	7.5
Cossor	410P	4,000	8	2.0	8.0
Mullard	PM4	4,000	8	2.0	7.5
Lissen	P410	4,000	8	2.0	7.0
Marconi	P425	2,300	4.5	1.95	14.0
Mullard	PM254	2,150	6.5	3.0	9.0
Six-Sixty	420SP	2,150	6.5	3.0	10.0
Marconi	P415	2,080	5.0	2.4	14.0
Osram	P415	2,080	5	2.4	14.0
Cossor	425XP	2,000	7	3.5	13.0
Lissen	P425	1,500	4.5	3.0	14.0
Cossor	415XP	1,500	4.5	3.0	15.0
Osram	PX25	1,265	9.5	7.5	—
Cossor	4XP	1,200	4.8	4.0	18.0

4-volt Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Lissen	SG410	950,000	120	.9	—
Cossor	410SG	800,000	800	1.0	—
Mullard	PM14	230,000	200	.87	—
Six-Sixty	4075SG	220,000	190	.87	3.0
Marconi	S410	200,000	180	.9	3.5
Osram	S410	200,000	200	1.0	3.5

4-volt Pentode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Marconi	PT425	50,000	100	2.0	8.0
Osram	PT425	50,000	100	2.0	8.0
Marconi	PT4	42,000	120	2.85	—
Osram	PT4	42,000	120	2.85	—
Lissen	PT425	28,000	70	2.5	15.0
Six-Sixty	415PP	27,000	60	2.2	15.0
Osram	PT25	25,000	100	4.0	—
Cossor	410PT	—	—	2.5	12.0
Mazda	Pen.425	—	—	2.4	14.0
Mullard	PM24	—	—	1.75	16.0
Six-Sixty	4Pen.M	—	—	3.0	—
Six-Sixty	4Pen.SP	—	—	2.0	—

6-volt Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Lissen	H610	60,000	40	.66	1.0
Marconi	H610	60,000	40	.66	.35
Osram	H610	60,000	40	.66	.35
Six-Sixty	6075RC	58,000	42	.7	.5
Cossor	610RC	50,000	40	.8	.75
Mullard	PM5B	49,000	40	.85	.5
Marconi	HL610	30,000	30	1.0	1.0
Osram	HL610	30,000	30	1.0	1.0
Lissen	HLD610	21,000	25	1.2	2.5
Cossor	610HF	20,000	20	1.0	1.75
Mullard	PM5D	20,000	26	1.3	1.0
Six-Sixty	607HF	15,200	17	1.1	2.0
Mullard	PM5X	14,700	17.5	1.2	1.6
Six-Sixty	610D	9,250	18.5	2.0	2.0
Mullard	PM6D	9,000	18	2.0	2.0
Lissen	L610	8,000	16	2.0	2.0
Cossor	610LF	7,500	15	2.0	3.4
Marconi	L610	7,500	15	2.0	3.0
Osram	L610	7,500	15	2.0	3.0
Mullard	PM6	3,550	8	2.25	7.0
Cossor	610P	3,500	8	2.28	8.0
Marconi	P610	3,500	8	2.28	6.0
Osram	P610	3,500	8	2.28	6.0
Six-Sixty	610P	3,400	7.8	2.3	8.0
Lissen	P610	3,200	8	2.5	6.0
Cossor	625P	2,500	7	2.8	13.0
Lissen	P625	2,500	7.5	3.0	8.0
Marconi	P625	2,400	6	2.5	11.0
Osram	P625	2,400	6	2.5	11.0
Cossor	610XP	2,000	5	2.5	15.0
Mullard	PM256	1,850	6	3.25	8.0
Six-Sixty	625SP	1,780	5.8	3.25	8.0
Marconi	P625A	1,600	3.7	2.3	20.0
Osram	P625A	1,600	3.7	2.3	16.0
Lissen	P625A	1,500	4.5	3.0	12.0
Six-Sixty	625SPA	1,500	3.9	2.6	20.0
Mullard	PM256A	1,400	3.6	2.6	20.0
Mazda	P650	1,300	3.5	2.7	20.0

6-volt Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Six-Sixty	SS6075SG	210,000	190	.9	—
Cossor	610SG	200,000	200	1.0	—
Mullard	PM16	200,000	200	1.0	—
Osram	S610	200,000	210	1.05	4.0
Marconi	S610	200,000	210	1.05	4.0

6-volt Pentode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Marconi	P1625	43,000	80	1.85	10.0
Osram	PT625	43,000	80	1.85	10.0
Six-Sixty	SS61PP	28,500	54	1.9	15.0
Lissen	P1625	24,000	60	2.5	14.0
Cossor	615P	—	—	2.0	17.0
Mullard	PM26	—	—	2.0	15.0

A.C. Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Six-Sixty	4DX.AC	36,000	7.5	2.1	3.0
Mullard	904V	34,000	75	2.2	1.8
Cossor	41MRC	19,500	50	2.6	2.7
Cossor	41MH	18,000	72	4.0	2.0
Cossor	41MHF	14,500	41	2.8	3.0
Six-Sixty	4GP.AC	12,000	36	3.0	4.0
Mullard	354V	12,000	36	3.0	4.0
Lissen	AC/HL	11,700	35	3.0	6.0
Mazda	AC/HL	11,700	35	3.0	3.0
Cossor	41MHL	11,500	52	4.5	4.0
Mazda	AC2HL	11,500	75	6.5	3.5
Marconi	MH4	11,100	40	3.6	4.75
Osram	MH4	11,100	40	3.6	4.75
Micromesh	HLA1	10,000	80	8.0	6.0
Six-Sixty	4H.AC	9,500	25	2.65	—
Marconi	MHL4	8,000	20	2.5	10.0
Osram	MHL4	8,000	20	2.5	10.0
Cossor	41MLF	7,900	15	1.9	9.0
Six-Sixty	4L.AC	5,000	16.0	2.0	8.0
Mullard	164V	4,850	16	3.3	8.5
Six-Sixty	SS4PAC	3,170	12	3.8	11.0
Mullard	104V	3,000	12	4.0	17.0
Osram	ML4	2,860	12	4.2	25.0
Marconi	ML4	2,860	12	4.2	25.0
Mullard	AC104	2,850	10	3.5	11.0
Lissen	AC/P	2,800	10	3.6	20.0
Mazda	AC/P	2,650	10	3.75	13.0
Cossor	41MP	2,500	18.7	7.5	24.0
Mullard	AC064	2,000	6	3.0	20.0
Cossor	41MXP	1,500	11.2	7.5	40.0
Mazda	PP5/400	1,500	9.0	6.0	26.0
Mazda	AC/P1	1,450	5.4	3.7	20.0
Six-Sixty	HV4/1	1,450	6.3	3.0	18.0
Marconi	PX25	1,265	9.5	7.5	—
Osram	PX25	1,265	9.5	7.5	—

Continued on page 542

The TYERS IRON-CORE THREE

Patents pending 31376/32, 31377/32, 15746/33, 15747/33
Pending Registration Trade Mark 542011

was designed around the new

WEARITE NUCLEON IRON CORE COILS

MANY months of intensive research work has culminated in this up-to-the-minute Receiver. The designer—a leading authority on coil design—in collaboration with Wearite perfected these amazing *new process* iron core coils—the "Wearite Nucleon." So outstanding was their performance that he has built this set around them, with the result that selectivity and range have taken on a new meaning. In addition the task of matching—hitherto the bugbear of all high-efficiency receivers—is made child's play. Build this set for "super" results. Remember no other coils will do.

BETTER SELECTIVITY — WIDER WAVE-BAND RANGE — PERFECT MATCHING

The Essential Coils for the "Tyers Iron-Core Three."

WEARITE NUCLEON Senior.	Type B.P.1	**12/6**
WEARITE NUCLEON Senior.	Type B.P.2	**12/6**
WEARITE NUCLEON Senior.	Type T.G.	**12/6**

Special Nucleon Wearite Iron Core H. F. Chokes are available for use in this Receiver. They are specially screened complete with pigtail. Leaflets covering these new chokes and also the new coils are now available.

WEARITE
Reg. Trade Mark

WRIGHT & WEAIRE LTD., 740 HIGH RD., TOTTENHAM, N.17. 'Phone : Tottenham 3847/8 9

3038

VALVES TO USE IN YOUR SET—Continued from page 540

A.C. Three-electrode Valves—Continued

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mullard	O54V	1,250	5	4.0	30.0
Mullard	AC044	1,150	4	3.5	30.0
Micromesh	PA1	1,050	12.6	12.0	35.0
Mazda	PP3/250	1,000	6.5	6.5	40.0
Marconi	PX4	830	5	6.0	35.0
Osram	PX4	830	5	6.0	35.0

All-metal A.C. Valves

Three-electrode type

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Marconi	MH4	11,000	40	3.6	—
Osram	MH4	11,000	40	3.6	—

A.C. Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Marconi	MS4B	350,000	1,120	3.2	—
Osram	MS4B	350,000	1,120	3.2	—

A.C. Variable-mu Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Marconi	VMS4	—	—	2.6	—
Osram	VMS4	—	—	2.6	—

A.C. Pentode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Marconi	MPT4	40,000	120	3.0	—
Osram	MPT4	40,000	120	3.0	—

A.C. Double-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Sixty-Sixty	4DGAC	70,000	7.0	.1	—
Cossor	41MDG	40,000	10	.25	—

A.C. Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Six-Sixty	4SGAC	1,000,000	1,000	1.0	1.5
Mullard	S4V	909,000	1,000	1.1	2.5
Mazda	ACS2	600,000	3,000	5.0	4.0
Cossor	MSG/HA	500,000	1,000	2.0	2.1
Marconi	MS4	500,000	550	1.1	2.5
Micromesh	SGA1	500,000	2,200	4.5	5.8
Osram	MS4	500,000	550	1.1	2.5
Six-Sixty	4XSGAC	485,000	1,600	3.3	—
Mullard	S4VA	—	1,000	2.0	4.5
Cossor	41MSG	400,000	1,000	2.5	3.0
Mazda	AC/SG	400,000	1,700	3.0	4.0
Marconi	MS4B	350,000	1,120	3.2	3.5
Osram	MS4B	350,000	1,120	3.2	3.5
Lissen	AC/SG	340,000	1,100	4.0	8.0
Six-Sixty	4YSGAC	300,000	900	3.0	—
Mullard	S4VB	257,000	750	2.5	9.5
Cossor	MSGLA	200,000	750	3.75	5.2
Six-Sixty	4YSGAC	—	900	3.5	—

A.C. Variable-mu Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Lissen	AC/SGV	300,000	—	—	—
Cossor	MVSG	200,000	—	2.5	7.8
Marconi	VMS4	—	—	2.4	—
Mazda	AC/SG.VM	—	—	3.0	—
Mazda	AC/S1.VM	—	—	14.0	—
Micromesh	VSGA1	—	—	6.5	5.5
Mullard	MM4V	—	—	3.0	10.0
Mullard	VM4V	—	—	1.2	8.2
Osram	VMS4	—	—	2.4	—
Six-Sixty	4MMAC	—	—	3.0	—
Six-Sixty	4VMAC	—	—	1.1	—
Osram	VMS4B	—	—	3.0	8.0

A.C. Pentode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Marconi	PT4	42,000	120	2.85	32.0
Osram	PT4	42,000	120	2.85	32.0
Marconi	MPT4	33,000	100	3.0	32.0
Osram	MPT4	33,000	100	3.0	32.0
Cossor	MS.Pen.A	—	—	4.0	9.0
Cossor	MP.Pen.	—	—	4.0	30.0
Mazda	AC/Pen.	—	—	2.5	30.0
Micromesh	7A2	—	—	3.1	40.0
Six-Sixty	SS4Pen.AC	—	—	3.0	—
Mullard	Pen.4V	—	—	3.0	—
Lissen	AC/PT	—	—	2.6	30.0
Cossor	PT41	—	—	3.0	30.0
Cossor	PT41B	—	—	2.25	30.0
Micromesh	PenA1	—	—	3.0	30.0
Mullard	PM24A	—	—	2.0	20.0
Mullard	PM24B	—	—	2.1	30.0
Mullard	PM24C	—	—	3.0	30.0
Mullard	PM24M	—	—	3.0	30.0

D.C. Three-electrode Valves

Filament Current .1 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mazda	DC3HL	11,700	35	3.0	2.5
Mazda	DC2P	2,650	10	3.75	15.0

Filament Current .25 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Marconi	DH	10,800	40	3.7	6.0
Osram	DH	10,800	40	3.7	6.0
Marconi	DL	2,660	12	4.5	25.0
Osram	DL	2,660	12	4.5	25.0

Filament Current .5 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mazda	DC/HL	13,000	35	2.7	3.0
Mazda	DC/P	2,220	10	4.5	15.0

D.C. Screen-grid Valves

Filament Current .1 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mazda	DC2SG	—	1,200	2.2	4.5

Filament Current .2 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mazda	DC2/SGVM	—	1,200	2.2	4.0

Filament Current .25 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Osram	DS	550,000	500	1.1	2.5
Marconi	DS	540,000	500	1.1	2.5
Osram	DSB	350,000	1,120	3.2	3.5
Marconi	DSB	350,000	1,120	3.2	3.5
Marconi	VDS	—	—	2.4	—
Osram	VDS	—	—	2.4	—

Filament Current .5 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mazda	DC/SG	—	1,000	2.75	4.0

D.C. Pentode Valves

Filament Current .2 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mazda	DC/2Pen.	—	—	2.5	3.0

Filament Current .25 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Marconi	DPT	30,000	90	3.0	40.0
Osram	DPT	30,000	90	3.0	40.0

Filament Current .5 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Mazda	DC/Pen.	—	—	3.5	3.0

SUPPLEMENTARY VALVE TABLE

2-volt Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 100 volts
Tungsram	R208	50,000	35	0.7	1.0
Triotron	WD2	25,000	25	1.0	1.0
Dario	Detector	25,000	25	1.0	1.0
Tungsram	H210	25,000	25	1.0	1.5
Tungsram	HR210	20,000	32	1.6	1.5
Dario..	Sup. H.F.	20,000	32	1.6	1.5
Tungsram	L210	16,000	16	1.0	2.0
Tungsram	LD210	14,000	18	1.25	1.8
Triotron	HD2	12,500	15	1.2	1.5
Triotron	SD2	11,000	20	1.8	2.5
Triotron	TD2	7,500	9	1.2	3.0
Tungsram	LG210	10,000	10	1.0	2.5
Tungsram	PD220	10,000	17	1.7	2.5
Dario	Un. Biv.	8,000	10	1.25	2.5
Dario..	Sup. Det.	7,500	15	2.0	3.0
Triotron	YD2	3,600	9	2.5	8.0
Triotron	ZD2	4,200	5	1.2	7.0
Triotron	E235	3,500	12.5	3.5	9.0
Tungsram	P215	3,500	5	1.5	8.0
Dario..	Sup.power	3,000	6	2.0	9.0
Triotron	UD2	2,800	5	1.8	8.0
Tungsram	LP220	2,600	7.8	3.0	6.0
Tungsram	SP230	2,500	5	2.0	15.0
Dario..	Hyp. Pwr.	2,400	7	3.0	12.0
Tungsram	E235	2,600	9	3.5	12.0
Triotron	SP2	2,000	3	1.5	12.0

2-volt Double-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 100 volts
Tungsram	DG210	5,000	5	1.0	1.0
Tungsram	DG210/0	5,000	10	2.0	1.5
Triotron	D210	—	—	1.0	—

2-volt Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 100 volts
Tungsram	S210	333,000	400	1.2	1.5
Triotron	S207	200,000	200	1.0	3.0
Dario..	SG	200,000	200	1.0	2.0

2-volt Variable-mu Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 100 volts
Tungsram	SV20	—	—	1.5	3.0
Triotron	S208	—	—	0.8	—

2-volt Pentode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 100 volts
Tungsram	PP200	150,000	300	2.5	6.0
Dario	Poly	40,000	60	1.5	12.5
Triotron	P215	37,500	60	1.5	8.0
Tungsram	PP230	33,000	50	1.5	10.0

6-volt Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Tungsram	HR607	15,000	30	2.0	1.5
Tungsram	LG607	8,250	16.5	2.0	3.0
Tungsram	P610	3,300	6.6	2.0	8.0
Tungsram	P615	3,300	10	3.0	8.0
Tungsram	SP614	2,300	6	2.6	12.0

6-volt Pentode Valve

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Tungsram	PP610	40,000	60	1.5	8.0

A.C. Three-electrode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Triotron	A440N	30,000	120	4.0	.5
Triotron	W415N	25,350	38	1.5	.5
Dario	Sup/HF.	20,000	40	2.0	3.0
Tungsram	AR495	17,000	85	5.0	3.5
Tungsram	AR4101	13,300	40	3.0	2.0
Triotron	A430N	7,000	24	3.5	6.0
Dario..	SuperDet.	7,500	24	3.2	6.0
Tungsram	AG495	6,250	24	4.0	5.0
Triotron	YN4	4,800	12	2.5	8.0
Dario	Sup. Pow.	3,000	9	3.0	14.0
Triotron	E430N	3,000	9	3.0	10.0
Tungsram	AP495	2,500	10	4.0	15.0
Triotron	K435/10	1,000	3.5	3.5	35.0
Triotron	—	1,000	3	3.0	65.0
Triotron	—	1,000	5	5.0	100.0

A.C. Double-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Tungsram	DG4100	5,000	5	1.0	3.0
Triotron	D410N	—	—	1.0	—

A.C. Screen-grid Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Tungsram	AS494	667,000	1,000	1.5	1.5
Dario	SG	600,000	700	1.1	1.5
Tungsram	AS495	428,000	1,500	3.5	1.0
Triotron	S412N	584,000	700	1.2	1.5
Triotron	S410N	400,000	400	1.0	4.0
Dario..	Super SG	300,000	900	3.0	3.0
Triotron	S430N	300,000	900	3.0	3.0
Tungsram	AS4100	180,000	250	1.5	3.5

A.C. Variable-mu Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Tungsram	AS4104	400,000	550	1.3	4.0
Dario	VMSG	300,000	300	1.0	6.0
Tungsram	AS4105	208,000	250	1.2	3.5
Triotron	S431N	—	—	3.0	—
Triotron	S415N	—	—	1.5	—

A.C. Pentode Valves

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Triotron	P440N	50,000	175	3.5	24.0
Dario..	Poly.	50,000	175	3.5	24.0
Tungsram	APP4120	33,000	100	3.0	32.0
Tungsram	APP4100	20,000	60	3.0	20.0
Triotron	P430	22,000	75	3.5	30.0
Triotron	P440	25,000	100	4.0	45.0

D.C. Three-electrode Valves

Filament Current .18 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Triotron	A2030N	14,500	38	2.6	4.0
Tungsram	R2018	13,300	40	3.0	2.0
Dario	Sup. Det.	11,000	38	3.5	6.0
Tungsram	G2018	7,000	25	3.5	4.0
Triotron	E2020N	3,000	6	2.0	10.0
Tungsram	P2018	2,800	7	2.5	20.0
Dario..	Sup. Pwr.	2,400	6	2.5	15.0

D.C. Screen-grid Valves

Filament Current .18 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Dario	SG	360,000	400	1.1	4.0
Tungsram	S2108	333,000	400	1.2	1.5
Triotron	S2010N	400,000	400	1.0	4.0
Triotron	S2030N	300,000	900	3.0	3.0

D.C. Variable-mu Valve

Filament Current .18 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Tungsram	SE2018	360,000	500	1.4	3.0
Triotron	S2012N	—	—	1.0	—

D.C. Pentode Valves

Filament Current .18 Ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Triotron	P2020N	40,000	80	2.0	15.0
Tungsram	PP2018	31,250	80	2.5	20.0
Dario..	D.C.Poly.	30,000	75	2.5	20.0

Universal A.C.-D.C. Valves

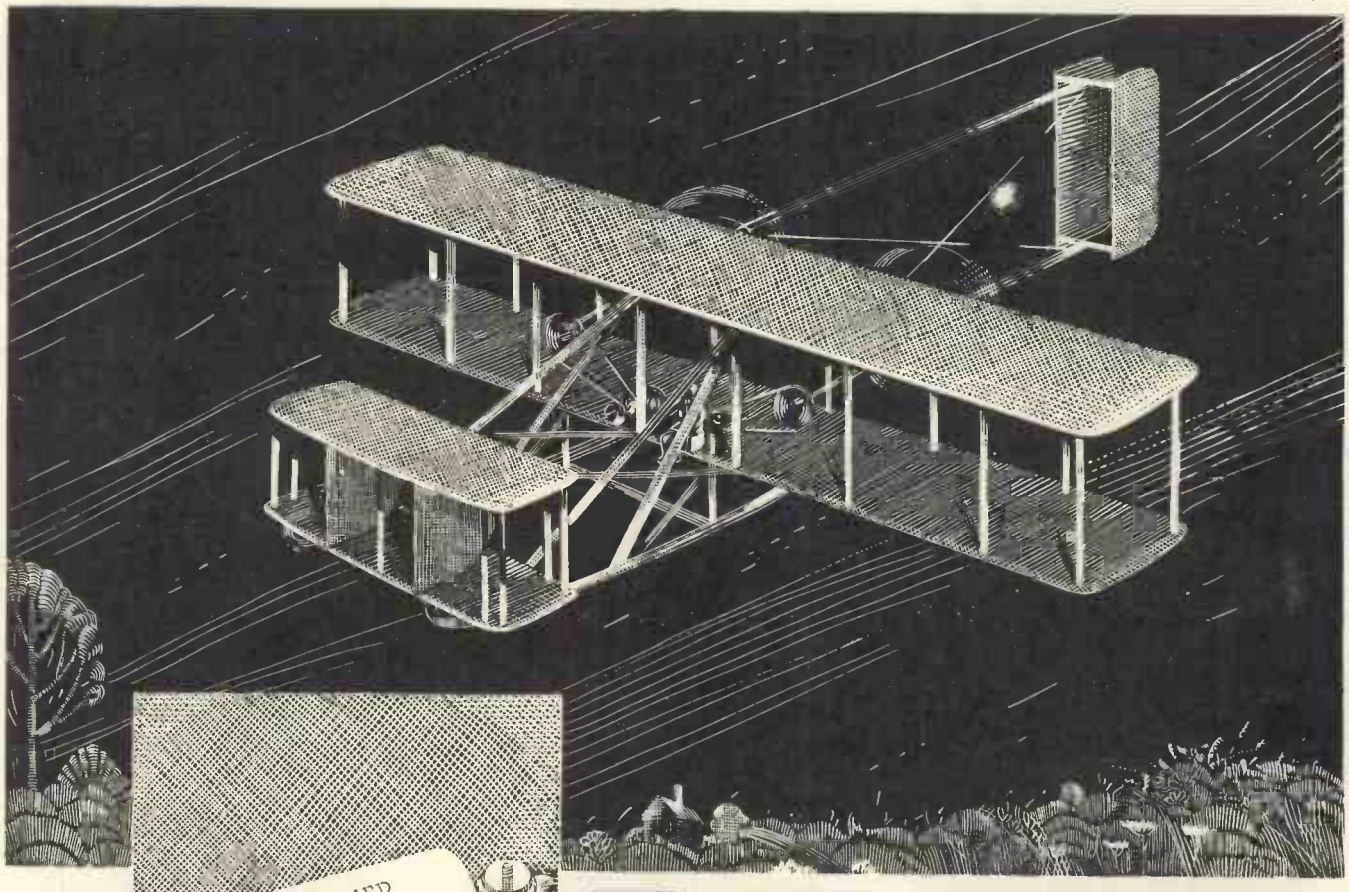
20 volt, .18 ampere

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
Tungsram	SE2018	360,000	500	1.4	3.0
Tungsram	S2018	333,000	400	1.2	1.5
Tungsram	R2018	13,000	40	3.0	2.0
Tungsram	G2018	6,500	25	3.5	4.0
Tungsram	P2018	2,800	7	2.5	20.0
Tungsram	PP2018	31,250	80	2.5	25.0

ORVILLE and WILBUR WRIGHT

Parallels of History No. 2

30 years ago, Orville and Wilbur Wright made the first flight by Man in a "heavier than air" machine. Their triumph was the beginning of Man's conquest of the air. The whole history of aviation is an epic of sacrifice and triumph. Its tremendous advance is an example of what can be achieved by men who have faith in their beliefs and confidence in themselves. The advance of aviation is similar to the progress made by Dubilier over their 21 years of trading. Starting in a small way, unheralded and hardly known, they have, through sheer determination and perseverance, brought their products to a standard of efficiency and reliability that is the envy and admiration of the whole industry.



DUBILIER CONDENSERS

DUBILIER CONDENSER CO. (1925) LTD. DUCON WORKS VICTORIA ROAD NORTH ACTON W.3

Guide to the World's Broadcasters

Specially Compiled for "Wireless Magazine" by JAY COOTE

(*Revised*)

Metres: 19.646, 25.36, 49.02 — **W2XE, WAYNE, N.J.** (*United States*) — *Kilocycles: 15,270, 11,830, 6,120*

Distance from London: Approximately 3,050 miles.

Standard Time: Greenwich Mean Time less 5 hours.

Announcer: Man.

Call: "Your station is WABC, New York, of the Columbia Broadcasting System"; or, alternatively, the call of another studio in the same network from which the programme is relayed may be given. At intervals the call of "W2XE, Wayne, N.J.," stating frequency of transmission, is also put out.

Times of Daily Transmission: G.M.T. 16.00-18.00 (on 19.646 metres)*; G.M.T. 20.00-22.00 (on 25.36 metres); G.M.T. 23.00-04.00 on 49.02 metres).

* The 19.646-metre transmission is broadcast from an aerial directional to Great Britain.

During the period of Summer Time in the U.S.A. the difference with B.S.T. is also 5 hours.

(*Revised*)

Metres: 19.737, 25.51, 31.381, 49.83 — **ZEESEN** (*Germany*) — *Kilocycles: 15,200, 11,760, 9,560, 6,020*

Distance from London: Approximately 588 miles.

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

Announcer: Man.

Call: "Achtung! Achtung! Hier der Deutsche Kurzwellensender," followed by name of studio or city from which relay is effected.

Interval Signal: Carillon; reproduction of the bells of the Potsdam Garrison Church.

Standard Daily Transmissions: B.S.T. 13.55-22.30, on 19.737 metres (DJB); B.S.T. 16.00-24.00, on 25.51 metres (DJD); B.S.T. 23.00-03.00, on 31.38 metres (DJA); B.S.T. 01.00-03.00, on 49.83 metres (DJC)*

The station closes down with the usual German good-night greetings, followed by the *Horst Wessel lied* (Nazi March) and German National Anthem (*Deutschland ueber Alles*).

* Broadcasts destined to U.S.A. are also occasionally simultaneously transmitted through DGK, Nauen, on 44.91 metres (6,680 kilocycles).

(*Revised*)

Metres: 31.43 *Power: 18kw.* — **RADIO NATIONS (Prangins)** (*Switzerland*) — *Kilocycles: 9,550*

Distance from London: Approximately 470 miles.

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

Announcer: Man.

Call: "This is the wireless station of the Information Department of the Secretariat of the League of Nations at Geneva, Switzerland." Also in French and Spanish.

Times of Transmission: A special broadcast relating to the activities of the League of Nations is made every Sunday night in French (B.S.T. 22.00), in English (B.S.T. 22.15), and in Spanish (B.S.T. 22.30); also occasionally on other days in special circumstances.

Simultaneous transmissions are also carried out on 31.31 metres (9,580 kilocycles) and 38.47 metres (7,790 kilocycles).

(*Revised*)

Metres: 49.4 *Power: 500w.* — **SKAMLEBAEK OXY** (*Denmark*) — *Kilocycles: 6,075*

Distance from London: Approximately 598 miles.

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

Announcer: Man.

Call: "Kalundborg-Köbenhavn og Danmark's Kortbolgesender." (Also Denmark's short-wave transmitter.)

Announcements are usually made in the Danish language, but when international concerts are broadcast, the German, French, and English languages are used in addition.

Interval Signal: Musical-box melody (a Danish twelfth-century folk song).

Relays Copenhagen programmes from B.S.T. 19.00 onwards.

Closes down as Copenhagen and Kalundborg (q.v.).

Metres: 259.3 *Power: 17kw.* — **FRANKFURT-AM-MAIN** (*Germany*) — *Kilocycles: 1,157*

Distance from London: Approximately 396 miles.

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

Announcers: Man and woman.

Call: "Achtung! Suedwestfunk," or when relaying Stuttgart (Mühlacker), "Hier Suedfunk und Suedwestfunk."

Interval Signal: Musical-box melody (excerpt from *The Watch on the Rhine*).

Main Daily Programmes: B.S.T. 06.00, time signal, weather, physical exercises; 06.35, relay of concert from Hamburg or Bremerhaven (Sunday), then continuous broadcast until 19.00, national hour (usually from Berlin); 20.00, main evening entertainment; 22.15, time signal, weather, news; 23.00, light concert, etc.

Good Night Greetings: "Gute Nacht, Meine Damen und Herren," followed by the Nazi March (*Horst Wessel* Song) and *Deutschland euber Alles* (German National Anthem).

Relays: Cassel, 246 metres (1,220 kilocycles), 0.25 kilowatt; Treves (Trier), 259.3 metres (1,157 kilocycles), 2 kilowatts.

Metres: 272.6 *Power: 5 kw.* — **ATLANTIC CITY (WPG)** (*New Jersey, U.S.A.*) — *Kilocycles: 1,100*

Distance from London: Approximately 3,230 miles.

Standard Time: Eastern Standard Time (G.M.T. or B.S.T. less 5 hours) (see note *re* Wayne, N.J.)

Announcer: Man.

Call: "Your station is WPG, Atlantic City (The World's Playground), operating on 1,100 kilocycles." When linked up with the Columbia chain. "This is the Columbia Broadcasting System," before the station call.

Times of Transmission: Daily broadcasts from about B.S.T. 19.00 until 04.00.

Metres: 424.3 *Power: 2 kw.** — **MADRID (EAJ7)** (*Spain*) — *Kilocycles: 707*

Distance from London: Approximately 800 miles.

Standard Time: Greenwich Mean Time (does *not* adopt Summer Time).

Announcer: Man.

Call (phon.): "Ay-ah hota see-yet-ay (EAJ7) Union Radio Madrid."

Opening Signal: Musical-box melody.

Main Daily Programme: B.S.T. 09.00, news; 12.30, concert (outdoor broadcast); 15.00, chimes, concert; 20.00, chimes, news, dance music; 21.00, talks; 22.30, main evening entertainment from studio or relay from theatre, news; 01.00, chimes.

Good Night Greetings: "Buenas Noches, Señores; hasta Mañana" ("until to-morrow"), followed by the *Song of Riego*.

*A super-power station is under consideration.

Associated Transmitters: EAQ, Madrid, 30 metres (10,000 kilocycles); Barcelona (EAJ1), 348.8 metres (860 kilocycles), 8 kilowatts; San Sebastian (EAJ8), 453.2 metres (662 kilocycles), 0.6 kilowatts; Seville, 368.1 metres (815 kilocycles), 1 kilowatt; Valencia, 267.6 metres (1,121 kilocycles), 1.5 kilowatt.

Metres: 569.7 *Power: 2 kw.* — **GRENOBLE PTT** (*France*) — *Kilocycles: 526.6*

Distance from London: Approximately 525 miles.

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

Announcer: Man.

Opening Call: "Allo! Allo! Ici le Poste d'Etat de radiodiffusion de la region des Alpes à Grenoble"; between items, "Ici Grenoble PTT."

Daily Transmissions: B.S.T. 08.00, news; 12.30, concert or gramophone records; 13.15, relay of Toulouse PTT or Marseilles; 20.15, main evening programme (from own studio or relay of Paris PTT). Closes down with usual French good-night greetings, followed by a local patriotic march, *Les Allobroges* and *La Marseillaise*.

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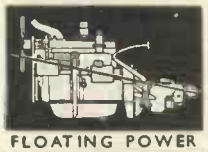
The success of the handsome New Vibrationless CITROËN Cars is due to their comprehensive and advanced design combined with unapproachable performance. Here are some of their exclusive features.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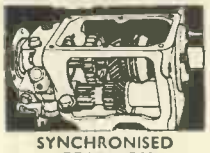
ENTIRELY NEW TYPE FRAME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HYDRAULIC SHOCK ABSORBERS AND DUO-SERVO BRAKES


MONOPIECE SAFETY BODY


LUGGAGE TRUNK

BUMPERS

SLIDING ROOF

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  Beautiful modern lines; strong and sound-proof.
- SUPER COMFORT TYRES
- DUO SERVO BRAKES
- SLIDING ROOF
- BUMPERS
- HYDRAULIC SHOCK ABSORBERS—
  Automatically and thermostatically controlled.
- LUGGAGE TRUNK
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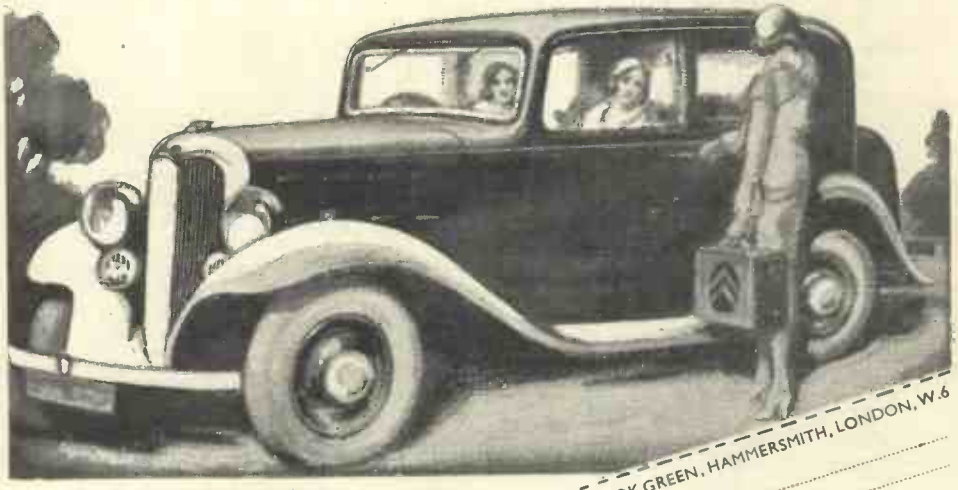
"LIGHT TWELVE" - £225 **"LIGHT TWENTY" - £275**



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Advertisers like to know you "saw it in the 'Wireless Magazine'"

WORLD'S BROADCAST WAVELENGTHS

Stations best received in the British Isles are indicated in bold type

Wave-length	Name of Station	Dial Readings		Country
13.93	W8X K, Saxonburg ...			United States
14.19	**Buenos Aires LSL- LSM** ...			Argentine
14.47	**Buenos Aires LSY** ...			Argentine
14.87	Rocky Point WQX ...			United States
15.576	**Rio de Janeiro** PPU ...			Brazil
15.61	Lawrenceville (N.J.) WKF ...			United States
15.625	Ruysselede (Bruges) ORG ...			Belgium
15.82	Buenos Aires **LSR** ...			Argentine
15.86	Rocky Point (N.J.) WQE ...			United States
15.93	Bandoeng PLE ...			Java
16.10	**Rugby** GBJ ...			Great Britain
16.26	Bogota HKD ...			Columbia
16.3	**Kootwijk** PCK ...			Holland
16.36	Lawrenceville (N.J.) WLA			United States
16.38	**Rugby** GBS ...			Great Britain
	Saigon FZS ...			Indo-China
16.56	Bandoeng PMC ...			Java
16.57	Chicago W9XAA ...			United States
16.66	Rocky Point WAJ ...			United States
16.66	Capetown ZSB ...			Sth. Africa
16.72	**Rocky Point (N.J.)** WQB ...			United States
16.76	Rocky Point WLL ...			United States
16.81	Bandoeng PLF ...			Java
16.85	Kootwijk PCV ...			Holland
16.878	**Boundbrook** W3XAL ...			United States
16.88	**Eindhoven** PHI ...			Holland
	Daventry Empire GSG ...			Great Britain
16.89	Königswusterhausen DJE ...			Germany
17.24	Kirkee VWZ			India
17.38	Norddeich DAN ...			Germany
17.44	Maracay YVG ...			Venezuela
18.37	Sydney VLR			N.S.W.
18.4	Kootwijk PCL ...			Java
18.44	Lawrenceville WLO-WLK ...			United States
19.3	Leopoldville			Belgian Congo
19.36	Kemikawoa (Tokio) JIAA ...			Japan
19.47	Jodhpur VWI... ...			India
19.56	**Schenectady** W2XAD ...			United States
19.64	**New York** W2XE ...			United States
19.67	Coytesville N.J. W2XAL ...			United States
19.68	**Radio Coloniale** ...			France
19.72	**Saxonburg** W8XK ...			United States
19.737	**Zeesen** DJB			Germany
19.815	Daventry (Empire) GSF ...			Great Britain
19.84	Rome (Vatican) HVJ ...			Italy
19.9	Heredia T14NRH ...			Costa Rica
19.99	Central Tuinucu CM6XJ ...			Cuba
20.0	**Drummondville** CGA ...			Canada
20.13	Manila KAY			Philippine I.
20.3	Rocky Point WQU			United States
20.49	Deal (N.J.) WND ...			United States
20.5	Chapultepec XDA ...			Mexico
20.7	Rocky Point WKJ ...			United States
20.97	Amateur Band ...			—
21.53	Rocky Point (N.J.) WIK ...			United States
21.83	Drummondville CGA ...			Canada
21.93	Szekesfehervar HAT			Hungary
22.26	Rocky Point (N.Y.) WAJ ...			United States
22.4	Rocky Point WMA ...			United States
22.58	Drummondville CGA ...			Canada
23.28	**Radio Maroc (Rabat)** ...			Morocco
23.7	Drummondville VE9AP ...			Canada
24.41	**Rugby** GBV			Great Britain
24.9	Kootwijk PDV			Holland
25.20	**Pontoise** FYA			France
25.24	Chicago W9XF			United States
25.27	**East Pittsburgh (Pa)** W8XK			United States
25.284	**Daventry (Empire)** GSE ...			Great Britain
25.34	Chicago (Ill.) W9XAO ...			United States
25.36	Wayne W2XE			United States
25.4	**Rome** 2RO			Italy
25.42	Bowmanville VE9GW ...			Canada
25.45	Boston WIXAL			United States
25.51	**Zeesen** DJD ...			Germany
25.532	**Daventry (Empire)** GSD ...			Great Britain
25.57	**Eindhoven** (PHI) ...			Holland
25.6	Radio Coloniale ...			France
	Winnipeg VE9JR ...			Canada
25.72	Rio de Janeiro PPB ...			Brazil
26.83	Funchal CT3AQ			Madeira
27.5	Kootwijk PCP			Holland
27.65	Nauen DFL			Germany
28.28	Rocky Point (N.J.) WEA ...			United States
28.5	Sydney VK2ME			New South Wales
28.83	Funchal CT3AQ			Madeira
28.98	Buenos Aires LSX			Argentine
29.04	Ruysselede ORG			Belgium
29.16	Königswusterhausen DIQ ...			Germany
29.58	Leopoldville OPM ...			Congo
29.83	Abul Zabal (Cairo) SUV ...			Egypt
30.0	Radio **Excelsior** LR5			Argentine Repub.

Wave-length	Name of Station	Dial Readings		Country
30.0	Madrid EAQ			Spain
30.2	Leopoldville			Congo
30.4	Lawrenceville (N.J.) WQN ...			United States
30.77	Lawrenceville WOF			United States
30.89	**Rugby** GCA			Great Britain
31.18	Lisbon CT1AA			Portugal
31.28	**Philadelphia** W3XAU ...			United States
	Sydney VK2ME ...			New South Wales
31.297	**Daventry (Empire)** GSC ...			Great Britain
31.31	**Radio Nations** HBL ...			Switzerland
31.35	**Springfield** W1XAZ ...			United States
31.38	**Zeesen** DJA			Germany
31.48	**Schenectady** W2XAF ...			United States
31.545	**Daventry (Empire)** GSB ...			Great Britain
31.55	Melbourne VK3ME			Victoria
31.58	**Rio de Janeiro** PRBA ...			Brazil
31.6	Poznan SR1			Poland
31.7	Rio de Janeiro PPU... ...			Brazil
31.71	Rocky Point WKJ			United States
31.86	Bandoeng PLV			Java
32.26	**Rabat**			Morocco
32.71	**Lawrenceville** WND ...			United States
32.93	Olivos **LST**			Argentine
33.59	Rocky Point (N.J.) WEC ...			United States
34.68	Long Island W2XV			United States
35.55	Rio de Janeiro PRDA ...			Argentine
36.92	Bandoeng PLW			Java
37.80	Doeberitz DOA			Germany
38.07	Tokio JIAA			Japan
38.476	**Radio Nations** HBP ...			Switzerland
38.65	Kootwijk PDM			Holland
39.58	Shanghai XGD			China
39.74	Calgary (Alb.) CKS			Canada
40.5	New Brunswick WEN ...			United States
40.54	New York WEM			United States
41.1	Amateur Band			—
41.6	Las Palmas EAR58			Canary Isles
41.7	Singapore VSIAB			Sts. Settlements
43.11	Rocky Point (N.J.) WEO ...			United States
44.51	Rocky Point (N.Y.) WEJ ...			United States
44.61	Rocky Point WQO			United States
44.91	Nauen DGK			Germany
45	**San Sebastian** EAR TBO...			Spain
	Constantine FM8KR ...			Tunis
45.31	Rio Bamba PRADO ...			Ecuador
45.38	**Moscow** REN			U.S.S.R.
45.5	Bucharest			Roumania
46.67	London (Ont.) VE9BY ...			Canada
46.69	Boundbrook W3XL			United States
46.73	Minsk RW62			U.S.S.R.
48	**Casablanca** CN8MC ...			Morocco
48.35	Bogota HKC			Colombia
48.54	Shanghai XGKO			China
48.8	Winnipeg VE9CL			Canada
48.86	**Saxonburg (Pa.)** W8XK ...			United States
48.9	Kuala Lumpur ZGE ...			F.M.S.
48.92	New York W2XA			United States
48.95	Maracaibo YVIIBMO ...			Venezuela
49.02	Wayne W2XE			United States
49.08	**Caracas** YVIBC			Venezuela
49.1	Calcutta VUC			Br. India
49.18	**Boundbrook** W3XAL ...			United States
49.2	Johannesburg ZTJ			Sth. Africa
49.22	Bowmanville VE9GW ...			Canada
49.34	Chicago W9XAA			United States
49.4	**Skamleback**			Denmark
49.43	Vancouver VE9CS			British Columbia
49.5	**Philadelphia** W3XAU ...			United States
	Havana CMCI			Cuba
	Cincinati W8XAL			United States
	Nairobi VQ7LO			Kenya Colony
49.586	**Daventry (Empire)** GSA ...			Great Britain
49.59	Halifax VE9GX			Nova Scotia
49.6	Vienna UOR2			Austria
49.67	**Miami Beach** W4XB ...			United States
	Boston WIXAL			United States
49.83	Chicago W9XF			United States
	Königswusterhausen DJC			Germany
49.96	**Drummondville** VE9DR			Canada
50	**Moscow** RV59			U.S.S.R.
50.26	**Rome (Vatican)** HVJ ...			Italy
51	St. Denis			Reunion
52.7	Tananarive FIUI			Madagascar
54.52	New York W2XBH			United States
56.9	Königswusterhausen DTG ...			Germany
57.03	**Rocky Point** WQN ...			United States
58.3	Bandoeng PMY			Java
58.31	**Prague**			Czechoslovakia
62.5	**Long Island (N.J.)** W2XV			United States
62.56	London (Ont.) VE9BY ...			Canada
66	Rocky Point WAD ...			United States

Continued on page 548

THE
McMICHAEL DUPLEX SUPER 5
'CLASS B' PORTABLE

Ask at any high-class Radio Store for a demonstration of this, or any of our other models, and details of our special "Deferred Payments on Hire Purchase Terms" system, if desired, or call at our **LONDON SHOWROOMS: 179 STRAND, W.C.2.**

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THE McMICHAEL DUPLEX SUPER 5 'CLASS B' PORTABLE

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Mention of the "Wireless Magazine" will ensure prompt attention

WORLD'S BROADCAST WAVELENGTHS

Continued from page 546

Wave-length	Name of Station	Dial Readings		Country
67.65	Doeberitz DFK			Germany
70.17	Rocky Point (N.J.) WIR			United States
70.2	Khabarovsk RV15			U.S.S.R.
79.5	Salisbury ZEA			South Africa
84.5	Berlin D4AGE			Germany
92.31	Doeberitz			Germany
208.3	Liege (Wallonie)			Belgium
209.8	Magyarovar			Hungary
	Pecs			Hungary
	Miskolcz			Hungary
211.3	**Newcastle**			Great Britain
214.9	Antwerp			Belgium
214.3	Warsaw (No. 2)			Poland
	Aberdeen			Great Britain
215.4	Chatelineau			Belgium
217	**Königsberg**			Germany
218	Salzburg			Austria
218.5	**Plymouth**			Great Britain
219.9	Beziers			Belgium
223.2	Swedish Relays			Sweden
224	**Cork**			Irish Free State
225.9	**Fécamp**			France
227.4	Flensburg			Germany
230.6	Malmö			Sweden
231.8	Kiel			Germany
235	Lodz			Poland
235.5	Kristianssand			Norway
236.2	**Bordeaux-Sud-Ouest**			France
237.9	Nimes			France
239	**Nurnberg**			Germany
240.1	Stavanger			Norway
242	**Belfast**			Ireland
244.1	Basle			Switzerland
245.9	Linz			Austria
	Berne			Switzerland
247.7	**Trieste**			Italy
249.5	**Juan-les-Pins**			France
250	Prague (No. 2)			Czechoslovakia
	Radio Schaerbeeck			Belgium
250.9	Barcelona EAJ15			Spain
253.1	**Gleiwitz**			Germany
255	Toulouse PTT			France
256.7	**Hörby**			Sweden
259.3	**Frankfurt**			Germany
261.6	**London National**			Great Britain
	West National (Tests)			Great Britain
263.8	**Moravska Ostrava**			Czechoslovakia
265.7	**Lille**			France
267.1	Valencia			Spain
268.3	**Bremen**			Germany
269.8	**Bari**			Italy
271.2	Cointe-Liége			Belgium
271.5	**Rennes**			France
273.7	**Turin**			Italy
276.5	**Heilsberg**			Germany
280	**Bratislava**			Czechoslovakia
281	**Copenhagen**			Denmark
282.2	Lisbon CT1AA			Portugal
283.6	Berlin			Germany
	Innsbruck			Austria
	Magdeburg			Germany
	Stettin			Germany
284.1	Radio Lyons			France
286	Montpellier			France
288.3	Bournemouth			Great Britain
	Scottish National			Great Britain
291	Viipuri			Finland
293	Kosice			Czechoslovakia
293.7	**Limoges PTT**			France
296.1	**Hilversum**			Holland
298.8	Tallinn			Esthonia
301.5	North National			Great Britain
304.3	**Bordeaux PTT**			France
306.8	Zagreb			Yugoslavia
307.5	Falun			Sweden
308.5	Vitus-Paris			France
309.9	West Regional			Great Britain
312.8	Cracow			Poland
313.9	Genoa			Italy
315	Marseilles			France
318.8	Naples			Italy
	Sofia			Bulgaria
319.7	Dresden			Germany
321.9	**Goteborg**			Sweden
325	**Breslau**			Germany
328.2	**Poste Parisien**			France
331.6	**Milan**			Italy
335	Poznan			Poland
338.2	**Brussels (No. 2)**			Belgium
341.3	**Brno**			Czechoslovakia
345.2	**Strasbourg**			France
348.2	Leningrad			U.S.S.R.
348.6	Barcelona EAJ1			Spain
352.1	Graz			Austria
358	Tivarpool			U.S.S.R.
355.9	**London Regional**			Great Britain
360.6	**Mühlacker**			Germany

Wave-length	Name of Station	Dial Readings		Country
363.6	Algiers			North Africa
365.5	Bergen			Norway
367.2	Frederikstaad			Norway
368.1	Helsinki			Finland
	Bolzano			Italy
	Kharkov			U.S.S.R.
369	Seville			Spain
372.2	Hamburg			Germany
376.4	**Scottish Regional**			Great Britain
381.7	Lvov			Poland
385	Radio Toulouse			France
385	Stalino			U.S.S.R.
389.6	**Leipzig**			Germany
395.2	**Bucharest**			Roumania
398.9	**Midland Regional**			Great Britain
403.8	**Sottens**			Switzerland
408.7	**Katowice**			Poland
413	**Athlone**			Irish Free State
416	Radio Maroc			North Africa
419.5	Berlin			Germany
424.3	Madrid (Espana)			Spain
	Madrid EAJ7			Spain
430.4	Belgrade			Yugoslavia
435.4	Makhatch-Kala			U.S.S.R.
	Stockholm			Sweden
441.2	**Rome**			Italy
447.1	**Paris PTT**			France
	Dantzig			Dantzig
453.2	Odessa			U.S.S.R.
	Klagenfurt			Austria
	Porsgrund			Norway
453.8	Milan Vigentino			Italy
456.6	San Sebastian			Spain
459	**Beromuenster**			Switzerland
461.5	Archangel			U.S.S.R.
465.8	**Lyons PTT**			France
472.4	**Langenberg**			Germany
476	Simferopol			U.S.S.R.
480	**North Regional**			Great Britain
483	Ivanovo-Vosnesensk			U.S.S.R.
488.6	**Prague**			Czechoslovakia
495.9	Trondheim			Norway
501.7	**Florence**			Italy
502.4	Nini Novgorod			U.S.S.R.
509	Astrahkan			U.S.S.R.
509.3	**Brussels No. 1**			Belgium
518.5	**Vienna**			Austria
525.4	Riga			Latvia
533	**Munich**			Germany
539.9	Palermo			Italy
540	Prague (testing)			Czechoslovakia
541.5	**Sundsvall**			Sweden
550	**Budapest**			Hungary
555.5	Tampere			Finland
559.7	Kaiserslautern			Germany
	Augsberg			Germany
564.4	Wilno			Poland
563.2	Freiburg			Germany
566	Hanover			Germany
569.7	Grenoble			France
574.7	Ljubljana			Yugoslavia
680	Lausanne			Switzerland
720	Moscow PTT			U.S.S.R.
748	Ostersund			Sweden
750	**Geneva**			Switzerland
779.2	Petrozavodsk RV29			U.S.S.R.
833	**Heston Airport**			Great Britain
840	Budapest (2)			Hungary
857.1	Leningrad			U.S.S.R.
937.5	Kharkov			U.S.S.R.
1,000	**Moscow**			U.S.S.R.
1,060	**Scheveningen-Haven**			Holland
1,061	Tiflis			U.S.S.R.
1,073.5	**Oslo**			Norway
1,084	Minsk			U.S.S.R.
1,153.8	**Kalundborg**			Denmark
1,140	Monte Ceneri (tests)			Italy
1,190	**Luxemborg**			Luxemburg
1,200	Reykjavik			Iceland
	Istanbul			Turkey
1,234.5	Boden			Sweden
1,250	Vienna			Austria
1,304	**Moscow**			U.S.S.R.
1,354	**Motala**			Sweden
1,380	Novosibirsk			U.S.S.R.
1,411.8	**Warsaw**			Poland
1,445.7	**Paris (Eiffel Tower)**			France
1,481	Moscow (RV1)			U.S.S.R.
1,538	Ankara			Turkey
1,554.4	**Daventry National**			Great Britain
1,634	**Königswusterhausen**			Germany
1,725	**Radio Paris**			France
1,796	**Lahti**			Finland
1,875	**Huizen**			Holland
1,910	Svendlovst			U.S.S.R.
1,935	**Kaunas**			Lithuania
2,625	Königswusterhausen			Germany
2,650	**Eiffel Tower**			France

In Tune with the Trade

FETTER LANE'S Review of Catalogues

SEND TO US FOR THESE CATALOGUES !

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

Just indicate the numbers (seen at the end of each paragraph) of the catalogues you want below : —

My name and address are :—

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

THESE ERIES

STRANGE how composition type resistances went out of favour for a little while, and we believed that only wire-wound jobs could be stable.

Then set manufacturers took to using very neat and compact new-style composition resistances which were much cheaper and just as good as the clumsier wire-wound components.

Personally I am all in favour of a good composition resistance as the new types are made of one composition throughout, and the resistance value can be chosen by accurate grinding and cutting in manufacture.

The new Erie resistors are typical of modern composition jobs, and if you want to know just how well they stand up under load and varying humidity conditions, then get the interesting little folder just produced by the Radio Resistor Co. This also gives details of the special supressors made by Erie for cutting out ignition interference on cars. **325**

◆ ◆ ◆

POLICE NOTICE !

TO paraphrase a well-known advertiser, Police Notice—and so do others that M.L. convertors have been used on the Flying Squad cars. These convertors are very useful for the less serious side of life, too. These convertors work from a low-tension battery and give a high-tension output, so that if you want to be rid for ever of battery and mains bothers, here is the very thing.

Rotax, Ltd., who market these convertors, have just brought out a number of technical folders showing how the convertor is used with a number of popular sets, so when sending in your inquiry please let me know the name or type of your receiver. **326**

◆ ◆ ◆

THE HARMONY TWINS

THE dual balanced idea certainly seems to have caught on. Balanced pairs of loud-speakers are made with matched characteristics so that . . . so that . . .

Well, the experts say " so that the inherent frequencies and resonant points balance out and the result is perfect reproduction over the whole harmonic range."

Or in less technical parlance, one loud-speaker takes the high notes and the other the low notes.

All of which is to tell you that Rola not only make dual-balanced pairs of loud-speakers for as cheap as £2 16s. 6d. a pair (permanent magnet moving-coils), but that there is an attractive little folder describing them. **327**

◆ ◆ ◆

A NEW PICK-UP

IN the very early days of gramo-radio, Blue Spot introduced a pick-up which was something of a revelation. Now I see that still another type of Blue Spot pick-up has been introduced. This is the Model 33, costing 35s. It is, of course, sold complete with pick-up arm and self-contained wire-wound volume control.

Incidentally, the latter is wound to give equal steps of volume, and the whole movement is available for control purposes. The weight on the needle is correctly adjusted for use with H.M.V. loud-tone or Columbia talkie needles. Tracking is good, the error on a 10-in. record not exceeding 1.5 degrees.

All the technical details you need to know are given in a new Blue Spot catalogue. **328**

A RADIOGRAM ROBOT

DURING the past few weeks I have been trying out one of the new Garrard automatic-record changers. It works so well that I was not really in need of the folder which the Garrard people sent me a few days ago to point out the changers' glistening virtues !

It is really a sound job and, when you work it out, very good value for a £10 note. What do you get ? A sound little chassis on which is mounted a solidly constructed Garrard-built electric motor and turntable drive; a Garrard patented speed regulator, a fine pick-up and tone arm, the former fitted with a swivelling head to facilitate needle changing; and finally automatic-record changing mechanism that works on any kind of record and does its job properly.

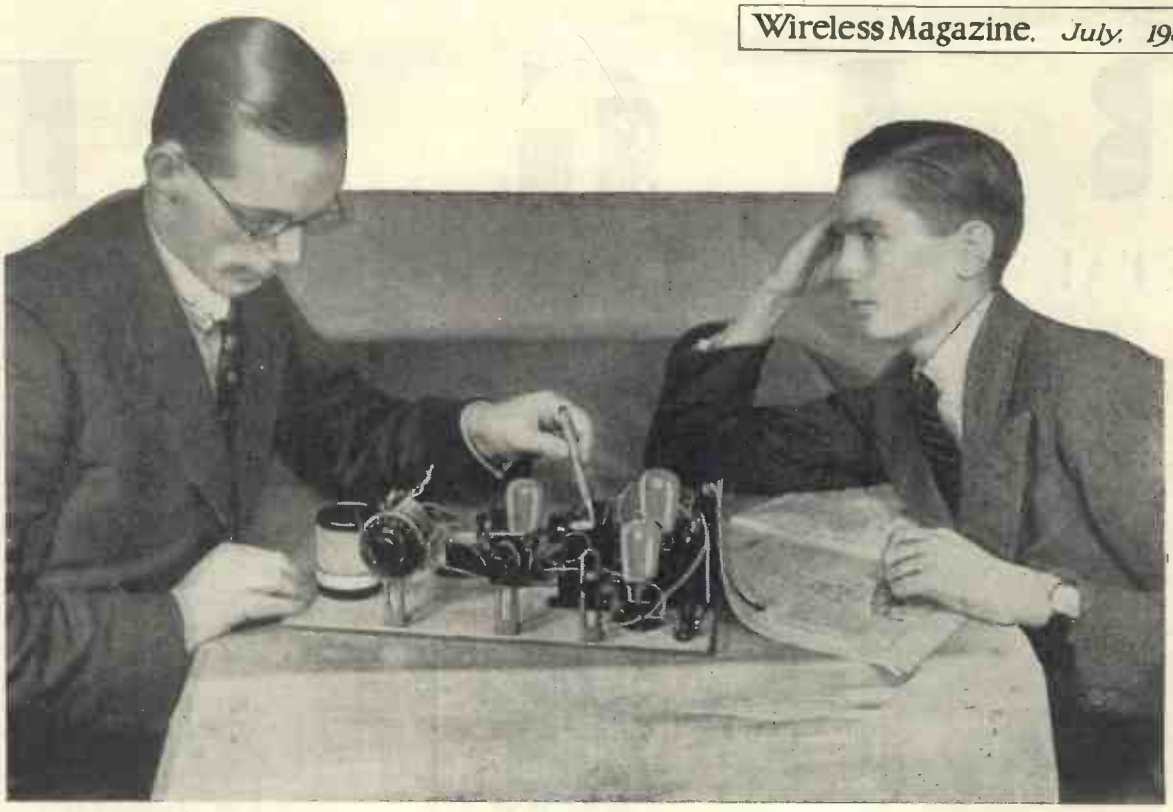
The record-changing mechanism will play consecutively for eight 10-in. or eight 12-in. records of any make. Any record can be repeated at the touch of a switch and any record rejected, even after it has started to play. This radiogram robot, as I say, is described in the latest Garrard folder, together with other interesting turntable drives and radiogram accessories. There is a Garrard single-spring motor as cheap as 17s. ! **329**

◆ ◆ ◆

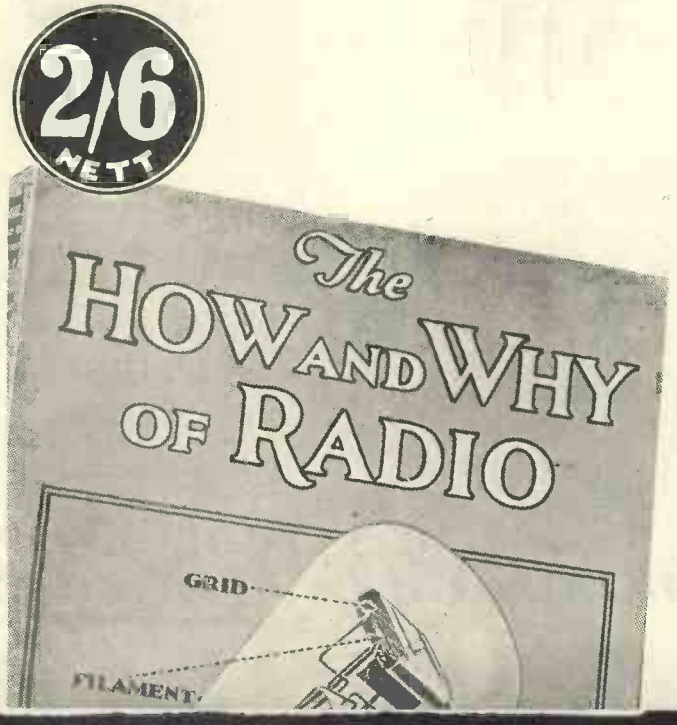
ALL ABOUT CONDENSERS

BAKELITE cased condensers, tubular non-inductives, metal-cased jobs, or little postage stamp condensers. No matter what it is you will find it in the Ashley range of " microfarads." There is a very useful six-page catalogue available through my Free Service—useful, that is, to anybody who builds, renovates or generally tinkers about with a set.

There are good illustrations and practical tables giving dimensions, working voltages, rated accuracies, test voltages and all the other facts you want to know when picking the condensers for that new circuit. **330**



Expressly written for the beginner



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

Get this indispensable Book NOW.
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RIGID

METAL CONSTRUCTION GIVES:—

1 GREAT MECHANICAL STRENGTH *due to cylindrical anode and interlocked electrodes. The Marconi Catkin Valve can be knocked or dropped in a manner which would be disastrous to a glass valve.*

2 GREATER UNIFORMITY *due to elimination of inaccurate glass pinch and bent supporting wires, and to the extreme accuracy of the electrode alignment.*

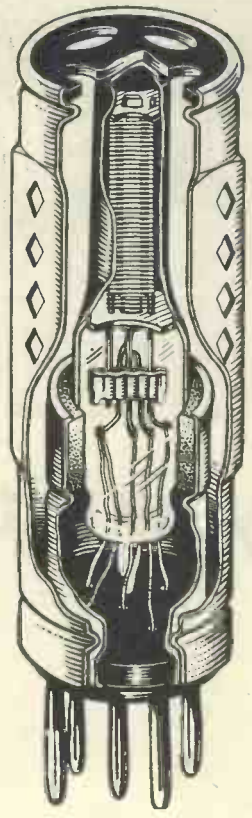
3 ABSOLUTELY CONSISTENT PERFORMANCE, *as the anode in direct contact with air promotes cooler running, hence reducing chances of gases and water vapour being set free during life.*

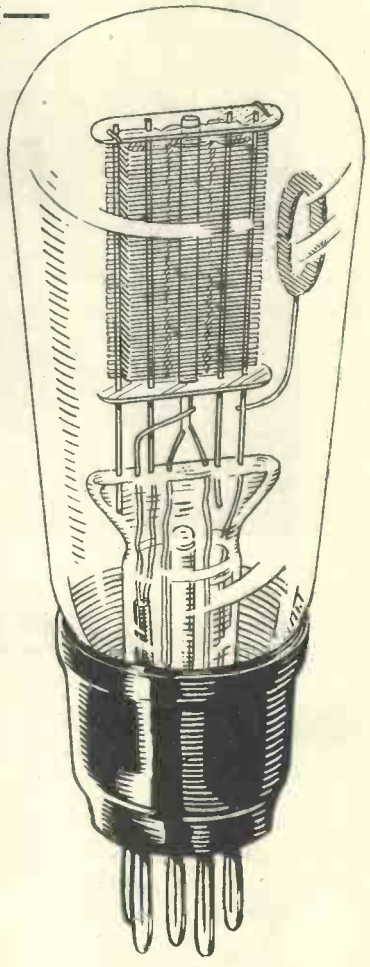
4 SMALLER SIZE *and improved appearance. Valves can be sent by post in the ordinary carton without extra packing.*

5 RUBBER MOUNTING *and rigid interlocked electrodes, which eliminate microphonic effects and reduce hum.*

6 A SOLID METAL SHIELD—*better screening than metallising on a glass bulb.*

7 A BASE *which cannot work loose or come off.*





We show here a cut-away drawing of the screened Marconi triode Catkin Valve MH4 in comparison with an equivalent glass valve drawn to the same scale. Note how the grid and heater of the former are rigidly locked at both ends inside the metal anode, which, in its turn, is rubber mounted and metal-armoured, and compare this with the glass valve, with its fragile pinch, many bent wires and delicate joints.

Hitherto the valve has changed little since Professor Fleming first invented it in 1904. Throughout all these years it has remained a de icate assembly of bent wires and welded joints in a fragile glass bulb. In the CATKIN VALVE, Marconi have overcome at one stroke all the weaknesses inherent in such construction. In characteristics, the A.C. CATKIN VALVES now introduced are similar to the existing glass types and can therefore be substituted for them in most modern A.C. Mains receivers.

The types at present available are : * VMS4. A.C. Variable-Mu. S.G., price 19/- . . . * MS4B. A C. Screen Grid, price 19/- . . . * MH4. A.C. General Purpose Triode, price 13/6 . . . MPT4. A.C. Power Pentode, price 20/-.

* With or without screening cover.

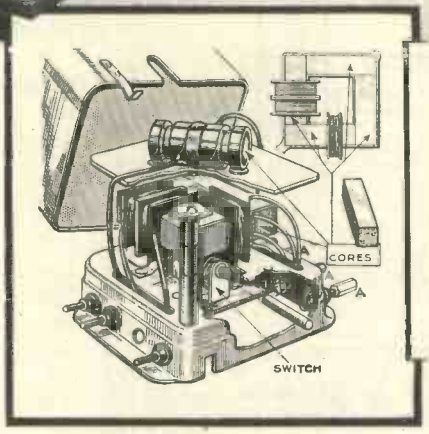
Write to the Marconiphone Company Ltd., 210 Tottenham Court Road, London, W.1, for a folder describing these remarkable new valves.

ASK FOR THE *UNBREAKABLE* G. Marconi

MARCONI CATKIN VALVE

THE TYERS IRON-CORE THREE

We are now able to present exclusive details of a new battery three-valver employing a new type of iron-cored coil, designed by Paul D. Tyers. Many readers will remember his famous "Multi-mag Three" described in these pages last year



Specially Designed for "W.M." by

Paul D. Tyers

I THINK the value of the iron-core tuning coil is already well known, but for the benefit of those who are not acquainted with the fundamental principle, I will outline it again in brief detail.

Coil Efficiency

Every tuning coil has a certain efficiency which is controlled by the losses. These losses are a direct function of the physical properties of the coil. In particular, there are what are known as copper losses due to the ohmic resistance of the wire with which it is wound. When an iron core is put into a coil its inductance is enormously increased.

Accordingly, if we wind a tuning coil with an iron core, we can reduce the number of turns very considerably and thereby reduce the copper losses and, of course, increase the overall efficiency. It has not been possible to do this previously because no suitable core materials could be found. The losses with ordinary iron at radio frequencies are colossal and accordingly iron-core coils have not previously made their appearance because of the absence of suitable core materials.

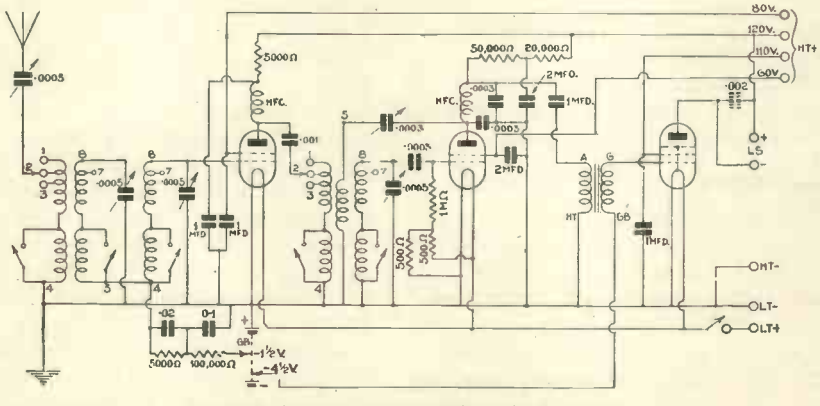
Iron cores used for tuning coils consist of minute particles of iron carefully insulated and bonded together. Several types of iron cores are now appearing, and the coils used in the receiver about to be described are examples of the new Nucleon coils which I have recently developed and designed.

The particular coils which I am using in this receiver are Wearite Nucleon senior models, types BP1, BP2 and TG.

Coil Arrangement

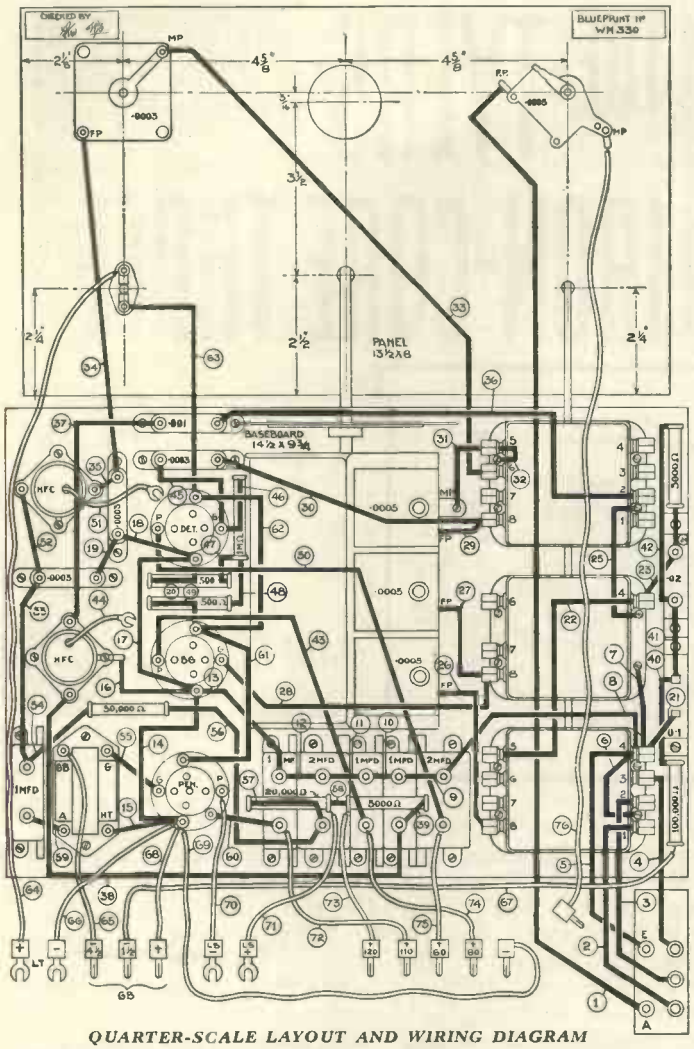
It will be noted that there are separate coils for the aerial and inter-valve coupling. Tapping points are provided for the aerial and inter-valve coupling circuits, and the relative inductances and transformer ratios have been arranged so as to give the best all-round working conditions with representative modern valves.

It will be noted that there is a tapping point on the grid circuit, so that a low grid tapping can be taken when required. I am not using this particular connection, however, in the present set, for reasons which will be dealt with later. I would here like to add a word of warning. If the covers are removed for the purpose of examining the coils



CIRCUIT OF THE TYERS IRON-CORE THREE

The valve combination consists of a screen-grid high-frequency amplifier, screen-grid detector followed by a pentode output stage



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

If desired, a full-size blueprint can be obtained for half price, that is 6d., post paid, if the coupon on the last page is used before July 31. Address your application to the "W.M." Blueprint Dept., 58-61 Fetter Lane, London, E.C.4. Ask for No. WM330

very great care should be taken that the coils are not touched. The efficiency of the coils is so high that a minute change in the inductance due to a slight shift of one of the coils would result in totally upsetting the ganging.

The coils are wound on small bobbins arranged on a channel trough which contains the iron core. These bobbins are actually cemented in position, but if by any chance one were moved a fraction of an inch, the whole coil would be out of gang with the others.

Delicate Handling of the Coils Essential

The same remark applies to the iron core which projects from the long-wave section. On no account should this be moved, as otherwise the same trouble would arise. A substantially closed circuit is used for the medium-wave section, but an open circuit is used for the long-wave section, and accordingly the position of the can has some slight effect upon the resulting inductance.

It is essential that a very excellent contact is obtained between the can and the base. If an indifferent contact is obtained it will add slightly to the losses of the coil, particularly on the longer wavelengths towards the top of the medium-wave section. Accordingly, the can should not be constantly removed. The cans are pressed firmly into position and they slide on with a slight taper, so that when they leave the factory the best possible contact is obtained.

Straightforward Circuit Arrangement

I have already hinted at the type of performance which can be obtained from a highly efficient coil. It is here necessary to point out that the whole benefits of the iron-core tuning coils will be completely lost if they are associated with low-grade components.

The circuit arrangement of this set is in the main quite straightforward, but there are one or two unusual features, which are really essential to the efficient working of the receiver. The input is a capacity-coupled band-pass circuit employing BP1 and BP2 coils. The high-frequency inter-valve coupling is a TG coil. These three circuits are simultaneously tuned by a three-gang condenser.

Reaction is used on the tuned-grid circuit, and this is capacitatively controlled. For detection, a screen-grid valve is used and operated in a somewhat unorthodox manner. This is resistance fed to a high-ratio transformer, which drives a pentode valve for the output.

A Difference in Characteristics

The valves used are a matter of very considerable importance, and I strongly suggest that no departure is made from those specified unless almost identical types are available. It should not be thought that all 2-volt screen-grid valves are alike. There is a tremendous difference in the characteristics. If any variation is made, then it is highly probable that the set may not function correctly. It may tend to oscillate, there may be bad reaction overlap, and finally, the gain may be considerably reduced.

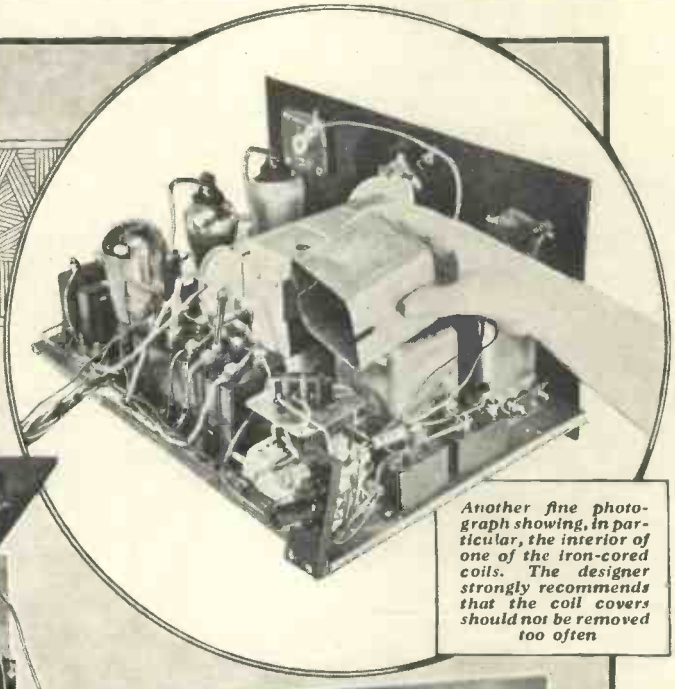
The first valve is an Osram S22, which is a very efficient high-frequency amplifier suitable for dealing with small inputs. The input is connected through the band-pass circuit, and particular care should be taken in the connection of the first coil, the BP1. Terminal 4 is the earth side of the aerial circuit. Terminal 5 is the low-potential side of the first tuned circuit and is joined to terminal 4 of the second band-pass coil, and these go down to earth through the capacity-coupling arrangement.

This is in the form of a .02-microfarad condenser which is shunted by a 5,000-ohm resistance. The first valve is negatively biased at 1.5 volts, obtained from the grid-bias battery. This circuit is decoupled with a 100,000-ohm resistance and a .1-microfarad condenser. The screen of the high-frequency amplifier is given about 80 volts and the anode circuit is connected to the full 120-volt tapping on the battery through a 5,000-ohm resistance and a 1-microfarad condenser.

The tuned-grid circuit is fed from the high-frequency choke in the anode of the high-frequency valve through

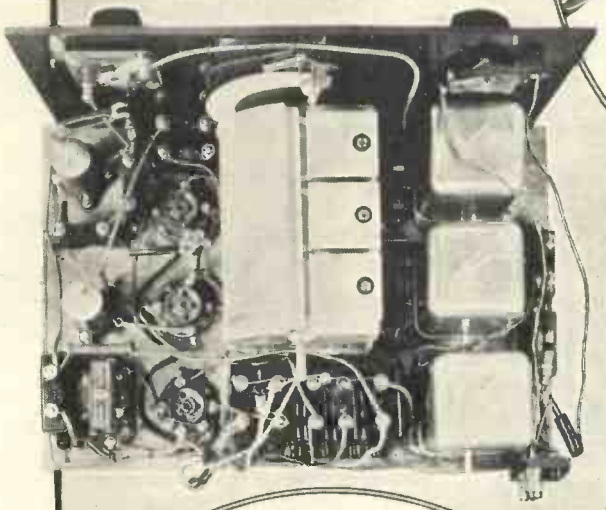
A Set that Brings You 60 Stations!

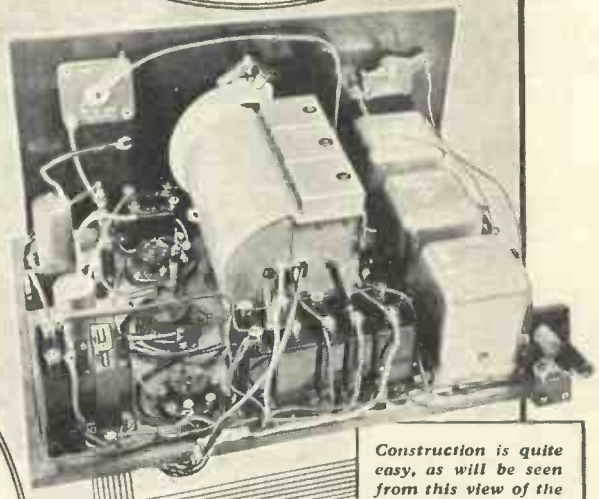
The Tyers Iron-core Three was specially designed for "Wireless Magazine" by Paul D. Tyers, whose famous three-valver, the Multimag Three, was one of the outstanding battery-operated sets of last year.



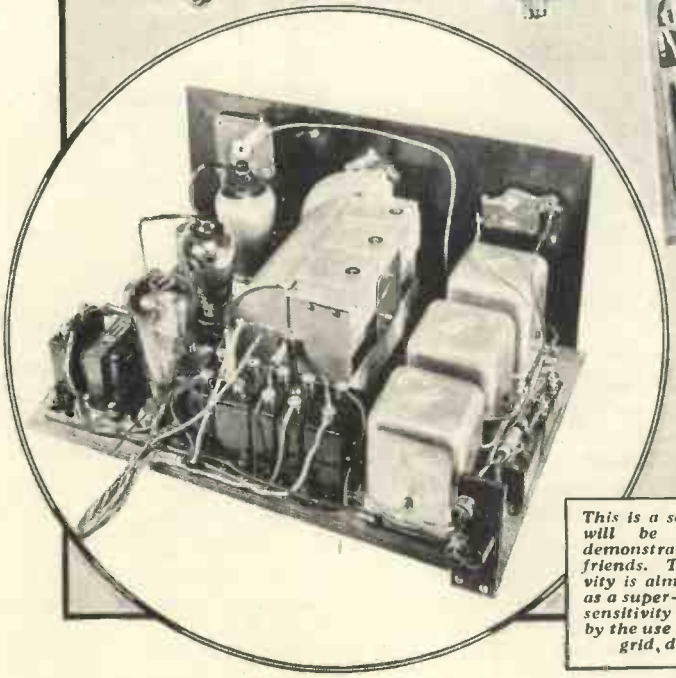
Another fine photograph showing, in particular, the interior of one of the iron-cored coils. The designer strongly recommends that the coil covers should not be removed too often

Below is a plan view of the set showing the neat arrangement of the parts on the base-board. Note the accessibility of the condenser trimmers





Construction is quite easy, as will be seen from this view of the Tyers Iron-core Three. Note the neat arrangement of the fixed condensers at the back



This is a set that you will be proud to demonstrate to your friends. The selectivity is almost as good as a super-het. Good sensitivity is ensured by the use of a screen-grid detector

a fixed condenser with a capacity of .001 microfarad. The tuned-grid circuit is tuned, of course, by the third section of the gang condenser. Reaction is controlled through a .0003-microfarad bakelite condenser.

Screen-grid Detector

A screen-grid valve is used for detection, as it imposes far less damping than an ordinary type of valve. The valve has to be run at somewhat reduced efficiency, as only

READY FOR THE CABINET
Here is a photograph of the complete set ready for fitting in the cabinet. This set, although only a straight three, is almost as selective as the super-het

120 volts are used for high tension. Accordingly, the input impedance is a little higher than usual, and by connecting the grid across the whole of the tuned circuit, it still does not introduce sufficient damping to spoil the selectivity.

Unorthodox Arrangement

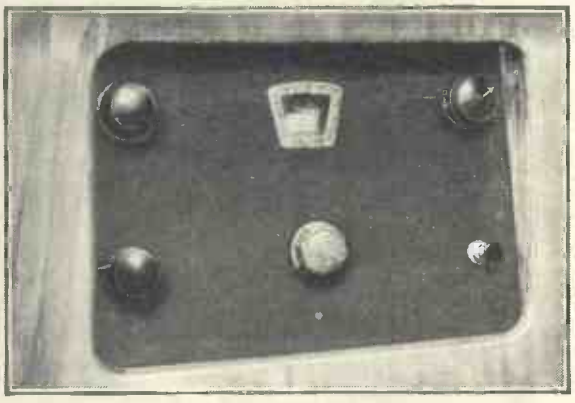
The feed resistance used has a value of 50,000 ohms, and this is decoupled through a 20,000-ohm resistance. This rather unorthodox arrangement gives an efficiency at least equal to that of an ordinary detector valve, but the damping is considerably less.

Mention must be made of the high-frequency filter in the anode circuit of the valve, consisting of a screened choke and two fixed condensers. Each of these has the rather unusual value of .0003 microfarad. The grid leak and condenser have values of 1 megohm and .0003 microfarad respectively. The grid leak is not connected to the filament, but goes to the centre point of a potentiometer, which consists of two 500-ohm resistances connected across the filament. This arrangement gives the correct operating point under the conditions chosen.

Reaction is perfectly even, and there is not the slightest suspicion of any overlap. It is actually possible to obtain knife-edge control in the region of 200 metres, a point at which so many sets become inefficient. The same degree of reaction control is obtained over the entire tuning range.

The inter-valve transformer has a ratio of 6 to 1. This gives sufficient gain to load the pentode valve. At the same time, the frequency characteristic is such that the slight bass loss compensates for the top loss due to side-band cutting.

The matter of the loud-speaker in a set of this type is of some importance and I have designed the set to give an even balance with a special Rola model. The pentode correction is by no means normal because there is already a lot of side-band cutting, and it is not necessary to reduce the high frequencies to any appreciable extent.



LAYOUT OF THE CONTROLS
In the centre is seen the main tuning control, on the left is the series-aerial condenser above the wave-change switch, and on the right is the reaction control above the on-off switch

Accordingly, use is made of a .002-microfarad condenser across the loud-speaker transformer. This condenser is actually mounted on the loud-speaker itself.

The layout of the set is a matter of extreme importance. If it is not followed in exact detail, it is quite possible that the set will oscillate owing to the stray coupling. The increased efficiency of the coils makes them far more prone to oscillate.

It may be thought that the arrangement of the components violates certain accepted principles. In fact, it actually does so because there are quite long grid leads. It so happens that by doing this other difficulties are overcome, and the grid leads are far enough away to cause no trouble. If a careful study is made of the layout and the photographs, there should be no difficulty whatever in successfully wiring the set.

Drilling the Panel

First of all the panel should be marked out and the holes made for the aerial-series condenser and the reaction condenser, in addition to the coil switch, filament switch, and, of course, the main tuning condenser and escutcheon opening.

The three-gang condenser is provided with brackets so that it can be mounted on its side. This brings the trimmers to the top—a very important feature as considerable accuracy is necessary in trimming the set. The trimmers are provided with separate screens.

Additional Screening

It will be found that the base of the condenser has openings below the stators. I have found that with certain valve combinations in which the efficiency is a little greater than normal owing to the permitted tolerances, there may be a tendency for self-oscillation. This is due to insufficient screening. Accordingly, a small aluminium or tin plate should be cut and screwed over the back of the middle-gang opening—i.e., the grid-circuit condenser of the high-frequency valve.

There is a screw hole directly above this opening and there is a screw supplied with the condenser which can be used for this purpose.

This extra screening may not be enough, and accordingly another small screen is bent up in the form of a channel. Stout tin plate or a strip of aluminium can be used for this.

These two screens may not be necessary, but I highly

recommend that they are fitted in the first place.

The first component to fit into position is the variable condenser, but this should not be done until the three wires have been fitted to the stators. The first or back section is used to tune the BP1 coil. This requires a grid wire projecting in one direction only.

The middle and back sections that tune the two grid circuits require wires projecting in both directions, as they have to go to the coils on the left, and the grids of their respective valves on the right, that is looking from the front of the panel. These wires should be covered with sleeving and left rather longer than required.

Mounting the Components

Next, the three coils should be assembled in line and screwed down to the baseboard. It is then best to mount all the valve holders, chokes and small condensers, and then commence the wiring. All the filament wiring and the short leads between the chokes, valve holders, and other small components can be wired up, and finally the condensers and resistances on the back of the set can be fitted into position.

Connections are made to the batteries by means of an eight-way battery cord. Having carefully checked over the various leads and made quite sure that the separate strands of the multiple cable are properly identified and labelled, a test can be carried out. I recommend that the set is tested out of the cabinet.

"Topsy-turvy" System

Testing should be carried out by a method, which I have found extremely helpful, and I believe it is frequently referred to as my "topsy-turvy" system. First of all, switch on the filament and see that the filament circuits are through and that there are no short circuits on any of the high-tension leads. Place the pentode in its socket and adjust the grid-bias plug to 4.5 volts. Switch off the filament and insert the main high-tension wander plug in the 120-volt tapping and the pentode priming grid at about 100 or 120 volts. On switching on the filament, there should be a "plop" in the loud-speaker indicating that everything is in order.

Next insert the detector valve in its socket, which is the front holder

Fine Results On Test

THE FINISHED SET
The Tyers Iron-core Three in its special cabinet is an attractive outfit. Every constructor will be amazed at the selectivity of the set

TWO brief test periods were enough to convince me that this set has sensitivity above that of an ordinary three-valver. Being summer time, with long daylight periods, it was impossible to compile a very large station log, but a quick run round the dials at 8 p.m. brought in about thirty programmes, loud enough to be of real entertainment value.

Forty-five Stations

A further hour was devoted to the test of the set between 11 p.m. and midnight, when darkness had set in. During this period forty-five stations were heard, of which eleven were obtained on the long waveband—quite good for this time of night when many of the Continental stations had concluded their programmes.

Selectivity was of a high order and it was possible to separate stations within a few kilocycles of each other. Mühlacker could be received at loud-speaker strength with only a very faint background of London Regional.

Long-wave Results

On the long waves Königswusterhausen was obtained clear of Daventry National—a really rigid test of the set's capabilities.

There are three alternative aerial tappings provided. Using an aerial of normal length I found it best to work on the tapping for maximum signal strength, and control selectivity by the series-aerial condenser.

Quality is pleasant and on a moving-coil loud-speaker the reproduction has a pleasing brilliance.

Simple Ganging

The process of ganging is comparatively simple, as only one trimmer, the one farthest away from the panel, is critical.

The use of a screen-grid valve in the detector position seems to be a great advantage in this set as it allows full advantage to be taken of the efficiency of the new iron-cored coils.

In order to assist readers in the tuning of their sets, I have given the dial readings of a few key stations. I am sure that, with careful handling, this set is capable of bringing in at least sixty stations during the course of a few evenings. S.R.W.

Dial Readings of the Key Stations

LONG WAVES

Station	Dial Reading
Warsaw	115
Eiffel Tower	120
5XX	137
Königswusterhausen	147
Radio Paris	160
Huizen	179

MEDIUM WAVES

Station	Dial Reading
Fécamp	25
London National	43
Turin	48
Scottish National	56
Hilversum	60
North National	63
West Regional	67
London Regional	91
Scottish Regional	102
Leipzig	108
Midland	111
North Regional	154
Brussels	164
Budapest	178

THE BACK OF THE SET
A photograph of the set neatly fixed in its C.A.C. cabinet, complete with batteries and loud-speaker

near the panel, and connect the lead from the high-frequency choke. The screen of this valve has a separate wander plug, which should be given approximately 60 volts. If this valve is given a gentle tap there should be a slight noise in the loud-speaker.

First Sounds

Next, take the aerial wire and tap it temporarily on to terminal 3 of the TG coil. It should now be possible to tune in the local station, and the reaction control should be working perfectly. This proves that everything is in order as far as the detector—that is, working backwards.

Make certain that the .001-microfarad fixed condenser goes to terminal 2 on the T.G. coil.

Now connect the screen-grid amplifier and adjust the screen tapping, which has a separate wander plug, to about 80 volts, and, of course, connect the bias plug to 1.5 volts. This time connect the aerial to the proper aerial terminal. The set, of course, will not be in gang.

Ganging the Set

Ganging should preferably be carried out at night when stations are coming in at good strength. Probably the easiest way to gang the set is to screw up all the trimmers as far as they will go, and then turn them all back about half way, giving them each the same number of turns.

Tune in a station somewhere round about 300 metres. First of all turn the back trimmer until the station is brought to maximum volume. Next make a similar adjustment to the middle trimmer, and finally the front trimmer.

Next tune in another station somewhere in the region of 230 metres and make a minute adjustment of the back trimmer. You should find that your previous setting is correct.

Do not put too high a voltage on the screening grid of the detector valve. If you do its efficiency will fall tremendously. If you put too much voltage on the screen of the high-frequency amplifier there may be a tendency for self-oscillation, while if it is increased still further the amplification will fall.

There should not be the slightest difficulty in obtaining from sixty to seventy stations.

If you happen to live a few miles from a main broadcasting station, you will find it necessary to utilise the last aerial tap when receiving on near-by wavelengths, and it is for this reason that I have arranged alternative sockets at the back. By putting the volume condenser at zero and using the last tap, it should be possible to obtain the local stations without blasting, unless you have a very large aerial.

Indoor Aerial Results

In this case I suggest using the maximum aerial tapping and about two or three yards of wire as an indoor aerial. Incidentally, all the main stations should come in on an indoor aerial in many localities. Normally, it is best to operate with the volume condenser fairly fully in.

Operating Hints

When receiving on a wavelength near that of the local stations, the aerial-series condenser should be reduced and greater use should be made of reaction. It will be found possible to tune in most of the main stations simply by the condenser adjustment.

The performance of the set approaches that of a super-het, and this is obtained with only three valves and a high-tension consumption of 6 or 7 milliamperes. This, I think, is sufficient evidence of the value of an efficiently designed iron-cored coil.

COMPONENTS YOU WILL NEED FOR THE TYERS IRON-CORE THREE

	£	s.	d.
CHOKES, HIGH-FREQUENCY			
2—Wearite screened, iron-core type	0	8	0
COILS			
1—Set of Wearite Nucleon iron-cored coils, types BP1, BP2, TG, senior models	1	17	6
CONDENSERS, FIXED			
3—T.C.C. .0003-microfarad, type 34	0	3	9
1—T.C.C. .001-microfarad, type 34	0	1	6
1—T.C.C. .002-microfarad, type 34	0	1	6
1—T.C.C. .02-microfarad, non-inductive type	0	1	9
1—T.C.C. .1-microfarad, type 65...	0	1	8
4—T.C.C. 1-microfarad, type 50...	0	10	0
2—T.C.C. 2-microfarad, type 50...	0	7	0
CONDENSERS, VARIABLE			
1—Utility .0005-microfarad three-gang with disc drive, and trimmer screens type W314/3...	1	7	6
1—Magnum .0005-microfarad aerial condenser	0	2	6
1—Utility .0003-microfarad reaction, type W298	0	2	0
EBONITE			
1—Peto-Scott 13½ in. by 8 in. by ¼ in. panel	0	5	0
HOLDERS, VALVE			
2—W.B. four-pin, miniature type	0	1	0
1—W.B. five-pin, miniature type	0	0	8
PLUGS AND TERMINALS			
2—Belling-Lee, type M, marked: Aerial and Earth	0	0	9
3—Belling-Lee insulated sockets, type 1071, marked: Aerial, Aerial 1, Aerial 2	0	0	6
2—Belling-Lee spade terminals, marked: L.T.+, L.T.— ...	0	0	4
1—Belling-Lee banana plug ...	0	0	2
1—Set Belling-Lee eight-way battery cord, 30-in. type	0	3	6
RESISTANCES, FIXED			
1—Packet of 8—B.A.T., 1-watt type, consisting of two 500-ohm, two 5,000-ohm, one 20,000-ohm, one 50,000-ohm, one 100,000-ohm and one 1-megohm ...	0	7	0
SUNDRIES			
Tinned-copper wire for connecting, say	0	0	9
Length of oiled-cotton sleeving, say	0	1	0
Small length of rubber-covered flex, say	0	0	6
1—Small ebonite strip for terminals and sockets, 1 in. by 3 in., say	0	0	4
SWITCH			
1—Bulgin junior on-off, type S38	0	0	10½
TRANSFORMER, LOW-FREQUENCY			
1—R.I. Hypermite, ratio 1 to 6, type DY20	0	12	6

ACCESSORIES

	£	s.	d.
BATTERIES			
1—Ever Ready 120-volt high-tension, Popular type	0	15	6
1—Ever Ready 9-volt grid-bias, Winner type	0	1	0
1—Smith's 2-volt accumulator, type 2RGN11	0	14	6
CABINET			
1—C.A.C. Norfolk model	1	15	0
LOUD-SPEAKER			
1—Rola permanent-magnet moving-coil, type F5PM-PDT ...	1	12	6
VALVES			
1—Osram S22	0	16	6
1—Mullard PM12A metallised ...	0	16	6
1—Osram PT2	0	17	6

Light-sensitive Cells

An Interesting Sideline for Experimenters

By PERCY W. HARRIS, M. Inst. Rad. E.

LIGHT-SENSITIVE CELLS

Two Osram photo-electric cells. That on the left is the type KMV6 or CMV6; the electrode system can be clearly seen in the right-hand photograph

Many experimenters who have been building straight radio sets for years are looking round for something new in the constructional line. In this article (which is the first of a series) Percy Harris suggests that there are great possibilities in the photo-electric-cell field; he explains just what a photo-electric cell is and what it can be made to do.

The cost of experimenting with photo-electric cells is comparatively low and there is a great deal of fun to be had in this way. In future articles of the series details will be given of the necessary apparatus needed to carry out simple experiments.

THE true radio experimenter—by which I mean the man who does not take everything for granted and likes to find out facts for himself—has usually acquired over a time a number of condensers, coils, transformers, resistors, and the like out of which he can "run up" experimental circuits at short notice. To this type of reader this article is specially dedicated.

Following New Tracks

It is often not only a relief, but most helpful, to get away from the regular lines of wireless experimenting, and to follow new tracks at least a little way to see where they lead. In this manner we come back fresh to the truly radio problems, and often the special knowledge so gained comes in unexpectedly useful.

Take, for example, the branch of science which we may call "photo-electrics."

Before the valve came along and provided a practical means of faithfully magnifying minute voltage and current changes, the fact that certain substances altered their resistance under the influence of light was not regarded of any special commercial importance, but was looked upon rather as a scientific novelty or "stunt."

Early Work

No doubt the so-called "practical" men of the time sneered openly at those research workers who endeavoured to find out all there was to be known about such substances as selenium which, when connected to an electrical circuit, is found to vary in resistance according to the intensity of the light falling upon it.

"Why don't you do something useful?" I can hear them saying. "How is anybody going to benefit if you *do* find out just why these peculiar effects occur?" I don't suppose they got any satisfactory answer, for the true research worker is rarely actuated by a motive of gain or particular advantage anywhere—he is just dominated by a desire to find out *why* things happen and what new facts can be elicited by experiment.

Actually, however, the information laboriously gained and accurately recorded formed one of the firm foundations upon which television has been built and television—although it has a long way to go yet before it reaches even the crude state of the earliest motion pictures, in spite of the highly optimistic and sensational publicity which seems to surround it—will, in the future, be of very considerable importance and utility.

Furthermore, although they did not know it (perhaps they would not have done the work if they did!) these scientists were laying the foundation for the modern talking picture.

But to become more detailed. At a comparatively small expenditure, the practical wireless amateur can learn a great deal about the interesting branch of photo-electrics, as so much of the apparatus necessary for the chief experimental work is either immediately available to him or can be "knocked up" from his spare parts and scrap box.

Practical Applications

The present-day practical applications of photo-electric cells cover television, the wireless transmission of pictures, switching on and off street lamps at sunset and sunrise, counting various manufactured products as they pass out of the machine, stopping printing machines if the paper should break, helping the blind to read by the production of sound from printed matter, the detection of the presence of smoke and therefore fire, the operation of burglar alarms, the setting in motion of apparatus to take a flashlight photograph of a person crossing the threshold of a particular door, and, last, but not least, the reproduction of sound-on-film talkies.

Distinct Asset

I have probably missed out quite a number of practical applications, some of which may be more important than a few of the instances named, but from what I have told you you will see that a knowledge of photo-electric work may be a distinct asset to the wireless experimenter and may come in very useful at some

time when he is not expecting it.

In a subsequent article I hope to give practical details of experimental work showing you just what to do and how to do it inexpensively. Meanwhile, in the present article I want to deal with general principles so as to give you a good idea of the basis of the art.

Photo-electric Cells

The most important unit in this work is a device known as a photo-electric cell. This may take one of many forms, it may be self-generating —that is capable of producing a current when connected into a suitable circuit merely by the action of the light itself, it may be of a type which just varies its resistance according to the intensity of light falling upon it and thus requiring in circuit with it a source of voltage; or it may be of the kind which looks very much like a wireless valve, having the same general form and even the same pins in the base, operating by means of an electronic emission from a cathode to an anode. This last type is that most used at the present time, particularly in the talkie world.

Photo-electric cells differ from one another very considerably in their characteristics. Some may be very sensitive but may have a considerable "time-lag," that is may be sluggish in their response to changes of light.

Others may have as little time lag as a wireless valve but may be so insensitive as to be practically useless for commercial work.

Others may combine sensitivity with a short life or great liability to damage with a slight overload—you will see that which kind you choose will depend upon a number of factors.

The earliest form of practical light-sensitive cell was made of the substance selenium, which, when suitably treated, has the peculiar property of varying its resistance according to the amount of light falling upon it.

As it is desirable that the maximum surface of the material should be exposed to the action of the light, the selenium cell can be a very thin sheet of the material cut in such a way as to give a long path of travel for the current.

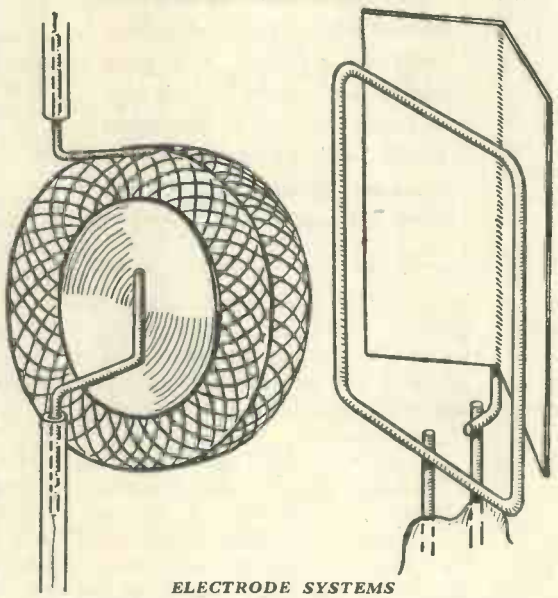
Selenium does not take a very large part in most of the applications of light-sensitive cells to-day, but in the last few years very considerable practical improvements have been made in cells using this material and there has been somewhat of a revival of its use in certain directions.

One of the disadvantages of selenium is that in most cases cells made with it have a very considerable time-lag, that is it will not respond sufficiently rapidly to light changes. The absence of an appreciable time-lag is of the utmost importance in such sound reproduction work as sound-on-film talkies.

In the reproduction apparatus of talkies a beam of light is projected through a narrow slit on to what is known as the "sound track" of the film on which variations of sound have been recorded as variations of opacity.

As the film passes the slit the light projected through it varies according to the density, while on the other side the light is received upon the active surface of a photo-electric cell.

The variations of current so brought about are magnified and ultimately turn up as sound reproduction from the loud-speakers. It follows that unless the cell will respond without appreciable lag to variations of sound up to eight or ten thousand a second we cannot get the quality of reproduction at which we aim.



ELECTRODE SYSTEMS

These diagrams show two typical electrode assemblies for photo-electric cells; they are two-electrode arrangements

Recently a most interesting photo-electric cell known as the "photronic cell" has been produced by the Weston Electrical Instrument Company, of Newark, New Jersey. This is one of the few self-generating cells, for the light falling upon this cell is converted directly into variations of voltage and a current will flow in a circuit connected to the cell whenever light falls upon it.

The photronic cell is remarkably sensitive and whereas in many photo-electric cells we are concerned with microamperes or millionths of an ampere, the photronic cell will give as much as 2 milliamperes when quite a medium light of day falls upon it.

Emission of Electrons

You will notice I have entitled this article "Light-sensitive Cells" rather than "Photo-electric Cells," as "photo-electric cell" has come to be recognised to mean one particular kind of cell, that is one in which there is an emission of electrons forming a current from an emitting cathode to an anode.

Strictly speaking, of course, a selenium cell is a photo-electric device, but it is now more usual to call it a "photo-conductive cell" and to keep the term "photo-electric" for the electron-emission type.

The study of photo-electric devices began as long ago as 1888 and by 1905 the main principles of these devices had been established although, of course, in those days the thermionic valve was not available for magnification purposes.

Modern photo-electric cells are of many types, but all depend upon the fact that certain metals emit streams of electrons under the influence of light and that if some collector is made positive in relation to the electron-emitting surface of metal the current will flow in the circuit connecting the cathode and anode.

These cells will invariably be found to be sealed—generally in a glass bulb and often the bulb is evacuated. This is not because a vacuum is necessary for their operation (some cells, as we shall see, are gas-filled), but because most metals which are of any use for this purpose oxidise immediately on exposure to air and so we must either seal them

in a vacuum or else introduce into the sealed chamber some inert gas with which the metal cannot combine.

With such readily oxidisable metals it might be wondered how a pure, untarnished surface can be prepared inside the bulb; in order to do this the manufacturers frequently have recourse to the distillation of metal.

Vaporised Metal

In this process the metal is actually vaporised in the bulb and on cooling forms a metallic surface on its walls. A similar process is used in the manufacture of modern valves to clean up the last remains of gas in the bulb and the vaporised metal so deposited on the wall gives a characteristic mirror-like appearance.

As a matter of fact, if you take an old valve of this kind and, after slowly warming it, hold one side in a flame for a moment the metal can often be re-vaporised from this hot portion and will settle again on the cool electrodes of the valve, thus leaving a clear space.

The makers of photo-electric cells, after causing one of the sensitive metals to be deposited on the cool glass walls of the cell, remove the coating in one part so as to form a window and as arrangements have previously been made to establish contact with the metallic coating inside the photo-electric cell, it is easy to see that a wire can be brought through the " pinch " to form a cathode.

How about the anode? This can take several forms and is often a metallic ring placed in the centre of the bulb in such a way that it does not appreciably hinder the passage of light through the window to the emitting surface of the cathode but when made positive will collect the electrons emitted and so enable us to get our current.

Rare Metals

The rare metals which have this photo-electric property in a useful degree are sodium, potassium, rubidium, caesium, lithium, strontium and barium. You will notice that all of these metals are of the kind found only in combination in nature and never in the pure metallic state.

They vary in their sensitivity, or rather, in their electron-emitting properties for a given amount of light, but those named will all respond to visible light.

Certain other metals, notably platinum, tungsten and cadmium give no appreciable emission with a visible light, but will respond to certain invisible rays, such as the ultra-violet, X-rays and others of very short wavelength.

There is a very important difference between the photo-electric cell and the selenium cell. If we have a selenium cell in which the active surface is 1 in. square and we have a photo-electric cell of a similar active area 1 in. square, then with the selenium cell our effect will depend upon the *uniformity* with which we spread the given amount of light, whereas with the photo-electric cell our effect will be the same if we spread the light uniformly over the surface or concentrate it all in one small spot.

In other words, it does not matter whether we have a weak emission all over the surface or a strong emission from one part, the total electron emission will be the same in both cases, for the same total light. This difference between photo-electric cells and selenium cells may, of course, have a very important bearing in some practical problems.

Another interesting point about photo-electric cells is the variation of their emission with the colour, or better expressed, the wavelength of the light falling upon them. If we plot the curve of a photo-electric cell showing wavelength of light against emission we shall always find in cells sensitive to visible light that there is a sharp peak somewhere and, indeed, it is only in this peak that the strength of the emission becomes really useful.

In preparing the cells great improvements have been made in the last few years, although the difficulties are such that it is still impossible to produce photo-electric cells with the same uniformity of characteristics as, for example, the modern thermionic valve.

One comparatively recent improvement consists in depositing the active metal as a thin film on a conducting surface so that the underlying conductor can establish good electrical contact.

The thin film of metal on glass, while a conductor, is often of too high resistance to be really satisfactory and the new method has therefore certain distinct advantages. Not only is the conductivity of the cell improved in this way but certain other beneficial effects appear, all of

MAKING LIGHT DO WORK

With such cells as these (Osram KG7 on left and the Gecovalve on the right) light can be made to do useful work

which are not fully understood as yet.

By the use of these thin films on conducting surfaces in place of the thin films on glass, it is now possible to use photo-electric cells in regions of the spectrum which previously were unavailable for photo-electric work.

Earlier in this article mention was made of " time-lag " in light-sensitive cells. There is a very distinct time-lag in the case of selenium, although it has been reduced in modern forms of selenium cells, but in the photo-electric cell there is no time-lag whatever in the emission itself, or rather none which makes the slightest practical difference in any application of photo-electric cells to date.

Valve Amplifier

This does not mean, however, that we may not have time-lag and equivalent troubles in apparatus using photo-electric cells, for it must be remembered we need a valve amplifier and the circuits of this in conjunction with the photo-electric cell may give trouble.

For example, it is impossible to make such a cell without some capacity between anode and cathode, and a certain time must be taken to charge this capacity. In practice, of course, capacities are kept as low as possible and the utmost care is taken in the design of the amplifier to prevent distortion.

(*To be continued*)

RADIO MEDLEY

A RADIO FAN'S CAUSERIE :: By BM/PRESS

A RIVERSIDE COMPANION

There is no doubt that the increasing popularity of motor-car radio will be reflected in greater interest in out-of-doors radio generally. Here is a Marconiphone portable in use

Cathode-Ray Television

For some time I have been of the opinion that the solution of the television problem will be found outside the realm of mechanics; in other words, when moving parts are no longer needed.

I was particularly interested to see at Ponders End the other evening a demonstration of the cathode-ray system developed by Mr. T. W. Price, of the Ediswan Company.

The apparatus used was such that a skilled constructor could put it together in a week or two. The expense would be rather on the high side; on the other hand, there is a never-ending opportunity for real experimental work. At present all the power is being obtained from batteries, and there is great scope for mains operation.

The interesting point about the system is that there are no moving parts; the cathode-ray tube acts like the power valve in an ordinary receiver, except that the movement of the electrons is visible on the opaque screen at the end of the tube instead of producing sounds from a loud-speaker.

The picture appears on a light-green background. At present the detail is poor and is not to be compared with some of the results I have seen with mechanical systems. Nevertheless, it has great promise, for it is only in its infancy and has been developed in a matter of months and not of years.

A cathode-ray tube for this purpose can be bought for about £7. Some people are frightened when they hear that 800 volts are needed to operate it, but they need not be, for the current consumption is measured in micro-amperes—not even in milliamperes.

The life of the batteries is therefore practically whatever their shelf life would be if they were not in use at all.

Ediswan are to be congratulated on producing such an interesting proposition for the more ambitious constructor. I shall watch further developments with interest.

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New Valves

If you are a mains man, by which I mean if you use all-electric sets, you will have some trouble this autumn in making up your mind as to what valves to use in the various stages.

Will you put your faith in Catkins or high-frequency pentodes for the radio frequency stages?

And will you use a plain diode, a double-diode-triode or a double-diode-pentode for the detector?

Or perhaps you will wait until the advent of the hexode if you want a combined oscillator-detector for a new super-het?

Really, there are so many new valves in the offing that it is no easy matter to keep track of them all. It is certain that during the next year the design of mains sets will be completely revolutionised; which leads me to prophesy that there will be a tremendous revival of home construction in the autumn.

It is a pity that the battery user is being left rather out in the cold as far as new valves are concerned. It seems as if he will have to be content with Q.P.P. and class B. Still, I shall not be surprised to hear of some new battery valves soon.

Inventive Genius

Nearly every amateur constructor at some time or other evolves a gadget which he hopes will enable him to make, if not a fortune, at least a nice little nest-egg. He thinks that if only he could take out a patent he would be walking on clover.

It is pretty safe to say, though, that less than half the wireless patents taken out ever bring any financial return to the inventors. And it is seldom indeed that an impartial adviser can recommend an amateur to apply for a patent.

If you think you have hit on a bright idea, however, you will want to look into the possibilities a little closer. To this end I recommend to your notice a small book published at 5s. by Herbert J. W. Wilberforce, of 101 Leadenhall Street, London, E.C.3 (available in pamphlet form for 8d., post paid).

Mr. Wilberforce is a patent agent, and his remarks are intended for the layman. He explains just what can and cannot be patented, and, if it can, how to set about it. The legal technicalities are made very clear, and can be understood by everybody.

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Wireless History

Those who take more than a passing interest in radio will like to read "Wireless Over Thirty Years," by R. N. Vyvyan, published by George Routledge & Sons, Ltd., at 8s. 6d. This is a book of 256 pages, with sixteen photographic plates and twelve diagrams.

The best way to give you an idea of the scope of this book is to run through the chapter headings, which are as follows :—

Early Pioneers; Marconi's Early Work; Poldhu and Newfoundland Experiments; Transatlantic Wireless; Incidents in a Wireless Engineer's Career; Carnarvon and the Other Wireless Stations; History of Imperial Wireless Communications; History of Beam Development;

Modern Commercial Wireless Stations in England; Wireless in War on Land; Wireless in War at Sea; Wireless in War in the Air; Wireless to the Rescue at Sea; Wireless Marine Communication; Wireless for Aviation; British Post Office Contribution to Wireless Development; Commercial Wireless Telegraph Development; Broadcasting—Development; Broadcasting—Present-day Problems; Wireless as a Career; and Research Problems.

As you will see, there is plenty of meat in this book for the enthusiast. One of the most interesting photographs is a portrait of Capt. H. J. Round, with whose contributions to "Wireless Magazine" you must be familiar.

Capt. Round dislikes publicity intensely, and this is the first photograph of him I have ever seen. He must have a high regard for Mr. Vyvyan! He was one of his associates in the Marconi Company.

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Iron-Cored Coils

From recent conversations I have had with interested manufacturers it seems that the making of iron-cored coils in quantity is not all milk and honey. Let us hope that the makers will have enough sense to hold their hands until they can supply coils without any snags.

One manufacturer took some new coils along to the "Wireless Magazine" laboratory for test; he was most enthusiastic about their performance. Of course, they were the best yet produced.

In due course they found their way to the test bench, when it appeared that they were by no means the best. In truth, they were very much the worst. Followed agitated conversations between the test department and the designer. The coils were replaced in a hook-up, which was carefully studied by the coil designer.

Eventually the latter found that all the sample coils he had submitted had been wound with the wrong gauge of wire! They have now been put right, and are working satisfactorily, I understand. What a life!

Ultra-Short Waves

There has been great excitement in the short-wave world (of which I am not yet an active member) over the 5-metre tests carried out from the Crystal Palace. Although theoretically these waves should not penetrate further than a beam of light, signals were picked up at a distance of over 100 miles. That is the chief cause of the chatter.

It is by such achievements that the amateur still leads the way in some branches of radio. The power used for the test was very small indeed, so the results are of all the more importance.

It is impossible to say how far these short waves will develop during the next ten years. It seems pretty certain that they will play an increasingly important part in radio communication of the future.

Even with present-day apparatus, television could be made reasonably satisfactory as a source of entertainment on such wavelengths.

Although we already have the Heaviside layer and the Appleton layer, I see the Marchese Marconi is searching for a third (and higher) ionic layer to explain these long-distance results on very short waves.

The result of his experiments will be eagerly awaited. May he be successful!

Screened Aerials

For some time I have been one of those who say that the aerial can be neglected now that receivers and broadcasting stations are so efficient. But that does not mean to say that I am not interested in the possibilities of the new screened downleads.

It is a fact that a great deal of the mush heard when receiving weak stations—and sometimes loud ones—is picked up by the aerial.

The addition of a screened down-lead does, in many cases, lead to greatly improved results as far as the elimination of background noises is concerned.

Most of the interference heard is radiated from the electric light wiring system, especially if you happen to be on A.C. mains. Interference is often caused when you use vacuum cleaners, refrigerators, or other electrical appliances. The motors in these gadgets are the main cause of the trouble.

If you are one of those who suffer from interference from some near-by electrical plant, I strongly advise you to look into the advantages of a screened down-lead. It may make all the difference between good and bad reception—as I know it has in two particular cases.

BM/PRESS.
London, W.C.1.

A FAMOUS 'CELLIST AT HOME

The famous 'cellist, Beatrice Harrison, whose playing is answered by the nightingales, faces a Philips microphone in her garden

RADIO COMPLETES THE PICNIC

Another photograph showing the advantages of radio out of doors. This portable receiver is a model 255 Marconiphone

The ALL-METAL FOUR

Here we present details of a fine A.C. receiver that looks both good and and is good technically. Great sensitivity is ensured by two variable-mu screen-grid stages, and selectivity is taken care of by a new type of iron-cored tuning coil

BY THE "W. M." TECHNICAL STAFF

WE are pleased to present to readers an A.C. four-valver that is really the last word in modern design. The set, which is built on a metal chassis, employs the new Catkin valves. That the set looks good is fully shown by the illustrations in these pages, and that it works well is shown by the special test report that appears on page 567.

Mechanically Robust

The "Wireless Magazine" Technical Staff have spared no pains to make this set a really first-rate job. It is very robust mechanically and so far as possible shielded components have been used to take advantage of the high efficiency of the valves.

Another feature is the use of new iron-cored coils, which add greatly to the sensitivity and selectivity of the set. The beginner at home-construction may fight shy of building a set that is built up on two sides of a metal chassis. Let us assure him at once that the construction of the All-metal Four is no more difficult than a set built on the ordinary type of wooden baseboard.

There will be no constructional troubles if the layout and wiring diagram or, better still, a full-size blueprint, is closely studied when the set is being built.

A few words about the technical side of the set. The circuit arrangement comprises two screen-grid variable-mu high-frequency stages, followed by a screen-grid detector, which is transformer-coupled to a pentode output valve delivering an undistorted output of about 2 watts —sufficient for all domestic purposes.

All the power needed for running this set is obtained from A.C. mains. Rectification is obtained by means of a full-wave rectifying valve in the conventional way.

It will be noted from the circuit diagram that we have not used a band-pass filter arrangement in the aerial-tuning circuit. During the preliminary tests of the set we found that the selectivity was adequate without the use of this arrangement. Tuned-grid coupling is used in the high-frequency stages. A feature of the set is the use of semi-variable coupling condensers, giving constructors a variable control of selectivity, which they can adjust to suit their individual requirements.

Thus listeners living in remote districts are assured of getting the best possible results from the set. Special provision is made for those who are, unfortunately, living in the swamp area of Regional transmitters. A separate aerial tapping, which places a small semi-variable condenser in series with the aerial, will enable normal results to be obtained from the set in the swamp areas.

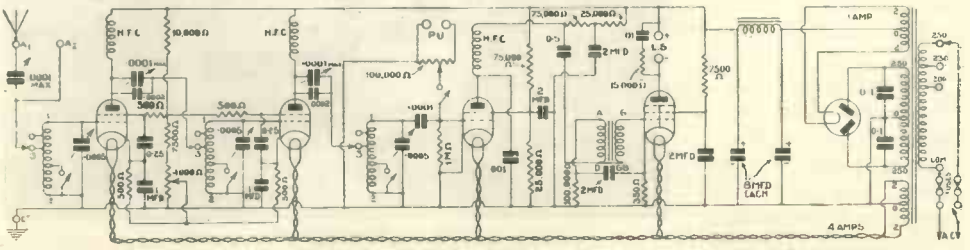
All-metal Valves

The introduction of the new Catkin valves, with their rigid construction and non-microphonic properties, simplifies the use of a screen-grid valve as the detector, without the usual disadvantage of instability and microphonic noises.

A great advantage of the screen-grid valve as detector is that it is extremely sensitive to small signals and, as its inter-electrode capacity is negligible, there is little damping introduced into the preceding circuit. Thus it is possible to make full use of the high selectivity of the iron-cored coils without the necessity of a

CIRCUIT DIAGRAM

The valve combination consists of two variable-mu stages, screen-grid detector transformer-coupled to a pentode output stage. A valve rectifier is used for the A.C. mains supply



reaction control to offset the damping of the detector valve.

Control of volume is effected by the usual potentiometer controlling the amount of grid bias on the variable-mu high-frequency valves. This method of controlling volume ensures that quality does not deteriorate when the volume of the set is reduced.

High Magnification

The coupling between the detector and the output stage is so designed to take full advantage of the high magnification that can be obtained from the screen-grid detector. Here the detector is auto-transformer coupled by means of a small high-permeability-cored transformer having a high primary inductance.

The usual filter, consisting in this case of a 20,000-ohm resistance in series with a .006-microfarad condenser, is connected across the loud-speaker terminals to prevent high-note distortion arising from the use of a pentode valve in the output stage.

Two sockets have been fitted to the back of the set for the plugging in of gramophone pick-up leads. We have fitted a 100,000-ohm pick-up volume control, so arranged that, when the control is turned to zero, the pick-up is automatically switched out of circuit. Therefore the pick-up can be left attached to the set when radio is being received.

The set has been fully decoupled and the use of metal-chassis construction greatly helps high-frequency stability. The usual method of automatic bias, consisting of fixed resistances inserted in the cathode circuit, is used.

Although all the essential details for the construction of the set are included in these pages, many readers will prefer to construct their set from a full-size blueprint. Building a set on a metal chassis requires a very careful study of the wiring plan. Wires may come from a component on the top of the chassis and pass through a hole in the chassis to a component fixed underneath.

The full-sized blueprint shows clearly the position of every wire and also the best order of fixing the wires. A full-size blueprint of this set can be obtained for half price, that is 9d., post paid, if the coupon to be found on the last page is used before July 31. Address your application to "Wireless Magazine" Blueprint Department, 58-61 Fetter Lane, London, E.C.4, asking for No. WM329.

The metal chassis for this set is supplied by the makers completely drilled, and ready for mounting the components. It will be noticed from the list of parts that no alternatives are specified. If readers use other than the parts specified, the chassis drillings will, of course, be incorrect and further holes will be necessary.

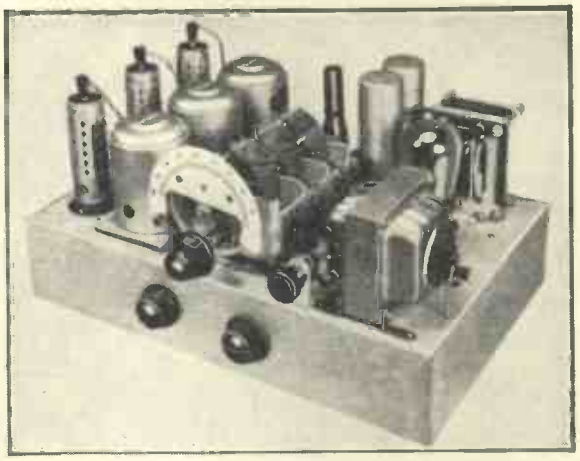
The first components to be mounted on the chassis are the five valve holders. Each valve holder is secured by two nuts and bolts.

Fixing the Components

Then the chassis should be turned upside down and the underneath components, consisting most of fixed condensers, high-frequency chokes, and the low-frequency transformer, should be bolted in position.

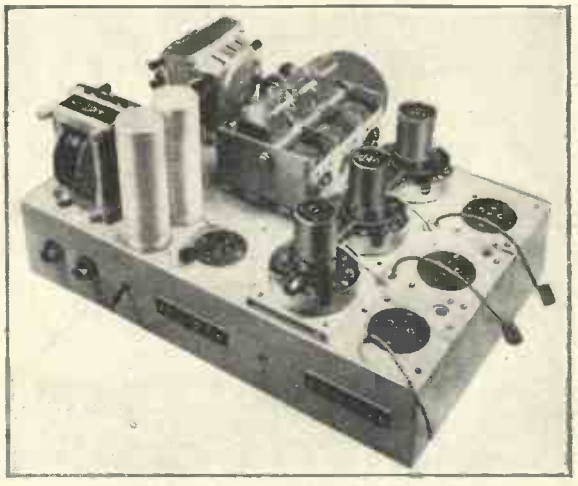
The fixed resistances should be placed in position when the set is being wired; many resistances being suspended in the wiring.

It should be remembered that every bolt is fitted with the screw head projecting above the top of the chassis and the fixing nut is always underneath. Therefore, it is always



WITH ALL-METAL VALVES

The three screen-grid Catkin valves can be seen on the left of this photograph. The two in the foreground are the variable-mu high-frequency valves and behind them is the screen-grid detector. As far as possible shielded components have been used

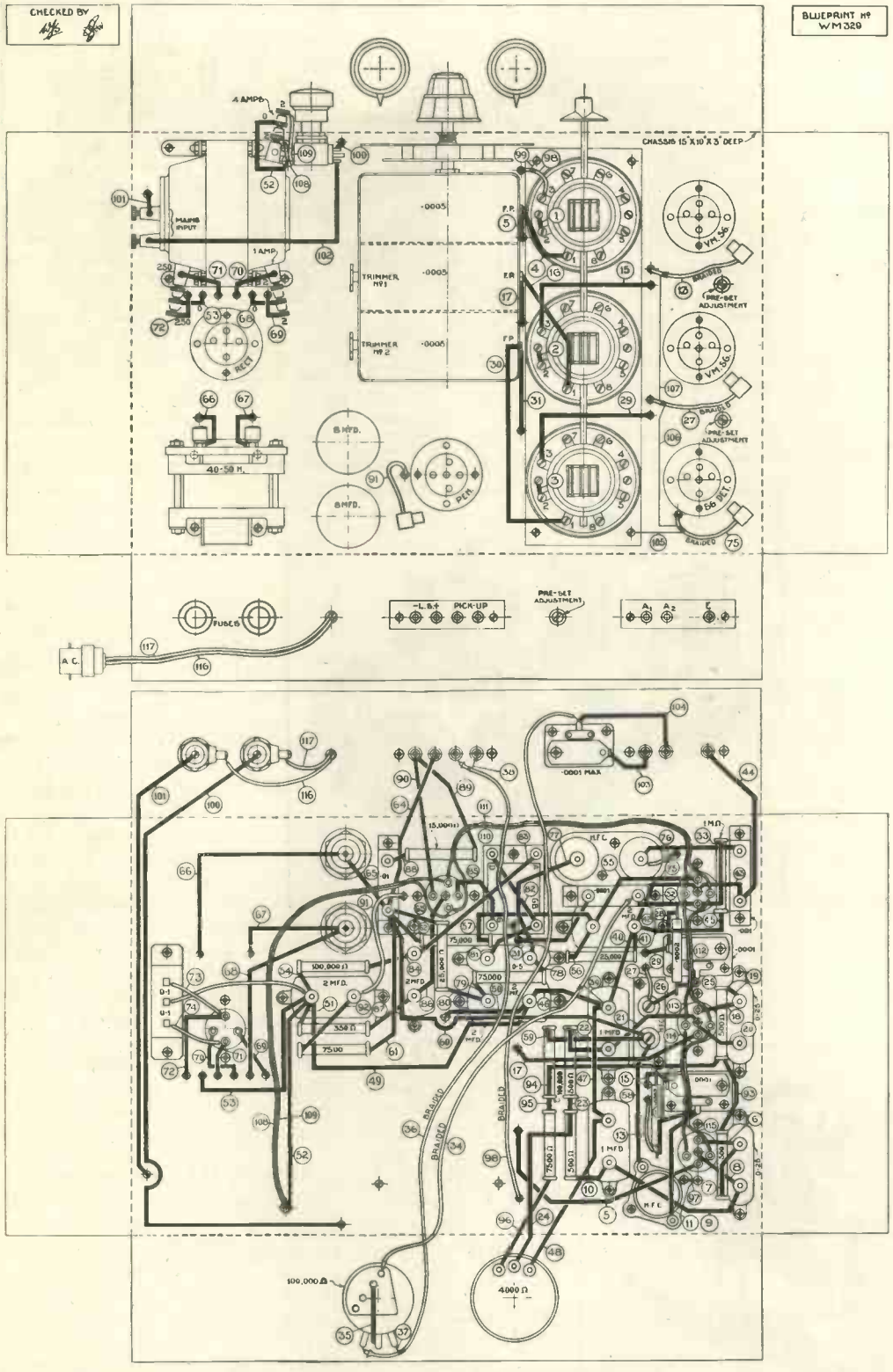


CONVENTIONAL CHASSIS CONSTRUCTION

A photograph of the All-metal Four, showing the set without the valves and the coil covers. The terminal strips fitted to the back are clearly engraved. Note the use of anode connectors for the screen-grid valves and the pentode—a wise precautionary measure

SIMPLE COMPONENT ARRANGEMENT

The extreme simplicity of the layout of the components on the top of the chassis can be seen from this photograph. Note the unusual shape of the Catkin pentode valve, which is placed between the electrolytic condensers and the coils



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

A full-size blueprint of the All-metal Four can be obtained for half price, that is 9d., post paid, if the coupon on the last page is used before July 31. Ask for No. WM329

essential that the underneath parts are fitted first, because many of the bolt heads for the underneath components are covered by the parts fitted on the top of the chassis. The last components to be fitted are the two potentiometers, which must be insulated from the chassis, and the chassis-mounting fuses and terminal strips. If constructors rigidly follow this order of fixing the parts to the chassis, they should experience no more difficulty than in the construction of a receiver built up on the baseboard method.

The wiring of all "Wireless Magazine" sets is simplified by the fact that every wire is numbered. The numbering of the wires is carefully arranged, so that if the set is wired in the ascending numerical order, construction becomes an easy task, even for the beginner.

Wiring Up

When you are wiring up the All-metal Four, start with wire No. 1 and continue in ascending numerical order. When a wire is connected to a fixed resistance, the connection from the other side of the resistance should be made. It will prevent confusion if the number of the wire is crossed out on the blueprint when the connection has been made.

Before Tests

After the set has been built and before it is tested, the valves should be inserted in their correct holders and the mains transformer adjusted to the voltage of the house mains.

The mains transformer is adjusted by taking out the screw on the side of the transformer and rotating the voltage adjuster to the correct house

Putting the Set Through Its Paces

READY FOR USE

When you have built the All-metal Four you will be proud of the outfit. The results will please even the most critical listener. This set will bring in all worth-while stations at good strength

IT is not often that I handle a receiver which embodies all my personal fads and fancies. The All-metal Four, which I have just tested is certainly the last word in A.C. fours, judging by its fine overall performance.

A Garden Test

The hot weather makes conditions very trying for set testing, particularly indoors, so I decided to give the All-metal Four a test in the garden.

I threw about 20 ft. of wire over the nearest tree and pushed an earth pipe into the ground—a garden lamp provided me with the necessary A.C. plug point. These conditions could hardly be called ideal, but even so, results on the long waves were outstanding.

Wide Wave-range

Nine stations were received at entertainment value, with only the slightest variation of the volume control.

An interesting feature of this set is the extensive wave-range covered. On the long waves Huizen and Croydon came in with a wide margin to spare at both ends of the dial.

On medium waves, between 5 and 7 p.m., thirty stations were picked up, giving thirty programmes really worth listening to. This is not a great number, but how many receivers will pick up thirty stations at this time of the year on a twenty-foot aerial by simply turning a single knob? After dark the number of stations picked up should, of course, be doubled, or even trebled, but at 5 p.m. this was certainly a good performance.

Selectivity was of a very high order, in fact reminiscent of a super-het. Such stations as Breslau, Poste Parisien and Brussels were received without any interference or sideband splash. This set proves what a combination of good design and good valves and coils will do.

My test of the All-metal Four was the first time that I had tried a receiver using the new iron-cored coils. If this receiver is a typical example of the selectivity and sensitivity obtainable from iron-cored coils, we have again passed another milestone in radio progress.

I had a feeling that the extreme selectivity must be due to the very short aerial I was using in the garden, so to prove the point I dropped the whole set into the dicky seat of my car—Catkin valves, remember—and took it to a near-by farm where there is a seventy-foot aerial, trailing round the house.

The change to the longer aerial had no detrimental effect on the selective properties of the set except that Daventry and Königswusterhausen were more difficult to separate; but it could be done. On the other hand, the average signal strength increased considerably, and I feel sure that with more time to spare I could easily have logged all the worth-while European stations.

Logging Stations

A list of stations was then quickly made. I only logged those that could be picked up easily by merely "twiddling" the tuning dial.

I was not surprised to find that this list soon went up to forty stations. Each station gave a programme really worth hearing.

Fécamp was heard at full loud-speaker strength at a reading of 22 on the tuning dial. This set will be ideal for those listeners whose local stations are working around 210 metres.

To give an example of the excellent reproduction I obtained from the All-metal Four, a friend who was listening commented on the very realistic speech, saying that it gave the impression of the announcer being right in front of the listener.

The volume from a pick-up arrangement gave ample output for quite a large room, and the quality was again good. K. J.

Stations Logged on the All-metal Four

LONG WAVEBAND

Croydon	Eiffel Tower
Oslo	Daventry National
Kalundborg	Königswusterhausen
Motala	Radio Paris
Heston	Huizen

MEDIUM WAVEBAND

Fécamp	Brussels No. 2
Trieste	Strasbourg
Gleiwitz	London Regional
Hörby	Hamburg
Frankfurt	Scottish Regional
London National	Leipsig
Lille	Midland Regional
Turin	Söttens
Heilsberg	Katowice
Bratislava	Athlone
Bari	Rome
Scottish National	Beromuenster
Hilversum	Langenberg
North National	North Regional
West Regional	Prague
Goteborg	Brussels No. 1
Breslau	Vienna
Poste Parisien	Munich
Milan	Budapest

COMPACT ARRANGEMENT
This photograph shows the completed set housed in the Camco cabinet and ready for use

On the left of the main tuning is the knob for changing the wave range of the iron-cored coils and on the right is the main on-off switch. Underneath on the left is the grid-bias control on the variable-mu valves and to the right of that component is the gramophone volume control, which incorporates the gramo-radio switch.

Operating the set is a very simple procedure that any member of the family will be able to do with little practice. The tuning control is turned to the station desired and the volume is adjusted by means of the control on the left.

We have mentioned previously in this article that the gramophone pick-up can be left permanently connected to the set. When it is desired to bring this pick-up into use, the volume control on the left should be turned to zero and the control on the right turned until the record reproduction is heard at the strength required.

When the set is being used for radio, the right-hand volume control must be turned to the left until the pick-up is switched out of circuit.

Ganging is Simple

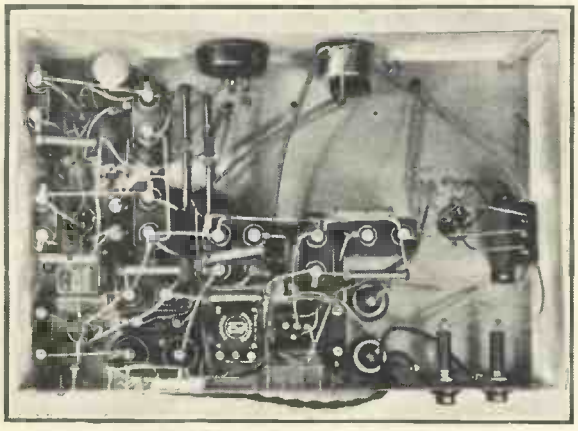
Many people fight shy of a set using a three-gang condenser because they worry unnecessarily about ganging troubles. This set is very simple to gang. The set should be tuned to a station on a wavelength of about 300 metres and the auxiliary trimmer on the front set to the middle of its course.

The centre trimmer on the condenser should then be adjusted until the signal is heard at maximum volume; then the same procedure should be carried out with the other trimmer on the condenser. Final adjustments can be made by means of the hand trimmer as each station is tuned in.

We are confident that this set will give an outstanding performance. It will greatly help the work of our technical department if readers give us their opinions on the set's performance.

voltage. The voltage to which the transformer is adjusted is shown through a small aperture on the side. Then the screw should be re-inserted and tightened. The leads to the house supply are taken from the two fuses fitted to the back of the set.

All the controls can be clearly seen from the photographs on these pages. It will be noticed that the three-gang tuning condenser is provided with an auxiliary trimmer fitted in front of the main-tuning control.



UNDERNEATH THE CHASSIS
It must be remembered by constructors that this set is quite easy to build. Most of the resistances are placed in position when the set is being wired

COMPONENTS YOU WILL NEED FOR THE ALL-METAL FOUR

CHOKES, HIGH-FREQUENCY

	£	s.	d.
1—Goltone, binocular type ...	0	2	9
1—McMichael, junior binocular type	0	4	0
1—Wearite screened, type HFP...	0	3	6

CHOKE, LOW-FREQUENCY

1—Parmeko, type A40/50... ...	1	1	0

COILS

3—Varley screened dual-range iron-cored, type Nicore BP30 ...	1	11	6

CONDENSERS, FIXED

1—Dubilier .0001-microfarad, type 620	0	2	0
2—Dubilier .0002-microfarad, type 670	0	2	0
1—Dubilier .001-microfarad, type 620	0	2	0
1—Dubilier .01-microfarad, type 620	0	3	0
1—Dubilier .2-microfarad centre-tapped, type BE31L	0	3	0
2—Dubilier .25-microfarad, type BB	0	4	6
1—Dubilier .5-microfarad, type BB	0	2	6
2—Dubilier 1-microfarad, type BB	0	5	0
4—Dubilier 2-microfarad, type BB	0	14	0
2—Dubilier 8-microfarad, electrolytic, 450-volt peak working type	0	11	0

CONDENSERS, VARIABLE

1—J.B. Unitune three-gang with disc drive, type 2070	1	7	0
3—British Radiophone .0001-microfarad preset condensers ...	0	6	0

HOLDERS, VALVE

4—Clix 5-pin, chassis-mounting, type B	0	3	0
1—Clix 4-pin chassis-mounting, type B	0	0	8

METAL CHASSIS

1—Magnum special metal chassis, ready drilled for the All-metal Four	0	7	0

PLUGS AND SOCKETS

1—Clix 4-socket chassis-mounting strip with plugs, marked: L.S.+, L.S.—, Pick-up (2) ...	0	1	4
1—Clix 3-socket chassis-mounting strip with plugs, marked: A1, A2, E	0	1	1
4—Belling-Lee anode connectors...	0	1	4

RESISTANCES, FIXED

1—Packet of 15 Erie 1-watt type, consisting of 1- 350; 4- 500; 2- 7,500; 1- 10,000; 1- 15,000; 2- 25,000; 2- 75,000; 1- 100,000 ohm, 1- 1 megohm	0	15	0

RESISTANCES, VARIABLE

1—Preh 100,000-ohm potentiometer combined with switch, type Luxus 6004PCS/GI/K ...	0	7	0
1—Magnum 4,000-ohm potentiometer, type 1120	0	7	6

SUNDRIES

Tinned-copper wire for connecting, say	0	1	0
Lengths of oiled-cotton sleeving, say	0	2	0
Length of rubber-covered flex, say	0	0	6
Length of Goltone shielded cable ...	0	0	9
4—Bulgin matched knobs, type K12 (2), K13, K14	0	1	9
A quantity of 6BA round-head bolts with nuts, length ½ in. and ¾ in. assorted, say	0	3	0
2—Belling-Lee 1-amp. panel mounting fuses	0	3	0
Small bracket for mounting mains switch, say	0	0	6

SWITCH

1—Bulgin mains on-off rotary, type S91...	0	1	9

TRANSFORMER, LOW-FREQUENCY

1—R.I. Parafeed, type DY28 ...	0	8	6

TRANSFORMER, MAINS

1—Wearite, type T21A	1	5	0

ACCESSORIES

CABINET

1—Camco Empire table model, in walnut or mahogany	1	15	0

LOUD-SPEAKER

1—Igranic permanent-magnet moving-coil, type D9	1	12	6

VALVES

2—Marconi or Osram VMS4, Catkin type	1	18	0
1—Marconi or Osram MS4B, Catkin type	0	19	0
1—Marconi or Osram MPT4, Catkin type	1	0	0
1—Marconi or Osram U10 rectifier	0	12	6

Something New in Sound-film Technique

Making Sounds from Drawings

By RENE LEONHARDT

DRAWING SOUNDS FOR A FILM

How the wave characteristic of the vowel "a" is drawn on a strip of paper. On the left can be seen the sound track for running through a projector

AN unusual film, entitled "Die tönende Handschrift" (literally translated "The Sound Manuscript") has been running for some time in Germany. The performance opens with an explanation of the making of the film and is followed by an excellent rendering of Handel's "Largo."

Created on Paper

The sound in this case has not been produced by musical instruments or by any of the new electrical instruments and then recorded on the sound film, but has been created on paper with the aid of compass, brush and pen, first leaping into life and producing audible sound when passed through a sound-film reproducing apparatus.

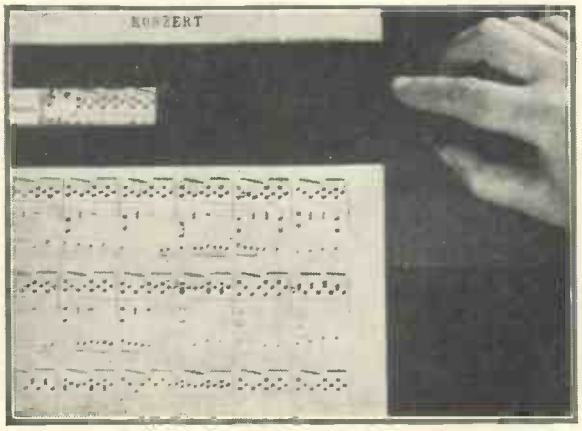
How is this possible? We all know that sound is nothing but certain undulatory movements of the air, which excite acoustic impressions in our ears. The especial characteristics of these undulations can be recorded with the aid of electrical instruments such as the oscillograph.

Thus with this instrument it is possible to record in continuous succession every tone of a violin to characterise accurately from these oscillographic records the individual sounds on paper. This results in a series of sound templates, or, so to speak, in an alphabet including every tone of the violin.

If, by reversing the process, several sound templates are arrayed together so as to constitute a melody, then photographed in suitable reduced proportion on the sound track of a film, and the latter is run through a sound-film reproducing apparatus, the loud-speaker *emits a melody which has never originated from a musical instrument.*

New Kind of Music

Probably it was deliberations such as these which culminated in the invention of the film "Die tönende Handschrift" by a German named R. Pfenninger. It is, however, not Pfenninger's intention to reproduce graphically the tones of well-known musical instruments such as the violin, the piano, etc. On the contrary, his aim is to construct music of entirely new timbre.

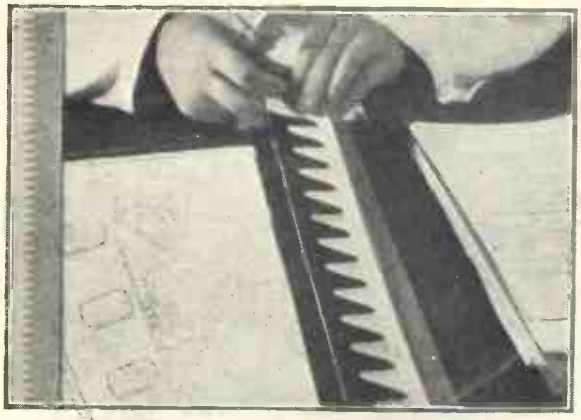


COPYING MUSIC FROM THE SCRIPT

The score is covered by a movable shutter and converted note by note into the "wave script" for projecting through a talkie reproducer

TONE TEMPLATES FOR MAKING FILM

Tone templates prepared for the sound film, "Pitch and Patch," one scene of which is reproduced on page 571. A whole series of these is needed for each film



PHOTOGRAPHING THE SOUND STRIPS

One sound strip after another is clamped into a frame and photographed from above by an ordinary cinema camera

In this respect he can already claim to have had a considerable measure of success with the Largo film. The timbre is quite unusual, varying between that of the violon-cello and the organ. At present three sound films of this kind are being displayed in Germany.

The Pfenninger graphical method of sound production has become a serious competitor of the modern electrical instruments, the products of the recent advancement in electrical acoustics. Pfenninger's process is still very intricate and laborious, and as yet no one else is capable of composing Pfenninger's "sound manuscript." Meanwhile the "sound manuscript" must remain an interesting curiosity.

Mechanical Production

Pfenninger hopes to perfect a method whereby sound waves can be "written" mechanically. It is said that he is at present constructing a contrivance resembling a typewriter, which, instead of letters, will set together wave signs in succession.

Setting Up and Printing

It will naturally be essential to have a separate "sound-waves typewriter" for every timbre, in view of the various characteristics of the sound waves. Setting up and printing of sound writings is quite within the realm of possibilities.

It is feasible that speech and songs could be produced on paper in a similar manner. *If this were to materialise we could then hear words and songs which have never issued from a human mouth.*

In the spring of 1931 an Englishman, E. A. Huphrias, had actually succeeded in drawing the words "all of a tremble" in wave script on paper and in producing them audibly with the aid of a conventional sound-film reproducing apparatus in the ordinary way.

AT WORK ON A FILM

Rudolf Pfenninger at work on the recording table. In front of him is the frame with the template of a single tone

But this invention does not seem to suffer comparison with the artistic value of Pfenninger's invention. Huphrias probably diligently studied the markings of various vowels and consonants on a film track and simply copied them.

Perhaps the Pfenninger method may also be suitable for retouching purposes. For instance, the hissing sounds of spoken words which are suppressed during the recording of the sound film could be subsequently replaced by drawings. Likewise it may be feasible to re-write an old Caruso record in sound script on paper by means of an oscillograph, purify the high tones by drawings, and eliminate the needle and other noises by retouching.

It remains to be noted that the idea of reproducing music by a graphical method is one of those inventions which have been worked on at different places without the inventors knowing anything about each other.

Gramophone Experiments

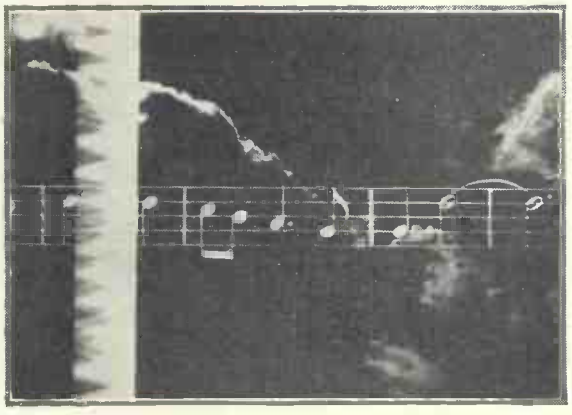
A similar idea, namely, the manual recording of notes in connection with the gramophone, was mentioned in the year 1925 by Professor Moholy Nagy, and tests were made with a "drawn" gramophone record, which, however, proved to be useless. In 1925 Moholy Nagy indicated the possibility of graphical note reproduction in connection with the projection sound film.

Lately Oscar Fischinger endeavoured to attain similar results with his "sound ornaments," through a sequence of varied ornaments. While Pfenninger employs relatively short sound templates, Fischinger today uses paper rolls of many yards length which are reproduced after having been "written."

However, Fischinger's method has not yet reached a stage of practical utility.

A Note on the Pfenninger Method

SPECIAL NOTE.—It will help to an easier understanding of the extremely ingenious method adopted by Rudolf Pfenninger if we reason from a



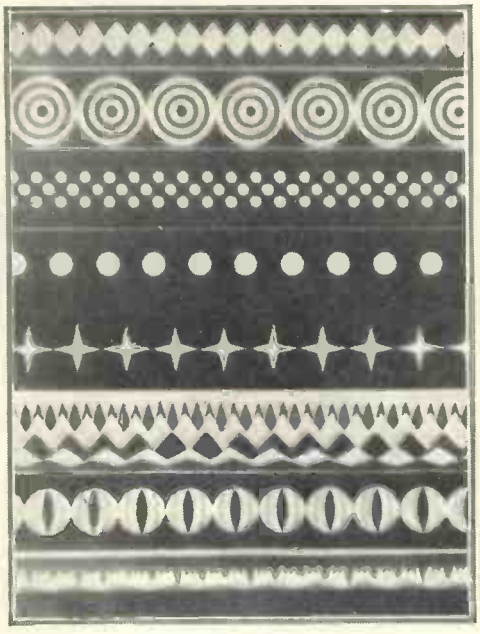
FROM THE FIRST DRAWN SOUND FILM

Part of the first sound film made without the use of musical instruments; every sound was made entirely on the drawing board

simple sound to one more complex.

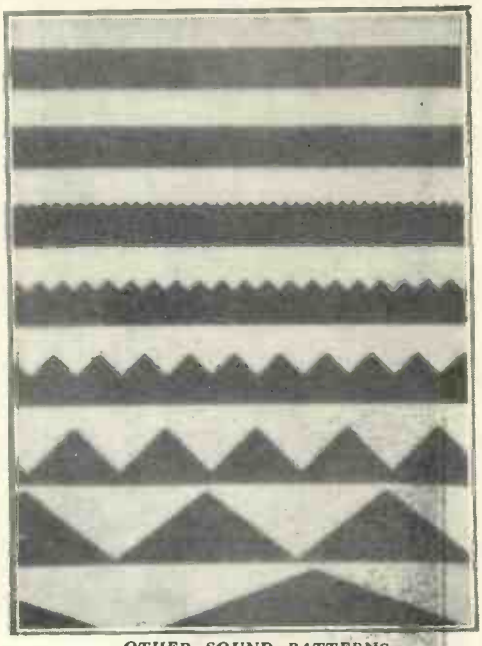
If, for example, we draw on a celluloid strip a pure sine curve, repeat it indefinitely, black out the lower half (or the upper—it does not matter which), and pass it in front of a photo-electric cell so as to intercept a beam of light falling upon the cell, then the varying width of the black portion will cause a variation of the light falling on the cell at a frequency depending upon the rate of movement of the strip.

If now we connect the photo-cell to an amplifier and loud-speaker, we can get a pure note so long as the strip maintains a uniform motion.



SYNTHETIC SOUNDS

When strips with these patterns are run through a talkie projector, they produce the sounds of a flute, electric bell, two bells, violin, motor-car, railway, bassoon, and a man's voice



OTHER SOUND PATTERNS

Further sound patterns drawn by Oscar Fischinger, who was also responsible for those shown in the photograph alongside. There is undoubtedly a great future for such synthetic sounds

Now a pure note of this kind is unpleasant and unmusical, if I may be permitted the term. It will sound quite different from the same note played on, say, a violin. Similarly, the violin note—let us take the middle C—will be clearly distinguishable from the middle C on an organ or piano.

Systematic Comparison

Let us next arrange to play the middle C on several different musical instruments and make a record of them on sound-film apparatus. This will enable us to compare the middle C, synthetically prepared from a sine curve, with those produced by the different instruments. We shall find the curves of all the notes, including our synthetic curve, will have peaks at the same and uniform distances,

A TRICK SOUND FILM

Another photograph of Herr Pfinninger at work on a scene for the film, "Pitch and Patch," a scene from which is reproduced

MADE WITHOUT ACTORS OR MUSICAL INSTRUMENTS

A scene from the sound film, "Pitch and Patch," a talkie made without actors and musical instruments

but the curves produced by the musical instruments will have complicated shapes, which, so to speak, are superimposed on a sine curve.

This is due to the fact that the musical instrument notes are *not pure*, being made up of other frequencies besides the middle C.

Further analysis will reveal the fact that the note of the violin differs from that of the piano by the differing proportions of the various harmonics and overtones present.

Harmonics are simple multiple frequencies and overtones submultiples, so if we draw other sine curves for these additional frequencies and superimpose them on our original sine curve we can exactly reproduce the characteristic note of *any instrument we like*.

Curve Repeated

Just as a sine curve exactly repeats itself every complete cycle, so a violin or other note repeats itself in its recorded curve at intervals dependent upon the distance between the beginning and end of the slowest cycle included.

It will thus be seen that stencils or printing cylinders can be prepared so as to reproduce with ease single or complex notes, *so long as they are sustained*.

When we come to chords, changing notes, *noises* (which can be looked upon as combinations of irregularly recurring peaks) and the like, a most careful study and understanding of the curves corresponding with particular sounds is necessary. *H.*

TESTING THEIR STRENGTH!
This interesting photograph shows how Catkins stand up to a bombardment from a toy cannon without damage

The STORY of the CATKIN VALVE

By MORTON BARR

THE appearance on the market of a new type of valve having so many interesting features of novelty as the Catkin comes as a welcome surprise.

Not, of course, that one wants to change one good thing for another merely for the sake of variety. But when novelty is combined with definite utility, the result spells progress—and from this point of view British manufacturers are to be congratulated on having stolen a march on the rest of the world.

Looking Abroad

For some time past we have got into the habit of looking abroad for our innovations. For instance, the class-B amplifier and the double-diode-triode valve came from America, whilst Germany produced the multi-stage amplifier housed in a single bulb.

But in this particular case we have got there first, and as it is likely that other countries will follow our lead, the electric-lamp type of valve may soon become obsolete.

The sceptic may ask: "Well, what is the big improvement? I agree that the Catkin is more robustly built, and will stand up to rough treatment—but who wants to throw his valves about, anyway?"

The best answer to this question is to be found in the old Scotch proverb which points out that "many a mickle makes a muckle."

First and foremost, the Catkin will do anything that a glass-bulb valve will do, and plenty more. The new method of construction allows not only of a more robust mounting, but also of a more exact alignment of the electrodes and, when necessary, of a closer spacing. This in itself ensures a better performance, and, above all, a more dependable and standardised performance.

In asking for a Catkin valve having a certain characteristic, one can be sure of getting it without being involved in subsequent trouble as regards matching and balancing.

Next there is the absence of secondary effects caused by the liberation of occluded gas whilst the valve is in operation, due in part to the more effective "furnace" treatment in manufacture and in part to the fact that as the anode is air-cooled excessive temperatures are avoided.

The flexible rubber mounting at the base of the electrodes ensures freedom from microphonic noise, whilst the electrodes themselves are firmly anchored in position by strong mica "spacers" fixed to rigid supports.

In addition there is the added convenience of compactness, which will tend not only to reduce the size of sets in general, but also the cost of packing and transport.

Sets can now be safely dispatched by rail or road with the valves already mounted in position, instead of having to be sent in a separate bulky package. The same applies, of course, to bulk consignments of individual valves.

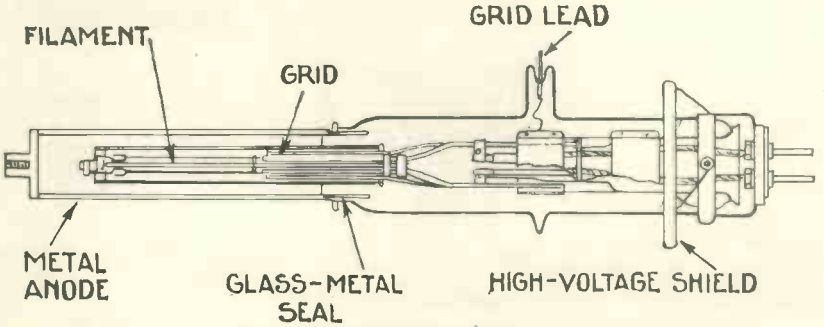
Replacing Breakages

The cost of replacing breakages *en route*, even with the present careful and expensive system of packeting, represents a very considerable item which is, of course, paid by the customer in the long run.

From this angle there ought to be another definite advantage coming to the purchaser—in the shape of a reduction in price—once the manufacturers have settled themselves well down to the job of mass-production.

Of course, it must not be assumed, simply because the Catkin valve made a sudden jump into the market, that it was born in a day. This is very far from being the case.

The problems associated with the change-over from glass to metal are



ORIGINAL OF THE CATKIN VALVE
The Catkin is a smaller edition of the cooled-anode transmitter valve as used in high-power stations. The anode is cooled by a continuous stream of water

many and intricate, and the cost of the plant required to carry out the new process is correspondingly high.

From one point of view this is all to the good since it helps to guarantee a high-quality product. No manufacturer is going to risk an enormous initial outlay unless he is confident that he can produce an article which will not only sell but retain the public confidence.

Standardised Product

Accordingly, once the metal valve is established we may expect it to remain as a more or less standardised product for many years to come.

The name Catkin is taken from the initials of the original "cooled-anode transmitter"—which dates back several years—plus the diminutive ending which labels it as a smaller edition.

An early C.A.T. valve designed in 1927 to generate an output of 15 kilowatts is shown on page 572. Actually it was the problem of increasing power which first turned the designer's mind to the desirability of replacing the usual glass bulb by a metal casing.

The maximum output which can be taken from any valve depends upon the power dissipated at the anode in the form of heat. In other words, the limit is in practice set by the temperature to which the anode can safely be raised without fusing. Obviously this will depend upon how effectively the anode can be cooled.

So long as it is completely enclosed inside an evacuated glass bulb, very little can be done in this direction since the bulb (unless it is made of expensive silica) tends to trap the heat and prevent radiation.

But if the anode is brought outside, that is, made to form part of the actual casing of the valve, then one can immerse it in a stream of water or other cooling fluid, and the problem is at once solved.

Since the inside space of the valve must be kept at a high vacuum, whilst the electrodes and the various leads have to be carefully insulated from each other, the ideal arrangement is a glass stub or mounting for the electrodes and the lead-in wires, combined with a metal anode forming part of the outer wall.

This, of course, involves some method of making a vacuum-tight "seal" between metal and glass.

By choosing a suitable mixture of nickel and iron it is possible to get an alloy which has the same co-efficient of expansion as glass. A ring of this alloy is first brazed on to the end of the tubular copper anode, and then—to make the connection absolutely air-tight—a thin film of copper is applied between the glass and the metal ring, before the whole is fused into one solid joint.

The success of the cooled-anode transmitter valve suggested to the valve-designer the possibility of turning out a mass-produced smaller edition, suitable for broadcast reception—but it took the best part of three years to complete the task.

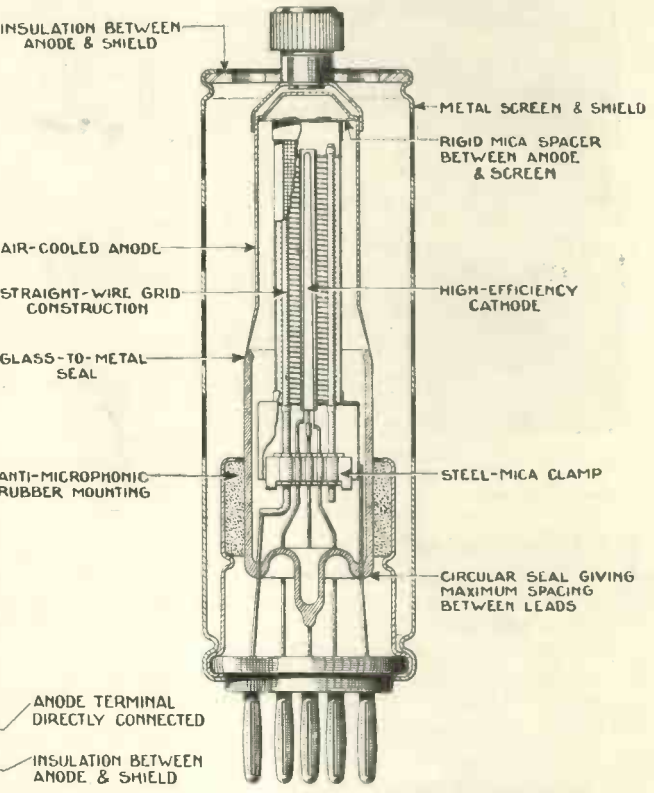
During that time a hundred and one production problems had to be solved, and a completely new design of electrode assembly worked out.

Amongst other things a particularly ingenious method was devised for securing the electrode supports in an insulated steel clamp, instead of in the usual glass pinch, the lead-in wires being passed through a glass disc so as to allow of ample spacing and freedom from leakage.

A Variety of Schemes

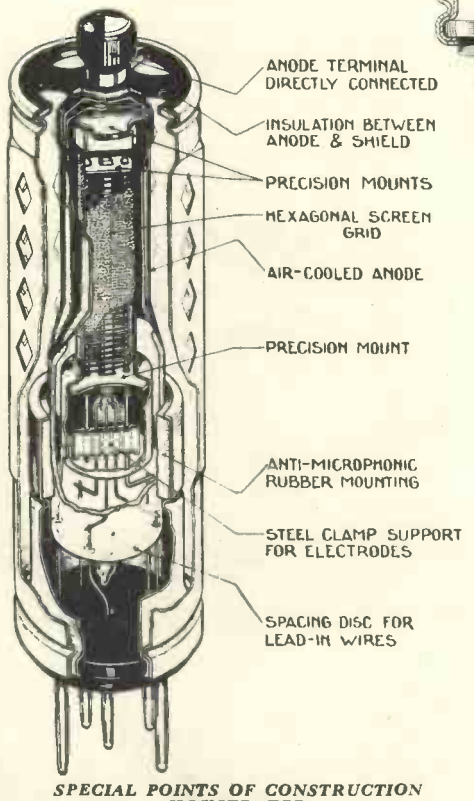
A variety of schemes for mounting the electrodes inside the valve had to be tried out and discarded, before the present system of using mica distance-pieces in combination with a straight-wire grid construction was adopted. Finally there were difficulties to be overcome in freeing the combined metal-glass tube from gas and occluded air.

One has, so to speak, to go behind the scenes to get a glimpse of the real life history of the Catkin valve.



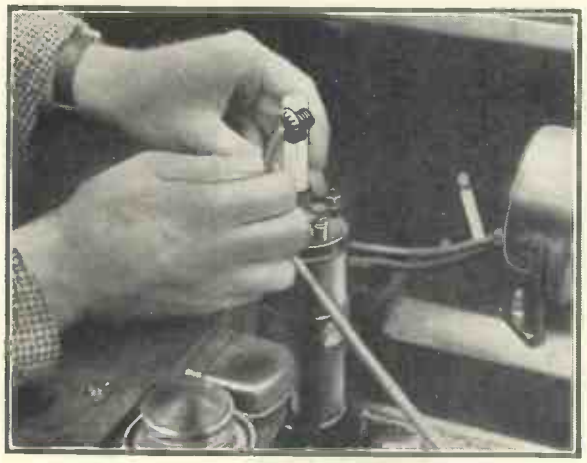
PARTS OF THE SCREEN-GRID CATKIN

This drawing shows the arrangement of the electrodes in the screen-grid type of Catkin valve; it is for A.C. mains sets



SPECIAL POINTS OF CONSTRUCTION ILLUSTRATED

Another drawing showing some of the special features of the assembly of a Catkin valve; this shows the screen-grid type



STOPPING CAR STATIC!
Putting the final touch to interference prevention in a car—the main distributor resistance being connected in the ignition system

Motor-car Radio

In this article KENNETH ULLYETT gives some practical advice on fitting a radio set on your car; he explains how to cut out ignition interference and obtain a supply of high tension. Reports on commercially produced car sets appear elsewhere in this issue

I CANNOT think of more than two reasons why everybody has not a wireless set fitted in the car.

One is that there is a mistaken impression about radio reception *en route* affecting the safety factor of motoring.

The other is that up to now only American-built sets have been available for fitting in cars. And these have been expensive. British amateur-built designs have not been a success and have suffered from lack of "punch," fading, and ignition interference.

Avoiding Snags

This summer, manufacturers have wakened up to these practical snags. I have just had an opportunity of testing one or two standard receivers in cars fitted with effective suppressors for cutting out ignition noise and the results have been extremely satisfactory.

Car motoring problems in the way of ignition and dynamo interferences are easily cured, as British manufacturers have brought out a number of resistances and condensers for inclusion in the dynamo and ignition systems.

American Practice

American radio outfits have always scored in freedom from electrical interference, and now that I have tried out some of these suppressors I know why.

Once you have got a perfectly clear background for reception you can use a really good set—even a super-het—without fear of getting high-frequency interference; and with a super-het the supressors prevent the intermediate stages from picking up extraneous noise.

And, what is far more important, when you have got a "clean" electrical background you can have a really stable set incorporating automatic volume control—as most of the American designers do—and so get over fading which has, up to now, prevented reliable radio motoring.

It all depends on that silent background.

After testing out these gadgets I find that there are three main sources of interference in a car. The plugs are the most troublesome, but the most easily cured. The spark gap, either in the case of the coil or magneto set, is a good "click" producer, and so in many French and American cars are the dynamo brushes.

Dubilier, Erie, and Claude Lyons are among those firms who make special resistance sets for cutting out interference on the ignition side; and Claude Lyons, who has had a great deal of experience with radio fitted to his own cars, makes complete sets, including resistances for each part of the circuit and shunt condensers.

Some of the accompanying photographs show various makes of suppressor, and the ways in which they are fitted to a car.

WHERE TO TAP IN FOR LOW TENSION
This Rotax system, typical of that fitted to many cars, has provision on the facia board for a plug which can be connected to the low-tension side of the set

Plugs are easily dealt with. You have only to connect a fixed resistance in series with each high-tension cable. This prevents the high-tension leads acting as miniature aerials for the high-frequency energy generated at the plug points.

The actual resist-

SILENCING THE DISTRIBUTOR
A fixed condenser can be connected at the distributor end, between the make-and-break gap and earth. This cuts out interference due to sparking at the points

ance value depends upon all sorts of factors; the compression ratio of the engine, the actual spark-plug gap, and the momentary surge voltage at the plug points.

Engine Revolutions

After testing various types I find that small cars with high-revving engines need series resistances of 12,000 to 20,000 ohms, while cars with slower-running engines of the Daimler and Bentley type will take series resistances of 5,000 to 10,000 ohms.

These values of resistance do not upset the ignition system, as the effective spark voltage is not reduced. It would no doubt be possible to use heavy-duty spaghetti resistances with oil-proof " macaroni " covering for these series resistances, but it is almost as cheap and far more satisfactory to buy the special resistances made up for the job.

These have porcelain or moulded containers which prevent a "short" in the high-tension circuit. They are fitted with combined clip-on and screw-down type terminals for either type of high-tension plug cable, and they have at the other end an "L" type of bracket which fits on at the sparking plug.

These resistances, you see, are connected directly to the ends of the plugs. But it would be possible to alter them for fitting down at the distributor end if the induction or exhaust manifolds come too close to the plugs to prevent the fitting of the noise suppressors.

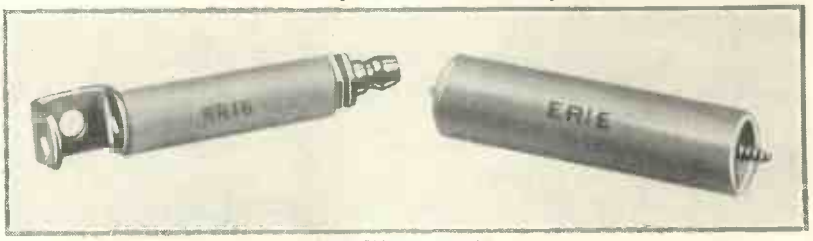
It is a good plan, especially in the case of coil-ignition sets, to have one common suppressor resistance in series with the main high-tension lead to the distributor.

Interference at the spark gap can be prevented by connecting a condenser from one contact to earth. In the case of coil-ignition sets, which are now almost standardised, it is very easy to connect this shunt condenser between one low-tension terminal to the coil and some earthed part of the dash support.

In the Claude Lyons suppressor kit this shunt resistance is included together with a bracket for mounting.

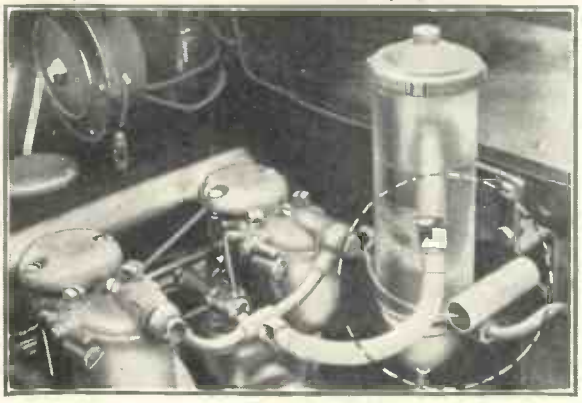
A COMPLETE HUSH-HUSH KIT

This kit of parts, made by Claude Lyons, Ltd., comprises suppressor resistances and condensers. These are now British made, based on extensive American experience, and the metal parts have a cadmium finish



FOR YOUR PLUGS

Some of the spark-plug noise-suppressor resistors made by Erie. These can be connected in the plug leads, or in the main lead to the distributor



PREVENTING PETROL-PUMP POPS!

Electrical accessories fitted to a car can cause radio interference. In the dotted circle a condenser is shown shunted across the contactor of an electrical petrol pump

None of these fitments will affect the normal working of the ignition, and, in fact, the fitting of an additional condenser in the low-tension circuit of a coil system often cuts down sparking at the points.

Dynamo interference must be cured by shunting condensers across the brushes. Ordinary 1-microfarad set-builder type fixed condensers will do. The best plan is to have a 2-microfarad centre-tapped condenser, or even a 4-microfarad job in some cases.

The centre terminal should be connected to earth through a fairly high lead, positively anchored to the chassis work. The two outer terminals can then be connected one to each dynamo brush.

As the working voltage of these condensers is generally twenty or thirty times the peak dynamo voltage, there will be no fear of a breakdown.

A final source of electrical noise capable of interfering with a wireless set is at the point where the set taps on to the low-tension supply—this only applies if the car battery is used to run the set. If you put a 4-microfarad condenser across the supply to the set you may find, as I did on one car, that a great deal of crackling is cut out.

High-tension Problem

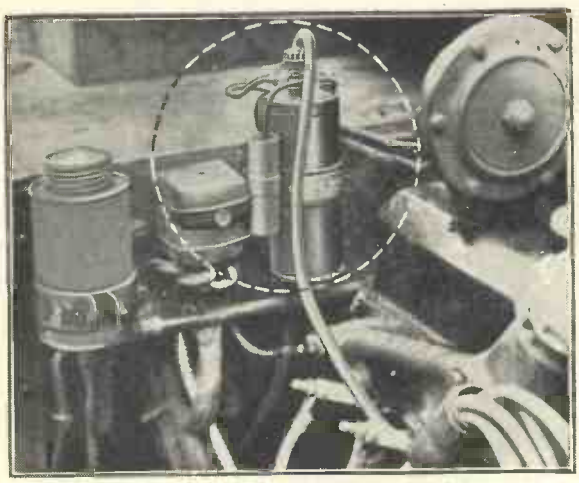
When the electrical side of the car equipment has been effectively silenced with spark-plug suppressors and shunt condensers, and when a noise-free aerial has been fitted in the roof, the high-tension problem has to be settled.

A special set designed to be permanently fitted in the car can have a class-B output stage, so that you can run from dry batteries with a quiescent current of only five or six milliamperes.

Separate Remote Control

As class-B output is being fitted to many transportables this year, there is no difficulty about getting high-tension economy in this way. What is really needed, however, is a class-B output fitted with separate remote control for car use.

When in the car, the portable could be worked from batteries, the high-tension current consump-



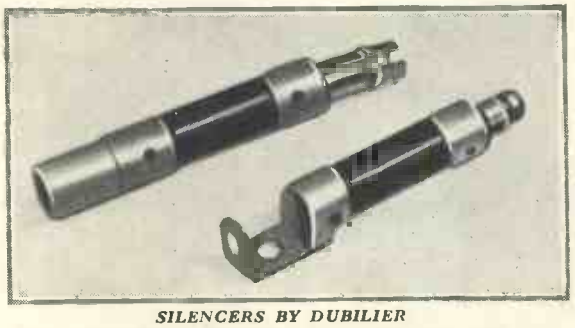
SILENCING THE COIL

A Claude Lyons fixed condenser (part of the complete kit), fitted to the low-tension side of the spark coil to cut out radio interference

tion being very low because of the class-B arrangement. For home use, the set could be detached and used with a valve or metal rectifier from the mains.

If you want to make a thorough job of high-tension in the car, then use an M.L. converter, made by the Rotax people, or one of the small high-tension converters made by the Electro Dynamic Construction Co. These work off the car battery (or a separate 6-volt accumulator) and give 120-150 volts output.

A series resistance in the input to the drive side of the converter is sufficient to regulate the voltage, so that the outfit can safely be used off the car battery and will not be subject to change of voltage, as the car battery charges up. This type of high-tension supply is used on all the radio-equipped police cars.



SILENCERS BY DUBILIER

These spark-plug noise-suppressor resistors are made by Dubilier. They have oil-proof casings

An alternative to the comprehensive portable designed specially for car use is the midget set which takes up so little room that it can be hung on the facia board of the average car and measures only a few cubic inches, so that it won't get in the way.

American Designs

American designers have concentrated on this type of set and at least two are now available in this country, the Emerson and the Radiette. These are both four-valve midgets. The latter weighs only about 6 lb., and measures about 9 in. by 6½ in. by 4 in. The agents for this are the Anglo Auto Accessories Co., Ltd., of 11 Great Queen Street, W.C.2.

No remote controls are used on either set, as the front of the panel is very attractive and the set can easily be hooked on to some part of the facia-board equipment.

Indirectly-heated 6.3-volt valves are used, and sets of this type can be used on the mains or in the car.

A Welcome Sign

It is a welcome sign that a number of London car dealers are now showing portable sets in their showrooms. In the early days of motoring lamps and all electrical fittings were charged as extras. By next season a radio set may be considered just as essential a part of the equipment as is an electric heater nowadays!

You've only to try a good set in your car for a short trip to realise what a convenience it is, if not a necessity.

Adding A Pick-up to A Class-B Set

THE driver valve of a class-B amplifying stage requires, generally, 3 or more volts. This is the peak voltage needed to give the full output of from 1 to 2 watts according to the valve used from the nearest B valve.

Insufficient Output

If, now, a pick-up is connected to the grid of the driver valve, the result will, as a rule, be poor, because while some pick-ups with the louder records will give a volt or two, when used with average or the more quiet records, the output voltage from the pick-up may be of the order of only .5 volt.

With a carefully-designed transformer to couple the pick-up and the grid of the driver to the class-B valve, the results may be quite fair, particularly if the pick-up is a really sensitive one. But experience indicates that in most cases it is desirable to use an additional stage before the driver.

The pick-up may be connected directly to the grid of this additional valve and the valve itself may be resistance-coupled to the driver. Resistance coupling and amplification of fifteen or twenty might be obtained, so it will be seen that there is a margin of safety.

If this valve is normally used as a detector in a wireless receiver then it will probably be transformer-coupled to the driver valve.

The magnification provided by the stage will then be from thirty to forty or perhaps a little more, and it will be necessary to use an effective volume control across the pick-up in order to avoid overloading the driver.

Overloading the Driver

It is the driver valve which is most likely to be overloaded out of the three to which we have referred, particularly if this valve has been rather overbiased in order to reduce its anode current to the smallest possible value.

This combination with a pick-up provides results which must surely be a revelation to battery users who have in the past had to be content with the results obtained from a rather small pentode in the output stage. It is certainly well worth trying.

W. James

BETTER BROADCAST VARIETY

By WHITAKER-WILSON

TELEVISION IMPRESSIONS

Laurie Devine in one of Whitaker-Wilson's choices for programme of impressionists. She is seen here preparing for a television broadcast

BY now, we are all thoroughly used to glancing down a programme of variety or vaudeville and making a shrewd guess as to whether it will be worth our hearing or otherwise.

We are not slow to estimate the worth of such programmes because we have already been entertained, made to laugh, made to yawn—almost made to *weep*—by those who have taken part in them.

Our criticism has been hard at times; we have slammed the switch off in a rage; we have asked what is the good of paying a licence to hear "that rot." We have all done this sort of thing time and time again.

We may not have gone deeply into the matter or taken the trouble to inquire into the construction of these variety shows, even though some of us have written hot letters to the B.B.C.

If we had thought more carefully we might have concluded that the very term *variety* is a dangerous one where so many of us are concerned. Those of us who like syncopated songs are none too keen on mandoline solos; those who like impersonations have no possible use for ventriloquists.

In fact, it goes farther than that. I, personally, enjoy Stainless Stephen and Leonard Henry, but I know people who will listen to neither. I laugh at Doris and Elsie Waters, but have been asked what I can see in either of them.

JEWISH HUMOUR

Julian Rose is a popular artist in any vaudeville broadcast and is especially good at monologues

The attitude of the B.B.C. is, in effect, that a variety show *is* a variety show; that it must be made up of a combination of these various "turns," and that listeners must put up with what they happen not to like because there is something in every vaudeville that is likely to please somebody.

The idea is good so far as it goes. It has been going for a long time now, and *still* the vaudevilles are the subject of discussion and the object of censure. The B.B.C. has gone on with them, trying every conceivable combination as though attempting to unlock a door with a secret combination of letters in a patent key.

Non-stop variety was one of the variations. This seems to have aimed at tearing through a programme, giving everybody a five-minute broadcast in two halves of two-and-a-half minutes each. The success of the venture has been doubtful—at least, in some minds, there has been no doubt. It has been considered a failure.

Thus, variety and vaudeville have not really developed at all during the past year.

I am of opinion that the time has come to suggest that the mixing together of varied types of broadcast in order to produce variety is fundamentally wrong, simply because it means that listeners must, of necessity, hear types they do not like in order to hear one or two isolated broadcasters who, by the way, never appear in the order advertised in the programme.

Adhering to Programme

Some time ago I suggested the programme should be adhered to with complete accuracy. When I said that at Broadcasting House I was jumped on. "We cannot always do that because we are never sure whether all our artists will be able to appear. Also, we get people in at the last moment."

I do feel certain that the principle of variety as we have had it in the past is a bad one.

To begin with, it does not conform to any classification. It is merely a mixture of contrasted items more or less of a light nature. When we switch on to a chamber-music concert we expect to hear a string quartet. If a vocalist appears as a contrast he or she will sing something of a high-class nature. We know what to expect.

In a Class by Itself

Again, a symphony concert is in a class by itself because orchestral symphonies, as well as violin, piano, or 'cello concertos, form its programme. Even if we listen to dance music we expect (and get) nothing *but* dance tunes; when it comes to listening to variety we are not certain of anything.

The B.B.C.'s answer may be that there is not the slightest reason why we *should* be, but our reply is to point

out that, at the best, variety programmes contain only a small percentage for each type of listener, whereas a symphony concert devoted to classical works pleases a particular class of listener from beginning to end.

Refraining

If that listener does not want classical music he will not switch in to that programme.

So that variety, as such, has failed on those grounds. It is impossible to please everybody—in variety especially, because people's sense of humour and enjoyment of light fare generally is far more varied than variety itself.

The suggestion I make is that an experiment shall be tried with a *two-part vaudeville*. I call it that for want of a better name. In two sections of half an hour each, it might be possible to attract two types of listener, and not bore either so long as care is taken to keep strictly to the two sections.

Humour, as we know it by radio, is diverse enough to stand one or two subdivisions. With this in mind, I give a few sketch two-part vaudeville programmes, carrying out the suggestions I have made :—

(1) *Syncopated Songs : Humorous Songs.*

From 8 to 8.30 p.m. : Florence Oldham, Mabel Marks, Billie Desmond, and Billy Noble.

These four will give a good selection of syncopated songs, either at the piano or with orchestra.

From 8.30 to 9 p.m. : Flotsam and Jetsam, Leslie Sarony, The Western Brothers.

Topical Song

Here you will get a topical sort of humorous song. If you enjoy topical humour, but are not keen on syncopated songs, you will not switch on until half-past eight.

(2) *Instrumental Solos : Comedians in monologues.*

Mario de Pietro, Teddy Brown, Terence McGoveran.

These three will tell you all you want to know about a mandoline, banjo, guitar, xylophone, and piano-accordion.

The comedians in monologue : Jean de Casalis, Ronald Frankau, Julian Rose, who would give good specimens of vaudeville humour of the monologue type.

(3) *Impressions : Humorous Scenes or Sketches.*

Impressionists : Floy Penryhn, Laurie Devine, Janet Joye.

Humorists : Mabel Constanduros and Michael Hogan, Clapham and Dwyer, Elsie and Doris Waters.

Here, again, there would be plenty of variety—classified variety—in the first half, and there would certainly be three laughable scenes in the second.

Norman Long, Leonard Henry, and Gillie Potter would make another group for humour. I would even go so far as to have Alexander and Mose followed by Nosmo King and Hubert because their humour, though admittedly very much of the same class, is by no means identical.

The whole point in having had all these entertainers for so long, and broadcasting under five or six different headings of entertainment, is now to make use of our knowledge of them.

IN SERIOUS MOOD
An unusual portrait of Flotsam and Jetsam, two of the most welcome broadcasters of humorous songs

By grouping them together designedley, instead of taking so much trouble to separate them, the Light Productions Department would make variety really popular. I am convinced this is the only intelligent way of dealing with vaudeville after the experiences we have had with it.

It was quite natural that the more ordinary methods should have been adopted at the beginning. The idea was to provide an entertainment with, as we say, "plenty of variety." The idea was borrowed from the music halls, where it was satisfactory because people who liked that kind of entertainment were its only patrons. Also there was plenty to *see*.

In a radio variety there is nothing to see; neither will there be for a few years. Until that time comes, and television is established at a price within the reach of all listeners, something must be done to make vaudeville appeal more and more strongly to an increasingly wide circle.

Looking at the Programme

The methods I have suggested will probably have this effect. You will come in one evening and take a look at the programme. Perhaps you will find there are syncopated songs from 8 to 8.30 p.m., and topical humorous songs from 8.30 to 9 p.m.

You decide not to hear the syncopated songs because you may be listening to dance music later on and do not feel inclined to hear the songs *and* the dance refrains in the same evening.

Therefore, you decide to switch on to the other programme in order to hear a light orchestral concert with a vocalist singing ballads until 8.30 p.m. At twenty-nine minutes past the hour you switch over and find the applause dying away for the first part of the programme; you are just in time to hear your three comedians announced. For half an hour you enjoy the topical songs.

The present method allows nothing of this kind at all. You are confronted with the penalty of sitting through a good deal that does not appeal to you in order to hear Gillie Potter or Leonard Henry or Stainless Stephen at the end.

Worse Than Ever

Or, it may be that the comedians come on first and you sit through the rest of the programme in the hope that somebody else will be funny at the end. If they are, you are pleased; if not, you are furious and say the vaudevilles are worse than ever.

The only way to deal with variety for wireless is to classify it, and to broadcast it in the order advertised.

Humour can be divided, subdivided, and divided again; so can the singers of light songs, songs at the piano, topical matter, imitations and impersonations, players of "vaudeville instruments," whistlers, yodellers, ventriloquists, players in sketches, monologue-players, etc.

How We Progress!

A Radio Revue in Three "Sets"

PAST

SCENE I. OLYMPIA.

Mr. and Mrs. Everyman have come to inspect some wireless sets, former looking very knowing, latter rather bored.

MRS. EVERYMAN : James, I'm simply dying for a cup of tea. Do make up your mind ! You can only have one—and they all look equally ugly to me.

MR. EVERYMAN : Quite ! I suppose you'll expect to get Vienna on a two-valver. That's just like all women. Simply because they don't know anything about a subject they hate anyone else showing a reasonable interest in it. You get your cup of tea, and I'll ring up Fred and we can have a good look round this show —in peace—for a couple of hours.

MRS. EVERYMAN (*relieved*) : All right. You can both go and submerge yourselves, but I'll expect you home for dinner at seven sharp. And for heaven's sake don't get anything too big. The dining-room is quite crowded enough as it is. Good-bye, my dear.

PRESENT

SCENE II. RADIOLYMPIA.

Mr. and Mrs. Everyman, reclining in easy chairs, are listening to subdued strains of music from an ultra-decorative loud-speaker.

EFFICIENT SALESMAN : A beautiful tone, sir. Here is a little gadget which may interest Madam. It brings in any programme you want, simply by turning this knob in the centre to the required station. They are all clearly marked. Not the slightest necessity to have any technical knowledge of how the set works.

MRS. EVERYMAN : What a good idea ! I can never listen to any decent dance music from abroad when my husband is out, simply because I can't get the proper knack of tuning-in to foreign stations. It's high time the manufacturers took pity on our ignorance, because it is we who really use the set two-thirds of the day.

MR. EVERYMAN : M-m-m yes, my dear. D'you know I fancy our old set is every bit as good as this one. It may not be quite so decorative, but the results are just the same.

MRS. EVERYMAN : Don't be silly, James. Take a stroll round and amuse yourself for a bit looking at your beloved gadgets. Mrs. Smith is going to meet me here for tea. I want her advice as to what loud-speaker will tone best with the colour scheme of the dining-room.

MR. EVERYMAN (*meekly*) : Oh, very well, but I shan't wait—not if Mrs. Smith is meeting you. See you at home later.

FUTURE

SCENE III. RADIO-VISIO-LYMPIA.

There are no men and no wireless sets visible, but strains of music are audible. What appear to be brightly lit mirrors, reflecting moving scenes, are mounted on handsome cabinets here and there, each surrounded by a group of women. The whole effect is reminiscent of an art exhibition. Murmurs of "colour," "form," "design" are heard on all sides. MRS. EVERYMAN *rushes in and sinks into a chair proffered by an attendant.*

EFFICIENT SALESWOMAN : Is there anything I can do for Madam? Would you be interested in our new baroque designs?

MRS. EVERYMAN : Yes. I'd like to see them—as soon as my friend arrives. Personally, I'm rather struck by the new tubular variety. I think it would just fit in over the divan . . . Ah ! There you are, Mrs. Jones. I'm sorry I'm late. James just dropped me here on his way to golf—said I could get anything I liked so long as I didn't go over thirty guineas. By the way, is that nice technical advisor still here? I suppose men still know a little more about the technical side than we do. He's gone, you say, replaced by Miss Wheeler. Not *the* Wheeler girl of the Bizarre Art Company . . . ?

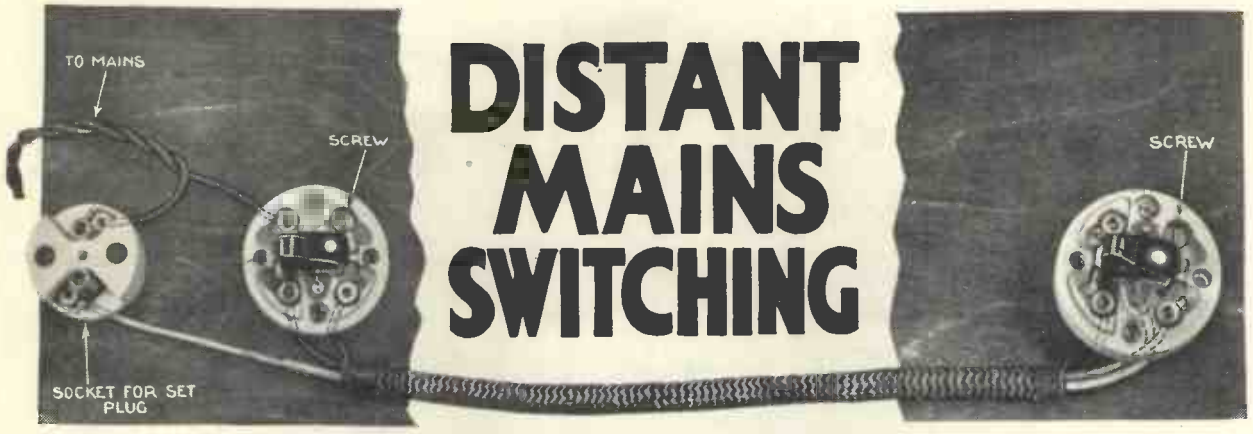
The rest is lost in the clatter of tea-cups and a burst of symphony which emerges from an exotic fan-shaped speaker in the centre of the hall.

EPILOGUE

It used to be said that the woman pays. Now she buys—and calls the tune.

S. J. H.

DISTANT MAINS SWITCHING



WIRING OF DISTANT MAINS SWITCHES

When the mains set is plugged into the left-hand socket it can be controlled by either of the two tumbler switches, which can be fixed in different rooms

IN the April issue the "Wireless Magazine" Technical Staff gave full constructional details for making a remote-control switch that could be used for controlling any radio receiver. Great interest was taken in the scheme, and many listeners fixed up the device for use with their sets.

Another Method

We are now bringing our readers' attention to another method of switching, slightly more expensive. It could be adopted for battery sets but, owing to the voltage drop that would be experienced with long wiring, we recommend that it should be confined to use with mains sets.

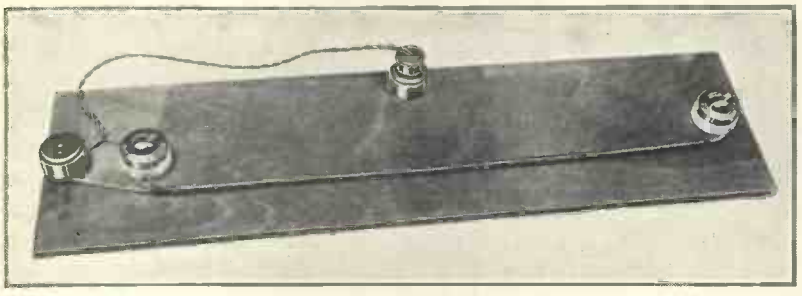
Landing Switches

The system is commonly used for switching electric lights on landings in houses. You switch the light on before you go up, and then switch it off from the upper landing afterwards. On the other hand, you can switch the light on upstairs and then switch it off when you have come down.

It is obvious that this scheme can be adapted for use with a mains receiver, the switches being placed in different rooms.

The photograph that forms the heading to this article shows how the switches are arranged. It can be assumed that the gear shown on the left is in one room and that the switch on the right is in another room. The lead marked "To mains" is permanently connected to the electric supply, and the plug from the set is put into the socket shown.

The set can then be controlled by the two tumbler switches (which are shown without their covers so that the wiring can be seen). The switch on the set is kept permanently in the "on" position, by the way.



MODEL TO SHOW ARRANGEMENT OF SWITCHES

The socket in the centre is connected to the mains and the set is plugged into the left-hand socket. The set can then be controlled by either of the two tumbler switches

After these preliminaries have been arranged the set can be switched on or off as desired from either of the two tumbler switches.

The connection between the switches is made by means of a three-way cable. That shown in the photograph has a cloth covering, but lead-covered cable is better. The photograph shows clearly how the connections are made to the switch terminals.

It is important, of course, that the correct types of switch should be used. Those used by the "W.M." Technical Staff were single-pole two-way switches made by "M.K." Electric, Ltd. They are of the 5-ampere type (List No. 3064), and the price is 1s. 7d. each in an all-brown finish.

Three Terminals

To avoid confusion in wiring, it should be noted that each switch has three terminals and a plain screw to which no wire is connected. It will be easier to follow the wiring shown in the heading photograph if the switches are fixed so that the plain screw is in the upper right-hand corner in each case.

It is best, if a really good job is to be made of this switching arrangement, that the work should be undertaken by a qualified electrician. He will be able to run the wire through the house in the most unobtrusive way, and he will know exactly the right kind of cable to get for any particular conditions.

Such a system arranged between the living-room and the bedroom is a boon to the average listener, especially if the set is a reasonably powerful one and can be heard in another room without difficulty.

Boon to Invalids

You can leave the set switched on right up to the moment when you want to go off to sleep. In the case of an invalid the set can be switched on and off from the bedroom as desired provided it is already tuned in to the desired station.

In conclusion, it need only be said that this system is equally applicable to alternating-current or to direct-current mains.

Should the reader intend to try it out for battery operation a voltmeter should be used to check the

voltage actually applied to the filaments of the valves. If the voltage drop is great an extra cell should be added to the battery. In other words, 2-volt valves will have to be run from a 4-volt accumulator—with a resistance, of course, to control the voltage accurately.

Alarm Control

SIR,—Seeing your remote-control switch in the April "Wireless Magazine," I am submitting a little gadget which I made to work in conjunction with the switch.

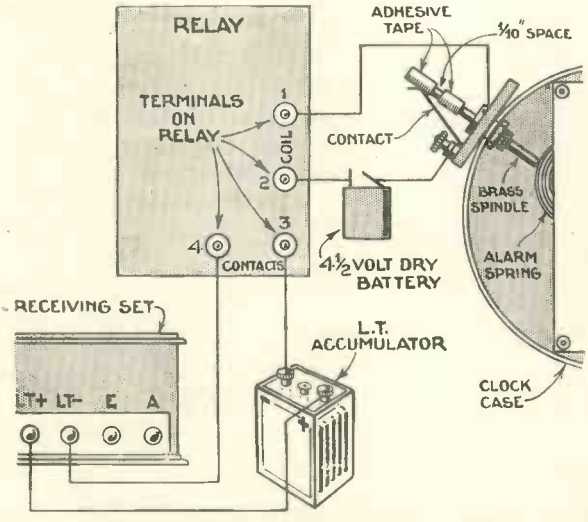
I obtained a reliable alarm clock, and fitted an ordinary push-pull switch on the side of it so that the spindle of it touched the spring of the alarm. I then bound two pieces of adhesive tape round the spindle, separated from each other by about $\frac{1}{10}$th inch.

I then connected it up as in the illustration, and set the alarm at the time I wanted the set to be turned off. As the alarm spring expands it pushes the spindle out, and makes contact for a little while, and so operates the remote control. Then, as the spring expands more, the spindle is pushed further out, and the contact is broken.

This, I found, was most useful in case I went to sleep and left the set on all night. The hammer of the bell can be bent so that the alarm does not ring and wake everybody up.

K. Farmer

Romford, Essex.



DISTANT CONTROL ON ALARM CLOCK
The arrangement described by a Romford reader in the letter printed above

A Simple Circuit Tester

MOST constructors possess a voltmeter with a low-voltage range (0-6 or 0-10 volts), but probably few ever use it for other purposes besides measuring the voltage of a low-tension battery.

With the addition of the simple gadget described in this note, however, a most useful testing instrument can be made at the cost of a few pence.

The gadget is made from a pocket (fountain-pen shaped) torch which can be bought at Woolworth's, an old flash-lamp bulb, a piece of thin brass rod, say $\frac{1}{8}$ in. in diameter, some rubber-covered wire, and a couple of crocodile clips or spade terminals. That is all.

The pink-coloured torch is very suitable since the case is celluloid or some similar insulating material.

The first step is to take out the conical spring and to it solder one end of a piece of the rubber-covered wire. Remove also the switching contrivance and the metal lining from the case and throw these away.

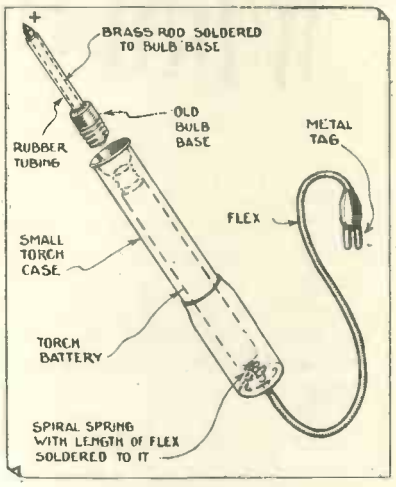
Drill a small hole at the end of the casing—that is the end not made for the bulb—just large enough for the rubber-covered wire to pass through. Thread the wire through so that the conical spring remains inside and to the other end of the wire outside fix a crocodile clip or spade terminal.

Now break away the glass part of the old bulb and the inside insulating material, and solder the brass rod inside the screwed casing which is all that remains of the bulb, so that contact is made between the brass rod and the tip of the screw.

Screw the rod into the place where the bulb usually goes.

Insert the torch battery in the ordinary way, and behold, you have a continuity tester complete with prod.

If you like, the brass rod can be covered with rubber sleeving, only the extreme end being left bare. That is advisable if you are going to use the tester when high-tension voltages are knocking about in a set.



SIMPLE TO MAKE
A testing prod that can be made for a few pence from a fountain-pen type of electric torch

The crocodile clip from the torch is clipped on to the negative terminal of the voltmeter, and a wire with another crocodile clip at its free end is attached to the low-voltage positive terminal.

The tester, as its name implies, is used to check continuity—or discontinuity—between any two points in a circuit. The free clip is clipped on at one of the points, and the torch is used as a prod to reach the other.

Electrical Continuity

If there is electrical continuity of not too high a resistance between the clip and the point touched by the brass rod in the torch, the voltmeter will show a permanent reading.

If the resistance between the two points is low the reading will be the voltage of the torch battery; if it is high the reading may be hardly perceptible since the resistance is then in effect in series with the voltmeter and so acting as a range multiplier.

With a little thought one can track down many a fault by a sequence of continuity tests of this kind. One must, of course, be familiar with the circuit diagram so as to be aware of the points between which continuity should exist and where it should not.

That, however, is fundamental to any system of fault tracing.

P. Wilson

What the Overseas Listener Needs

Every overseas reader will be interested in the suggestions put forward in this article by an amateur constructor who has had several years experience with radio under tropical conditions. In the course of these notes the author has several suggestions to make regarding the improvement of the Empire Short-waver, which was described in the March 1933 issue of "Wireless Magazine." We shall be interested to hear from anybody who tries out the suggested alterations

NO, this has nothing to do with programmes from the Empire broadcasting station—at least, nothing to do with their subject matter.

It is an attempt to inform manufacturers, set designers, and purchasers of what to make, what to design, and what to look for in receivers intended for short-wave reception, particularly in the tropics.

My only excuse for having the nerve to do anything of the sort is that I have been experimenting for the last six years in such matters at about eight hundred miles from the Equator.

Suggestions Realised

Last year I wrote an article for "Wireless Magazine" in which I suggested ways in which better quality of reception could be obtained at lower cost than was then possible. Since then all the suggestions I made have been realised in practical form to some extent.

I can only hope that what I am going to suggest now may also be realised in practical form before the next show at Olympia—whether as a result of this article or not being quite immaterial.

Stress has been laid on the question of suitable materials for cabinets, panels, and so on by many people in many places—no need to dwell on that point, as it is quite well understood by manufacturers and designers already.

Unfortunately the same cannot be said of such important components as low-frequency transformers, chokes of both varieties, and, above all, paper-dielectric condensers; also potentiometers, which must become of ever increasing importance.

Chokes, transformers and potentiometers all suffer from the same disease—fracture of the fine wire with which they are wound. In the case of potentiometers, one would expect to hear that the fractures were due to friction, but this is not my experience.

The fracture occurs on the broad, flat portion of the winding, sometimes on the inside, sometimes on the outside, nor is the trouble confined to one make.

I never use any components other than the reputed best, which also means that they are by no means the cheapest—with one notable exception, of which more anon.

I have had to send two of the highest-class low-frequency transformers to England for the same reason—fractures in the secondary windings—different makers and only used in parallel-feed circuits.

On each occasion I should, at the time, have been reduced to three valves instead of four if I had not had two transformers as spares from which to choose a replacement until my high-class invalid returned.

These two are identical and at the time I bought them—in 1927, I think—they must have been the cheapest on the market.

My reason for doing so had nothing to do with their price, but because the firm who made them employed a striking way of advertising the fact that they were damp-proof—at any rate in England.

As a matter of fact they have proved to be so here, too, in spite of an average all-the-year-round temperature of 80 degrees Fahrenheit and 80 per cent. saturation.

This brings me to paper condensers. A 2-microfarad by the same makers has also stood the climate without alteration, though not for quite so long—still long enough to know that if it breaks down it will not be due to climatic conditions.

Synonyms of Reliability

Both condenser and transformers are sealed with the same composition, so far as I can see. Would that all paper-condenser manufacturers used a similar composition!

At home the names of certain such manufacturers must occur at once to readers of "Wireless Magazine" as synonyms of reliability—and quite rightly. Here, unfortunately, they are nothing of the sort.

The trouble comes in the same way in each case. The sealing compositions in the base shrink round the edges during the dry season—February to April—then, when the rains start, they have to retire to the museum of duds kept by my "boy."

As for complete receivers, it is useless to pretend that British-made ones can compete at present with those of U.S.A. origin. I am not saying this for the sake of damning our home manufacturers, but in the hope of getting them to mend their ways.

Badly Handicapped

I also realise that they are badly handicapped in several ways. In the first place many of them are in the happy position of having all they can do to supply the home market.

Secondly, they have had to cover medium and long waves as opposed to medium and short waves as in the U.S.A., and, moreover, there is little or no point in listening to short-wave transmissions in England.

Thirdly, they are very badly handicapped by the price of British valves. The most popular type of set in this part of the world is a ten- or eleven-valve A.C. super-het covering medium and short waves, having

at least 2 watts undistorted output, automatic volume control, and costing, complete with valves, retail ex factory in U.S.A., £10 at par.

Add up the cost of even ten suitable A.C. British valves (three must be variable-mu) and a suitable rectifier, and see how much—if anything—is left out of £10 to cover everything else in the set. It simply cannot be done.

Somewhat of A Problem

Even allowing for the fact that equally good, and probably better, results can be obtained with half that number of British valves, it would still be somewhat of a problem to be able to sell retail such a receiver for £10 ex factory U.K.

As for our designers, it is only too clear that they have not yet grasped the fact that selectivity of the same order as is required on the medium waves in Europe is equally necessary in short-wave receivers to be used in Canada and the West Indies, to my certain knowledge, and quite possibly throughout the Empire.

Group of Stations

Let me give a definite group of stations: Zeesen, DJA, 9,560 kilocycles; Springfield, W1XAZ, 9,570 kilocycles; GSC, 9,585 kilocycles; Philadelphia, W3XAU, 9,590 kilocycles. To these must be added Radio Nations HBL, supposed to be on 9,595 kilocycles, but only heard here on 9,580 kilocycles.

As all are heard here—except GSC—at R7 to R9, the necessity of extreme selectivity is obvious. All that GSC does is to heterodyne HBL and W3XAU.

This would be bad enough if these channels were otherwise clear, but at least two morse stations must be imagined as using intermediate channels, leaving only 2 or 3 kilocycles separation.

It is very necessary that designers should (if they can manage it) forget that high-tension and grid-bias batteries have ever existed. The shelf life of such articles in the tropics is only about half the working life at home and if anything approaching even moderate quality is wanted they become ruinous. Lack of volume and quality is preventing the sale of British sets here.

Take the "Wireless Magazine" Empire Short-waver. I have no doubt that it will do all that is claimed for it, but it would be only another bad advertisement for British-made sets.

Even with 150 volts high tension, the undistorted output is only 150 milliwatts, the total consumption being some 13 milliamperes. Cross modulation is inevitable and it requires a grid-bias battery.

I amused myself this morning in designing a set to go into the same cabinet, with the same layout, except for the removal of the low-frequency stage, which will give 500 milliwatts of undistorted output, avoid cross-modulation, and have perfect volume control, automatic grid bias, and use only 14.5 milliamperes at 150 volts high tension.

In the large towns A.C. mains are available. Houses on the estates mostly have electric-light plants, which means that rotary converters can be used—all of which means A.C. sets with at least class-B quality reproduction.

In my own case I have a 50-55 volt British lighting set, which enables me to use a five-valve A.C. super-het with an output valve (pentode) taking 300 volts on the plate for 25 milliamperes anode current, which means just on 2 watts undistorted output, and I have not yet heard an American set which can compare with it.

Three Separate Portions

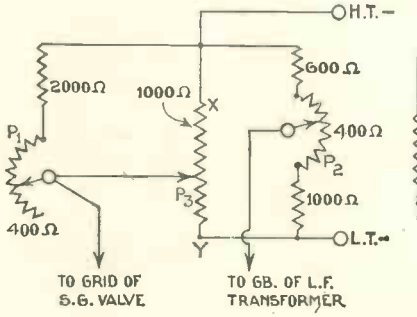
This set is, admittedly, not a commercial proposition. It takes up a great deal of space, being in three separate portions, without the rotary converter or loud-speaker, no less than five portions in all. I will, therefore, say no more about it.

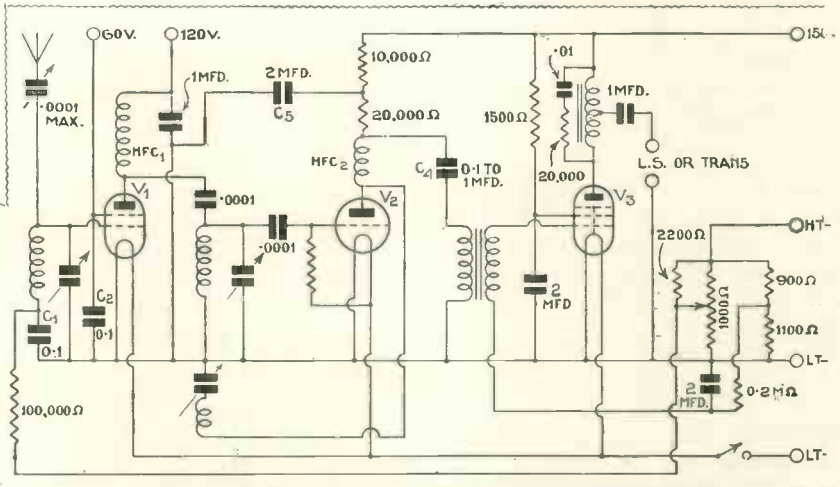
Just one word more. I recently asked two of our leading valve manufacturers to send me the anode volts/anode current curves of certain valves when used as power-grid detectors for various R.M.S. volts inputs.

Contrary to Policy

In both cases they refused to supply the information as being contrary to their policy. Their policy is, of course, their business and not mine, but there is no doubt that the technical press would earn the gratitude of all amateur experimenters if they would publish these curves for the best detectors every year after Olympia and before Christmas.

Sixty Degrees West





SUGGESTED ALTERATIONS TO THE EMPIRE SHORT-WAVER

These circuits are alterations to the Empire Short-waver (described in the March 1933 issue of "Wireless Magazine") suggested by the author. In the circuit above, C1, C2, C3, C4, and C5 are to be non-inductive; V1, Mazda S215VM metallised to be mounted vertically with Bulgin spring safety anode connector through screen; V2, Mullard PM1HL metallised; and V3, Marconi or Osram PT2. All resistances Dubilier 1-watt metallised

As regards the mains unit on the left, the two 400-ohm potentiometers can be of the Igranic baseboard type. With P3 set at X and with the aerial disconnected adjust to give 6.5 milliamperes plate current for V3. Then set P3 to Y and adjust P1 to again bring V3 to 6.5 milliamperes plate current

Wireless Magazine. July, 1933

New Detectors Promise Better Results

The D.D.Pen and the Hexode

By J. H. REYNER, A.M.I.E.E.

During the next few months it seems certain that radio reception will be revolutionised by the many new valves that are being developed. In this article we are able to give details of the double-diode-pentode (known as the D.D.Pen) and the hexode, two interesting mains valves that may make their appearance at any moment

THE detector valve is the heart of any set and the attention of the valve makers has been focused in this direction for some time past. Two new valves in particular have emerged which are worthy of comment.

The first of these is the double-diode-pentode (or D.D.Pen., to give it its official name). This is a self-controlling detector designed to avoid the prevalent bugbear of overloading, which spoils the performance of so many sets.

Varying Amplification

It comprises a pentode with an extra long cathode, around the bottom of which are two small anodes used as diodes. One of these diodes provides the detection and the other supplies a D.C. voltage for controlling the performance of the valve so that its amplification depends on the strength of signal.

This same voltage may be used for automatic volume control (A.V.C.) if the set is suitable.

The excellent quality of diode rectification is well known and this, coupled with the simplicity of the system, has led to its very general adoption for A.V.C. systems.

Unfortunately, the diode is not sensitive. The low-frequency output is only a fraction of the high-frequency input, instead of being several times as great as with the usual form of detector. For this reason an extra amplifying valve is required, but it is very easy to incorporate this in the same bulb as the diode.

This valve is designed to give a step-up of about fifteen or twenty, which is sufficient to provide an output large enough to feed an output pentode direct.

The double-diode-triode has already appeared, and this valve is straightforward in its operation. The triode simply steps up the low-frequency signal developed by the diode rectifier. In the double-diode-pentode the process is carried a little further, resulting in a valve which has a very useful application.

The voltage applied to the detector valve varies considerably. It may be a fraction of a volt on a weak station and a good many volts from a strong station. How much amplification are we to provide between the diode rectifier and the output valve?

If we make it enough to fill the valve on a weak signal, then everything will overload horribly on a strong signal. If we make it just right for a strong signal, then it will be very insensitive on distant stations.

The obvious answer is to make the amplification depend upon the strength of the signal, so that if we apply ten times as strong a signal to the detector the amplification is only one-tenth as great.

This is what the D.D.Pen does. By using a special variable-mu pentode in conjunction with the double-diode arrangement, it is possible to ensure a practically constant voltage output after a certain limit has been reached.

The high-frequency voltage applied to one of the diodes develops a voltage which applies grid bias to the pentode portion of the valve. As the strength of the signal increases, this grid bias increases and runs the valve back down its characteristic so that its effective amplification falls.

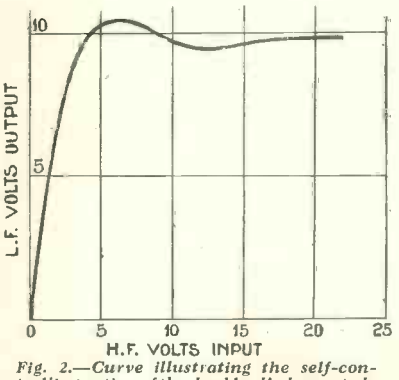


Fig. 2.—Curve illustrating the self-controlling action of the double-diode-pentode

Incidentally, this grid voltage may also be used to apply bias to the high-frequency valves in the receiver and thus obtain automatic volume control.

The circuit of the valve is shown in Fig. 1. The first diode provides the A.V.C. voltage which biases the grid of the pentode through a 1-megohm leak. The second diode (which is connected to the first through a .0001-microfarad condenser) provides the low-frequency rectification, so that audio-frequency voltages are set up across the resistance R_2 and transferred through a high-frequency choke and blocking condenser to the pentode grid. Amplified oscillations appear in the anode circuit, and these are coupled straight to the output valve.

The sensitivity of this detector is definitely better than the ordinary grid detector, but is not quite as good as a screen-grid

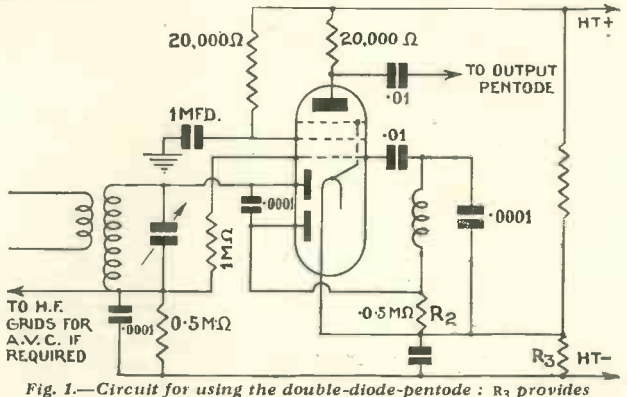


Fig. 1.—Circuit for using the double-diode-pentode: R_3 provides a small permanent bias of about 3 volts for the pentode grid

detector. It is possible to use reaction with it, so that it has a distinct application to simple sets, apart from its obvious application to super-heterodynes with automatic volume control.

Fig. 2 illustrates the voltage output in terms of high-frequency input, showing the self-controlling action.

Now let us turn to the other valve, which is known as a hexode. As the name implies, this has six electrodes —a cathode, anode, and four grids. It has been designed to overcome the difficulties experienced with com-

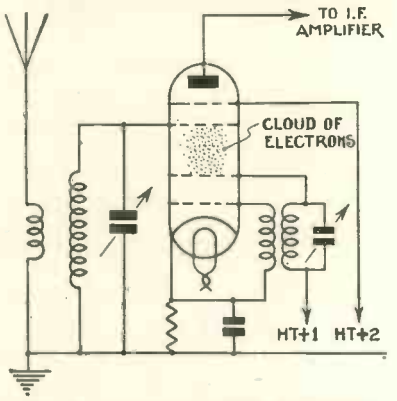


Fig. 3.—Circuit for using the hexode valve, which, as its name implies, has no fewer than six electrodes

bined oscillator-detector circuits for super-hets.

One trouble is that for satisfactory volume control the detector requires to have variable-mu characteristics, while for efficient super-heterodyne mixing the valve requires straight characteristics. A further difficulty is that, as the bias on the detector part of the valve is reduced in order to cut down the sensitivity, the oscillator will often stop working altogether.

Generally speaking, the combined oscillator-detector of to-day is not very satisfactory, and many designers prefer separate valves for this reason.

The hexode is an ingenious device which is claimed to behave better than two separate valves. Its construction is fundamentally new in valve practice.

The arrangement of the electrodes is shown in Fig. 3. Consider the first two grids and the cathode. These are connected in the same way as the grid and anode of a triode, and are actually used for the oscillator circuit. The second grid has thus a high-tension voltage on it and attracts electrons from the filament, while the first grid controls the flow of the electrons just like the grid of an ordinary valve.

This portion of the valve, therefore, maintains oscillations in an external circuit.

Due to the fact that this second grid is not a solid anode, quite a number of the electrons shoot through the spaces between the wires and carry on until they reach the third grid, which is connected to a negative potential.

This immediately chokes back the electrons and prevents them from going any farther. They consequently remain there in a sort of a cloud, wondering which way to go next; and the cloud is constantly getting bigger and bigger, due to the accumulation of electrons which are creeping through from the cathode.

Outside the whole is an anode, again connected to a high positive potential, and if we make this third grid slightly positive the electrons will be released and will fly to the anode outside.

In other words, this cloud of electrons, together with the third grid and the anode, act as a second valve, and this portion of the valve is used as the detector, being connected to the aerial circuit.

The important point is that the supply of electrons is not constant. The electrons from the cathode are being used to maintain the oscillations in the oscillator circuit, and it is only the spare electrons which shoot through the second grid and become available for the upper portion of the valve.

Consequently, the electrons come through in pulses or jumps, which means that the incoming signals picked up on the aerial are modulated at the oscillator frequency, as we require for super-het work.

The valve, therefore, automatically modulates the incoming signal, and the efficiency is claimed to be very high.

Fourth Grid

We have omitted to consider the fourth grid. This, however, is simply a screen between the third grid and the anode, and means that the detector portion of the valve is really a screen-grid detector. The fourth grid is connected to a suitable high-tension point, just like the screen of any screen-grid valve.

The valve is in use in America and some of the British firms are at present experimenting with it. Whether it will be used in this country to any extent depends upon the truth of the claim that it gives better results than two individual valves.

Stories of the Operas

BENVENUTO CELLINI

(Berlioz)

CHARACTERS

Cardinal Salviati.....Bass
Balducci, Papal Treasurer.....Bass
Teresa, his daughter.....Soprano
Benvenuto Cellini, a goldsmith.....Tenor
Ascanio, his apprentice.....Mezzo-Soprano
Francesco, Bernardino } artisans in Cellini's workshop.....Tenor, Bass
Fieramosca, sculptor to the Pope...Baritone
Pompeo, a bravo.....Baritone

Time : 1532. Place : Rome.

ACT I

The Carnival of 1532. The Papal treasurer is scolding his daughter Teresa because she keeps looking out of the window. He is also annoyed because the Pope has sent for Cellini to go to Rome. Teresa is happy because she has found a note from Cellini in a bouquet thrown to her in the street by a masked man. He then came close to her and proposed an elopment.

In the carnival mask in the morning he will wear a monk's hood of white. Ascanio, his apprentice, will wear a brown one. They will join her. Unfortunately, Fieramosca, the Pope's sculptor, is a rival of Cellini's, and has overheard the plot.

ACT II

A courtyard of a tavern. Cellini is seated there with his assistants. He pledges his love in wine. The host refuses to give him further credit. At that moment Ascanio brings money from the Pope's treasurer, but in return Cellini must complete his statue of Perseus by the morning.

Cellini informs Ascanio of his plot to carry off Teresa. Fieramosca has again been eavesdropping, and now hires the bravo Pompeo to assist him in carrying her off first. The scene changes. A crowd of maskers. Balducci and Teresa enter.

In the crowd come two monks with white hoods, and Teresa is puzzled. One of the brown-hooded monks falls mortally wounded; Cellini has stabbed Pompeo. Cellini is surrounded but the carnival is at that moment declared over as it is Ash Wednesday. Cellini escapes and Fieramosca, the other white-hooded monk, is siezed.

ACT III

Before Cellini's house. Ascanio assures Teresa that Cellini is safe. He enters with a band of monks and describes how he escaped. Balducci and Fieramosca enter. Balducci wishes Teresa to marry Fieramosca. Then Cardinal Salviati arrives to see the statue.

Cellini has spent the money he received, the statue is not finished and he has murdered Pompeo. He is to be punished and someone else will finish the statue. He seizes the statue and hurls it into a casting mould.

He produces a perfect work of art and is forgiven. (The statue of Perseus by Benvenuto Cellini is one of the most famous creations of the age. It is now at Florence.)

WHITAKER-WILSON

WHEN WE DON'T NEED STRAIGHT-LINE AMPLIFICATION

By Noel Bonavia-Hunt, M.A.

THERE is one question which is agitating the minds of designers of amplifiers at the present time, and that is how far should the attempt be made to reproduce the original sounds exactly as they are produced in the studio or concert hall?

At first sight the question seems to be one that provides its own answer. "Obviously," you would say, "the resemblance should be as close as possible." Should it? That is just the point I wish to raise.

Factors Overlooked

There are several factors which must be taken into account in this matter, and they are apt to be overlooked. We hear a great deal, for instance, about the ideal amplification curve, and we are told that this should not be a curve at all, but a straight line. That means that every note should be amplified uniformly throughout the musical scale, as otherwise we cannot expect to get a faithful copy of the original performance.

It does sound quite a logical argument, I admit. But I know it is wrong, all the same.

In fact, I did succeed eventually in convincing a radio engineer that he was incorrect in thinking that "straight-line" amplification was the thing to strive for. I remember it took me some time to do it. And, honestly, I believe all my readers are siding with my opponent! So much the better, if they are: this article will, in that case, be justified.

Now please note that I am not concerning myself at the moment with the radio-frequency side of wireless. What the B.B.C. are sending out to us is, as far as this article goes, their concern. It is supposed to be a faithful copy of the original sounds that we pick up on our sets—that is to say, a straight-line frequency curve is assumed as far as the transmitting station is concerned.

What we do with that ourselves, in our thermionic amplifiers, is another matter altogether. Ought we to preserve the straight-line characteristic right up to the output to the loud-speaker? That is what most people would insist upon.

In the case of the gramophone record we know that there is a definite fall off at either end of the musical spectrum, due to deficiencies in the recording system: a corrective is therefore obviously needed in the pick-up and amplifier. But what about wireless signals?

There are three good reasons why we cannot afford to let our own home receivers work on an absolutely straight-line basis. I am assuming that no side-band cutting is required on the high-frequency side, and that the signal input to the detector possesses a straight-line characteristic.

Very often this is not the case, as I am only too painfully aware: but the question of "tone correction" for high-note loss in high-frequency circuits is not one that can be entered into here.

In fact I would prefer to assume that a linear detector such as the diode (hot or cold) is giving us a reasonable copy of the original. Now from this point I want to show that we cannot proceed to amplify *all* frequencies uniformly.

Response Not Uniform

1.—The first reason is that moving-coil loud-speakers are incapable of responding uniformly to the complete band of musical frequencies. Or perhaps it might be truer to say that they cannot be expected to do so when all the resonant peaks have been eliminated.

The characteristic curve of a loud-speaker shows a definite fall-off at the extreme ends. Between 100 and 4,500 cycles it can be made quite passably good. And for that matter so can a reed-driven cone of the Lion or Beverley type.

But no seeker after realism is going to be content with such a limited gamut. One can only maintain the frequency level from 30 to 8,000 cycles or higher by either introducing resonances into the loud-speaker or by adjusting the curve of the amplifier.

GERMAN GIRLS ENJOY A BROADCAST TALK

A group of pupils at a German dancing school listening to a talk being broadcast by one of their fellows. They seem to be giving it close attention

As regards the top portion a more or less straight-line amplification up to 8,000 cycles could doubtless be worked in connection with a good electrostatic loud-speaker, provided a special output circuit is used. But the lower frequencies can only be brought up to the standard of the original required by the human ear by adopting a rising characteristic in this portion of the amplifier.

In short, if we design an amplifier giving what is called a straight-line voltage-amplification frequency curve we shall find that the loud-speaker will not give straight-line reproduction in terms of sound.

Small Area of Source

2.—The second reason is that all the sounds are propagated from a comparatively small area of source. This is especially unfortunate in the case of orchestral music. The result is that the large and small amplitudes interfere with each other through having inadequate space in which to radiate.

This question of radiation is very important, and none too easy to explain.

Let the reader compare the actual air-space set in motion by the Queen's Hall orchestra with the

A FINE TENOR AND A FINE SET

Beniamino Gigli, one of the finest tenors in the world, listening to the H.M.V. Autoradiogram Seven, which has an automatic record changer

absurdly small air-space occupied by the oscillating diaphragm of a loud-speaker, and perhaps he will visualise the difference more clearly.

The air-space set in motion by a piano, or even a violin (to say nothing of several violins), is greater than that in which a loud-speaker cone is working, and one can only properly compare the air-space used by the human voice or one orchestral instrument such as the flute or clarinet with that used by the loud-speaker.

MOBILE VAN WITH A "SEARCHLIGHT" LOUD-SPEAKER

One of the Marconiphone mobile vans for public-address work. Note the "searchlight" type of loud-speaker mounted on the roof

The result on the *ear* is an attenuation of the lower and upper frequencies when *both* are required in combination.

It is easy enough to secure one *or* the other, but not both at once.

When we add to this difficulty the well-known fact that it is not possible at present to get rid of all resonances in the loud-speaker, it should be evident that a straight-line amplifier will only cause disappointment to a critical ear.

3.—There is a third reason which is apt to be overlooked. If we except speech and certain individual musical instruments, it is generally agreed that it is not desirable to reproduce the actual volume and intensity of the original performance in our own living rooms. A deaf reader may view the matter differently, or one who possesses a large music room. But I feel sure I am voicing the opinions of the vast majority.

Moreover, a great many wireless sets have to be designed to suit the feminine ear, and the feminine ear is usually more sensitive than the man's.

Old people, too, are unable to tolerate very loud sounds. I know several dear old ladies who are "hard of hearing" and will turn on the set very loud for speech items, and when music is on decrease the volume considerably.

Now immediately we begin to reduce the overall intensity of our signals we are tampering with the original curve. Thanks to the asymmetrical response of our ears, the bass and extreme treble diminish out of all proportion to the middle and treble.

To be a little more precise, we begin to lose notes below 200 cycles and notes above 4,000 cycles. Some ears find the difficulty starting as soon as the 3,500-cycle note is passed. We can easily prove this for ourselves by walking away from an open-air band.

Preserving Amplitude

If, therefore, we wish to preserve the original amplitude curve in its reduced form, we must strengthen the lower and upper ends, and thus compensate for losses in these regions. We know that in the case of gramophone records this is necessary because the losses are due to the actual recording process, but in radio reception, even granting that the amplitudes are correctly preserved on the carrier wave transmitted to our sets, we are still compelled to boost up the frequencies at each end of the scale in order to obtain a comfortable loudness level in the average room.

A perfect loud-speaker—if it ever

comes—will still leave us with the necessity to compensate for aural losses, the only possible exception being the case in which it is permissible to reproduce the original loudness level or exceed it.

It will be noticed that between 200 and 4,000 cycles I have assumed that a straight-line response is normally permissible. In fact I should feel inclined to extend that band of frequencies to 100 or even to 90 cycles, because most moving-coil loud-speakers are rather favourably disposed towards these particular notes.

Loud-speaker Characteristics

In any case it is supremely necessary to take the loud-speaker characteristics into account when designing the amplifier. And where an electrostatic loud-speaker is in use for the purpose of upper-note compensation, I should advocate the extension of the straight-line curve to 6,000 cycles. Above this point a rise is advisable provided it is graduated and free from peaks.

In every amplifier design the greatest danger lies in the 1,000 to 4,000 cycle zone, and the utmost care has to be exercised in preventing a rise here. The ideal is a straight line; but anything is better than a rise, even a slight fall. One may almost go so far as to say that the quality of a receiver depends on the character of this portion of the frequency-response curve. It is much easier to get this part right with an output triode than with a pentode.

Having cleared what I believe to be a common misconception on the part of designers of amplifiers, I seem to be aware of someone asking whether it is possible to reproduce the original at all! Let me reply at once that it is *not*. The best we can get is a photographic likeness. But need we worry over much about it? We cannot listen to the real thing and its reproduction in our own room simultaneously.

At best, we accept the reproduction as such, and if it succeeds in conveying to us the enjoyment and satisfaction that we should expect to derive from the original, I think we have every right to be proud of our apparatus. Let it never be forgotten that even the *original* may be far from blameless!

Who, in the musical world, has not heard a musician exclaim with more candour than charitableness : " I shouldn't trouble to walk across the road to hear *that* fellow play! " We know to our sorrow how rare is the good vocalist, and a bad vocalist sounds worse than he might be when heard on the loud-speaker, because local radiation serves to gloss over many a fault in voice production which the microphone unerringly detects.

Violinists differ tremendously in the quality they extract from their strings, and many, alas, are far from perfect. One frequently hears good technique wedded to indifferent tone.

Organists do not invariably select the most suitable combinations of stops, and not all organs are designed for broadcasting.

There are pianists whose touch is far from fairy-like, and whose fingertips seem to be lacking in the fleshly covering that should preclude all risk of metallic quality.

Some speaking voices are characterised by a dominant chest resonance, others by a disagreeable formant. Women's voices are a problem to all of us, because the formant is unusually concentrated, and the slightest peaks in the curve of the reproducing apparatus upset the shape of the formant. The professor giving a lecture on biology may be suffering from a slight attack of pharyngitis. In all such cases, with the exception of the woman's voice, exact reproduction of the original would fail to produce " that grateful feeling."

But there *are* occasions when the original (whatever it may be actually!) does come through magnificently. We then exclaim: " What can I want better than this? " It may be that an even better result is possible. The lad on the push bicycle is supremely happy until he exchanges it later for a motor bicycle.

Better Taste

It is good for the wireless trade that our ears should develop a taste for something better and still better in the realm of sweet sounds. What we should all strive for in our radio sets is not so much a *literal* reproduction of the original as a *musical production based on the original* and possessing all those features and points that make the original so attractive.

If we are listening to an orchestra, we want the *correct proportions* of the original, the beautiful soft caressing qualities, the loveliness and spriteliness of pizzicato and staccato passages, the clear-cut obbligato of the individual instrument, the light and shade, the pianissimos, fortissimos, accents, sforzandos, the intricate network of parts; in a word the *spirit* of the piece must be conveyed with at least some of the realism of the original.

WELL LAID-OUT RADIO ASSEMBLY SHOPS

A view of the radio assembly shops at the Ferranti works at Hollinwood. There is an elaborate overhead conveyor system. A batch of moving-coil loud-speakers can be seen in the foreground

The Double-diode-triode

By F. E. HENDERSON, A.M.I.E.E.

Here are very complete details on the use of a new type of Marconi and Osram valve, which will have important applications in mains sets. Never before have so many new types of valves been produced within such a short period. Besides the double-diode-triode, there is the double-diode-pentode and the hexode, both described in another article in this issue

THE many new varieties of receiving valve which we have been led to expect will arrive on the market in time for the next season may be classified briefly as :

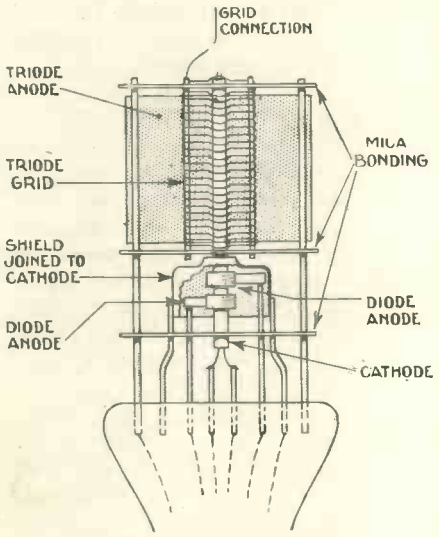


Fig. 1.—Electrode arrangement of the Marconi and Osram type MHD4 double-diode-triode

(*a*) Modifications to existing valve types.
(*b*) Entirely new types.
(*c*) Multiple valves, which are combinations of known valve designs into one envelope.

Under heading (*a*) may be included valves such as high-frequency or screen pentodes, which are pentodes as we know them now, but modified in electrode design and connection; variable-mu pentodes; and "high-slope" valves.

New Electrode Designs

Classification (*b*) must mean valves incorporating new forms of electrode design, and time alone can show what may transpire in this direction; while (*c*) includes the grouping together on one valve base of the combined electrode systems of two or more known valve types.

Under this head come class-B double valves for the output stage, and also detector valves, in which the diode rectification element and the amplifying element are combined "under one roof," so to speak.

This article is intended to deal in more detail with one of these "multiple valves" classified above under group (*c*) and to describe the design and use of the multiple detector-amplifier valve known as a "double-diode-triode."

We have gradually become accustomed during the past few years to the introduction of new valves to the market containing an increasing number of grids or control electrodes.

Thus we start first with the simple *triode*, containing a single grid and anode; this is followed up by the introduction of the *tetrode*, which has appeared in two forms, first in the form known as a bi-grid, in which the extra grid is utilised to overcome the filament space charge and, secondly, in the form of the screen-grid valve, in which the extra grid is employed to neutralise the anode-grid capacity.

The tetrode is then followed by the *pentode*, in which a third grid is added to overcome secondary electron emission from the anode and increase the power-handling capabilities of the tetrode.

Now, however, the multiplicity of electrodes takes on a new aspect and it is anticipated that we shall during the next few weeks see on the market a most interesting newcomer in the form of a valve which is now being developed—the MHD4 type *double-diode-triode*. This contains a single control grid, but three anodes.

The simplest way of approaching a consideration of this new valve is to think of it as a grid-leak detector in which the dual functions of rectification and amplification commonly combined in this device are divided so that each can be made to operate at higher efficiency.

Grid Rectification

It is well known that, in the ordinary grid-leak detector, rectification is accomplished in the grid circuit and the rectified voltage appearing between the grid and filament is reflected in audio-frequency changes of anode current. In other words, such a valve is, in effect, a diode rectifier in its grid circuit combined with a triode amplifier.

The biggest disadvantage of the commonly employed grid-leak detector triode is that, in order to obtain efficient rectification in the grid circuit, the grid voltage has to be so fixed that the capacity of the triode portion for distortionless amplification is extremely restricted.

An improvement may be effected by so constructing and operating the valve that the shape of the triode characteristic is such that it will accept a moderately large rectified signal voltage from

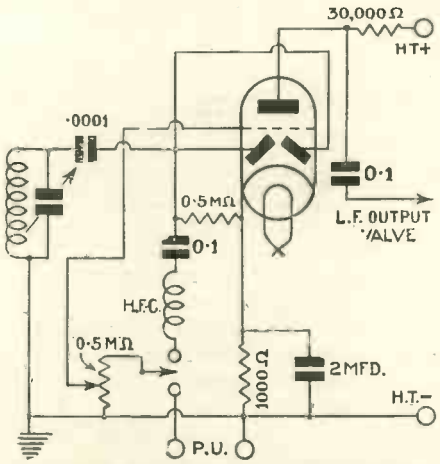


Fig. 2.—Double-diode-triode connected for simple diode detection and low-frequency amplification with provision for a pick-up

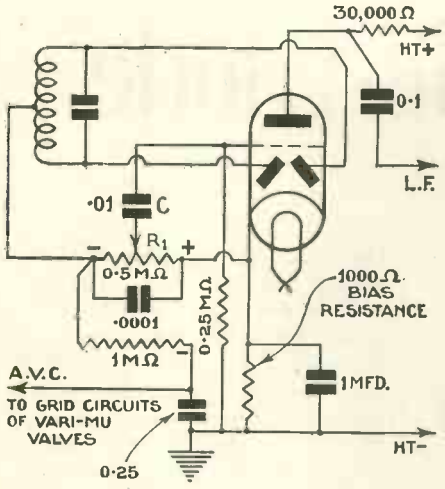


Fig. 3.—Double-diode-triode connected for full-wave diode detection, automatic volume control and low-frequency amplification

Thus the electron stream from a common cathode is utilised for both the diode and triode elements.

A single-diode anode would alone be of great benefit in providing possibilities of better quality rectification, but the utility of the valve has been still further increased by the addition of the second anode, also surrounding a small portion of the cathode, as will be described.

The general design of the MHD4 double-diode-triode valve is shown in Fig. 1. Fig. 2 shows the double-diode-triode connected for diode detection and low-frequency amplification, with provision for gramophone pick-up.

Special precautions have been taken in this valve to ensure that the capacity between the diode and the triode anodes is reduced to a minimum and, further to decrease the electrode capacities, the grid lead is taken to the top of the bulb.

By the inclusion of the two diode anodes, a number of very interesting and important possibilities of circuit design arise. The most outstanding application, and one of the greatest interest at the moment, is certainly that of automatic volume control.

One of the greatest drawbacks to reception of distant stations is the occurrence of "fading," particularly on the shorter wavelengths. This effect is very noticeable when listening after nightfall to stations such as Radio Normandie, or even London National, at distances over fifty miles.

A device to overcome fading becomes, therefore, of the greatest interest and importance to set designers and involves circuits incorporating automatic volume control.

The subject of automatic volume control and its associated circuits is one which calls for a special article by itself, but two circuits are given here which indicate the principle which is used in applying the double-diode-triode valve to this form of circuit.

In Fig. 3 the valve is shown as utilising the two diode anodes for rectification of the radio-frequency signals, and the circuit is so arranged that at the same time it provides automatic volume control.

Variable-mu Importance

At this point the importance of the development of the variable-mu valve becomes apparent in providing an easy and effective method of utilising the automatic volume control voltage as a means of increased grid bias to the variable-mu valves operating in the radio-frequency or intermediate-frequency stages prior to the detector.

In the circuit Fig. 3 it is noted that the two diode anodes provide full-wave rectification and that this rectified voltage is applied across the resistance R_1. The strength of the rectified signal controls the D.C. voltage developed across this resistance, so that the stronger the signal fed from the tuned circuit shown, the greater will be the voltage across the resistance.

By taking a lead from one end of the resistance to the grid circuits of the variable-mu high-frequency amplifying valves, the increased voltage developed across the resistance R_1 can be considered as an increased negative bias applied to the variable-mu grids.

This increased bias will have the effect of cutting down the amplification of the variable-mu valves and so reducing the input to the detector. Thus the effect of the resistance R_1 is to maintain a substantially constant degree of amplification afforded by the variable-mu valves and thus to narrow down the range of input voltages applied to the detector anodes.

In addition to the D.C. voltage developed across the resistance R_1, there is an audio-frequency A.C.

the grid circuit, whilst still giving a more or less linear audio-frequency output, and a valve used in such a circuit has come to be known as a "power-grid" detector.

In other words, the input voltage (signal) permissible before "anode-bend" rectification occurs is increased. Anode-bend rectification in a valve intended for a grid-leak detector, or vice versa, is obviously going to cause bad distortion, and therein lies the chief drawback of the triode detector. (See Fig. 5, curve 1.)

Peculiar Limitations

There are thus two peculiar limitations of this form of rectifier, the first being that the bias operating point of the triode amplifying portion of the valve is determined entirely by the strength of the signal applied and the value of the grid leak and, for the second, in a valve of this type the anode-grid capacity is usually of a sufficiently high order to upset the radio-frequency tuning in the grid circuit by the addition of damping and throw-back from the anode circuit.

A Logical Step

The logical step, therefore, appears to be to separate the diode rectifier from the triode amplifying element, and this is done in the new valve.

The way it is accomplished in the new MHD4 is to provide the diode rectifier in the form of a pair of small anodes surrounding a portion of the cathode, but allowing for the major portion of the cathode to be enclosed by the triode amplifying portion.

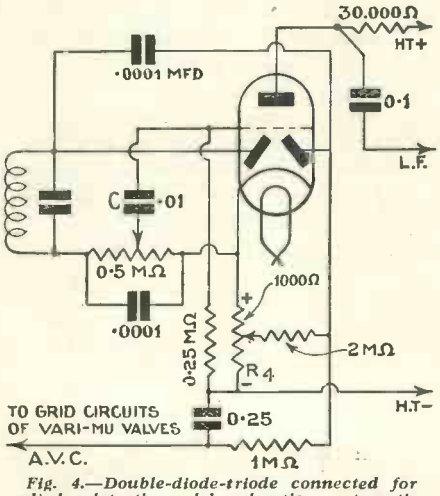


Fig. 4.—Double-diode-triode connected for diode detection, delayed-action automatic volume control and low-frequency amplification

component due to the rectifying action of the diodes, and this is passed on through the coupling condenser C to the grid of the triode element, whence it appears as an amplified voltage in the anode load circuit.

Volume Control

The resistance R_1 can conveniently take the form of a potentiometer, the slider of which forms a useful audio-frequency volume control and prevents the triode grid being overloaded.

By the combination of the value of resistance R_1 the characteristics of the variable-mu valves, and the setting of the potentiometer slider, it is possible to ensure that the grid of the triode element can never be overloaded. (See Fig, 5, curve 2.)

A disadvantage of the circuit described is that, although it is effective in providing automatic volume control to prevent detector overload, the effect of the instantaneous control is that the amplification of weak signals is never allowed to reach its maximum.

Constant Input

Automatic volume control, to be really effective, should maintain a reasonably constant input to the detector for a wide range of signal strengths, so that we ultimately hear the weak and loud stations at similar volume levels. (See Fig. 5.)

To do this a further circuit has been developed which allows us to select any desired degree of loudness, so to speak, and so arranged that the automatic volume control comes into action only when the amplified signal exceeds this predetermined value.

By ensuring sufficient high-frequency amplification, this circuit permits a much wider range of signal strengths to be heard at similar volume level.

Thus the second circuit (Fig. 4) shows one of the diode elements operating as a normal half-wave rectifier from which the audio-frequency rectified voltage is passed on to the grid of the triode in the same way as for the circuit Fig. 3. The second diode is arranged to be fed from the tuned circuit and is given a small permanent negative bias by means of a suitable tapped potentiometer R_4 in the valve cathode circuit, as shown.

In consequence of this small negative bias the automatic volume control circuit will not be responsive to very weak signals, but will only rectify when the signal voltage exceeds a certain value, determined by the position of the slider on the potentiometer R_4.

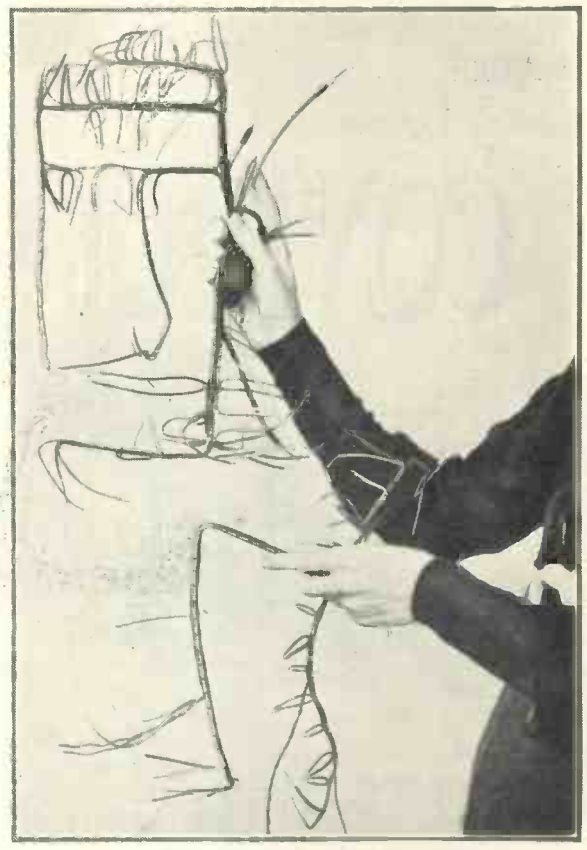
By this means a set can be arranged to give its maximum amplification until this point is reached, after which the automatic volume control circuit comes into operation and prevents the detector being overloaded. (See Fig. 5, curve 3.)

It is only possible here to give these two brief examples of the use of the double-diode-triode in automatic volume-control circuits, but its possibilities are being further explored and there is no question that it forms a most valuable addition to the range of receiving valves, comparable in importance only to the introduction of the variable-mu screen-grid valve, some two and a half years ago.

Avoiding Overload

In order to avoid overload of the triode grid when the output from the diode portion is of sufficient voltage fully to bias back the previous variable-mu valves, it is necessary, in view of the high amplification factor of the triode, to feed this from only a portion of the rectified diode output.

This is effected by means of a potentiometer shown as a resistance R_1 in the accompanying diagrams.



HOW A FACTORY SET IS WIRED
This interesting photograph shows the built-up wiring of the Columbia seven-valve super-het receiver. The leads fall into position almost automatically

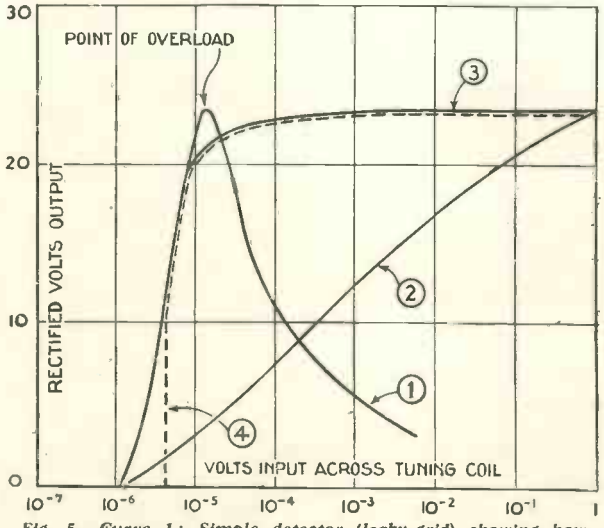


Fig. 5.—Curve 1: Simple detector (leaky-grid) showing how output increases as input is increased, up to a point where overloading occurs, after which output is diminished. Curve 2: Simple automatic volume control, showing avoidance of overload, but uneven degree of output. Curve 3: Delayed A.V.C., showing level output for wide differences of signal input. Curve 4: "Quiet" delayed A.V.C., showing that any signal below a certain predetermined minimum is not passed on, which reduces reception of "mush" and interference

MAJOR R. PHILLIPS, O.M.E.

Explains

CONTROL BY WIRELESS

Ever since radio was discovered people have been interested in the possibility of controlling machinery by wireless. In this article Major Raymond Phillips, who has spent many years in the development of wireless-controlled mechanism, explains how simple control apparatus can be constructed. The necessary apparatus can be made by any skilled amateur who has a few tools—and a little patience

A SIMPLE sequence selector is really a "distant-control switch" arranged to open or close various circuits in sequence.

As so many inquiries have been received from amateurs asking for details of such a device it is proposed in this article to describe the construction of a selector suitable for the control of an electric motor fitted to a model electric locomotive, or model boat, but it will be apparent that construction of the apparatus can be varied as desired.

Simple Conversion

The writer has frequently seen various relay-operated mechanisms "ready made" which can, at small cost, be converted into a selector, thus saving a great deal of constructional work.

A case in point is the dial mechanism for electric clocks which are operated by a "master" control. Amateurs would, of course, use their own ingenuity as to the best method to be adopted for utilising such a device to suit their requirements.

When constructing a selector the first thing to decide is the number of contacts that will be required for controlling the mechanism involved.

The selector for the writer's well-known wireless-controlled airship was provided with eighteen contacts on the revolving drum, the latter being divided into six spaces. The contacts were so arranged that four shunt-wound electric motors could be controlled and a trap door opened as desired.

It is well to remember that whatever type of selector it is decided to construct, one contact must always be provided for closing a circuit connected with a de-cohering device if wireless control is involved.

Such a contact is usually made by attaching a short piece of hard brass or copper wire to the armature of the electromagnet operating the selector, so that when the armature is attracted by the electromagnet the piece of wire comes in contact with a piece of "spring" brass attached to an insulated base, thus providing a "rubbing" contact and eliminating defects due to dirty surfaces.

The arrangement is shown clearly in Fig. 1.

Model electric motors fitted with a "sequence" reversing mechanism are much simpler to control than those not so fitted, as it is only necessary to "switch on," and "switch off" electric current to reverse the direction of rotation of the motor armature.

Construction Simplified

This only involves fitting one contact to a selector apart from the de-coherer circuit contact, and obviously simplifies matters considerably.

Ordinary model motors constructed with a "wound" or "perma-

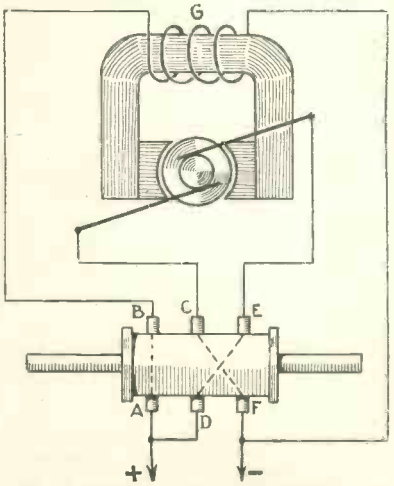


Fig. 2.—Circuits and contacts required for a model electric motor constructed with a "wound" or "permanent" field magnet

nent " field magnet present more difficulties, as it is necessary to reverse the direction of flow of electric current to the motor armature by means of some form of reversing switch fitted to a selector. This appears to be the snag which confronts most amateurs.

Fig. 2 shows the circuits and contacts required for a model electric motor constructed with a " wound " or " permanent " field magnet. It will be noted that contacts A and B do not reverse the direction of flow of electric current to the field-magnet windings.

Circuit Reversed

The dotted lines, which can be seen inside a selector drum (Fig. 2), show contact D connected with E, and contact C connected with F. On rotating the drum contact C would be connected with D, and contact E with F, thus producing a reversal of the circuit to the armature windings.

This arrangement is suitable for a " shunt-wound " motor. For a " series-wound " motor, the field magnet winding shown connected with contact F (Fig. 2) should be connected with contact D; the latter being disconnected from contact A. Contact F would be connected with a source of electrical energy, and other contacts connected as shown.

By eliminating the field-magnet winding G and substituting a permanent magnet, contacts CD and EF only would be required.

To avoid the trouble of making and winding an electromagnet suitable for operating the " step by step " movement of the selector, a magnet taken from an ordinary electric-bell movement (3-in. gong) will be found quite satisfactory.

Securing the Magnet

Its armature should be removed and the magnet secured to a metal plate as shown in Fig. 1. The latter is a " side elevation " of the complete selector. The plate should be made of brass 6 in. by 4 in. by $\frac{1}{8}$ in. thick, and secured to a base made of wood which can be polished or finished as desired.

The selector drum should be made from a length of fibre tube 2 in. long by $1\frac{1}{4}$ in. in diameter. The tube should be divided into two equal parts so that each half can be secured to two flanged spindles, as shown in Fig. 3. The complete drum should then be

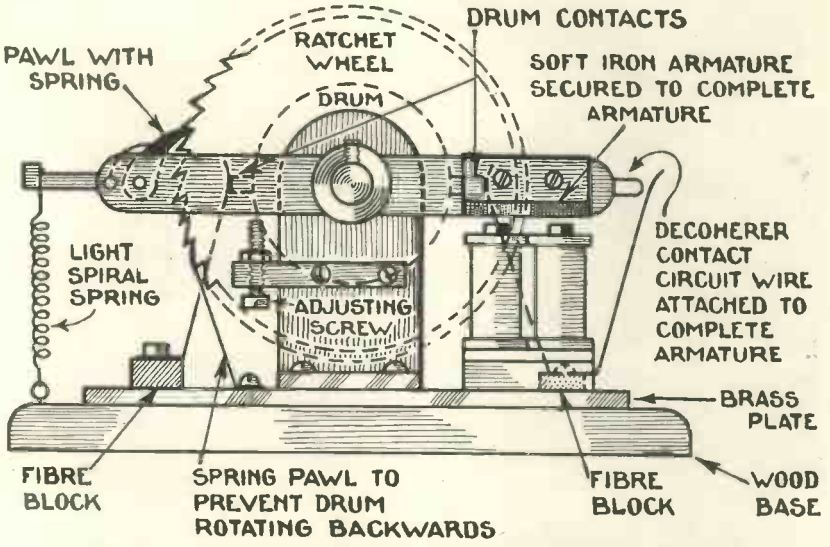


Fig. 1.—Side elevation of selector gear for the remote control of electrically driven models. Such a device is used for the author's well-known wireless-controlled airship

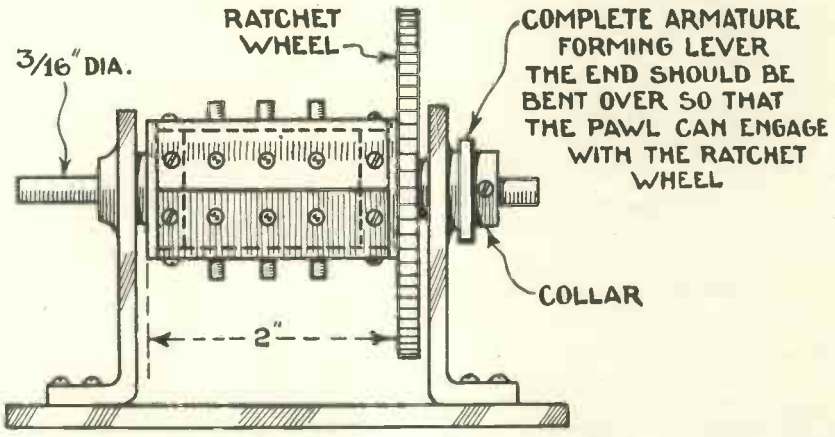


Fig. 3.—Elevation of selector gear, showing contact drum. It is not at all difficult to construct

marked off into six equal parts.

This can be done with a scriber or other-sharp pointed tool and, according to the number of contacts required, holes should be drilled and tapped on the dividing lines to accommodate No. 8 B.A. brass screws $\frac{3}{8}$ in. long. The latter should be screwed in from the inside of the drum.

A short piece of insulated flexible wire can be soldered to the heads of the screws, and circuits arranged as desired. Fig. 2 shows an example.

When all circuits are completed the two halves of the drum should be carefully put together and secured to the flanged spindles by screws. Tests should then be made to ensure that there are no short-circuits.

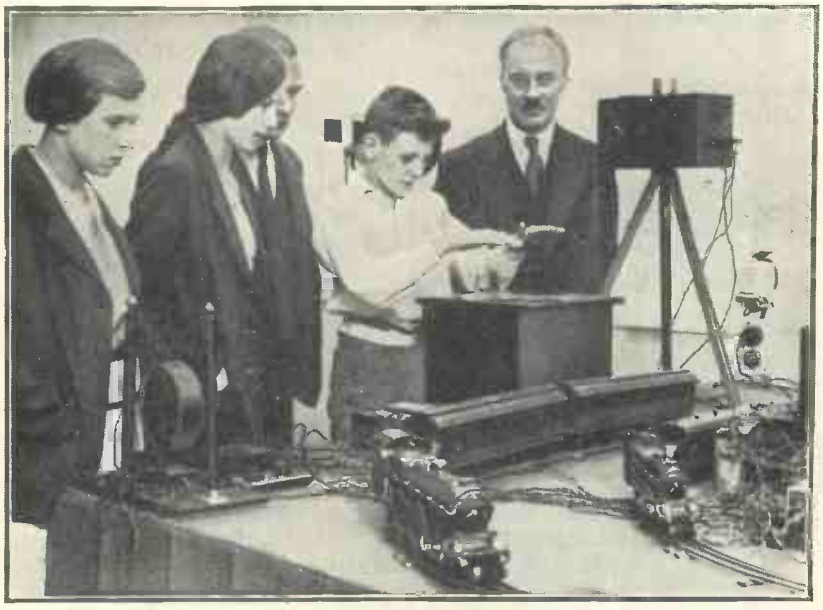
Bearings must now be made to support the spindles of the selector drum. The simplest way to do this is to make the bearings in the form of brackets from brass strip $\frac{3}{4}$ in. wide by $\frac{1}{8}$ in. thick, as shown in Fig. 1.

It will be noted that the distance from the base to the centre of the drum spindle bearing is 2 in. This will allow sufficient space for a ratchet 3 in. in diameter to be secured to one of the drum spindles.

Ready-made Ratchet

The ratchet can be purchased " ready made " from most clock material dealers, and should be as light as possible. It should also contain as many teeth as practicable for efficient working. Coarse teeth will be found to greatly impair the smooth working of the selector, and should, therefore, be avoided at all costs.

It may be necessary to make a " boss " for the centre of a ratchet,



CONTROLLING TRAINS BY CAPACITY EFFECT
Major Raymond Phillips (right) seen at the Model Exhibition demonstrating his radio-controlled train. The control is effected by variations in capacity

many being sold "plain" as cut from a brass plate. A "boss" can be made by soldering a short piece of brass tube on the centre of the ratchet. A hole should be drilled and tapped in the "boss" so that a sett-screw can secure the ratchet to the drum spindle, or the ratchet can be secured to the drum itself.

Special Armature

The next component comprises a special armature which can be made from brass strip and soft iron. The brass strip should be 4½ in. long by ½ in. wide by $\frac{3}{32}$ in. thick. A $\frac{3}{16}$ in. clearance hole should be drilled in the centre of the strip, and a "boss" made and fitted as described for the ratchet except that a sett-screw will not be required.

A brass pawl (this can be purchased "ready made" from almost any clock material dealer) to engage with the ratchet should be loosely secured to one end of the brass strip, and a light flat spring should keep the pawl pressed against the ratchet teeth when the complete armature is placed in working position.

Mounting Electromagnet

A piece of soft iron, 2 in. long by 1½ in. wide by $\frac{1}{16}$ in. thick bent in the form of a right angle, should be secured to the other end of the brass strip. The electromagnet should be mounted under this so that the complete armature will be attracted, as shown in Fig. 1.

A light spiral spring should be fitted near the pawl (also shown in Fig. 1) to ensure the complete armature returning to its normal position after being attracted by the electromagnet.

The movement of the complete armature can be regulated by means of an adjusting screw, as shown in Fig. 1. When making adjustments the armature should be kept as near as practicable to the cores of the electromagnet.

A flat spring is shown engaging with the teeth of the ratchet attached to the selector drum spindle to prevent the latter from rotating backwards.

The selector is now complete with the exception of contacts which will have to be made and arranged to engage with those fitted on the selector drum.

The contacts should be made from No. 30-gauge hard-brass sheet cut into strips about 3½ in. long by $\frac{3}{16}$ in. wide and a short length at one end of the strip should be bent at right angles and holes drilled so that the base can be secured to a fibre block. The latter should be 1 in. wide by ¼ in. thick.

Number of Contacts

The length will, of course, depend upon the number of contacts required, and that will be decided according to the number of circuits it is desired to control. It is, of course, advisable not to have too many contacts, otherwise there will be a risk of overloading the electromagnet, and the latter might, in that event, be unable to rotate the drum.

The contacts can be bent to shape by using a small pair of watchmaker's long-nose pliers. Care should be taken when undertaking the work so that there is ample clearance between each contact on the selector drum.

All wire connections can be attached to terminals if desired; the terminals, of course, being secured to the wood base upon which the complete selector is mounted.

Holding Armature

When all the work is completed a small collar with grub screw will be required to fit on one of the drum spindles to hold the complete armature in position. The collar can easily be made with a piece of brass tube in which a hole is drilled and tapped for the grub screw.

The selector described in this article is, in the writer's opinion, about the simplest that can be devised for amateurs to construct. Another type involves a great deal of lathe work and also requires much technical skill.

Australian Broadcasters

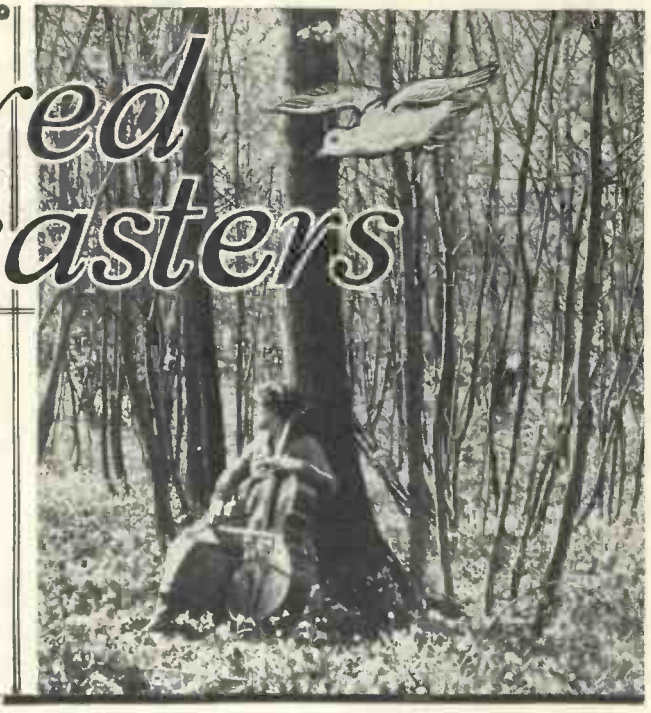
OVERSEAS readers of "Wireless Magazine" who wish to try for distant reception should make a note of the wavelengths of the twelve Australian broadcasting stations that are now in operation.

The wavelengths and call signs are as follows:—

236 metres	..	Sydney, 2SM
248 metres	..	Sydney, 2CH
267 metres	..	Sydney, 2UW
280 metres	..	Sydney, 2KY
293 metres	..	Sydney, 2UE
316 metres	..	Sydney, 2GB
351 metres	..	Sydney, 2BL
375 metres	..	Melbourne, 3LO
395 metres	..	Brisbane, 4QG
411 metres	..	Adelaide, 5CL
451 metres	..	Sydney, 2FC
492 metres	..	Melbourne, 3AR

A number of these stations start broadcasting as early as 7 o'clock in the morning and then go on almost continuously throughout the day.

Feathered Broadcasters



ENTICING THE NIGHTINGALE
Beatrice Harrison, the well-known 'cellist, plays her instrument in a wood to encourage the nightingales to break into song

WHEN the B.B.C. first conceived the happy idea of broadcasting the song of an English nightingale, they paved the way for a long and varied succession of bird broadcasts, many of which seem to have proved exceptionally popular with listeners everywhere.

From All Parts of the World

To-day, bird broadcasts of different kinds find a place in the programmes transmitted by quite a number of stations in Europe and other parts of the world.

Apart from the occasional O.B.'s in which the song of wild birds is relayed direct from the countryside (as in the case of the nightingale broadcasts which have formed such a popular annual feature of the B.B.C. programmes), bird voices are now heard frequently in various novel ways over the wireless.

POLLY FACES THE MIKE
Polly at the London Zoo rehearsing for a special broadcast through the B.B.C. transmitters

Broadcast gramophone recitals, for instance, frequently include bird records. Recent examples have ranged in variety from the bird chorus which greets the dawn breaking over the English countryside to (the opposite extreme, geographically!) the melodious song of an Australian lyre-bird, and the singing of a "choir" of trained canaries.

Another instance of the popularity of bird songs and calls with listeners of all nationalities is afforded by the bird interval-signals (or opening and closing-down signals) which are broadcast daily by many stations on the Continent and farther afield (but you need a short-wave set for those).

The signals to be heard include the crowing of a rooster; the song of a mechanised "nightingale" from some of the Italian stations; the cuckoo call favoured by several different foreign transmitters; and the cry of the kookaburra or laughing jackass, broadcast by the short-wave station at Sydney, Australia, which works on 28.5 and 31.28 metres.

It is a noticeable fact that these bird signals seem to retain their popularity year in and year out, whereas many of the other sounds adopted as interval signals have soon palled upon listeners, and have had to be altered or abandoned in consequence.

Even in radio drama birds have played a part. The most noteworthy instance occurred in *Carnival*, where the tense atmosphere of the seashore scene depended largely on the weird cries of seagulls (specially recorded for the purpose) which formed a most convincing background to that part of the play.

The latest and greatest possibility of giving delight to many thousands of birdlovers among the listening public all over the world has been opened up by Empire broadcasting. There must be innumerable listeners in lonely parts of the Empire to whom it would be a very real joy to hear the songs of British birds, bringing back vivid memories of our countryside.

Relay from a Bird Sanctuary

A brief relay from, say, a bird sanctuary or wood at a time when a large number of birds are in full song would undoubtedly be welcomed by many Empire listeners as a fairly regular feature of the programmes transmitted from the short-wave station at Daventry.

It is generally admitted that in beauty of song British birds are unsurpassed; broadcasting affords a unique opportunity of letting the whole world enjoy the beauty of British bird song at its best. Let us have more bird broadcasts! *Violet E. Oliver.*

Something You Can Try in Your Own Set

A NEW IDEA IN TRANSFORMER COUPLING

By L.F.E. JOHNSON, Ph.D.

THE use of iron-cored inter-valve transformers as a means of coupling in audio-frequency amplification has become at the present time almost universal and has superceded resistance-capacity coupling in practically every well-known design.

It is surprising, however, that the essentials of a good transformer appear to be very imperfectly understood and even the test reports in the various technical journals give little more than the so-called amplification curves and the inductance of the primary with and without D.C.

Practically Straight Line

From a careful examination of the published curves of the commercial transformers, varying in price from as little as 5s. to as much as 15s. and even more, it will be apparent that they all, irrespective of price, show what is practically a straight-line amplification from about 100 cycles or 150 cycles to 6,000 cycles or a little higher; some go a little lower and some a little higher before the amplification falls off to an appreciable extent.

The only real apparent difference is that some give more amplification than others, even when their turns ratio are identical.

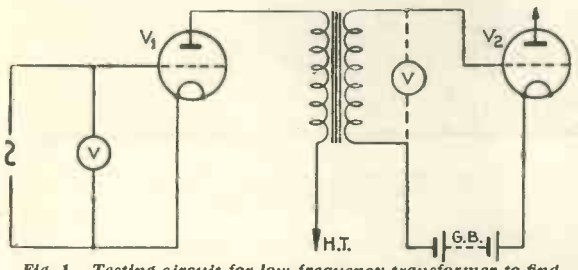


Fig. 1.—Testing circuit for low-frequency transformer to find relationship between input and output

Are we to assume from this that they are all equally good and that there is nothing to choose between them?

Any reader who has tried out various makes of transformers—and there are few who have not—will know that this is far from being the case and that their difference in performance is out of all proportion to what one might be led to expect from a study of their amplification curves.

Must we then assume that the curves are no criterion of performance? Not entirely. A good transformer will show a good curve, but not every transformer with a straight-line amplification curve is a good one. Curves can be very misleading.

A simple example will make this clear. A certain transformer has a published curve showing equal amplification from about 100 cycles to 5,000 cycles.

When tested in the usual way (Fig. 1) the input volts at varying frequencies applied to the grid of the valve V_1 were measured and compared with the amplified volts supplied by the secondary of the transformer across the grid of the valve V_2, the measurements being made by means of a Moulin voltmeter reading R.M.S.

Voltage Ratio

The ratio of the volts across the grid of V_2 to the volts across the grid of V_1, giving the amplification due to combined effect of valve V_1 and the transformer, was found to be practically constant throughout the whole frequency range from 100 to 5,000 cycles and in agreement with the published curve.

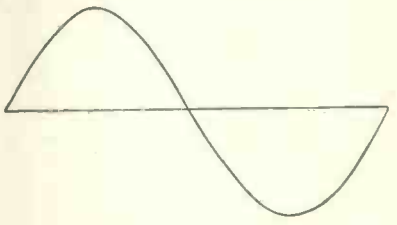


Fig. 2.—Pure sine wave with equal positive and negative half-cycles

It will be remembered that for a pure sine wave the peak value is 1.414 times the R.M.S. value, and this value is the same for both positive and negative half cycles of the wave (Fig. 2).

The peak value can be measured by means of a special-type valve voltmeter, and when the measurement of the volts developed across the grid of V_2 were made with such a meter it was found that the ratio between peak volts and R.M.S. was not 1.414 and, further, that the positive and negative half-cycles had different values, although the input

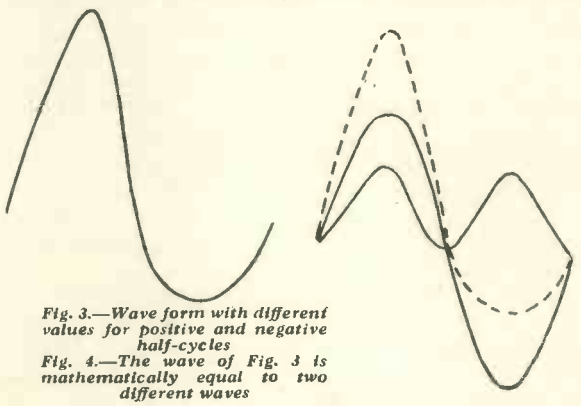


Fig. 3.—Wave form with different values for positive and negative half-cycles

Fig. 4.—The wave of Fig. 3 is mathematically equal to two different waves

volts across grid of v_1 were a true sine wave.

In fact, the wave form was as shown in Fig. 3, a wave which has different values for its positive and negative halves.

Such a wave is mathematically equivalent to, and has the same effect, as two waves, one being twice the frequency of the other (Fig. 4).

Octave Superimposed

The net result is that when this electrical wave is converted into sound in the loud-speaker the ear not only hears the true note of the frequency applies to the grid of v_1, but also its octave (the second harmonic, as it is called) superimposed upon it to a greater or less extent, depending upon the amount of wave-form distortion (amplitude distortion, as it is called) that the transformer has introduced.

As the intensity of sound is proportional to its frequency, quite a small percentage of second harmonic can have a very noticeable effect.

This amplitude distortion is caused by the saturation of the iron core of the transformer due to the D.C. current through its primary windings, and although there may still remain a fairly high inductance, the operating point is at a curved portion of the magnetisation curve instead of a straight part (Fig. 5).

The result is analogous to that which obtains when a valve is working near the bottom bend, either through over bias or overloading. It seems at first sight that parallel feed would overcome this difficulty and, in fact, many manufacturers of transformers, especially of the nickel-iron core type, recommend its use.

A further study of the curve (Fig. 5) will show that there is a fallacy in this assumption and that the operating point has now been removed from the top bend to the bottom bend and second-harmonic distortion again results.

The lower the input voltage and the less the percentage modulation the more marked will be the distortion.

It is a matter of common observation that parallel feed tends to give more "top" to the reproduction and also it cannot be too strongly emphasised that this kind of "top" is not a compensation for side-band cutting due to the selective tuning units, as the high notes produced are spurious harmonics of lower frequencies and not the true high frequencies of the transmission.

The reproduction resulting has, to the musical ear, no resemblance to the original.

It seems that the true solution of the difficulty lies in controlling the actual D.C. component flowing in the transformer primary winding, but here we are limited by the characteristic of our valve and in power-grid detection the value of this current may be of quite a high order, 8 or even more milliamperes.

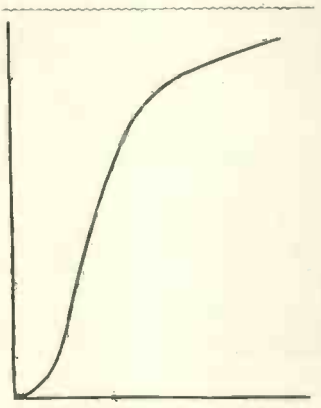


Fig. 5.—Operating point removed from the top bend to the bottom bend

To overcome these difficulties the writer devised a circuit* in which the D.C. component could be completely controlled and given any assigned value.

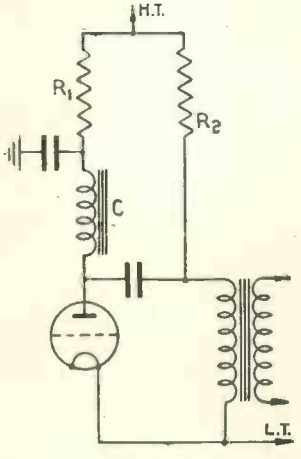


Fig. 6.—D.C. component supplied separately through a high resistance

In effect, the circuit consists of a transformer arranged as for parallel feed, with a D.C. component supplied separately through a high resistance (Fig. 6), and by varying the value of this resistance, which is generally of the order of 2 or 3 megohms, it is possible to determine the position on the curve about which the alternating audio frequency is operating.

It will be seen that this is analogous with biasing a valve to ensure its working on the straight-line part of its characteristic.

To sum up: Of the two evils, amplitude distortion (that is, the introduction of alien harmonics) is, to the musical ear, far more objectionable than frequency distortion (that is, a rendering of certain frequencies at a greater or less intensity than that at which they should be reproduced in proportion to the rest).

A purchaser would do well to insist upon a manufacturer giving some guarantee with regard to the percentage harmonic distortion introduced by his transformer under working conditions and it would be of considerable assistance if the technical press would include such data in their reports on transformers sent to them for test.

* British Patent No. 325812.

Battery Charging

WHEN you are charging your own accumulators a good indication of whether they are fully charged is to see whether *both* plates are "gassing."

The reason for gassing in this way is that the electric current has done all it can to change the changeable chemicals inside the cell and, as all the active material has been reconverted in the manner described in a previous article, the energy is used up in breaking up the electrolyte or acid into its constituent gases.

Actually, it is the water which is being decomposed into hydrogen and oxygen, the presence of the acid helping the process.

Acid on top generally causes corrosion, too, and the formation of a kind of chemical excrescence round the terminals.

Non-corrosive Vaseline

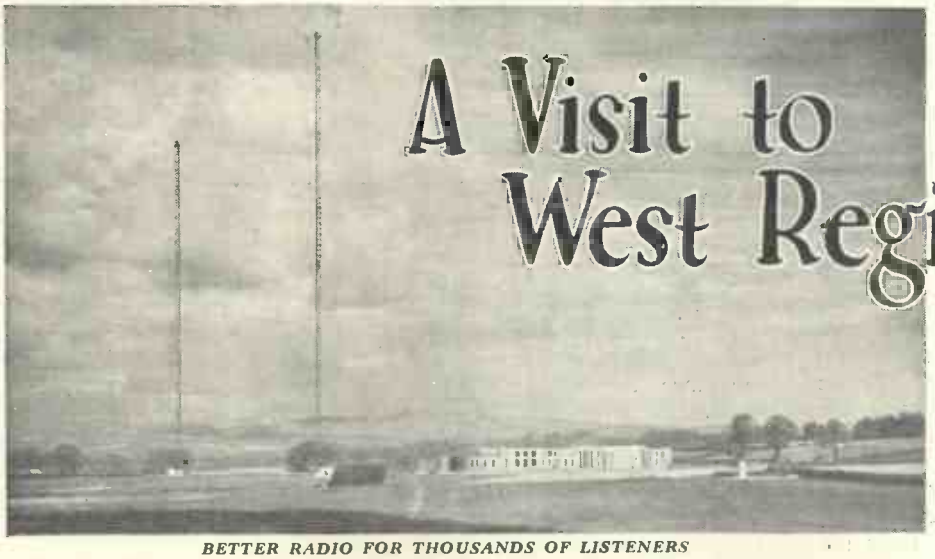
The best thing to do is to wipe the terminals thoroughly clean and dry, and then smear them over with non-corrosive vaseline. And just because the plates and acid interact, see that *all* of the plate surface is immersed in the acid by keeping the acid at its proper level.

As only *water* evaporates out of the acid, distilled water should be used for this "topping up." Do not use tap water, which contains lime and other substances.

Distilled water or, at a pinch, rain water is the only substance to use. If you add acid you will upset the concentration and perhaps damage the plates.

P. W. H.

A Visit to West Regional



BETTER RADIO FOR THOUSANDS OF LISTENERS

A fine view of the new West Regional station at Watchet in Somerset. The National programme is radiated on 261.3 metres and the Regional on 309.9 metres

A member of the "Wireless Magazine" staff who recently visited the new West Regional transmitter at Washford Cross gives some interesting details of the station and discusses its service area in view of the introduction, for the first time in the history of broadcasting, of two high-power stations synchronised on a common wavelength

WEST REGIONAL, the last of the dual-programme stations planned under the regional scheme, has been built near Watchet —a delightful village mid-way between the Quantock and Brendon Hills in North Somerset, and about two miles inland from the south bank of the Bristol Channel.

Wales and the West

The object of this station is to provide a regional programme service to the greater part of Wales and the West of England, and a national programme mainly to the thickly populated districts of South Wales. Watchet is just over twenty miles, as the crow flies, from Cardiff, and about forty miles from Swansea.

A minimum service area of seventy miles will be provided by the regional programme on a wavelength of 309.9 metres. This distance will be exceeded in some directions, especially to the north-west, where many miles of the service area consists of the waters of the Bristol Channel. It is well known that there is less attenuation of wireless waves over water. Hence the service area in this direction may exceed 100 miles.

Early reports from Welsh listeners show that the regional programme is giving better reception than the old transmitters at Cardiff and Swansea, even in the immediate vicinity of the old stations.

Much has been written of the transmitting gear at regional stations, so that only a very brief description of West Regional is necessary. The general design of Watchet is similar to that of Scottish Regional at Falkirk, which was opened early last year.

The building, which is of reconstructed stone, is divided into five sections. At the rear there is the power house containing four Diesel engines driving four generators, which deliver an output of 230 volts D.C. at 1,085 amperes. This current is passed to the machine-room, where the various voltages for the transmitting apparatus is generated.

Like the ordinary receiving set, a transmitter requires high tension, low tension, and grid bias. The anode consumption of our own receivers is ridiculously small when we compare it with the current of 12,000 volts at 19 amperes taken by the anodes of the water-cooled transmitting valves. About 5,000 gallons of water are used daily for the engine and valve cooling plants.

In the event of a complete breakdown in the power-house, a massive bank of storage batteries of 230 volts 2,000 ampere-hour capacity, which are contained in a room adjoining the power house, will keep the station running for one hour.

The Show Place

The transmitting plant is housed in a large hall, complete with domed roof—the show place of the station. Each transmitter is housed in five steel and aluminium cabinets with glass doors. Special precautions are taken to ensure the safety of the resident engineers from the high voltages.

No engineer can gain access to a cubicle without first switching off all high voltages, the doors of the cabinets being specially interlocked with the power switches.

The two huge masts, one for the regional-programme aerial and the other for the national aerial, are of the steel-lattice type, 500 ft. high, with red aircraft warning lights fitted to the platforms at the top. They can be seen for miles around the Somerset countryside.

Porcelain Insulators

Each aerial consists of three radiating conductors suspended from the top of the mast, which is insulated from earth by being mounted on porcelain insulators to avoid mast-shadow effect.

An engineer explained that during a stiff breeze the tops of the masts sway about 5 ft. Climbing them is a job for a man with iron nerves!

At the time of writing these notes test transmissions from the West National programme on 261.3 metres —the same wavelength as London National—have not started. When these tests begin it will be the first time in the history of broadcasting that two high-power stations have been synchronised for working on a common wavelength.

Tuning-fork Control

Both London and West National transmitters will employ tuning-fork control to maintain exact synchronism. There has been no trouble in the synchronism of Scottish National and Bournemouth on 288.5 metres, but an experiment with two high-power stations within 150 miles of each other is a different story.

Even B.B.C. engineers are not certain of the result of this rather daring experiment, but they have good reason to believe that it will result in success.

We know that the satisfactory service area of London National varies according to the direction, but 40 or 50 miles seems to be the limit. At Dorking, in Surrey, which is about 35 miles from Brookman's Park, fading is often experienced in the evening.

Whether listeners on the fringe of the service areas of London and West National will experience "mushy" reception is a problem that only the tests will show. The expensive tuning-fork control arrangement, which is being used to ensure absolute synchronism, should minimise any trouble.

If any difficulty does arise it will be on account of the reception of the reflected wave. For instance, listeners in the London area might get the reflected wave of the West National station and *vice versa*.

The reflected wave leaves the aerial and shoots off to the Heaviside Layer, and comes back to earth outside an area of 250 miles of the transmitting aerial. Therefore the service of London National should not be affected by reflected waves from West National and, of course, *vice versa*.

That the impossibility of finding an exclusive wavelength for West National will lead to the planning of a different scheme for covering the country with a guaranteed two-programme service depends largely on the results of the wavelength appropriation conference now being held at Lucerne.

On the other hand, it is believed that when Droitwich, the new 100-kilowatt station, which is being built to replace Daventry National on 1,554.4 metres, is opened next year, an entirely new scheme in regional broadcasting will be evolved.

Droitwich will give a satisfactory service of the national programme in the areas now served by London, North and West National transmitters. These transmitters will then be closed down and dismantled, and re-erected at remote parts of the country, which are badly served under the present system.

RADIO EXHIBITION

Readers who are arranging to spend their summer holidays in London should note that the Radio Exhibition will be held at Olympia this year from Tuesday, August 15, to Thursday, August 24. Every keen listener will, of course, make a special effort to visit the show, which this year will be full of new developments that will have a far-reaching influence on future radio technique.

"Now, Smith, what is a gramme?"
"The part that plays the records, sir!"

Radio Drama

A RADIO DRAMA festival is to be held in the autumn. Twelve plays will be broadcast, one each week, from the beginning of October until the end of the year. The list includes plays written between 1925 and 1931.

Most of them mark a development in writing for the microphone, and no plays will be included which have been produced at London theatres. In fact, there are no adaptations except from novels. Moreover, all the plays are by English writers.

First Radio Play

The list opens with the first short play written for broadcasting in 1925, a play called *Danger*, written by Richard Hughes. Another play of the same year is one rather in the Grand Guignol style by Martin Hussingtree, called *The Wrong Bus*.

The third play in the list was written for Armistice Day, 1925. It is a war play called *The White Chateau*: author, Reginald Berkeley. Cecil Lewis, remembered by the children as "Uncle Caractacus," wrote a thriller in 1928 called *Pursuit*, and Sieveking wrote the first production, using a multiple studio for its performance in the same year. It was called *Kaleidoscope the First*. Both are being revived.

In 1929 Holt Marvell adapted Compton Mackenzie's novel *Carnival* which, being a good specimen of adaptations of this sort, has been included.

The 1930 list is longer. It was a vintage year. Tyrone Guthrie's *The Flowers Are Not for You to Pick* is to be followed by an original farce called *Matinée*. Dulcima Glasby's *Obsession*, Gielgud's *Red Tabs*, and Peter Creswell's adaptation of Joseph Conrad's *Romance* complete the list for that year.

Two plays originally broadcast in 1931 were *The Path of Glory* by Du Garde Peach and the adaptation of *The Three Musketeers* by Guthrie and Riddell. Both are down for revival.

No biographical or historical plays were written for broadcasting in 1931. *W.-W.*

The Return of the Diode

"Quality" Detection Discussed by J. H. REYNER, B.Sc., A.M.I.E.E.

THE earliest form of valve employed for wireless reception was a two-electrode valve, or diode, which was used for detection. It consisted simply of a filament and an anode, and possessed the property that no current would flow through it unless the anode were positive.

No high-tension voltage was required, but, of course, there was no magnification, and the valve was very soon superseded by the three-electrode type which is so universally used to-day.

Replacing the Triode

For many years the triode has held the field. It has been replaced in the high-frequency portion of our sets by the screen-grid valve, and to some extent it has been ousted by the pentode in the output stage, but in the detector circuit a triode valve is still employed in the great majority of cases.

In certain special cases (such as for automatic volume control) it has been found desirable to revert to the diode, and it is interesting to speculate whether this will not herald a general return to the diode detector.

The great disadvantage of the triode detector is the ease with which it can be overloaded. Consider the case of a signal having a weak modulation. The average modulation of some foreign stations is little more than 10 per cent., which means that the effective low-frequency voltage applied to the grid of the detector is only one-tenth of the high-frequency voltage.

Now the detector valve does two things. It amplifies both the high-frequency signal and the low-frequency modulation and it may be considered for purposes of simplicity as two separate valves.

Suppose we want to develop a 10-volt signal in the anode circuit of the detector. If the detector valve has an amplification of 25, this corresponds to .4 of a volt on the grid.

With a 10 per cent. modulation, however, this means 4 volts carrier applied to the grid, giving 100 volts in the anode circuit, and since the detector valve is usually only supplied with about 100 volts high tension, if that, it is quite unable to handle such a large signal and distortion results.

True, the case quoted is a little on the extreme side, and we can also minimise the effect by using a by-pass condenser from anode to filament of the detector valve which tends to limit the amplification at radio frequencies, but the difficulty remains, and most readers will have experienced the trouble.

It usually manifests itself by an actual reduction in strength as the station is tuned-in. As the input increases the signal becomes stronger up to a point, but after this the detector begins to overload, and the signal strength falls off.

As one goes beyond the tuning point the signal strength *increases* at first and then falls off, so that we have a very pronounced double-hump effect, which is most unpleasant.

The novice, in fact, may be very bewildered because he may have his set tuned in but with the volume control so adjusted that the detector is not overloaded. He may then find that increasing the volume control causes the signal strength to decrease.

In despair he turns the volume control the other way and finds that the volume also decreases ! He then decides that the set is a rotten one.

A diode detector overcomes these difficulties. To all intents and purposes it will not overload, but it has no amplification, and therefore a further valve must be used.

No Overloading

We have, in fact, split up the two functions of detector and low-frequency amplifier which are normally combined in the triode, and by doing so we have avoided this bugbear of overloading, having in fact made both functions more efficient.

The diode is quite a simple device, and its use suggests various possibilities.

One is the inclusion of the diode in the same bulb as the triode, and this is being done in some of the special A.V.C. valves just released.

Another alternative is the use of a metal or crystal detector in place of the valve, while it is still possible that we may see diodes put on the market at a cost of a shilling or two only, specially for rectification in conjunction with an ordinary triode.

The diode has several disadvantages, one of the most serious being the lack of amplification, which makes it difficult to obtain reaction, while the damping imposed by the valve is rather heavy, although not necessarily more so than with a grid detector.

These difficulties, however, can be and are being overcome, and there is quite a possibility that we shall see a number of diode circuits in use next season.

WIRELESS WAVES AND SEA WAVES

A happy group of holidaymakers make their beach visits more enjoyable with a Marconiphone portable receiver

At the Eleventh Hour

TO show that I bore no ill-will, I tried a little pleasant conversation with the two men who had just failed to catch me with the confidence trick.

As the elder, a crestfallen look on his forbidding features, was slipping the cards into his pocket, I pointed to the great masts of Rugby Radio, which our train was then passing.

"Wonderful thing, this wireless," I remarked.

"Wonderful?" queried the younger man, crossly. "I could 'ave called it something else last night: I build sets, you see."

"Disappointing job, ain't it, Fred?" muttered the other sympathetically. "I *know*."

"Started building one last night," proceeded Fred. "I was getting the components all nicely mounted when—"

"I know," broke in the other. "It's 'appened to me, too. Got everything started nicely when, dang it, if the man from upstairs or down below didn't drop in for the loan of his screwdriver!"

"You've struck it, Albert," said Fred. "Well, in the end he brought back the screwdriver and I was able to get down to the job nicely for a time."

"For a time," echoed Albert, in ironical tones. "And then the Missus came in and asked you to go out and look for the dawg."

The younger man turned to me with a startled expression.

"Ain't he a marvel? It's as true as I'm sittin' 'ere!"

"Of course," said Albert. "I *know*."

"When I got back," resumed Fred, "I really did get on with the job. I finished the components, started the wiring—"

"Started the wiring," chimed in the other, "and then you found that the kids had used up half the reel to make a mousetrap or something."

"Rat-trap," corrected Fred. "I unscrambled the rat-trap and went on with the wiring. Got the blooming thing wired up and—"

Albert broke in with a laugh.

"And then you began looking for the valves."

"Couldn't find 'em nowhere," Fred admitted.

"So you borrowed a set of valves from the bloke upstairs," ventured Albert.

"Dahnstairs," said Fred, "'cause upstairs' is a crystal. Well I fixed in the valves, connected up the batteries and hitched in the aerial and earth. So far, so good."

"Eksackly," commented Albert. "Then you looked at the clock and found it had gone twelve."

"Now that's where you're wrong!" cried the other with a look of triumph in my direction. "It was only eleven, and there was dance music till midnight."

"Go on?" said Albert, incredulously.

"Five past eleven, and me and the Missus was all ready to listen when—"

"'Alf a mo'," Albert interrupted. "I know. Yer blinkin' accumulator had run down."

"On the con*trary*, it was frothing over."

Albert gazed at me defensively.

"Look 'ere!" said Fred. "This gentleman'll bet me ten bob you can't guess what the snag was. We'll give you till the train stops. That's fair, ain't it?"

"Give me time to think," said Albert. "Er — I'll hold the stakes."

The train was already slackening speed, so it seemed easy money, but I waited till Fred had passed Albert his ten shillings before parting with mine. Albert stroked the notes with a far-away look on his face.

"Yer mean to say, Fred, that arter spending a whole evening on the ruddy thing, yer couldn't tune in?"

Fred nodded.

"Cruel, I call it." And then a light came in Albert's eye. We were drawing into Rugby Station.

"Fred," he said, with a sob in his throat "I've got it. You suddenly remembered you 'adn't bought a wireless licence."

From the look in the young man's face I knew Albert was right.

Bernard Bland.

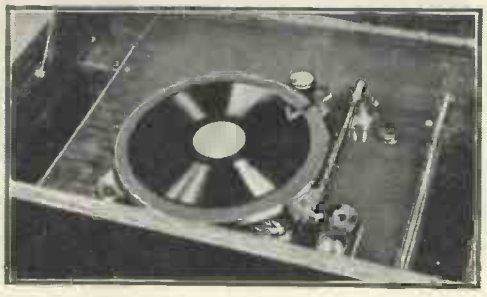
By the "Wireless Magazine" Technical Staff

The D.C. CALIBRATOR

ALTHOUGH there are not a very great number of homes in the country supplied from direct-current mains, there is an insistent demand from a section of "Wireless Magazine" readers for good D.C. designs.

In these pages we describe the construction and operation of a powerful and efficient four-valve set, making use of a wavelength-calibrated tuning unit that avoids ganging troubles.

The valve sequence is a variable-mu screen-grid high-frequency amplifier and a detector feeding into a push-pull output stage using two pentodes. The output is, therefore, in the neighbourhood of 4 watts; it will give all the volume that can possibly be required in normal circumstances.



VIEW OF THE MOTORBOARD

This photograph shows how the motorboard of the D.C. Calibrator is arranged. The motor will work from either D.C. or A.C. mains

The Tuning Unit

There is no need to say much here regarding the special merits of the tuning unit, which has already been used in previous "Wireless Magazine" Calibrator sets. It consists of a three-coil assembly with a three-gang condenser, giving band-pass aerial input tuning and a tuned-anode coupling for the high-frequency stage.

With this unit ganging troubles are cut to a minimum, thanks to the fact that the coils are actually matched up with the gang condenser during manufacture. Trimmers are fitted to the condenser in the usual way.

All of the valves used are of the indirectly-heated type so that, apart from the fact that no high-tension rectifier is needed, the set is very much like an A.C. receiver.

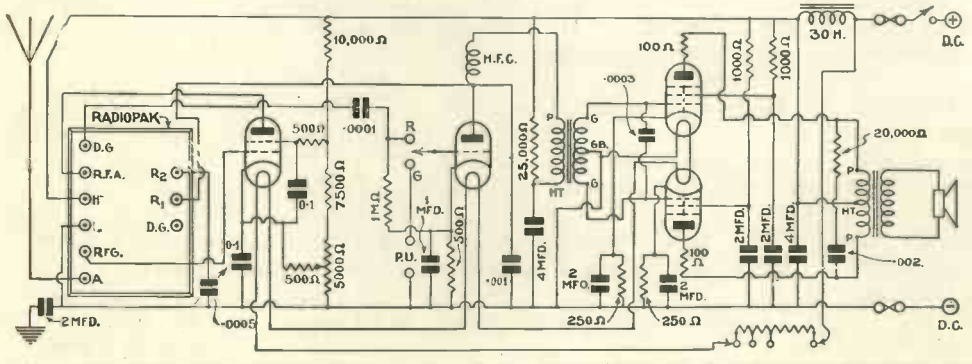
In order to provide great stability there is ample decoupling; small resistances are also provided in the anode circuits of the two push-pull valves to prevent self-oscillation.

The screening grid of the high-frequency valve is provided with a decoupling resistance of 500 ohms and a condenser of .1 microfarad. The 500-ohm grid-bias resistance is also by-passed by a .1-microfarad condenser.

Controlling Volume

The screening-grid circuit is controlled through a potentiometer consisting of three resistances, two fixed ones of 10,000 and 7,500 ohms, and a variable potentiometer of 5,000 ohms. By varying the position of the potentiometer slider the grid bias on the valve is altered, and therefore the volume of reproduction is controlled as desired.

The detector valve is arranged on the leaky-grid principle, but when it is desired to use a pick-up for the reproduction of gramophone records this valve is provided with grid bias and therefore functions as an amplifier. The bias is obtained automatically through



THEORETICAL CIRCUIT

The valve sequence employed is a variable-mu high-frequency stage followed by a detector feeding into two pentodes arranged in push-pull, giving an output of about 4 watts. Ample decoupling is incorporated to ensure complete stability. There is a high-note filter in the pentode output stage to prevent too much "top"

a 500-ohm resistance by-passed by a 1-microfarad condenser.

In the anode circuit of the detector is the usual high-frequency choke to give a good reaction effect, the amount of feedback being controlled by a .0005-microfarad variable condenser. There is a by-pass condenser of .001 microfarad across the anode and cathode of the detector to improve its efficiency.

Unusual Transformer Coupling

The transformer coupling between the detector and the two push-pull valves deserves some comment. The particular model used is actually a Q.P.P. instrument and has been chosen on account of its high step-up ratio, which is 1 to 10. The primary is decoupled by a 25,000-ohm resistance and a 4-microfarad by-pass condenser.

In order to reduce mains hum and to keep the pentode response from having too much "top" a .0003-microfarad condenser is placed directly across the secondary of the intervalve transformer.

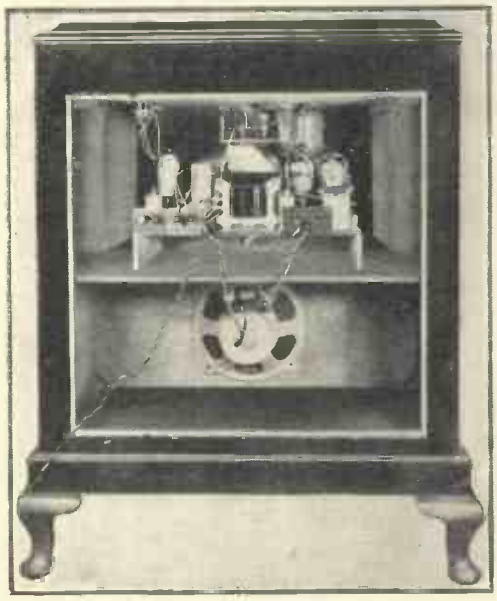
Bias is applied automatically to the grids of the two push-pull pentodes by means of 250-ohm resistances, included in the cathodes, each being by-passed by a 2-microfarad condenser.

Negligible Hum On Test

The priming grids of the pentodes are supplied with the correct operating voltage through 1,000-ohm resistances, by-passed by 2-microfarad condensers.

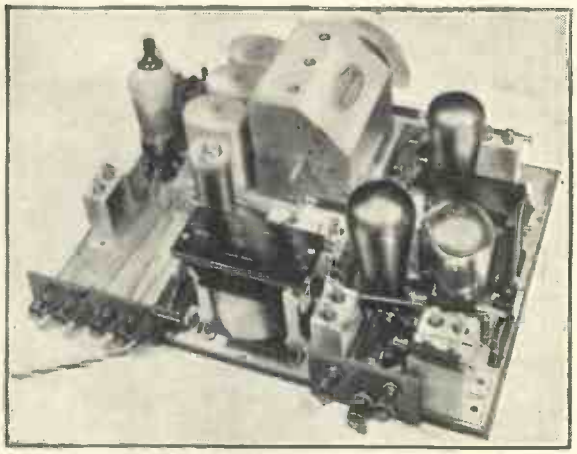
Mains ripple is smoothed out by a 30-henry choke and a 4-microfarad condenser. Tested on the D.C. mains in the "W.M." laboratories the mains hum was found to be negligible.

As is well known, pentodes are inclined to give rather high-pitched reproduction; to avoid too much of this a high-note filter is provided across the primary of the loud-speaker output transformer. It takes the form of a 20,000-ohm resistance in series with a .002-microfarad condenser.



COMPLETE ASSEMBLY

How the set and loud-speaker are arranged in the Osborn radio-gramophone cabinet. The whole outfit is most handsome in appearance



WELL LAID-OUT DESIGN FOR D.C. MAINS

The D.C. Calibrator is a first-class proposition for any listener with D.C. mains. It is presented as a complete radio gramophone, the whole outfit being housed in a fine cabinet

The heaters of the valves take .25 ampere each at 16 volts, so they can be run in series direct from the mains provided some of the voltage is wasted. The voltage is controlled by a large resistance, which is provided with tappings for mains of the following voltages: (1) 200 to 220, (2) 220 to 240, and (3) 240 to 250 volts.

It should be noted that the set will not operate efficiently on mains of less than 200 volts.

Fuses are provided in the positive and negative mains leads. It is also of the utmost importance to *use a high-voltage condenser in the earth lead;* this should be of about 2 microfarads capacity. If the positive main happens to be earthed and the set were connected to earth without this condenser the whole supply would be short-circuited, probably with disastrous results.

MAINS RESISTANCE

This view shows how the voltage-tapping tags are arranged on the mains resistance. Care should be taken to make the right connections

As it stands the circuit incorporates every refinement to give the greatest stability in operation and the most efficient results from the point of view of strength and selectivity.

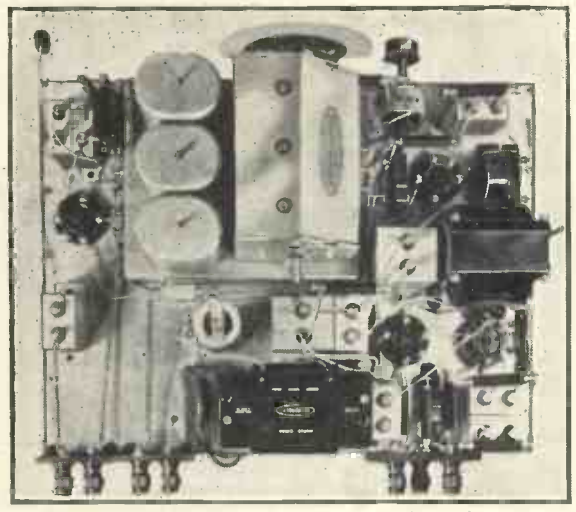
Latest D.C. Practice

A point we would emphasise is that technically this circuit conforms to the latest practice as far as D.C. circuits are concerned. In other words, if it is built now it will *not* be out of date in two or three months time. It can be relied upon to give extremely satisfactory service for the coming season.

Although a quarter-scale layout and wiring guide is included in these pages we strongly advise constructors to make use of a full-size blueprint, which can be obtained for half-price, that is 9d., post paid, if the coupon on the last page of the issue is used by July 31. Address your application to "Wireless Magazine," Blueprint Department, 58/61 Fetter Lane, London, E.C.4, and ask for No. WM328.

If undertaken methodically, there will be no difficulty about the construction of the set.

It will be noted that the baseboard is covered with a sheet of



PHOTOGRAPHIC PLAN VIEW

This special photographic plan view shows clearly the layout of all the parts in the D.C. Calibrator, an unusual four-valver for mains operation

aluminium foil or of Konductite. There will be no difficulty about screwing the baseboard components into position, while the control components (with the exception of the reaction condenser) are also fixed to the baseboard.

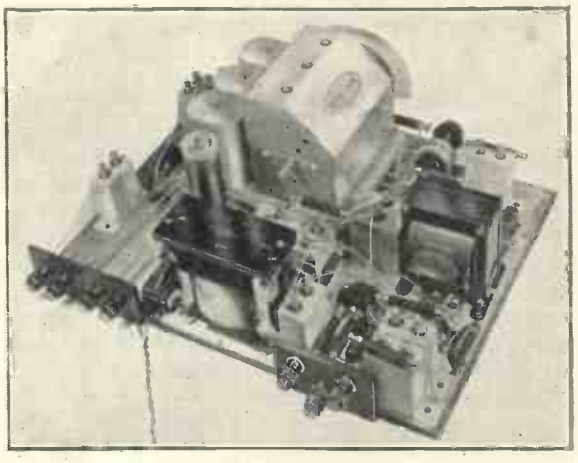
As will be clear from the photographs, the reaction condenser is mounted by a bracket on the underside of the baseboard, the connections being taken to it through two small holes.

Wiring should be undertaken in the numerical sequence indicated on the blueprint (or the reduced reproduction on page 605). It will be seen that each wire is numbered separately; the numbers indicate the best and most convenient order of making the connections.

Start off with wire No. 1 and carry on in the proper numerical order. It is a good plan to cross each number through with a pencil on the blueprint as the connections are completed; there will then be no chance of omitting any connection.

OPERATING THE SET

Controls of the D.C. Calibrator are so simple that the inexperienced listener will have no trouble with them



FREE FROM MAINS HUM

Tested in the "Wireless Magazine" laboratories the D.C. Calibrator was found to be practically free from mains hum

Care should be taken to connect the large mains resistance for the particular voltage mains on which the set is to be used. As shown, the set is suitable for use on 240 to 250-volt mains. Wire No. 72 is taken to the bottom tag on the resistance, while connections 2 and 3 are common to the top tag.

It will be seen from the photographs that the " common " tag is at the top of the resistance element, while the three voltage taps are arranged at the bottom, one above the other. Constructors should use care here.

LISTS OF PARTS NEEDED FOR THE D.C. CALIBRATOR

	£	s.	d.
CHOKE, HIGH-FREQUENCY			
1—Graham-Farish, Snap type (or Kinva, Peto-Scott)	0	2	0
CHOKE, LOW-FREQUENCY			
1—Davenset 30-henry, type 102 (or Parmeko, Ferranti)	1	5	0
CONDENSERS, FIXED			
1—Telsen .0001-microfarad, type W240 (or Lissen, Goltone) ...	0	0	6
1—Telsen .001-microfarad, type W245 (or Lissen, Goltone) ...	0	0	6
1—Telsen .002-microfarad, type 246 (or Lissen, Goltone)	0	0	6
2—Peak .1-microfarad, type 250 (or T.C.C., Dubilier)	0	4	0
1—Peak 1-microfarad, type 250 (or T.C.C., Dubilier)	0	2	6
5—Peak 2-microfarad, type 250 (or T.C.C., Dubilier)	0	16	3
2—Peak 4-microfarad, type 250 (or T.C.C., Dubilier)	0	11	0
CONDENSER, VARIABLE			
1—Graham-Farish .0005-microfarad reaction (or Polar, Bulgin)	0	2	0
FUSE			
1—Belling Lee twin fuseholder and fuses (or Bulgin)	0	2	6
HOLDERS, VALVE			
4—W.B. five-pin, miniature type (or Benjamin, Wearite)	0	2	8
RESISTANCES, FIXED			
14—Graham - Farish Ohmites, values 100 (2), 250 (2), 500 (3), 1,000 (2), 7,500, 10,000, 20,000, 25,000 ohms and 1 megohm (or Erie, B.A.T.)	1	1	0
1—Bulgin skeleton type D.C. mains resistance, type MR9	0	5	6
SUNDRIES			
Tinned-copper wire for connecting, say...	0	1	0
Lengths of oiled-cotton sleeving, say...	0	2	0
1—Sheet of aluminium foil, 16 in. by 12 in., say	0	1	0
1—Wearite mounting bracket ...	0	0	6
1—Bulgin duplex needle cup ...	0	2	6
1—Length of Goltone shielded cable	0	0	9
1—Piece of ebonite for mounting three terminals, say	0	0	4
2—Sovereign terminal blocks (or Belling Lee)	0	1	0
TERMINALS AND CONNECTORS			
7—Belling Lee type B, marked: Aerial, Earth, Pick-up (2), Loud-speaker (3) (or Clix, Eelex) ...	0	3	6
3—Belling Lee anode connectors (or Eelex)	0	1	0
TRANSFORMER, LOW-FREQUENCY			
1—Ferranti input, type AF11c ...	1	14	0
TUNING UNIT			
1—British Radiophone Radiopak, band-pass model with gramo-radio switch and 5,000-ohm potentiometer and extra knob ...	3	5	6

ACCESSORIES

	£	s.	d.
CABINET			
1—Osborn radio gramophone, Model 234, in mahogany ...	6	5	0
GRAMOPHONE MOTOR			
1—Garrard universal	5	5	0
LOUD-SPEAKER			
1—Magnavox, type 142 Magna, with push-pull output transformer for 2-DPT's	3	7	6
PICK-UP			
1—Belling Lee with adjustable arm	1	7	6
1—Belling Lee volume control ...	0	4	6
VALVES			
1—Osram VDS metallised (or Marconi VDS)	0	19	0
1—Osram DSB metallised (or Marconi DSB)	0	19	0
2—Osram DPT (or Marconi DPT)	2	0	0

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

For 200 to 220 volts mains wire No. 72 should be connected to the top one of these three lower tags, while for 220 to 230 volts mains the connection should be made to the middle of the three lower tags.

Braided Connections

In cases where a braided connection is indicated the connection should be made with metal-braided wire. Care should be taken to see that the metal braiding is pushed well back from the wire when the latter is bared, or there may be an accidental short-circuit to earth.

In every case the metal braiding is, of course, earthed to the metal baseplate.

It should be noted that the star-shaped ends of several of the wires indicate that a connection is made direct to the metal foil on the baseboard.

The actual operation of the receiver is not at all difficult as there are only four knobs to control altogether.

In the centre, one above the other, are the main tuning controls and the reaction control.

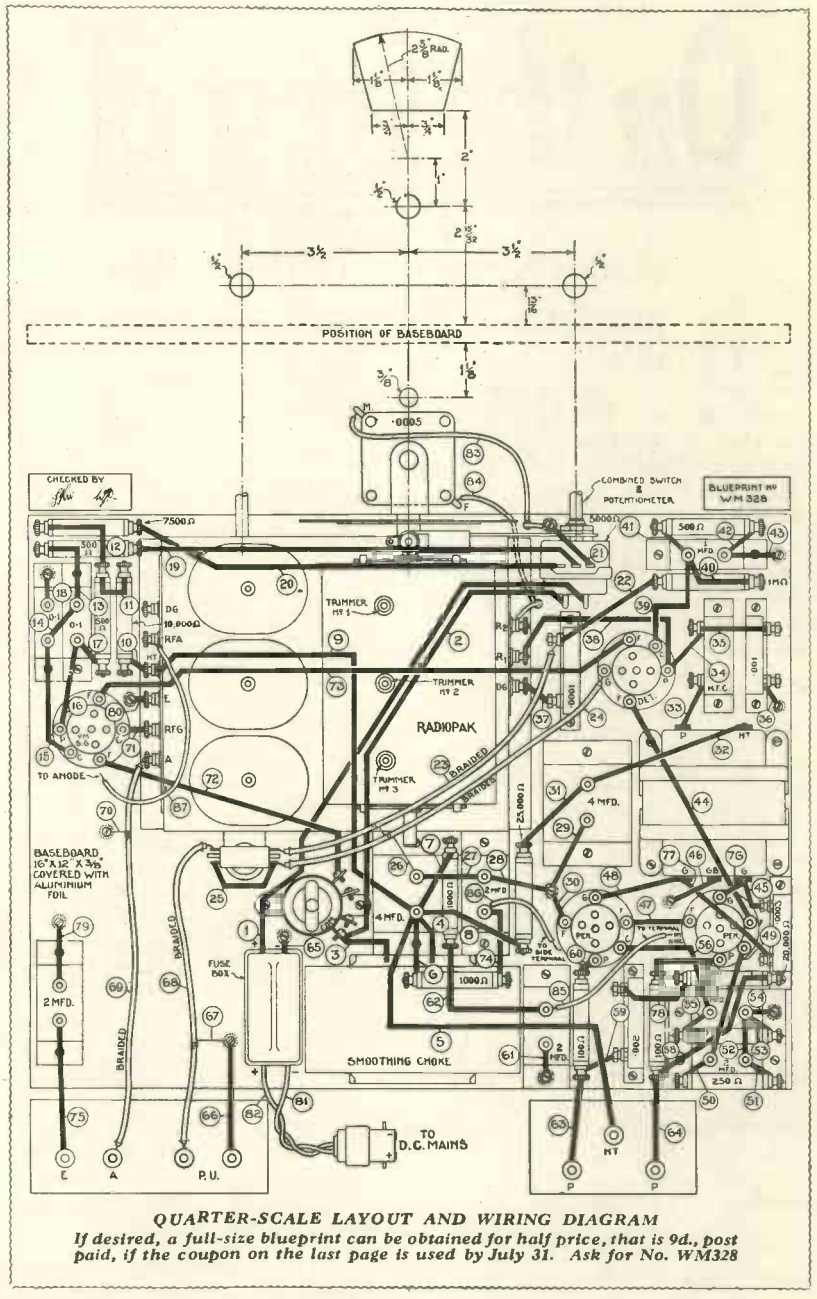
Layout of Controls

On the left is the volume-control potentiometer, with which is combined the main on-off switch.

The knob on the right has three positions, namely medium waves, long waves, and gramophone reproduction.

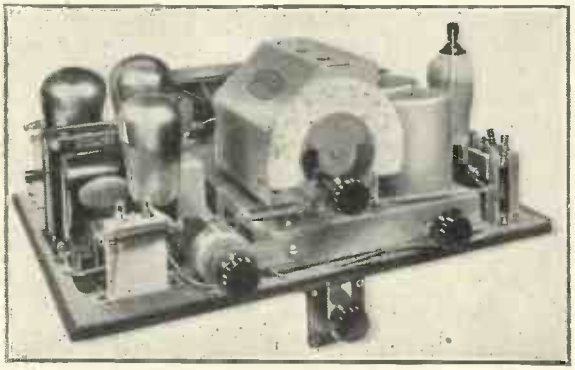
It will thus be appreciated that after a few minutes' practice the operation of the set can be mastered by the least technical operator.

Before the set is finally housed in its cabinet, however, it will be necessary just to trim up the gang condenser for the maximum strength. The positions of the trimmers are clearly shown on the blueprint; they



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

If desired, a full-size blueprint can be obtained for half price, that is 9d., post paid, if the coupon on the last page is used by July 31. Ask for No. WM328



SIMPLE CONTROLS

This view of the D.C. Calibrator shows how simple are the controls. Note that the reaction condenser is mounted on a bracket underneath the baseboard

are numbered from 1 to 3 for easy reference.

First of all screw all three trimmers until they are in the half-way position. Then adjust the main tuning control to about 300 metres (remember that the tuning dial is already marked in wavelengths).

Next adjust trimmer No. 2 until the greatest signal strength is obtained; then proceed with trimmers No. 1 and 3 in the same way. Experience shows that if the trimming is done in the order indicated, ganging is obtained without difficulty.

When it is desired to reproduce gramophone records electrically it is only necessary to turn the right-hand switch to the " gramophone " position, the detector being automatically changed over to form an amplifying circuit.

Volume of record reproduction must be controlled by a potentiometer mounted on the motorboard alongside the pick-up. A suitable type is specified in the list of parts.

On the Crest of the Waves

Radio News from All the World : : By JAY COOTE

AUSTRIA

SIMULTANEOUSLY with the construction of the new high-power station it had been intended to build a short-wave transmitter, but the installation of the latter plant has been indefinitely postponed. As, however, Austria is anxious that its programmes should be available to listeners overseas, arrangements are to be made with Germany to transmit special entertainments from Vienna on fixed dates between B.S.T. 2 and 3 a.m. through the Königswusterhausen short-wave transmitter.

◆ ◆ ◆

With the opening of the new Bisamberg 120-kilowatt station the Ravag intends to extend and develop the Vienna studio broadcasts. More hours are to be devoted to relays of performances from the State Opera House, and during the summer months a number of outside broadcasts by massed military bands is to be given.

◆ ◆ ◆

In order that foreign listeners should experience no difficulty in identifying the Vienna programmes the studio, as an interval signal, has adopted an abbreviated musical box version of *The Blue Danube*.

BELGIAN CONGO

At either Leopoldville or Boma the Belgian authorities propose to build a broadcasting station which, in addition to providing a local programme, would relay for the benefit of white residents news bulletins and entertainments from Brussels. These would be supplied through the Ruysselede short-wave transmitter near Bruges, which has been carrying out experimental transmissions with the Congo.

BELGIUM

Such small private broadcasting stations as Radio Schaerbeek, Binche, and Radio LL (Châtelineau), which were opened before the establishment of the I.N.R. at Brussels in 1930 are only temporarily licensed. As the power of the two main transmitters is to be increased there is a possibility that only five small privately owned stations will be allowed to work and it is anticipated that they may be asked to group themselves into one organisation.

CZECHOSLOVAKIA

Although, in addition to the Prague high-power station, there are four other medium-power transmitters, it is claimed that the northern district of the country is badly served and requests have been made by the inhabitants of Pilsen for the installation of a relay station in that city.

EGYPT

Up to the present there has been no established broadcasting service in Egypt although some local wireless entertainments have been provided by small privately owned stations such as Radio Heliopolis, Radio Voice, Szabo, etc. It appears that the Egyptian Government has now definitely voted a sum of money towards the completion of a 20-kilowatt broadcasting transmitter at Abu Zabal (Cairo), and for the installation of a 1-kilowatt relay at Ras-el Tin, Alexandria.

FRANCE

Poste Parisien, Paris, after many attempts to find a new interval signal, in a recent competition allotted a prize of 500 francs to one of their local listeners who suggested a short phrase from Charpentier's opera, *Louise*. It consists of six notes only and is produced by an electrical musical box.

◆ ◆ ◆

There is little likelihood of any drastic reorganisation of the French broadcasting service, as the Bill which could have put matters right has been rejected by the Chamber of Deputies. With a view, however, to an increased revenue to the State, an annual tax of 20 francs on a crystal receiver and 50 francs on each valve set will be levied by the authorities. In addition, 15 per cent. of the sale price of valves is also collected from manufacturers or dealers.

GERMANY

With the advent of the Hitler government, even the interval signals used by the broadcasting stations are to adopt the modern German spirit. Berlin, between items in the programme, now broadcasts a short excerpt of a favourite army marching song, " *Volk ans Gewehr* " ("People to Arms "); Königswusterhausen for its signal transmits the first notes of a patriotic song played on the Potsdam Garrison Church carillon; Leipzig commemorates the death of one of its famous composers, Bach, by playing on a vibraphone-like instrument notes representing the four letters of his name.

◆ ◆ ◆

Nightly, between 01.00 and 03.00 B.S.T., on 49.83 metres (6,020 kilocycles), special transmissions for the benefit of German residents in North and South America are broadcast from Berlin or another studio through DJC, Zeesen. In some of the programmes short talks in English are included; they are not limited to news, but deal with current topics in an endeavour to give foreign listeners a true appreciation of life in the Fatherland.

HOLLAND

Although PCJ, Hilversum, has not broadcast since October, 1931, PHI at Huizen has now inaugurated a regular service of transmissions destined to listeners in the Netherlands' East and West Indies. During the summer months these are carried out on 16.88 metres (17,775 kilocycles) on Mondays, Thursdays, Saturdays and Sundays between 13.00 and 15.00 or 15.30 B.S.T. The station, however, is sometimes used on other days when occasion arises.

If the channel used is not deemed

favourable in the latter months of the year, an alternative wavelength of 25.57 metres (11,730 kilocycles) will be adopted. As the broadcasts, although mainly destined to Dutchmen residing overseas, are also well heard by listeners of other nationalities announcements are frequently given out in English, German, French, Italian, Spanish and Portuguese.

HUNGARY

Hungary is not only anxious to increase her number of registered listeners, but is also desirous to see the tax paid when due. In order to offer suitable encouragement the authorities have instituted a special lottery in which radio listeners only are entitled to secure tickets. As the prizes are worth winning it is hoped by this means to develop the broadcasting system in addition to securing a good profit on the transaction!

LATVIA

Experimental tests of the 15-kilowatt Madona station having proved satisfactory, the transmitter now works daily on 452 metres (664 kilocycles), the greater bulk of its programmes being relayed from Riga. The wavelength has been temporarily adopted and may be exchanged for a more favourable channel at a future date. Work has been started on the 25-kilowatt transmitter to be erected at Kuldiga (Goldingen) and it is hoped to complete the installation by the end of 1933.

MEXICO

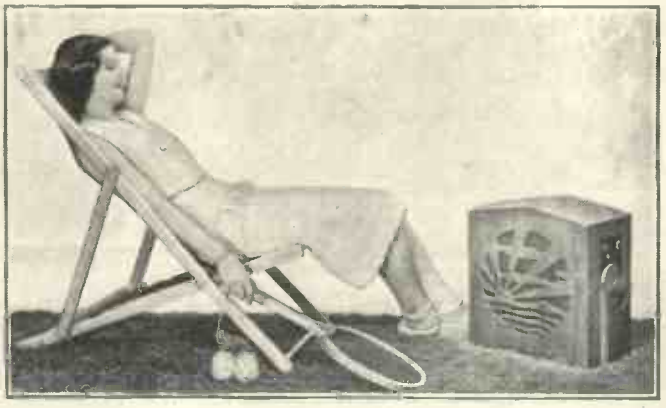
During the winter months broadcasts from stations in the Argentine Republic, and in particular from Buenos Aires, have been regularly heard in the British Isles, but so far reports on transmissions picked up from Mexican stations have been very scarce. In the near future there is a good possibility that the calls of such stations as XER and XEPN may appear more frequently in listeners' logs.

A 500-kilowatt transmitter at Villa Acuna (Coahuila) has been licensed by the authorities to work on 407.9 metres (735 kilocycles) and/or 450.9 metres (665 kilocycles); also XEPN, at Piedas Negras, on the United States border, of which the power is 22 kilowatts, is already operating on 338.8 metres (885 kilocycles). Both stations are privately owned and as the wireless entertainments, including sponsored concerts, are as much destined to the United States as to Mexico announcements are made in both Spanish and English.

RUSSIA

International propaganda broadcasts continue to be put out by the Moscow and Leningrad transmitters on 1,481, 1,304, 1,000, and 857 metres. On some nights, when important official announcements form the feature of the programmes, the stations may be heard giving out the same news in different languages.

On both 1,000 and 50 metres the schedule for the talks is as follows: German on Sundays, Mondays, Thursdays, and Saturdays (20.00-21.00 B.S.T.); Dutch on Fridays (22.00-23.00) and on Tuesdays (20.00-21.00); Swedish on Thursdays and Saturdays (22.00-23.00); Spanish on Sundays; Magyar on Tuesdays; Czech on Wednesdays and Fridays.



RADIO AS A SUMMER RELAXATION

After a strenuous game of tennis there is nothing like a good half-hour with a portable set. This photograph shows the Pye model Q/MT battery transportable

From the Trades Unions' station, on 1,304 metres and on 46.6 or 50 metres, between 21.00 and 23.00, lectures are broadcast in English daily, with the exception of Tuesday and Thursday. On those evenings and also on Saturday, between 21.00 and 23.00, they are given in French.

SPAIN

Pending the reorganisation of the Spanish broadcasting system, and its extension to districts which have not yet been endowed with a station, steps are being taken by independent organisations to erect small transmitters for the supply of local wireless entertainments. The first to appear on the ether is Radio Galicia, a 200-watter installed at Santiago de Compostela, situated between Corunna and Vigo in the old province of Galicia. It is working on 368.1 metres, a channel already shared by Bolzano (Italy) and Helsinki (Finland).

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Following a series of proposals the Spanish authorities have now decided that to feed the country several high-power stations will be needed. It is understood that the latest scheme was submitted for the consideration of the International Broadcasting Union at Lucerne.

Authority is desired to erect a 160-kilowatt station in the neighbourhood of Madrid to work, if possible, on a channel in the region of 1,425-1,450 metres; another 100-kilowatt transmitter for which an exclusive wavelength is also required, two of 50 kilowatts on a channel above 300 metres and two of 20 kilowatts to operate in the lower portion of the waveband.

TURKEY

Notwithstanding the recent reports that broadcasts from Istanbul could be heard in the intervals of the Radio Luxembourg programme, it is seldom that listeners in the British Isles succeed in picking up readable signals from either Istanbul or Ankara.

The stations are only rated at 5 kilowatts and their distance from Great Britain is respectively, 1,550 and 1,800 miles approximately.

UNITED STATES

The Amalgamated Broadcasting System of America is a new association, which has been recently formed in competition with the Columbia and National networks. It has started modestly with a chain of nine broadcasters, mostly in the State of Michigan, but hopes to extend the organisation to include 100 transmitters. The bulk of the entertainments will be drawn from Washington.

Cheerful Summer Programmes

By T. F. Henn

No introduction is needed for Major Christopher Stone, who is probably the most popular broadcaster in this country

JULY is going to be a month that lovers of really pleasant light entertainment will not forget for some time.

In glancing through the projected programmes I have come to the conclusion that, for once in a while, the dominating features have changed from the classical-music broadcasts to the better-liked variety type of entertainment.

Frank Thomas, a member of the Western Studio Orchestra, often gives violin recitals in the West Regional programmes

Every night there will be a popular variety programme or a concert by some unusual combination, such as Walford Hyden's New Magyar Orchestra. The highbrow will be almost forgotten.

Except for an occasional chamber-music concert—mostly on Sunday evenings—, song recitals, and a few special broadcasts, the highbrow will have to search further afield for his entertainment.

A cinema organist who gives regular recitals from the Regal Cinema at Kingston, Reginald Foort. He has written a book on cinema organs

The real reason for the absence of classical-orchestral music is that the main body of the B.B.C. Orchestra will be away on holiday and there are no relays of symphony concerts from Queen's Hall.

That such a position should arise is all to the good. It will give the light-programme department of the B.B.C. a chance to show what they really can do. And, believe me, they are out to do it !

I could mention hosts of splendid light turns that are booked for presentation. Mantovani and his fine Tipica Orchestra, a comedy revue by Tommy Handley, variety relays from the Argyle Theatre at Birkenhead, new dance bands, and Lew Stone in a special studio broadcast are but few of the notable light programmes in store.

"Prom" Rehearsals

The complete orchestra will not be back at Broadcasting House until the middle of July, and then they will be kept busy by rehearsals for the season of Queen's Hall promenade concerts, which open—rather late this year—on August 12.

Sir Henry Wood will be conducting. This will be the thirty-ninth season of "Proms," all of which have been conducted by Sir Henry.

Harry Fryer is music director of the Shepherd's Bush Pavilion. His orchestra broadcasts regularly in the National programmes

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The inauguration of the new organ in the Concert Hall at Broadcasting House during June was an important occasion in the history of British broadcasting. While many American and Continental studios have had their own organs, we have had to rely on outside sources, many with difficult acoustical properties, for our organ music.

Now we have an instrument that is undoubtedly the last word in broadcasting organs.

Listeners will remember that when the studio tower was built it was specially treated with sound-insulating material to prevent sound from one floor being heard on adjoining floors and also outside the tower itself.

Organ Vibrations

Last month I mentioned that during preliminary tests vibrations from the organ had been felt in the passages outside the tower. Now I learn that during further tests the organ has been heard in the basement vaudeville studio and in the

A great violinist, Orea Pernel, frequently gives recitals. She is a great favourite with "Prom" audiences

three studios situated on the floor immediately above the Concert Hall, besides in the corridors outside the tower.

Very Slight Noise

In the vaudeville studio the noise is very slight and does not affect programmes in any way.

It is not proposed to curtail the number of outside organ broadcasts. A notable O.B. will be a recital by G. D. Cunningham at Queen's Hall, on July 21, at 12.30 p.m. I do wish that the B.B.C. would permanently fix this Sunday-morning session for good organ music.

The B.B.C. organ will be used for accompanying religious broadcasts, for compositions with orchestra, and for special recitals.

Many listeners will remember that on several occasions I have suggested the need for an alternative to the late dance music. Unfortunately, I learn that the chances of any programme development on these lines is almost out of the question.

In the first place it is stated that the supposed small number of listeners after 10.30 p.m. would not

Reginald King, pianist and conductor, whose orchestra is one of the most popular items in the light programmes

warrant the expense, and that it would be impracticable because London National and Midland Regional are engaged in television broadcasts on four nights of the week.

However, I have found a remedy that might appeal to many enthusiastic listeners. Almost every night I tune in to Leipsig (which you will find on your dials just below Midland Regional) and listen to light music of the very best kind. Light German compositions, selections from tuneful operettas, and Strauss waltzes are but few items of the wonderful entertainment given.

I recommend you to try Leipsig's fare; I am sure you

Vladimir Vladimoff is conductor of his own orchestra, Vladimoff's Balalaika Orchestra. He is holding the balalaika

will agree that it takes some beating.

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One of the most popular of broadcast concert parties is the Roosters, who make very frequent appearances before the mike. There are very few artists who can claim, like the Roosters, that they have made regular appearances in the programmes since the first days of broadcasting in 1922.

The Roosters, who are known mainly for their breezy sketches on

Ray Noble, the brilliant English dance-music composer, is making his first broadcast with the H.M.V. Dance Orchestra in July. He makes a speciality of giving real tuneful dance music with plenty of "pep"

Florence Oldham is one of the most popular singers of light songs in the vaudeville programmes

the brighter side of Army life, came together on the Salonika front in 1917 and quickly made a name for themselves.

After the war they were persuaded to keep their party together and became an instantaneous success wherever they went.

A Record Review

In addition to early broadcasts for the B.B.C., this cheery group made their appearance on Columbia records as far back as 1922. They are still recording, and one of their most successful records is reviewed in the Gramo-radio Section this month.

The Roosters hold the distinction of being the only concert party to have given two concerts in the Albert Hall. Their broadcasts are one of the really bright spots in the programmes.

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Another relay from Germany will be heard on July 1, when Act 1 of

Organist of the Southfields Central Hall, Norman Askew gave a special recital last month in provincial programmes

Richard Strauss' opera, *Arabella*, will be relayed from the State Opera House at Dresden. This relay has been arranged by the Central German Broadcasting Company (Reichs-Rundfunk-Gesellschaft) in conjunction with the B.B.C.

This should be an interesting broadcast, mainly on account of the invigorating music of Richard Strauss. Listeners who are fond of this composers' music should note that a special gramophone recital of his best-known works will be broadcast on July 9, at 3.15 p.m.

An unusual broadcast will be heard on July 2, when a programme entitled, "Music from the High Places of the Earth," will be given by the Leslie Bridgewater Harp Quintet, with Hugh Mackay as soloist. The amount of preparation that must have been necessary for this broadcast is shown by the collection of songs that will be heard.

An Interesting Collection

We shall hear some of the folk songs of Wales, songs from the Scottish Highlands, national music of Norway, mountain songs of Switzerland, folk songs of English origin collected in the Appalachian Mountains by Cedric Sharpe, the 'cellist, mountain songs of North Carolina which have been collected by Suzannah Westmar and Marshal Bartholomew, and some Tyrolese melodies.

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Ray Noble and the H.M.V. Dance Band are making their first broadcast on July 10 in an hour's show beginning at 8 p.m. Ray Noble is, of course, one of England's most brilliant dance-music composers. Many will remember his great tune, "Good Night, Sweetheart," which was all the rage some seasons ago. An event certainly worth hearing!

This is the composer of "He Played His Ukelele as the Ship Went Down," Leslie Sarony. He is a frequent broadcaster

Robert Tredinnick gives special gramophone recitals in the Midland programme. He is a popular turn

A provincial singer, Essie Ackland, contralto, often appears in the programmes. She is well known for her records

By the
"W.M." Set Selection
Bureau

WE TEST BEFORE YOU BUY

THAT WAS A GOOD JOKE!

Waiting for their call at the recent command performance at the Palladium, these artists spent their time listening to a Gecophone receiver

NEXT season's most popular set is likely to be a four-valve super-het, which we think will take the place in the public's popular favour of the ubiquitous three-valver of to-day. One reason why the new four-valve super-het will oust the three valver is probably that of price. *To-day it is possible to buy a really first-rate four-valve super-het costing appreciably less than a three-valver of last year.*

Quite apart from all technical considerations, price has a way of arbitrarily forming public opinion in the choice of wireless receiving apparatus. Fortunately, this year the average set-buyer will be able to indulge in his technical fancy without delving too deeply into his pocket.

Of course, it has been known for a long time that, good though the average three-valver undoubtedly is, it does not fully satisfy the exacting demands of to-day.

Most Popular Set of the Season

This is something the super-het can and does do most decisively. Therefore, we may expect the popular set of the coming season to represent a real step forward in that for the price of a three-valver to-day you will be able to select from a wide range of four-valve super-hets one that will provide the last word in selectivity.

Most of the new super-hets we have tried so far are notable for the way troublesome background noises have been suppressed. Second-channel interference, or the production of "images" of any given station at two or three points on the tuning scale, seem to have been entirely eliminated. That this has been done with so little mutilation of the final quality of reproduction speaks well for the research work of our set designers.

Another decisive advance in the new sets, and here we are not referring specifically to super-hets, is the wonderful improvement in the *readability* of the tuning scales. Not only have the wavelength calibrations been made clearer, due to the use of much larger scales, but much additional assistance has been provided by the equally clear station names.

Exactly what is to happen to these scales if the much-talked-of Lucerne plan radically alters the distribution of European wavelengths we hesitate to say!

Better Quality From Battery Sets

As we anticipated, the coming of class-B valves has revolutionised the quality of commercial battery-operated sets. From the few sets we have so far been able to try incorporating this new system, it is perfectly obvious that the days of weak and distorted reproduction from battery sets are over. There is no reason why anybody should tolerate indifferent quality when buying battery sets now or in the future.

Not only do these new class-B battery sets give you much better quality because the output is not overloaded at the required volume, but there is the very great additional advantage that the total anode current extracted from the inevitable standard-capacity high-tension battery is lower than it used to be in the bad old days of over-run and greedy power valves.

The greatly increased power from class B that can be obtained without distortion enables moving-coil loud-speakers to be used even though they may be less sensitive than the moving-iron type they are so rapidly displacing.

In other words, there is enough power in reserve to run a loud-speaker of moderate sensitivity and still obtain ample volume. Here again the set-buyer definitely gains in improved quality of reproduction.

Of the class-B sets we have already tested not one is appreciably inferior to the best of mains sets, simply because there is no longer any over-loading of the power valve and because the moving-coil loud-speaker, backed by ample power, brings out the bass notes in their right proportion.

FREE ADVICE TO PROSPECTIVE SET BUYERS

To make the most of this free advice service, we ask you to answer the following questions :—

(1) The maximum price you wish to pay, and whether you are prepared to exceed this if there is no suitable set at your desired price.

(2) The locality in which the set will be installed.

(3) The stations required, that is, locals only or a selection of foreigners.

(4) Whether you want an entirely self-contained set or one with external aerial and earth.

(5) Whether battery or mains driven. If the latter, whether A.C. or D.C.

A stamped-addressed envelope for our reply is your only expense. Address your inquiry to Set Selection Bureau, "Wireless Magazine," 58-61 Fetter Lane, E.C.4. Tell your friends about this useful service, exclusive to "W.M."

Philco Transitone

MAKERS : Philco Radio and Television Corp. of Great Britain, Ltd.
PRICE : 29 to 32 guineas, with extra £3 for fitting.
VALVE COMBINATION : Six-valve super-het sequence.
POWER SUPPLY : Rotary converter working from the car battery.
TYPE : Special car radio equipment, comprising screened set, moving-coil loud-speaker, remote-control disc, roof aerial, rotary converter and suppressor units for ignition and plugs.
REMARKS : Brings in home and foreign programmes without background when the car is travelling on the road, with very little fading and good quality of reproduction.

A SET FOR YOUR CAR

On the left is a rear view of the Philco Transitone receiver and on the right the small control unit, which fits on the steering column of the car

WE have spent an interesting hour touring around London in a car fitted up with the Philco Transitone equipment for car-radio reception. Frankly, we were taken aback by the results obtained. There was an entire absence of background noises from the car ignition system and the strength and quality of the many stations received were much better than we had thought possible.

In the past there have been serious difficulties with radio on cars. Fading strength, interference and weak reception generally have ruled out such sets from the field of real entertainment. The Philco people have been working on all these snags for some years and the apparatus demonstrated to us seems practically perfect.

We heard both the London stations at terrific strength, and even above the roar of Piccadilly traffic we could follow the programmes with ease. We were amazed at the strength of Post Parisien, which came through with no more background than anyone would expect to put up with on a home installation during the daytime.

Everything is hidden except a small heart-shaped disc about 2½ in. in diameter, which is fitted to the steering column. Then fitted on the left-hand side of the scuttle, beneath the dash, is a powerful six-valve super-het, which is a marvel of compactness, being only one foot square.

The super-het works into a generous-sized moving-coil loud-speaker, which is fitted on the right of the scuttle, and gains some sort of baffle advantage from this position. The aerial—wire netting—is fitted between the cloth upholstery and the top of the roof of the car—out of sight and entirely non-directional, of course. The earth is made to the nearest point on the car chassis.

Power is supplied from a neat little rotary converter fitted under the passenger seat and working from the starter battery. Philco suppressor units are fitted to the plugs and distributor, and all parts of the apparatus are well shielded.

Control is very simple, special flexible drives for tuning and volume fitted to the disc on the steering column making set operation, even while driving at 50 miles an hour, quite a simple job.

H.M.V. Radiogram Five

MAKERS : Gramophone Co., Ltd.
PRICE : £30 9s.
VALVE COMBINATION: Four-valve super-het sequence with fifth valve for mains rectification.
POWER SUPPLY : A.C. mains.
TYPE : Model 512; Pedestal radio gramophone.
REMARKS : Fine value for money. Gives delightful quality with plenty of volume on radio and records.

ONCE again we are pleased to review a product from the Hayes factory, this time a beautiful-looking radio gramophone embodying a brand-new four-valve super-het chassis. The walnut cabinet is handsome even for an H.M.V. instrument. Some idea of its good looks can be obtained from the photograph on this page. When the lid is closed the only external control is a knob working volume on gramophone reproduction. On lifting the lid we find a simple layout of controls on the right of the gramophone turntable and pick-up.

The most outstanding feature is undoubtedly the dual-tuning scales. Very accurate and clearly engraved wavelengths are shown, in addition to the positions for most of the well-heard foreigners. Apart from these scales there are four control knobs, one for radio volume, another for tone control, another for tuning, and the last a combination switch knob.

Inside the cabinet we find a typical H.M.V. metal-chassis set having a powerful four-valve super-het circuit, and a fifth valve for mains rectification. Although there are only two high-frequency circuits in the super-het sequence, the designers have entirely eliminated second-channel interference.

For a four-valve super-het, the entire elimination of second-channel interference is really a great technical feat. As with all H.M.V. radio gramophones, the record reproduction is above reproach, needle scratch being entirely eliminated, if necessary, by cutting off top notes with the tone control.

On the radio side we were very impressed with the elimination of background noises, and for the reception of most foreigners there was no sideband splash. Such stations as Breslau and Poste Parisien were separated with ease. Long-wave performance is exceptional, Königswusterhausen being clear of Daventry and Radio Paris. There is more top than usual on the long waves. There is absolutely no mains hum, even when using the mains aerial, which brings in plenty of foreigners.

A MODERN SUPER-HET RADIOGRAM

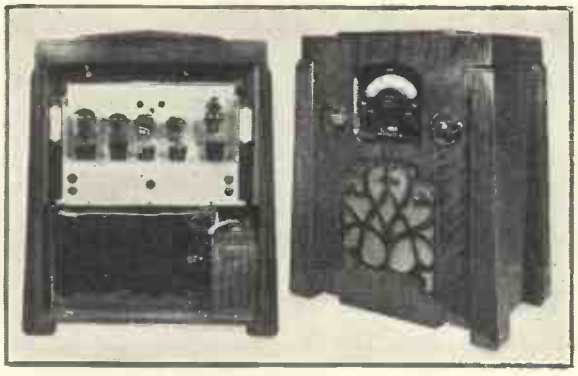
A photograph showing the very handsome cabinet that houses the new H.M.V. radiogram. Note the unusual tuning scale shown in the left-hand photograph

McMichael Transportable

MAKERS : L. McMichael, Ltd.
PRICE : £19 19s.
VALVE COMBINATION : Screen-grid (Cossor 215SG), detector (Osram HL210), first low-frequency (Osram HL210), driver stage (Cossor P215), and class-B output stage (Cossor 240B).
POWER SUPPLY : Self-contained batteries.
ANODE CURRENT : Varies according to volume.
TYPE : Self-contained transportable.
REMARKS : Really fine quality with economical battery running.

WE were especially interested to try this new McMichael set because it is one of the first commercial products to make use of the Cossor 240B (class-B) output valve. As you probably know, this gives big volume with a low anode current. The standing current for the whole set was only 6 milliamperes. With moderate volume loud passages caused this to increase to 9 milliamperes, and with really fine volume, notable for the full-bodied bass, the peak current was 15 milliamperes, the needle hovering around 8 or 9 milliamperes most of the time. Thus, for an average of, say, 10 milliamperes you get really splendid volume and quality with this set.

It is housed in a fine dark walnut cabinet, with a slightly tapering design, and a turntable underneath. The set is entirely self-contained. The metal-chassis five-valver is on top, and below a very neat compartment



NEATLY CONSTRUCTED PORTABLE
A feature of this new McMichael battery-operated receiver is the class-B output stage that gives results equivalent to a mains-operated set. The construction is robust

for the high-tension battery and accumulator behind the moving-coil loud-speaker.

Control is well arranged. There is a fixed wavelength scale at the centre with a pointer moving across it. The gang condenser is worked by a knurled disc at the bottom of the panel, with trimming done by an auxiliary lever knob on the right. A similar lever knob on the left changes the wavelength range of the tuning circuit, at the same time moving the point to appropriate wavelength calibrations. There is a well-marked reaction control on the extreme left, and a similar shaped control on the right provides variation of volume.

Selectivity is good, the locals being limited in their interference to two or three wavelength channels on either side. Sensitivity is uniform over all the wavebands, and full-body volume was obtained from foreigners even during broad daylight. There is a time-lag on the volume control, but reaction is beautifully smooth.

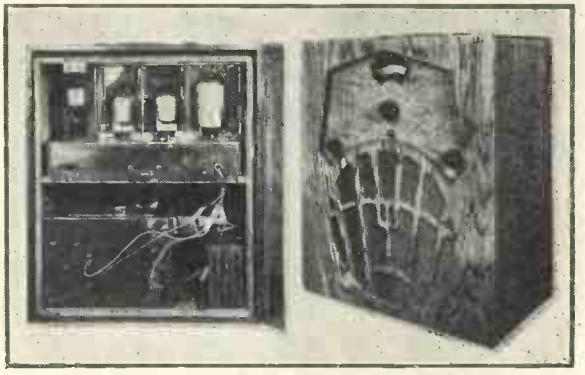
Sensitivity is really ample, Radio Paris being full strength with reaction at minimum, as is Luxembourg.

K.B. Hika Four-valver

MAKERS: Kolster Brandes, Ltd.
PRICE : £10 10s.
VALVE COMBINATION: Screen-grid, detector, low-frequency and pentode output.
BATTERY SUPPLY: Self-contained high-tension, low-tension and grid-bias batteries, 100-volt high-tension maximum.
ANODE CURRENT: 8.5 milliamperes.
TYPE: Table-cabinet transportable, with frame aerial, moving-iron loud-speaker and batteries all in the cabinet.
REMARKS: Good straight four-valver for economical battery operation.

HERE we have a very sturdy transportable type of set that should be of use among battery users who do not like a lot of external accessories trailing about the house.

The four-valve chassis is housed in a light varnished cabinet. Underneath is a turntable, so that the set can be rotated bodily to make use of the directional effect of the frame aerial inside. On top is a handle, which enables you to carry the set from room to room. The name Hika is not, we imagine, intended to convey the



SELF-CONTAINED BATTERY FOUR
These two photographs show the general layout of the controls and the interior design of the new K.B. Hika transportable. It is simple to operate

idea that the set can form part of a hiker's equipment—the weight and size prove that !

There is special technical interest in the set, as it makes use of three of the new Micromesh valves, only the high-frequency stage being a Mazda type. Two Micromesh HLB1 valves are used for detection and first low-frequency stage. A Micromesh PenP1 is the output valve.

Layout of controls. There is centre scale marked in degrees from 0 to 100, moving behind a fixed hair-line indicator. The two-gang condenser works by a knurled knob at the centre, with a super-imposed trimmer knob. This gives accurate tuning without difficult operation. Two other controls : left knob for combined wave changing and battery switching, and right knob for reaction, which builds up the strength of the foreign stations very nicely.

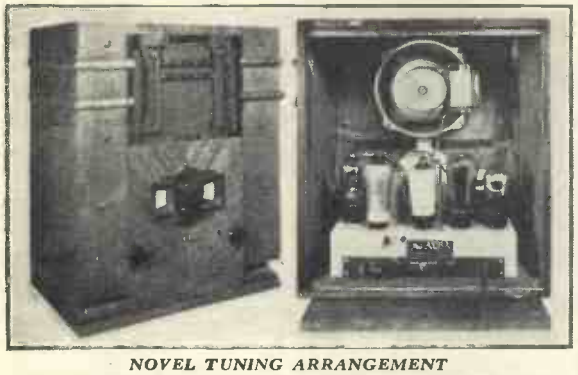
Little knob under the main tuning acts as local-distance switch—very useful for local stations, which cannot, of course, be reduced in volume by adjustments of the reaction control.

Sensitivity : Gets the foreigners quite easily in daylight; Fécamp and Brussels, for examples, quite good. On long waves, Radio Paris very strong, with only the faintest trace of Daventry. Quality is quite satisfactory, the loud-speaker handling good volume without rattling. Bass not pronounced, but treble strong, making speech clear and music unobjectionable.

Alba Superhet

MAKERS : A. J. Balcombe, Ltd.
PRICE : £16 16s.
VALVE COMBINATION : Four-valve super-het sequence with PM24M pentode output and fifth valve for mains rectification.
POWER SUPPLY : A.C. mains.
TYPE : Table-cabinet super-het with self-contained moving-coil loud-speaker.
REMARKS : Good straightforward design giving clean-cut station separation.

ALBA is a newcomer that should meet with a good reception, we think. Here we have an example of the four-valve super-het that seems likely to take the public by storm next season. The circuit comprises a combined oscillator-detector, an intermediate-frequency valve, a second detector, and a pentode output valve, with a fifth valve for mains rectification. This circuit is interpreted as a compact metal chassis with Radiopak tuning assembly and all the valves with the mains transformer are on top, with the rest of the components out of sight. This chassis fits into the bottom of a rather



NOVEL TUNING ARRANGEMENT
The photograph on the left shows the dual-tuning scale, which is calibrated in stations and wavelengths, of the new Alba super-het. The fine cabinet is of figured walnut

light figured-walnut cabinet, fashioned on homely lines with a neat base arrangement. A Magnavox moving-coil loud-speaker is at the top. Mains aerial, pick-up and earth terminals are provided.

The tuning escutcheon is unusual. The centre knob works the gang condenser and also a double-acting tuning scale. There is an aperture on the left for long waves and a similar aperture on the right for medium waves. A circular scale rotates behind these apertures, but attention is fixed on one scale at a time because there are two separate bulbs, only one of which lights up at a time, the lighting being changed by the wave-change switch.

Control apart from the central tuning device is limited to two knobs, one a combined mains switch and volume control on the left, and the other the wave-change switch on the right. When working this set we soon realised that selectivity was good. We can say that this set does all that a good super-het should do in station separation. We got Algiers clear of London Regional, but owing to the weakness of Mühlacker we could not get that station clear. On long waves Königswusterhausen was fair in strength and clear. Clean-cut separation of most of the ether giants was possible.

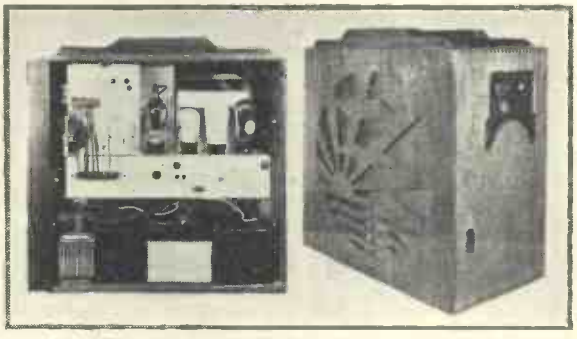
Quality is aided by cabinet resonance, but the loud-speaker has enough top-note response to prevent objectionable emphasis of low notes. The set takes lots of volume without blasting, and the tone is not affected by the volume control adjustment.

Pye Q/MC

MAKERS : Pye Radio, Ltd.
PRICE : £14 14s.
VALVE COMBINATION : Screen-grid (Mazda SG215), detector (Osram HL2 metallized), low-frequency valve (Mazda HL2 metallized), and pentode-output (Mazda Pen220).
POWER SUPPLY : Self-contained combined high-tension and grid-bias battery, and two-volt accumulator.
POWER CONSUMPTION : 9 milli-amperes anode current.
TYPE : Battery-operated portable, entirely self-contained.
REMARKS : Fine quality and exceptional sensitivity.

AN amazingly sensitive set—our most striking impression when we put this portable on test. Heaps of foreign stations came in in broad daylight. Moreover, the quality of the reproduction is far above the average for a battery-operated set of this type. And the running cost is extremely low.

It is a four-valver with a straight circuit, having a pentode output valve transformer coupled to a self-contained moving-coil loud-speaker. No one could say that it is truly portable, but it certainly is very easily *transported*. The handle on the top simplifies this job, and does not seem out of place with the good-looking walnut-cabinet construction. There is a large loud-speaker fret at the front, and the back opens bodily to get at the inside. There we find a well-engineered metal chassis. Ample space for the combined high-tension and grid-bias battery at the bottom, and along side it the accumulator.



HANDSOME AND COMPACT BATTERY FOUR
Two photographs of the new Pye Q/MC, which incorporates a permanent-magnet moving-coil loud-speaker. All the controls are neatly fitted on the side of the cabinet

On test we found the set took only 9 milliamperes high-tension current—small, in view of the fine quality. This quality really is good, having a pleasing amount of bass and more top than usual, as shown by the heterodyne whistles on certain stations. There is a bit of time lag on the volume control, but it cuts down the locals to non-blasting strength without spoiling quality.

Sensitivity. Stations such as Hilversum and Brussels at full strength in the early evening. Later thirty stations on medium-wave band, and eight on long-wave band tuned in.

Selectivity. Frame aerial on this set aids separation of stations coming from different directions. We found the auxiliary tuning useful in further separating stations. Control altogether is very simple, the gang tuning condenser being worked with a disc drive on the right and a similar disc on the left for trimming. The tuning scale is marked in wavelengths—quite reasonably accurate. The two remaining knobs for volume and reaction are easily handled.

Note. An external loud-speaker can be added.

Marconiphone Model 272

MAKERS : Marconiphone Co., Ltd.
PRICE : £15 15s.
VALVE COMBINATION : 4-valve super-het sequence with fifth valve for mains rectifier.
POWER SUPPLY : A.C. mains on 200 to 250 volts.
POWER CONSUMPTION : 65 watts.
TYPE : Table-cabinet set with self-contained moving-coil loud-speaker. Needs only external aerial for reception.
REMARKS : First-rate technical and structural design. Tuning control outstanding.

THIS new four-valve super-het is typical of a new trend in popular radio. In fact, we imagine that by the autumn this type of set will have superseded the ubiquitous three of to-day.

We like the cabinet of this set. It is of quiet design in dark walnut, with modern square lines with the novelty of bakelite mouldings for the loud-speaker fret and for the control escutcheon.

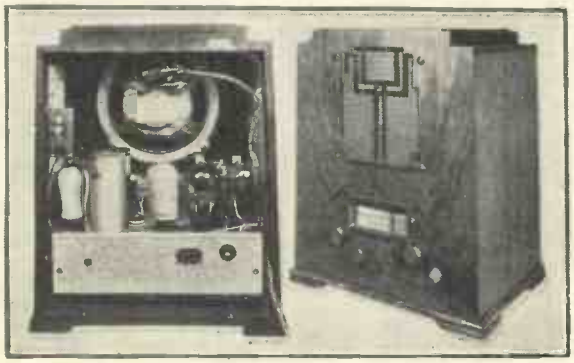
The circuit is well done. There is a screen-grid combined detector-oscillator, a variable-mu intermediate-frequency valve, a power-grid second detector, and a pentode power output valve. All these take their high-tension supply from the A.C. mains through a heavy-duty valve rectifier.

Controls are very well arranged. There are four knobs fitted below the main tuning scale. Volume is controlled by the extreme left-hand knob. Next to this is a tone control, then the knob for tuning, and finally on the right the combination switch-knob. These knobs are in bakelite, and have their functions clearly engraved on them.

The tuning scale is really outstanding. It consists of a profusely-engraved scale over which travels a horizontally moving knife-edge pointer. Underlining the names of stations are clear indications as to the permissible limits of tuning adjustment for any given station. In practice we found the markings extraordinarily accurate.

First tests showed there was no mains hum, even without the earth. The mains aerial connection works well. A normal 50 ft. aerial is better, of course. Selectivity : Mühlacker was clear of London, and Königswusterhausen almost clear of Daventry—only a little side-band splash. Volume : Ample for the home, being as much as 2 watts undistorted output.

Sensitivity : Better at the top end of the scale than at the bottom, which for most people is an advantage. Fécamp fair during daylight, and Brussels No. 1 excellent. Quality is a little low-pitched but very pleasing. The absence of whistles is a real point. In fact, this set is as well behaved as a straight three.



NEW FOUR-VALVE A.C. SUPER-HET
A handsome walnut cabinet houses the new Marconiphone A.C. super-het. Note the easily-read tuning scale in the right-hand photograph

Beethoven S.G.3

MAKERS : Montague Radio Inventions and Development Co., Ltd.
PRICE : £11 11s.
VALVE COMBINATION : Screen-grid, detector, low-frequency and pentode output.
POWER SUPPLY : Self-contained batteries.
POWER CONSUMPTION : Anode current 9 milliamperes.
TYPE : Self-contained table-cabinet set, quite easily transportable.
REMARKS : An easy to operate set with economy of running.

A THREE FOR BATTERIES
An attractive three-valver that gives particularly good results. It incorporates a moving-iron loud-speaker and the cabinet is of dark walnut

IN the ornate, light-figured cabinet of this set, with its side pieces acting as handles whereby the set can be lifted, is included everything for reception. There is a turntable underneath the cabinet so that the set can be bodily rotated to make the most of the directional effect of the frame aerial.

Construction consists of a neat metal chassis with everything totally screened except the valves. These valves are in a good circuit for this sort of set. There is a frame aerial input and a moving-iron loud-speaker.

Control is well thought out to make things easy. The moulded escutcheon carries the three control knobs. The centre knob is for tuning the gang condenser. It has a superimposed trimmer knob to make sure of accurate tuning. Left-hand knob acts as wavechange and battery switch and right-hand knob as reaction, which on test was very smooth. A special feature is the lighting of the scale—rather unusual in a battery set. Wavelengths are clearly marked and help to find the stations.

Sensitivity. Well up to standard, though it is important to keep the trimmer in step with the main knob to get good strength from foreigners during daylight. Hilversum was fair in the early evening and Brussels also worth hearing. Poste Parisien also very strong. Plenty to hear on long waves. On test we were not worried with local-station swamping.

Quality has an incisive clarity, especially on speech. There is a bit of cabinet resonance, which adds, without offence, to the limited bass-note response of the loud-speaker. There is ample volume short of the distortion point due to overloading. Both pentode and loud-speaker handle loud signals well.

Running this set is economical because the high-tension current taken from the battery is small, being only 8.5 milliamperes in the model tested.

Notes. The wavelength range is unusually wide, being from 190 to 590 metres on medium waves and from 790 to 2,200 metres on long waves. External aerial and earth can be added if wanted, as can a gramophone pick-up. An external loud-speaker can be plugged in parallel with the self-contained one.

Homeaids Four-valvers

MAKERS : The Homeaids Radio Co. (Distributors).

PRICE : Radiette, £10 10s.; Emerson, £12 12s.

VALVE COMBINATION : Screen-grid pentode, screen-grid detector and pentode output, with mercury-vapour rectifier.

POWER SUPPLY : Car battery.

ANODE CURRENT : 9 milliamperes.

TYPE : Midget universal mains set for car installation.

REMARKS : Inexpensive equipment suitable for home or car use at will.

FOR CAR OR HOME RADIO

This Emerson midget set can be used on A.C. or D.D mains in the home, or with suitable extras it makes a useful car radio installation

YOU will remember that last month we dealt with an amazingly compact set suitable for either A.C. or D.C. mains without internal alteration. The Homeaids Radio Co. has now adapted these little sets for car radio, and we have had an opportunity to examine the Radiette model, weighing 6 lb. and measuring 8¾ in. by 4½ in. by 4 in., price £10 10s. There is a more de luxe-model known as the Emerson, weighing 6 lb. also, measuring 9½ in. by 7 in. by 4½ in., price £12. 12s.

These sets, as before, can be operated from any supply of A.C. or D.C. of voltages between 110 and 250. No elaborate aerial or earth is needed, because a small coil of wire extends from the set and can be run round any convenient wall or picture rail. When fitted to a car these sets need all the essential attachments for suppressing ignition and dynamo noises. These are included in the car kit—that is, plug suppressors, main high-tension suppressor, condenser for the dynamo, and special aerial wire and clips. Even a novice can fit up this little car radio outfit in about half an hour. When the battery cable plug is inserted in the back of the set, the filaments are automatically connected for parallel working from the 6-volt lighting battery, the total current being .9 ampere. In addition to this a high-tension battery is, of course, required. This can be of standard capacity, as the total anode current taken by the valves is only 9 milliamperes.

The aerial is preferably run zig-zag fashion in the roof of the car. If it is an open car a special aerial attachment can be slung *between the two axles !* An advantage of this particular car radio equipment is that only a few seconds is needed to remove the set from the car to use it in the home. As the circuit consists of a high-frequency amplifier, actually a high-frequency pentode, a screen-grid detector and a resistance-coupled pentode output valve, there is quite a fair reserve of power even with the make-shift aerial. Ample volume is obtainable from the balanced-armature loud-speaker, which, it will be remembered, is contained in the bakelite case.

Aerodyne Swift

MAKERS : Aerodyne Radio, (Hustler, Simpson & Webb, Ltd.).

PRICE : £4 4s.

VALVE COMBINATION : Detector, transformer-coupled low-frequency amplifier, transformer-coupled small-power output.

POWER SUPPLY : Self-contained batteries.

ANODE CURRENT : 5 milliamperes

TYPE : Self-contained table set needing external aerial and earth.

REMARKS : Inexpensive little battery set, giving reliable local reception and a fair sprinkling of foreigners.

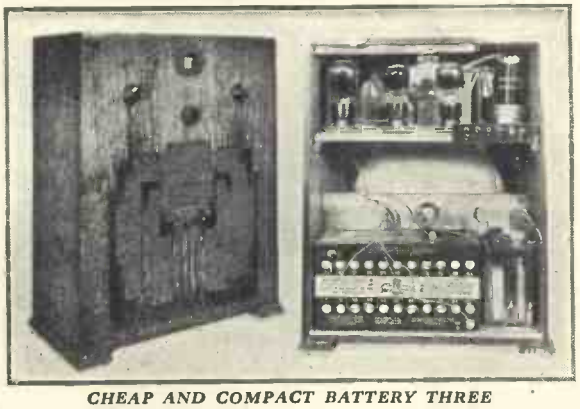
THIS set makes use of an unusual circuit—unusual these days, although at one time very common. There is a detector valve followed by two transformer-coupled low-frequency stages, the second of which is, of course, the power output. We think that even now this circuit is useful, provided the tuning coil is of good design and full use is made of the selective property of reaction. In this set there is a dual-range coil, single-layer wound for medium waves and honeycomb wound for long, tuned with a bakelite-dielectric condenser.

We found on test this circuit was extremely selective with reaction fully advanced. High-note cutting? Not appreciable, because the transformers probably have rising characteristics, and so the overall quality on the moving-iron loud-speaker is quite definitely satisfactory. The three-valve set with loud-speaker and batteries is contained in a dark oak cabinet of simple design. The three-valver is on the top shelf, with ample room below for the batteries behind the loud-speaker.

On the front we find three knobs, the centre one for the tuning condenser also working the tuning scale, which is marked from 0 to 180 degrees. This scale lights up when the set is switched on, thus making it very easy to read. The left-hand knob is a combined battery and wavelength-range switch. On the right is the knob for reaction, which tests prove is very smooth in action. It makes a great deal of difference to the results, not only in volume but in selectivity.

The total anode-current consumption proved to be only 5 milliamperes for the three valves, so the standard-capacity 99-volt battery should last many months with average set use. The set works surprisingly well with a normal outside aerial and a good earth.

The two London stations were restricted to about 10 degrees on the scale, which means that only two or three stations on each side of the locals would be wiped out in the ordinary way. On long waves Radio Paris was quite clear of Daventry, and very fair in strength.



CHEAP AND COMPACT BATTERY THREE

This new three-valver will meet the needs of those who want cheapness combined with reliability. These photographs show the general layout of the set

Cutting Out Interference

"GOOD-BYE, my dear! I hope you have a nice time . . . Jill, you haven't forgotten your toothbrush, have you? All right. Be sure to enjoy yourself."

Jill leant out of the taxi window, waved cheerfully to her mother, and sank back with a thrill of delight into the corner. At last the time had come. She surveyed her new week-end case with satisfaction, and then her own reflection in the mirror with equal satisfaction. Yes, her new hat was definitely a success, and she was going to have a marvellous time.

Her old school pal, Mercia, had married George Straker and was now mistress of a big house in Sussex, with plenty of money and hosts of friends. She had asked Jill down several times before, but something had always cropped up to prevent her going. Still, here she was actually en route at last.

A couple of hours later she was bowling up the drive of Mercia's new home, a solid block of a house surrounded by lawns, and rather dismal-looking shrubbery.

"A bit grim," was Jill's mental comment. "I suppose it will look a lot nicer when I've had my tea. Chauffeur didn't seem too cheery, either." She studied the back of his head.

"Madame regrets that she could not come to meet you herself," he had informed her at the station.

"I wonder if Mercia has changed much since she got married," Jill pondered uneasily. "It must be nearly a year since I've seen her."

The next moment her doubts were dispelled.

"Jill, my angel, I'm so glad to see you. You haven't changed an atom. Before I say another word, I've got to apologise. My most eligible young man has foolishly brought his brother with him, and I'm afraid he's a bit of a bore."

"But who is he, and which is which?" protested Jill feebly, as she was swept upstairs.

"You'll soon find out. To be exact—the right young man is a Captain White, who is home on leave from India. His brother is a nice enough boy—but inclined to be too self-centred. For the moment he's gone mad on wireless and can talk about nothing else. However, leave your things here and come and be introduced and have some tea—you must be exhausted."

◆ ◆ ◆

During dinner Jill realised the truth of her friend's remarks. She sat between the two young men, and although the gallant captain had obviously taken a violent fancy to her, he had no chance against the eloquence of his brother, who insisted on regaling Jill with a detailed account of his recent accomplishments.

"I've just built a new portable super-het. Puts up a positively amazing performance. Brought it with me, by the way, and you must let me put it through its paces for you after dinner. Why, only last night I got forty stations in less than an hour. And the quality. . ."

Her neighbour, on the other side, made a feeble attempt to engage her attention, but was again swept aside.

"The extraordinary thing about wireless is the number of chaps who go in for home construction without knowing anything whatever about the technical side. Of course, a lot of my own friends come to me for advice. Why, only the other day. . ."

Jill listened patiently to the monologue though her spirits steadily began to sink.

At last dinner was over and she made her escape to the drawing-room, where she soon revived under the vivacious chaffing of her hostess.

◆ ◆ ◆

Less than a quarter of an hour afterwards the young enthusiast reappeared on the scene, carrying with him the famous portable, which he placed on a side table at the far end of the room.

"Come along," he beckoned to Jill. "You must listen to this. It is the goods."

"Half a mo, my lad," interrupted his brother. "You're wanted to help Mrs. Straker. Something's gone wrong with her set, and it's not often she has an opportunity of getting really expert advice."

"But," protested Mercia. . . .

"I happened to be trying it out before dinner," continued the captain, with a swift look at his hostess, "and it seemed to be far from well. Almost on the point of expiring, in fact."

Mercia rose to the occasion.

"I should be so grateful if you would, Mr. White. The local man is rather hopeless, and if I have to send it up to town I shall feel lost without it."

Young White glowered helplessly.

"Delighted, I'm sure," he muttered.

"George," said Mercia to her husband, "will you please show Mr. White to the wireless room."

◆ ◆ ◆

As Jill was having her third dance to the strains of Henry Hall's orchestra from the new portable, she ventured:

"But Mercia's set was perfectly all right, Captain White, I listened to it myself after tea."

Her partner nodded. "You see, I thought from the beginning that the young lad might prove a bit trying. He's quite a good scout really, though he does ride his hobby a bit over-much. That gave me an idea, so I just nipped in before dinner and altered one or two connections. And I'm willing to bet it takes him the best part of the night to put matters right."

He looked down at her. "You do realise that I had to cut in some time. Don't you?"

S.J.H.

"Wireless Magazine" GRAMO-RADIO SECTION

A Special Section for Those Interested in Radio-gramophone Technique

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

CLASSICAL ORCHESTRAL MUSIC

★(*a*) **Hungarian Dance No. 5,** (*b*) **Hungarian Dance No. 6,** (Brahms), San Francisco Symphony Orch., 4s.
H.M.V. E607

These two (Nos. 5 and 6) of the Brahms rhapsodies are the two best known. If you want to add to your Brahms collection—and you should because it is his centenary year—you cannot do better than include these. They are beautifully done.

PIANO SOLOS

Ballade No. 3 in A Flat (d.s.), Ignaz Friedman, 4s.
COL. DX466

This must have been recorded as many times as years Chopin lived. M. Friedman's effects are a little too sudden for my personal liking. The recording could not be better.

IGNAZ FRIEDMAN

★(*a*) **Clair De Lune** (Debussy), (*b*) (a) **Prelude in C Minor, Op. 28, No. 20** (b) **Mazurka in A Minor, Op. 68, No. 2** Chopin, John Hunt, 4s.
H.M.V. C2567

Ask to hear this. It is one of the Neo-Bechstein pianos, which are supposed to be able to "swell" on a chord and sustain a note like an organ. I want to hear something really good on one before I venture to pass an opinion.

(*a*) **Eglogue** (Liszt) (*b*) **Polonaise Fantasie, Op. 61** (Chopin), Walter Rheberg, 2s. 6d.
DECCA-POL 5071-2

Two good piano solos. Personally, I like the player in the Liszt better than the Chopin, but both are very attractively played, and suitable *as works*. There are three sides to the Chopin, by the way.

★**Sonata in C Sharp Minor, Op. 27, No. 2** (Beethoven), Mark Hambourg, 4s.
H.M.V. C2551-2

Those who are admirers of Hambourg — his Beethoven especially—will do well to add this to their collection of piano records. He plays it as he has always done, not extravagantly, and with good insight into its meaning.

CHORAL RECORD

★**Dear Old Home Songs** (d.s.), B.B.C. Wireless Chorus, 4s.
COL. DX468

They sing all the oldest songs imaginable, but they sing them so well that it is worth having. I imagine this record will be a big seller. It is certainly worth your attention.

SONGS AND BALLADS

(*a*) **Annie Laurie,** (*b*) **Jessie, the Flower of Dunblane,** Joseph Hislop, ten., 2s. 6d.
H.M.V. B4413

Joseph Hislop makes a good record because he does not overdo his tone. So many tenors are careless in this respect. Here you will find two songs that come through smoothly and evenly.

★(*a*) **Bell Ringer,** (*b*) **Out on the Deep,** Malcolm McEachern, bass, 4s. **COL DX467**

Jetsam at his best. There is nothing further to be said. Just buy this record.

(*a*) **Celeste Aida,** (*b*) **Je Crois Entendre Encore,** Enrico Caruso, ten., 6s.
H.M.V. DB1875

A "new" Caruso record is worth having. It has been re-recorded by the new process. The effect is amazingly good. Another for your Caruso library, if you collect!

(*a*) **Dear Stranger,** (*b*) **My Love Song,** Masked Singer, 2s.
DECCA F3556

I cannot say whether the singer is wearing his mask or not, but he is styled the "Masked Singer." He has rather an attractive style—not particularly vocal, perhaps, but quite pleasing. I think this will find favour with many collectors.

★(*a*) **Devil-May-Care,** (*b*) **Merry-Go-Round,** George Baker, 2s.
DECCA F3546

I like him in "Devil May Care" the better, but both are good. Mr. Baker can generally be relied on for a good record, and this is no exception. I wish he chose better songs, and sang them with orchestra. Much more effective.

(*a*) **Die Fussreise,** (*b*) **Verborgenheit,** Josef Manowarda, 2s. 6d.
DECCA PO5068

Operatic baritones are preferable in many ways to tenors. At least, that is how I look at it often enough. This singer has a fine resonant voice, and the record has evidently been made where there is some echo. All it lacks is an orchestra; a piano makes poor accompaniment to such arias as these.

(*a*) **For You Alone,** (*b*) **I Hear You Calling Me,** Master Leslie Day, 2s. 6d.
COL. DB1122

For a boy he records well, which is quite unusual. You know the songs, so I need say no more.

★(*a*) **Je Crois Entendre Encore** (Bizet), (*b*) **Que Cette Main Est Froide** (Puccini), Giuseppe Lugo, ten., 4s.
DECCA CA8158

I consider this one of the best operatic records I have heard this year. "Your tiny hand" is the more effective, perhaps, but both are far above the average. Strongly to be recommended.

(*a*) **Mother Machree,** (*b*) **My Irish Song of Songs,** Jack Doyle, 2s.
DECCA F3555

Sung by the famous Irish boxer, Jack Doyle. As you would expect, the recordings have a punch in them. Very attractive in every way. Ask to hear it.

(*a*) **That's All That Matters to Me,** (*b*) **What Have We Got to Lose,** Anona Winn, sop., with Orch., 2s. 6d.
COL DB1125

Miss Winn is so well known to wireless listeners that any record of hers is surely welcome. This you will like, provided you are sympathetic to her style, of course. One has to make that proviso because tastes differ so much.

LIGHT ORCHESTRAL MUSIC

★**Music in the Air** (d.s.), Light Opera Company, 4s.
H.M.V. C2568

This, of course, is a very popular show. Judging from one side of it I imagine it will be popular for a long time. The music is not of the jazz type, and very pleasant to listen to—really melodious!

(*a*) **Clatter of the Clogs,** (*b*) **Dance of the Nymphs,** Bournemouth Municipal Orch., 2s. 6d.
COL DB1110

Both sides were recorded in the Bournemouth Pavilion, with Sir Dan Godfrey conducting. I don't know that there is anything distinctive about the result—any orchestra could do as well—but the music is of a light and pleasant type. Quite worth hearing on that account.

(*a*) **In Every Nook and Corner You Are Missing,** (*b*) **My Wishing Song** (w.), Alfredo Campoli and His Salon Orch., 2s. **DECCA F3554**

Another successful light music record. The singer has a pleasant voice, and you will find the orchestral accompaniment attractively played. Very good and melodious, I call it.

★**Londonderry Town** (d.s.), Howard Flynn and His Orch., 1s. 3d. **PANA 25502**

This is very pleasant. The voices are delightfully blended, which always makes for a good record. Strongly to be recommended—*both sides.*

(*a*) **Pale Volga Moon** (O'Hagan) (w.), (*b*) **Second Serenade** (Heykens), Julian Rosselli and His Salon Orch., 1s. 3d.
PANA 25497A

This is the sort of lunch-time music record I have often recommended in these columns. You will find the playing very good and the reproduction better. A very good record.

★(*a*) **Serenade** (Schubert), (*b*) **Spring Song** (Mendelssohn), Angelus Octet, 1s. 6d.
REGAL ZONO MR909

Two old favourites quite well done. I mark it for your consideration because the surface is so good and the playing so sympathetic.

BAND MUSIC

★**Woodland Pictures — Rura Suite** (d.s.), B.B.C. Wireless Military Band, 4s.
COL DX465

This should sell well. The B.B.C. Military Band is a great favourite, as everyone knows. This is a perfect specimen of its art.

NOVELTIES

★**Ceremony of the Keys** (d.s.), 4s. **H.M.V. C2358**

Recorded at the Tower of London, Feb. 2, 1932. If you are historically-minded, you cannot do better than add this to your collection. You will remember that the ceremony was broadcast quite recently.

★**Tommy's Little Day** (d.s.), Roosters' Concert Party, 4s.
COL 9926

The Roosters are very popular with listeners. It is some time since I heard them. Here you will find them as jolly as ever, chipping each other and generally making nuisances of themselves in the eyes of the sergeant. It all comes through very well. I certainly recommend it to those interested.

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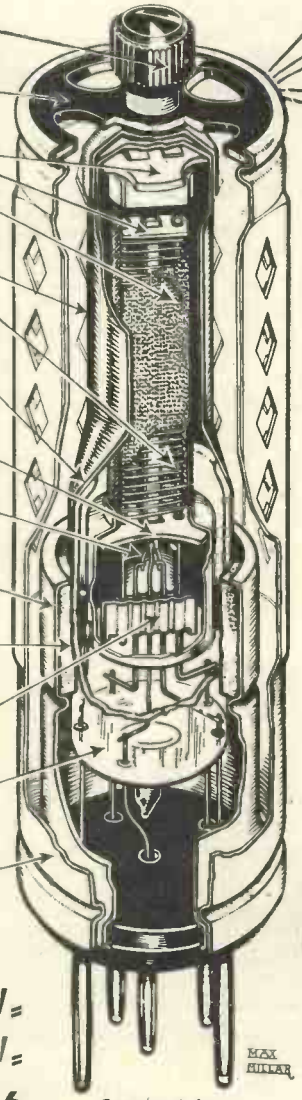

Metal *instead of* Glass

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RECORDS REVIEWED by CHOPSTICK

LIGHT SONGS

(*a*) **Forty-Second Street,** (*b*) **Shuffle Off to Buffalo,** Boswell Sisters, 2s. 6d.

BRUNS 01516

Those who revel in the syncopated art of the Boswell Sisters should hear these numbers, which are from the American film, *Forty-Second Street*, recently released in this country. An added attraction to this disc is the excellent accompaniment by the Dorsey Brothers' Orchestra. By the way, the Boswell Sisters will visit London in July.

(*a*) **Girl In the Little Green Hat,** (*b*) **Seven Little Steps to Heaven,** Rhythm Kings, 1s. 6d.

REGAL-ZONO MR905

The first record by a new group of syncopated singers with talent above the average. (*a*) gives the artists plenty of scope for some unusual vocal effects and (*b*) the first recording of the tune, will undoubtedly be a hit later. A pleasant disc!

★(*a*) **My Honey's Loving Arms,** (*b*) **Some of These Days,** Bing Crosby, 2s. 6d.

BRUNS 1469

Bing Crosby, America's king of crooners, is splendid, of course. You will enjoy his two minutes of "boob-a-doob-doobing" on (*a*). The famous Mills Brothers are responsible for Crosby's accompaniment on (*b*). The Mills quartet play guitars and other plucked string instruments, but their great gift is the vocal imitation of orchestral instruments. One of them imitates the sousaphone; the illusion is perfect.

(*a*) **Sidewalk Waltz,** (*b*) **When It's Lamp Lighting Time in the Valley,** Don Hall Trio, 2s. 6d. **H.M.V. B4430**

H.M.V. tell me that the Don Hall Trio is from America with a new and original style in tunes, which have a natural swing to them. To my mind they are of the hill-billy type and rather uninspiring. Unusual is the only recommendation I can give.

INSTRUMENTAL SOLOS

(*a*) **Sing,** (*b*) **That's My Home,** Nat Gonella, 2s.

DECCA F3531

Nat Gonella is the trumpet player in Lew Stone's Monseigneur Band. He is also probably the finest trumpet player, of his class, in this country. His performance here is magnificent, but his singing of the choruses is a matter of personal taste. The accompaniment, too, is outstandingly good.

Tunes of the Times on Two Pianos (d.s.), Bert Read and Harry Jacobson, 2s.

DECCA F3551

Here are three samples of the type of tune featured: *I Wish I Knew a Bigger Word Than Love, Stay on the Right Side of the Road, And So I Married the Girl.* Harry Jacobson sings two vocal choruses quite well. It is strange that we do not have more piano-duets of the light variety; they are popular, and good entertainment.

CINEMA-ORGAN MUSIC

Desert Song (d.s.), Harry Davidson, 1s. 6d.

REGAL-ZONO MR907

Lovers of Romberg's delightful music should get this. It is well recorded and well played. Davidson's style, however, is apt to become tiring after a time. This record was made in the Commodore Cinema at Hammersmith, the home of the famous broadcasting orchestra.

★(*a*) **Down South,** (*b*) **Whistler and His Dog,** Lew White 1s. 3d. **PANACHORD 25518**

There is no need to describe the two tunes played. Lew White plays them in an exceedingly novel manner. In (*b*) he uses his pedals and flute-like notes only, with queer noises representing the barking of dogs. One word for the recording. This is one of the finest pieces of recording I have had from Panachord. The bass notes are well recorded and the record is admirable for test purposes.

★(*a*) **This Lovely Rose,** (*b*) **You've Got Me Crying Again,** Quentin M. Maclean, 2s. 6d.

COL DB1123

This is the star record of the month. Maclean is a genius; his brother cinema-organists in London openly admit it. This is a marvellous example of the ingenious use of various groups of stops for which Maclean is famous. (*a*) is a similar tune to *Her Name is Mary*, and is by the same composer, Harold Ramsay.

DANCE MUSIC

(*a*) **Chewing Gum** (f.), Art Kassel and His Kassels-in-the-Air, (*b*) **You Are Too Beautiful** (f.), Fred Rich and His Orch., 2s. 6d.

COL CB614

Art Kassel's band is another new band on Columbia, and are a tuneful and cheery group. (*a*) is an American number with rather sillier words than usual. The repetition of the words "chewing gum" twenty-five times is a trifle boring. (*b*) is being played by almost every band. This is a fair version, although not outstandingly good.

(*a*) **Girl in the Little Green Hat.** (f.), (*b*) **Tree Was a Tree** (f.) Roy Fox and His Band, 2s.

DECCA F3537

You know the tunes and the inimitable style of the Kit Cat band. The band is well up to form here, and the recording is good. A useful dance disc.

(*a*) **Goodnight But Not Goodbye,** (*b*) **I'd Do Anything In the World For You,** Billy Reid and the London Piano-Accordion Band, 1s. 6d.

REGAL-ZONO MR902

One of the best recording accordion bands. If you like their style of music, try what Billy Reid offers.

(*a*) **Hustlin' and Bustlin' For Baby** (f.), (*b*) **You've Got Me Crying Again** (f.), Adrian Rollini and His Orch., 2s.

DECCA F3518

This band has a particularly fresh style. Although I am not acquainted with Adrian Rollini and his orchestra, I have no hesitation in recommending their records. Notable points of the orchestration are fine piano, accordion, and xylophone solos, and a cheerful American-accent vocal. A couple of very snappy tunes!

★(*a*) **Hyde Park Corner,** (*b*) **Walters on Parade,** Billy Cotton and His Band, 1s. 6d.

REGAL-ZONO MR901

Two invigorating tunes in one-step time. If you want really cheerful dance music then you can't do better to try Billy Cotton's records. The titles explain the type of tune. His other record this month, Regal-Zono MR917, is also recommended.

(*a*) **It's the Band** (march), (*b*) **This is the Rhythm For Me** (f.), Jack Hylton and His Orch., 2s.

DECCA F3549

Both are real rousers! The march on (*a*) by Steininger, is one of those tunes that are admirably suited to the boisterous style of this band. A record for those who prefer *lively* dance music!

(*a*) **It's the Band** (one-step), (*b*) **When the King Goes By** (quick-step), Debroy Somers Band, 2s. 6d.

COL CB621

Debroy Somers does his best to imitate a military band here. As far as such an impossibility is possible he makes a fair job. (*a*) is cleverly done, the effective vocal chorus being sung by Raymond Newell with male-voice quartet.

★(*a*) **It's Within Your Power** (f.), (*b*) **Maybe I Love You Too Much** (f.), Ray Noble and His Orch., 2s. 6d.

H.M.V. B6347

As usual, Ray Noble introduces some very effective orchestration novelties that make the record interesting. In (*a*) a trumpet and clarinet duet with the vocal is an outstanding piece of work. (*b*) is a fine slow foxtrot with some unusual "shadow" work by the brass section. This is a go-ahead band!

(*a*) **I Wake Up Smiling** (w.), (*b*) **Sylvia** (f.), Ambrose and His Orch., 2s. 6d.

BRUNS 1502

Two useful dance numbers typical of Ambrose's polished manner. Both have vocal choruses sung by Sam Browne, who makes a particularly effective job of a whistling solo on (*a*). If you use this record for dancing, slow down your gramophone motor for the waltz; it is played too fast.

(*a*) **Jealousy** (tango), (*b*) **Say Goodbye** (tango), Don Pedro and His Tango Orch., 2s.

DECCA F3536

An ideal record for dancers who enjoy good tango music. Incidentally it is pleasant light entertainment for the ordinary music lover. By the way, the vocal choruses are sung in French.

★(*a*) **Nocturne** (Hughes, (*b*) **Someone Stole Gabriel's Horn** (f.), Spike Hughes and His Negro Orch., 2s.

DECCA F3563

Spike Hughes—many will remember him as the composer of *Harlem Symphony* — recently visited America, where he composed (*a*). The negro band was specially trained for this recording. It is a pleasant work that will appeal to those who study new styles in modern-rhythmic music. I expect great things in the future from this gifted young composer—the only English equivalent to Duke Ellington, the famous American dance band leader and composer.

★(*a*) **No More Love** (f.), (*b*) **Waltzing in a Dream** (w.), Guy Lombardo and His Royal Canadians, 2s. 6d.

BRUNS 1493

Here are a pair of really well-played tunes. (*a*) is a foxtrot at perfect slow time, and (*b*) is a *slow* waltz with a beautiful melody. Guy Lombardo's style is quiet, and he can always be relied upon to get the best tuneful arrangements. "Radio Guide," an American journal, recently held a popularity vote between thirty-six of the best-known dance band leaders in the States. Guy Lombardo was second to Ben Bernie. America should know!

★(*a*) **Stormy Weather** (slow f.), (*b*) **You've Got Me Crying Again,** (slow f.), Ambrose and His Orch., 2s. 6d.

BRUNS 01523

This record must be starred because Ambrose tells me that it is the best record he has ever made; even better than *Body and Soul*. Undoubtedly the record is outstanding but, in my opinion it does not eclipse his recognised dance-tune masterpiece, *Body and Soul*. (*b*) appears to be a popular tune at the moment. The vocal chorus is sung by Elsie Carlisle—good, of course.

(*a*) **You Are Too Beautiful** (f.), George Olsen and His Music (*b*) **You've Got Me Crying Again** (f.), Isham Jones and His Orch., 2s. 6d.

H.M.V. B6346

(*a*) is a number from an American film, *Hallelujah, I'm a Tramp*, and played by one of the best bands in the States. The arrangement is quite straightforward and pleasant; an interesting point being a finely played trombone solo. I am personally very fond of Isham Jones and his band. They always appear to open up unexpected methods in dance-tune orchestration. Here an attractive viola and tenor saxophone duet is an unusual feature.

ABBREVIATIONS USED IN THESE PAGES

bar.	..	baritone	orch.	..	orchestra
COL	..	COLUMBIA	PARLO	..	PARLOPHONE
com.	..	comedian	REGAL-ZONO		REGAL-ZONOPHONE
con.	..	contralto	sop.	..	soprano
d.s.	..	double-sided	ten.	..	tenor
f.	..	fox-trot	w.	..	waltz
H.M.V.		HIS MASTER'S VOICE	WIN	..	EDISON BELL

(*a*) and (*b*) indicate the titles of each side of a record.

GRAMO-POEMS

A Fascinating Musical Pastime

A NEW and very fascinating game of tremendous interest to listeners and gramophone lovers has been invented—that of making gramo-poems. The chief attraction is that one need not be either a " born " or a " made " poet to enjoy it. Everybody who seriously listens to good music experiences certain emotions and these sensory stimulations often lead to a desire to express in words the sensations which such music induces.

Reverse Process

(In a broad sense, the process is the reverse of the making of an opera. Here a story or legend attracts a composer and upon what is often a slender or thematic foundation is built a glorious musical structure.)

The gramo-poem, however, is infinitely easier.

In a recently published book* on this new diversion, the author makes quite clear by many examples how the pastime is within the capacity of the majority of all those really interested in music. To begin with, it is not essential that lines should rhyme unless a particular composition so lends itself by reason of regular rhythmical structure.

Rules of the Game

The rule in making gramo-poems is to follow the melody, splitting up the periods according to the musical phrasing. The author's enunciation summarises the *raison d'être* of the gramo-poem thus: " Music has an advantage over words in its ability to intensify emotion," and it is to create the verbal equivalent of that emotion that the gramo-poem enthusiast strives."

The gramophone record is the *sine qua non* of our pastime. It is only by this means that one may adequately become familiar with a composition and thus " react " to its writer. And so the relatively passive listener becomes a creator—a creator of *poetry*, almost without knowing it.

In practice, the game works out in this way: one chooses a gramophone record, carefully selecting one whose melodic content is strongly marked. Take, for instance, Schubert's *Marche Militaire* as does Mr. Gibbons. We play the first six bars. The verbal resultant which the author gets from this is:

" Tramp you can hear them, tramp you can hear them,
Tramping, tramping, tramping, tramp along the King's Highway."

Could anything be simpler? And could anything " hit off " the spirit of the piece better?

Sometimes, of course, the music falls in such a compass (or can be transposed) to come within the scope of the human voice; again, it may soar or fall to limits which do not. But always the result remains the same—a " translation " has been made which not only supplements the melody by *verbal* cadences, but which perpetuates the sensory impression of the melody in the writer's mind—a very valuable aid to musical appreciation indeed.

Different Sensations

As an entertainment for informal gatherings of musical folk, the gramo-poem is ideal. It is extremely likely that half a dozen people experience entirely different sensations from the same record. And, if so, all the better, for the listeners are at once on the threshold of absorbing discussion of the composer's intent when the piece was written. The pastime can even lead to a new technique of musical study for ordinary folk.

Criticism will doubtless be encountered from the very-highbrows who contend—as one did—that "a beautiful melody is sufficient unto itself." Christopher Stone in an admirable and homely foreword, vigorously manhandles such gentry! And from a standpoint which is at once aesthetic and sensible he heartily commends the author's " romantic quest " to music-lovers who have gramophones.

A Delightful Book

John Murray Gibbon has written a thoroughly delightful book which not only offers new delights for leisure hours, but, in his generosity, presents his readers with pleasantly written miniatures of ten famous composers, cleverly drawn to countenance the gramo-poem and its underlying principles.

ADVANCE RECORDING OF THE TATTOO

A party of pipers and drummers of the Gordon Highlanders recording a stirring march for H.M.V. at Aldershot. The Gramophone Company's £10,000 mobile recording van can be seen in the background The Gramophone Company are making special records at the actual Tattoo performance, which will be released in the near future

**The Magic of Melody* (with an introduction by Christopher Stone) by John Murray Gibbon —J. M. Dent & Sons, Ltd.—(5/-).

Wireless Magazine, July, 1933

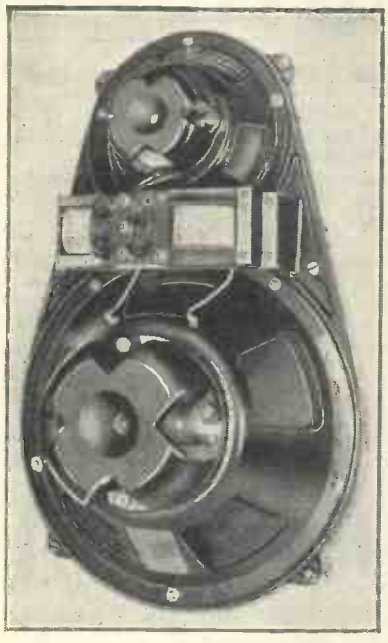
TESTS OF NEW APPARATUS

Celestion Loud-speakers :: Micromesh Power Valve :: Franklin Electrolytic Condenser :: Atlas Pentode Choke :: Baker Loud-speaker :: Bulgin Resistor :: Belling-Lee Pick-up

CELESTION REETONE LOUD-SPEAKERS

APPARATUS: Dual-compensated loud-speakers.
TYPE: Reetone, type S29.
PRICE: £6 6s.
MAKERS: Celestion, Ltd.

A NEWCOMER to the range of dual loud-speakers is the Celestion Reetone model. The two loud-speakers in this dual unit are mounted on a rigid cast metal chassis, which is somewhat pear-shaped in construction.



DUAL LOUD-SPEAKERS
The Celestion Reetone assembly consists of two moving-coil reproducers mounted one above the other

The two loud-speakers fitted are, as usual, of different sizes, the actual diameters being approximately 8½ in. and 5 in. The well-known Celestion Hyflex one-piece type diaphragm is used.

The centring devices are of the usual type, that belonging to the large loud-speaker being mounted behind the diaphragm, while in the case of the other it is held from the centre polepiece. The permanent magnets are of massive construction and are of the cross type, these being coated to prevent rusting.

Two input transformers are fitted, mounted on a small platform arranged between the two loud-speakers, and tappings are provided to enable the loud-speakers to be used satisfactorily with all types of power valve.

On test the loud-speaker gave very good results, the reproduction of both high and low frequencies being very good. The main bass resonance occurred at approximately 100 cycles, but a good response was obtained as low as sixty-four cycles.

◆ ◆ ◆

MICROMESH PB1 VALVE

APPARATUS: Battery power valve.
TYPE: PB1.
PRICE: 8s. 9d.
MAKERS: Standard Telephones & Cables, Ltd.

WE have tested this month one of the Micromesh valves recently placed on the market. This valve, which is known as type PB1, belongs to the small-power class capable of giving an output of the order of 200 milliwatts.

An inspection of the electrode system, which is clearly visible through the very lightly gettered bulb, reveals that the usual Micromesh construction has been abandoned, and a normal make-up with very fine clearances has been used, which accounts for the high amplification factor obtained.

The constants of the valve were measured and were found to be practically identical with the maker's ratings, the amplification factor being 16, the mutual conductance 4.2 milliamperes per volt, and the impedance 3,800 ohms.

These figures were obtained with 100 volts on the anode, and zero grid volts. With 150 volts on the anode the valve should be capable of delivering 180 milliwatts.

◆ ◆ ◆

FRANKLIN ELECTROLYTIC CONDENSER

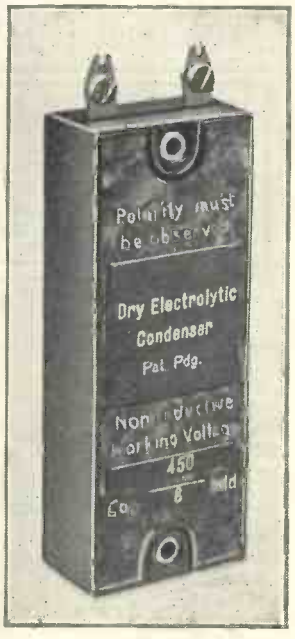
APPARATUS: 8-microfarad dry electrolytic condenser.
TYPE: 450 D.C. working voltage.
PRICE: 6s.
MAKERS: Franklin Electric Co., Ltd.

THE Franklin condenser is rated to have a capacity of 8 microfarads at a working voltage of 450 D.C., and it is one of a very comprehensive range of condensers having capacities varying from 2 to 600 microfarads.

These condensers are housed in black moulded bakelite cases, the tags for the external connections protruding through the top. The condensers are stated to be non-inductive and to have a low power factor. The makers claim that they have a voltage safety margin of something like 40 per cent.

(*Continued on page* 626)

POWER VALVE
The Micromesh PB1 valve is a power amplifier for battery operation



FIXED CONDENSER
Note the unusual appearance of the Franklin dry electrolytic condenser

TESTS OF NEW APPARATUS

Continued from page 624

HANDY FOR CONSTRUCTORS
This Atlas choke is well made and is very useful to the experimenter

ATLAS PENTODE CHOKE

APPARATUS ; Pentode output choke.
TYPE ; CPS.
PRICE : £1 1s.
MAKERS : H. Clarke & Co. (M/cr.), Ltd.

A CONVENIENT choke for the experimenter is the Atlas pentode choke made by H. Clarke & Co. (M/cr), Ltd. This is a heavy-duty tapped choke provided with four tappings, enabling ratios varying between 1 : 1 and 5 : 1 to be obtained.

The D.C. resistance of the sample was 400 ohms and the inductance was reasonably constant, varying from 30 henries at no D.C. to 20 henries at 60 milliamperes (with 1 milliampere A.C.). The choke is thus capable of carrying the full anode current of a 5-watt pentode without saturation.

The model illustrated herewith is shrouded with a metal cover, finished a dark green colour. It is possible to obtain the choke in chassis form, however, if so desired.

◆ ◆ ◆

BAKER LOUD-SPEAKER

APPARATUS : Moving-coil loud-speaker for Class-B output stage.
TYPE : Permag Class B.
PRICE : £2 1s.
MAKERS : Bakers Selhurst Radio.

THE Baker class-B loud-speaker is an interesting component. It is of the permanent-magnet type, a compact but powerful E-type magnet being bolted to a light pressed-metal chassis finished in black crackle enamel.

An output transformer is mounted on this chassis, the primary winding being centre-tapped for connection to the class-B valve.

The total resistance of the primary winding is 325 ohms, while the inductance of one half of the primary winding was 2.5 henries with 28 milliamperes flowing, both of which figures are satisfactory.

The impedance curve shows a very uniform impedance, the usual rise in the upper frequencies being delayed until quite late, while there is a distinct rise in the impedance in the bass. The loud-speaker, therefore, may be expected to give an excellent reproduction free from shrillness and we found on an actual test that this was so.

The actual order of the impedance

NEW LOUD-SPEAKER
A new Baker instrument designed for sets with a class-B output stage

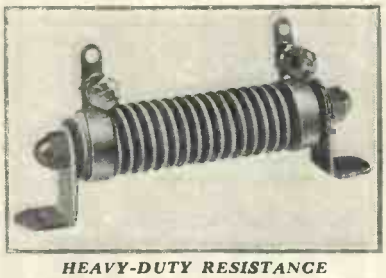
is a little low, particularly around 300 cycles, but we understand that the output transformer is being slightly modified to correct this feature.

The loud-speaker has an overall diameter of 8½ in. and stands 5 in. back from the panel. It is well worth consideration.

◆ ◆ ◆

BULGIN RESISTOR

APPARATUS : Heavy-duty wire-wound resistance.
TYPE : 20-watt rating.
PRICE : 5,000-ohm type, 3s. 6d.; 100,000-ohm type, 6s.
MAKERS : A. F. Bulgin & Co., Ltd.



HEAVY-DUTY RESISTANCE
The new Bulgin resistances are made in sizes ranging from 5,000 to 100,000 ohms

THE pioneers of the spaghetti type of resistance, A. F. Bulgin and Co., Ltd., have recently introduced a heavy-duty resistor. The wire is first wound round an asbestos core to form a cord. This resistance cord is then wound on a grooved porcelain former with generous spacing between the turns.

Connection is made at each end by a clamp, to which are fixed soldering tags and terminals. These clamps can, if necessary, be moved along to reduce the total resistance or extra clamps may be fitted to take tappings. Two small feet are provided at the ends. The whole job is neat and compact, the dimensions being 3 in. by ½ in. by 1½ in. high overall.

Our tests showed that the resistance was not only accurate, but capable of carrying its rated current quite comfortably. These resistors are actually 20-watt rating, so that a resistance of 100,000 ohms can be wound to carry 14 milliamperes while, at the other end of the scale, a 500-ohm resistance will carry 200 milliamperes.

◆ ◆ ◆

BELLING-LEE PICK-UP

APPARATUS : Pick-up with adjustable tone-arm.
TYPE : A.
PRICE : £1 7s. 6d.
MAKERS : Belling & Lee, Ltd.

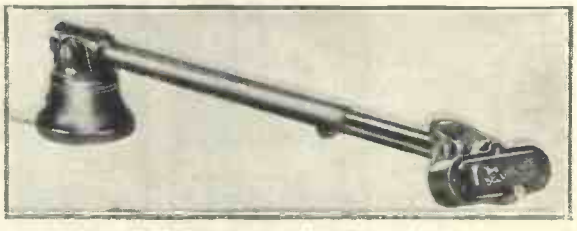
THE Belling-Lee pick-up illustrated herewith is marketed complete with tonearm. The pick-up, which is distinctly smaller than the average, is carried on the end of a telescopic arm, the length of which can be adjusted to the user's requirements.

A useful feature is that the angle between the pick-up and the arm is also adjustable, so that the correct tracking can be obtained without any difficulty. A template is provided which renders the operation of setting up extremely simple.

The whole tone-arm rotates to facilitate the insertion of the needle.

The electrical output is lower than the average and is reasonably uniform.

The conventional rapid rise in voltage in the lower frequencies was not observed on test, it being presumably left to the user to provide such compensation as he feels is desirable.



PICK-UP WITH ADJUSTABLE ARM
The new Belling-Lee pick-up. A model is available for clipping on ta the side of a portable gramophone

How to Listen on 5 Metres

Some Short-Wave Hints by KENNETH JOWERS

THERE have been some exciting times in the 5-metre world just recently. The English record has been raised to 130 miles—pretty good going—but we still have a long way to go to catch up the American record of 280 miles set up last year.

These records must show even to the lay reader that wavelengths of 10 metres and under will surely be the solution to our present selectivity troubles and cumbersome receivers.

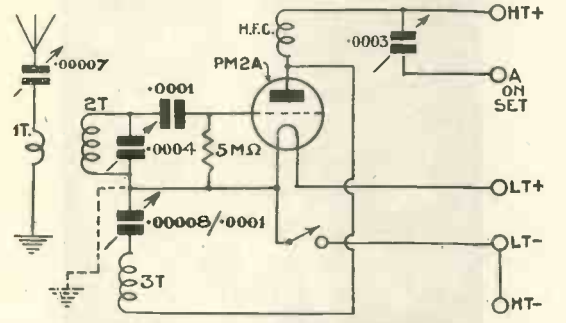
Television will also be available in the course of time, as I understand that the B.B.C. television test on 7.75 metres was heard up to 40 miles away. Of course, J. L. Baird has been experimenting for quite a while on 6.1 metres from his Long Acre studios with excellent success.

Not only will the selectivity problem be solved by means of these "ultra shorts," but a wider band will be available for each station, which would give us better reproduction and clearer television images.

I am glad to see that more readers are making up receivers suitable for these short wavelengths, but I am even more glad to see that manufacturers can supply the components from stock.

No one need have any trouble in hearing the B.B.C. 7.75-metre transmissions within a reasonable distance or the 5-metre amateurs if they go about building the right kind of receiver in the right way.

It can be taken for granted that except for those in the shadow of the transmitter, a straight Reinartz or Hartley detector will be quite useless. A super-regenerative is quite good, but for the novice rather difficult to handle, and a trouble to build.



CIRCUIT FOR 5-METRE CONVERTER

Schematic circuit of a converter for 5-metre reception. Such a unit can be added to almost any set with stable high-frequency amplification

A super-het always sounds complicated and expensive, but a single-valve converter is almost the same thing and will do quite well. Indeed, the conventional autodyne combined oscillator detector does at first glance appear to be a straight single-valve receiver.

The circuit shown has been used for some time with great success. The values of the various components are given, and if the wiring is kept reasonably short and the coils wound with extreme care, results should be entirely satisfactory.

For 7 to 8 metres the tuning coil consists of two turns tightly wound on a 1-in. former and then slid off. The spacing between the turns is approximately ¾ in. The coil is mounted directly on to the condenser; so important is this fixing that a close-up view is shown.

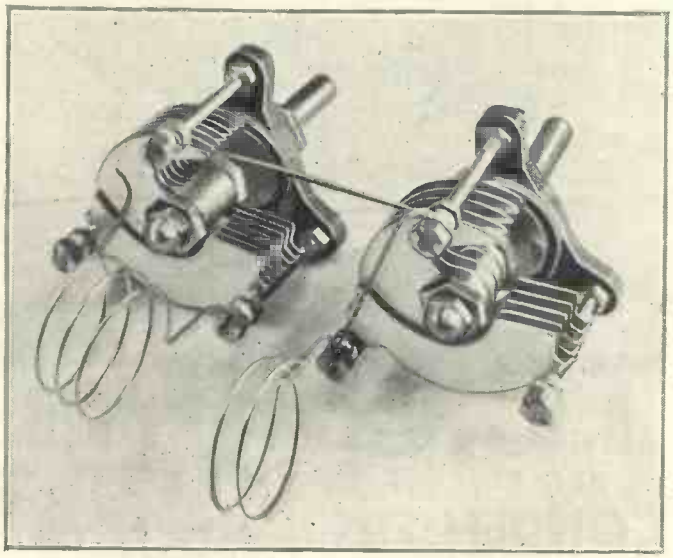
Making the Coils

The reaction coil is wound in a similar way, but consists of three turns with the same spacing. If No. 14- or 16-gauge wire is used it will keep quite rigid without support, which is essential when dealing with frequencies in the order of thirty or forty million per second.

The unit should be connected to the aerial terminal of any set with one or more *stable* high-frequency stages. Unlike the normal short-wave converter, the receiver should not be tuned to a high wavelength of 1,800 metres, but to about 250 metres, otherwise it may be a trifle unstable.

It is not much use giving all these details of the receiver if we do not go into the type of aerial that should be used, for this is most important. A good average length is between 10 ft. and 18 ft., but for maximum results a flatly-tuned aerial should be used, that is to say, one having a natural wavelength of either 5 or 7 metres as the case may be.

Taking, for example, a 5-metre aerial, the length is about 16 ft. 4 in., so an aerial of this length should be erected. Should you have any difficulty in making the receiver oscillate, however, use a half-wave aerial of 8 ft. 2 in. and no earth connection.



TUNING SYSTEM FOR 5-METRE RECEPTION

This photograph shows how 5-metre coils made with fairly heavy-gauge wire are self-supporting and can be fixed directly to the tuning condensers, which have very low capacities

Blueprints are the key to the building of a successful receiver

The issue of blueprints for every set produced by the WIRELESS MAGAZINE removes the usual difficulty which confronts the home-set builder who has little or no technical wireless knowledge.

These blueprints illustrate, in the most simple manner, the complete construction of receivers in such a way that a two-valver or a complicated seven-valve super-het can be assembled in the short space of an hour or two.

Turn to page 631 of this issue for details of four "star" sets

What Are These New High-frequency Pentodes?

THERE is now a general release of three new high-frequency pentodes, two from Mullard's and one from Ferranti's, now giving us four valves to consider, for the Cossor MS-Pen-A was issued some months ago and is of a different type altogether.

Theoretical and Practical

We know that with a very efficient A.C. screen-grid valve a *theoretical* amplification factor of up to 1,200 is possible. Assuming the coils used are of the maximum efficiency, a *practical* stage gain of between 200 and 300 is quite probable, but the average constructor should be satisfied to obtain a gain of between 100 and 150.

You may well ask how the new high-frequency pentodes compare with the screen-grid stage.

The Mullard VP4 is a high-impedance pentode having a variable grid base and amplification factor. It is designed on similar lines to the companion screen-grid valve, but has in addition a third or suppressor grid connected internally so that the number of contacts remains the same, making for an easy change-over from screen-grid to pentode.

With this valve a *theoretical* amplification factor of 5,000 is possible! It is not likely that the practical gain will be anywhere near this figure—in fact, the percentage gain is less than with a screen-grid valve.

A Valuable Point

On test it is quite evident that even with coils of normal efficiency a practical stage gain of 400 to 500 times is quite possible with complete stability.

This high gain is of the utmost value—most constructors know that if the selectivity of the aerial circuit is increased beyond a certain point, the volume drops considerably.

With a high-frequency pentode the selectivity is naturally better, owing to the high A.C. resistance or internal impedance of the valve and, owing to the increased gain, a little of this can be sacrificed to still better the selectivity.

Briefly, with a high-frequency pentode we can expect greater selectivity and consequently more stations without losing volume; in fact, with reasonable coil efficiency an increase in volume is more likely.

The Mullard VP4 and Ferranti VPT4 are similar in design, and are intended for high-frequency work in A.C. receivers only.

The Mullard SP4 has a fixed grid base and an amplification factor of about 2,700. It is designed primarily for use as a first detector or frequency changer in a super-het but, owing to its generous grid acceptance, it is excellent as an ordinary speech detector in a straight or super-het receiver.

NEW HIGH-FREQUENCY PENTODES
A group of four new high-frequency pentodes. From left to right they are the Mullard VP4, Mullard SP4, Cossor MS-Pen-A and the Ferranti VPT4. These valves will benefit nearly everyone using A.C. receivers

As a power-grid detector it is extremely good, particularly when used close to a powerful station, as it does not overload very easily. Selectivity is again increased as damping is considerably less than with a triode or even a screen-grid detector.

Finally we have the third type of pentode—the Cossor MS-Pen-A. This is a comparatively low-impedance valve, and is designed for use as a power-grid or anode-bend detector. It is not a variable-mu, for the grid base is fixed, but the grid input can be up to a very high order without any distortion—an ideal valve as a second detector in a super-het. K. J.

NOTES AND JOTTINGS

WE regret that in our report on the midget mains set on page 509, last month, we wrongly referred to the Kadette, which is 10 guineas, when really the set on test was an improved model at 12 guineas, with combined mains on/off switch and volume control. Known as the Emerson, this set has dimensions of 9¼ in. by 6¾ in. by 4½ in. The Emerson is designed for A.C. or D.C. mains, and is available, like the Kadette, from Homeaids, of 56 Victoria Street, S.W.1. The Kadette set is, by the way, the same as the Radiette set reviewed on page 616 of this issue.

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Arrangements have been made by the General Electric Co., Ltd., for the pairing of Osram valves of the LP2 and PT2 types for use in Q.P.P. output stages. Stocks of matched valves are now held at the various branches of the G.E.C. in London and the provinces. No extra charge is made for matching.

◆ ◆ ◆

We have received from S. Smith and Sons (M.A.), Ltd., a folder giving details of their complete range of Anodex high-tension batteries. New types for Q.P.P. sets are included.

◆ ◆ ◆

The Dubilier Condenser Co., Ltd., are manufacturing a range of static condensers for the power-correction factor of neon signs. Listeners who have neon signs on their premises and are troubled by interference with their radio sets should write to the makers at Victoria Road, North Acton, W.3, for a copy of this leaflet.

◆ ◆ ◆

C. A. Vandervell, Ltd., of Well Street, Birmingham, have issued a comprehensive chart showing suitable C.A.V. accumulators and high-tension batteries for use with all makes of portable and transportable receivers. Copies are available on request.

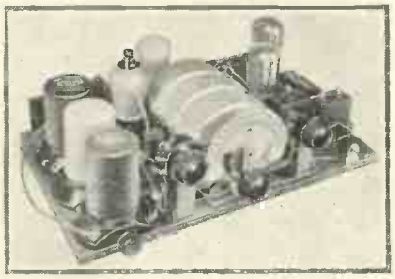
(*Continued on page* 632)

YOU CANNOT GO WRONG IF YOU USE A

FULL-SIZE BLUEPRINT

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 paid. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Wireless Magazine," Blueprint Dept., 58-61 Fetter Lane, London, E.C.4.

The TABLE QUAD



Circuit: SG., Detector, L.F., and power output (4 valves). Price of set: £5, less valves.

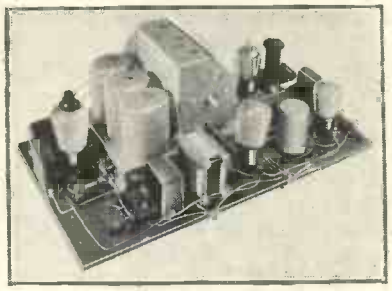
Clapham (London, S.W.).—*I am pleased with the results I am getting from the Table Quad. It is undoubtedly the best battery four-valver I have handled. Up to the time of writing, I have identified over forty stations—your log only differs by one or two degrees at the most. Thank you!*

The W.M. SHORT-WAVE SUPER

Designed by W. G. Hill. Circuit: 5-valve short-wave super-het. Price of set: £6 10s. without valves.

Walthamstow (Essex).—*I wish to commend the "W.M." Short-wave Super. This set is the ninth short-waver I have built, and I am convinced that it is the real "easytune" short-wave set. I did not realise that there were so many languages in the world until I toured on the "W.M." Short-wave Super. The log to date is twenty-three stations, all at good strength. W8XK provides a real good programme from 9 p.m. onwards. It is truly the last word in short-wave sets.*

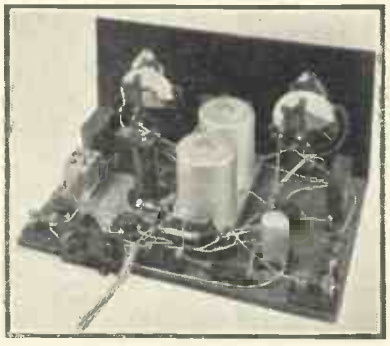
The CALIBRATOR



Circuit: SG. Detector, L.F. and Power output (4 valves). Price of set: £6, less valves.

Blackpool (Lancs).—*I thought you might be interested to know how pleased I am with the Calibrator. I have adapted the set for all-mains working and am extremely satisfied with the results obtained. I can log over forty-five stations at good loud-speaker strength.*

The WIZARD 3



Circuit: SG., D., Trans. Designed by Percy W. Harris. A simple battery three-valver, a fine station-getter, and an ideal family set. Approximate cost, less valves, £4.

Swansea.—*Have built up the Wizard from a kit of parts, and have pleasure in giving the results I have had with this truly magical three-valver. Have already logged thirty-seven stations at good loud-speaker strength and an American station, also at loud-speaker volume. I must say that, for a three-valver, this one takes top score.—D. R.*

SPECIAL HALF-PRICE OFFER

Blueprints of the following "Wireless Magazine" sets described in this issue are obtainable at the special price, given below, if the coupon on page 632 is used before July 31, 1933.

D.C. Calibrator (SG, D, Trans), No WM328 ... ... **6d.**

All-metal Four (2SG, D, Trans), WM329 **9d.**

Tyres Iron-core Three (SG, D, Pen), No. WM330 ... ... **6d.**

And here are over 50 more to choose from—

CRYSTAL SET (6d.)

1931 Crystal Set AW308

ONE-VALVE SETS (1s. each)

Easy to Build One AW304
B.B.C. One-valver AW387
Portable Short-wave One AW354

TWO-VALVE SETS (1s. each)

New Economy Two (D, Trans) WM265
Family Two (D, Trans) WM278
Economy A.C. Two (D, Trans) WM286
Screen-grid Two (SG, Trans) WM289
A Two for 7 Metres (D, Trans) WM295
New-Style Radiogram (D, Trans) WM299
A.C. Quality Gem (D, Trans) WM312
Ideal Regional 2 (D, Trans) AW357
Quality 30s. Two (D, Trans) AW361
Ether Music Two (D, Trans) AW364
Clarion-voice 2 (SG, D, Pen) AW371
Home Station A.C. 2 (D, Pen) AW374
B.B.C. National Two (D, Trans) AW377
Melody Ranger Two (D, Trans) AW388

THREE-VALVE SETS (1s. each)

Multi-mag Three (D, 2 Trans) WM288
Percy Harris A.C. Radiogram (D, RC, Trans) WM294
Prosperity Three for Batteries (SG, D, Trans) WM296
1933 Economy S.G. Three (SG, D, Trans) WM306
Harris Ethergram (SG, D, Trans) WM308
A.C. Calibrator (SG, D, Trans) WM309
Narrow-pass Three (SG, D, Trans) ... WM314
£6 6s. Radiogram (D, RC, Trans) WM318
Simple-tune Three (SG, SG Det, Trans)... WM327
£8 Radiogram (D, RC, Trans) AW343
Wizard (SG, D, Trans) AW360
£2 2s. Family Three (D, 2 Trans) AW368
Build As You Learn Three AW366
Build As You Learn SG3 (SG, D, Trans) ... AW372
James Push-Push Three (SG, D, Q.P.P.) (1/6) AW378
Everybody's Home Radiogram (SG, D, Trans) AW381
Home-Lover's New All-electric 3 for A.C. mains (SG, D, Trans) AW383
Our Up-to-the-Minute Three (SG, Westector, LF, Trans) AW384
Class-B Three (D, Trans, class B) AW386

FOUR-VALVE SETS (1s. 6d. each)

Quadradyne (2 SG, D, Pen) WM273
A.C. Quadradyne (2 SG, D, Pen) WM279
Ideal A.C. Home Super (Super-het) ... WM290
Gold Coaster (A.C. Short-waver) WM292
Triple-tune Four (2 SG, D, Trans) ... WM293
Calibrator (SG, D, RC, Trans) WM300
Table Quad (SG, D, RC, Trans) WM303
"Words and Music" Radiogram (2 SG, D, Trans) WM307
Home Short-waver (SG, D, RC, Trans) ... WM311
"Words and Music" Radiogram de Luxe (SG, D, RC, Q.P.P.) WM307a
Empire Short-waver (SG, D, RC, Trans) ... WM313
Calibrator de Luxe (SG, D, A.C. Trans) ... WM316
Melody Ranger (SG, D, RC, Trans), with copy of "A.W." 4d. postage AW375
"A.C. Melody Ranger" (SG, D, RC, Trans) AW380

FIVE-VALVE SETS (1s. 6d. each)

Super-quality Five (2 HF, D, RC, Trans) ... WM320
James Short-wave Super (Super-het) ... AW328
Simple Super (Super-het) AW340

SIX-VALVE SETS (1s. 6d. each)

1932 Super 60 (Super-het) WM269
1932 A.C. Super 60 (A.C. Super-het) ... WM272
Ideal Home Super (Super-het) WM280
Easytune 60 (Super-het) WM284
"W.M." D.C. (Super-het)... ... ... WM321
James Class-B Super (Super-het with iron-cored coils) WM326
Welcome Portable with class-B output stage WM325
New Century Super (Super-het), with copy of "A.W." 4d. post free AW363
New A.C. Century Super (A.C. Super-het) AW365

SEVEN-VALVE SETS (1s. 6d. each)

Super Senior (Super-het) WM256
Seventy-Seven Super (A.C. Super-het) ... WM305
Q.P.P. Super 60 (Super-het) WM319

PORTABLES (1s. 6d. each)

Town and Country Four (SG, D, RC, Trans) WM282
Everybody's Portable (five-valve Super-het) WM291
Welcome Portable (six-valve Super-het) ... WM322
General-purpose Portable (SG, D, RC, Trans) AW351

MISCELLANEOUS (1s. each)

Voltage Regulator WM287
Class-B Mains Unit WM324
"A.W." Trickle Charger AW352
Add-on Band-pass Unit AW359
Plug-in Short-wave Adaptor AW382

BLUEPRINT COUPON

Valid only until July 31, 1933 (or until August 31, 1933, for overseas readers)

FOR ONE BLUEPRINT ONLY

If you want a full-size blueprint of any ONE of the sets constructionally described in this issue for half price, cut out the above coupon and send it, together with a postal order, to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

This coupon is valid for a blueprint of any ONE only of the following sets at the prices indicated :—

D.C. CALIBRATOR (page 602), No. WM328, price 6d., post paid.

ALL-METAL FOUR (page 564), No. WM329, price 9d., post paid.

TYERS IRON-CORE THREE (page 553), No. WM330, price 6d., post paid.

INFORMATION COUPON

Valid only until July 31, 1933 (or until August 31, 1933, for overseas readers)

If you want to ask any questions, cut out the above coupon and send it, together with a postal order for 1s. and stamped-addressed envelope, to the Information Bureau, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

Note that not more than two questions may be asked at a time and that queries should be written on one side of the paper only.

Under no circumstances can questions be answered personally or by telephone. All inquiries must be made by letter so that every reader gets exactly the same treatment.

Alterations to blueprints or special designs cannot be undertaken : nor can readers' sets or components be tested.

If you want advice on buying a set, a stamped-addressed envelope only (without coupon or fee) should be sent to the Set Selection Bureau, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

Ferrocart Developments

CONSTRUCTORS who are following the development of iron-cored tuning coils will be interested to learn that the basic Ferrocart material will in future be manufactured in Britain by the General Electric Co., Ltd.

The position now is that four groups are interested in Ferrocart developments in this country :—

Colvern, Ltd., have acquired the sole right of making and selling Ferrocart coils for constructors.

Electrical and Musical Industries, Ltd. (comprising Columbia Graphophone Co., Ltd., Gramophone Co., Ltd., and Marconiphone Co., Ltd.) have acquired a licence to make Ferrocart coils for their own receivers.

General Electric Co., Ltd., have the sole right of making Ferrocart core material, the sole right for the use of Ferrocart for electric communication through wires, and a licence for making Ferrocart coils for their own sets and kits.

Marconi's Wireless Telegraph Co., Ltd., have a licence for the use of Ferrocart in transmitters and commercial receivers.

NOTES AND JOTTINGS

(*Continued from page 630*)

Readers who are interested in power-amplifier equipment should write to Eric J. Lever (Trix), Ltd., for a copy of their latest catalogue. Every conceivable type of apparatus is described, from microphones to complete amplifiers for public-address use.

◆ ◆

We have received details of the Fluxite soldering set—a handy outfit, which makes soldering a very simple job. The outfit, which costs 7s. 6d., contains a soldering iron with non-heating metal handle, pocket blow lamp, Fluxite soldering paste, and solder. The blow lamp can be bought separately for 2s. 6d. Fluxite soldering accessories are obtainable at most ironmongery stores.

◆ ◆ ◆

Readers who are interested in the Tyers Iron-core Three should make a point of seeing the set, which will be on show at Selfridges Radio Department, in Oxford Street, W.1, during the currency of this issue.

INDEX TO ADVERTISERS

We have received from Plew and Dear, of 22 George Street, Hanover Square, W.1, an interesting anti-fading device. In appearance, the unit is similar to a low-frequency transformer. We tried the unit on a standard receiver in our laboratories and found it quite satisfactory. On a set with two high-frequency stages the control given should be sufficient to counteract serious fading. The price of the unit is 10s. 6d.

Printed for the publishers, BERNARD JONES PUBLICATIONS, LTD., 58-61 Fetter Lane, London, E.C.4, by The Sun Engraving Co., Ltd., London and Watford. Colonial and Foreign Agents : AUSTRALIA—Gordon & Gotch, Ltd., Melbourne (Victoria), Sydney (N.S.W.), Brisbane (Queensland), Adelaide (S.A.), Perth (W.A.), and Launceston (Tasmania). BELGIUM—W. H. Smith & Son, Ltd., 71-75 Boulevard Adolphe Max, Brussels. CANADA—Gordon & Gotch, Ltd., Toronto. FRANCE—Messageries Hachette, 111 rue Réaumur, Paris, 2me.; W. H. Smith & Son, Ltd., 248 Rue de Rivoli, Paris. HOLLAND—Meulenhoff & Co., Amsterdam. NEW ZEALAND—Gordon & Gotch, Ltd., Wellington, Auckland, Christchurch, and Dunedin. Sole Agents for SOUTH AFRICA—Central News Agency, Ltd. (London Agents : Gordon & Gotch, Ltd.) July, 1933.

Specified for the "ALL METAL THREE"

BLUE SPOT 99PM

THE designers of the *Wireless Magazine* "All Metal Three" wisely chose the only speaker that can do justice to so modern a receiver, Blue Spot 99PM Moving Coil—the best speaker in the world.

Whether *you* are building the "All Metal Three" or any other set, pay your work the compliment of giving it the perfect voice—Blue Spot 99PM.

We say "perfect voice" advisedly, for your set will be judged by the way it "talks" and it can have no purer, truer voice than 99PM. This triumph of Blue Spot quality in design and construction is amazing in its mastery of tone. It reproduces every note and word so perfectly that the most expertly trained ear can discern no fault or flaw in its performance. It is the quintessence of naturalness — the highest achievement in the science of sound reproduction. Yet it is not unduly expensive as a glance at the outstanding features below will prove to you.

Price Complete (as illustrated above, chassis only) **59/6**

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SPECIAL FEATURES

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in artistic design of first quality mahogany or walnut as desired. The movement (Blue Spot 45PM) is mounted to an independent baffle before being fitted in cabinet. A really fine speaker. PRICE **67/6**

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Extension Model without transformer 27/6

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Your dealer is waiting for you to put this thoroughbred through it's paces. Ask for a trial of model 620 to-day in your home, and enquire about gradual payment.

MODEL 620.

Four valves, including rectifier. One knob tuning. Illuminated station guide and flood-lit horizontal scale calibrated in wave-lengths. Columbia Cradle Chassis. Electric induction motor. Field-excited moving coil speaker. Handsome walnut cabinet. (A.C. or D.C.)

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