MUSH ELIMINATORS AND OTHER SPECIAL GADGETS

Wireless Magazine

1/-

JANUARY 1934

BUILD OUR NEW QUADRADYNE TO BRING IN THE NEW YEAR

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Here's News

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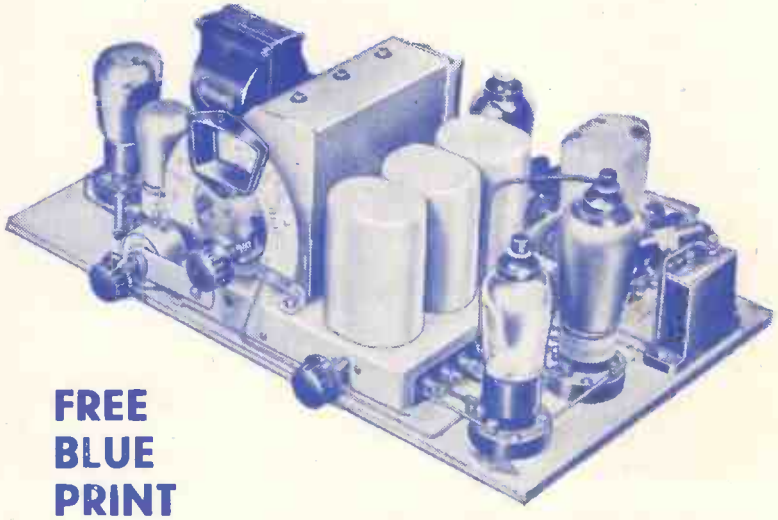

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Editor-in-Chief: BERNARD E. JONES
Technical Editor: J. H. REYNER B.Sc. (Hons.), A.M.I.E.E.
Radiovision Editor: H. CORBISHLEY

Wireless Magazine

The Best Shillingsworth in Radio

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Those Gadgets!

GADGETS! I read the other day that the compilers of the supplement to the "Oxford Dictionary" do not know how this useful little word originated. It must have been by spontaneous creation, because obviously "gadget" is the only word for a—gadget.

Gadgets we give in plenty in a special section this month and all of them can be added to the ordinary set without, in most cases, interfering with the wiring. Static eliminators, earths, mains aerials, remote controls, lightning switches, etc.—we illustrate and describe them all.

It is the gadget-lover, by the way, who will take, perhaps, the greatest pleasure in Kenneth Jowers' article, "Radio in Your Car," in which is given expert opinion as to what car radio equipment should be, help in deciding the type of receiver, information on how to fit the concealed aerial, etc.

A most interesting gadget is the stroboscope, the use of which, for adjusting the speed of a gramophone turntable, has become fairly general amongst people who have the use of a 50-cycle A.C. supply.

P. Wilson, in his unusual article, carries the idea to its logical conclusion and makes a stroboscope out of the turntable itself, instead of using paper discs, which are easily spoilt or lost. He makes very clear the principle and its application.

We have a lot to say about supers this month. Our four-valve A.C. super—The Merrymaker—described in the preceding issue, was made possible by the pentagrid valve and in an article in this issue we show how and why. There are many new ideas in The Merrymaker Super and we point out some of them in this article.

Rutherford Wilkins, in his "How Many Valves in Your 1934 Super?" suggests that the two-valve super is no longer impossible; indeed, he offers a circuit for such a set, using a special pair of valves a pentagrid and a diode-pentode. A very practical article is "Making the Most of a Super-het," by J. H. Reyner, who shows how, by adjusting the frequency-changer end—the very heart of the set—you can really get the best out of this type of set.

We give this month an all-wave three, covering two short wavebands in addition to the normal medium and long waves; the A.C. Quadradyne, a neat chassis set, the new mains version of our old friend the Quadradyne; and the A.C. Transportable, a three-valve A.C. set, self-contained and all ready to plug into the mains. A special feature of the constructional notes on the last-named set is a three-stage wiring guide designed to take all the troubles out of set construction.

"The De-bunking of Radio" is Percy Harris's task this month. When you "de-bunk" you simply remove the nonsense from anything and in his three-thousand-word article, illustrated with a few sketches, Percy Harris does his best toward that end.

G. S. Scott, the author of the article in our preceding issue, entitled "Depth-sounding by Radio," now continues the subject in his article, "Measuring the Heaviside Layer," and he reminds us that we are indebted to that layer for all distant wireless communication.

He speaks of the work of Oliver Heaviside and Professor A. E. Kennelly, who suggested the existence of a layer high up in the air which "reflected" wireless signals to earth at considerable distances. Professor E. V. Appleton, one of the best-known names in wireless research to-day, has been able to prove that this layer is at a height of about 100 kilometres above the earth and that there is a further layer higher up at about 230 or 250 kilometres. Mr. Scott's article will be read with very great pleasure by every reader of an inquiring turn of mind.

B. E. J.

FOR THE CONSTRUCTOR

TECHNICAL FEATURES

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GENERAL ARTICLES

GRAMOPHONE FEATURES

Mush Eliminators and Other Special Gadgets—See page 603

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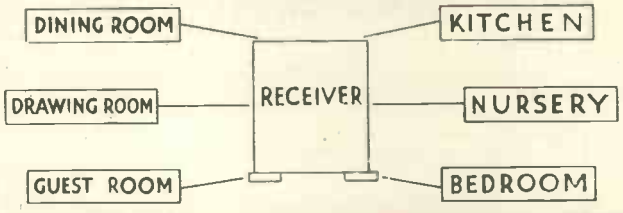

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Guide to the World's Broadcasters

Specially Compiled for "Wireless Magazine" by JAY COOTE

Metres: 16.878 *Power:* 12 kw. — (*Revised*) **BOUNDBROOK (W3XAL)** — *Kilocycles:* 17,780

New Jersey, U.S.A.

Distance from London: Approximately 3,050 miles.
Standard Time: Greenwich Mean Time less 5 hours.
Announcer: Man.
Interval Signal: Three notes, as other N.B.C. stations.
Call: "This is W3XAL, Boundbrook, New Jersey, a short-wave station of the National Broadcasting Company of America operating on *kilocycles." The call is usually given after the interval signal every fifteen minutes.
Standard Transmissions: G.M.T. 17.30-23.30 (daily except Fridays and Saturdays). Relays programmes from WJZ, Boundbrook (394.5 metres, 760 kilocycles).
* Transmits on 49.18 metres (6,100 kilocycles), on Saturdays from 20.00-05.00.

Metres: 31.23 *Power:* 0.3 kw. — **MEXICO CITY (XETE)** — *Kilocycles:* 9,608

Mexico

Distance from London: Approximately 5,508 miles.
Standard Time: Greenwich Mean Time less 7 hours.
Announcer: Woman.
Languages: Spanish and English.
Call: "This is station XETE of the Ericsson Telephone Company, Mexico City operating on 9,608 kilocycles."
Times of Transmission: G.M.T. 19.30-22.00; 23.30-24.00.
Occasionally relays programmes from XETR, Mexico City (491.8 metres, 610 kilocycles).
Closes down with the playing of a gramophone record: "L'Amour, Toujours L'Amour (Friml)."

Metres: 45.5 *Power: 0.2 kw.* — **BUCAREST** — *Kilocycles:* 6,593

Romania

Distance from London: Approximately 1,300 miles.
Standard Time: Eastern European (G.M.T. plus 2 hours).
Announcer: Woman.
Call: "Radio Romana."
Announcements are made in Romanian, French, and occasionally English and German.
The station is operated by students of the Bucarest Technical College at odd times, but a broadcast is usually given on Sundays from G.M.T. 15.00
Closes down with good-night greetings in several European languages.

Metres: 49.5 *Power: 0.5 kw.* — (*Revised*) **NAIROBI (VQ7LO)** — *Kilocycles:* 6,060

Kenya Colony

Distance from London: Approximately 4,300 miles.
Standard Time: Greenwich Mean Time plus 2 hours 30 minutes.
Announcer: Man.
Call: "This is 7LO, the Nairobi station of the East African Broadcasting Company, calling."
Standard Transmissions: G.M.T. 10.45-11.15, 16.00-19.00 (Mondays); 08.00-09.00, 16.00-19.00 (Tuesdays); 10.45-11.15, 16.00-19.00 (Wednesdays); 13.00-14.00, 16.00-19.00 (Thursdays); 10.45-11.15, 16.00-19.00 (Fridays); 16.00-20.00 (Saturdays); 15.50-19.00 (Sundays).
Occasionally relays Daventry Empire programme and Big Ben chimes.
Closes down with good-night greetings, followed by "God Save the King."
Simultaneous broadcasts are made on 400 metres (750 kilocycles).

Metres: 298.8 *Power: 1 kw.* — **SALONICA** — *Kilocycles:* 1,004

Greece

Distance from London: Approximately 1,325 miles.
Standard Time: Eastern European (G.M.T. plus 2 hour).
Announcer: Man.
Call: "Empros etho Thessaloniki (Hullo! here is Salonica)."
Broadcasts once weekly only, namely, every Saturday from 19.00 to 21.30 G.M.T.
Following the Lucerne Plan, this station should work on a wavelength of 373.1 metres (804 kilocycles) on and after January 15, 1934.

Metres: 315.8* *Power:* 0.8 kw. — **MARSEILLES (P.T.T.)** — *Kilocycles:* 1,049

France

Distance from London: Approximately 625 miles.
Standard Time: Greenwich Mean Time (France adopts B.S.T.).
Announcer: Man.
Language: French only.
Call: "Allô! Allô! Ici Marseille-Provence P.T.T."
Opening Signal: Folk song from Bizet's, *Maid of Arles.*
Interval Signal: Three bells, G, E flat, F.
Main Daily Programme: Mostly relays PTT, Paris. G.M.T. 07.45, news; 12.30, concert; news, 17.00, women's hour, talks, concert; 19.30, main evening entertainment.
Closes down with usual French good-night greetings followed by *La Marseillaise.*
* On and after January 15, 1934, the wavelength will be altered to 400.5 metres (749 kilocycles). A high-power station is being erected at Realtor.

*Metres: 318.8** *Power: 1.5 kw.* — **NAPLES** — *Kilocycles:* 941

Italy

Distance from London: Approximately 1,063 miles.
Standard Time: Central European (G.M.T. plus 1 hour).
Announcer: Woman.
Language: Italian only.
Opening and Interval Signal: "Pipes of Pan."
Call: "Eh yar Radio Napoli, Roma (e Bari)."
Main Daily Programme: Mainly relays entertainments from Rome, with which studio broadcasts are also exchanged.
Closes down as other Italian stations with the words, "Fine delle transmissione, Buona notte a tutte," or "Signori, Buona notte," followed by the Fascist march, *Giovinezza* and Italian National Anthem, *Marcia Reale.*
* Following the Plan de Lucerne, Naples, will broadcast on 271.7 metres (1,104 kilocycles) on and after January 15, 1934.

Metres: 348.8 *Power: 8 kw.* — **BARCELONA (EAJ1)** — *Kilocycles:* 860

Spain

Distance from London: Approximately 708 miles.
Standard Time: Greenwich Mean Time (Spain does not adopt B.S.T.).
Announcer: Man.
Languages: Catalan and Spanish.
Opening Call: "Aqui Estacion EAJ1 (Ay-ah-hota-oono) Union Radio Barcelona instalada en la cumbre del Monte Tibidabo, Parque del Hotel Florida." Between items: "Aqui Radio Barcelona."
Opening Signal: Musical box melody.
Main Daily Programme: G.M.T. 07.15 and 08.00, physical exercises (Sundays); 11.00, chimes from Cathedral, news; 12.00, Women's Hour, gramophone records; 15.00, special broadcast for hospitals; 17.00, gramophone records, talks; 20.00, dance music (Sundays); 21.15, main evening entertainment, dance music from Hollywood Bar.
Closes down with good-night greetings, "Buenas noches, Señores, hasta mañana," and concludes with the National Anthem, *Himno de Riego.*

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	W8XK, Saxonburg		United States
13.95	Chicago W9XF		United States
13.97	Daventry GSH		Great Britain
13.979	Coytesville W2XAL		United States
13.997	Boston WIXAL		United States
14.47	**Buenos Aires** LSY		Argentine
14.58	Bandoeng PMB		Java
15.48	Prangins HBL		Switzerland
15.5	Bandoeng PMA		Java
15.5	Buenos Aires LSY		Argentine
15.92	Bandoeng PLE		Java
16.00	Maracay YVR		Venezuela
16.1	**Rugby** GBU		Great Britain
16.36	Lawrenceville (N.J.) WLA		United States
16.38	**Rugby** GAS		Great Britain
16.57	Chicago W9XAA		United States
16.66	Rocky Point WAJ		United States
16.81	Bandoeng PLF		Java
16.85	Kootwijk PCV		Holland
16.86	Daventry Empire GSG		Great Britain
16.878	**Boundbrook** W3XAL		United States
16.878	Downer's Grove W9XAA		United States
16.88	**Eindhoven** PHI		Holland
16.89	Königswusterhausen DJE		Germany
16.98	New Brunswick W2XAO		United States
19.56	**Schenectady** W2XAD		United States
19.61	La Paz CP4		Bolivia
19.646	**New York** W2XE		United States
19.67	Coytesville N.J. W2XAL		United States
19.68	**Radio Coloniale** FYA		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
19.85	Tashkent (RAU)		U.S.S.R.
19.88	Moscow (RKI)		U.S.S.R.
19.99	Central Tuinucu CM6XJ		Cuba
20.27	Rocky Point WQV		United States
20.49	Deal (N.J.) WND (W2XBJ)		United States
20.5	Chapultepec XDA		Mexico
20.7	Rocky Point WKJ (WEB)		United States
20.97	Amateur Band		—
21.45	Rocky Point WQB		United States
21.5	Bucarest CVI		Roumania
21.83	Drummondville CGA		Canada
21.92	Szekesfehervar HAS2		Hungary
22.26	Rocky Point WAJ		United States
22.35	Rocky Point WHR		United States
22.68	Ships		—
22.684	Zeesen (DHB)		Germany
23.39	**Radio Maroc (Rabat)**		Morocco
24.41	Rugby GBU		Great Britain
24.9	Kootwijk PDV		Holland
25.0	Moscow RNE		U.S.S.R.
25.16	Moscow RW50		U.S.S.R
25.25	Chicago W9XF		United States
25.25	Radio Coloniale, Paris (FYA)		France
25.27	**Saxonburg** (Pa) W8XK		United States
25.274	Calcutta VUC		Br. India
25.284	**Daventry (Empire)** GSE		Great Britain
25.34	Chicago (Ill.) W9XAA		United States
25.36	**New York** W2XE		United States
25.4	**Rome** 2RO		Italy
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	Winnipeg VE9JR		Canada
25.63	Radio Coloniale FYA		France
26.83	Funchal CT3AQ		Madeira
27.65	Nauen DFL		Germany
27.88	Marapicu PSA		Brazil
28.28	Rocky Point (N.J.) WEA		United States
28.68	Buenos Aires LSX		Brazil
29.16	Zeesen (DIQ)		Germany
29.58	Leopoldville OPL		Belgian Congo
29.6	Marapicu PSD		Brazil
30.0	Radio Excelsior LR5		Argentine
30.0	Madrid EAQ		Spain
30.4	Lawrenceville WON		United States
30.4	Tokio JIAA		Japan
30.89	**Rugby** GCA		Great Britain
31.23	Mexico City, XETE		Mexico
31.25	Lisbon CTIAA		Portugal
31.28	**Philadelphia** W3XAU		United States
	Sydney VK2ME		New South Wales
31.297	**Daventry (Empire)** GSC		Great Britain
31.32	**Radio Nations** HBL		Switzerland
31.35	**Springfield** W1XAZ		United States
31.38	**Zeesen** DJA		Germany
31.48	**Schenectady** W2XAF		United States

Wave-length	Name of Station	Dial Readings	Country
31.545	**Daventry (Empire)** GSB		Great Britain
31.55	Melbourne VK3ME		Victoria
31.55	Caracas YV3BC		Venezuela
31.6	Rocky Point WEF		United States
31.63	Poznan (SRI)		Poland
31.71	Rocky Point WKJ		United States
32	Heredia T14NRH		Costa Rica
32.71	**Lawrenceville** WND		United States
33.26	Rugby GBS		Great Britain
33.59	Rocky Point (N.J.) WEC		United States
35.0	Khabarovsk (RV15)		U.S.S.R.
36.65	Rio de Janeiro PSK		Brazil
36.88	Bagdad YID		Iraq
37.04	Quito HCJB		Ecuador
37.33	Rabat (CNR)		Morocco
38.47	**Radio Nations** HBP		Switzerland
39.7	Bogota HFR		Columbia
40.3	Radio Nations HBQ		Switzerland
40.54	Rocky Point WEM		United States
41.1	Amateur Band		—
41.6	Las Palmas EAR58		Canary Isles
41.7	Singapore VSIAB		Sts. Settlements
41.9	Manizales (HJ4ABB)		Colombia
42.0	Maracay YV2AM		Venezuela
42.92	Jelöy LCL		Norway
43.0	Madrid EAR 110		Spain
44.61	Rocky Point WQO		United States
45	Constantine FM8KR		Tunis
45.38	Moscow		U.S.S.R.
45.31	Rio Bamba PRADO		Ecuador
45.38	Moscow RW72		U.S.S.R.
45.5	Bucarest		Roumania
46.07	London (Ont.) VE9BY		Canada
46.09	Boundbrook W3XL		United States
46.73	Minsk RCAD		U.S.S.R.
48	Bogota HJ3ABF		Colombia
48.05	Barranquilla (HKD)		Colombia
48.8	Winnipeg VE9CL		Canada
48.86	**Saxonburg (Pa.)** W8XK		United States
48.9	Moscow (RKK)		U.S.S.R.
48.91	Caracas YV3BC		Venezuela
48.92	New York W2XA		United States
48.94	Mexico XETE		Mexico
48.95	Maracay YV11BMO		Venezuela
49.0	Johannesburg ZTJ		Sth. Africa
49.02	New York W2XE		United States
49.08	**Caracas** YV1BC		Venezuela
49.1	Halifax VE9HX		Canada
49.1	Calcutta VUC		Br. India
49.18	**Boundbrook** W3XAL		United States
49.18	Chicago W9XF		United States
49.22	Bowmanville VE9GW		Canada
49.3	La Paz CP5		Bolivia
49.34	Chicago W9XAA		United States
49.4	Skamlebaek OXY		Denmark
49.43	Vancouver VE9CS		British Columbia
49.5	**Philadelphia** W3XAU		United States
	Cincinnati W8XAL		United States
	Nairobi VQ7LO		Kenya Colony
49.586	**Daventry (Empire)** GSA		Great Britain
49.67	Boston (WIXAL)		United States
49.67	**Miami Beach** W4XB		United States
49.87	Mexico (XEW)		Mexico
49.83	Chicago W9XF		United States
	Zeesen DJC		Germany
49.96	**Drummondville** VE9DR		Canada
49.96	Tegucigalpa (HRB)		Honduras
50	**Moscow** RNE		U.S.S.R.
50.26	**Rome (Vatican)** HVJ		Italy
52.7	Tananarive FIQA		Madagascar
54.52	New York W2XBH		United States
56.9	Konigswusterhausen (DTG)		Germany
57.03	**Rocky Point** WQN		United States
58.03	Bandoeng PMY		Java
58.31	**Prague**		Czechoslovakia
62.5	**Long Island** (N.J.) W2XV		United States
62.56	London (Ont.) VE9BY		Canada
65.93	Rocky Point WAD		United States
68.18	Moscow (RFCK)		U.S.S.R.
70.2	Khabarovsk RV15		U.S.S.R.
73	Quito (HCJB)		Ecuador
76.0	Maracay (YV11AM)		Venezuela
84.5	Berlin D4AGE		Germany
202.3	Liege (Wallonie)		Belgium
209.8	Magyarovar		Hungary
	Pecs		Hungary
	Miskolcz		Hungary
211.3	**Newcastle**		Great Britain
	Antwerp		Belgium
214.3	Warsaw (No. 2)		Poland
	Aberdeen		Great Britain

WORLD'S BROADCAST WAVELENGTHS

Continued from page 582

Wavelength	Name of Station	Dial Readings		Country
215.6	Chatelineau			Belgium
217.1	**Königsberg**			Germany
	Brussels			Belgium
	Dublin			Irish Free State
218.5	Salzburg			Austria
	Plymouth			Great Britain
219.9	Beziers			Belgium
220	Turin (No. 2)			Italy
222.1	Binche			Belgium
224	**Cork**			Irish Free State
225.9	**Fécamp**			France
227.4	Flensburg			Germany
230.6	Malmö			Sweden
231.7	Kiel			Germany
235	Lodz			Poland
235.5	Kristianssand			Norway
236	**Bordeaux-Sud-Ouest**			France
238	Nimes			France
239	**Nurnberg**			Germany
240.6	Stavanger			Norway
242.3	**Belfast**			Ireland
244.1	Basle			Switzerland
245.9	**Linz**			Austria
	Schaerbeek			Belgium
	Dornbin			Austria
	Berne			Switzerland
247.7	**Trieste**			Italy
249.4	**Juan-les-Pins**			France
250.9	Barcelona EAJ15			Spain
253.1	**Gleiwitz**			Germany
255.1	Toulouse PTT			France
257.3	**Hörby**			Sweden
259.3	**Frankfurt**			Germany
261.6	**London National**			Great Britain
	West National			Great Britain
263.8	**Moravska Ostrava**			Czechoslovakia
265.7	**Lille**			France
267.6	Valencia			Spain
269.8	**Bari**			Italy
271.5	**Rennes**			France
273.7	**Turin**			Italy
276.5	**Heilsberg**			Germany
279.7	**Bratislava**			Czechoslovakia
281	**Copenhagen**			Denmark
282.2	Lisbon			Portugal
283.6	Berlin			Germany
	Innsbruck			Austria
	Magdeburg			Germany
	Stettin			Germany
284.6	Radio Lyons			France
286	Montpellier			France
288.5	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
307.1	Zagreb			Yugoslavia
	Vitus-Paris			France
309.9	West Regional			Great Britain
312.5	Genoa			Italy
312.8	Cracow			Poland
315	Marseilles			France
318.8	Naples			Italy
	Soña			Bulgaria
	Dresden			Germany
319.5	Naples			Italy
321.9	**Goteborg**			Sweden
325	**Breslau**			Germany
328.2	**Poste Parisien**			France
332.2	**Milan**			Italy
334.4	Poznan			Poland
338.2	**Brussels (No. 2)**			Belgium
341.3	**Brno**			Czechoslovakia
345.2	**Strasbourg**			France
349.6	Barcelona EAJ1			Spain
352.1	Graz			Austria
355.9	**London Regional**			Great Britain
360.6	Stuttgart (temp.)			Germany
363.2	Algiers			North Africa
364.1	Bergen			Norway
366.7	Frederikstaad			Norway
368.1	Bolzano			Italy
	Helsinki			Finland
	Kharkov			U.S.S.R.
	Seville			Spain
369.5	Radio LL			France
372.2	**Hamburg**			Germany
376.4	**Scottish Regional**			Great Britain

Wavelength	Name of Station	Dial Readings		Country
380.7	Lvov			Poland
385.1	Radio Toulouse			France
389.6	**Leipzig**			Germany
394.7	**Bucharest**			Roumania
596	Vladikavkaz			U.S.S.R.
398.9	**Midland Regional**			Great Britain
403	**Sottens**			Switzerland
408.7	**Katowice**			Poland
413	**Athlone**			Irish Free State
416	Radio Maroc			North Africa
419.9	Berlin			Germany
424.3	Madrid (Espana)			Spain
	Moscow-Stalin			U.S.S.R.
428.6	Belgrade			Yugoslavia
435.4	Makhatch-Kala			U.S.S.R.
436	Stockholm			Sweden
441.2	**Rome**			Italy
447.1	**Paris PTT**			France
	Danzig			Danzig
451.8	Agen			France
452	Madona			Latvia
452.8	Milan Vigentino			Italy
453.2	Klagenfurt			Austria
	Odessa			U.S.S.R.
	Porsgrund			Norway
456.6	San Sebastian			Spain
459.4	**Beromuenster**			Switzerland
465.8	**Lyons PTT**			France
472.4	**Langenberg**			Germany
480	**North Regional**			Great Britain
488.6	**Prague**			Czechoslovakia
495.9	Trondheim			Norway
501.7	**Florence**			Italy
	Astrakhan			U.S.S.R.
509.3	**Brussels No. 1**			Belgium
518.1	**Vienna**			Austria
527	Riga			Latvia
532.9	**Munich**			Germany
539.8	Palermo			Italy
542	**Sundsvall**			Sweden
550	**Budapest**			Hungary
550.7	Tampere			Finland
	Kaiserslautern			Germany
	Augsberg			Germany
563	Wilno			Poland
565.2	Freiburg			Germany
570.3	Grenoble			France
577.5	Ljubljana			Yugoslavia
582	Tartu			Estonia
690	Oulu			Finland
720	Moscow PTT			U.S.S.R.
747	Ostersund			Sweden
760	**Geneva**			Switzerland
779.2	Petrozavodsk RV2			U.S.S.R.
833	**Heston Airport**			Great Britain
844.8	Budapest (2)			Hungary
848	Rostov			U.S.S.R.
857.1	Leningrad			U.S.S.R.
882	Saratov			U.S.S.R.
900	Moscow			U.S.S.R.
937.5	Kharkov			U.S.S.R.
1,000	**Moscow**			U.S.S.R.
1,034	Kiev			U.S.S.R.
1,060	**Scheveningen-Haven**			Holland
1,071	Tiflis			U.S.S.R.
1,083	**Oslo**			Norway
1,105	Minsk			U.S.S.R.
1,137	Monte Ceneri			Italy
1,153.8	**Kalundborg**			Denmark
1,190	**Luxembourg**			Luxembourg
1,200	Reykjavik			Iceland
	Istanbul			Turkey
1,229	Boden			Sweden
1,255	Vienna			Austria
1,304	**Moscow**			U.S.S.R.
1,355	**Motala**			Sweden
1,380	Novosibirsk			U.S.S.R.
1,411.8	**Warsaw**			Poland
1,445.8	**Paris (Eiffel Tower)**			France
1,481	Moscow (RV1)			U.S.S.R.
1,538	Ankara			Turkey
1,554.4	**Daventry National**			Great Britain
1,635	**Deutchlandsender**			Germany
1,725	**Radio Paris**			France
1,796	**Lahti**			Finland
1,875	**Kootwijk**			Holland
	Moscow			U.S.S.R.
1,910	Svendlovst			U.S.S.R.
1,935	**Kaunas**			Lithuania
2,625	Königswusterhausen			Germany
2,650	**Eiffel Tower**			France

This complete list of broadcasting stations covers the ultra-short, short, medium and long waves. Names shown in heavy type are not necessarily an indication of high power, but show that these particular stations are well heard in this country, and can be depended upon for reliable reception. On and after January 15, 1934, the medium- and long-wave stations will change wavelengths according to the Lucerne Plan.

BETTER

RANGE & SELECTIVITY

Marconi VS 24

Variable-Mu battery S.G.

Marconi VS24 is a new high-efficiency 2-volt Variable-Mu valve giving high and stable amplification with strict economy in H.T. and L.T. current consumption. VS24 is constructed on extremely robust lines and is thus remarkably free from microphonics, while its short grid-base simplifies both Automatic and Manual methods of volume control.

15/6

WITH THESE BETTER H.F. VALVES

Marconi VP 21

The battery H.F. Pentode

Marconi VP21 is a Marconi innovation of first importance—the very first Variable-Mu H.F. battery Pentode. VP21 is particularly suited to the new iron-cored coils which make the most of its exceptional characteristics, with the added advantage of smooth and distortionless volume control . . .

15/6

G. Marconi

Valve Dept.,
The Marconiphone Co. Ltd.
210 Tottenham Court Road,
London, W.1.

Please send me full details of 'better' Marconi valves for every stage.

Name.....

Address.....

.....

W.M. JAN, 1934.

MARCONI VALVES *The choice of the experts.*

In Tune with the Trade

FETTER LANE'S Review of the Latest Catalogues

SEND TO US FOR THESE CATALOGUES!

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

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

My name and address is :—

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

EQUILODE EXTENSION

THE extension loud-speaker idea seems to have caught on. W.B.s have just brought out an extension model which certainly appears to be the goods.

This new job is intended solely as an extension, and it is claimed by the makers to be the first and only moving-coil instrument which will work perfectly from the " extra speaker " terminals of any set, no matter what the make or type. It is well known that the lack of standard practice among set manufacturers has caused some confusion in the minds of both public and trade where the fitting of an extra speaker is concerned, and it is this inconvenience which the W.B. Equilode has been designed to remove.

There is a single switch to adjust the impedance and suitable adjustment of this arm also provides a volume control effect independent of the volume control in the set itself.

If you want to know more about the Equilode, drop a note through my free catalogue service. **363**

◆ ◆ ◆

THIS ETHER WAR

WE are just on the eve of some wavelength changes according to the Lucerne Plan. This will mean that some of the stations which you have previously logged at certain positions on the dial will come in elsewhere.

E. K. Cole, Ltd., have issued a statement of interest to owners of sets having the tuning scale marked in station names. " The changes to British wavelengths are mostly trifling," continues this Ekco statement, " and possibly many listeners may not feel the need for a new tuning scale. Those who do, however, will be supplied at a very nominal charge with an up-to-date scale which can be fitted with ease."

It is also pointed out that Ekco sets are calibrated in metres as well as by station names, so that, at the worst, the listener will still be able to identify stations by this means.

And while considering this scale question, I humbly suggest that you apply to my free catalogue service for a copy of the latest Ekco set folder! **364**

◆ ◆ ◆

FURTHER TUNGSRAM VALVES

A SPECIALISED range of high-efficiency A.C. mains type valves has been designed by Tungsram with the particular purpose of what might be called " re-vitalising " the performance of old mains sets. These are known as Tungsram Symphonic valves.

The idea behind the design is, in simple terms, to associate volume and quality in their correct proportions, permitting side-by-side teamwork instead of a compromise. A remarkable degree of extra volume is thus achieved with a corresponding brilliance of tone.

The range comprises symphonic straight or variable-mu screen-grid, symphonic straight or variable mu high-frequency pentodes, symphonic indirectly-heated multi-grid output valves and symphonic detectors.

For battery users there is a new high-efficiency valve, type SV.220—a variable-mu high-slope screen-grid valve of exceptionally high sensitivity. It gives a remarkable high-frequency amplification. The S.220 corresponds to the above, but is a straight slope type.

For moderate power output with extraordinarily low consumption there is the PP220—a multi-grid valve. There is also a fine class-B valve in Tungsram's new chatter-proof dome-shaped structure. **365**

◆ ◆ ◆

HY-WATT

HAVE you heard about Hy-watt? This is a new type of resistance just brought out by Watmel, and is absolutely moisture proof and noiseless due to the welding of lead wire.

These resistances are wire-wound and are suitable for high voltages, as each turn is insulated. I have just been glancing through a couple of characteristic curves given in the latest Hy-watt folder. One of them shows a test carried on a resistance rated at 3 watts. Overloading was carried out up to 20 watts and the resistance still remained perfect.

Hy-watt resistances are already extensively used by leading set makers and are now available to home set builders. They are made in all values from 1 to 50,000 ohms and if you get the latest Hy-watt folder you will be able to gather all the necessary technical details. **366**

◆ ◆ ◆

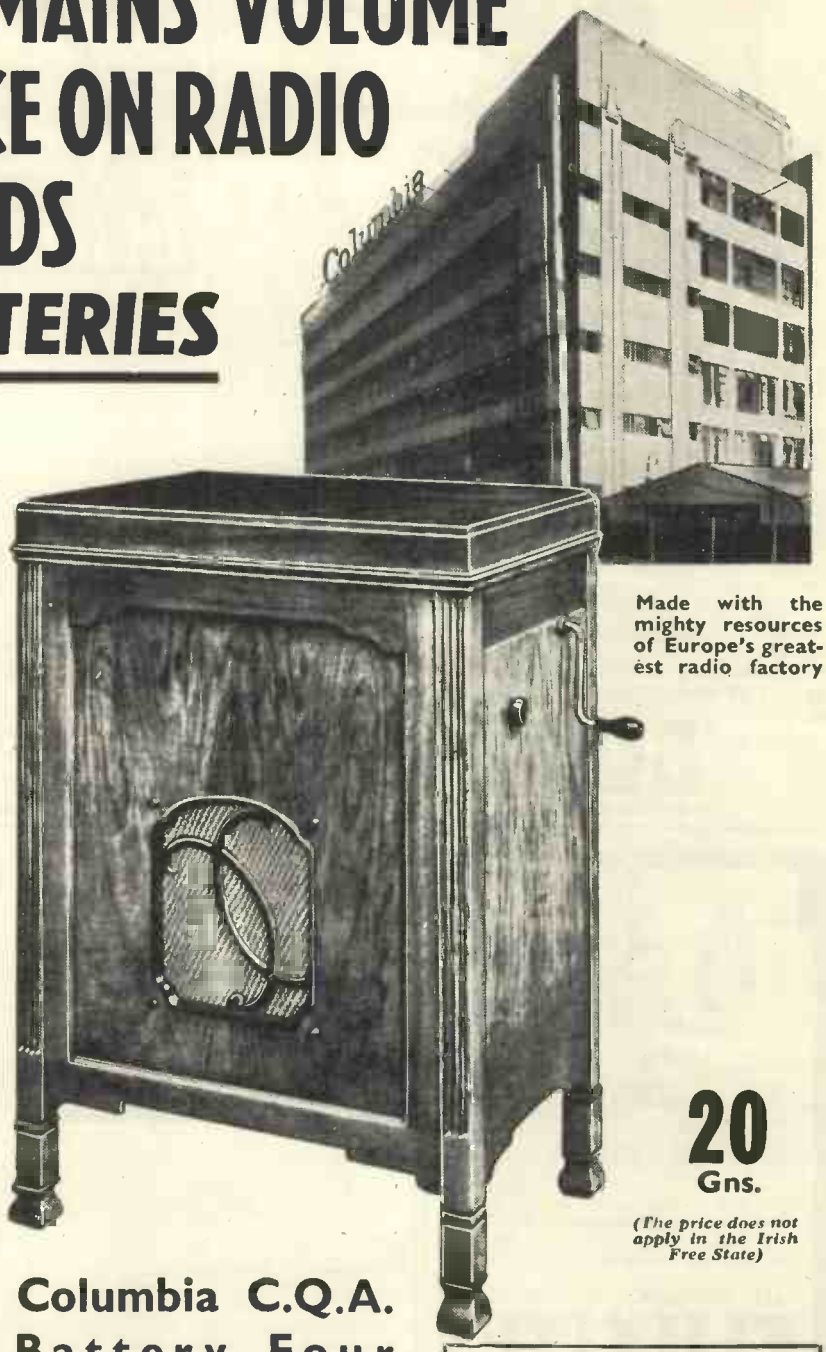
THESE K.B. SETS

THIS is not to introduce Kolster Brandes sets to you. It is to bring to your attention the latest " K.B.—The New Radio " production, a 16-page catalogue covering all the latest Kolster Brandes sets, short-wave converter, Rejectostat units, gramophone pick-up, etc.

In presenting these new Kolster Brandes receivers, it is claimed that nothing less than a conquest of man-made electrical interference has been achieved. The Rejectostatic system guards a Kolster Brandes receiver at every port of entrance—the aerial-earth system, the actual receiver circuits, and the electric supply mains.

Details of the new K.B. receivers, including the automatic volume control and automatic tone compensation, which feature in their specification, are given in this catalogue, which I recommend. **367**

ENJOY ALL-MAINS VOLUME & BRILLIANCE ON RADIO AND RECORDS *FROM BATTERIES*



Made with the mighty resources of Europe's greatest radio factory

WITH the Columbia C.Q.A. Battery Radiograph you can have reproduction as clear, tone as full, as from any all-electric radiogram of the same size. And you will have several features on your instrument which you would find in few all-electric radiograms . . . These are the revolutionary results of Columbia's discovery, "Constant Quality Amplification." Because it has C.Q.A. you can damp down volume without damaging tone; you can increase volume without coarsening tone. And you use only enough H.T. current to produce each actual note you hear. Constant fullness of tone; constant current economy; choice between radio and records . . . a year ago only an expensive all-electric radiogram would give you what you can now enjoy *from batteries for 20 gns.*

20 Gns.

(The price does not apply in the Irish Free State)

Columbia C.Q.A. Battery Four Radiograph

Columbia

RADIO AND RADIO-GRAPHOPHONES

To the Columbia Graphophone Co., Ltd., 98 Clerkenwell Road, E.C.1.

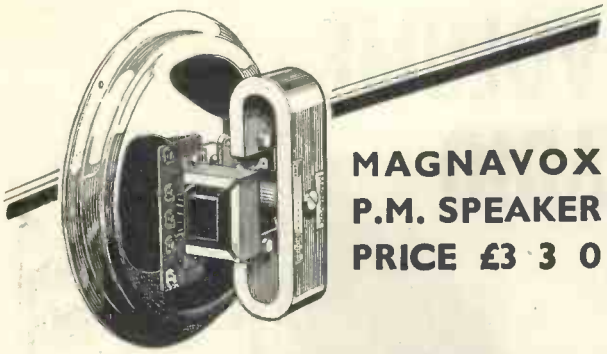
Please send me particulars of the C.Q.A. Battery Radiograph, Model 1003, without obligation.

NAME.....

ADDRESS.....

.....

W.M. 1/34



MAGNAVOX P.M. SPEAKER PRICE £3 3 0

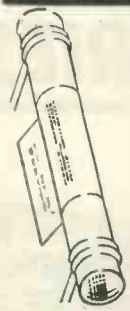
A loud-speaker is necessarily an expensive item in every set, so when you decide on one be quite certain it is the best — a Magnavox, in fact. These Permanent Magnet Speakers of ours represent the cumulative effect of knowledge gained over twenty-one years' indisputable leadership. There are two models: "Standard," price 37/6; and the "Senior," a super model with a 9-in. cone and a most cunningly designed magnet of cobalt and chromium alloy, price £3 3s. Both models have Universal Transformers, to suit Class "B," etc.

EXCLUSIVELY SPECIFIED FOR "THE MERRYMAKER" and "THE RADIOPHONE MATCHED PERFECTION SEVEN"

BENJAMIN

The Benjamin Electric Ltd., Tariff Road, Tottenham

I'M SHERLOCK OHMS



I've stopped Resistor trouble. That is, Eries (which I stand for) have stopped it. Eries have superseded all old-type resistances. They are made to stop trouble. They will never break down. Why? My dear Watt-son, they are *specially impregnated* so as to withstand overload or humidity. They cannot fail. Ask your dealer. Look for the Kits of Eries on his counter; just the Resistors you want—easily selected.

All values—Colour Coded and Labelled.

ERIE *IMPREGNATED* **RESISTORS**

1/- *PER WATT In all values*

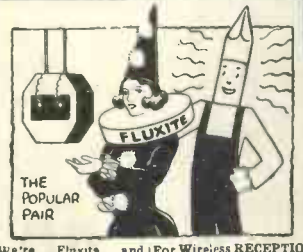
ERIE RESISTORS are specified for the

BRITISH RADIOPHONE "MATCHED PERFECTION 7"

Write for new Colour Code Chart, FREE!

THE RADIO RESISTOR CO.

1, Golden Square, Piccadilly Circus, London, W.1



"We're Fluxite and Solder—the reliable pair; Famous for Soldering—known everywhere!

For Wireless RECEPTION we've done our share! So now we're announced—as "THE POPULAR PAIR"!"

See that Fluxite and Solder are always by you—in the house—garage—workshop—anywhere where simple, speedy soldering is needed.

ALL MECHANICS *WILL* HAVE

FLUXITE

IT SIMPLIFIES *ALL* SOLDERING

All Ironmongers sell Fluxite in tins: 4d., 8d., 1s. 4d., and 2s. 8d. Ask to see the **FLUXITE POCKET SOLDERING SET**—complete with full instructions—7s. 6d. Ask also for our leaflet on **HARDENING STEEL** with Fluxite.

Fluxite Ltd., (Dept. 332), Rotherhithe, S.E.16

FOR *ALL* REPAIRS!

1934 RADIO HANDBOOK "MAINS POWER"

Here is a very useful Handbook for the person who requires information on how to run his radio from the mains. Twelve circuit diagrams for Mains Units, two for Battery Chargers and one for energising low voltage M.C. Speakers. Heayberd Mains Units, Assembled Kits, Class 'B' Units, Transformers, Chokes and Condensers, etc., are detailed in this handbook with many technical hints and tips. Get this book now and see for yourself that HEAYBERD Mains Products are the best obtainable.

POST COUPON NOW

Enclose 3d. in stamps for 36 p. booklet packed with hints, tips, circuit diagrams and other useful information.

Mr.....

Address .....W.M.

F.C. HEAYBERD, 10, Finsbury St., London, E.C.2.

HEAYBERD

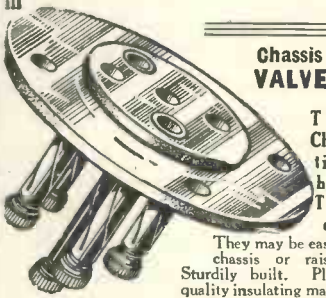
MONARCH OF THE MAINS.

CLIX *specified for the*

"MERRYMAKER SUPER"

AND THE

"A.C. TRANSPORTABLE"



Chassis Mounting VALVEHOLDERS

The ONLY Chassis Mounting Valveholders with TERMINAL connections.

They may be easily mounted on chassis or raised baseboard. Sturdily built. Plate of highest quality insulating material.

Resilient sockets guarantee full-surface contact with ANY type of valve pin and definitely prevent arcing. For easy entry and withdrawal the sockets move laterally and align with valve pins.

(Standard Type)
4-Pin ... **8d.**
5-Pin ... **9d.**

(Floating Type)
7-Pin ... **1/-**

CLIX "MASTER" PLUG

Positive METAL to METAL wiring. Firm grip and full contact with ALL sockets with internal diameters from ⅛in. to 5/32in. battery socket. Curved ends for easy insertion. Price **1½d.**

Write for New Clix Folder "W.M."

CLIX

CHEAPEST *PERFECT* CONTACT

LECTRO LINX Ltd., 79a, Rochester Row, London, S.W.1

DE-BUNKING RADIO

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

WIRELESS in these days is so cluttered up with superstitions, fallacies, misconceptions and what-not, that it is high time someone stepped in and took a hand at de-bunking it. The verb to "debunk," in case you do not know it, dear reader, hails from the other side of the Atlantic, and means "to remove the bunk or nonsense" from anything. And so, at the risk of offending a few people, let us start upon our self-appointed task.

In this welter of misconception we must begin somewhere, so let us pick a radio accessory at random. What is the first thing that catches my eye? A loud-speaker! Goodness knows, the loud-speaker of all devices wants de-bunking!

How many times have you heard that wretched word "mellow" used in conjunction with a loud-speaker? What on earth has mellowness to do with a device, which, if it is to serve its purpose rightly, must transmit to the listener in the form of sound waves, everything put into it as faithfully as it can? If "mellow" is to mean anything at all, we might as well define it. Here is what my dictionary says: "Mellow—soft and ripe; well matured; soft to the touch, palate, ear, etc.; genial; half-tipsy."

I have certainly heard several loud-speakers which sounded far too ripe and almost completely tipsy, but that, I am sure, was not what the advertisers had in mind when they described their instruments as mellow. To use the word "mellow" in connection with a loud-speaker is to suggest that the reproducer itself imparts some kind of colouration, modification, or tone to what is emitted by it. This is entirely the wrong function of a loud-speaker, which, as indicated above, should be to impart not the slightest individual colouration to its output.

The same false idea is conveyed in the description of a loud-speaker as a "musical instrument." It is nothing of the kind! While loud-speakers frequently, and probably in the majority of cases do, transmit music, they are often required to reproduce speech as well as raucous and unpleasant noises, such as those we hear during certain dramatic presentations. A loud-speaker is no more a musical instrument than is an open door through which we hear a piano playing!

And, speaking of music, have you noticed how much nonsense is talked in advertising about valves? "Ensure crystal-clear reception with —— valves." "——'s valves for purity of tone!" "His set sounded entirely different as soon as he used —— valves"—and so on, as if the make, and not the type, of valve affects the quality of reproduced music and speech.

Now I am not foolish enough to suggest that all makes of valves are as good as one another—they naturally vary. It is occasionally true that when you buy a new valve and substitute it for an old one the quality improves considerably, but this is generally due to the fact that either the old valve had lost its emission and thereby could not handle the signal without distortion, or else was of an unsuitable type. Provided you have the right type of valve and one of suitable impedance for the circuit, the only difference between various makes—in most parts of a circuit, anyway—will be in strength. Some valves will be more efficient than others, or perhaps may have longer life.

In many cases a purchaser has given special credit to the make of a valve when he has changed from one manufacturer's product to another's, not realising that a new valve of the previous make would have given just as good results. I do not think, however, it is fair for manufacturers to capitalise this muddle-headedness

"This is just a plain ordinary lie"

and perpetuate the fallacies in the way they sometimes do.

A surprising number of people still think that by putting a power valve into their set they will make signals more powerful, whereas just the opposite is frequently the case. A valve which will handle a considerable amount of power without distortion generally has a lower magnification factor than one which will not. This is why sometimes when changing from a low-frequency valve to a power valve the user is disappointed to get weaker signals. A power valve is merely one which will handle a considerable amount of power put into it without distorting the output and one has to pay the price for this in a greatly increased high-tension consumption.

"So-and-so's valves ensure distortionless reception!" I saw this statement in an advertisement not so long ago. This is just a plain ordinary lie. Distortion in a set arises from half a dozen different reasons, if not more, and only one of them may be connected with the valve. A great deal of distortion comes from low-frequency instability, high-frequency instability, interaction between components, and insufficient high-tension.

Very often, too, the substitution of a valve, which is actually better as a valve, will increase distortion; its additional magnifying power adding still further to the feed-back effect. I can name a dozen different causes of distortion, not one of which could be remedied by any changes in the valve; so any firm that says that its valves will ensure distortionless reception is just talking through its hat.

Long ago in the history of broadcasting, someone discovered that in some broadcast receivers the aerial coupling was too tight and selectivity would be improved by loosening it. Similarly a set, which on the average aerial is fairly loosely coupled and therefore reasonably selective, will be too tightly coupled with some kinds of aerial and the tuning will thereby be flattened.

One of the simplest ways of loosening the effective coupling of an aerial without altering the inside of a set is to put a series condenser in the aerial. If we make this condenser a variable one it is quite easy to adjust it, so as to give the best effect with any particular set, so improving its selectivity. It doesn't matter much how you make the small series condenser in the aerial, provided its losses are low. It can be of the ordinary compression type or a small variable condenser mounted on a little bracket with a rotating knob, or it can be a little tube with a terminal on each end, one part of the tube sliding into the other and so varying the capacity.

The flights of fancy often indulged in with loudspeakers are nothing to those sometimes associated with little series condensers for putting in your aerial. I gathered from one such advertisement, which I read recently, that no matter what set I had at the present time, or however flat its tuning, it would become equal unto a super-heterodyne if I invested in one of these little devices.

I thought I knew quite a little about condensers and the effect of placing them in series with an aerial and a wireless set—in fact, I have been doing this with them on and off for about twenty years—but I must say that

"The idea of giving the listener a nice comfortable feeling of safety"

the advertisement taught me a great deal I did not know before!

And then there is the whole question of lightning protection or, rather, the absence of it. We all know that a wireless aerial can act as a lightning conductor, and it is, of course, not advisable to pass a lightning discharge straight through one's wireless set. All kinds of devices are sold with the idea of giving the wireless listener a nice comfortable feeling of safety. In the main, they are either devices which switch the aerial straight to earth, disconnecting the set—these are the best kind—or else forms of lead-in containing a small spark gap adjacent to the lead-in wire, the idea being that if lightning strikes the aerial, instead of going through the set it will jump to earth across this little spark gap, which incidentally is joined to the earth wire.

Others have a kind of gaseous discharge path, acting practically as an infinite resistance in normal circumstances, but which will break down and become conducting with a high-potential charge. Some so-called lightning protecting devices join the aerial lead-in to earth without disconnecting the set.

I have just been looking at a trade paper and I find among the advertisements the following statement: "You must sell a —— lightning arrester to give your customers absolute safety." There is no such thing as absolute safety with any of the lightning devices sold for attachment to broadcast receivers. Lightning either strikes your aerial or it doesn't; there are no half measures. If lightning does strike your aerial, it may or may not jump this gap, it may or may not go through the set, but ten chances to one it will go through the gap to earth and *also* through the set! Lightning may even jump off the aerial wire and take a short cut to earth through a drainpipe.

If you have ever seen the effect of a strong lightning discharge through a comparatively thin conductor like a wireless aerial, you will have no illusions about the strength of it. Lightning never seems to worry about a silly little gap of an eighth of an inch or even an inch. I have heard of a wireless set being ruined by induction from a lightning discharge when there has been no aerial wire within a couple of feet of it. The value of the ordinary earthing switches and protecting devices is mainly in shunting to earth comparatively small electrical discharges during storms and to prevent the accumulation on the aerial of heavy static charges.

Cases of lightning striking wireless aerials are so few as to be practically negligible, but if lightning *does* strike your aerial, I do not think there is a single device available which will ensure you "absolute safety." If you have any doubts on this, ask any expert on atmospheric discharges.

Another prevalent fallacy is that the performance of a receiver is the same wherever it is used, given similar sizes of aerial. There is no bigger fallacy than this. Erect two identical aerials in different parts of the same town, give them both excellent earth connections, and the same set may give entirely different results on the two aerials. I know a place not far from London where reception at the bottom of the hill is about six times as good as at the top; and I know places where reception conditions are so good that almost any set performs brilliantly.

When I moved into my present house, the situation of which is such that one would imagine that excellent reception would always be obtained, I took all kinds of pains to put up a good aerial. Not long after this, I took one of my own sets to a friend's house not a mile and a half away and on an aerial only half the height of mine and no longer the results were very much better than at home.

"I took all kinds of pains to put up a good aerial"

And then there is the whole question of distant reception. It sometimes happens that you get six or seven days right off in the winter time when conditions are so wonderful that you feel that with the set you have you can "guarantee" to get any of the leading Continental stations at "full loud-speaker strength" any evening you like. And then, without warning, there may come three or four days when the whole set goes dead and the stations which you thought were "certs" pass right out of hearing.

You test your battery, change your valves, overhaul everything, and still nothing happens. Of course, this deadness invariably occurs when you have invited a friend in for the purpose of showing him what a good set you have.

And then one night somebody suggests you try so-and-so's valves. You take them home, put them in, switch the set on and immediately the old sensitivity returns and you get more stations than ever before at excellent quality! "There you are!" you say to your wife, "it was all a question of the valves! See, these new valves have given new life to the set. I will put the old ones back and you see how poor it is with them!"

And so you put the old valves back, and what happens? The set works just as well as with the new ones! Nothing

at all has been wrong with the set all the time—it is merely that atmospheric conditions, always erratic, have been playing " old harry " with reception.

Every experienced listener knows of these changes, but to the newcomer to the art they may cause all kinds of worry and bother. Many wonderful advertising campaigns for receivers have been built up on nothing more than one or two nights' tests in exceptionally good conditions. It may have occurred to you that if distant stations using only a few kilowatts can always be heard at any time the B.B.C. would not put up powerful 50-kilowatt stations while claiming such small service areas for them.

In making out test reports for my own receivers, I always spread the test over a considerable time and deliberately make them on an inefficient indoor aerial so as to give a report likely to reflect average conditions. Long experience has told me that this method is the best, for very frequently readers write in to say how much better results they get than I gave in my test report and quite a few write to say their results are not so good. But as the majority get at least as good results as I do, I am convinced that my method is a fair one.

This leads me to the subject of selectivity, as claimed by sundry advertisers for their sets. Of course, nowadays every set is " razor-sharp," has " knife-edge " tuning, gives " clean-cut " reception and so forth. As every season arrives, one gathers that the last limits of selectivity have now been reached and certainly all the adjectives have been used up. But what is selectivity anyway ? You will find it very hard to define!

Let us imagine that a manufacturer says his set has 9-kilocycle selectivity. This sounds like something definite, but really it is as vague as the rest of the statements. Almost any moderately good set will clearly differentiate between two stations 9 kilocycles apart provided the wanted station is stronger than the unwanted, or even if the stations are of equal strength.

Run over the tuning dial of any average modern three-valve set consisting of a high-frequency stage, detector and low-frequency valve, and so long as you are not among the powerful locals, you can pick one out from the other quite well. Where we really need selectivity and where the bother comes in, is when we want to receive a weak station adjacent to a powerful one, which may be—and generally is—the local station. What does 9-kilocycle selectivity mean, then ?

In America, where there are a large number of powerful stations fairly close together, it is the custom of manufacturers to issue selectivity curves from which something definite can be learned; that is, if the curves are accurate ones, and very frequently they are not! You see, the mere statement of so many kilocycles selectivity may mean something or nothing, according to conditions.

Quite a number of sets are now fitted with what are politely called " tone controls," the advertisements being so worded as to suggest that by turning a knob you can adjust the balance of bass and treble to suit your taste or to suit the particular music. In a few—very few—cases, the tone control knob *does* actually change the proportion of bass and treble giving in one adjustment a high preponderance of bass with little treble, and at another a predominance of treble with little bass.

A great majority of the so-called tone controls, however, are simply devices for removing progressively what upper frequency reproduction there is. And with the tone control set at a maximum position with all the top possible the set is often still deficient in vital high frequencies.

Of course, any talk about adjusting the balance of bass and treble to suit the particular music is so much nonsense as all modern transmitting stations—at least, those in this country—send out the music correctly to start with and if the receiver is really giving the faithful reproduction, which is so often claimed for it, we can only spoil this by altering the tone control. Some people, however, don't like any " top " in their reproduction, so it is as well they should be given some device for cutting it off.

In addition to any possibility of changing the tone, there is the difficulty that most tone-control devices have some effect on the volume. This is often more apparent than real, for when the frequency range is reduced the apparent effect on the ear is that the volume is reduced. Sometimes this is an advantage, but generally it is not.

I have come to the end of my space, and the debunking is not even half done ! I think, however, you will agree that a little cleaning-up of radio claims would do a lot of good. Anyway the actual "tone" of a receiver is always open to discussion. When all is said and done it is really a matter of personal taste.

"Where we really need selectivity and where the bother comes in"

The 1934 A.C. QUADRADYNE

Following last month's presentation of a modern version of the Quadradyne, a set with two screen-grid high-frequency stages described in February, 1932, the "Wireless Magazine" Technical Staff have produced, in response to many requests from readers, a new A.C. version incorporating up to the minute ideas, including a form of automatic volume control

THERE is a lot of talk about straight sets being as selective as a super-het for a given number of valves. This new A.C. receiver has four valves; is it, many will ask, as selective as a four-valve super-het? In our opinion, after exhaustive tests, we believe that this Quadradyne *will* compare very favourably with many four-valve super-hets as far as selectivity is concerned.

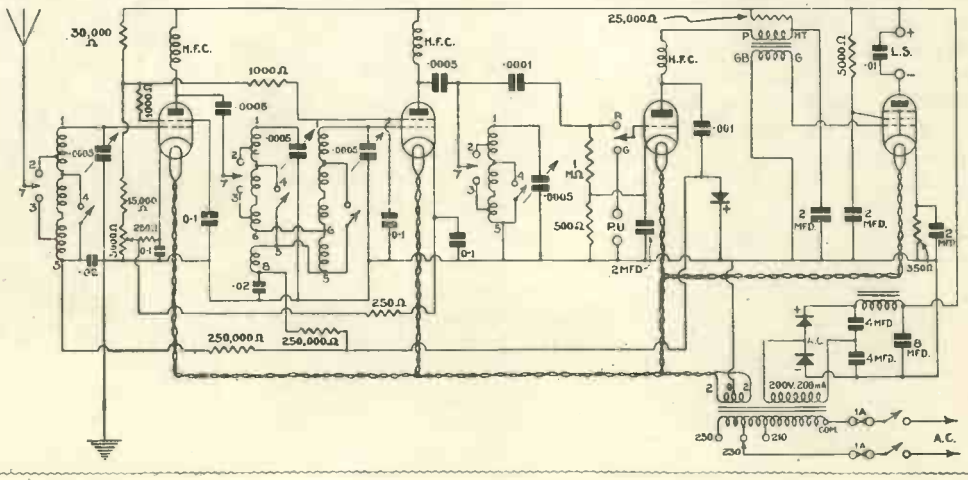
Another interesting point of comparison is the question of quality. There are people who think that no super-het can give as good quality as can be obtained from a straight circuit. We do not hold that view, but there is no question that the quality of reproduction to be obtained from the 1934 A.C. Quadradyne is of a very high order and will satisfy the most fastidious listeners.

The selectivity of the set (as was the case with the previous Quadradyne described in these pages nearly two years ago) is obtained by the use of four tuned circuits; this does not mean a great deal of complication in tuning, for a four-gang condenser is used to give complete one-knob control.

There are several points of interest about the actual coil assembly employed. It is of a new type and is built up with real midget iron-core coils. These are of the same efficiency of other iron-core coils of much larger size, but, of course, they save a great deal of space in the layout of the receiver.

These coils are provided with soldering tags instead of terminals. This may sound as if it will lead to complications in wiring, but this does not happen in practice, for the tags are very easily accessible from the underside of the chassis and there is no necessity to drill a lot of holes in the chassis to take wires from the top to the underneath.

This much will be clear from the photographs reproduced in these pages. Actually there are very



CIRCUIT ARRANGEMENT

Here is the circuit of the 1934 A.C. Quadradyne. The valve combination consists of two variable-mu screen-grid amplifiers, detector and pentode output. A metal rectifier is used for mains rectification

ON WITH THE JOB
Here is one of the members of the constructional staff at work on the original set. Note the metal rectifier on the side

few connections to be made in any case.

But before going further into practical matters it will be as well to consider some points of interest in the circuit. The valve combination is two screen-grid high frequency stages, a triode detector and a large pentode output valve.

It will be noted that the input connection to each coil is tapped down. This increases the selectivity and at the same time reduces the damping imposed on the various circuits. Thus the maximum efficiency is obtained from the combination. The aerial tuner is a single coil, but the coupling between the first and second screen-grid stages takes the form of a band-pass circuit—this again reduces the loading on the aerial circuit and improves the efficiency of the set.

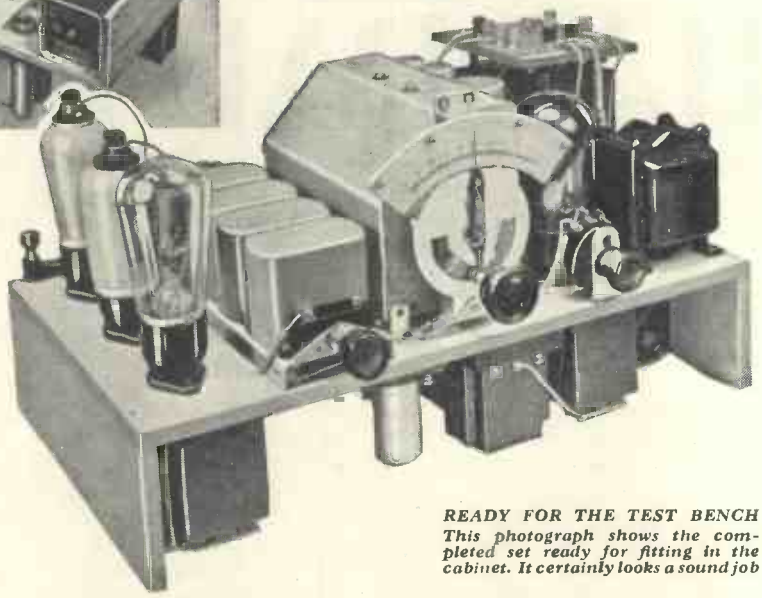
It will be noted that the grid of the detector valve is also tapped down on the fourth coil. This increases the effective resistance of the load thrown back by the detector valve into the tuning circuit—a point of some importance. If this were not done there would be an effective resistance of only about 40,000 to 50,000 ohms across the coil.

A simple form of self-adjusting volume control is incorporated in the set. It takes the form of a small metal rectifier placed in the anode circuit of the detector valve; voltage is fed back from this stage to the grids of the two screen-grid valves and so the bias is automatically varied in accordance with the strength of the signals being received.

As a signal increases in strength so the bias increases—this means that more grid bias is applied by a strong signal, and thus the volume is automatically cut down to the right level. Whilst the action of this simple form of self-adjusting volume control is not absolutely complete, it does go a long way towards preventing bad fading during the reception of distant stations.

As this is a mains set, all the high-tension points are led to one common lead, which is, in turn, connected to the output side of a metal rectifier. In each anode and screening grid circuit a limiting resistance is included to cut the voltage down to the right value (where this is necessary). Care has been taken with the arrangement of the smoothing circuit and it will be found in practice that the receiver is quite free from hum.

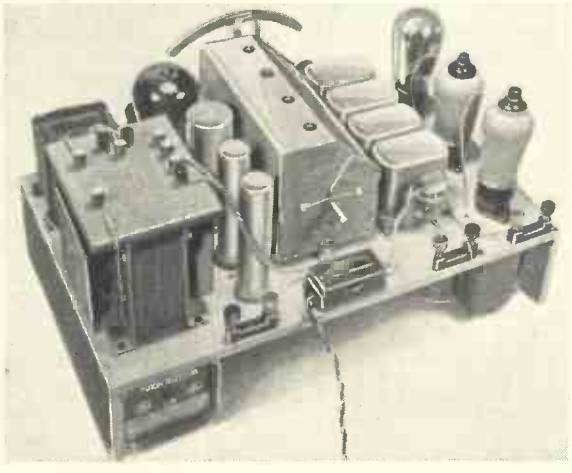
The claims we make for the set are extraordinary good selectivity and good quality. As far as volume is concerned, the output pentode gives approximately 2.5 watts. This is enough for almost all ordinary occasions; in fact, it will be too much for most people and they will quickly turn to the volume-control knob.



READY FOR THE TEST BENCH
This photograph shows the completed set ready for fitting in the cabinet. It certainly looks a sound job

Talking of controls, it will be noted that there are only three knobs on the front of this set. On the left is a combination wave-change, on-off and gramo-radio switch; in the centre is the main tuning control; and on the right is the volume control.

From this it should be clear that the left-hand switch has four positions : off, on for medium waves, on for long waves, and on for gramophone reproduction. With such a switch as this, there will be very little likelihood of even an inexperienced listener making a mistake with the controls. It should be remembered, though, that when the set is first switched on there will be a



LOOKING FROM THE BACK
The arrangement of the components on the top side of the baseboard can be seen from this photograph. Note the fuses behind the ganged condenser

slight time lag before anything is heard while the heaters of the valves get warmed up.

The functions of the other two knobs are so self-evident that they need no comment.

An important point to realise is that this set has no reaction control; reaction is not needed with a circuit that has two efficient screen-grid stages. This is a point of great interest to the family man, for the proper control of reaction is still, to many listeners a bugbear. This set is as simple to operate—and is just as incisive in its action—as a good super-het.

It might be thought that there is a little complication in the ganging of the four tuned circuits, but no trouble will arise in practice. Not only are all the coils matched up carefully for inductance before they are assembled into a unit, but each completed unit is actually given a test in a receiver before being dispatched by the manufacturer. This ensures absolutely accurate matching.

All the details essential for the construction of the set are included in these pages. Many readers who intend to build the set, however, will prefer to work from a full-size blueprint. These are available for half price, that is 9d., post paid, if the coupon on the last page of the issue is used by January 31. Ask for No. WM349, and address your application to "Wireless Magazine" Blueprint Dept., 58-61 Fetter Lane, London, E.C.4. A copy will be sent by return of post.

There are one or two points that should be noted about the construction of the set. In the first place it is built up on a metallised-wood chassis; this gives all the advantages of complete metal-chassis construction, but the wood is, of course very much easier to work than metal.

A slot must be cut in the chassis to accommodate the connections from the four-coil unit. It will also be necessary to cut away parts of the wood where the three electrolytic condensers are mounted. The screw threads with which these are provided are not long enough to enable the connections to be firmly made if they are put through the whole thickness of the baseboard. It should also be noted that the centre of the three condensers is insulated from the metal covering on the baseboard by means of a washer.

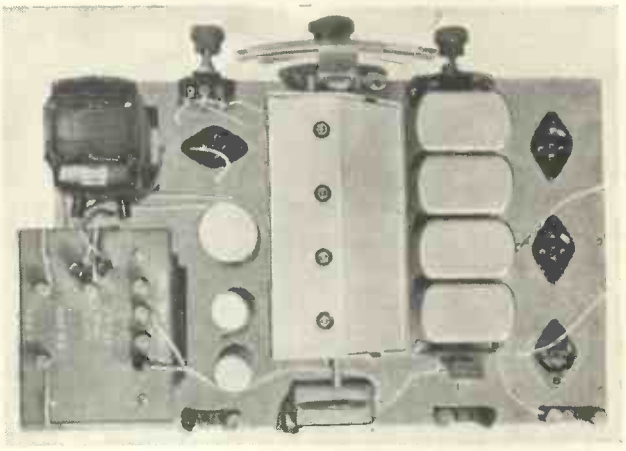
Do not forget before fixing any of the components in position to drill the holes needed to take connections through from the top of the chassis to the underside. The positions of these holes can easily be marked out if the top part of the blueprint is laid squarely over the top of the baseboard. The positions can then be marked through with some sharp-pointed instrument.

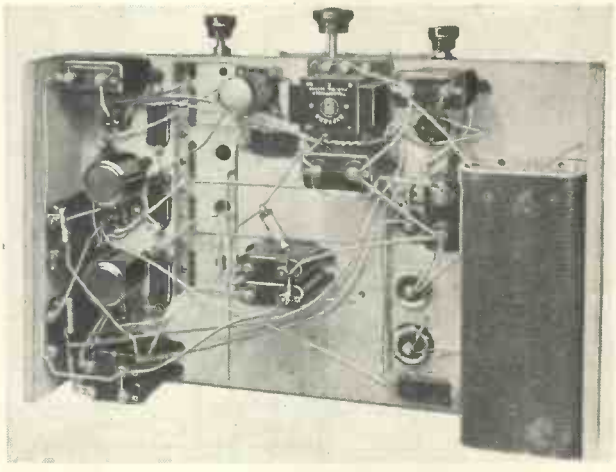
When all the parts have been firmly fixed in position it is time to think about wiring up. Here, again, the blueprint (or the quarter-scale reproduction on page 598) will prove an invaluable aid, for all the connections are numbered separately in the best and most convenient order of assembly.

For instance, start with wire No. 1 and then carry on in the proper numerical order until the wiring has been completed. The holes through which wires pass from the top of the chassis to the underside are marked with small letters, both on the top and on the bottom of the blueprint.

It will be noticed that the resistances are very small and can be held easily by the wiring itself.

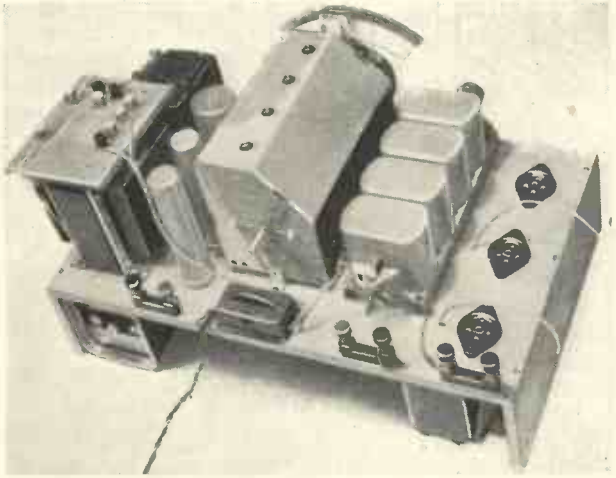
Great care should be taken in drilling the front of the cabinet to





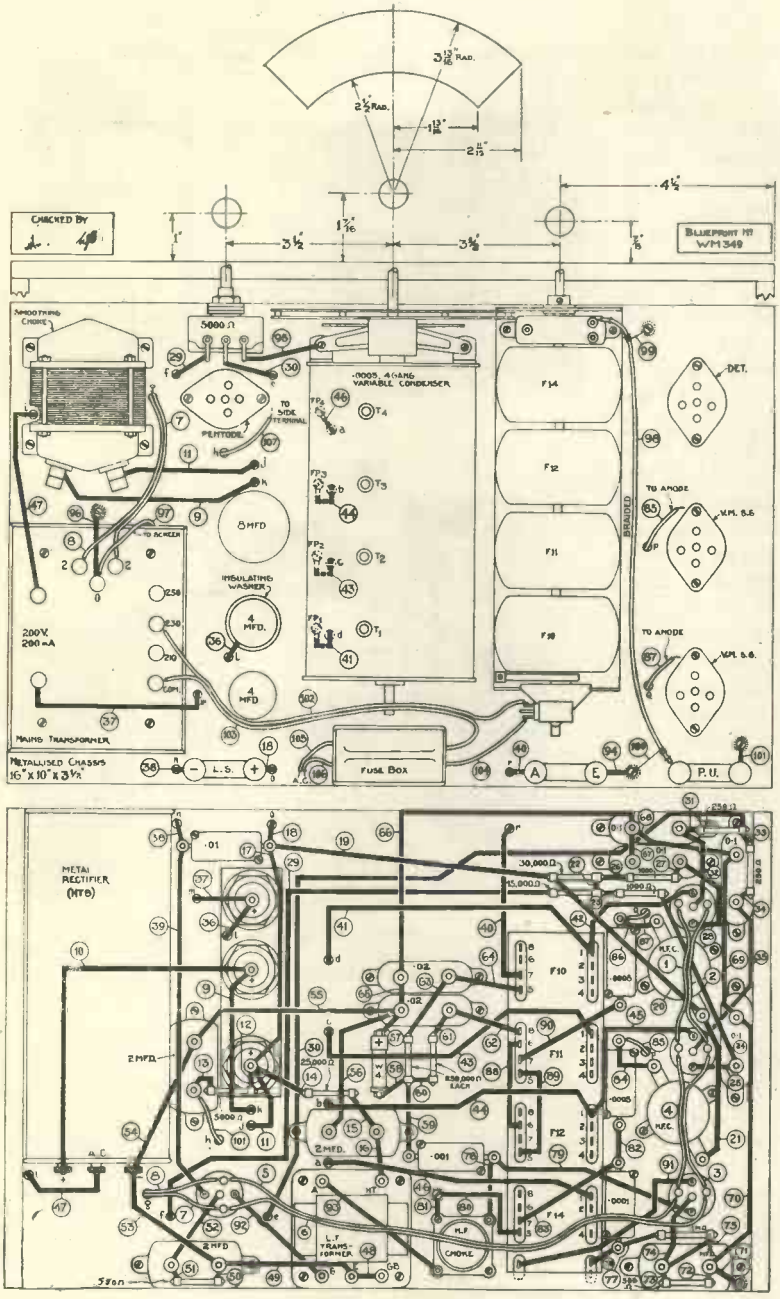
HOW THE SET IS BUILT

These two plan views show how easy the set is to build. Note on the bottom plan how the baseboard is cut away so that the coils and electrolytic condensers can be wired up on the underside



ANOTHER BACK VIEW

Here you can see the three valve holders, for the two screen-grid high-frequency amplifiers and the detector, which are neatly sunk into the Metaplex baseboard



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 January 31. Ask for No. WM349 when ordering

accommodate the control spindles, otherwise a perfectly good piece of furniture may be irreparably damaged. The hole for the condenser escutcheon can be marked out without trouble with the aid of the template supplied by the makers.

This is a set that deserves a good loud-speaker. Every precaution has been taken to get good quality as far as the set itself is concerned and the good qualities of the circuit should not be spoilt by using an inferior reproducer.

It is well known that a pentode has a rising frequency characteristic as the volume increases, so to prevent the reproduction from being too high-pitched, a .01-microfarad condenser is placed across the output terminals of the transformer.

There will be no difficulty about sorting out the valves and valve holders, for the latter are clearly marked on the layout guide.

(By the way, in case any readers should be wondering why, for this set, we have not adopted the three-stage wiring method used for the A.C. Transportable described in other pages of this issue, we would point out that there are so few wires going from the top to the underside of the chassis that there is no need for the improved system in the case of this set.)

When the set is first put into operation it will be necessary to adjust the four-gang condenser for the best results. In the first place all four trimmers should be placed at about their half-way positions. A fairly weak station at about 15 to 30 degrees on the dial should then be tuned in on the medium waves and each trimmer carefully adjusted until the best results are obtained. As each trimmer is screwed up and down the main tuning knob should be slowly turned through the tuning point. If this is not done it will be impossible to make certain that all the trimmers are being tuned properly.

But as we have already pointed out, the factory tests for matching with the coil unit used for this set are so complete that there is not likely to be the slightest difficulty in practice.

This set has been designed very largely to meet the needs of builders of the original A.C. Quadradyne who think the time has come for a more up-to-date receiver. That is why iron-core coils and self-adjusting volume control have been incorporated.

Those who intend to rebuild their old sets will find that many of the parts used in the original design can be worked into this new model, in which case the cost of construction will be brought down to a comparatively small amount.

There will be a great temptation to use old valves, but no constructor should succumb. There have been very great improvements in all valve characteristics during the past year and the results obtained from the set with old valves are not likely to come up to expectation. If you want to see what the set really can do, turn to the test report

Continued on page 600

Result of an Evening's Test

EASY TO TUNE

In spite of the exceedingly good results that can be obtained with the 1934 A.C. Quadradyne, the controls are few in number and easy to handle

I STARTED this test with memories of the original Quadradyne and so naturally expected the 1934 version to have a very high degree of selectivity. I was not disappointed. The combination of four tuned circuits and iron-core coils gives the Quadradyne a degree of selectivity which is almost uncanny for a " straight " set.

This is especially noticeable on medium waves where London Regional and National only spread over 2 degrees on a 100-degree scale. It was quite a simple matter to get Strasbourg free from interference by London Regional, and the adjacent German station was heard with only a faint background of the " local " transmission.

On long waves, a similar state of affairs prevailed, but there was a rather noticeable falling off in sensitivity towards the top end of the dial. This was not very serious, however, as the only station really affected is Kootwijk which, with its huge power of 60 kilowatts, is usually strong enough to come through well under any conditions.

Eiffel Tower was brought in at fine loud-speaker strength well clear of Daventry (5XX); in fact, there was quite a gap on the dial in between the two transmissions.

Owing to the fact that the circuits in the set are very sharply tuned, it is essential that the circuits are properly ganged.

I found that this was best carried out at about 350 metres, and the station selected was Scottish Regional. As the set is provided with a form of automatic volume control, I used a 0-15 milliammeter in the high-tension lead to the two screen-grid valves to give an indication of resonance, and trimmed for the maximum depression of the needle.

Once trimmed up the set held its ganging well over the rest of the medium and long wavebands without any further alteration.

The amount of automatic control provided is not great, but it is sufficient to prevent undue blasting from the loud-speaker when tuning through a very powerful signal. It is also helpful in compensating fading on such a signal as Fécamp, which is apt to fade very badly at night.

The three controls on the new Quadradyne are extremely simple. The four-way switch on the left performs four functions. In two positions it switches the set on to medium or long waves, and by means of the other position the set can be switched on to gramophone or switched off completely.

The other two controls are main tuning and volume control. There is no reaction condenser, but the volume control is so arranged that the set just oscillates at the end of its travel, just past maximum volume.

I spent quite a long time twiddling the one and only tuning dial of this set. And I enjoyed myself; stations came in without any trouble and remarkably free from next-door-neighbour interference. In fact, except in the case of the stations either sides of the locals, I think it is no exaggeration to say that this set behaved just like a four-valve superhet.

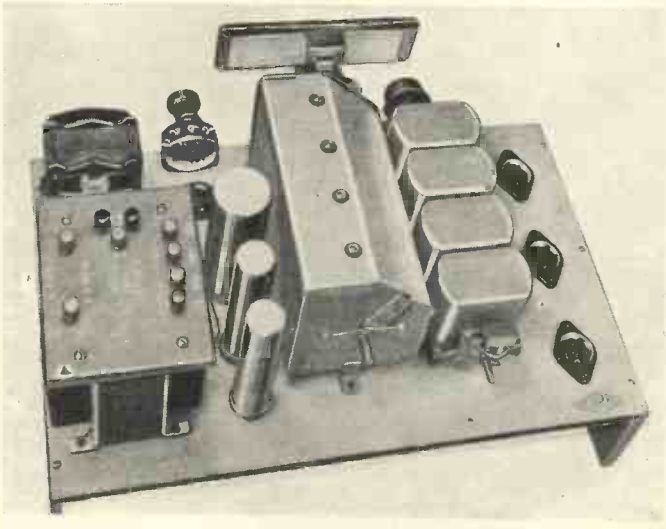
The only real difference is that during daylight the sensitivity of the 1934 A.C. Quadradyne was much *better*. I found no difficulty in logging such stations as Fécamp, and two Brussels, the medium-wave Dutchman, Langenberg, and several others at good listening value.

Quality I found to be really first rate; difficult to describe, perhaps, but let me say that there was ample bass and plenty of clearly defined top.

In conclusion, the Quadradyne would make an ideal family set. Selectivity and quality are excellent, and sensitivity is enough to provide a large number of alternative programmes with great ease of manipulation.

A full-sized aerial, I found, could be used without any detrimental effects on the selectivity of the set. In fact, the larger the aerial the better results, as the set is very sharply tuned. A good earth is also essential

H. W. S.



A TOP VIEW WITHOUT THE WIRING

Some idea of the simple layout on the upper side of the baseboard can be seen from this photograph, which was taken before the set was wired. This is a fine set and is ideal for modern conditions

A NEAT OUTFIT

Here is the finished set housed in its attractive Camco cabinet

that appears on page 599. No exaggerated claims have been made, and we are certain that all who build the set will be pleased with its performance from all points of view.

We should perhaps emphasise the good results obtained from the set when used for gramophone reproduction. Installed in a good radio-gramophone cabinet the 1934 A.C. Quadradyne will grace any home in which it is used and it can be relied upon to give many months of pleasure to the whole family.

And if you have synchronised electric mains, why not complete the job by building one of the many excellent electric clocks that are available into the radio-gramophone cabinet? Then you will always know exactly when to tune in to hear your favourite items. What is more, your set will most certainly be the envy of everybody who sees it in operation and hears it!

GANGING THE SET

Although there are four trimmers on the condenser the ganging is quite simple if carried out in the right way

There is no need for us to point out that every "Wireless Magazine" receiver undergoes very thorough tests before being described. Many months are taken in perfecting designs so that when the home constructor has finished his model, he can be almost sure of having an exact replica of the original "Wireless Magazine" model, working equally as well.

The art of the cabinet-maker has so improved recently that really modern pieces of furniture can be obtained to house wireless receivers. Perhaps you are one of those enthusiasts who take a delight in building your own "boxes" for your sets.

Anyway, remember to take a photograph of your "Wireless Magazine" set when you have it finished. We pay half a guinea for photographs of this kind published in "Wireless Magazine."

IN ITS CABINET

This photograph shows the set fixed in the cabinet. Note that the loud-speaker is fitted upside down

COMPONENTS NEEDED FOR THE 1934 A.C. QUADRADYNE

	£ s. d.
CHASSIS	
1—Peto-Scott, 16 in. by 10 in. by 3½ in.	3 6
CHOKES, HIGH-FREQUENCY	
1—Wearite screened, type HFP (or Goltone, Telsen)	3 6
2—Kinva screened, standard type (or Bulgin, Telsen)	5 6
CHOKE, LOW-FREQUENCY	
1—Heayberd, 30-henry, type 752 (or Ferranti, Parmeko)	12 6
COILS	
1—Set Colvern, types G10, G11, G12, G14, mounted on one base with combined mains on-off switch	2 11 6
CONDENSERS, FIXED	
1—Dubilier .0001-microfarad, type 670 (or Lissen, Telsen)	1 0
2—Dubilier .0005-microfarad, type 670 (or Lissen, Telsen)	2 6
1—Dubilier .001-microfarad, type 670 (or Lissen, Telsen)	1 3
1—Dubilier .01-microfarad, type 670 (or Lissen, Telsen)	2 0
2—Dubilier .02-microfarad, type BB (or Lissen, Telsen)	1 9
1—Dubilier .1-microfarad, type BB (or Lissen, Telsen)	7 4
4—Dubilier .2-microfarad, type BB (or Lissen, Telsen)	14 0
2—Dubilier 4-microfarad electrolytic 500v. D.C. (or Telsen Peak)	9 6
1—Dubilier 8-microfarad electrolytic 500v. D.C. (or Telsen Peak)	5 6
CONDENSER, VARIABLE	
1—British Radiophone four-gang .0005-microfarad, type 366C complete with full-vision dial, type 583A	2 1 6
HOLDER, FUSE	
1—Belling-Lee twin, complete with 1-ampere fuses (or Bulgin)	2 6
HOLDERS, VALVE	
4—W.B. five-pin, skeleton type (or Clix)	2 0
RECTIFIERS	
1—Westector, type W4	7 6
1—Westinghouse metal rectifier, type HT8	18 6
RESISTANCES, FIXED	
2—Siemens 250-ohm ½-watt, type SS (or Erie, B.A.T.)	1 2
1—Siemens 350-ohm ½-watt, type SS (or Erie, B.A.T.)	7
1—Siemens 500-ohm ½-watt, type SS (or Erie, B.A.T.)	7
2—Siemens 1,000-ohm ½-watt, type SS (or Erie, B.A.T.)	1 2
1—Siemens 5,000-ohm ½-watt, type SS (or Erie, B.A.T.)	7
1—Siemens 15,000-ohm ½-watt, type SS (or Erie, B.A.T.)	7
1—Siemens 25,000-ohm ½-watt, type SS (or Erie, B.A.T.)	7
1—Siemens 30,000-ohm ½-watt, type SS (or Erie, B.A.T.)	7
2—Siemens .25-megohm ½-watt, type SS (or Erie, B.A.T.)	1 2
1—Siemens 1-megohm ½-watt, type SS (or Erie, B.A.T.)	7
RESISTANCE, VARIABLE	
1—Claude Lyons 5,000-ohm, type P185/M5	5 6
SUNDRIES	
1—British Radiogram 2-in. metal mounting bracket	6
3—Telsen terminal blocks	1 6
Tinned-copper wire No. 20 gauge for connecting, say	9
Oiled sleeving (Lewcos), say	1 0
1 ft. shielded cable (Lewcos), say	3
4 yds. thin flex (Lewcos), say	4
TRANSFORMER, LOW-FREQUENCY	
1—R.I. Hypermu (or Ferranti, Varley)	15 6
TRANSFORMER, MAINS	
1—Bryce, type AB8, with the following windings, primary to suit domestic mains voltage, secondary 200-volt 200 milli-amperes, 4 volts 4 amperes, centre-tapped	1 8 6
ACCESSORIES	
CABINET	
1—Camco Argyle	1 15 0
LOUD-SPEAKER	
1—W.B., type PM4A	2 2 0
VALVES	
1—Marconi VMS4 (or Osram VMS4)	17 6
1—Mazda ACSG/VM	17 6
1—Marconi MHL4 (or Osram MHL4)	13 6
1—Marconi MPT4 (or Osram MPT4)	18 6

THINGS TO COME

In this interesting article MORTON BARR assumes the role of prophet and speculates on the advances which broadcasting will make in the next five years or so. He makes some interesting prophesies about the future of television and the allocation of wavelengths

THINGS THAT HAVE COME

The grid system seems a gigantic monster beside the small aerials which pick up only a minute current. This fine photograph was taken at Wallington, Surrey

IN his latest book, *The Shape of Things to Come*, H. G. Wells casts a far-seeing eye over the future and tries to anticipate what changes will have taken place—and what progress the world will have made—some two hundred years hence.

There are few who can assume the role of prophet with greater ease than Mr. Wells, but even he must shrink from attempting to forecast the precise state of wireless development so far ahead as that. The subject is crammed with too many possibilities of which we have, so far, barely touched the fringe.

One might, perhaps, look forward for the next five years or so and speculate as to what advances they are likely to bring forth. Anticipation is always risky, but over so short a period one stands a better chance of keeping within the mark.

There is one quarter, at least, in which a change is already overdue. The ether is the common highway for all broadcast traffic and it is to everyone's interest that it should be properly controlled and regulated.

At present we are rapidly drifting into a fantastic state of congestion and overcrowding. Month by month new transmitters come into operation forcing others, in turn, to increase their power or be submerged, with the result that listeners everywhere are being progressively "blanketed" from all but the biggest—or nearest—stations.

The International Broadcast Commission, which is supposed to supervise and control all broadcast "traffic," is unfortunately only able to make pious recommendations, without having the necessary power to enforce them. Its latest attempt to bring the various European countries into general agreement has again failed, particularly as regards the longer waves, and the long-awaited Plan of Lucerne is likely to go into the melting-pot.

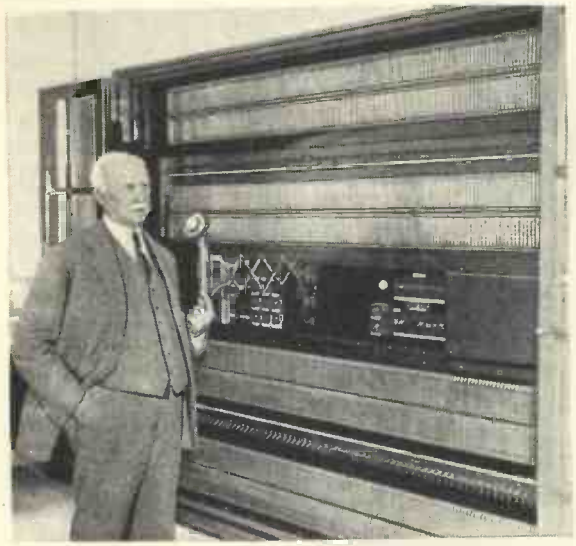
While the fog is still thickening, television has been making good progress and is now definitely ready to claim a place in the ether. Its demands will be heavy because it uses a wider frequency band than broadcasting and requires a correspondingly larger margin of elbow room. Finally, we must anticipate a television-with-sound service, which means, of course, provision for a double channel of transmission.

The problem of finding extra accommodation is urgent and difficult, but luckily the position is not perhaps so desperate as it seems. Certain remedies are available as soon as circumstances become ripe to enforce them.

The weight of public opinion must first of all compel the different European countries to agree on a common policy so far as wavelength accommodation is concerned. The present medium and long wavebands should be given over entirely to a strictly limited number of what we may call "National" transmitters; each country to be allotted one, or at most two, of these according to its size and population.

The primary purpose of each of these stations will be to provide a widespread service suitable for the needs of its own citizens—and more particularly for those who live in the thinly populated districts outside the area of the larger towns.

The European "Nationals"—once restricted in number and limited in power—could then be allotted an even wider margin of elbow room than the present 9-kilocycle spacing, which is admittedly too narrow to combine high-quality



THIS IS NOT THE TELEPHONE EXCHANGE!
This huge public address system, installed in an American school at St. Louis, makes it possible for the school superintendent to broadcast messages to the 3,000 pupils, either simultaneously or in sections

modulation with freedom from side-band overlap.

As an additional measure of relief the transmitting aerials will be designed to produce a radiation field having a definite "spread" or shape. Directional methods of transmission will be adapted, for instance, to "favour" the geographical lie of the particular area to be served.

The radiated field will also be mainly "earth-bound," that is, the so-called space wave will be cut down to a minimum and the direct wave intensified. In this way the area of dependable service can be enlarged for a given power-output, whilst at the same time "fading" is reduced by cutting down reflection from the Heaviside layer. Moreover, with a "limited" field, interference with distant stations is obviously minimised.

We are as yet only beginning to realise how much can be done to shape and otherwise control the distribution of the energy radiated from a transmitting aerial. Further progress on these lines must prove of immense advantage in helping to clear the ether.

So much for "National" broadcasting.

Turning for a moment to another side of the problem, it is safe to anticipate that the ultra-short wavelengths must sooner or later be brought into use for broadcast and television purposes.

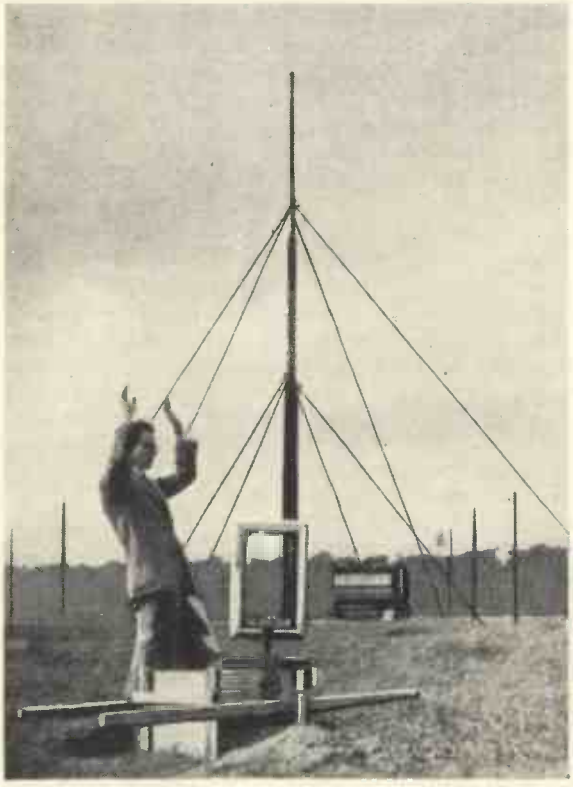
In this part of the frequency scale there is room and to spare for both sound and television programmes. For instance, in the region between 7 and 10 metres there is waveband accommodation for more than 2,000 different broadcast transmitters, assuming each to be separated by the normal 9 or 10 kilocycle gap.

Still more important is the comparative ease with which wavelengths of this order can be controlled and confined to a definite area. On the long waves, the problem may be more difficult, but with short waves it can be reduced almost to an exact science.

The clear-cut directional field produced by a beam aerial, for instance, is due to the fact that when using a 15-metre wave it is possible to erect an aerial system several wavelengths long. On a 7-metre transmission the aerial system is still more compact and it is practicable to radiate not only a narrow beam but an omnidirectional field—suitable for broadcasting—and covering a definite and limited area.

Here, then, is one method of providing a "localised" broadcast service for the towns and densely-populated areas, namely, by coming down to the only part of the ether where there is plenty of room, leaving the rural population—where interference is less of a problem—still catered for by the long and medium-wave "Nationals."

The entire programme service will be supplied from separate studios in a central control station, which would be connected to the National transmitters through trunk lines. The network of "localised" services, on the other hand, will be linked up to the central studio by means of short-wave "beam" transmitters, each confined to a narrow and clear-cut ether channel.



FIELD MEASURING TESTS AT TEGEL
Here you see an engineer signalling to his assistant during field measurement tests at Tegel, near Berlin, where the new 60-kilowatt ether giant is being built. Tests begin next spring

In this way one can draw a probable picture of broadcast conditions in the future. First of all, one sees the highly-populated districts of each country supplied by localised short-wave transmitters, having a limited radius of from five to twenty miles as the case may be.

Next, wired wireless will also be brought into use for those who are on the telephone or electric supply-lines. Television programmes, in particular, may be distributed in this manner to a wide circle of subscribers over specially-loaded transmission lines. Such lines are capable of carrying high-frequency currents up to a million cycles without appreciable loss.

Finally, the "National" high-power transmitters, more widely spaced apart than at present, and less subject to interference, will cater for the more isolated portions of the community.

Useful Gadgets to Add to Your Set

All About Mush Eliminators and Other Special Gadgets

Since the first days of radio, the word "gadget" has always played a prominent part. No matter how good your present set may be, there is always a simple way of improving reception by the addition of some gadget or another. In this interesting article many useful accessories are described, and their advantages are fully explained

AS modern receivers cater so successfully for almost every taste, it is difficult to conceive how they can be improved upon. However, there are still many people who have little fads and fancies for gadgets, so they can have their radio just as they want it. This year has been very productive of what appears to be readers' ideas commercialised.

We have received innumerable gadgets which have been tested with varying results. Some have definitely proved to be a distinct aid to reception. Others are suitable for the lazy person and distinct time savers, while some have been, so far as we could tell, of little value.

Looking through a whole number of test reports we realise that there are quite a number of these ideas which can be used to advantage by almost every listener.

Although most of the commercial sets to-day are free from hum and quite stable in operation, there are very few of them that cannot be improved with a good earth connection, because it has been our experience that the earth connection is a very much neglected item. This is probably due to the fact that it is difficult to get a really good earth connection; a water pipe is usually a long way away and if there is a garden you probably haven't got a suitable copper plate or earthing device of the proper material to bury in it.

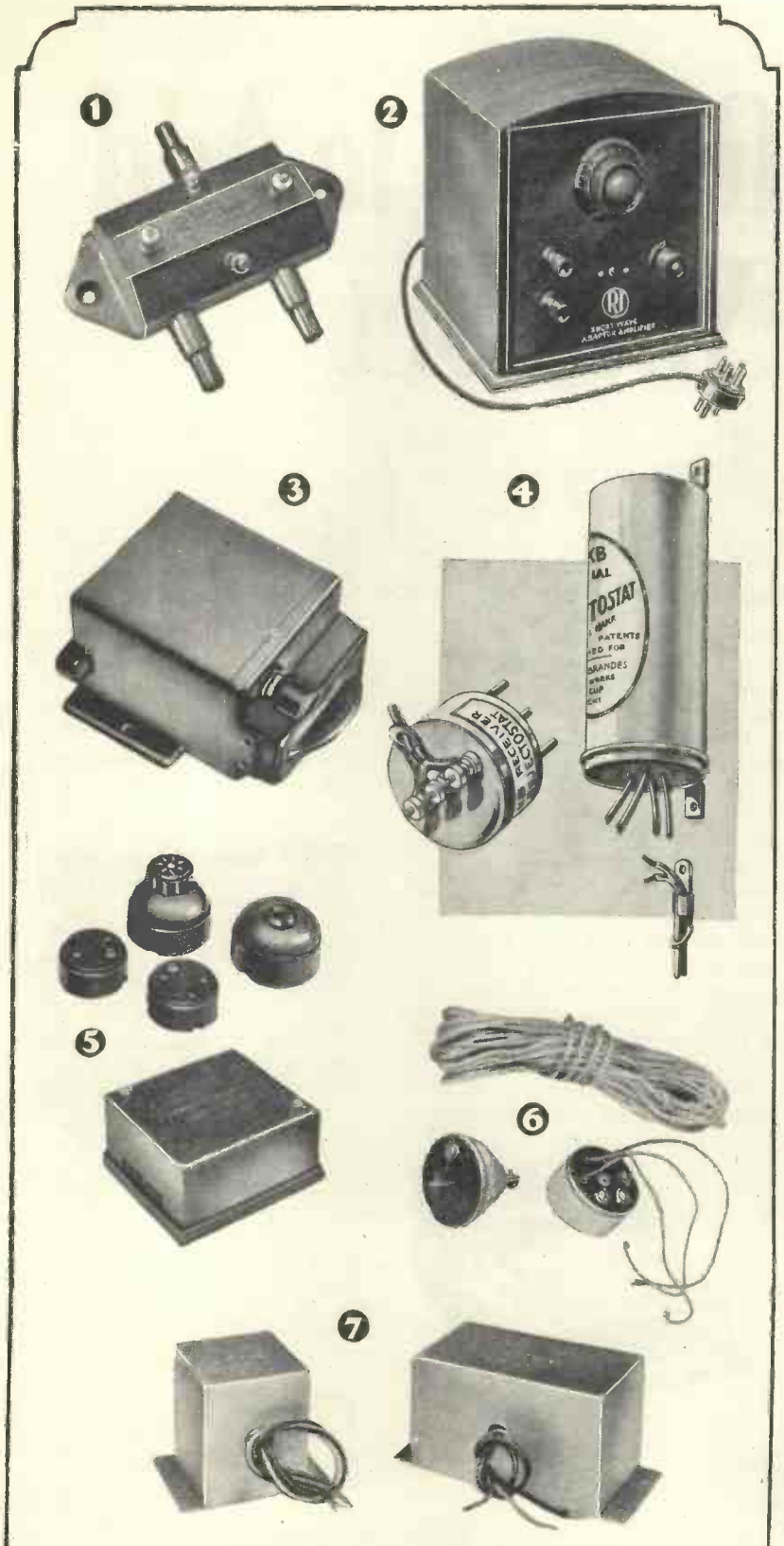
The new Block plateless high-tension accumulator is little larger than an ordinary dry battery

You can easily convert your present set to a radiogram by this Harlie unit

We have tried some good earth tubes and earth substitutes. Take, for example, the Ronnie earth tube. This is a long copper tube with a terminal at the top end so that you do not have to do any soldering; the centre of the tube is filled up with a chemical compound which attracts moisture. This is knocked into the ground at the nearest convenient point and you get a really efficient earth.

The new Wharfedale extension loudspeaker in its neat cabinet. A useful accessory for modern sets

Then there is the Wright & Weaire version of this type of earth tube. This is a 3-ft. copper rod plentifully covered with holes so that the contact with the ground is good. A unique feature is the method of connecting the wire. If you look at the illustration you will see that at the top of the tube are two small cups and above the top cup is a circular ring.



Here is a range of useful accessories; mostly for the aerial end of your set. (1) Biflo static suppressor; (2) R.I. short-wave adaptor amplifier; (3) T.C.C. interference-suppressor unit; (4) K.B. Rejectostat units; (5) remote control unit by Bulgin; (6) Radioformer interference elimination kit and (7) two of the Bulgin range of interference-suppressor candensers

This is an ingenious idea. Just connect your earth wire around the top cup and push the ring on to the wire. Then fill the bottom cup with methylated spirit and put a match to it. The heat from the methylated spirit causes the ring, which is a special low temperature solder, to melt and the earth wire is automatically soldered on to the tube.

The Graham Farish Filt could hardly be called a new gadget. It's a well-tried veteran. This type of earth requires little manual labour. After digging a hole in the ground you connect your earth wire to the side of the case of the Filt earth and bury it. The Filt percolative earth is quite a simple idea. It is a copper can filled with chemical matter which readily absorbs and attracts moisture when buried in the ground.

The Siltit Chemical Earth, another variation of the percolated earth system, consists of a piece of copper tubing about 5 in. long, percolated by holes at regular intervals. Through the end of the tube protrude fourteen strands of wire, which are intended to be spread fanwise so as to obtain a good earth contact.

Talking about earths, you must not forget the despised aerial, which also calls for some attention. Take the Pressland Cop, for example. This is a combination lead-in tube, spark gap and selectivity device. If you look at the illustration you will see that the aerial of this lead-in wire is connected on to the end terminal, the side terminal goes to earth, while the ebonite knob is connected to the receiver. By pulling this knob, which varies a small condenser in the body of the lead-in tube, you can decrease or increase the selectivity of your set.

Another selectivity device is the Chooza station selector. This is a modernised version of the wavetrap idea, but it is so selective that local stations can be cut out with the greatest of ease. Many will remember the Dubilier Ducon aerial eliminator consisting of a holder which plugs into the electric light socket and has two terminals, one on either side of the case. This device can be used instead of an indoor aerial by simply joining one of these terminals to the aerial terminal and leaving the other one blank, or by joining them together and taking

them both to the aerial terminal. There are various ways of connecting up the Ducon.

Bulgins, who are world-famous as gadget makers, have introduced condenser packs for eliminating interference. They are also effective in reducing mains hum.

Quite a number of listeners are worried about lightning. The very thing for them is the Bulgin lightning arrestor that can be screwed on to the wall. Before you go to bed simply pull over the switch contained in this unit and then go to bed and sleep soundly.

Interference eliminators have played a prominent part in improving radio reception this year. Most of them do not require any introduction. The Kolster-Brandes Rejectostat cuts out about 95 per cent. of man-made static and can be erected in a very simple manner. Another type of interference filter is made by Dubilier and combines two functions. It consists of a condenser pack, earthing terminal and fuse box and really does do its job extraordinarily well, besides protecting your set from any mains shorts.

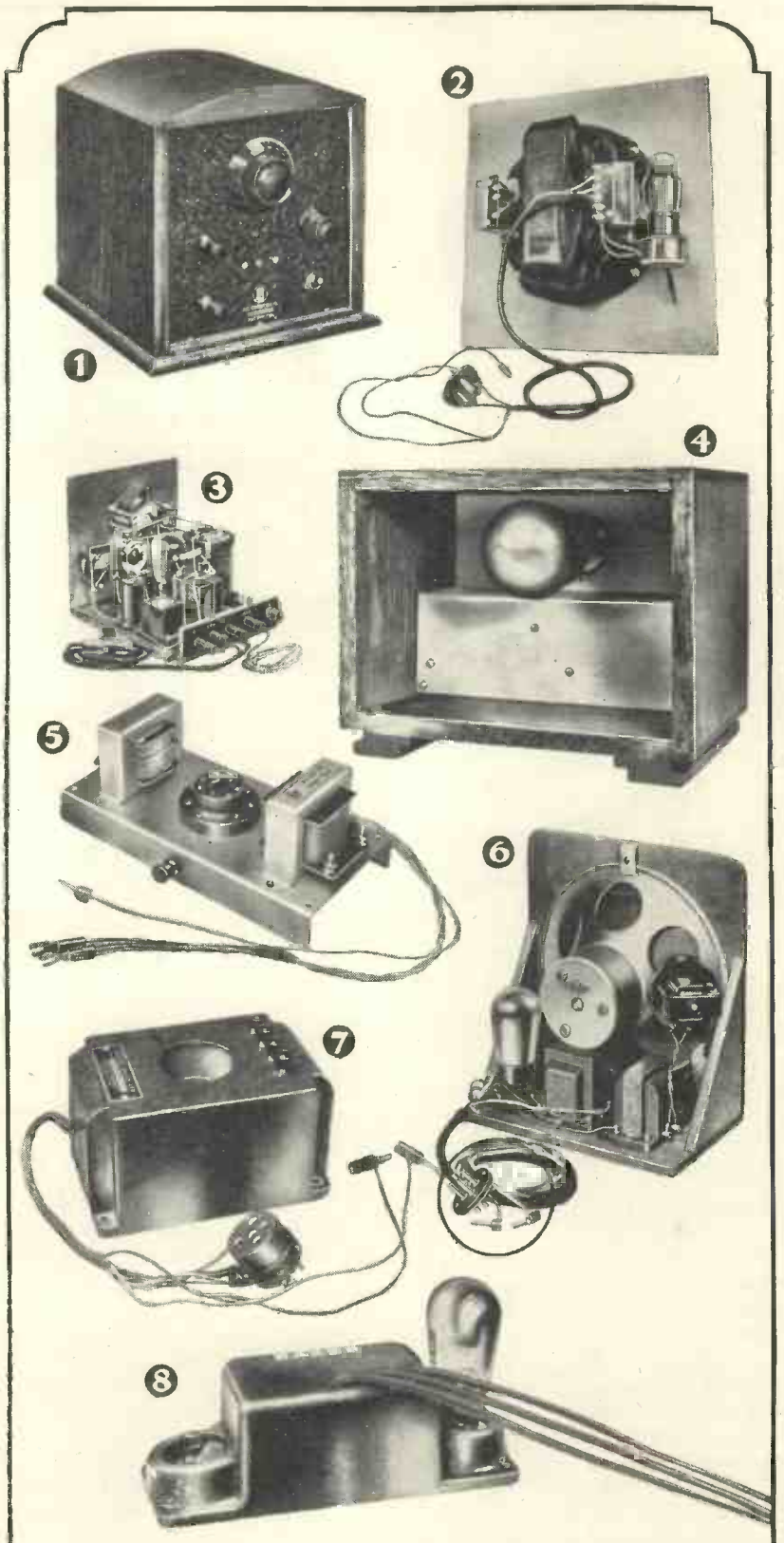
Biflo's make a static cut-out on similar lines.

Finally, don't forget the Radioformer, which is an efficient impedance-coupling device. If you have any local interference that you want to cure, invest in a Radioformer kit.

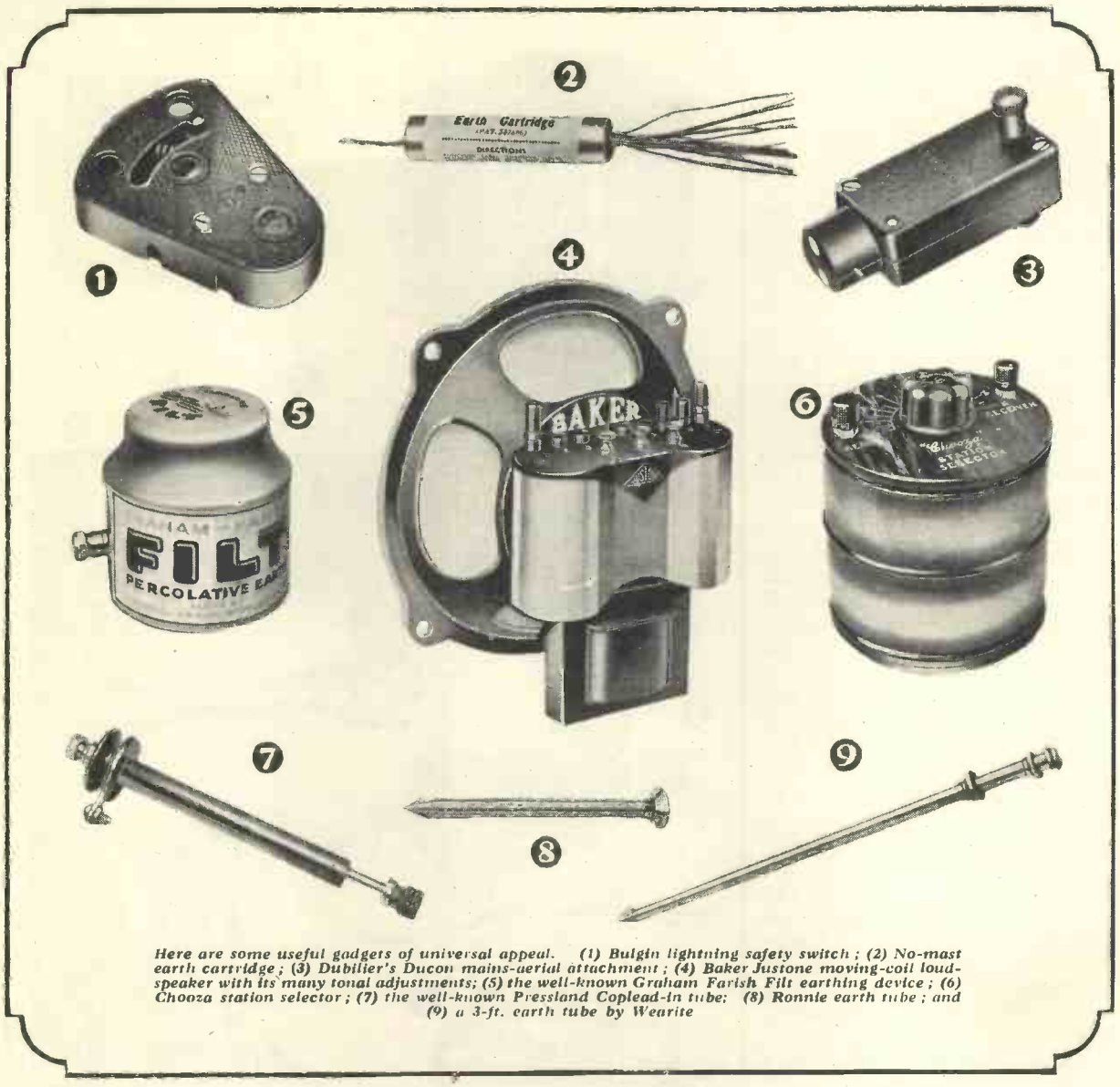
So many battery sets do not give sufficient output for the noise fiend, so during the last few months we have seen the introduction of a number of class-B units, which will convert your existing set to give 1.5 or 2 watts output. No radical change need be made to your present set.

There is, for example, the Blue Spot unit, but there is no need for us to refer to that here. Just turn over a few pages to the test report on page 661. The W.B. unit is in chassis form—very convenient for mounting in your loudspeaker cabinet if you have any space to spare. Then there are the Sound Sales and Multitone units, both completely self-contained. All of these will give you really excellent results. If you want a little extra volume for dancing, give your set a class-B output stage.

Of course we mustn't forget the Baker unit which is entirely self-



These gadgets are mostly in the form of add-on amplifiers. (1) R.I. A.C. short-wave converter; (2) Rola loud-speaker with class-B amplifier combined; (3) R.I. short-wave unit; (4) interior of the Multitone class-B amplifier; (5) chassis-mounting class-B unit by W.B.; (6) Peto-Scott class-B amplifier and loud-speaker; (7) Sound Sales class-B unit; and (8) add-on class-B amplifier by Baker



Here are some useful gadgets of universal appeal. (1) Bulgin lightning safety switch; (2) No-mast earth cartridge; (3) Dubilier's Ducon mains-aerial attachment; (4) Baker Justone moving-coil loud-speaker with its many tonal adjustments; (5) the well-known Graham Farish Filt earthing device; (6) Chooza station selector; (7) the well-known Pressland Coplead-in tube; (8) Ronnie earth tube; and (9) a 3-ft. earth tube by Wearite

contained and embodies many novel features. And then there are loud-speakers with class-B as an integral part. A good example of this type is the Peto-Scott unit, which includes valve, driver transformer, output choke and all the rest of the class-B components.

Rola also supply a loud-speaker on these lines with the class-B valve mounted on the same baffle as the loud-speaker. At this rate of progress loud-speakers will begin to look like miniature sets before we have finished.

The Baker permanent-magnet loud-speaker, called the Justone, is provided with nine tappings to give variations in tonal pitch. This is a good idea for extension loud-speakers, which very rarely give the right tonal pitch unless the matching has been carefully carried out. Talking about extension loud-speakers, do you know that Bulgin can supply a remote control unit that can be fitted up by a non-technical user in a matter of moments. This idea is quite good if you are listening to an extension loud-speaker at some distance from the receiver.

Short waves are coming into their own at last. What with discussions on ultra short-wave television and a general increase of interest in American reception, short-wave converters are being designed in large numbers.

R.I.'s always put out just what is wanted at the right moment. They have now available quite an extensive range of short-wave units. For example, they have a short-wave converter for use with A.C. mains which includes its own power pack. R.I. make a similar version for adding to an existing battery set. These are available as short-wave converters of the super-het type or as plain plug-in adaptors.

With units of this kind, practically any existing family set can be modified in a matter of seconds to receive short-wave stations. Programmes can be heard in this way from all over the world.

You will see from this very brief résumé of some outstanding gadgets that the expenditure of a few shillings can greatly improve your radio reception.

"Radio Music is Alive"

—says Dr. Felix Weingartner, the eminent conductor who recently conducted a B.B.C. Symphony Concert, to WATSON LYLE in this exclusive interview for "W.M."

Dr. Weingartner at home in his library

WHEN one mentally reviews the careers of the conductors prominently before the public to-day, it is rather surprising to find the majority have definitely found their powers as wielders of the bâton somewhat late in their careers, having gravitated to the rostrum from some other branch of musicianship. Indeed, with the exception of Sir Henry J. Wood, who unwaveringly entered upon his life work at the age of twenty-five, I can think of none among those who may be termed the great conductors of our time, saving Dr. Felix Weingartner, who officially took up the important duty of directing a full orchestra at a similarly early age.

Since his career as a conductor began at the age of twenty-two, with appointments at Danzig, Hamburg, and Mannheim, leading on to the distinguished engagement as Court Kapellmeister of the Opera at Berlin from 1891-98, Weingartner's achievements as conductor have been built upon that sure foundation of early familiarity with the technique and art of conducting.

His positions in this capacity include those of successor to Gustav Mahler at the Hofoper at Vienna in 1907-1910, and 1919-1920 Director of the Volksoper in the same city. He has made many appearances in London both before and since the War, his début in the Metropolis dating back to May, 1898.

Here we know him best as a conductor of marvellously lucid and sensitive interpretations of the major works of Beethoven, but his fame on the Continent is concerned as well with the varied spheres of music criticism, and composition. Besides songs and chamber music he has to his credit six symphonies and six operas, the initial one, "Sakuntala," having been produced at Weimar in 1884, about a year after the young musician of twenty knew Liszt.

When first I met Weingartner, some ten years ago, at the house in Bayswater of friends with whom he was staying, I remember asking him how it was he managed to get so much into, or rather, get so much out of, his readings of Beethoven that one rarely, or never, heard from other men. He smiled, in his quick, amused way, and said simply, "I just read what is there and seek to present the music as Beethoven wrote it."

I found him little changed when I talked with him on the day before his recent appearance here at the B.B.C. Symphony concert in Queen's Hall on November 15 last. Still the sincere, unaffected musician, eager in the service of the art he loves. Though physically sparer and more active, his clear, grey eyes swiftly light up, as of yore, with an eternally youthful interest and amusement in life. Other times, other subjects; and it was natural we should talk about mechanical music.

"Do you consider that music is reproduced better from a gramophone and record than by the loud-speaker of a wireless set, Dr. Weingartner?" I asked.

"By radio," he said, decisively, "it is alive. Music recorded is—so—" he expressively denoted the limitations of a box with his hands, "it is static; crystallised. It stays as it was performed."

"Which is a blessing for musically uneducated performers," I murmured.

"As it is directed by the conductor, and performed by the orchestra," he went on, "so it comes to the vast, unseen audience by the radio—living, as it leaves the hall."

"Provided the sets are good ones that receive it, and the transmission is good," I remarked.

Nodding in agreement he smiled slightly; then his expression changed to the look of serene contemplation it has in repose, an expression reminding one of his graduation as a student of philosophy, for a few months before he cast every other interest to the winds for music by entering the Leipzig Conservatorium in 1881.

"And what of radio as an educational influence in music with the public in general?" I asked.

"It is a splendid thing," he said, "that the people should be able to listen to fine music, to great music, in their own homes. Especially the many who can never have any opportunity to hear it in a concert hall because they live in far away, in country places; and for the sick, and the lonely."

"But if they prefer jazz——"

He smiled expansively.

"Well, then, they switch off, and get another station sending out jazz!"

"May we not hope that, sometimes, some listener who has not realised the appeal of good music may come to discover the deep satisfaction it can give by hearing—accidentally, so to say—a symphony?"

Dr. Weingartner looked at me contemplatively for a moment, before replying, slowly, "Well, it may be."

"Or it may be," I said, ruminatively, "that radio helps everybody to find their own musical level."

A Room Fit for Your Set

Photo: Marconiphone

By G. H. DALY

NO wireless set can give good reproduction if its surroundings are bad acoustically. Even the most expensive set, the super radio costing well over a hundred guineas, will sound cheap and nasty if the sound properties of the room or hall in which it is placed, are inferior.

The wireless set which will give bad quality in one room may reproduce very good quality in another room. For instance, the average drawing room, being furnished in tapestry chairs and settees, carpets, etc., is usually better acoustically than the average dining room with its wooden furniture and hard fittings.

To decide which is the best room in the house for the loud-speaker is very easy of solution to most people. Many of us, one might say the majority, have one room in the house which we occupy more frequently than any other and naturally the wireless set is installed in this room.

Sometimes we are lucky and reproduction is good, but in the greater number of cases the excellent quality of many modern sets is rendered mediocre by the bad acoustics of the room. There are, however, a number of ways in which this may be improved. If, for instance, the set, which we will imagine is normally modern, is inclined to be " boomy " and " echoey " then, if the receiver is up to standard, the fault, to express it technically, is due to the rooms' low coefficient of absorption; meaning that the walls, furniture and even the people in the room are not absorbing the sound waves sufficiently but reflecting them back and thus causing too much echo with subsequent distortion.

There is a lack of definition in the instruments of an orchestra, or speech, which although loud, is distorted a few feet away from the loud-speaker.

This trouble is not always the set as most people usually suppose, but is due to the bad acoustics of the room.

The room may be too small for a given volume of sound, especially if a modern set is in operation, or the distortion may be due to reflection or echo caused by any one or a combination of the following: plain distempered walls, wooden furniture —especially if it is varnished, lino-covered floor—particularly if the lino is unpolished, stone or similar floors, uncurtained or short casement curtained windows.

A room furnished like the above would be inclined to give too much echo; there would not be sufficient absorption for clear reproduction especially if only one person was occupying the room. If, however, half a dozen adults were in the room reproduction would be considerably improved.

From the point of view of echo, the number of persons in a room is of considerable importance, for each adult person supplies about 4.7 units of absorption to the room or hall and thus greatly reduces echo. A plain wooden chair supplies only .15 units whereas a cushioned seat supplies from 1 to 2 absorption units.

Absorption can be increased and echo reduced by introducing into the room heavy window curtains, cushions, rugs, tablecloths, mats, and other similar materials.

If there is not sufficient echo in the room, however, and everything sounds dead, and the loud-speaker, while giving good volume close at hand, sounds weak from the other side of the room, then an improvement can be accomplished by reducing the absorbing factors, such as cushions, rugs and so forth.

To test the acoustics of a room, clap the hands smartly and listen for echo. Usually this is negligible or very small in the average room. If, however, there is an appreciable echo lasting perhaps half a second, then the room is too " echoey " for the average loud-speaker and absorbing materials as mentioned above should be introduced. Although a slight amount of echo is desirable, because it tends to brighten and give life to the reproduction, too little echo rather than too much is to be preferred, for echo means distortion.

To get the best out of a wireless set, the room should be especially decorated, curtained and furnished for the purpose.

If possible, it should be shaped to give the best acoustic results. This, of course, is not an economical proposition for most of us, but a great deal can be done by studying the simple acoustics of the wireless room and adjusting accordingly.

WHITAKER-WILSON takes you on a

Musical Tour of the Ether

I AM just beginning to understand the radio fan !

That, however, is merely because I happened to have a new set and naturally wanted to try it out, but being alone in the house, I suppose I lost some of the thrill of finding the various stations. I think one needs a companion to enjoy that sort of thing to the full.

Perhaps it might have been different had I not stumbled on a Schubert concert from Vienna. The very place to expect such a concert, of course. Schubert lived there all his life. As I happened to catch the concluding strains of all he wrote of the celebrated *Unfinished Symphony* I found myself ruminating over the events that led up to his writing it at all.

A strange being, Schubert. He could forget his own name, almost. At all events, he contrived to forget he had written a symphony in B Minor. It ought to have been called the *Forgotten Symphony*.

It all came about this way. He and a friend—a young lawyer named von Schober—decided to take a short holiday together in the Styrian mountains. Just before they set out the conductor of a musical society in Gratz called on Schubert and asked him if he would write a symphony for the society. Schubert, ever obliging and without a thought of pecuniary reward, said he would be very pleased.

Schubert and von Schober spent the first few days of their holiday walking. Von Schober asked Schubert if he had brought any work with him and Schubert told him about the symphony. Then von Schober said : " You can do that when we get back to Vienna. Let's do an opera together."

Nothing seemed pleasanter, so they set to and worked out the ideas for *Alfonso und Estrella*. Then Schubert, who could write at an amazing speed, left von Schober to get on with the libretto and wrote down the first two movements (and a few bars of the third) of what we now know as the *Unfinished Symphony*.

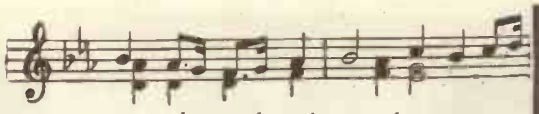
When he arrived home he tossed it down on his desk and turned his attention to the opera. A few weeks later the conductor called and asked if the symphony were ready. Schubert looked at him in blank astonishment for a moment. Then he remembered the symphony and fished it out from under a pile of opera manuscript. " Here it is," he said. " I am frightfully sorry I haven't finished it, but you shall have the other two movements to-morrow or the next day." The man thanked him and departed with the score of the two movements.

The other two never came, and, I suppose, the conductor did not care to worry Schubert. That was in 1822. Schubert lived until 1828, but he never completed the work. I doubt whether he ever thought of it again. The Forgotten Symphony.

As I do not listen to foreign stations very often I am not always sure where in the world I get to on these wireless trips. I lingered over a variety show in Polish, but somehow the humour missed me. I prefer Stainless Stephen's dialect.

However, Berlin seemed to be doing quite well with chamber music. I found myself listening to Haydn's *Rasirmesser* Quartet. I forgot all about poor Schubert and his symphony, and found myself thinking of how dear old Papa Haydn came to write that quartet.

Salomon, the celebrated violinist, was very successful in London as a concert manager about the year 1787. He had always wanted to get Haydn to come over here. Cramer had tried twice to induce him to come, but Haydn always said he was content to remain with Prince Esterhazy.



Salomon, finding it useless to attempt to persuade Haydn by letter, sent Bland (the publisher) to Vienna with strict instructions not to return without Haydn. Bland arrived at at Esterhàz in due course, and found Haydn in the act of shaving. Bland says he heard Haydn grumbling about the state of his razor. " I would give my best quartet for a decent razor," he muttered. Bland left the house and went back to his hotel. He returned in a few minutes' time with his own razor. This he subsequently presented to Haydn who, in return, gave him the score of a quartet. It is still known as the " Razor-blade Quartet."

Slipping round the dial quickly, I landed in Budapest and found somebody playing on a piano. I liked the player better than the piano, but all sorts of stuff came through at the same time, so perhaps it was not quite fair to judge. The piece played was Beethoven's *Andante Favori*, which I cannot have heard for years.

The hearing of a few bars of it rather amused me. I recalled how angry Beethoven was with his friend Ries over that charming little work. Beethoven always liked to play over his latest creation to Ries and Krumpholz. Both liked the Andante so much that they prevailed upon Beethoven to repeat it. It was an air with variations.

So far as Ries was concerned, the second performance was enough. He practically had it from memory. That evening Ries went to dine with Prince Lichnovsky and played what he could remember of the Andante.

The Prince was an excellent musician. " Play it again," he demanded. Ries played it three or four times. Then the Prince tried to reproduce it—very successfully, from what Ries says. At all events, he could play the main theme well enough to pull Beethoven's leg.

If he had known Beethoven better he would not have risked playing a trick, but he may have thought as he was a Prince he could afford to take risks. He called in to see Beethoven the next day. After a while he said, " Now, Maestro, I must really play you my latest." Beethoven looked interested, and the Prince, thus encouraged, sat down and played the opening bars of the Andante.

Then the sparks flew. Beethoven roared like a bull and practically turned the Prince out of doors. Ries was punished by never being allowed to hear Beethoven in private again, an edict which even extended to the Prince and his friends. Beethoven was no respecter of persons.

I wondered what he would have said if he had heard the piece from Budapest. However, I floated over Warsaw again. The vaudeville had evidently finished. As Chopin was being played—in his own native city, too—I thought it worth while to listen. Very nice, too. Chopin broadcasts perfectly. The work was one of the nocturnes which reminded me of a little breeze which Chopin had with Liszt one night. It was a trifle awkward for them both as they were out to dinner.

During the evening Liszt was asked to play. He was always very fond of Chopin personally, but rather inclined to embellish his music when he played it. Rather annoying to have your music embellished, however cleverly !

On this occasion Liszt put in several embellishments of his own which entirely missed the company who were not familiar with the work. When it was over everyone said " How lovely !" or something to that effect—all except Chopin, who was biting his lip with annoyance. Liszt glanced over in his direction and saw his expression.

Chopin said, very quietly, " Look here, Abbé, when you do me the honour of playing a work of mine, I should be glad if you would play what I wrote." " Play it yourself, then," said Liszt, rudely. Everybody felt awkward, and there was a silence that made the hostess tremble. Chopin rose without a word, sat down at the piano, and played the work perfectly.

At the end nobody dared to offer any comparative comment, with two great geniuses in the room. Liszt broke the silence. " You are quite right, Fritz," he said. " I am sorry. You are the artist, I merely a mountebank." Very generous of him.

Liszt was always getting into hot water with

Photo. H.M.V.

" . . . some of the thrill of finding the various stations "

"Christopher Stone trying to pronounce the title of a record in German." Christopher is here seen with Ray Noble in the H.M.V. studios

Mendelssohn for playing monkey-tricks with his works. It came to a head one evening when Liszt appeared as soloist for Mendelssohn's G Minor piano concerto, Mendelssohn himself conducting. It was certainly rather cheeky to elaborate some of the simpler passages, but Liszt filled them up as he went along. Nothing could be said then, and nothing was actually said afterwards, but Mendelssohn did not say "good-night" to Liszt nor thank him for playing the concerto.

". . . ruminating over the events that led up to his writing it at all"

He had this revenge, all the same. Both taught at the conservatoire. Mendelssohn, you must know, was an excellent artist as well as a musician. The next time Liszt went to the conservatoire he saw a huge crayon sketch of himself playing the concerto. It was lifelike. He rather admired it—until he noticed that his fingers were represented by small hammers, a satire on his heavy style of playing. He knew at once who had done it, but thought it wiser to say nothing.

Thereby hangs another tale about Liszt, who was really a kindly old man. He was always good to any young pianist who asked to be allowed to play before him.

He was rather amused when asked by an American woman to hear her daughter play. Streleszki received her and took her to the maestro's study. "Our Mamie can knock spots off a pi-anner," she told Liszt. The Abbé knew no English—certainly no Americanised form of it. He turned to Streleszki for translation.

"Madame wishes to assure you, Maestro, of the excellence of her daughter's technique," he explained, but a twinkle in his eye made Liszt suspicious. He bowed courteously. "What will you play, Mademoiselle?" he asked. "Do you know any of Mendelssohn's music?" asked Mamie. Liszt understood that, and said, "Yes—a little." Probably he thought of the concerto as he said it.

"Then I will play you the *Bee's Wedding*," said Mamie. "No," said Liszt. "Don't do that. I would much rather have the *Spider's Divorce*"!

Wandering on my little journey, I hovered over a station I could not identify. I lingered for a moment because I heard one of the worst orchestras possible. The horn player seemed to be sickening for something, judging by his playing. Being in a thoroughly reminiscent mood, I thought of old Dr. Hans Richter, the famous conductor, at Manchester, whom I knew well at one time. Then by a strange twist of the memory I found myself thinking of Spohr.

Spohr was, as everyone knows, one of the greatest violinists of his age. During the year 1807 considerable excitement was occasioned at Erfurt. Napoleon had called together his famous congress of Princes. Spohr was anxious to see the Princes, Napoleon in particular. Hearing that the royal visitors were being entertained nightly by a French troupe of players, Spohr went to Erfurt in order to be present. To his dismay he found no tickets available.

As he had his fiddle with him, Spohr applied to join the orchestra, but was informed there was no vacancy. This was rather annoying, but Spohr took the second horn-player out to a café and succeeded in persuading him to have an evening off, offering to play for him. "The trouble is," said Spohr, "I have no instrument here." The horn-player proffered his own, and even fetched the band part for Spohr to look at.

He knew nothing about horn-playing, and spent the rest of the day making very disagreeable noises on the borrowed instrument. He turned up in the band-room at night with his lips quite swollen from hours of unaccustomed pressure. How he played does not concern the story, but a notice pinned on the door concerned *him* very much. It was to the effect that the players were to sit with their backs to the audience, *and were forbidden to look round*, as the royal party occupied the front row of stalls.

Spohr did not intend a little thing like that to prevent his seeing Napoleon and Co., especially after all he had gone through. He happened to carry a small pocket mirror. This he placed on his desk, and had a perfect view of Napoleon.

Somebody was playing a saxophone in Strasbourg; a Catalan play was going on in Barcelona. I lost patience and dropped into our National and heard Christopher Stone.

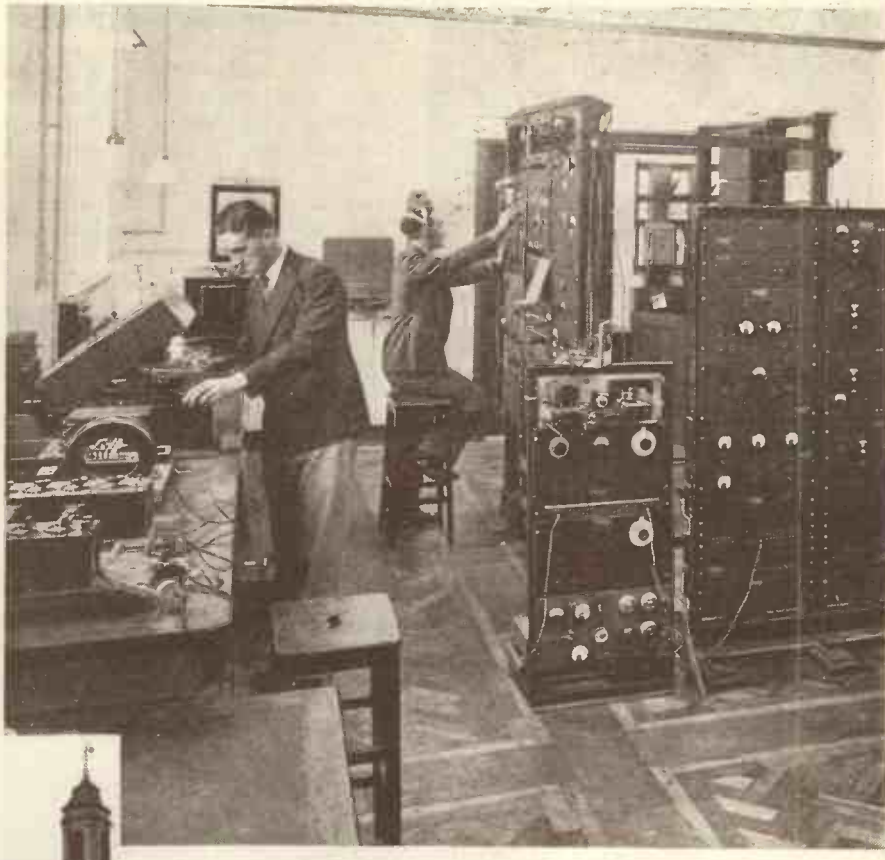
That didn't remind me of anything on earth—excepting Christopher, of course. I remained with him for three minutes. Then the telephone bell went. A friend wanted to know if I cared to go round and hear his new set. He said he could get seventy stations on it!

TO most of us the Post Office organisation is just an every-day affair that looks after the telephone service, delivering letters, selling stamps and worrying us with little red pieces of paper demanding that we pay our wireless licence fee of ten shillings forthwith.

A visit to the new Post Office research station at Dollis Hill will soon convince you that the work of the P.O. embraces much more than mere selling and delivering.

Dollis Hill, which was recently opened by the Prime Minister, consists of a fine block of buildings on the top of a hill about six miles north-west of Marble Arch. Although so close to London, the station is sufficiently isolated from the railways and heavy traffic to enable the most sensitive measuring instruments to be used without outside disturbance.

In the main research building, which is on three floors, there are a large number of laboratories staffed with experts for investigation into the many-sided aspects of the art of communication, of which radio, of course, takes a large share.



Above is a view of the research laboratory at Dollis Hill, where experiments on ultra-short wave transmissions are carried out. Below is a front view of the imposing buildings of the research station, which is only six miles from Marble Arch

There are laboratories in which investigations are carried out on new methods and systems of signalling over telephone lines. The wear and tear of apparatus, which would normally be experienced during the forty years or more of life in a telephone exchange, is found during extensive durability tests lasting a few months.

In one room a machine is in operation which subjects the new types of telephone instruments to the usage that they may be expected to receive in the ordinary subscriber's hands with the object of determining their durability and to show up any weak spots.

Another group of laboratories deals with the problems connected with the telephone lines themselves. Most of the work being done at present is centred on carrier systems by which several separate channels for speech may be obtained on the same wires by the modulation of high-frequency carriers.

An interesting gadget just developed at Dollis Hill has been described as the Robot Operator. You know that when you are in a hurry and want such-and-such a number it is invariably engaged. We know that it is engaged by the characteristic "busy" tone repeated *ad lib.*

Most of us can recognise this sound by now but the P.O. believe that there are thousands of subscribers who still hold on the line and hope for the best. Now, by means of this robot operator you will hear a feminine voice repeating, "Line engaged, line engaged," also *ad lib.* We can well imagine many subscribers telling this young lady what they think of her, but it will be no good, for "she" is only a strip of film wound round a revolving disc.

Actually, this device is an application of the talking film to the telephone. On the film is recorded

REAL RESEARCH!

the words "line engaged," on a sound track, of course, and this is reproduced through a photo-electric cell and amplifier to make speech.

Another new idea is the Post Office loud-speaker, which can be used instead of the conventional earpiece of the receiver. At the bottom of the loud-speaker is a volume control by means of which you can adjust the volume from the reproducer; a useful gadget especially if you are talking to the landlord or the income-tax collector.

In another laboratory the Post Office engineers make home-made lightning for testing lightning arrestors. During a recent visit to Dollis Hill we saw a practical demonstration by this home-made lightning.

Banks of condensers were connected in parallel to store up potential, for the discharge of which the condensers were switched in series. One side of the condenser bank was taken to a large copper sphere, a little larger than a loaf of bread. The other side of the condenser bank was connected to a copper plate, which was suspended a foot or so below the copper sphere.

A miniature forest of small trees, represented by twigs of wood about 6 in. high, was arranged on top of this copper plate. Then an engineer warned us to step back while he switched on the "juice." The storm began. As the air dielectric between the sphere and the copper plate was broken down, blue streaks of lightning played havoc with those twigs. Afterwards we examined the "forest"; most of those twigs were blackened to a cinder.

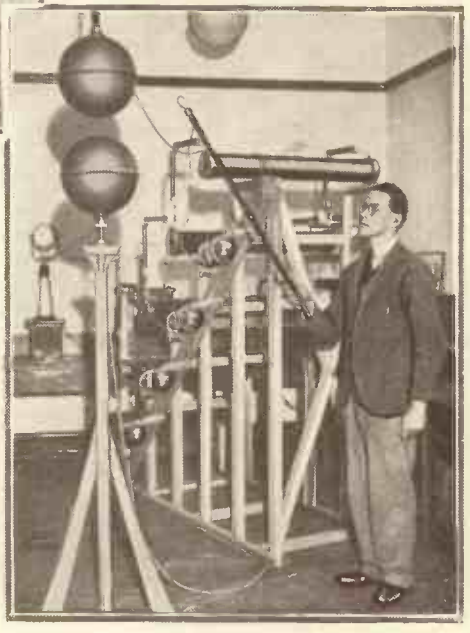
This is where loud-speakers are tested. This room is padded to a depth of 18 in. with wool to obviate any possibility of sound reflection. On the right you see the apparatus for testing lightning arrestors. It can generate 250,000 volts!

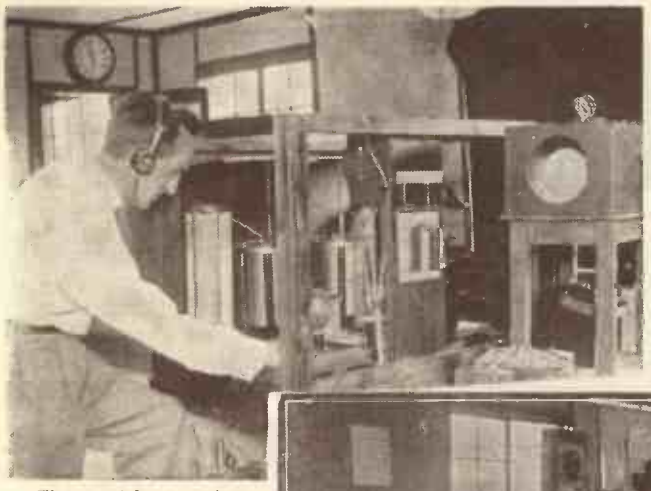
In the acoustic laboratory a special silence chamber has been built so that loud-speakers and other speech-reproducing apparatus can be tested for acoustic performance. The room has its walls padded with wool to a thickness of 18 in. so as to provide conditions for accurate measurement; it is imperative that there should be no reflection of sound from the walls, the roof or floor.

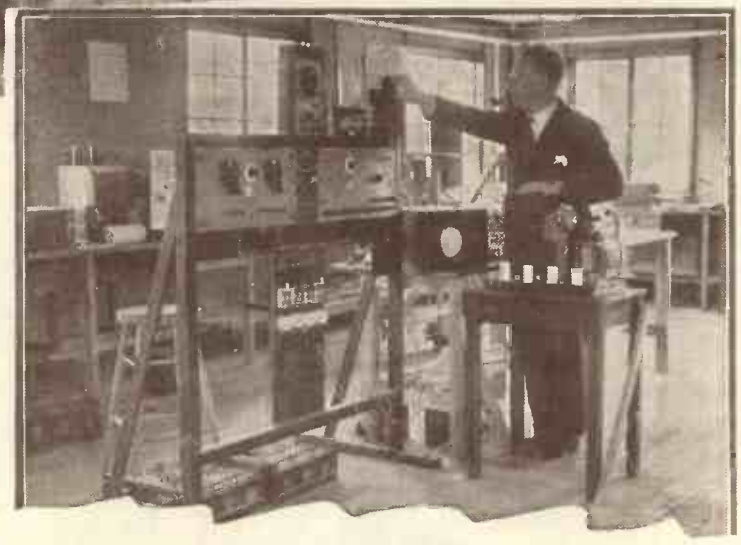
We saw an interesting demonstration in an all-steel room about a hundred yards or so from the main building. When we went in, a familiar Pye portable set was filling the air with music. The engineer-in-charge went over and as he shut the door so the music faded away completely. The explanation, of course, was that the room was so completely screened that even when the Pye set was tuned to Brookman's Park, only a few miles away, and the door was shut, it was impossible for wireless waves to enter the room.

Besides the laboratories, Dollis Hill has its own workshops in which any apparatus required for research work can be constructed and in which samples of developed apparatus can be made for the guidance of Post Office contractors.

Last year, of the 511 investigations carried out, fourteen of them resulted in an annual saving to the Post Office of £190,000. Dollis Hill is also the technical training centre of the P.O. Engineering Department. During this year 1,700 students will receive instruction at the station and another 1,450, who live in the provinces, by means of postal correspondence courses.







The special transmitter erected at Simavik for polar ionisation experiments. Transmissions have been conducted between Simavik and Tromso

MEASURING *the* HEAVISIDE LAYER

By G. S. SCOTT

THE rôle of the Heaviside layer in wireless propagation is well known in these days, even to the most ordinary broadcast listener, let alone the experimenter. It is to the layer that we are indebted for all distant wireless communication.

For many years before the advent of wireless the science of the times had been gradually leading to a state of knowledge suggesting the existence of ionisation or electrical activity somewhere high up in the air. Early in the history of wireless it was found that signals were received at distances much beyond those which experimenters had any right to expect. This led Oliver Heaviside in England and Professor A. E. Kennelly in America to suggest definitely the existence of such a layer, which (by a process more or less akin to reflection) returned wireless signals to earth at considerable distances.

Proved by Experiment

The truth of this is now well recognised, although Heaviside did not live to see the existence of his layer proved beyond doubt by rigorous experiment. The first such proof was due to Professor E. V. Appleton, who showed that the Heaviside layer, which is responsible for our reception of continental broadcasting stations, was at a height of about 100 kilometres above the earth.

Not content with one layer, however, the use of shorter waves led Appleton to the conclusion that there was a further layer higher up, at about 230 or 250 kilometres. It also appeared that this Appleton layer was much more strongly electrified than the Heaviside layer, so that waves of higher frequencies which did not find enough electrons to reflect them in the lower layer might still do so at the upper layer.

Our present state of knowledge is, therefore, that there are two such main layers, the lower being mostly responsible for the return of the longer waves (such as those of the broadcast band and upwards), while the upper layer is responsible for the amazing distances reached by the shorter waves, e.g. below 100 metres. The reason why broadcast waves are not returned in the day-time is that the layer is then in a condition such as to *absorb* their energy. After dark it acquires a density of ionisation suitable for *reflection*.

Despite the state of our knowledge there appears no doubt that we have still a tremendous amount to learn about the habits of these electrified regions before we are able to write the whole story of wireless communication over all the world and at any time of the day. Experimental work on this subject is thus of the highest importance in advancing our practical knowledge of wireless communication, besides its more abstract function of widening our knowledge of the universe in which we live.

Echo-sounding Methods

The method which is now in use for exploration of the layers is particularly neat. It is an example of echo-sounding, except that its scale of operation is enormously different from that of echoes to which we are otherwise accustomed.

The principle of echo-sounding is remarkably simple, and even in its application to the immense speeds (186,000 miles per second) of wireless waves the method is substantially the same as that used for the echoes of the much slower air waves with which we are more familiar.

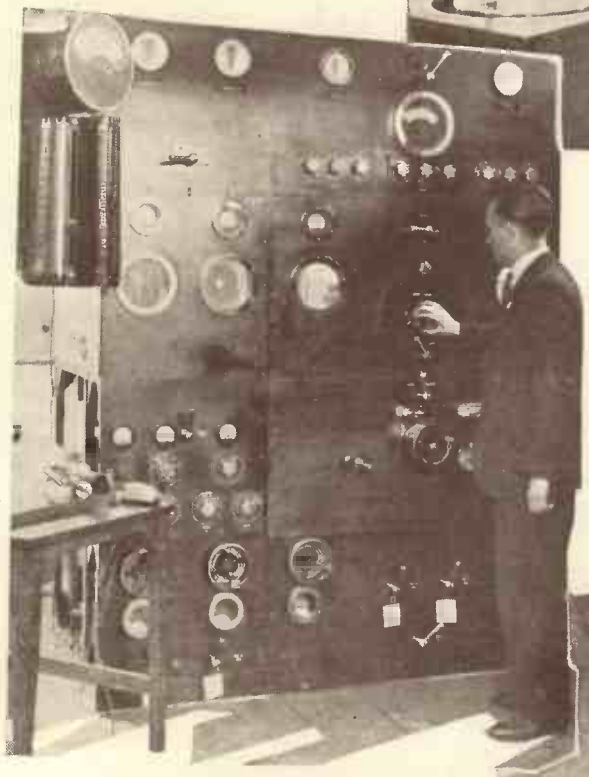
Echo-sounding Principles

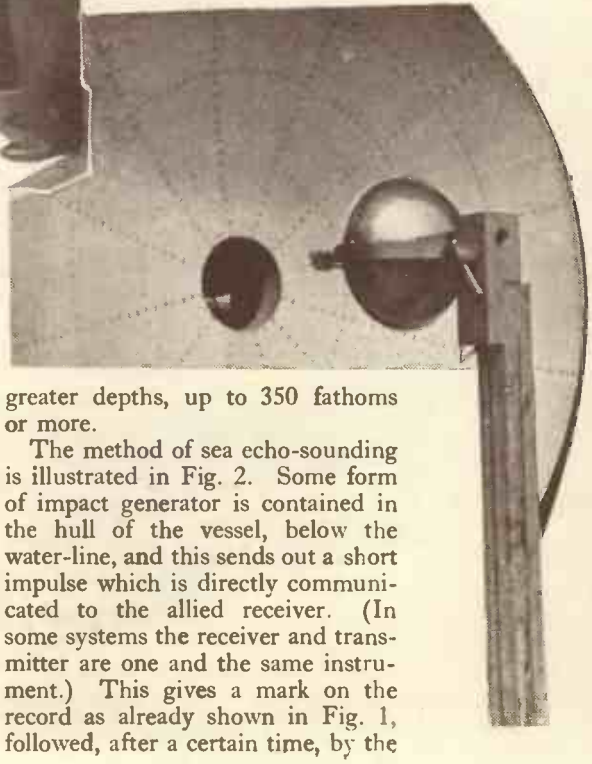
The essential principle of the method is shown in Fig. 1. Suppose we have a recording instrument which makes a continuous record against time over some period. If at some stage in the record the

instrument receives a short impulse—that is of a duration short compared with the total length of time recorded—the record might be of the typical form shown in Fig. 1.

Reflection

If the impulse is at the same time propagated through some medium and reflected back from a suitable reflecting surface, the echo can also be caused to actuate the recording instrument and produce another impulse as shown also in Fig. 1.





The properties of the upper atmosphere are investigated by this latest experimental transmitter panel (shown by the above photograph) at the National Physical Laboratory at Teddington. The right-hand photograph is of a micro-wave bowl reflector aerial. The top photograph on this page is of the Reichpost experimental station at Tempelhof

It is then only necessary to determine the time A—B in Fig. 1 to find out how long the echo has taken to get there and back. This time is twice that taken for the impulse wave to reach the reflecting surface. If then we know the speed at which the wave travels through the particular medium, the distance of this surface can be determined.

One of the best known methods of echo-sounding is that of finding the depth of the ocean. The principles of this method were outlined in 1887, but nothing practical on a sea-going scale was attempted until during the war. Since then the method has been further developed to peace-time navigation and trawling. Ordinary big ship navigators are interested in depths of a few fathoms upwards (1 fathom = 6 feet) while trawlers need knowledge of much greater depths, up to 350 fathoms or more.

The method of sea echo-sounding is illustrated in Fig. 2. Some form of impact generator is contained in the hull of the vessel, below the water-line, and this sends out a short impulse which is directly communicated to the allied receiver. (In some systems the receiver and transmitter are one and the same instrument.) This gives a mark on the record as already shown in Fig. 1, followed, after a certain time, by the echo-impulse which has traversed the path marked by arrows.

The rate of propagation of a wave in water varies according to the temperature and saltiness of the water.

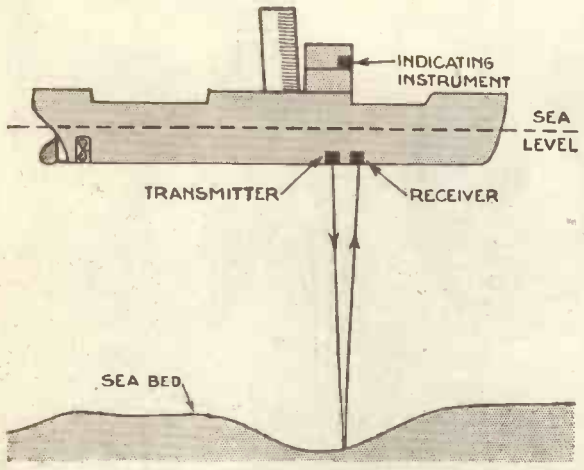
Wave Speed in Water

The accepted limits are 4,700 feet per second for the Baltic, which is nearly fresh, and 5,100 feet for the Red Sea, which is nearly saturated. The Atlantic Ocean has an average of about 4,900 feet per second. Thus, if we find that the time A—B in Fig. 1 is .43 of a second, it means that the impulse has travelled three-sevenths of 4,900 = 2,100 feet. Since this is the total distance of its go and return journey, the reflecting surface is 1,050 feet or 175 fathoms deep.

An example of a series of echo-sounding observations on the Great Banks is shown in Fig. 3.

Making Air Echoes Visible

Actually the method of echo-sounding in air does not appear to have been used to any extent. There is an obvious possibility of using the method for determining the height of aircraft, but many difficulties



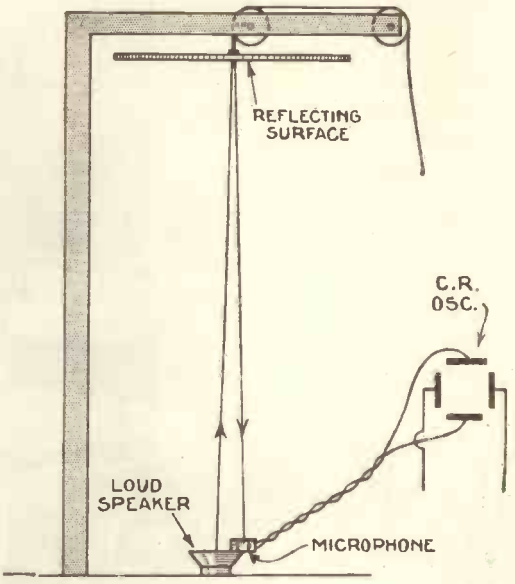


Fig. 2 (above) illustrates the general method of sea-echo sounding. Fig. 4 (right) illustrates the demonstration scheme described in the accompanying article. The loud-speaker gives short impulses of a high-pitched note

stand in the way, e.g., the noise of the engine itself and the accommodation of the instruments in a machine with little room to spare for trimmings.

A very beautiful experiment of echo-sounding in air was recently shown, however, at the I.E.E. lecture

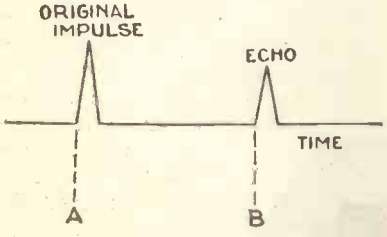


Fig. 1.—It is only necessary to determine the time A-B to find how long the echo has taken to get there and back

by Sir Frank Smith, head of the Department of Scientific and Industrial Research. The experiment was designed to be an acoustic analogy illustrative of the method of echo-sounding used in exploring the Heaviside layer.

I.E.E. Demonstration

The arrangement of the demonstration is shown in Fig.4. A loud-speaker was arranged to give out short impulses of a high-pitched note. The impulses were allowed to impinge on a microphone, sitting, as shown, practically on the loud-speaker, while at the same time sound waves were being sent up into the air and impinging on the reflecting surface, from which they were returned to the microphone so as to arrive at it some time after the impulse received directly from the loud-speaker.

The output from the microphone was applied to a cathode-ray tube, as shown, while the timing plates of the oscillograph had a time-base of the saw-tooth type.

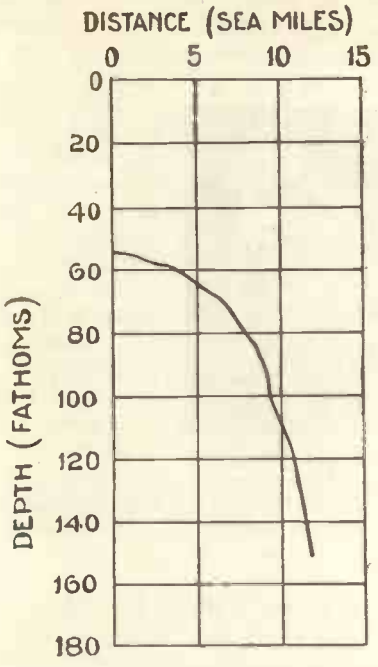
The rate of emission of the sound impulses and the time-base voltage were both controlled from the same source (apparently the 50-cycle A.C. mains) so that the impulse directly received by the microphone always landed on the same point of the time-base, and gave a perfectly steady picture which could be watched on the oscillograph screen. An echo (or echoes, for there were usually several to be seen) from the reflecting surface also showed each in a steady position on the time-base so long as the height of the reflecting surface was kept constant. As the height was varied—by a string approximately as shown in the figure—it was seen that while the directly-received impulse remained stationary the echoes were crowded to or separated from it as the reflecting board was lowered or raised so that the echoes took a shorter or longer time to go and return. Differences in the height of the reflecting layer could thus be seen directly on the oscillograph.

An echometer made by the Marconi Sounding Device Co., Ltd., for determining the depth of water under a ship. A focused high-frequency beam is used

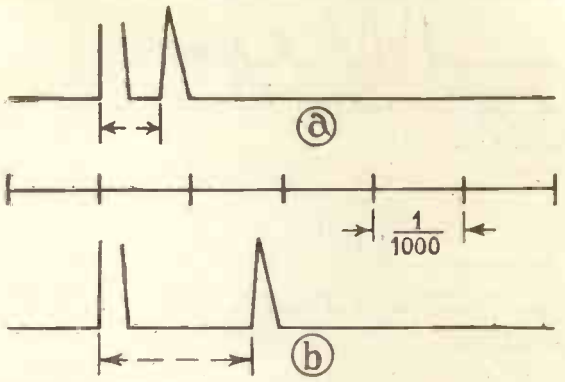
Echoes from the Heaviside Layer

This is exactly the method which is used for exploring the Heaviside layer, but using wireless signals instead of sound waves as in the experimental demonstration.

The method is to send out very short impulses of wireless signal and to receive them on



(Left) Fig. 3.—This shows an example of a series of depth soundings taken off the Great Banks



(Right) Fig. 5.—(a) illustrates the time taken for an echo to be received from the Heaviside layer and (b) from the Appleton layer. The time-scale of milliseconds is used

an aerial only a very short distance away. The signal which has travelled across the ground from transmitting to receiving aerial is received practically instantaneously, whereas the echo signals sent up to the Heaviside layer and back take quite a measurable time to be received. For example, assuming the Heaviside layer to be 100 kilometres high, the signal travels 200 kilometres, which represents $\frac{200}{300,000} = \frac{2}{3,000}$ of a second $= \frac{2}{3}$ of a millisecond. Similarly a signal from the Appleton layer at, say, 250 kilometres, travels 500 kilometres and takes $1\frac{2}{3}$ milliseconds (millisecond is $\frac{1}{1,000}$ of a second).

Echoes from the Layers

These conditions are shown in Fig. 5 where (*a*) illustrates the time taken for an echo to be received from the Heaviside layer, and (*b*) from the Appleton layer. Each trace is

To measure the height of either of the layers it is thus necessary to have (*a*) a very short signal pulse so that the signal arriving directly along the ground is received, recorded and finished with before the first echo arrives, and (*b*) a means of measuring small intervals of time such as $\frac{1}{1,000}$ of a second.

The latter is provided by means of a cathode-ray oscillograph. The method which has been developed by the Radio Research organisation, with which Professor Appleton is connected, is to control the sending-out of the signal pulses by means of the 50-cycle mains and to synchronise the time-base at the receiver by controlling it from the same source. This means that in each sweep of the time-base the ground signal always lands on the same part of the base, so that in, say, one-tenth of a second five such impressions are superimposed on each other and give an intensity of illumination sufficient to be photographed. Although echoes are liable to fairly rapid variation, they mostly remain sufficiently steady to give a similar super-position for such short periods as those of the one-tenth second exposure. The whole pattern of ground signal and echoes can be photographically recorded.

Multiple Echoes

The examples so far considered have been of one echo only, but in practice it is often found that echoes are received which have been up and down several times between the layer and earth. Instances of this kind are shown in Fig. 6, which is drawn from actual photographic records that have been published by the Radio Research Board. A time-scale of milliseconds is added to the records by means of an oscillator giving a square-topped wave-form as shown. Fig. 6 (*a*) shows a record of the ground signal and five echoes from the Heaviside layer. Fig. 6 (*b*) shows a series of echoes in which the second echo from the Heaviside layer becomes slightly mixed with an echo from the Appleton layer. It is interesting to reflect that the fifth echo in Fig. 6 (*a*) represents a signal that has been up to and down from the layer five times = 1,000 kilometres in getting from

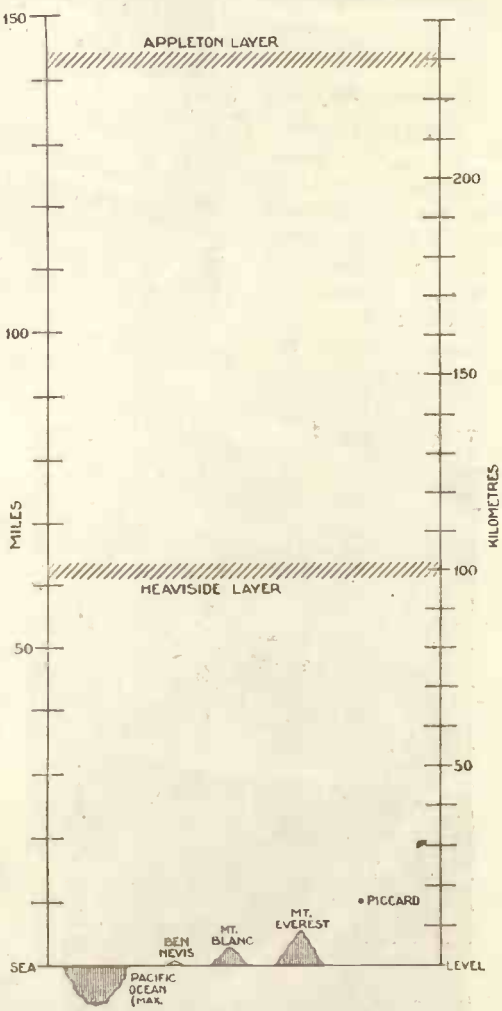


Fig. 7.—This sketch shows clearly the respective heights of several familiar landmarks on Earth compared with the height of the Appleton and Heaviside layers. Note the height attained by Professor Piccard

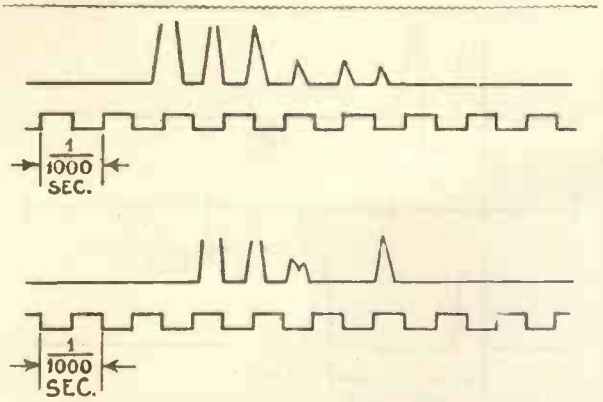


Fig. 6.—(a) Shows a ground signal and five echoes from the Heoviside layer and (b) another series of echoes, the second of which is affected by an echo from the Appleton layer

a transmitter to a receiver only a few hundred yards away. This distance of 1,000 kilometres is approximately equal to that between London and Genoa.

Ionised Layers Shown to Scale

On shorter wavelengths similar echoes are received from the Appleton layer, with increased spacing as indicated in Fig. 5 (*b*).

Some idea of the height of the Appleton and Heaviside layers in relation to familiar heights above the earth's surface can be gathered from Fig. 7. The record height reached by Professor Piccard is 16 kilometres, while Mount Everest is only about half that height. The deepest part of the Pacific Ocean is about the same distance below sea-level as Everest is above it.

The heights mentioned here are, of course, only typical. The levels of the layers and also their reflecting powers vary from hour to hour, and from day to day. A complete knowledge of these variations and of their cause is necessary before we can write the complete story of wireless.

Instances have been recorded of a rare type of wireless echo received back on earth after intervals of about 15 seconds. This delay is much greater than any connected with the Appleton layer, and so far these rare cases do not appear to be adequately explained. Certainly pages of "Wireless Magazine" are not tall enough to let us make a scale copy of the height from which these extraordinary echoes are received.

Professor Appleton is closely connected with the Radio Research Board

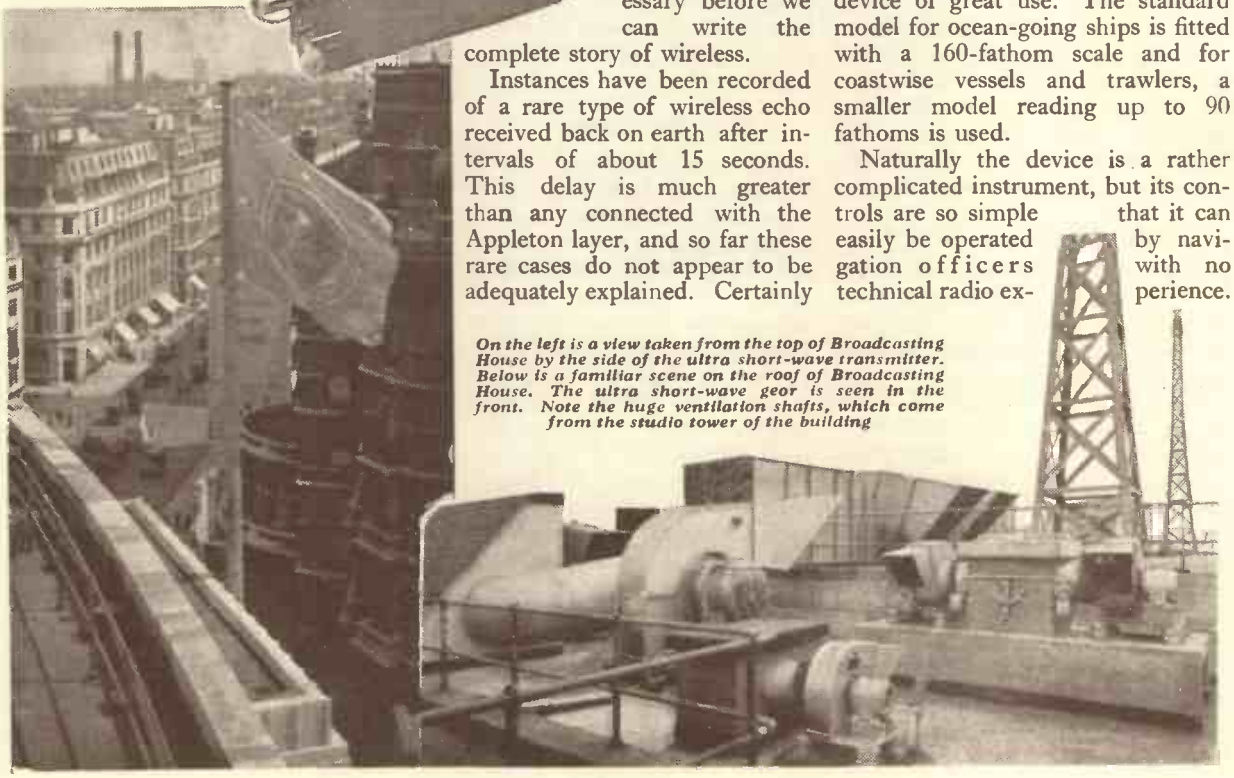
Readers who are especially interested in echo-sounding as applied to navigation, should read an article in last month's issue of "Wireless Magazine." A few copies are still available, price 1s. 3½d., post paid, from the Publisher, "Wireless Magazine," 58-61 Fetter Lane, E.C.4.

Standard Fitting for Ships

The Echometer, made by the Marconi Sounding Device Co., Ltd., is now a standard fitting on many ocean-going vessels. It has many advantages. The navigator of the ship has only to press a button to find the depth of water under the keel of the ship.

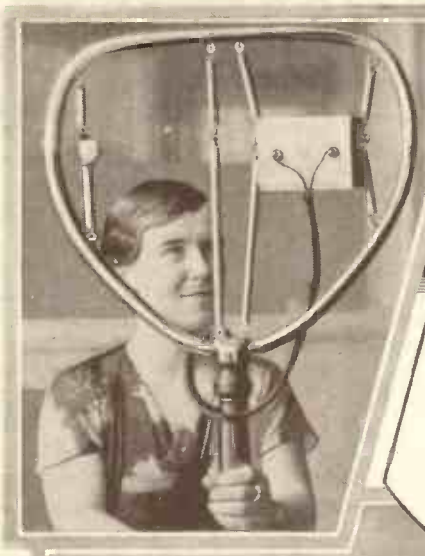
One does not have to be a sea-going person to realise what a boon this device is to the navigator. In times of fog, especially, is this device of great use. The standard model for ocean-going ships is fitted with a 160-fathom scale and for coastwise vessels and trawlers, a smaller model reading up to 90 fathoms is used.

Naturally the device is a rather complicated instrument, but its controls are so simple that it can easily be operated by navigation officers with no technical radio experience.



On the left is a view taken from the top of Broadcasting House by the side of the ultra short-wave transmitter. Below is a familiar scene on the roof of Broadcasting House. The ultra short-wave geor is seen in the front. Note the huge ventilation shafts, which come from the studio tower of the building

RADIO RIGA



Riga, the capital of Latvia, has a State-owned broadcasting system with studios in the city, together with a 15-kilowatt transmitter and a 35-kilowatt transmitter out in the country

The General Post Office building in Riga in which are the Radio Riga studios. Two of the announcers are shown above, Mme. Stein-Birkmanis and M. Baltpurvins

(Above) On the banks of the Duna, that immense river which runs half across Russia, before ending up in Latvia. A typical scene near Radio Riga

Mme. Stein-Birkmanis at the "mike" in the picturesque costume of the country. (Above) a bus conductress, who proves that in Latvia women have the same rights as men!

HOW MANY VALVES —in your 1934 Super?

By S. RUTHERFORD WILKINS

EVEN in these enlightened days the idea seems to prevail that the super-het is necessarily a large and unwieldy set simply bristling with valves and full of complications. Moreover, they will tell you that such sets are extremely costly to build and, although they will give excellent results in the hands of an experienced engineer, they present innumerable difficulties to the amateur constructor.

In the Good Old Days

These disturbing ideas originated in the good old days before the advent of neutralisation and the screen-grid valve. It was almost impossible to get any appreciable magnification from a straight H.F. stage, using a simple three-electrode valve, and the only means of obtaining a reasonable H.F. amplification was to employ a super-het. This made use of a large number of high-frequency stages, each contributing a small gain. Self-oscillation due to the high inter-electrode capacity of the valves was damped out by means of a " losser " resistance, which had the effect of making the circuits very efficient.

A set of this description often employed as many as four or five stages of intermediate frequency, and it can be easily realised that troubles due to instability were extremely prevalent, especially as the set was usually operated on the verge of self-oscillation in order to get the maximum amount of amplification.

The background noise level was very high, often being enough to drown quite powerful stations.

Since the advent of the screen-grid valve (and more recently still, the screened high-frequency pentode), super-het design has been a much simpler matter. One, or at the most two, efficient high-frequency stages will give as much magnification as will be needed for any ordinary purpose.

The introduction of the new multiple-electrode valves, such as the pentagrid, has made it possible to design a highly efficient super employing only four valves. The Merry-maker Super, which was described in the Christmas issue, was a set of this description, and represents, to my mind, the ideal set for the discriminating home constructor. The cost is reasonably low, the quality is excellent, and the selectivity and sensitivity are of an order that can cope with the most stringent ether conditions.

It is because of its high order of selectivity and stable sensitivity that the super-het scores, and, judging from the number of high-power transmitters that are springing up all over the world, it will soon be the only type of set capable of giving reception of any entertainment value.

With this thought in view, I have been experimenting lately with a view to lessening the number of valves in the super-het. A small number of valves means low running costs and a large saving in the number of coupling components required. These factors can all be summed up in two words—simplicity and cheapness—and when one combines simplicity and cheapness with a high standard of performance we surely have the ideal set.

The first problem that confronted me was the combination of the detector and output valve. Many wonderful tales have been told of the performance of a low-frequency pentode as a combined power detector and output valve, but I am afraid that success will never be achieved on these lines.

Pentode as Power Detector

Even when fully loaded, the average 2-watt A.C. pentode will not give more than 200 or 300 milliwatts output when used as a power detector, and this output can only be achieved on local stations. Better results have been obtained with an experimental valve consisting of two triodes contained within the same glass bulb and working from a single filament, one being used as a rectifier and the other as an output power valve. Such valves are not yet on the market, but the valve manufacturers are experimenting on these lines. I am convinced, however, that the most suitable valve for the job would be a combination of diode and low-frequency pentode.

Three-valve Super Coming ?

There is at present a very efficient pentode on the market that will give an output in the neighbourhood of 2 watts with an input of only about 5 volts. This input could be easily provided by a diode rectifier preceded by one or two efficient high-frequency stages.

Presuming that we shall soon have a valve of this kind, the three-valve super-het immediately becomes a practical proposition. The most obvious sequence of such a set would be combined detector-oscillator followed by one intermediate-frequency stage working into a diode-pentode. A set of this description would give excellent results from quite a large number of stations and

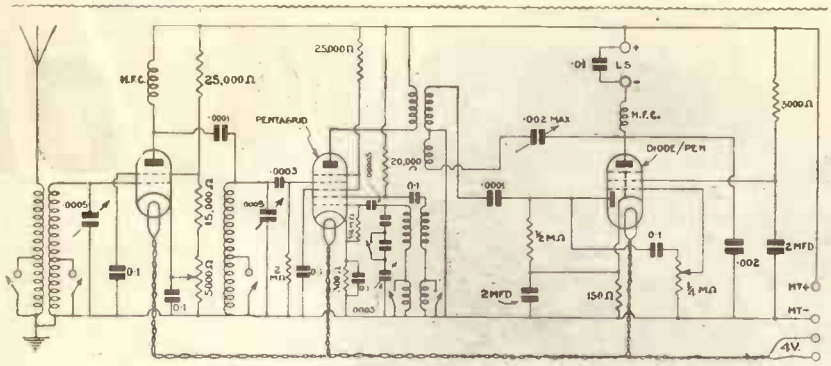


Fig. 1.—A circuit diagram of a three-valve super-het based on the considerations made in the accompanying article

will still have all the advantages of a super-het. Sensitivity will be somewhat restricted, owing to the fact that there will be no amplification between the rectifier and the output valve. This will necessitate a fairly large input to the first detector, which can only be provided by tight coupling between the aerial circuit and the first detector grid circuit.

Unfortunately, however, this will limit seriously the amount of pre-selection preceding the first detector and will give rise to a great deal of second-channel interference.

Compromise Necessary

This must be avoided at all costs, since it detracts from the main advantage of super-heterodyne reception—free from interference. Thus a compromise would have to be reached between sensitivity and selectivity, with the balance on the side of selectivity.

The type of set that I have just described could be made to give a high quality output from a limited number of stations free from interference and would form an excellent family set.

Another way of tackling the three-valve super problem would be to dispense with the intermediate-frequency valve and have a stage of high-frequency preceding the first detector.

No I.F. Amplification

The diode rectifier would be connected in the secondary of the first intermediate-frequency coil and there would be no amplification at the intermediate frequency. By this means pre-selection would be greatly enhanced and the aerial could be quite lightly coupled to the high-frequency valve without an undue amount of second-channel interference.

This system as it stands would give very little more magnification than a simple two-valve arrangement consisting of a tuned high-frequency stage followed by a diode pentode.

The advantages of the super-heterodyne circuit would be that the damping imposed by the diode on the preceding circuit would not be so noticeable at intermediate frequencies, and that the oscillator tuning, being sharp, would give the set a much higher degree of selectivity than the simple tuned high-frequency arrangement.

If we were to apply reaction to the single intermediate-frequency transformer of our three-valve super, its rather low magnification would be greatly enhanced. This, combined with the high degree of pre-selection obtained by means of the pre-high-frequency stage, should make an excellent little super. A great advantage of applying reaction to the intermediate-frequency transformer is that it does not have to be changed for different stations.

As all stations are ultimately amplified at the intermediate frequency, the amount of feedback needed to produce a given degree of magnification is always the same and the reaction control, once set, will need no further adjustment. It need not be a panel control, but can take the form of a simple pre-set condenser.

The difficulty with this scheme will be to get the necessary feedback after the diode rectifier to give the required reaction. However, I should think that sufficient high-frequency for the purpose could be obtained from the anode circuit of the pentode part of the diode-pentode. This could be by-passed by means of a high-frequency choke and condenser in the normal way.

Pentagrid Three-valve Super

A circuit diagram of a three-valve super based on the foregoing considerations is shown in Fig. 1. A pentagrid is used as a combined detector-oscillator and the output valve is the diode-pentode which, as I have mentioned earlier, is at the moment purely a theoretical assumption.

A suitable circuit for a two-valve super-het is shown in Fig. 2. It follows closely on the lines of the three-valve super, but the pre-high-frequency stage has been dispensed with and replaced with a bandpass filter.

Single Diode-pentode Circuit

These previous circuits have been made on the probable introduction of a single diode-pentode. But, presuming that success is obtained along these lines, there is nothing to stop a double diode-pentode being manufactured. The other diode can then be used to provide automatic volume control in the usual way in any super-het employing this valve with a high-frequency stage.

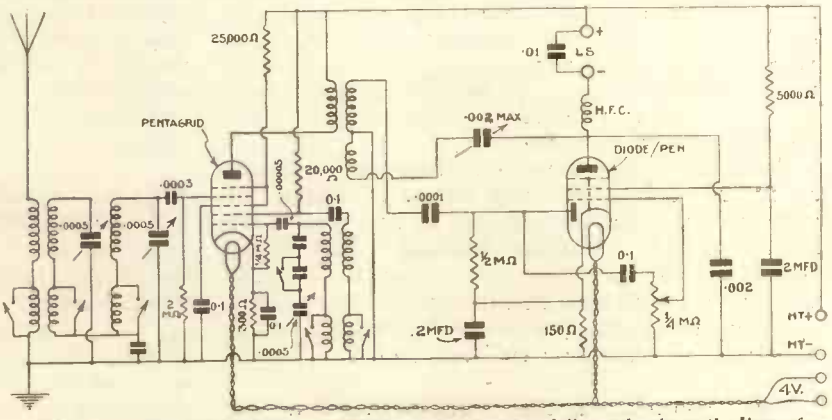
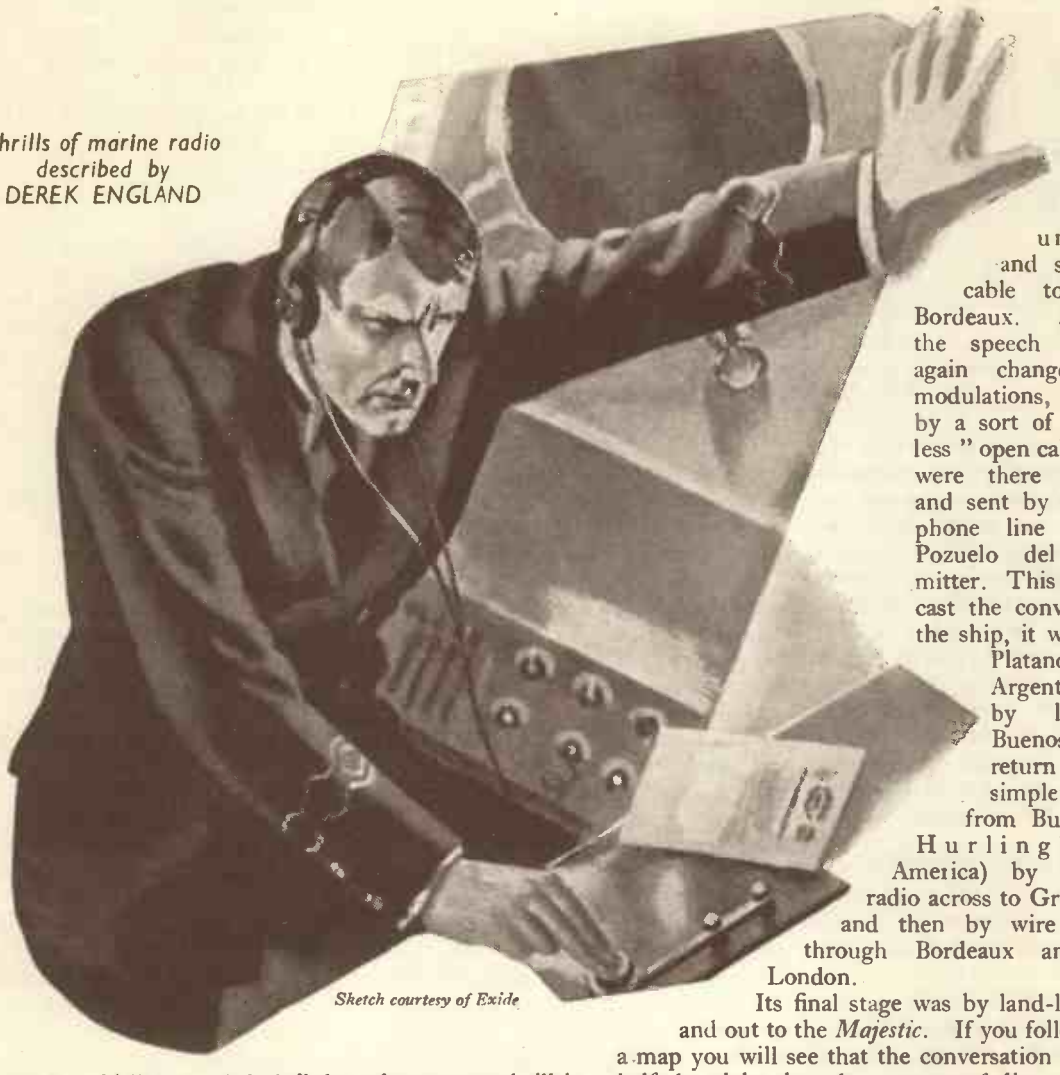


Fig. 2.—A suitable circuit for a two-valve super-het which follows closely on the lines of the three-valve circuit above, but has no pre-high-frequency stage

ON

Thrills of marine radio described by DEREK ENGLAND



Sketch courtesy of Exide

IN the old " dot and dash " days there was a thrill in giant liners being able to keep in touch over distances of thousands of miles. Morse code is still used for commercial telegraphy, but the introduction of ship-to-shore wireless telephony has added another thrill to ships' broadcasting.

Four years ago reliable ship-to-shore telephone conversation was considered impossible, but the Post Office officials and the wireless engineers have been hard at work, and the passengers on most of the bigger boats can now ring up any subscriber in Great Britain, throughout a voyage between Europe and the U.S.A. There is a special call office on board apart from the ordinary radio room.

The telephony from these special transmitters is picked up by the G.P.O. receiving station at Baldock in Hertfordshire, which is connected by land cable to the London Trunk Telephone Exchange. The return journey is made via Rugby, and so there is no mutual interference between the transmitters and the receivers.

A long-distance call was made when the *Majestic*, in mid-ocean, en route for New York, spoke to Buenos Aires.

What happened was this: Baldock picked up the ship's signals and passed them on to the London Trunk Exchange in the ordinary way. The Exchange plugged in to an underground and submarine cable to Paris and Bordeaux. At Bordeaux the speech signals were again changed to radio modulations, and were sent by a sort of " wired-wireless " open cable to Madrid, were there rectified and and sent by ordinary telephone line to the big Pozuelo del Rey transmitter. This station broadcast the conversation from the ship, it was received at Platanos in the Argentine and sent by land-line to Buenos Aires! The return journey was simpler, namely, from Buenos Aires to Hurlingham (South America) by land-line, by radio across to Grinon in Spain, and then by wire via Madrid, through Bordeaux and Paris, to London.

Its final stage was by land-line to Rugby, and out to the *Majestic*. If you follow this out on a map you will see that the conversation hopped across half the globe, but there was no fading—and the right number was obtained first time!

Ship-to-shore telephony will undoubtedly take up a deal of time on all liners in the near future, but it is only one of the many radio activities on board ship. The radio room has, at least, four separate jobs. The long-wave transmitters, coupled up to automatic morse senders, handle the commercial telegrams; and in the reverse direction pass news and correspondence from land to the liners. Most big ships have a daily paper printed by a small machine on board, and the news is gathered from Reuters, Central News and other agencies and received on wavelengths of 5,000 metres and upwards.

On the ordinary broadcast long wavelengths, and between 400 and 1,000 metres, weather reports are picked up and transmitted. These are sent by hand, but are in a figure code so that time is not wasted in transmission.

The rows of figures which can be received show the degree of visibility, the direction and strength of wind and weather cyclones and anti-cyclones, height of clouds and so on. Not only do the liners get weather reports from the shore meteorological stations, but they, in turn, " watch " the weather, and pass on radio reports.

THE HIGH SEAS!

Listening for S O S signals plays a big part in a liner's radio routine, of course, and some ships are fitted with an automatic receiver and S O S transmitter. In case of distress the automatic transmitter sends out a group of dashes which are so timed that they operate " tuned " relays of any automatic receivers within range, and ring an alarm bell. Most broadcast listeners imagine that " sparks " on board ship still uses apparatus savouring of the coherer days; they would have a surprise if they could see the bank of transmitters, receivers and auxiliary gear on a modern liner.

The *Empress of Britain*'s radio plant includes telegraph transmitters and receivers for long and short wavelengths, short-wave duplex apparatus with a world-wide radius; lifeboat wireless sets; a direction finder and, although not strictly speaking wireless equipment, a band repeater which provides entertainment throughout the ship.

A two-kilowatt Marconi transmitter for long-wave telegraph transmission is augmented by a two-kilowatt short-wave installation, and selective receivers are installed to ensure good reception over the complete band of wavelengths used by the ships. A direction finder facilitates the work of the navigators, and the latest type with the fixed frame aerial system has been installed.

Bearings with this instrument can be either true or relative to the ship's head, and a gyro-repeater, fitted with the direction finder, adds to the simplicity of taking true bearings by giving a direct reading from the compass dial. The outstanding section of the equipment is, of course, the short-wave radio telephone installation.

A refinement in the *Empress of Britain*'s equipment is the ability to speak from the ordinary cabin 'phones which are connected to the wireless telephone through the ship's manual switchboard, so that the telephone service on the ship is equally as convenient as that on shore.

The apparatus itself is designed for quick adjustment to the wavelength best suited to the atmosphere conditions of the moment, and is capable of communicating directly with any country offering suitable terminal facilities, and of making use of the land-line or wireless 'phone connections from such countries.

In this way, London is the connecting link between ship and practically every telephone subscriber in Europe, and similarly New York provides a telephone service for Canada, the United States, Mexico and Cuba.

The band repeater is a fine idea, of course, for it broadcasts music all over the ship. In order to present a variety of programmes, three schemes are provided. Microphones can be plugged-in in various places to relay the ship's orchestra, concerts and other events of interest.

A special type of receiver provides broadcast programmes as they become available; and gramophone records relieve the orchestra when necessary and supply the latest dance tunes. The main amplifier wireless receiver, gramophone with a double-turntable and a motor-generator, are accommodated in the band repeater room, lounge, and first-class dining saloon. Announcements can also be made through a microphone in the band repeater room.

Gone is the day when " sparks " occupied one small cabin on the upper deck! Four large cabins are devoted exclusively to the wireless equipment. The long and short-wave outfits and a broadcast receiver are contained in a large cabin just aft of the bridge. Two other cabins on the top deck are devoted to the radio 'phone apparatus. The receiving cabin is between the first and second funnels, and the transmitting cabin between the second and third funnels.

Mind you, although ship's wireless is not " broadcasting " in the normal sense of the word, this kind of thing is not remote from ordinary amateur listening. A " Wireless Magazine " reader Mr. C. E. Baron actually succeeded in picking up an S O S which saved a Russian steamer.

He happened to rise early one Sunday morning. This was at a time when great gales were causing havoc all over the country."

A gale had caused his aerial to blow down over night, and it seems like the working of Fate that, on this Sunday morning, he was so keen to listen to some of the ship traffic that he should be energetic enough to climb a 50 foot fir tree, in a strong wind, just in order to refix the aerial. There was much doing on 600 metres, and he spent several minutes picking up morse, idly jotting down figures and messages. The set he was using was a simple home-made three-valver, with a detector and two L.F. stages. Then he chanced upon quite a strong signal, and it wasn't until he recorded it that he realised what it was, " SOS SOS GNF GNF de RAEW RAEW SOS SOS. Please everybody come and help urgent."

Translated from the lingo of operators, this meant that a ship with the call-sign RAEW was in distress, and wanted help from the Post Office station GNF at North Foreland. He went on listening to this thrilling call for help, but no reply came from North Foreland. Risking a reprimand from the authorities, he rushed to the telephone, explained matters to the exchange, and in three minutes was speaking from his Surrey home to the officer in charge of GNF.

When he went back to the set he found that GNF was calling out for the ship, and was giving the warning signal QRT so that the Channel might be cleared for the S O S call. In the meantime he looked up the call RAEW in the official list, and found that it belonged to a Russian boat of 1.812 tons—*Jakov Sverdlov*—it had been driven ashore. Later he heard GNF tell the *Jakov* that three tugs were being sent to her assistance. Later still he picked up en route message from one of the tugs. Owners of short-wave sets often amuse themselves by listening to the trans-Atlantic ship-to-shore telephony on about 30 metres. This is not always jumbled for secrecy, and adds to the interest of radio reception!

RADIO KOOTWIJK!

THE MAIN KOOTWIJK SHORT-WAVER
This fine building is one of the group at Kootwijk housing the various transmitters described in the accompanying article

THE main point of the Kootwijk transmitters is for communication between Holland and her overseas possessions. The Dutch Government subsidises any attempt to maintain communication with the Dutch Eastern West Indies, and it was under a similar scheme that the short-wave broadcasts from Huizen were first started.

The first short-wave telephony transmitter (PSLL) was built there in June, 1927. A duplex conversation with Bandoeng, Java, which took place on September 20, 1927, was immediately a success and was one of the first duplex radio conversations over such a long distance.

This first station was a three-stage non-crystal-controlled transmitter of 32 kilowatts working on a wavelength of 18.4 metres. The corresponding station in Bandoeng was ANE, whose regular broadcasting transmissions on 15.93 metres were well known throughout the world.

On January 28, 1928, regular radio-telephony services between Holland and the Dutch East Indies was inaugurated. In the meantime, a new crystal-controlled transmitter with a power of 80 kilowatts was built.

On a new site three stone buildings have been erected, all of a simple character, but well suited to the purpose, while the distance from towns and railways ensures freedom from disturbance. In the first of these buildings are four telephone transmitters; in the second, the new telegraph transmitters; while the third one accommodates a completely new short-wave station.

The four telephone transmitters are used for traffic with the Netherlands East Indies and can, in an emergency, be used also as telegraph transmitters. They are amongst the largest in the world, and each develops an anode energy of 80 kilowatts in the last stage.

Eindhoven (PHI), 25.57 metres, 20 kilowatts; Eindhoven (PHI), 16.88 metres, 20 kilowatts. Transmits on Mondays, Thursdays and Fridays, 2-4 p.m.; Saturdays and Sundays from 2-4.30 p.m.

Of the four transmitters, two may be used simultaneously. On the right of the entrance to the building are the transmitters PCK (wavelength, 16.3 metres) and PDK (wavelength, 28.8 metres), which, having the same high-tension and modulation equipment, cannot be used at the same time. As a rule the shorter wavelength is employed, but the longer one is frequently used in the afternoons.

On the other side of the building are the transmitters PCV (16.85 metres) and PDV (38.3 metres), which correspond, constructionally, with the other two. The transmitters are all crystal controlled, and each consists of five stages, the final stage comprising four water-cooled transmitting valves, each of 20 kilowatts anode power.

The telephone transmitters here are worked on the Heising (choke control) modulation system. The modulation transformer weighs no less than four tons and is erected behind the switchboard. The stage comprises six water-cooled valves, each of 15 kilowatts, and there is a sub-modulator which comprises a 1.5-kilowatt valve.

To ensure the safety of those in the building, the transmitters are entirely enclosed by metal casings, so that it is impossible to come into contact inadvertently with any live parts.

Moreover, in case anything has to be done to the gear inside any casing, pressure on a single knob cuts off the power immediately, while each stage may be cut off separately if desired. Similarly, in case of emergency, the whole of the power of the station can be cut off by a single movement. Should the cooling water cease to operate on a single valve, the whole transmitter automatically stops.

The aerials for the beam transmissions, one for PCV and one for PCK, are both of the latest design, emanating from the Dutch Post Office Technical Service. Each beam aerial consists of thirty-two horizontal "doublets," hung in four rows of eight, one row above another between wooden framework masts 200 ft. high.

The connection of the vertical feeders with the central feed is so arranged that the distance between this point and each of the vertical wires is the same.

At about a quarter wavelength behind this aerial is a reflector, which corresponds in every detail with the transmitting aerial itself. By this arrangement, and by means of a change-over switch, the two beams which are normally directed towards the East Indies may be reversed so that the direction becomes that of America and the West Indies.

In the second building are eight short-wave telegraph transmitters of the same type as the telephone transmitters.

Here is just such a set as is needed in many homes—a three-valve A.C. transportable, self-contained and all ready to plug into the mains. It has been designed by the "Wireless Magazine" Technical Staff, of course. A special feature is a three-stage wiring guide—something that takes all the troubles out of chassis construction. Just read the article and find out all about this fine receiver!

The A.C. TRANSPORTABLE

Designed by the "W.M." Technical Staff

EVERYBODY is convinced of the convenience of a completely transportable receiver that can be carried about whenever it happens to be needed. Yet in spite of this, the popularity of portable receivers has declined amazingly during the last few years. The reason is, of course, that most people want to use mains sets if possible and the ordinary type of portable set means the use of batteries—with all their attendant troubles of running out and the need for recharging.

If it is desired to take the set out of doors, then, of course, there is no alternative to batteries. But if it is only desired to move the set from point to point in the house as occasion arises, then it is quite possible to make use of the electric-light mains.

That, then, has been our object in designing the A.C. Transportable—A.C., of course, because the majority of homes are provided with that type of lighting supply.

Here is a set that can be used anywhere in the house, provided there is an electric-light point into which to plug the mains connection. Apart from the necessity for making contact with the mains, the set is completely self-contained—with aerial and loud-speaker.

The advantages of such a receiver will be obvious to everybody. No longer will it be necessary to freeze in a cold dining-room because the set happens to be installed there, and the only fire in the house is that in the sitting-room. And if any member of the family should be confined to bed with a cold or 'flu, then the set can be taken into the bedroom during the day when the family does not need it and taken downstairs at night again when the "patient" is resting.

There is only one drawback to such a set—at least, that we can think of. In order to make the cost of construction reasonable, there is a limit to the number of valves—and a limited number of valves with a frame aerial means that only a limited number of stations can be picked up.

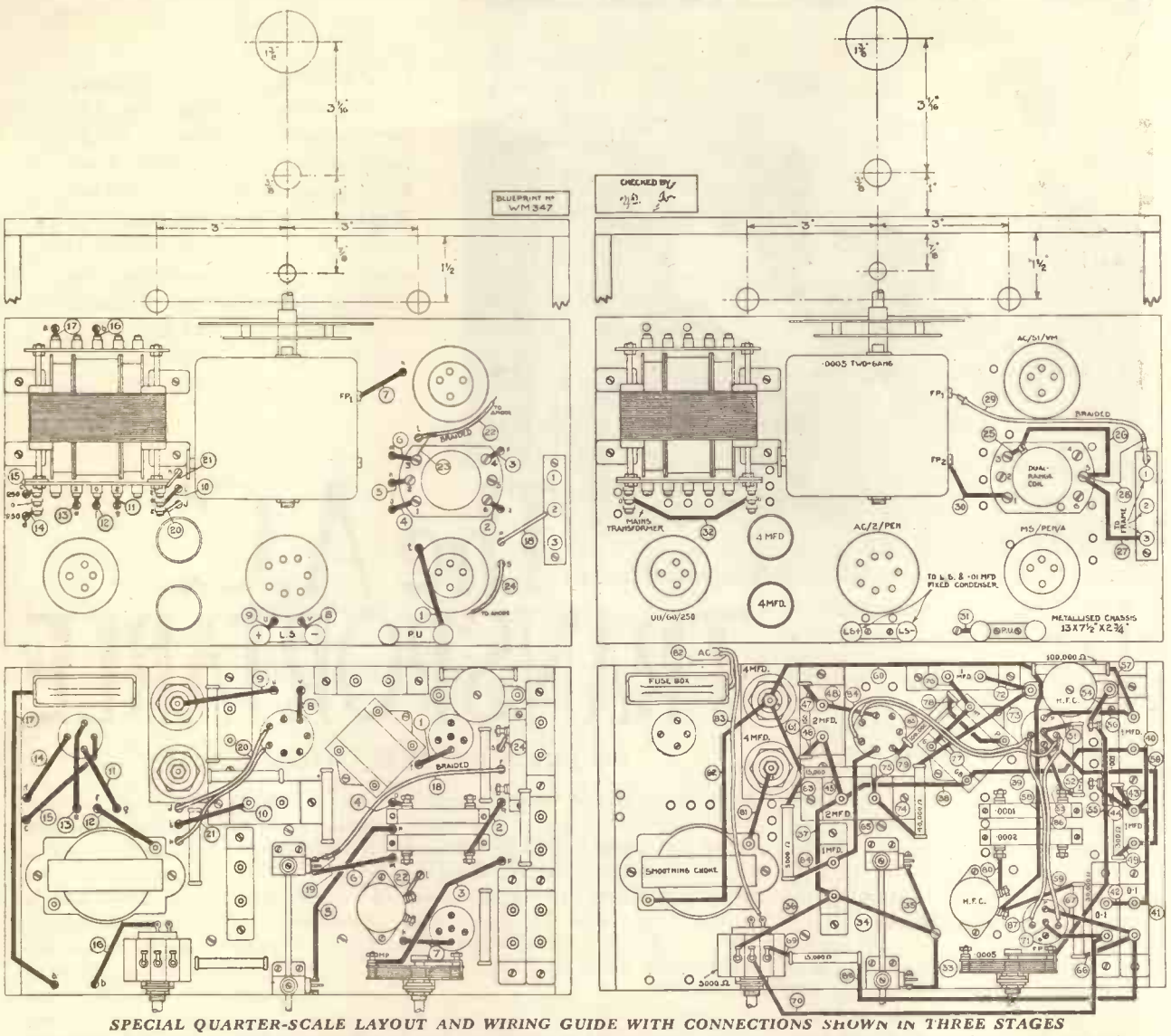
But—as our tests reveal—there is ample choice of programmes for most people—especially when the other advantages of the receiver are taken into consideration.

MODERN CHASSIS DESIGN
The set itself is mounted on the removable aerial framework for easy assembly and manipulation

This set, by the way, will make a most acceptable gift to almost anybody—provided they have A.C. electric mains laid on. Even families who already have a radio will welcome an additional receiver of the type of this A.C. Transportable.

Another point is, that the set occupies but a small space, and can be tucked away in any odd corner of the room, while, should it be desired to take it on a visit to friends or relations, it can easily be stowed away in the back of the car.

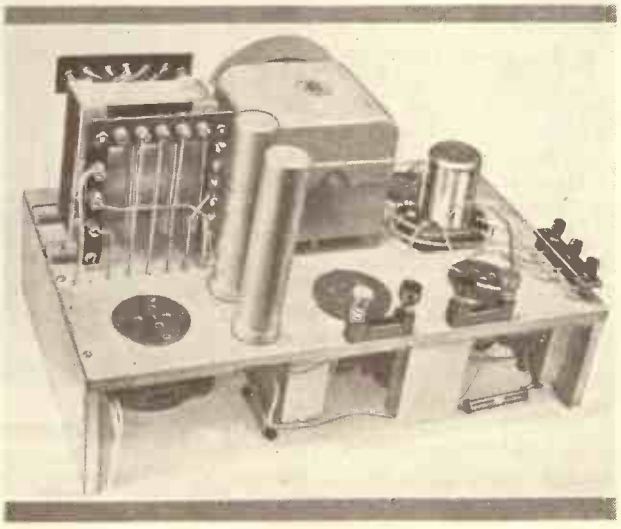
In operation the set is as simple as it is convenient in a general sense. There are only four control knobs and the operation of these will be mastered even by the non-technical listener in a few minutes.



SPECIAL QUARTER-SCALE LAYOUT AND WIRING GUIDE WITH CONNECTIONS SHOWN IN THREE STAGES

From the left-hand portion the wires that go from components on the top of the chassis to components on the underside can be easily followed. On the right all the wires on the top and bottom of the chassis respectively can be followed without difficulty. A full-size blueprint can be obtained for half price (that is, 9d., post paid), if the coupon on the last page of the issue is used by January 31

It will be noticed from the photographs, by the way, that there are actually four valves in the set although we rate it only as the three-valver. The function of the fourth valve is simply to rectify the A.C. supply from the electric mains to D.C. for application to the anodes of the three receiving valves. When considering the cost of construction, therefore, it must be borne in mind that this set is of a type that many manufacturers list as a four-valver.

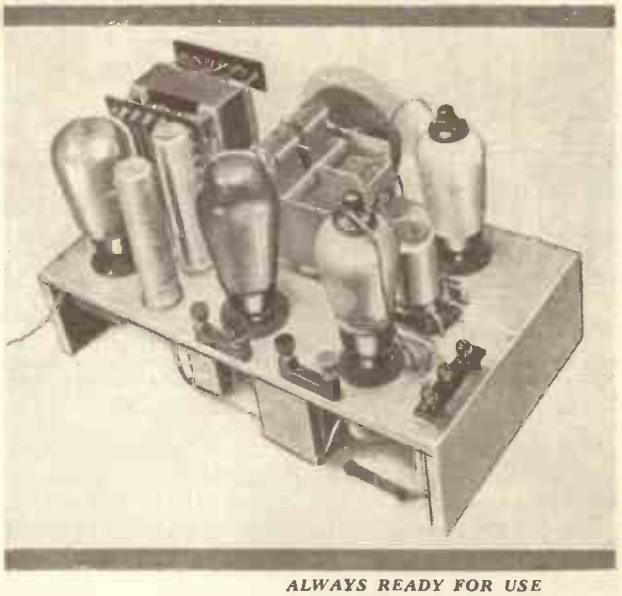


There is no need here to go into the details of the theoretical circuit, a diagram of which is reproduced on page 628. Signals picked up by the frame aerial are amplified by a variable-mu type of screen-grid valve, rectified and amplified by the detector, and then further magnified by the power pentode until they emerge from the moving-coil loud-speaker as programmes for your entertainment.

As already explained, we have used a valve rectifier in this set for converting the A.C. mains supply to

D.C., but those who prefer for any reason to use a metal rectifier can easily alter this part of the set to suit their own requirements. It should be noted, though, that the metal rectifier will occupy more space than does the rectifying valve and the layout may have to be altered accordingly.

In these pages we reproduce every detail necessary for the construction of the receiver. But at the same time we appreciate that many readers who intend to build the set will prefer to work from a full-size blueprint. Copies of this can be obtained in the usual way from the " Wireless Magazine " Blueprint Dept., 58-61 Fetter Lane, London, E.C.4. Ask for No. WM347 when ordering, and don't forget that you can get it for half price (that is, 9d., post paid), if the coupon on the last page of the issue is used by January 31.



ALWAYS READY FOR USE

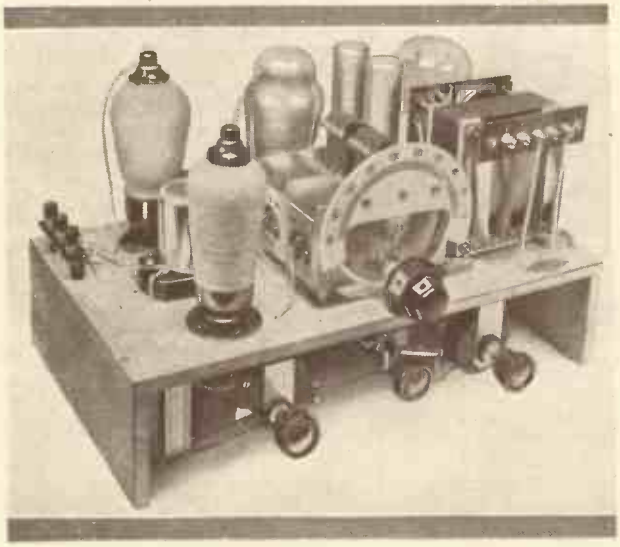
On this page we show three further views of the A.C. Transportable, the self-contained receiver that is always ready for instant use as soon as it is plugged into the mains

The reader will have noticed from the photographs that a chassis form of construction has been adopted. And in this connection the blueprint (and the quarter-scale reproduction opposite) has been arranged in an unusual way, which we believe will take all the complications out of this form of chassis construction.

It will be seen, in fact, that the whole layout has been drawn in duplicate. The wiring has then been shown in three sequences. First, on the left-hand blueprint, we show all the wires that pass from components on the top of the chassis to components on the underside. Secondly, on the right-hand blueprint, we show all the wires that go from point to point on the top of the chassis; and then we show all the wires that go from point to point on the underside of the chassis.

Thus there can be no confusion as to which wires go through holes in the chassis. We believe that constructors who build this set will welcome this innovation in wiring plans, for it does save a tremendous amount of time and trouble in sorting out the connecting leads.

In every instance, of course, the wires are numbered separately in the best and most convenient order of assembly—another thing that makes " Wireless Magazine " sets so simple to build, although they are of advanced technical design.

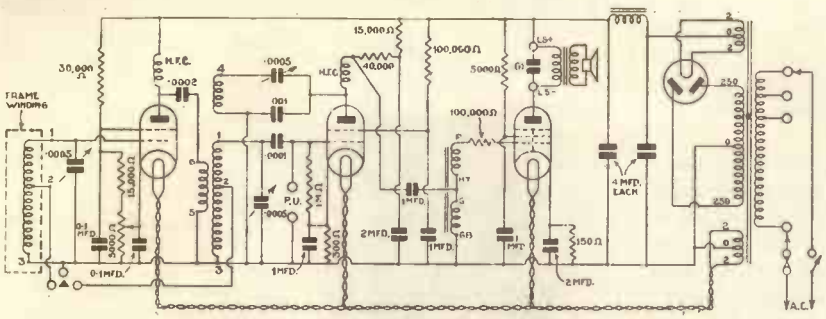


The method of construction is, therefore, as follows :

1.—Lay the top left-hand portion of the blueprint over the top of the metallised wooden baseboard (before the end supports are fixed into position) and then mark through with a sharp-pointed instrument the positions of all the holes that are needed for the component-fixing screws and for the wires that go from the top of the chassis to the underside.

2.—Reverse the baseboard (taking care that the top edge is kept in the proper position), and then mark through from the lower part of the blueprint the positions of the fixing screws for the remainder of the parts. The positions of the wiring holes have already been marked out on the top side.

3.—Drill through the holes needed in the baseboard for the connecting wires to pass through from one side to the other.



CIRCUIT OF THE A.C. TRANSPORTABLE

Three receiving valves are used in the set, the fourth valve being the mains rectifier. Every precaution has been taken to ensure complete stability of operation

4.—Fix in position all the components that are mounted on the top side of the chassis.

5.—Fix the remainder of the components on the underside of the chassis.

6.—Screw the end supports in position so that the chassis can be supported without any of the parts touching the bench.

7.—Start putting in position the wires that pass from the top of the chassis to the bottom. Begin with No. 1 and then work through in the proper numerical order, crossing the numbers on the blueprint through with a pencil as the corresponding connections are completed.

8.—From the right-hand side of the blueprint complete all the wiring on the top of the chassis (all the difficult top-to-bottom wiring has been done, by now, remember).

9.—Turn the chassis over and finish off the wiring of the set by connecting all the wires needed on the underside of the chassis.

10.—Put the valves in position, fix the set in the frame-aerial cradle, plug into the mains, and give a preliminary test!

Sounds very simple, doesn't it? And it is simple in practice for the "Wireless Magazine" staff have already done all the hard work for you. You have only to enjoy yourself for a few hours with a very clear wiring guide to help you.

It will be seen that the tuning condenser is of the trimmer two-gang type. This is so that the frame aerial and the coil in the grid circuit of the detector valve can be adjusted simultaneously with only one knob on the front of the set.

In other words, the frame has been designed to match up with the coil, as far as waverange is concerned. If any other coil is used, it is pretty certain that the winding of the frame aerial will have to be modified before the two tuned circuits can be brought anything like into step.

It would be an improvement, we admit, if the tuning scale were calibrated in wavelengths, but—short of using a complete tuning pack with coils and condensers in a single unit—that is impossible until our coil and condenser manufacturers get together and agree on standard inductance and capacity values—a standardisation that is long overdue.

It should be realised that the framework for the aerial is a sort of inner cabinet framework; in other words, the whole of the aerial assembly can be pulled right out of the cabinet, as will be necessary for winding on the wire. The method of doing this work will be clear from the diagram on the opposite page.

There are two sections of this winding, one for medium-wave tuning, and a second for long-wave reception. Both sections are switched to either waveband, together with the separate grid-tuning coil on the chassis, by means of a single wave-change switch, which is mounted directly under the main tuning knob.

On the left of the set is the reaction control, while on the right is the combined volume control and on-off switch. The latter knob is turned as far as possible to the left (that is, anti-clockwise) to switch the set off. As

COMPONENTS YOU WILL NEED FOR THE A.C. TRANSPORTABLE

	£	s.	d.
CHASSIS			
1—Peto-Scott Metaplex to specification	0	3	0
CHOKES, HIGH-FREQUENCY			
1—Varley, type Junior BP2 (or Telsen)	0	3	6
1—Lewcos, type MC (or British Radiogram)	0	2	6
CHOKES, LOW-FREQUENCY			
1—Igranic, type CH4 (or Heayberd, Ferranti)	0	9	6
COIL			
1—Telsen screened iron-core dual-range, type W349	0	8	6
CONDENSERS, FIXED			
1—Lissen .0001-microfarad (or T.C.C., Dubilier)	0	0	6
1—Lissen .0002-microfarad (or T.C.C., Dubilier)	0	0	6
1—Lissen .001-microfarad (or T.C.C., Dubilier)	0	0	6
1—Lissen .01-microfarad, type LN197 (or T.C.C., Dubilier)	0	1	0
2—Peak .1-microfarad, type A4 (or Lissen, T.C.C.)	0	3	8
4—Peak 1-microfarad, type A4 (or Lissen, T.C.C.)	0	8	8
2—Peak 2-microfarad, type A4 (or Lissen, T.C.C.)	0	5	6
2—Dubilier 4-microfarad electrolytic (or Peak)	0	9	0
CONDENSERS, VARIABLE			
1—J.B. two-gang .0005-microfarad, type Unitune (or Utility, Polar)	0	17	6
1—Polar .0005-microfarad, type compax (or Lissen, Magnum)	0	2	6
HOLDER, FUSE			
1—Belling Lee single, complete with 1-ampere fuse, type 1045 (or Bulgin)	0	1	6
HOLDERS, VALVE			
1—Clix four-pin chassis mounting	0	0	8
2—Clix five-pin chassis mounting	0	1	6
1—Clix seven-pin chassis mounting	0	1	0
RESISTANCES, FIXED			
1—Erie 150-ohm (or B.A.T., Siemens)	0	1	0
1—Erie 300-ohm (or B.A.T., Siemens)	0	1	0
1—Erie 5,000-ohm (or B.A.T., Siemens)	0	1	0
2—Erie 15,000-ohm (or B.A.T., Siemens)	0	2	0
1—Erie 30,000-ohm (or B.A.T. Siemens)	0	1	0
1—Erie 40,000-ohm (or B.A.T., Siemens)	0	1	0
2—Erie 100,000-ohm (or B.A.T., Siemens)	0	2	0
1—Erie 1-megohm (or B.A.T., Siemens)	0	1	0
RESISTANCES, VARIABLE			
1—Claude Lyons 5,000-ohm potentiometer, type M5	0	5	6
SUNDRIES			
2—British Radiogram 2-in. metal mounting brackets	0	1	0
1—British Radiogram terminal strip and insulating bushes and terminals	0	1	0
2—Telsen terminal blocks	0	1	0
Round tinned copper wire No. 20-gauge for connecting (Lewcos), say	0	0	6
Oiled sleeving (Lewcos), say	0	1	0
1—Bulgin knob, type K14, with reducing sleeve for 5/32-in. rod	0	0	5½
25 yds. Lewcos 27/42 Litz silk-covered wire	0	4	1½
100 yds. Lewcos 9/42 silk-covered stranded wire	0	4	0
SWITCHES			
2—Bulgin toggle, type S80B, complete with brass rod 6 in. by 5/32-in.	0	3	8
TRANSFORMER, LOW-FREQUENCY			
1—Varley Nicklet, type DP21 (or Igranic, R.I.)	0	7	6
TRANSFORMER, MAINS			
1—Igranic, type X22, with following windings: Primary, 200-250 volts. Secondary, 250-0-250 volts, 60 milliamperes; 2-0-2 volts, 3 amperes; 2-0-2 volts, 1 ampere	1	17	6

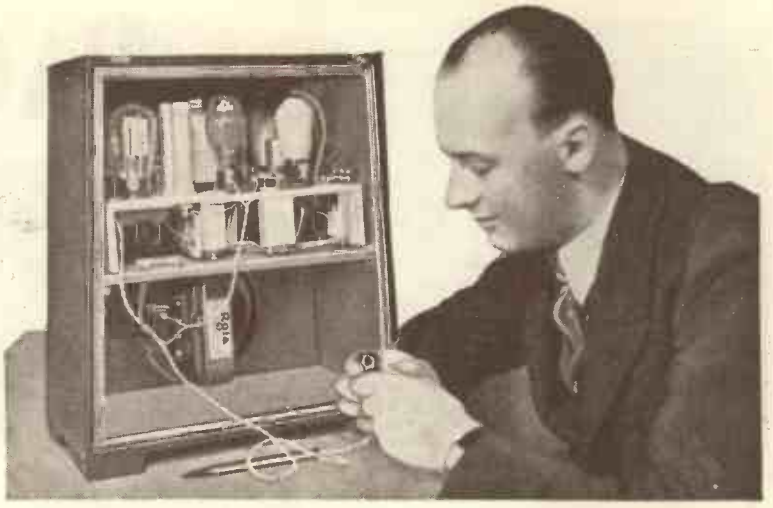
ACCESSORIES

CABINET			
1—C.A.C. type Stafford	1	15	0
LOUD-SPEAKER			
1—Rola, type F5PMP	1	12	6
VALVES			
1—Mazda ACSGVM	0	19	0
1—Cossor MSPenA	0	17	6
1—Mazda AC2Pen	0	18	6
1—Mazda UU60/250	0	12	6

the knob is turned to the right, the on-off switch is first put into the "on" position and from then on the volume is progressively increased until the point of maximum volume is reached on the right.

The reaction control is used in the usual way, of course; that is, it is turned carefully to the right until the set is brought into the desired state of sensitivity.

Before the set is completely housed in the cabinet it should be tried out in the inner framework. Don't forget to screw the chassis itself into position in the aerial framework in case it should be given an accidental knock; if it fell out on the bench it is almost certain that some damage would be done to the parts.



Some readers will wonder how the front of the cabinet can be marked out to accommodate the four control spindles that project through. The system we use in the "Wireless Magazine" laboratories is to remove the knobs from the spindles and then moisten the ends of the latter with white paint. The chassis is then slid into position and the first spindle to come into contact with the front of the cabinet leaves a white mark. The chassis is then withdrawn and a clearance hole drilled.

The chassis is again pushed into position and any other white marks are drilled out. In this way, the positions of all the holes are automatically found in exactly the right positions even though the spindles are of different lengths.

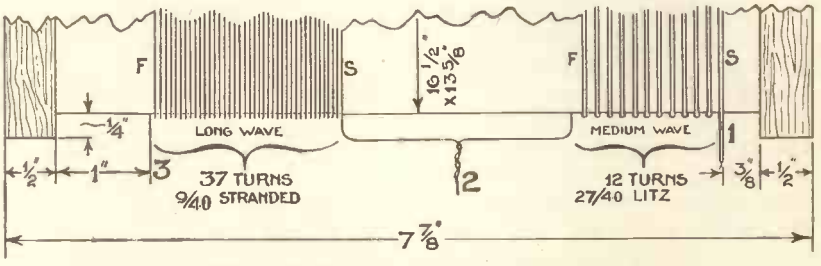
There is no necessity for readers to use this procedure, however, unless they particularly wish to do so, for on the blueprint the positions and sizes of the holes needed in the front of the cabinet for the control spindles are clearly shown.

Here are some final points about the design that should be noted by the prospective constructor:—

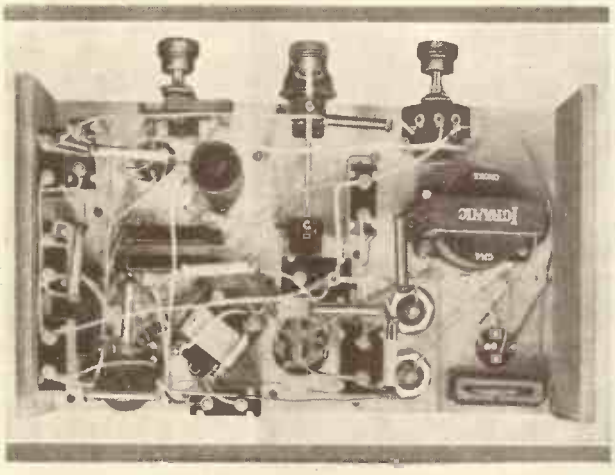
The material for making the chassis is metallised wood, but if desired, stout metal sheeting can be used. The latter is, however, very much more difficult to work and does not readily lend itself to changes of components.

The metal covering must be cut away from that part of the underside of the baseboard where the two electrolytic condensers are fixed.

The wave-change switch in the centre of the set is provided with an extension spindle and is therefore mounted on two brackets, one to carry the switch itself and the second to act as guide for the spindle.



HOW THE FRAME AERIAL IS ARRANGED
This diagram shows clearly the arrangement of the frame aerial for the A.C. Transportable. The winding is placed on an inner framework



UNDERSIDE OF THE CHASSIS
Note the compact nature of the layout. There will be no wiring difficulties, however, with the aid of the special three-stage wiring plan

When the set is first put into operation, the trimmer on the two-gang condenser should be adjusted until the maximum signal strength is obtained on a station about 350 metres with the panel trimmer at the half-way position. It is a good plan to gang at two points on the medium waveband, and then this ganging should hold good over the long waves.

A sure way of correct ganging is to insert a milliammeter in the detector-anode lead. When the needle is at its maximum dip, the set is correctly ganged. The main tuning knob should be turned up and down on the station very slowly during the operation. The milliammeter should preferably be of the 0-5-milliampere type.

And, in conclusion, even if you do not build this particular set will you drop us a post card and let us know what you think about the dual wiring plan?

RADIO IN YOUR CAR

By KENNETH JOWERS

TO have or not to have radio in a motor car is causing far too much argument. It is more irritating than amusing to those who have followed this side of the industry in America, where in a very short time sales have exceeded one million sets. In spite of the many setbacks car radio has received from scaremongers—who talk glibly about possible dangers—entertainment whilst travelling is definitely becoming more popular.

That most of these scaremongers have never had any experience of radio, let alone radio in cars, is quite obvious, otherwise how could they talk in such a manner? There is absolutely no need for all this outcry against car radio—can a radio be compared with a talkative companion when it comes to distracting the driver's attention on the road?

I am absolutely against listening-in when going through large towns or in heavy traffic, but here again only the most foolhardy drivers would do such a thing. Being a motorist with a radio fitted to my car, I have been watching points to see just what effect radio had on passengers and driver.

After the novelty has worn off, the receiver is used much less frequently—only when it is really needed, and there are such times. Just imagine what happens after a long journey of two hundred miles or so. You buy a local paper with an almost unheard-of name and find it full of news that is absolutely local with perhaps just the bare bones of the London news.

With news bulletins broadcast at least twice during the evening one does not feel so isolated from current events and, what is more, the correct time and weather forecasts are always available.

I remember some little time ago, before I fitted my car with radio, travelling north to Sheffield. Going into a little newspaper shop, I was sold the local edition, which contained absolutely nothing of interest to me. I meekly asked if they had any idea how the Arsenal had fared that afternoon. I was told with great emphasis that they hadn't the slightest idea and, to add insult to injury, followed this up with a lengthy discourse on the finest football team on earth, the local United. One is apt to forget little things of this kind, but anyway, with a radio all the news I wanted could have been picked up from Daventry.

It has to be experienced to realise the pleasure it gives to tune in a favourite item, such as a dance band or a Queen's Hall concert when a long way from London, say on the Yorkshire moors or in Scotland. Many may say that they are not likely to go on long trips and certainly not to the Yorkshire Moors; well then, what happens when you go to a theatre? The main evening radio programme starts round about eight o'clock as a general rule and goes on for a little over an hour. This means that you hear the first two or three items, which are usually of little importance, and then have to leave for the theatre in the middle of the programme when the best items are due.

With radio in the car the position is quite different, the most interesting items can be heard on the way to the theatre, for remember that town traffic is very light at that time in the evening.

In America we have a totally different outlook to consider. Every new motor car, even if it is not actually fitted with a complete radio outfit as extra standard equipment, is supplied with an aerial, earth, and clips for the radio set so that the radio is a matter of only a moment's fitting. All long-distance passenger coaches are equipped with either a loud-speaker or headphones for each

RADIO AT BROOKLANDS

Instructions can now be given to racing car drivers during the course of an event by short-wave radio. Here is an M.G. fitted with a set to pick up short-wave signals from the pits

To cut out interference from the electrical system of a car, suppressor resistances must be fitted in series with each plug lead as shown in the photograph above. Car radio sets are simple to control and the right-hand photograph shows the control panel of a Philco-fitted car

passenger. Admittedly, the journeys are considerably longer, but why should we not make our comparatively short trips as comfortable as we can? The commercial vans are quite often equipped with radio, particularly on long night runs, as the American stations are on the air until two and three in the morning.

For some time there has been a great deal of talk about banning radio in cars, and it has done the whole of the radio trade a great deal of harm. Fortunately, most of those who were interested at the time soon realised that such a ban could not possibly be put into operation as it would make this country look particularly foolish in view of the situation in other parts of the world, and America in particular.

It must not be thought for one moment that there is anything complicated about car radio or that it must be expensive, it is simply an entirely new technique. Providing that certain fundamental principles are borne in mind, any amateur could build his own receiver from parts available from manufacturers who specialise in miniature and small type components.

There are three features which cannot be overlooked if you intend to be successful. The first is ample high-frequency amplification, the second is compactness and last, but by no means least, is automatic volume control, for without this refinement the whole installation would be practically useless.

When trying to decide the type of receiver to build, instead of wasting time discussing the relative merits of various designs, it is quicker and better to cast an eye over the various specifications supplied by set manufacturers. They know by costly experience the best type of set to build, while at the same time keeping an eye on the all-important shillings.

If we consider one of the best examples of car radio design to-day, the Page type "A," we find a set with an all-steel chassis using six valves in a super-het circuit. A single stage of high-frequency amplification precedes the first detector-oscillator, to give freedom from whistles and to make up for the small pick-up by the comparatively inefficient aerial.

Westectors are used to provide automatic volume control, otherwise Catkin valves—which are almost unbreakable—are used throughout. In common with most other manufacturers, the Catkin pentode provides sufficient volume to drive a moving-coil loud-speaker without taking up too much space.

The controls—tuner, wavechange switch, combined volume control and on-off switch are all terminated in a remote-control unit that is intended to be clamped to the steering column.

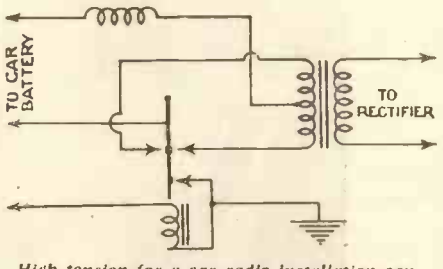
Practically all car radio sets use a super-het circuit with perhaps one exception, that is the Philips. They use their special Super Inductance circuit, which is the nearest approach to a super-het.

When the receiver is wanted only for weather reports and time signals much simpler apparatus would be quite suitable. Do you remember P. K. Turner's "baby" set in *Amateur Wireless*? This could be adapted quite easily.

The most difficult job of all is fitting the aerial, because so many of our motor car manufacturers do so like emulating Rip Van Winkle, but if you have a Hillman, Humber or a car that has chicken wire on the roof, the job is as good as done. Unstitch an inch or so of the roofing fabric, clean the chicken wire behind it and connect to this a length of rubber-covered flexible wire for a lead-in. Of course, if you haven't any chicken wire the idea is not so good, so you will have to go about it in a different way!

The earth contact is even more simple—just connect a wire to the car chassis or to the negative side of the accumulator.

Accumulators bring us to the all-important power supply. Your final choice here is more a matter of pocket depth rather than of relative efficiency. A converter that will give 200 volts or so A.C. from a 12-volt accumulator is undoubtedly the only sound way of obtaining the necessary current.



High-tension for a car radio installation can be provided by means of a vibrator converter. This circuit shows the scheme of connections used in the Philco vibrator

A Radio Fan's Causerie—

AMAZING VALVE MACHINE
This robot machine in the Cossor works "getters" valves and then runs them with grid and anode voltage to stabilise the characteristics

Towards the New Year

THIS issue of "Wireless Magazine" will be in most readers' hands before Christmas, I expect, so let me take this opportunity of wishing you all the best for both Christmas and the New Year.

Once again His Majesty the King will speak to us on Christmas Day. His voice will be heard all over the world, it seems, for as I write these notes I learn that the royal message will be sent out from the Empire transmitters at Daventry and will also be relayed throughout the United States via the Columbia and N.B.C. chains.

What more convincing demonstration could be given of the great power for good and international good feeling that broadcasting has given to the world?

◆ ◆ ◆

Tricks in Valve Making

Although it is often said that the manufacture of valves is no more difficult than the making of electric lamps, that is not exactly the literal truth, of course.

There are many snags to be overcome that do not crop up at all in lamp manufacture. The last valve factory I visited was Cossor's; and this month I am able to reproduce a photograph of an amazing endless band that "getters" valves and then "ages" them under load.

This machine is the only thing of its kind that I have come across and it is certainly most spectacular. The valves are put into position ungettered at one end of the "run" and at the other end are removed—having been "gettered" and "aged" during their travel to the roof and back!

◆ ◆ ◆

An Adventure with Hum

A few days ago a friend and I went to see some people whose set had developed noises because of a faulty switch in the tuning coils. It was a five-valve A.C. receiver and in order to get at the works it was necessary to pull the set out of the cabinet. This we did without first switching it on; we knew from experience where the trouble lay.

A PEEP INTO BROADCASTING HOUSE
A scene taken during the broadcast of a revue entitled "Good Evening." Olive Groves is singing "Blackbird in the Apple Tree"

MEDLEY

Conducted by BM PRESS

Having put in a new set of coils (I held the screwdriver and pliers while the other fellow did the actual work!), we switched the set on and hoped for the best. Well, there were no crackles from the coil switch, but there was a most objectionable hum from the loud-speaker. This surprised us because previously the set had been almost entirely free from such an annoyance, although it was being used on mains that have a most unsavoury reputation locally.

We both scratched our heads and poked about inside the set. Nothing seemed to have fallen off and we began to suspect that some part of the smoothing gear must have suddenly given up the ghost.

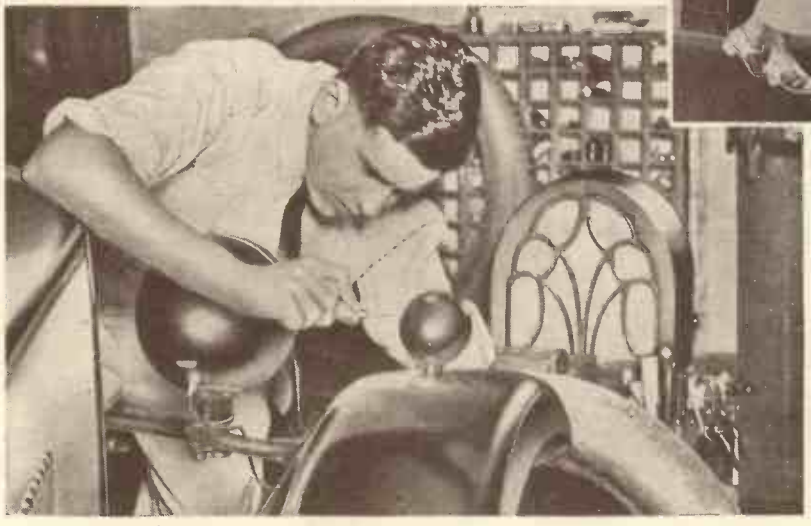
Tracking the Trouble

Suddenly it occurred to me that the mains leads to the set were running very close to the loud-speaker leads (remember that the set was out of its cabinet on the floor). I suggested moving them—and the hum at once disappeared.

Smiling to ourselves, we began to lift the set up to place it back in the cabinet. Imagine our amazement, then, to hear the hum come back at full force when the set was about a foot off the floor!

Further trial showed what the trouble was—and it was not easy to guess. It appeared that one of the lighting leads to a wall plug was right under the floor—just at the spot where we had rested the set. As soon as the whole thing was moved a yard away from this hidden mains lead there was no more trouble.

I don't quite know what the moral of this experience is—except that you never can tell in radio!



RADIO WHILE AT WORK ON THE CAR

Making good use of extension loud-speaker, in this case an H.M.V. moving-coil model, while doing some odd jobs in the garage—an idea many motorists will want to copy

Putting Up the Selectivity

As a matter of fact we had another problem to face with this particular set when it was working again. The new coils we had put in were more sensitive than the old ones, with the result that an aerial series condenser was needed to bring the selectivity up a bit on the aerial coil.

Of course, we had no series condenser with us and there wasn't one in the house either. Another problem to solve! Well, that was soon settled, for I have had to improvise such a condenser before. We simply cut the aerial lead to the set, overlapped the two ends by about a foot, and then twisted them together!

This proved quite an effective solution of the problem. Did I mention "improvisation"? Well, the arrangement has been left to work permanently!

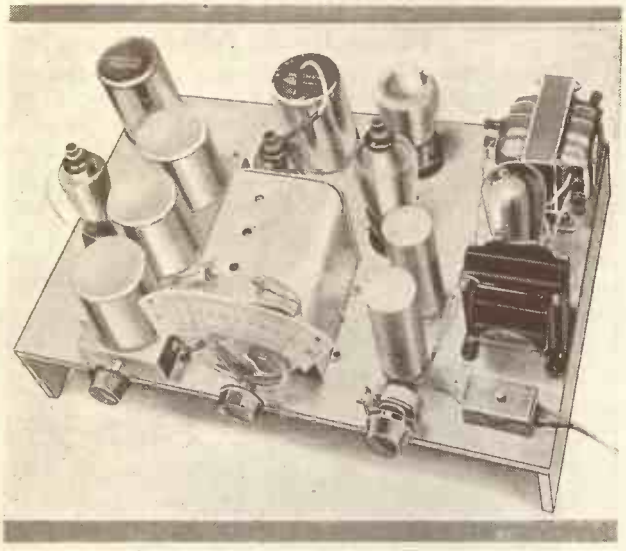
London, W.C.1. BM/PRESS

A GERMAN MONSTER

Seven times life size, this giant model of a new receiver was exhibited in Germany recently. Note the novel tuning-dial arrangement; the scale carries the names of many broadcasting stations

MORE ABOUT

The MERRYMAKER SUPER



Last month we gave full constructional details of this very efficient four-valve A.C. super-het. In these pages we explain the many new technical ideas incorporated

IT is quite safe to say that without the pentagrid valve the Merrymaker Super would not have been possible. This may sound a sweeping statement to make unless the design is carefully analysed in all its aspects. Of the ordinary run of super-hets, the detector-oscillator circuit is the weakest point. With uneven oscillation over the wavebands and bad coupling, results are generally a compromise of extreme efficiency and average results over both wavebands.

The pentagrid has changed all that. Electronic or emission stream coupling made constant oscillation possible, while more efficient coils have been used which will gang up without difficulty and, what is more, *stay ganged*.

How successful this circuit is can be seen by the tuning graph given last month on page 479. This graph is almost perfect, with only the slightest curve at the extreme top and bottom. It need hardly be stressed that with such perfect tuning ganging is the easiest thing in the world; no juggling is needed to find the best average position for the trimmers.

With the detector-oscillator position cleared up you can be sure that we went right ahead to make the Merrymaker Super the best ever, for remember that this was the first time we were able to use a pentagrid. We do not use new valves if they are not available in quantities.

The intermediate-frequency stage was easy. A variable-mu high-frequency pentode gives almost the gain of two screen-grid valves of standard type, so we need not worry about the efficiency of this stage.

Although getting stations is quite a simple matter, quality is of greater importance in a high-class set of this kind.

Two or three points are at once obvious. The second detector will have to handle large inputs without stress, and at the same time give distortionless output. Automatic volume control must be included, otherwise the DX possibilities of the set would be at a discount.

This calls for a diode for detection and a diode for the self-adjusting volume control voltage. Well, a double-diode would be suitable for the job, but has the disadvantage of giving practically no output. To overcome this difficulty a Cossor DD/Pen was finally used. The output was found to be greater than that of a standard triode detector, but with much better quality owing to the diode detection.

We have been asked to explain why it is that the quality is so good with such a small low-frequency transformer and a standard pentode valve. Part of this has been answered already; it is due to diode detection and a band-pass filter input which gives the maximum selectivity without top-note cut-off.

In addition to these

A SET FOR THE CONNOISSEUR
All the latest modern radio refinements have been incorporated in the Merrymaker. The photograph shows the set ready for use

features, the low-frequency stage is not so simple as it looks. Have you noticed how the transformer is coupled to the DD/Pen ?

You should know that to obtain good quality the transformer primary must have a high inductance when anode current is flowing through it. To obtain this high inductance a combination of a large soft-iron core and plenty of primary turns is required.

As it is quite impossible to get these qualities in a transformer of this minute size, other ideas have to be considered. Without any primary current even quite a small transformer will have a fairly high inductance. As the current need not flow through the transformer primary it can be connected to the anode by means of a really large fixed condenser, so that all frequencies down to 40 cycles or so are passed on.

Now this condenser will prevent D.C. current from going anywhere except to the valve anode, but it does not prevent the speech currents from reaching the transformer and feeding into the pentode valve. This system of coupling is known as parallel feed. The inductance is kept high even though the anode current is raised to a higher level than usual.

Looking back on previous sets and comparing them with the Merrymaker, we wonder where valve design will lead us.

The pentagrid valve: five grids and eight electrodes in all. Six electrodes in the high-frequency pentode and a three-in-one valve, then the double diode-pentode with its eight electrodes, not to say anything of the simple output pentode with a mere six electrodes.

There is no need to wonder from whence the selectivity and volume comes.

Self-adjusting volume control is an asset, though not generally appreciated.

EASY TO GANG

A feature of the Merrymaker is its extreme simplicity of operation. Once ganged, the set will stay ganged over both wavebands

We will try to tell you what it means to you and why you cannot be without it. Connect up side by side a normal four- or five-valve set and the Merrymaker. Tune in a station that you know fades and dithers. On the normal set reception will be like the sad sea waves, continually increasing and reducing, while the Merrymaker will provide steady reception for 95 per cent. of the time.

As this sort of thing happens with nearly all foreign stations at some time or another, it stands to reason that the Merrymaker must provide more entertainment over a given period than a set *without* automatic volume control. That is why you cannot be without it.

COMPONENTS YOU WILL NEED TO BUILD THE MERRYMAKER SUPER

	£	s.	d.
CHASSIS			
1—Peto-Scott Metaplex, to specification	0	4	6
CHOKE, HIGH-FREQUENCY			
1—Wearite type HFS (or Bulgin, Goltone)	0	4	6
CHOKE, LOW-FREQUENCY			
1—Ferranti, type B1 (or Heayberd, Parmeko)	1	1	0
COILS			
1—Wearite set of three mounted on one base, type GN3	1	10	0
CONDENSERS, FIXED			
1—T.C.C. .00005-microfarad, type S (or Dubilier, Telsen)	0	1	3
2—T.C.C. .0001-microfarad, type S (or Dubilier, Telsen)	0	3	9
1—T.C.C. .0003-microfarad, type S (or Dubilier, Telsen)	0	1	3
1—T.C.C. .001-microfarad, type S (or Dubilier, Telsen)	0	1	6
1—T.C.C. .01-microfarad, type S (or Dubilier, Telsen)	0	2	6
1—T.C.C. .05-microfarad, type 40 (or Dubilier, Telsen)	0	1	9
5—T.C.C. .1-microfarad, type 50 (or Dubilier, Telsen)	0	9	2
3—T.C.C. 1-microfarad, type 50 (or Dubilier, Telsen)	0	5	8
3—T.C.C. 2-microfarad, type 50 (or Dubilier, Telsen)	0	7	8
1—Dubilier .2-microfarad centre-tapped, type BE31L (or Peak, T.C.C.)	0	3	0
2—Dubilier 8-microfarad electrolytic (or Peak, Telsen)	0	11	0
CONDENSERS, VARIABLE			
1—Polar three-gang .0005-microfarad, type Star Minor, with arcuate drive	1	4	6
HOLDERS, VALVE			
3—Clix four-pin chassis mounting	0	2	0
2—Clix five-pin chassis mounting	0	1	6
2—Clix seven-pin chassis mounting	0	2	0
HOLDERS, FUSE			
1—Bulgin twin, complete with fuses type F14 (or Belling Lee)	0	2	3
RESISTANCES, FIXED			
1—300-ohm Siemens, type SS, ½-watt	0	0	7
1—350-ohm Siemens, type SS, ½-watt	0	0	7
1—450-ohm Siemens, type SS, ½-watt	0	0	7
2—5,000-ohm Siemens, type SS, ½-watt	0	0	7
2—20,000-ohm Siemens, type SS, ½-watt	0	0	7
2—25,000-ohm Siemens, type SS, ½-watt	0	0	7
1—30,000-ohm Siemens, type SS, ½-watt	0	0	7
1—50,000-ohm Siemens, type SS, ½-watt	0	0	7
1—100,000-ohm Siemens, type SS, ½-watt	0	0	7
1—¼-megohm Siemens, type SS, ½-watt	0	0	7
1—½-megohm Siemens, type SS, ½-watt	0	0	7
1—1-megohm Siemens, type SS, ½-watt	0	0	7
1—2-megohm Siemens, type SS, ½-watt	0	0	7
RESISTANCES, VARIABLE			
1—Claude Lyons ½-megohm with two-point switch, type P5/500A/S	0	8	6
SUNDRIES			
1—B.R.G. 2-in. metal mounting bracket	0	0	6
Round tinned copper wire, No. 20 gauge, for connecting (Lewcos), say	0	0	9
Oiled sleeving (Lewcos), say	0	1	6
3 ft. shielded sleeving (Lewcos), say	0	0	6
4 yd. thin flex (Lewcoflex), say	0	0	4
2—Bulgin knobs, type K14	0	0	9
1—Bulgin knob, type K12	0	0	6
TERMINALS, ETC.			
1—Clix strip, marked: A1, A2, E	0	0	7
1—Clix strips, marked: Pick-up, L.S.+, L.S.—	0	0	8
TRANSFORMERS, INTERMEDIATE-FREQUENCY			
1—Wearite, type OT1	0	10	6
1—Wearite, type OT2	0	10	6
TRANSFORMER, LOW-FREQUENCY			
1—R.I. Auto-Parafeed, type DY45	0	6	9
TRANSFORMER, MAINS			
1—Wearite, type T21A	1	5	0
VALVES			
1—Ferranti Heptode, VHT4	1	0	0
1—Ferranti VPT4	0	17	6
1—Cossor DD/Pen	1	0	0
1—Cossor MP/Pen	0	18	6
1—Cossor 506BU	0	12	6

ACCESSORIES

	£	s.	d.
CABINET			
1—Osborn 259	3	10	0
GRAMOPHONE MOTOR			
1—Garrard A.C., type 202A	2	10	0
LOUD-SPEAKER			
1—Magnavox Permanent Magnet Senior, type 252	3	3	0
NEEDLE CUP			
1—Bulgin Duplex	0	2	6
PICK-UP			
1—B.T.H. De Luxe	1	17	6

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

Wireless Magazine. January, 1934

Making the Most of the Super-het

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

The heart of the super-heterodyne receiver is the frequency changer. This article goes to the root of the matter and will be of practical value to all super-het enthusiasts

IN a super heterodyne receiver the oscillations picked up by the aerial are changed in frequency by a valve which used to be called the first detector but is now more usually termed the frequency changer. The main part of the amplification of the signals is then carried out at the intermediate frequency, or I.F. for short, and the amplifier can be designed to be both powerful and selective.

Frequency Changing Explained

It is clear that a great deal must depend on this operation of frequency changing, but the significance of this stage is often overlooked. Let us analyse the process briefly.

The method usually adopted is to provide a local oscillation which is adjusted to be a certain definite frequency away from the signal being received. This oscillation and the received signal are both applied to a detector valve where they mix and produce a composite oscillation. The exact frequency of this composite wave does not worry us at the moment, but the interesting point is that its strength is continually rising and falling.

Maximum Resultant Current

If the local oscillation and the signal received on the aerial happen to add up at any particular moment the strength of the resultant current is a maximum. If they are in opposite directions the result will be the difference between the two, and the strength of the composite wave produced will vary between these two possible extremes. It will actually continue to do this at a rate equal to the difference between the frequencies. If we have an incoming signal at 800 kilocycles and a local oscillation of 900 kilocycles the wave produced by the mixing action in the frequency-changing valve will vary in strength at a frequency of 100 kilocycles, i.e., 100,000 times per second. This is what we call the intermediate frequency, and we select this and pass it on to the intermediate-frequency amplifier.

This is the process in simple terms. In practice we have to consider two specific points :

(*a*) We require the arrangement to give a large I.F. output for a small received signal.

(*b*) We do not want any other frequencies apart from the true intermediate frequency.

Both these conditions are fulfilled by using a " square-law " detector. This is just the reverse of the ordinary form of detector, for in a straight set we require the output from the detector to be directly proportional to the input. In this case we require it to be proportional to the *square* of the input so that if we double the input we get four times the output, and so on.

The reason for this involves a discussion of the theory of detection, and it is not necessary to go into this now. The point to be considered here is how to obtain square-law detection. This may be done by using an anode bend detector, provided the strength of the local oscillation is not too great.

The ideal arrangement is to use entirely separate valves for generating the oscillation and for frequency changing. Fig. 1 shows a suitable circuit in which the local oscillation is generated by an ordinary triode while the frequency changing is carried out by a screen-grid valve arranged to operate as an anode bend detector *having a fixed bias*.

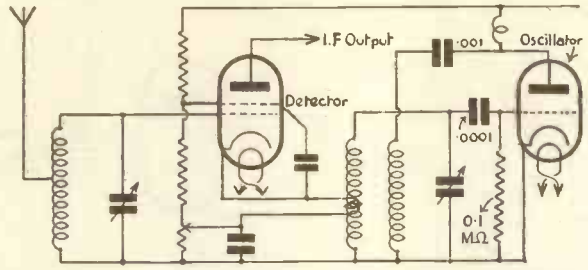
Importance of Fixed Bias

This latter point is important. There is a potentiometer connected across the high-tension supply which feeds the screen of the valve. This potentiometer is made to take several milliamps current so that the effect of the anode current of the valve (which is quite small, since the valve is acting as a detector) is negligible. The bias for the valve is then taken by tapping off a suitable voltage on this potentiometer, and this keeps the bias voltage reasonably steady. Under these conditions the valve will act as a square-law detector, and if another signal is mixed with the local oscillation, the intermediate frequency produced is proportional both to the incoming signal and to the strength of the local oscillator.

Most Sensitive Arrangement

Consequently, by increasing the strength of the local oscillation up to the limit, we are able to make the arrangement more and more sensitive.

The limit is reached where the valve ceases to act as a square law detector, but up to this point very sensitive operation can be obtained, and a conversion gain of well over 100 is possible. Conversion gain means the ratio between the I.F.



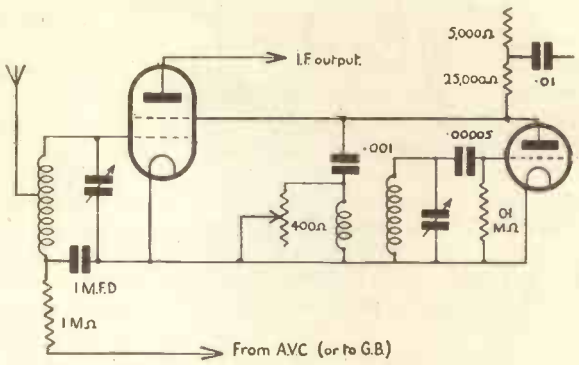


Fig. 1 (above) shows an ordinary three-electrode oscillator and a screen-grid first detector working on the anode bend principle
Fig. 2 shows a battery circuit which is easy to use and is efficient in operation

output (which is handed on to the next valve) and the signal picked up on the aerial. Thus a valve properly arranged in the manner described will not only change the frequency but will give an amplification of over 100 times in doing so.

Rather Critical Operation

There is one difficulty about this circuit which is that its operation is rather critical on the actual setting of the grid bias in terms of the local oscillation. It is therefore desirable to keep the local oscillation constant as far as possible, but this can be done quite easily by connecting a grid condenser and leak in the circuit as shown in the figure. This operates quite simply as follows. If the strength of the oscillation tends to increase the grid voltage becomes slightly positive at the peak values of the oscillation. This produces a little grid current which flows into the grid condenser and builds up a negative charge which increases the effective bias on the valve. This immediately checks the strength of the oscillation and if the circuit is such that the reaction effect is already reasonably constant this device will keep the oscillation quite steady enough for practical purposes.

Most Efficient Condition

In order to obtain the most efficient conditions, particularly for weak signals, the bias can be made variable as shown in the figure. It can then be left in a reasonably sensitive condition for searching, and if desired it can be readjusted when the station is found in order to give the maximum possible signal strength.

The method of injection of the oscillator voltage is a matter depending on the circumstances. One common method is to use cathode injection in which a small amount of oscillator voltage is introduced into the cathode lead by means of a coupling coil as shown. This coupling coil must be of low resistance consisting only of a few turns of wire tightly coupled to the oscillator coil and it should arrange to introduce somewhere between 3 and 5 volts of local oscillation. The by-pass condenser across the cathode bias resistance must, of course, not be connected across this coil or it will short-circuit all the local oscillations.

An alternative method is that shown in Fig. 2, which is shown applied to a battery valve. Cathode injection is not nice with battery valves for obvious reasons. In a mains valve the cathode is independent of the heater and we can introduce coupling coils and what-not between the cathode and H.T.—. In a battery valve we cannot do this and after some experiments I have found that the method shown in the figure is the most satisfactory. It is not so sensitive as cathode injection and also battery valves do not give the same step-up as mains valves, but a conversion gain of the order of 20 can be obtained, which is good going for a battery frequency changer. The local oscillation here wants to be considerably stronger than before, and it should be between 20 and 30 volts if possible. This is quite easy to arrange if the circuit is connected up as shown.

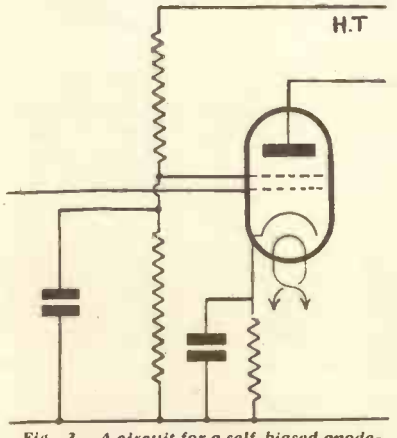


Fig. 3.—A circuit for a self-biased anode-bend detector giving linear rectification

Avoids Overloading

Incidentally a compromise might be adopted by making this valve a vari-mu valve. This unfortunately departs from our square-law rectification, but it does avoid a certain amount of overloading on local signals and it also makes a very convenient method of volume control, either separately or in conjunction with the bias on the I.F. valve. The circuit is in fact particularly amenable to automatic volume control.

Effect of Linear Detector

I have stated somewhat categorically that square-law detection is desirable. It does not follow that other methods will not work, but if a linear detector is used, i.e. an anode-bend detector with self-bias as shown in Fig. 3, or a grid detector, the intermediate frequency generated is only proportional to the incoming signal and is hardly dependent at all on the local oscillation. This is often considered an advantage because the local oscillation can be allowed to wander all over the shop, as far as its strength is concerned, without seriously affecting the performance of the set, but to my mind this is begging the question, and the true solution of the problem is to keep the local oscillation reasonably steady.

The second point is that the frequency-changing operation with a linear detector does not produce

only the intermediate frequency. It produces harmonics of this frequency, and these may interfere with other frequencies which have forced their way through the circuit (owing to the fact that it is not perfectly selective) and produce hoots and whistles. Every super-het user will know that some sets are full of "birdies," while others are surprisingly free from this trouble. The detector has a great deal to do with the elimination of these undesirable offenders.

Tendencies of To-day

So much for the separate oscillator and frequency changer. Unfortunately, there is a tendency to-day to try and make one valve do the work of two. It is unfortunate because the amount of ingenuity expended on trying to overcome this problem could be very much better applied to making a two-valve arrangement work really well. However, the demand is there and numerous circuits have been suggested. By far the most satisfactory are those using the new high-frequency pentodes and Fig. 4 illustrates a typical mains case.

The Ideal Impossible

It is impossible to achieve the ideal here, for the square-law detection must be sacrificed to some extent. However, this particular circuit does retain the operation to some small extent. The oscillation is controlled by shunting the reaction coil with a variable resistance and this is an important feature. The reaction must not be allowed to do as it likes so that the oscillator voltage can soar to all sorts of values at those points where the reaction coupling is most efficient. The arrangement shown holds the oscillator in check and keeps it operating more steadily and provides quite a useful control over the behaviour of the whole circuit.

A second point is that the oscillator coil should be good. The present practice of using very small oscillator coils wound on any old former is to be avoided because it introduces harmonics which, in turn, produce the birdies which are so irksome. Generally speaking, you will find that the better the oscillator coil the cleaner is your performance. Use a good 2-in. coil in a 3-in. can and have done with it.

I do not propose to show a battery single-valve frequency changer because no satisfactory circuit has yet been devised. If you want to avoid trouble, use a 2-valve arrangement similar to that shown in Fig. 2, but do not waste time with any attempt at combined oscillator-detectors.

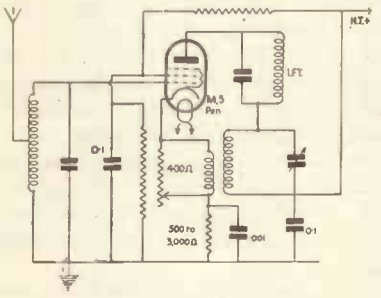


Fig. 4 shows how a screened pentode can be used as a combined oscillator-detector

In conclusion of this article, reference may be made to the pentagrid which has recently come to the fore and which may be used to a considerable extent this coming season. This valve works on a rather different principle which I cannot discuss in detail just now. The valve contains four grids and they are arranged as shown in Fig. 5. The outer portion of the valve is constructed just like a screen-grid valve. There is a control grid, a screen and an anode, and the control grid is usually made to give vari-mu characteristics. This is the valve which is used as the first detector.

Now this electrode system, of course, requires a supply of electrons from a cathode, but in this case we surround the cathode with two grids which act like the grid and anode of an ordinary triode. These two grids are connected to the oscillating circuit and oscillations are generated in the usual manner. The point is that the supply of electrons from the cathode is now no longer steady but the supply fluctuates according to the currents generated in the oscillating circuit.

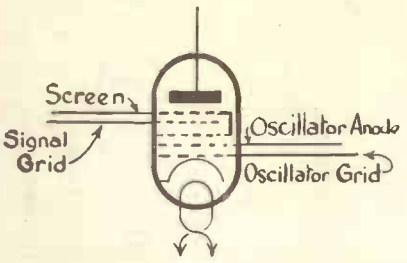


Fig. 5.—This shows the arrangement of the electrodes in a diagram of the pentagrid

Automatic Mixing

Consequently, the valve itself produces an automatic mixing of the oscillation frequency and the signal picked up on the aerial. The operation is not so much a mixing as a modulation, and if the valve is properly designed and used, a good intermediate-frequency oscillation is obtained free from harmonics and showing a considerable step-up. Some of the experimental pentagrid valves which I have tried have given conversion gains of 200 and more.

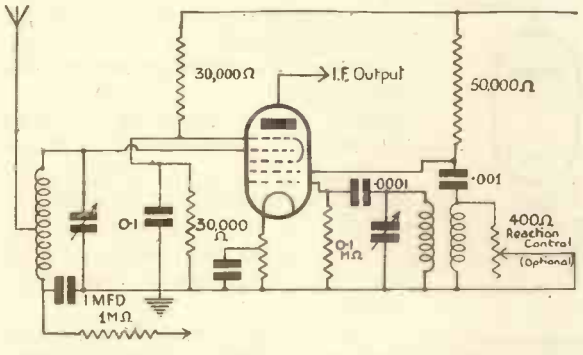
The pentagrid has a further advantage that it can be produced in battery form and a single-valve battery frequency changer becomes a practicable proposition with this system.

Battery Pentagrids

The valves, however, are not yet generally available, and it is advisable to defer any further discussion until they are.

There has been a tendency to drop the pentagrid in America owing to noise because the improved efficiency and greater conversion gain obtainable by the use of the pentagrid has brought up background noise to a rather serious extent in some cases.

Personally, I am not convinced that this is a valid criticism, but it is quite impossible, as yet, to say definitely one way or the other.



Here is a typical circuit showing the use of the new pentagrid valve

TURNTABLE STROBOSCOPES

By P. WILSON, M.A.

THE use of a stroboscope for adjusting the speed of a gramophone turntable to exactly 78 revolutions per minute has become fairly general amongst those people who are lucky enough to have an alternating current 50-cycle lighting supply laid on; and various types of paper stroboscope discs for placing over the turntable spindle are available.

Few people, however, seem to have carried the idea to its logical conclusion and made a stroboscope out of the turntable itself, though this is a very convenient arrangement since paper discs are apt to get misplaced.

Moreover, of those who may have conceived the idea, comparatively few will be able to carry out the work, straightforward as that is, without some assistance in the calculations involved, particularly if the electric supply happens to have a periodicity other than 50 cycles.

The Principle Explained

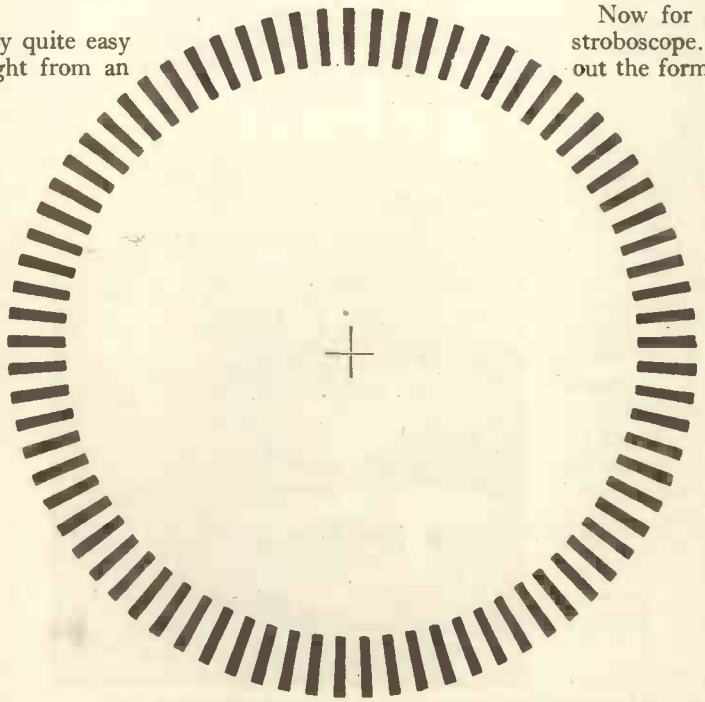
So far as I know, all the instructions that have previously been published have stopped short at the essential practical application of the principle.

This principle is really quite easy to understand. The light from an alternating current consists of a series of rapid flashes which normally the eye smoothes out just as it does the series of pictures on a cinema screen. These flashes occur at twice the frequency of the electric supply since in the heating of a filament the negative half of the alternating current wave is just as effective as the positive. Thus if the supply is at 50 cycles per second there will be 100 flashes per second.

With an ordinary filament lamp these flashes are not specially well marked since the filament retains sufficient heat to remain fairly bright in between the flashes. With a neon lamp, however, they are practically instantaneous so that for delicate work with a stroboscope a neon lamp is always used. One finds in practice, however, that for this purpose of adjusting the speed of a gramophone turntable the ordinary filament lamp used for lighting the room is quite good enough. It is not even necessary to fit a lamp near the turntable, unless of course the stroboscope is to be used in the daytime. The room lighting gives sufficient illumination.

The stroboscope consists of a disc ruled with a number of alternate black and white sectors as in the illustration. The number of these sectors is determined so that when the disc is rotating with the turntable at the desired speed the time taken for one black sector to move to the place of the adjacent black sector is exactly the interval between the flashes. In that case if the sectors are identical in shape, there will be nothing for the eye to distinguish between the appearance of the disc at one flash and the next and therefore the sectors will appear to be stationary. If the speed of the turntable is slightly fast, however, one black sector will overtake the next one in the interval between the flashes and therefore the stroboscopic disc will appear to be moving round slowly in the direction in which the turntable is moving.

On the other hand, if the speed of the turntable is slow, the sectors will not move fast enough in between flashes to arrive at the position previously occupied by adjacent sectors and therefore the disc will appear to the eye to be rotating slowly backwards, that is in the opposite direction to that in which the turntable is actually moving.



A useful stroboscope showing 78 r.p.m. Cut this out, puncture it at the X in the centre, and place over the turntable spindle. When illuminated with a lamp fed by a 50-cycle A.C. supply, the segments will appear to remain stationary at 78 r.p.m.

Minute Accuracy

In these circumstances it is an easy matter to adjust the speed regulator of the gramophone until the sectors on the disc appear to be stationary. The margin of possible error is extremely small; a very small departure from the correct turntable speed is immediately obvious.

Now for the rules for making a stroboscope. First of all, I will work out the formula by means of which the number of black sectors required (n) for any turntable speed (s revolutions per minute) and any periodicity of supply (p cycles per second) can be calculated. As the black sectors are $\frac{1}{n}$ of the circumference apart and the turntable makes s complete revolutions per minute or $\frac{s}{60}$ revolutions per second, each black sector will move to the position of the neighbouring one in $\frac{1}{n} \div \frac{s}{60}$ i.e., $\frac{60}{ns}$ seconds. This must equal the interval between successive flashes since there are two flashes for each alternating-current cycle, this interval is $\frac{1}{2p}$ seconds.

Table giving number of black or white sectors and the lengths of the appropriate chords for constructing Stroboscopes to give 78 r.p.m. at different periodicities of electric supply.

Periodicity	25	33⅓	40	50	60	80	87½	100
Number of Sectors	38	51	62	77	92	123	135	154
Accurate Speed of Turntable	78.9	78.4	77.4	77.9	78.3	78.0	77.8	77.9
Length of Chord (in inches) on 10 in. circle	0.413	0.308	0.253	0.204	0.171	0.123	0.116	0.102
Length of Chord for Larger Sector	—	5.0	—	1.423	3.827	5.0	1.045	1.423
Number of Larger Sectors		3		11	4	3	15	11

We thus get :

$$\frac{60}{ns} = \frac{1}{2p}$$

$$\text{or } n = 120 \times \frac{p}{s}$$

Thus for 80 r.p.m. on a 50-cycle supply :

$$n = 120 \times \frac{50}{80} = 75$$

In this case, then, there must be 75 black sectors and of course 75 equal white ones. The circumference of the stroboscope disc has therefore to be divided into 150 equal sectors alternately black and white.

For convenience, I give a table giving the number of black sectors required for a turntable speed of 78 r.p.m. at various periodicities. In this table I have given the value to the nearest whole number. It is not feasible to have a fractional number of sectors; the stroboscope would not work in such a case. In practice all this means is that it is not possible to get *exactly* 78 r.p.m. by means of a stroboscope for all electric supply periodicities; but in any particular case, the error is not such as to make any appreciable difference to the reproduction. The exact speed which the whole number gives is noted in each case.

Dividing Up

The next question that arises is how to divide up the disc into the appropriate number of sectors, in order to be confident that all the sectors are exactly of the same size.

The only really satisfactory way is to measure off chords on a circle of large diameter. A convenient size is 10 inches. So one draws a circle of 5 inches radius and with a pair of dividers steps off a series of chords round the circumference as illustrated in the figure. When the appropriate number of sectors has been stepped off we should arrive back at exactly the same point as that from which we started. This means that the dividers must be set quite accurately to start with by means of a scale which reads to 1/100 of an inch.

Then the radial lines to the centre of the circle must be drawn in very carefully with a fine pointed pencil.

The calculation of the appropriate length of chord in the different cases is somewhat involved so I have given the lengths in the table.

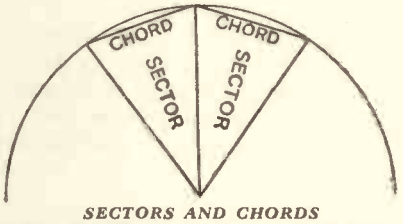
Before stepping off these small lengths round the circumference, however, it is well to divide the circle up into larger sectors according to the factors (if any) of the number of black and white sectors. Since there is always an equal number of black and white sectors, the first step is obviously to draw a diameter thus dividing into two equal parts. Then, for example, for a 50-cycle, 78 r.p.m. stroboscope which requires 2 × 77 sectors, one would naturally divide each semi-circle into 11 equal parts and then each of these parts into 7 by stepping off the small chord given in the table. By proceeding in this way one can ensure by trial that the dividers are accurately set to step off the distances so as to divide up exactly into equal parts.

Accordingly, I have also given in the table the lengths of chord required for the larger sectors specified.

If one sets out to paint a stroboscope on the rim of the turntable itself, a number of methods of procedure suggest themselves. Thus, one might wrap a strip of paper tightly round the rim and then cut it so that the ends just meet without overlapping. The length of this strip will represent the length of the circumference and then by dividing this length into the appropriate number of parts and gumming it temporarily round the turntable rim again one has a template for marking off the rim itself.

I myself tried this method and also tried to use the strip itself as a stencil for painting the rim, cutting out alternate little slots in the strip for the purpose.

In the end, however, I decided that this method was too clumsy to be really satisfactory and I changed to another method.



SECTORS AND CHORDS

This sketch illustrates the way in which the circumference of a circle is stepped off with a pair of dividers, forming sectors

This was to draw a disc stroboscope about 11½ inches diameter, according to the method already described. To do this, of course, it was only necessary to draw radial lines from the divisions on the 10 inch circle out to the 11½ inch circle.

Marking the Turntable

The paper disc I then used as a template, placed centrally on top of the turntable, for marking off the rim with a scriber. I then painted in each division carefully with a very fine brush.

At first I thought that as the rims of my turntable are nickelled it would only be necessary to paint in the alternate black sectors. I found, however, that it was desirable to paint the white ones as well. I daresay that with an oxidised copper rim it will only be necessary to paint the white sectors.

I also found it desirable to use a paint with a matt finish. I made mine by mixing a little lamp black or whiting with gum (Arabic). I happened to have those materials handy, but no doubt there are better ones. As it is, though the image is rather shadowy it is clear enough to set the speed.

CHRISTOPHER STONE'S STROBOSCOPES

The edges of some of the gramophone turntables at the B.B.C. are painted with strips arranged to form a stroboscope.

We Test Before You Buy

By the "W.M." Set Selection Bureau

This fair listener is enjoying the evening concert with a Marconiphone, model 274 radiogram

THE Set Buyers' Guide, which we presented to you last month, has brought to light many interesting points about receiver design. Not long ago the development of A.C.-D.C. receivers took a step in the wrong direction and lagged behind in incorporating the new ideas. During the last month, many designers have been considering the problem of A.C.-D.C. sets from the set buyer's point of view. We have come to the conclusion that there is a demand for sets of this kind, particularly in areas where the mains supply will eventually change from D.C. to A.C.

Ostar-Ganz, who fostered the introduction of high-voltage universal mains valves in this country, is about to market three entirely new sets suitable for A.C. or D.C. mains without alteration. The high-voltage mains valve, which is a valve requiring over 200 volts on its filament, is slowly but surely becoming more popular; the general public is beginning to realise its many advantages and general usefulness.

An all-voltage, any mains, all-wave set will be one of the first new sets available and will use high-voltage valves. It will be a seven-valve super-het tuning from 15 to about 2,000 metres with internal wave-change switching.

As with all modern high-class receivers, this set will embody an efficient form of self-adjusting volume control, tone control, and a simple mains aerial device.

A conventional five-valve super-het will be the second receiver to be sponsored by Ostar-Ganz and this will be followed by a three-valve home constructor kit.

The Cromwell people have been making a universal mains set for some time using the comparatively low 16 or 20-volt mains valves with great success. Those who are doubtful as to the mains supply will be well advised to consider sets of this kind.

Two or three manufacturers are going full speed ahead on ultra short-wave receivers suitable for television. A few sets of this kind will soon put television on the front page early in the New Year. Other interesting sets are promised for 1934—super-hets with three detectors; two separate stages of intermediate-frequency amplification, both of different frequencies, and a unique oscillator circuit. Various new patents are being taken out on a new type of super-regenerative set to overcome the defects of the old system, and to provide quality good enough for television.

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."

How many non-technical listeners can handle a strange set with any confidence. Very few, we are sure ! We have tested the majority of the 1933-4 receivers and it is becoming quite obvious that slowly but surely receiver controls are becoming more standardised so that before long it will be a simple matter for the novice to tune in almost any receiver without first digesting the instruction book.

Most sets have the same control arrangement; a tuning knob, volume and switching, with perhaps a tone control and/or scratch filter in or under the loud-speaker fret. Some have little variations, such as combining the volume control and master switch, while others combine the wave-change switch with the pick-up switch, but on the whole receiver controls are beginning to show a great similarity.

A combined radio and gramophone type of receiver has always been rather too expensive to command a large following. Perhaps this accounts for the scarcity of really good radio gramophones at a reasonable figure. The introduction of a new Pye radiogram at a low figure should prove to be one of the most popular sets of the year. No concrete details are available at the moment, except that the chassis is the same as that of the Pye E/AC super-het. The new outfit will be designated E/AC/RG and will cost £27 6s.; one of the cheapest super-het radiograms available.

Atlas A.C. Three-valver—Model 334

BRIEF SPECIFICATION

MAKERS : H. Clarke & Co. (M/cr.), Ltd.

MODEL : 334.

PRICE : £9 17s. 6d.

VALVE COMBINATION : Screen-grid high-frequency amplifier (Mazda AC/SGVM), detector (Mazda AC2/HL), and triode output (Cossor 41MP). A metal rectifier is used for mains rectification.

TYPE : A neat three-valve A.C. set in an attractive walnut cabinet for use on A.C. mains 200-250 volts. A moving-coil loud-speaker is built into the cabinet.

REMARKS : Good value for money. The set is especially notable for its fine results with the mains aerial device.

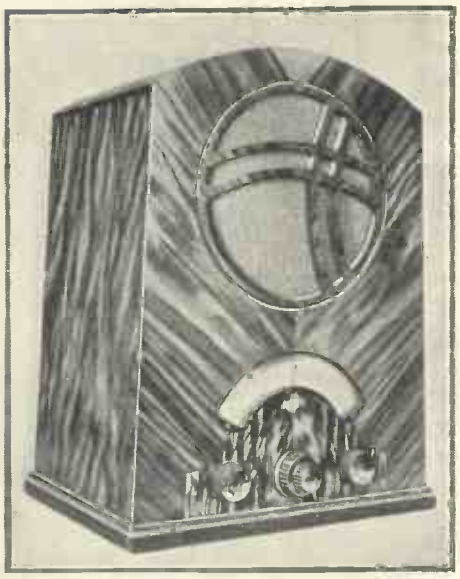
THAT the modern A.C. three-valver is quite capable of giving efficient results in these "muddled-ether" days was proved by our tests of this Atlas 334. The circuit of this set follows modern practice. There is a stage of high-frequency amplification, which makes use of a variable-mu valve, followed by the detector, arranged in the power-grid fashion, transformer-coupled to a large triode output valve.

As far as appearance is concerned, we think that no listener will have just cause to be dissatisfied with the delightful walnut-finished cabinet. May we draw your attention to the uncommon design of the loud-speaker fret? So different from the usual design, and, we think, it is really attractive.

A feature of the front design of the cabinet is the fine full-vision scale calibrated in wavelengths and stations. This is, of course, illuminated when the set is in operation.

Below the scale are the three tuning controls in line. In the centre is the main tuning control, which has a superimposed trimmer for making fine adjustments when weak foreigners are being received. On the left is the simple rotary wave-change switch, and on the right the volume control. The on-off switch is conveniently placed on the top of the set chassis just inside the cabinet—the set is supplied without a back.

The set chassis is of rather unusual design, being built up at the back to give protection to the valves. On the back of this chassis is a small ebonite panel on which is fitted aerial, earth, pick-up, and external loud-speaker plugs and sockets, together with the set's mains-voltage adjustment panel.



"No listener will have just cause to be dissatisfied with the delightful walnut-finished cabinet"

To adjust the set for your domestic mains voltage there is only a screw to be pushed home in the appropriately labelled socket. Two tappings for external aerial and one for the mains aerial are also provided on this panel.

Our tests with the 334 were spread out over an afternoon and evening and were made in South London, about 25 miles from Brookmans Park. During the afternoon we tried the set's daylight capabilities on a 35 ft. outdoor wire.

Fécamp at the bottom of the medium waveband was, undoubtedly, the best foreigner picked up on this waveband. Next in order came Brussels No. 1, Langenberg, and Hilversum. There was no trouble in logging these stations. The wavelength calibrations were almost dead accurate, and it was only necessary to set the dial to the correct wavelength marking and adjust the volume control to get the required signal strength. Both aerial tappings were tried and we found that for really satisfactory daylight reception the more sensitive tapping was advisable.

Long-wave results were specially good. Radio Paris was heard quite clear of Daventry and Kootwijk quite clear of Radio Paris. At the lower end of this waveband Kalundborg was nearly clear of Luxembourg. The interference on either of these stations was so slight that both might be said to give fine entertainment value.

During the evening on the medium waves we logged about twenty worth-while stations quite free from side-band twitter or any other unpleasant noises. At the top end of the scale, particularly, were the results good. Rome came in with the quality and punch of the local station.

There is no doubt that the quality from the straight A.C. three-valver with a large output takes a lot of beating. Here, there was plenty of top-note response coupled with just the right proportion of bass to give a delightful musical balance. There was a little mains hum, but not enough to interfere with reception, even in quiet musical passages.

One great point that must not be forgotten is the efficiency of the mains aerial. There was no increase in mains hum when this was used, and it was so sensitive that in all we logged a dozen foreign stations, in addition to the locals, on the medium band. This Atlas set is excellent value for money.

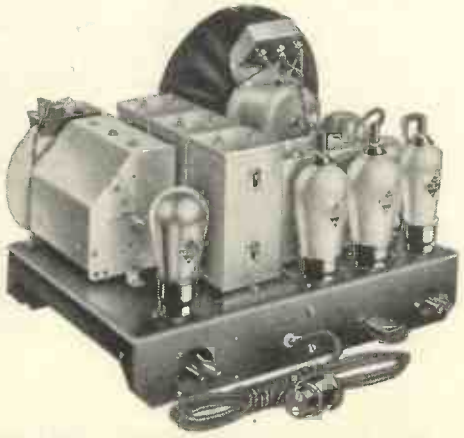
"Set chassis is of unusual design, being built up at the back to give protection to the valves"

Cossor A.C. Super-het—Model 635

ONE of the most efficient receivers in the Cossor range is the model 635 super-het, for A.C. mains. The designer of this set obviously drew from the wealth of experience he had gained from designing kit receivers, for he has made this set ideal for family use and at the same time suitable for the knob twiddler or DX enthusiast.

Compactness and portability are always notable features, but only when the receiver performance has not been affected in any way. This Cossor set consists of six valves, including a full-wave rectifier. The first detector is a variable-mu pentode, with a triode as an oscillator. The single intermediate-frequency stage is also a Cossor MVS/Pen and this is followed by a high-impedance screen-grid valve as an anode-bend second detector. The output valve is a power pentode, giving a little over 2 watts undistorted output.

The whole receiver has obviously been designed for the family man who is not technically inclined, and at the same time an eye has been kept on future developments. In view of the coming wavelength shuffle, the tuning scale has been calibrated in wavelengths and not station names. This means that, unlike many receivers, the wavelength change on January 15 will not have any detrimental effect.



"Compactness and portability are notable features, but only when the performance has not been affected in any way"

The wave-change switch is original. As the knob is moved an ivorine scale marked "long" and "short" is visible through a slot in the cabinet. The master switch and volume control are combined, so that before the volume can be turned up the receiver must be switched on. This prevents the possibility of switching the receiver on when it is tuned to the local station and obtaining excessive volume accidentally.

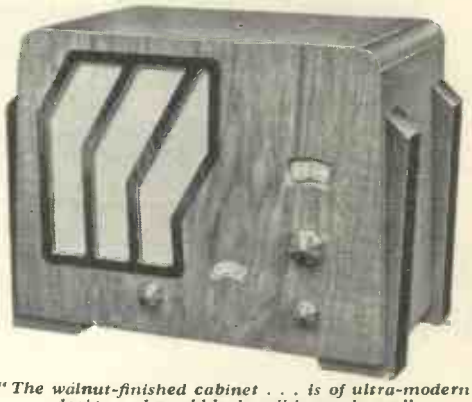
To give some idea of the compactness of this receiver, the walnut finished cabinet is 13 in. high, 18 in. long, and 11½ in. deep; it is of ultra modern design and would look well in any home.

Although the reproduction is exceptionally fine, a variable tone control has been incorporated which operates on both radio and gramophone, so that the tone can be adjusted to suit personal tastes. When the set is used with a pick-up it is advisable to make quite sure that this gives an output of more than .5 volt, for this output will just be sufficient to obtain approximately 2 watts from the output pentode.

Just a word as to the performance and the conditions under which the set was tested. The length of aerial did not seem to have very much effect on the results obtained, although below 15 ft. the daylight range deteriorated while above 50 ft. no improvement was noticed.

For quite a while the receiver was used with the mains-aerial attachment supplied, and under such conditions, twenty or so stations could be picked up without any difficulty, although the background noise was slightly increased. From this test it proves that the receiver would be ideal when used in a flat or anywhere else where an outdoor aerial would not be convenient.

The tuning range is between 200 and 570 metres for the medium



"The walnut-finished cabinet . . . is of ultra-modern design and would look well in any home"

waves, and 1,000 to 2,000 metres on the long waves, so that listeners in the Bournemouth, Newcastle, and Aberdeen areas will be able to tune in the local stations without any difficulty. Such stations as Fécamp and Cork should both be received at full loud-speaker strength without interference, although there are only 9 or 10 kilocycles between them.

Below the London National practically every transmitter can be picked up, including an extraordinary number of Swedish relays working on low power. Unfortunately, as Mühlacker has now closed down and been replaced by a comparatively low-power station, it is no test to say that the new Mühlacker station should be received free from London.

Instead of telling how many stations you can receive on this set, which really is little guide to its efficiency, it is better to say that the number of stations which can be held for a long period to provide definite entertainment is considerably above the average. Very few receivers to-day can tune in forty stations free of interference and that come in at sufficient strength for an hour or so, without any retuning or variation of the volume control. We have every confidence in this Cossor super-het.

BRIEF SPECIFICATION

MAKERS : A. C. Cossor, Ltd.

MODEL : 635.

PRICE : £14 14s.

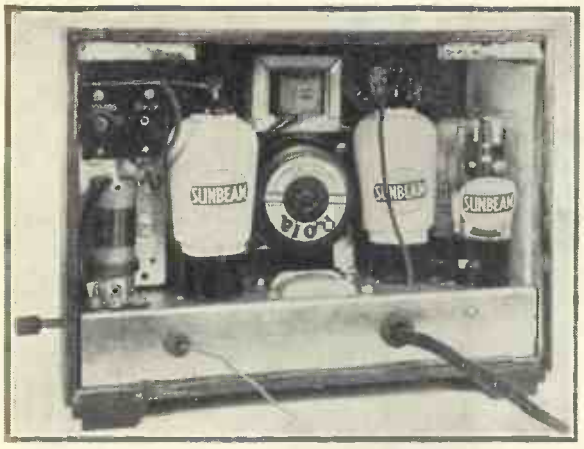
VALVE COMBINATION : First detector (Cossor MVS/Pen), intermediate-frequency amplifier (Cossor MVS/Pen), oscillator (Cossor 41MP), second detector (Cossor MSG/HA), pentode (Cossor MP/Pen), and valve rectifier (Cossor 442BU).

POWER SUPPLY : A.C. mains 220-250 volts, 40-100 cycles.

TYPE : Compact super-het that can be used without an aerial.

REMARKS : A fine set that has been designed to give the highest degree of selectivity without loss of quality.

Sunbeam Universal A.C./D.C. Midget



" Technically it has all the leading features of the larger table sets. It is entirely self contained "

WITHOUT doubt, this Sunbeam midget is the smallest receiver that has made its appearance on our test bench; its overall dimensions are 10½ in. long, 8½ in. high, and 5½ in. deep.

Even though it is not much larger than a box camera, we want to make it quite clear this set is no toy. Technically it has all the leading features of the larger table sets. It is entirely self contained; it can be used on both D.C. and A.C. mains of from 200 to 250 volts without alteration, and besides an advanced circuit design, this little outfit incorporates its own moving-coil loud-speaker.

Sunbeam's slogan, "Personal Radio," is indeed very true. The set is so small and compact that it can be carried about under the arm and installed anywhere in less than a minute providing, of course, a mains socket is available. Attached permanently to the set is 25 ft. of wire, which, we found, was quite sufficient to bring in the local stations at full loud-speaker strength. No earth is needed.

Before the set is installed, there is only one adjustment necessary. This is to the mains-voltage panel fitted just inside the set and having two positions only, one for mains up to 220 volts and the other for 230-250 supplies.

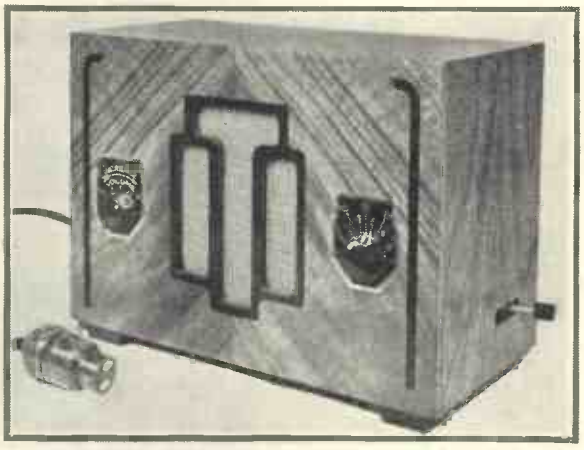
From an appearance point of view the set is very tastefully designed. The cabinet is finished in a medium shade of walnut, edged with black round the loud-speaker fret, at the cabinet sides and bottom. The silk backing for the loud-speaker fret is of pale blue silk.

Controls are childishly simple. There are only two knobs on the front. The control on the left is a combined on-off switch and volume control and on the right is the tuning knob. On a metal plate behind this latter knob are wave-length calibrations, which we found to be very accurate on test.

On the right-hand side of the receiver is the wave-change lever; it is brought forward for medium-wave and pushed back for long-wave reception.

Before we tell you of the satisfactory results obtained during our tests, just one word about the circuit. Three valves are used in the circuit; there is a screen-grid high-frequency amplifier, a screen-grid detector, and a pentode output. A valve is used for mains rectification.

Our first tests were made about 25 miles from Brookmans Park, with the set's own little aerial and on A.C. mains. This little aerial was hung round a picture rail. Our first run round the small dial brought in Fécamp, Trieste, Poste Parisien, Leipzig, Athlone, Rome, and several other worth-while foreigners at full loud-speaker strength. Full loud-speaker results on this midget is quite a considerable noise.



" The cabinet is finished in a medium shade of walnut, edged with black round the loud-speaker fret, at the cabinet sides and bottom "

The moving-coil loud-speaker gave well-balanced quality, which was crisp and brilliant, but naturally it lacked bass response to some extent. There was no mains hum; background was quite silent.

At this stage of our tests we noticed that the mains leads to the wall socket were getting rather warm. Upon investigation into technicalities of design we found that dropping resistances for the heaters of the valves were incorporated in these leads, which are well protected with a thick covering.

With an outdoor wire connected to the set's own aerial we logged many more stations. From Rome upwards almost every station worth hearing came in without interference at remarkably good strength. On the long waves our log for the evening totalled a dozen stations. Radio Paris was a good signal, but Berlin, just below, suffered some interference from Daventry.

Our final tests were made at the "W.M." laboratories at Fetter Lane, where both D.C. and A.C. mains are installed. On these D.C. mains, results were just as good as on our A.C. mains outside town. There was again no trace of mains hum.

BRIEF SPECIFICATION

MAKERS : Sunbeam Electric, Ltd.

MODEL : M30.

PRICE : £7 7s.

VALVE COMBINATION : High-frequency amplifier (Tungsram SE2018D), detector (Tungsram S2018D), pentode output (Tungsram PP2018D) and valve rectifier (Tungsram R2018D).

TYPE : Midget table receiver for use on both A.C. and D.C. mains. Small internal aerial provided with set ; no earth is needed.

REMARKS : A handy little set that gives surprisingly good results for its size. Gets many foreigners in addition to the local stations.

Kolster Brandes 666 A.C. Super-het

OUR tests proved that although the price of the KB666 has just been increased by a guinea, it is still remarkable value for money.

The model supplied to us for test was in the de-luxe cabinet, finished in medium-tone walnut and Macassar ebony with chromium-plated edges and loud-speaker fret. This may sound rather ornate, but on the contrary the combination is extremely attractive, toning with the average household furniture very nicely. This cabinet is, without question, one of the most attractive of this season's designs. Inside the layout is notable for its clean design and complete shielding arrangement.

At first sight the circuit is conventional, but after the set had been on test for a few moments we found that the performance was well above that of the usual run of super-hets. The fact that three high-frequency pentodes are used has a lot to do with the outstanding performance, for these valves have a theoretical amplification factor of 5,000.

If you want a receiver to give a high output—enough for a small hall or for dancing at Christmas time—this is the very set, because the output pentode valve that the K.B. people use will give approximately 3 watts of undistorted power.

We chose as a testing position a spot about thirty miles or so north of London, where there was severe local interference from a small factory. This was done deliberately because we wanted to see how the K.B. Rejectostat equipment would work in conjunction with one of their receivers, which had been carefully designed to minimise interference pick-up.

"Inside the layout is notable for its clean design and complete shielding arrangement"

With the receiver used in the normal way—that is, connected to a 50-ft. external aerial—during daytime, reception was completely blotted out at intervals by interference from a motor in the factory. The outside aerial was then taken down and re-erected on the other side of the house so that it was as far away as possible from the source of the interference. The Rejectostat filters were then brought into action.

"The de-luxe cabinet, finished in medium-tone walnut and Macassar ebony with chromium-plated edges and loud-speaker fret"

These filters are actually two matched impedance couplers; one is connected to the aerial at the top of the pole and the other is plugged into the three sockets on the chassis of the receiver. The normal lead-in wire is dispensed with, the two couplers being connected together by means of twin-screened wire.

That motor interference had been cut down by means of the Rejectostat was quite obvious. After making a number of tests in a fairly comprehensive manner we found that while the noise was reduced by at least 85 per cent.; the loss in volume was less than 15 per cent. Incidentally, 15 per cent. is almost unnoticeable to the average ear. We feel that had the filter been erected with more care, the interference could have been almost completely eliminated. For those on tramway routes or close to " winking " or neon signs, this equipment is invaluable.

To receive sixty or seventy stations is quite an easy matter with a high-class set, but how many of these stations are worth listening to for long periods? When we tuned the KB666, the fact that stations were received at full loud-speaker strength at almost every degree was rather overlooked. The high light was that the average strength of these stations did not vary as one would expect and that those stations which usually fade badly only dithered once or twice during the whole evening.

The daylight range of a receiver shows up quickly whether or not the set has been carefully designed. With this set a minimum of twenty stations was easily picked up in the early morning—that is, round about 9 or 10 a.m.—while in the early afternoon the daylight range was almost as good as after dark.

The self-adjusting volume control really does prevent fading. To the non-technical listener, it is as well to explain, perhaps, that the self-adjusting volume control keeps volume almost constant and that in practice the entertainment value of the receiver is increased by nearly 50 per cent.

To sum up, the receiver is ideally simple to operate and gives exceptionally well-balanced quality.

BRIEF SPECIFICATION

MAKERS : Kolster-Brandes, Ltd.

MODEL : KB666.

PRICE : £16 16s. (de luxe model £18 18s.).

VALVE COMBINATION : Five valves in super-het sequence, using three high-frequency pentodes, double-diode-triode, power low-frequency pentode, and full-wave valve rectifier.

POWER SUPPLY : A.C. mains, 200-250 volts 40-60 cycles.

TYPE : Five valve super-het in neat horizontal table cabinet.

REMARKS : An outstanding set in many ways. It includes a good system of self-adjusting volume control.

Ekco Model 74 Battery Super-het

BRIEF SPECIFICATION

MAKERS : E. K. Cole, Ltd.

MODEL : Battery 74.

TYPE : Seven-stage super-het receiver for battery operation housed in a bakelite cabinet of ultra-modern design.

PRICE : Walnut finish, £13 13s.; black and chromium finish, £14 14s.

VALVE COMBINATION : Five valves in super-het sequence. Combined detector-oscillator (Cossor 215SG), intermediate-frequency amplifier (Mullard PM12M), second detector (Mullard PM1HL), low-frequency driver (Mullard PM2DX) and class-B output (Cossor 220B).

REMARKS : An outstanding battery-operated super-het. Gets all the best European stations at real entertainment value. Quality is a notable feature.

EKCO'S introduction of a battery-operated five-valve super-het—their first venture into the battery set market—has undoubtedly been a great success. Conventional ideas about wooden cabinets, small tuning controls and small tuning scales have been replaced by entirely new features.

In appearance this model 74 will be hard to beat. The cabinet is made of bakelite and can be obtained in two finishes, walnut or in black with chromium-plated controls and fittings. Incidentally Ekco make two stands for this set, one of the modern chromium-steel bar type and the other of beechwood in black or walnut finish. Both are specially designed to match the model 74.

"The cabinet is made of bakelite and can be obtained in two finishes, walnut or in black with chromium-plated controls and fittings"

A unique feature of this set is the detachable loud-speaker fret, so that the user can change the backing silk to harmonise with his home furnishing scheme.

A glance at the front-view photograph will show the unusual front of the set. Pride of place in the centre is taken up by a large dual tuning scale. The top division for medium waves is calibrated in wavelengths and thirty-six of the best received stations are marked. In addition to wavelengths, eleven long-wave stations are marked on the lower scale.

There is no conventional pointer moving across these scales. Instead, when the set is switched on, a triangular patch of light with a fine shadow line in the centre appears on the appropriate scale. When the big tuning knob, in the centre just below the scale, is turned, the beam of light moves across the scale.

We found this device very accurate in nearly every case on the medium waveband, the fine shadow line crossed through the first letter of a station name when that station was tuned in. Again the big knob greatly helped tuning; the user can get much finer adjustment, without fiddling, with a large knob.

Grouped round the main tuner are the rest of the controls. On the left is the wave-change and gramo-radio switch, underneath a local-distance switch, and on the right a combined on-off switch and volume control. Here we came across another sensible feature. This volume control is operative on both pick-up and radio; there is no need to fit an external volume control to the pick-up.

Just a word about the circuit. The five valves are arranged in super-het sequence, the features of which are that there is one stage of intermediate frequency amplification and class-B output feeding into a good-sized permanent-magnet moving-coil loud-speaker.

"The high-tension battery . . . fits snugly on a shelf behind the loud-speaker. Room has been made for the 2-volt accumulator in one corner"

Inside, the layout follows more or less the usual practice. The high-tension battery, which has a section for grid bias, fits snugly on a shelf behind the loud-speaker. Room has been made for the 2-volt accumulator in one corner of the set chassis, which is at the bottom.

Plugs for aerial, earth and pick-up are mounted on the panel at the back of the set chassis. Just beside this panel is a small trimmer for curing second-channel interference, should it be experienced. The makers send out sets with this trimmer adjusted and we found no need to touch it.

Our tests, which were made on a 35 ft. outdoor aerial about 25 miles from Brookman's Park, proved what a really good job this model 74 is. All the stations marked on the medium-wave scale were easily captured. Even Belfast and Newcastle were logged at full loud-speaker strength. Selectivity was well up to super-het standard; Frankfurt was nearly free of London National. Our log for the medium-waves alone in one evening totalled some seventy stations.

Our log for the long waves was just as impressive. Some fifteen signals, including some unidentified Russians were heard at full loud-speaker strength. Here, selectivity also was well up to standard. Although there was only negligible interference between Berlin and its neighbours, it was easy to get Kalundborg free from Luxembourg.

Quality was especially brilliant; bass was good and there was a moderate percentage of top notes.

(Right) The Three Ginx, three light entertainers who have featured in December vaudeville programmes. (Below) You know this artist without any introduction. She is, of course, Gracie Fields, who has made a welcome return to vaudeville broadcast

H.M.V. Photo

Music of the Month

By T. F. HENN

JANUARY is the month in which we make resolutions to break in February. As far as I can see we shall not have the chance to accuse the B.B.C.of breaking resolutions, for at present they have no new plans for 1934. Perhaps they believe that they have got the programmes to such a state of perfection that their only job is to maintain a standard and not to reach for new levels.

Believe me there is a deal of work in compiling the programmes. One has to visit Broadcasting House and see the various stages —letters, auditions, then planning and rehearsals, all before the finished article emerges from our loudspeakers.

There is just one extension that I do want the B.B.C. to introduce. I have mentioned it many times. It is an alternative to the late dance music. Quite recently I was motoring back from the South Coast, rather late at night, and stopped at one of these roadside cafés. This particular café, I learnt, was the haunt of motor cyclists, who used to make it the rendezvous of an evening's run.

In this café was installed an up-to-date radiogram and naturally at 11 p.m. I expected to see a merry company listening to the strains of dance music. Imagine my surprise when, instead, I saw the proprietor treating his customers to a selection of moderately highbrow music. They were enjoying it, too. During the half-hour I was there I heard some of the Tchaikovsky *Casse Noisette Suite* and songs by Tauber and Peter Dawson.

I was still more surprised when I was told that the young visitors were "absolutely tired" of dance music. I think the moral of this little episode shows that we can have too much of a good thing; dance music is being overdone.

I can still recall the days when Midland Regional broadcast an orchestral concert on three days a week from 10.15 to 11.15 p.m. And to-day, with a much larger crowd of listeners, I believe that this orchestral alternative is essential. I do hope that the B.B.C. will wake up its ideas and cater for the listener who listens at this time of night.

Guessing percentages is a hazard, but I am sure that more than half the five—or is it six?—million listeners would be in favour of this alternative. Perhaps in time—

◆ ◆ ◆

Some readers will

Two more light entertainers who have made recent appearances in the vaudeville shows, Derrickson and Brown

Columbia Photo

Here is Carroll Gibbons, the famous dance-band leader and pianist, who made a welcome appearance at the "mike" last month

remember my caustic comments on the dullness of studio acoustics compared to the freshness of the Sunday night hotel broadcasts. My remarks were directed mostly against London transmissions, for I remember saying that North Regional acoustics were much better. This remark surprised some B.B.C. officials who believed that Manchester "balance" was all wrong.

The famous German conductor, Bruno Walter, is likely to be heard a good deal in future programmes

Anyway, times change. Some bright person has found out that the B.B.C. Theatre Orchestra broadcasting in the *empty* St. George's Hall sounds really lifelike. I, too, noticed the great improvement in recent Theatre Orchestra broadcasts. This experiment, I understand, is to be carried further. Probably this will amount to a minor revolution in broadcast acoustics.

By the way, talking about the Theatre Orchestra, reminds me to advise you to listen to their concert on January 4. They are giving a Strauss-Lanner potpourri and, for the first time, the orchestra will be augmented by musicians from outside. Popular music like this, played by a big orchestra, should sound well.

◆ ◆ ◆

What did you think of Quentin Maclean's first recital on the B.B.C. organ? From a technical view I thought his performance was remarkable, but in the choice of music I was rather disappointed. This music did, however, prove Maclean's versatility.

If you want greater proof of this organist's skill, you should hear a Columbia record of the first movement of Grieg's *Piano Concerto* arranged for piano and organ, just released. In the Trocadero Cinema, from which he broadcasts every Wednesday, Maclean played the organ part, then a week later at the gramophone studios, he listened to the organ part through earphones while he played the piano part, which the Columbia people cleverly superimposed on the wax recording of the organ.

H.M.V. Photo

A master of light music, Sidney Baynes arranges the numbers which are broadcast by his orchestra

I have just played the record through and, except for a little error on the second side, I thought the performance was extremely well done.

While on the subject of the B.B.C. organ, I am told that next year we shall hear more recitals by Berkeley Mason, one of the B.B.C.'s accompanists. January 2 and 3 are two of the dates fixed.

It was arranged that Dom Gregory Murray, the organist of Downside Abbey, should broadcast on January 14, but the engagement has been cancelled because Dom Murray cannot get to Broadcasting House. Perhaps later we shall have the opportunity of hearing this organist, who knows the ins and outs of this type of instrument. The organ at Downside Abbey is almost a replica of the B.B.C.'s instrument.

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New Year's Eve falling on a Sunday will naturally restrict the gaiety of broadcast celebrations. The real fun of the evening begins at 5.30 with a relay from the National Broadcasting Institute of Belgium.

The programme, which will be played by an orchestra under Frans Andre, will include a *Russian* potpourri, *Slav* and *Hungarian* Rhapsodies, three *Viennese* pieces, and excerpts from Albeniz' *Espana*. Seems to me rather a waste of money on expensive landlines and whatnot for a mixed orchestral variety.

At 9.5 you will have the choice of a popular concert by the Theatre Orchestra or a performance of Bach's *Christmas Oratorio*. The Theatre Orchestra seems the best investment. Then at 10.30 the New Year's Eve

Leslie Bridgewater, leader of the quintet, is one of the "regulars" in present-day programmes

programme begins. Messages of goodwill from all parts of the Empire will be heard, relays from the Continent, but this year their will be no Grand Good-Night.

◆ ◆ ◆

Light shows for the first few weeks of the new year are rather interesting. *Follies of the Air* will be dropped in favour of a new *Songs From the Shows* series. The first theatre to be dealt with will be the Adelphi. Olive Groves, George Baker, Anona Winn and Reginald Purdell will be in the cast with John Watt as compère.

Helen Perkin will play the solo part in a new piano concerto by John Ireland, at a British Music Concert on January 12

As before, two performances will be given of each show, but this time one will be heard during the evening, probably on the Friday or Saturday night, and the other during the Saturday afternoon. This matinée performance may replace the present *First Time Here* entertainment of new artists. I believe the B.B.C. is finding some difficulty in getting even first-time artists who come up to a reasonable standard of efficiency.

The last series of *Songs From the Shows* was so popular that in the new year they will be given weekly instead of monthly. So far, arrangements have been made for January and February. Other theatres in the series will include the Shaftesbury, Drury Lane, the old Empire and the Vaudeville.

Then we have for January the imposing list of light shows with a music hall every week, a Café Colette show, the Kentucky Minstrels, the bands of Jack Hylton, Jack Payne, and Percy Chandler with Billy Reid's Accordeons in studio shows. Programmes should not be dull.

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There is, unfortunately, no repetition of last year's Christmas "Prom" season, but instead there is a series of six concerts of British music.

This famous cinema organist, Quentin Maclean, recently made a "first appearance" with the B.B.C.'s Concert Hall organ

These concerts, given by the B.B.C. Orchestra of ninety players, will be relayed from Queen's Hall on Mondays, Wednesdays and Fridays during the first fortnight in January.

The list is far too comprehensive to give full details, but there are one or two items that are worth jotting down. In the first concert on January 1 Constant Lambert's *Rio Grande* and Delius's *Song of the High Hills* are the best works.

A soprano of note, who is another "regular," Isobel Baillie. She will be heard again this month

A first performance of a new work by Delius, *The Fantastic Dance* and William Walton's *Belshazzar's Feast*, will be broadcast on January 12.

The concert on January 3 is a special celebration for the seventy-fifth birthday of Dame Ethel Smyth. Dame Ethel has composed almost every type of musical work, from operas to string quartets. This concert will be representative of her most popular and best works.

It will open with *The Prison*, a symphony for soprano, baritone, chorus, and orchestra, then we have the *Concerto in A*, for violin, horn, and orchestra; *Hey Nonny No*, a choral work, with the overture to *The Wreckers* to finish up the evening.

Two famous duettists, Layton and Johnston, will make their re-appearance in vaudeville shows in the new year. They record for Columbia

The ALL-WAVE THREE

In these pages the "Wireless Magazine" Technical Staff presents details of a battery-operated three-valver giving reception on the short waves below 100 metres in addition to the usual two broadcast bands. More stations are springing up on these short waves and with this set listeners will have all the advantages of a short-waver in addition to a normal broadcast receiver

NO reader of "Wireless Magazine" needs to be told that the long and medium wavebands do not represent the only wavelengths on which interesting broadcasts can be picked up—there are literally hundreds of stations that work on wavelengths below 100 metres. More and more listeners are turning to these short waves as a change from ordinary reception and the demand for short-wave receivers grows.

A large number of prospective short-wave listeners rather baulk at the idea of having to have a special set put aside for these low wavelengths; what they want is a receiver that will meet all their needs as the occasion arises. In fact, they want a set that will cover the short waves and the medium and long wavebands as well, whenever such reception is desired.

There are very few tuners available that will do what is wanted. But of those that do exist there is one that is particularly noteworthy because of its low price. It is, in fact, remarkably good value for money, and it *will* give good short-wave reception. In order to keep the cost of construction as low as possible we have built this special tuner into a simple type of receiver, namely a three-valver with a detector and two low-frequency stages. "What about the selectivity?" you will immediately ask. Well, there is all the selectivity that you need on the long and medium wavebands, thanks to the aperiodic aerial windings incorporated in the tuner.

You know that selectivity does not enter into the question on the short waves. Tuning is so inherently sharp that the problem is to pick up stations at all and not to tune through them accidentally. If you have never listened on the short waves before, you will learn from the short-wave tuning section of this set what razor-sharp tuning really is!

To set your mind at rest, though, regarding the long and medium waves, will you just glance through the test report that appears on page 653? There you will see the results of a test made with the set only a few miles from the Brookmans Park aerials. It is not likely that many of you will be using the set so close to a high-power broadcasting station.

On the short waves high-frequency amplification is still something of a gamble. In other words, reception is usually so good that signals can be picked up on almost any kind of set, or else they are so elusive that no amount of amplification will produce any results. When conditions are any good at all, therefore, you will get reception with this simple All-Wave Three just as well as with a much more elaborate set.

SIMPLE AND EFFICIENT THREE-VALVER

A glance at this photograph shows the simplicity of the design of the All-wave Three, which any constructor can build in the course of an hour or so. Control is quite as simple as the construction

Which brings us to the point that for long-distance work it is desirable to use a pair of headphones. Often signals from stations literally five or six thousand miles away will be too weak to receive on the loud-speaker, even when a much bigger set than this is used. With a good pair of 'phones you will be able to range over the four corners of the earth

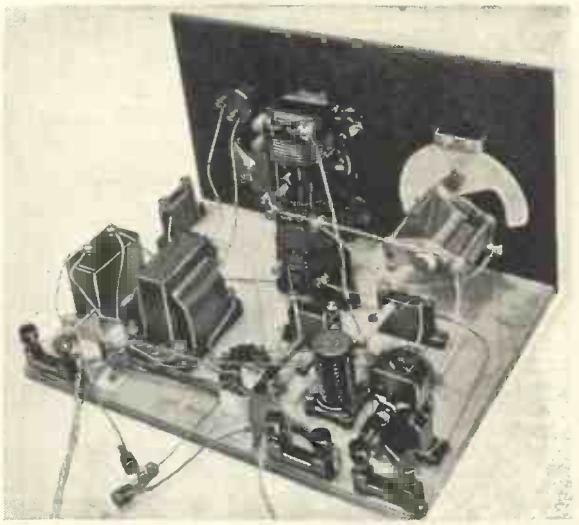
for your entertainment. On the short-wave section of the tuner there are two windings, which cover two different short-wave ranges. The first is from 14.5 to 40 metres, and the second from 32 to 90 metres. Now we must warn you that unless the wiring of the set is very well carried out and the earth system used with the set has a very low resistance, you will find it almost impossible to get down to below 16 metres. That will not worry most people, of course, but we do not want to mislead anybody. There will be plenty of stations to hear in any case.

The medium and long wavebands cover 200 to 550 metres and 900 to 2,000 metres approximately.

Now about the selectivity arrangements. In the aerial lead (as will be seen from a glance at the circuit diagram on page 652) there is a pre-set condenser. This, of course, is adjusted in the usual way; in other words, the capacity is reduced as it is desired to increase the selectivity of the set. It must be remembered that the lower the capacity, however, the smaller will be the actual voltage applied to the grid of the detector valve.

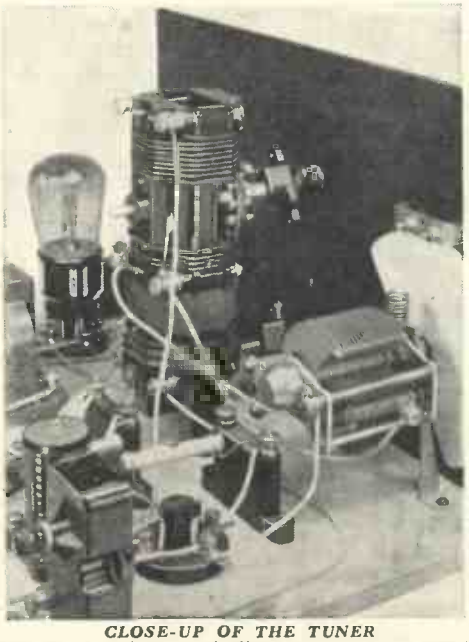
This condenser will be needed for short-wave reception though quite apart from its use as a selectivity control. For short-wave reception only a short length of aerial is needed. Assuming that the set is to be used on an ordinary aerial designed primarily for medium-wave reception, the use of the pre-set condenser will result in effectively shortening the length of the aerial wire. Thus always reduce the capacity of this condenser for short-wave reception even though the set is selective enough on the medium and long waves with the knob screwed right down.

Then on the front panel of the set will be found a control with four positions. In one position the aerial is connected directly to the grid end of the tuning coil; in the second position the aerial is tapped down on the coil; in the third position it is disconnected from the tuner altogether; and in the fourth position a small aperiodic winding is brought into use. With these positions and the proper adjustment of the aerial-series condenser no operator will have any difficulty about getting the required degree of selectivity.



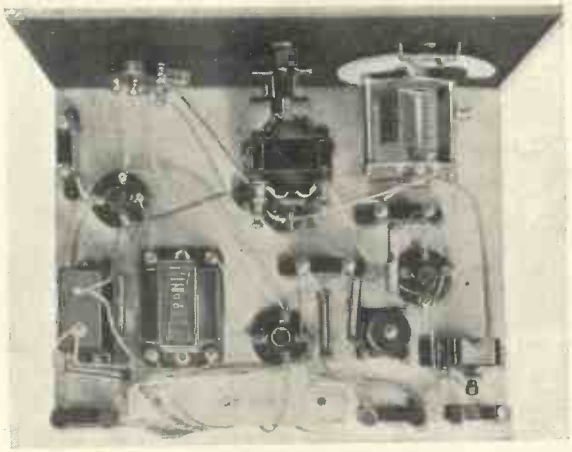
HEART OF THE SET

The All-wave Three is designed round an efficient all-wave tuner, covering all the essential wavelengths between 14.5 and 2,000 metres



CLOSE-UP OF THE TUNER

How the British General all-wave tuner is mounted to the panel is easily understood from this close-up view



LOOKING FROM THE TOP

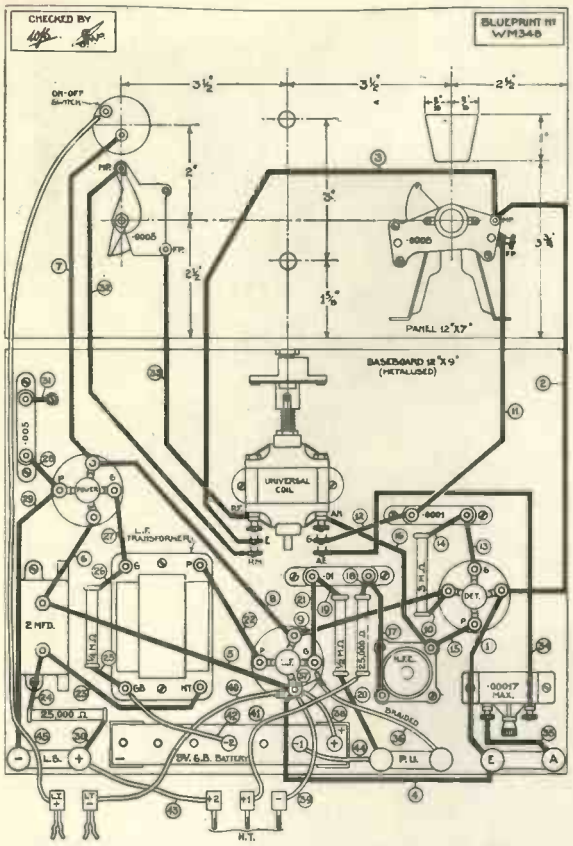
This view emphasises the extreme simplicity of the layout. Note the space for the grid-bias battery at the bottom of the baseboard

The arrangement of the set will be clear from the photographs and diagrams that appear in these pages; everything essential for easy construction is included. For those who prefer to work from one, however, a full-size blue-print has been prepared. This can be obtained for half-price, that is 6d., post paid, if the coupon on the last page of the issue is used by January 31. Address your application to "Wireless Magazine," Blueprint Dept., 58-61 Fetter Lane, London, E.C.4, and ask for No. WM348. A copy will be sent to you by return of post.

The construction of the receiver will be clear from the blueprint (a quarter-scale reproduction appears on page 652). In spite of its versatility there are only six connections to the four-range tuning coil, which is screwed to the baseboard in the usual way.

It is very desirable in wiring the set to keep all the leads as short and straight as possible, particularly the connections to the detector stage. High-frequency currents (and short waves mean very high-frequency currents) easily leak away through stray capacities in wiring and components and unless care is taken, all the signals will leak away before they have been amplified at all by the detector valve.

It will be seen that two high-tension positive tappings are



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM
Construction is much simplified by using a full-size blueprint which can be obtained for half price, that is 6d., post paid, if advantage is taken of the coupon on the last page before January 31. Ask for No. WM348 when ordering

provided. The first supplies the detector stage only, and the second supplies the anodes of the low-frequency and power valves. The detector valve will often give good reception with less than the usual 120 volts; the best value should be found by trial and error, and valves vary considerably in this respect.

Another thing that can be experimented with (as far as short-wave reception is concerned) is the resistance of the grid leak. We have shown a value of 3 megohms, but with different valves a higher or lower value may give the best results.

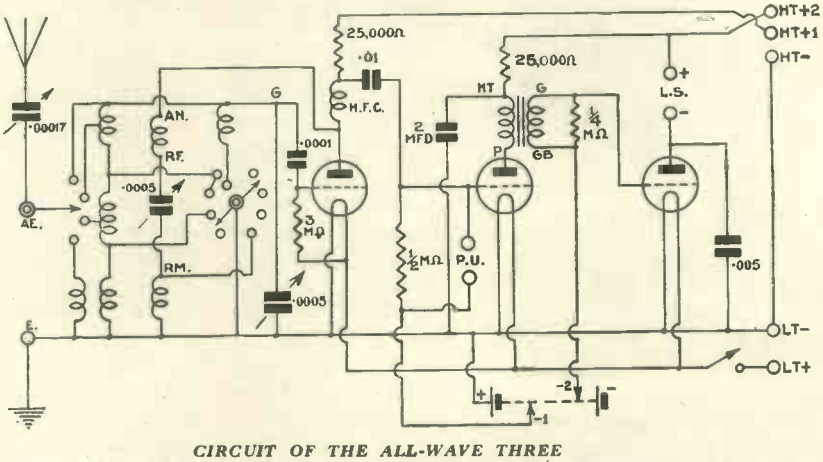
Note that the set uses only one low-frequency transformer, although it has two low-frequency stages. This is because the detector is resistance-capacity coupled to the second valve. The resistance has a value of 25,000 ohms and the condenser is of .01 microfarad. Here, again, other values may be tried, especially if the constructor already has a few odd condensers and resistances of about these values on hand.

The transformer stage is decoupled with another 25,000-ohm resistance and a 2-microfarad condenser. The .25-megohm (250,000 ohms) resistance across the secondary of the transformer is to keep the top-note response down a bit and thus helps to prevent instability.

It would be difficult to design a more useful and promising three-valver at anything like the price of the All-wave Three. The tuner is cheap and good; and the remainder of the parts are also all good value for money. Old hands who already have a selection of components on their shelves will be able to build the set up for a few shillings.

And remember, this set will definitely give you world-wide reception. When the usual medium and long wavebands offer no promising entertainment you can try for other fields. There are amateurs on all kinds of wavelengths and all over the globe, besides the broadcasting stations listed on pages 582 and 584 in this issue of "Wireless Magazine." Whenever you like you will be able to hear the United States direct, while there is no reason why your log should not extend to Australia and Japan!

So now, you long-distance fans, get going and let us know what you can do!



CIRCUIT OF THE ALL-WAVE THREE
It will be seen that the arrangement of the set is quite straightforward. The valve combination is of the detector and two low-frequency sequence

B.B.C. on Light Entertainment

AS Director of Light Entertainment, Mr. Eric Maschwitz recently invited me to a discussion of his past and future plans for broadcast variety and vaudeville shows.

First he made out a very good case for the continued use of a studio audience, or better still of an audience in a hall, such as the St. George's.

As he pointed out, very few artists can give their best performances when they are asked to appear alone before a microphone. The majority need some sort of audience as a stimulus. A much better effect was obtained in a hall than in a small studio.

Owing to the shortage of really good acts that could stand alone, Mr. Maschwitz thought that in future the tendency would be towards emphasising feature programmes rather than individual artists.

As to immediate shows, Mr. Maschwitz explained that he had no intention of dropping out the Eight Step Sisters, but in future they would be used rather more vocally than in the past.

"In Town Tonight" would continue as a Saturday night feature, but for the time being the "First Time Here" programmes would be dropped on Saturday afternoons in the near future.

A. H.

A Test of the All-wave Three

IN these days when money is getting tighter and tighter it is little wonder that the short waves are not going ahead as quickly as was anticipated earlier in the year. It has been realised that short waves are here for good and that they do offer definite entertainment value, but normally for the average man it means constructing an entirely separate short-wave receiver. Just recently, however, manufacturers have seemed to realise this point, and have designed one or two tuning units which tune from 2,000 right down to the short wavelengths.

This enables all-wave sets to be constructed which are highly efficient on every waveband. When the British General tuner was introduced, I saw, immediately, the possibilities of this coil. At last a receiver could be designed tuning from about 14 or 16 metres right up to 2,000.

Being particularly interested in short-wave reception, I was glad to test the results of the "Wireless Magazine" experiments with the British General all-wave tuner.

The All-Wave Three is quite a straight simple set. How is it possible to hear such stations as Sydney and New York on a little set like this ?

Perhaps my tests will help to prove just what can be done with an all-wave set of this kind. On the medium and long waves the All-Wave Three behaved like a normal three-valve set. The selectivity was sufficient. At a distance of twenty miles north of Brookman's Park I cut out the National station within a few degrees of the maximum tuning point. The same remark applies to the Regional.

With little care in tuning and a moderately short aerial, I logged Hamburg without difficulty. With the various selectivity tappings on the coil the degree of selectivity can be varied to suit your own particular requirements, so that you are not tied down to any particular selectivity. This flexibility enables the maximum signal strength to be obtained, and consequently the maximum number of stations.

IN ITS CABINET

In its neatly designed table cabinet, the All-wave Three is certainly a neat outfit. It is cheap to build and gives efficient results

On long waves, as is to be expected with a set of this kind, all the worth-while stations can be tuned in without difficulty. In fact, while using the most sensitive aerial tapping I found that the daylight range was remarkably good.

On the short waves I was particularly interested in the results.

Just to prove the capabilities of this set, it will be sufficient to say that I logged W2XAD, Schenectady, New York, on the loud-speaker at 6 p.m. one evening without any trouble.

Of course, the local Continental short-wavers and some of the commercial telephone stations could be picked up with the reaction control a long way from the maximum setting.

Conditions were not too good when I made these tests; short-wave conditions vary quite a lot. However, what I did hear left me with a very favourable impression. I found that there were no snags in operating the set, but, naturally, one has to turn the tuning condenser very slowly when searching for short-wave signals. Again for short-waver work the best use should be made of the reaction condenser.

If you use a moderately short aerial and take particular care in your tuning, I believe that this receiver will live up to its name and bring in stations from all over the world.

K. J.

COMPONENTS NEEDED FOR THE ALL-WAVE THREE

	£	s.	d.
BASEBOARD			
1—Peto-Scott Metaplex 12 in. by 9 in.		1	6
CHOKE, HIGH-FREQUENCY			
1—Wearite, type HFO (or Goltone, Bulgin)		6	6
COIL			
1—British General all-wave tuner		9	6
CONDENSERS, FIXED			
1—T.C.C. .0001-microfarad, type 34 (or Dubilier, Telsen)		1	3
1—T.C.C. .005-microfarad, type 34 (or Dubilier, Telsen)		2	0
1—T.C.C. .01-microfarad, type 34 (or Dubilier, Telsen)		3	0
1—T.C.C. 2-microfarad, type 50 (or Dubilier, Telsen)		3	6
CONDENSERS, VARIABLE			
1—Polar .0005-microfarad, Aperture type		3	6
1—Polar .0005-microfarad reaction, Compax type (or Magnum, Graham-Farish)		2	6
1—Lissen .00017-microfarad preset, type 992 (or Sovereign, Telsen)		2	0
HOLDERS, VALVE			
3—Lissen four-pin, type LN5069 (or Telsen, W.B.)		1	1½
PANEL			
1—Peto-Scott 12 in. by 7 in., ebonite		3	6
PLUGS AND TERMINALS			
6—Belling-Lee marked H.T.+2, H.T.+1, H.T.—, G.B.+, G.B.—1, G.B.—2 (or Clix, Eelex)		1	0
2—Belling-Lee spade terminals marked L.T.+, L.T.— (or Clix, Eelex)			4
3—Telsen terminal blocks (or Lissen)		1	6
RESISTANCES, FIXED			
2—Erie 25,000-ohm (or B.A.T., Telsen)		2	0
1—Erie ¼-megohm (or B.A.T., Telsen)		1	0
1—Erie ½-megohm (or B.A.T., Telsen)		1	0
1—Erie 3-megohm (or B.A.T., Telsen)		1	0
SUNDRIES			
Pair Bulgin grid-bias battery clips, type No. 1			6
6 in. shielded sleeving, say			3
Tinned-copper wire, No. 20 gauge, for connections (Lewcos), say			6
Oiled sleeving (Lewcos), say			9
4 yds. thin flex (Lewcoflex), say			4
SWITCH			
1—Bulgin rotary on-off, type S85		1	6
TRANSFORMER, LOW-FREQUENCY			
1—Ferranti, type AF10 (or Lissen Graham-Farish)		8	6
ACCESSORIES			
BATTERIES			
1—Drydex 120-volt high-tension, type H1006 (or Anodex, Siemens)		11	0
1—Drydex 9-volt grid-bias, type H1001 (or Anodex, Siemens)		1	0
1—Smith 2-volt accumulator, type RBN (or Oldham, Exide)		8	6
CABINET			
1—Peto-Scott Universal		15	0
LOUD-SPEAKER			
1—R. & A., type Multex (or Blue Spot) in standard cabinet	2	5	0
VALVES			
1—Cossor 210Det (or Hivac D120, Osram L210)		7	0
1—Cossor 210LF (or Hivac L210, Osram L210)		7	0
1—Cossor 220P (or Hivac P220, Osram LP2		8	9
MAINS UNIT (In place of batteries)			
1—Ekco, model AC.12/3	2	9	6

Choosing

Here Whitaker-Wilson, the "W.M." Music Critic, tells you all about the latest gramophone records. In particular, this month, he deals with many records from the gramophone companies' Christmas lists

"'The Sacred Hour,' sung by Peter Dawson with a chorus, proved one of the most delightful things I have heard for a long while"

THERE is some good singing to report this month. Personally, I am rather tired—or was—of *In a Monastery Garden*, but I cheered up wonderfully when I heard Peter Dawson sing a vocal edition of it. Quite nice! That, as a matter of fact, was all I was going to say about it until I remembered I hadn't heard the other side. (When one has a stack of records, it is not surprising if one makes that mistake.)

However, I turned the disc over, being a trifle conscientious in these things, and I am glad I did. *The Sacred Hour*, sung by Peter Dawson with a chorus, proved one of the most delightful things I have heard for a long while. This record is far and away the best of the whole batch, in my opinion. That is why I have talked about it now. Its number is H.M.V. C2595 (4s.). Get it. You won't be disappointed.

While I am on the subject of singers, I had better deal with the others. There is a remarkable Caruso record in this month's releases. He sings *The Lost Chord* and *Ombra mai Fu* (Handel's *Largo*, in other words) to Herbert Dawson's accompaniment on the Kingsway Hall organ. Rather an eerie experience for any organist to accompany a singer he has never heard in real life.

That shows what things are coming to! It is now possible to isolate a singer from his original record, "play" him to an organist, and make a record of the result. What next? The record is H.M.V. DB2073 (6s.).

I can't say I wanted Richard Crooks to sing *Nirvana* because I'm not too fond of the song. That's a matter of opinion, and yours is as good as mine, of course.

What I can tell you about that record, and *How Lovely are Thy Dwellings* (on the reverse) is that it is remarkable for clarity of diction. Every syllable comes through, and as Crooks makes such a pleasant noise while giving you the words so vividly, I am pretty certain you will like the record (H.M.V. DB1951, 6s.).

Another tenor voice which always records well is that of Charles Kullman, whose impassioned style has captivated a good many people. *Love, Here is My Heart!* is not such slop as you might think from the title. The reverse is a song called *Vale*, which is quite worth hearing. The chief thing about this record is Kullman's style, which I like very much. (Columbia DB1227, 2s. 6d.)

"If you are tired of your own party you can hear Stanley Holloway tell you about one given by Sam Small"

Ina Souez, singing *My Hero* and *Love Will Find a Way*, on Columbia DB1226, is worth your while, especially if you like the modern ballad type of song. Her style of singing makes up for anything you lose in the actual song. She is definitely good.

Now for one or two orchestral items. A Decca-Polydor record of the Berlin Philharmonic Orchestra playing Schreker's *Little Suite for Chamber Orchestra* is well worth your notice. The scoring is rather unusual, something of everything from what I could tell. There seems to be a piccolo, a flute, an oboe—indeed, one each of all the wind family. I noticed a piano, a harp, and a celeste; a triangle, a side-drum, a bass drum, cymbals, xylophone, and a glockenspiel. There was also some sort of bell instrument—it may have been a stabglocken.

At all events, you get plenty for your money. The music is a trifle modern, but it won't curl your hair or anything like that. The recording is almost perfect—but these D-P records are like that. Two discs: D-P5082-3, 10-inch, half a crown each. Very cheap and very good!

The House of Brunswick sent me one of their records this month. They have what they call their Studio Quartet. Rather cunningly made up, too. It consists of a fiddle, a 'cello, an organ, and what they describe as a

Your Records

string bass. Don't they mean a double bass? Anyhow, the record 01626, 2s. 6d., *is really good*. You know "Dook" Ellington's *Sophisticated Lady*, of course? Well, you have her very nicely presented on one side of this record. The other is called *Blue Prelude*. I can't tell you why a prelude should be blue, but I like the work. Moreover, the recording by this firm takes beating.

If you want some first-rate light orchestral music you can do worse than go in for Tchaikovsky. He is everybody's composer. H.M.V. has had the happy idea of recording *The Swan Lake*, with the London Philharmonic Orchestra under Barbirolli and with Brosa as solo violin. So you are getting something worth having. The Waltz, especially, captivated me. They played it beautifully. The numbers are C2619-20, and cost 4s. each.

Something for the children is provided on T206 by Decca in the form of Roger Quilter's *Children's Overture* in which *Boys and Girls Come out to Play* is the chief theme. Also there are quaint and rather amusing variations of *Three Blind Mice*, *A Frog Who Would*, and *I Saw Three Ships*. As the Grenadiers play it, I need say no more.

Albert Sandler plays the *Londonderry Air* and Handel's *Largo* on Columbia DB1223 in a way that should appeal to many of you. I can recommend it, I assure you.

Going a little lighter still, you might consider *Colonel Bogey on Parade* (Columbia DB1249, 2s. 6d.), a Wireless Military Band record. Quite good!

As this January issue will be in your hands before Christmas, it is not too late to review a batch of records which may be useful at Christmas and New Year parties.

One attracted me particularly. It is called *Forfeits, Old and New* (H.M.V., B8048). One side of the disc has six forfeits for ladies, and the other side is for things like you and myself. You cannot tell before hand which forfeit will be yours. They are certainly amusing.

Do you want a tale by A. J. Alan? It's a good one all about a prawn named Percy. I had thought of giving you my construction of the ending, but I should want half the Magazine to prove my contentions, so I will leave you to quarrel over it. So get Regal-Zonophone MR1118, 1s. 6d., but don't write and abuse me if you quarrel with your best girl. I take no responsibility with A. J. A.

If you are miserable over it, or think you are likely to be, you had better order Charles Penrose and Kaye Connor's laughing records (Columbia DB1200, 2s. 6d.). That may put things right, but I do not guarantee it!

George Buck sings *Why Build a Wall Round a Graveyard*, one of those grave questions which only Leslie Sarony would think of asking or attempt to answer. You will find that on one side of Regal-Zono 1122.

Are you going to dance the Lancers, think you? Very good for you. *Hearts of Oak Lancers* are worth dancing to. They occupy three sides out of four on H.M.V. 262-3. The fourth side is thoughtfully devoted to an old favourite of mine, *Valse Septembre*. Sidney Baynes and his Orchestra are responible for all of it and my candid opinion is that it is a welcome change from foxtrots and one-steps.

Those two admirable people, Layton and Johnstone, have been at it again—this time with quite a captivating version of *Goodnight, Little Girl of My Dreams*. Very attractive indeed! (Columbia DB1254.)

The rest of my batch are really rowdy. Let's have a chorus (*J.B.'s Body*, and such-like) on Columbia DX549; *Round the Camp Fire* (if you can stand that sort of thing this weather) introducing *J.B.'s Body* again but also *London's Burning* and *There's a Tavern*. This is on Winner 52, only 1s.

Perhaps *Drinks All Round* would suit you better? You can have them on Columbia DX546, when you will hear all about that little brown jug and also the merits of one Cole, *Rex et Imperator*.

A record by Jack Buchanan (above), the stage and film favourite, is reviewed by Chopstick on the next page. Whitaker-Wilson recommends a new record by Richard Crooks (left), the famous American tenor, this month

What more can you want? If you are tired of your own party you can hear Stanley Holloway tell you all about one given by Sam Small on Columbia DX512, and Cicely Courtneidge has something to say about a girl she knows in the Post Office on H.M.V. C2623, so you need not be wretched this Christmas.

If you look through these reviews—admittedly they will not all please you—I am pretty certain you will find something at least to your taste. If not, in the words of a popular song—*Don't Blame Me!*

Additional Records Reviewed

By CHOPSTICK

LIGHT SELECTIONS

Geraldo Nights (No. 1), (d.s.), Geraldo and His Orch., 2s. 6d. **COL DB1257**

Geraldo shows us in a sparkling way the deal of entertainment that can be got by mixing up good light tunes of the moment. He has picked on all the best tunes—at least, I think so. He uses a "straight" band and not his gaucho-tango combination. Here are the best numbers: *Trouble in Paradise, Don't Blame Me, Lazybones* and *I Cover the Waterfront.*

★**The Bands That Matter,** 2s. 6d. **DECCA K710**

This title needs an explanation. The dance bands of Hylton, Fox, Lew Stone, and Ambrose are

Ambrose, the famous dance band leader

massed, and play four favourite waltzes—*Blue Danube, Voices of Spring, Chocolate Soldier*, and *Merry Widow*. Massed dance bands are something new. Everyone will like this disc. It is a trifle noisy, but the brass of four big dance bands is probably greater than the brass in the B.B.C. Symphony Orchestra. You can gather the "tone" of this disc from that.

★(*a*) **Whispering,** (*b*) **Three Old Favourites,** Roy Fox and His Band, 2s. 6d. **DECCA K713**

One of the best records of the month. (*a*) is a concert version of Roy Fox's signature tune; every listener to broadcast dance music knows it. This version opens with a "grand" introduction, then the straight tune followed by some clever variations. In (*b*) Roy Fox revives three good tunes—*Tea for Two, Lover Come Back to Me*, and *I'll See You in My Dreams*. A clever production, which will please Fox's army of fans.

LIGHT SONGS

★**Gracie Fields At the Theatre** (d.s.), Gracie Fields, 12s. the set. **H.M.V. C2625-6-7**

These three records are supplied in an H.M.V. album, embossed with gold lettering; an honour which I thought was reserved for music and musicians. Never mind, Gracie deserves this honour. This is a complete recording of a Gracie Field's show at the Holborn Empire. Here are the gems: *There's a Cabin in the Pines, Whiskers and All*, the famous *Rochdale Hounds*, with *Sally* as an intended conclusion. After prolonged applause, in which Gracie tells the audience that they are greedy, she ends by tormenting them, and me, with *Stormy Weather*. Songs, asides, patter, and applause is all here—a marvellous entertainment!

★(*a*) **I Was in the Mood,** (*b*) **Why Don't They Leave Us Alone,** Hildegarde, 2s. 6d. **COL DB1247**

The first English record of Hildegarde, the twenty-six-years-old American girl radio and vaudeville star. She is an "intimate" singer with very delicate expression. Her success is certainly due to two things—she sings softly, and her diction is faultless. There is hardly a trace of American accent—a good point. These two songs, both sentimental ballads, really do this great girl justice. Undoubtedly, the best record of its kind I have heard.

Jack Buchanan Medley (d.s.), Jack Buchanan, 4s. **H.M.V. C2630**

Hildegarde a new American singer—a sensation!

Jack Buchanan, the film and stage favourite, needs no introduction. This record conjured delightful memories of his best successes. The nicest tune of the selection is *Who*; at least, I think so. Others include *Two Little Bluebirds, Good-night Vienna, It's Not You*, and *Fancy Our Meeting*. You will like all these numbers because they are sung as only Jack Buchanan can sing them and because the orchestral accompaniment is really brilliant.

Musketeers Melodies (No. 1) (d.s.), Four Musketeers with Mabel Pearl, 2s. 6d. **COL DB1252**

Medleys are much in vogue at the moment. You probably remember that these four bright lads, with Mabel Pearl at the piano, helped the B.B.C. Band some time back. I have just played the second side with *Trouble In Paradise*, then *Yvonne*, and *The Last Round-up* as a finish. Very well produced—these people can sing.

(*a*) **Summer is Over,** (*b*) **Close Your Eyes,** Ruth Etting, 2s. 6d. **BRUNS 1614**

This is the first time I have heard a record of Ruth Etting. I did hear an impression of her in Eddie Pola's second broadcast burlesque of American artists. Please don't ask for my opinions on impressions. Ruth Etting has a typical American lady crooner's voice, and these are sentimental ballads. You must form your own opinion from that.

(*a*) **The Last Round-Up,** (*b*) **Home on the Range,** Bing Crosby, 2s. 6d. **BRUNS 1608**

Bing is in his element with "The Last Round-up." It is his best record. Though known as a crooner, Mr. Crosby can sing. Now you round-up fans, if you want to hear this tune properly, just hear this. It is the last word!

INSTRUMENTAL

Very Merry Christmas (d.s.), Organ Solo by Sidney Torch, 2s. 6d. **COL DB1196**

A real jazz medley of old-time tunes. *O dem Golden Slippers, Home Sweet Home, Little Brown Jug, Sir Roger*, and *Drinking* are examples of the ingredients. Just a word about *Drinking*. You know the finish of this song when the low notes descend with D-R-I-N, etc. Torch uses some real bass here; it is ideal as a test record. On the other hand, it is jolly good stuff for this time of the year and, incidentally, a fine example of good organ playing.

★(*a*) **Vamp Till Ready,** (*b*) **Ain't She Sweet,** Piano Solo by Fred Elizalde, 2s. 6d. **DECCA M450**

Brilliant playing by Elizalde. I recommend this disc to students of modern piano playing and to the ordinary music-lover as well. It is a clever and tuneful record. *Ain't She Sweet*, a great hit two or three years ago, is brought back with a new freshness; in fact, the tune is hardly recognisable. A brilliant production and well recorded!

DANCE MUSIC

(*a*) **Cage In the Window** (f.), (*b*) **Monkey on a String,** Scott Wood and His Orch., 1s. 6d. **REGAL-ZONO MR1134**

Two fine numbers; both of the comedy type. I think the best title would be "delicate descriptive" numbers. Scott Wood is a clever arranger and has done his best here. The titles give the clue to the tunes; the sort of record that will suit the kiddies' tastes.

(*a*) **Dance of the Lame Duck** (f.), (*b*) **Buji** (f.), Casa Loma Orch., 2s. 6d. **BRUNS 1620**

Ray Noble, the well-known dance composer and conductor

Henry Hall is known to you all—a great favourite

Two "advanced" numbers. I think they are, perhaps, a little too modern for general appeal. From a "modern-rhythmic" point of view they are beyond reproach. Both are original and both startling. Brunswick tell me that Casa Loma records are used exclusively by the Murray Dancing Studios, in the States, whose pupils number over 10,000.

(*a*) **I Took My Harp to a Party** (comedy w.), (*b*) **The King Made Whoopee** (quickstep), Billy Cotton and His Band, 1s. 6d. **REGAL-ZONO MR1127**

Two "rousers" in Billy's best style. Here them and you are bound to agree.

More Turkish Delight (comedy (f.) (d.s.), Ray Noble and His Orch., 2s. 6d. **H.M.V. B6424**

By Max Kester and Ray Noble. At this time of the year there is some excuse, I suppose, for comedy numbers of this type. My grouse about silly comedy numbers is that in nine cases out of ten, the music is second-rate and the words are more ridiculous than usual. Many will, however, find great fun in this excursion to the East. Ideal for a party!

(*a*) **Thanks** (f.), (*b*) **The Day You Came Along** (f.), B.B.C. Dance Orch., 2s. 6d. **COL CB672**

Two more good dancing tunes. (*a*) is a great favourite; it is the theme song of the film, *Too Much Harmony*. (*b*) is another tune from the same film. Well up to this band's standard. Recommended as a reliable dancing disc.

(*a*) **This Town's Too Quiet** (f.) (*b*) **My Hat's On the Side of My Head** (f.), Ray Noble and His Orch., 2s. 6d. **H.M.V. B6421**

Leslie Sarony, a marvel at light numbers, is the "author" of (*a*). Original and full of life, this number has that rollicking swing just right for parties. Its novelty is that hearers are asked to join in the chorus—a queer effect is produced for the solitary listener. (*b*) from the film *Jack Ahoy* is another lively number and ideal for dancing.

★(*a*) **Weep No More My Baby** (f.), (*b*) **Down a Long, Long Road** (f.), B.B.C. Dance Orch., 2s. 6d. **COL CB670**

Not very exciting names for this time of the year, but names are often deceptive. You can say exactly what you like about this band, but no one can deny that it is an ideal combination for dancing. Their time is always right—except waltzes—and the rhythm is well marked. Both (*a*) and (*b*) have been broadcast often. Les Allen is responsible for both vocals—overworked man.

(*a*) **Who's Afraid of the Big Bad Wolf?** (f.), (*b*) **A One-Horse Town** (f.), The Barnstormers, 1s. **WINNER W38**

Do you know the history of this band? They are late members of Jack Payne's band, and play at the Barn, a roadhouse on the Barnet By-pass just outside London. I liked their treatment of (*a*); not too heavy or silly, but with all the essential foolishness of this very popular hit. They make a feature of solo playing, which I found very enjoyable. Well worth a shilling!

Your Dance Music COMES FROM-

Here is Harry Roy, a real favourite, who broadcasts every Friday from the Mayfair Hotel

Geraldo, who is famous for his tango music

Among the most popular items broadcast in the programmes, dance music occupies a very prominent position. Probably it is the most well-liked feature on the air. Here are some very familiar leaders of the dance-music world who entertain you on the radio.

(Above) Jack Hylton and his merry men

(Right) Percival Mackay will broadcast in January

(Above) Here is Carroll Gibbons the famous syncopated pianist with his Savoy Hotel Orchestra

Arthur Salisbury, another of the Savoy dance-band leaders is very well-known

"Britain's Brightest Band" is a slogan often applied to Harry Roy's Band at the Mayfair Hotel

The "lab" of Mr. H. B. Crowe, an enthusiastic London experimenter

By KENNETH JOWERS

USING YOUR SET ON THE SHORT WAVES

USING your set on the short waves—that sounds all very well, but the majority of readers will immediately say "Why should I?"

It is quite easy to keep on repeating that the whole world can be tuned in with quite simple apparatus if wavelengths of under 100 metres are used. As the programmes obtainable from local and Continental stations usually satisfy most of the family, it is considered that additional programmes are quite unnecessary, particularly as it would mean added expense. There is always a time with every listener when he becomes bored with the usual run of programmes, which vary so very little during the year.

It is then that the short-wave unit comes into its own. I have purposely left out the short-wave receiver as it is very unlikely that those unacquainted with short-wave listening will go to the expense of a complete short-wave set. That comes later.

With everyday apparatus I would not attempt to try to convince you that the programmes on short waves can compete with medium-wave broadcasts. It is not from broadcast matter that the short waves obtain their fascination, it is the uncertainty of what you will hear; perhaps an American station would be heard and next to it on the tuning scale an Australian, or perhaps a more local Danish station.

On a medium-wave set signal strength is usually an indication of distance, but on short waves it is often the more powerful station that is the furthest away. For example, in this country it is very difficult to pick up the Empire broadcasts from Daventry at good strength, but on the other hand we can often hear these broadcasts being re-transmitted by Colonial stations at reasonable loud-speaker strength.

I have just received a letter from a Birmingham schoolboy, who, with a simple detector and low-frequency set and a pair of headphones, has been picking up Sydney every Sunday afternoon for the last month or so. Now such a set costs only a few shillings to make and is definitely an asset to the enthusiast for he can amuse himself for hours on end when the family are listening to the local station.

There used to be a very old fallacy that short-wave reception was only possible after midnight and the small hours of the morning with a receiver having long extension handles, valves with their bases taken off and very special components. The fact that these ideas are entirely wrong doesn't seem to have gained much ground, so for some reason or other short-wave sets are definitely not nearly as popular as the family set.

As an example of what can be done by the inexperienced listener—not by the enthusiast with a super short-wave set—let us review the results of an evening with a super-het converter in front of a set, such as the Cossor Melody Maker or any S.G.3.

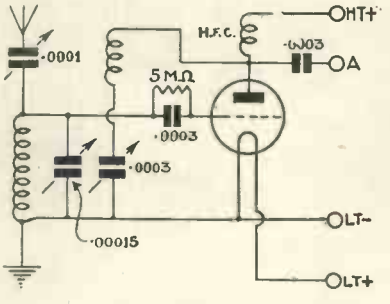


Fig. 1—A typical circuit of a combined detector-oscillator short-wave unit

Early in the evening we turn to the bottom end of the tuning scale, up to, say, 30 metres. Down at the bottom end on the 16-metre band W3XAL literally falls in with one of the Empire stations on one side at *poor* headphone strength and one or two Atlantic telephone stations on the other; all come within two or three degrees on the dial.

A little higher up the scale W2XAD on 19 metres odd can be heard about three nights a week, not because it is hard to get, but because they are the only times it is on. Then comes the most interesting band of all; the 20-metre amateur band, the wavelength band used by private amateur transmitters all over the world.

Although they use quite low power the strength at which they can be heard is surprising. Such stations as VE3HE, in Toronto; W2ADY, in Leonia, N.Y.; or even W6EPE, in Los Angeles, nearly 6,000 miles away, can be heard quite frequently. Although they do not transmit programmes, the tests carried out are amusing and, at the same time, do give an idea of the great distances they can cover, and, incidentally, the efficiency of your own set.

There is a great thrill in hearing stations five or ten thousand miles away; a thousand miles is neither here nor there with a short-wave set. I remember some little time ago hearing of a number of listeners picking up the transmission by

Captain Byrd on his way to the South Pole; others following the R.A.F. 'plane half-way on its journey to the Cape, while quite a number have followed expeditions in South America after they have been out of touch with civilisation.

It must be fairly obvious that a simple adaptor costing only a few shillings is certainly worth while, even though it is not used as much as your family set. The most popular set to-day is undoubtedly the simple screen-grid three or a small super-het.

Now both of these sets can be adapted for short-wave work without alteration. It simply means using a single-valve adaptor or converter to suit the type of set with which it will be used. Take, first of all, the straight three with a single screen-grid high-frequency stage. If we connect in front of this set a single-valve super-het converter consisting of a combined detector-oscillator, the set is then changed into a four-valve short-wave super-het.

Now, such a set is of the highest sensitivity and cannot be bettered for short-wave reception, but remember that you cannot add a super-het adaptor to a set without a high-frequency stage. Perhaps it would be as well just to point out that the three-valver and the adaptor make a four-valve super-het consisting of a combined detector-oscillator, an intermediate-frequency stage, second detector, and power valve. In the straight set we simply tune to about 1,800 metres, converting the high-frequency stage into an intermediate-frequency stage.

Fig. 1 is a typical circuit of a combined detector-oscillator unit. You will see that it is not complicated and it is virtually a single-valve set. The components are all quite standard, although of unusual values. The condenser in the aerial is essential and can be of the pre-set or neutralising type, having a low minimum capacity.

The idea of this condenser is to remove the damping of the aerial from the grid circuit. If the aerial is too long the set will not oscillate. The tuning condenser can be of almost any capacity, but it is advisable to use a small one, otherwise the stations will be cramped together and hard to tune in. The reaction condenser can be of the solid dielectric type, providing it has a pigtail and is not noisy. Noise must be prevented at all costs.

All coils can be of the plug-in type for cheapness, such as Igranic. I mention Igranic coils in particular, because on the side of the coil they fix a little slip, showing the tuning range of the coil when used with a particular size of tuning condenser. Such a unit as this can be made up on a baseboard, and where the shillings are of importance a cabinet need not be used.

Now, as regards the connections; the terminal marked high-tension positive should be connected to a tapping on your high-tension battery at about 90 volts. The aerial terminal from your existing set is taken off and connected to one side of the .0001-microfarad variable condenser.

The terminal marked A on the unit is connected to the original aerial terminal on the set by means of a piece of flexible wire, kept as short as possible. Of course, low-tension positive and negative terminals go to the existing accumulator.

There is one point which must not be forgotten. There is not a high-tension negative connection when a common high-tension battery is used because connection is made through the original set. The earth connection can be left on the original set or, if you wish, it can be connected to the earth terminal on the unit.

As I have already mentioned, the family set must be tuned to about 1,800 metres, that is just above Radio Paris, with the volume control increased to maximum and the receiver nearly oscillating.

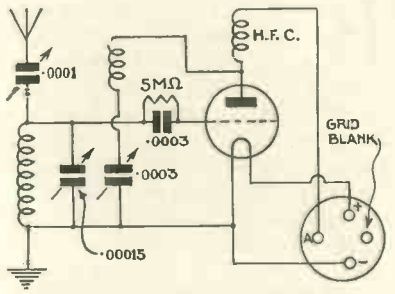
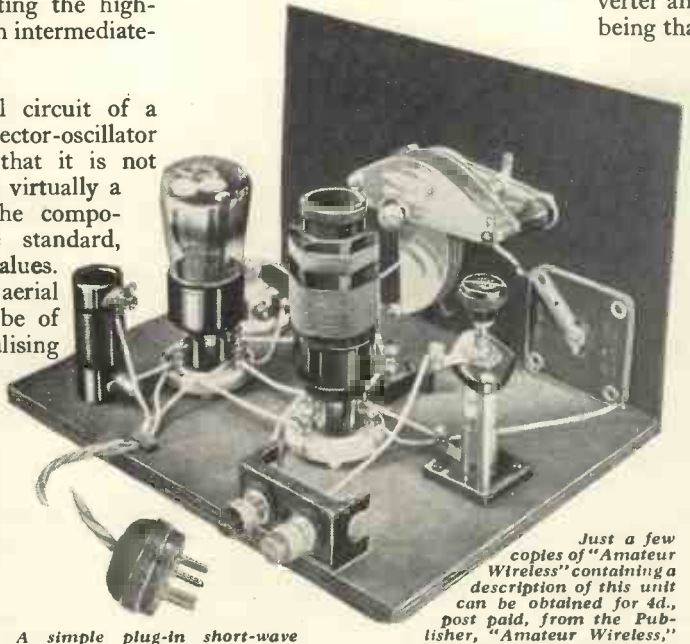


Fig. 2—The circuit of a plug-in adaptor for use with sets without high-frequency stages

If you have a super-het, the converter can be connected in front of this in the same way as with a straight set, with the exception that there is no high-frequency stage to tune. Some consider that with a super-het or a set without a high-frequency stage it is better to use a plug-in adaptor, which is almost the same as a super-het converter except for the method of connection. Fig. 2 shows a typical plug-in adaptor circuit.

The components are identical with those in the super-het converter and the only circuit difference being that the low-tension and high-tension terminal connections are taken to a four-pin plug. You will see that the grid connection is left blank. This is because the grid circuit of the detector valve is cut out in favour of the short-wave tuning circuit in the unit.

No additional high-tension or low-tension supply is necessary as this is automatically obtained through a four-pin plug from the detector valve holder into which this plug is inserted. This type of circuit is very simple, but it only changes the receiver into a straight short-wave set without a high-frequency stage and not into a super-het, so that it is not so efficient as the converter.



A simple plug-in short-wave adaptor that will give efficient results

Just a few copies of "Amateur Wireless" containing a description of this unit can be obtained for 4d., post paid, from the Publisher, "Amateur Wireless," 58-61 Fetter Lane, E.C.4. Ask for issue dated March 18, 1933

On the Crest of the Waves

Radio News from All the World : : By JAY COOTE

BELGIUM

BOTH lack of funds and the suspension of licences has compelled the closing down of some of the small privately owned broadcasting stations in the provinces, but there still remain a number of them scattered over such towns as Antwerp, Charleroy and Liége.

The last city alone boasts of five small transmitters operating daily ! The growth of these "radio mushrooms" is forcing the Belgian Government to take steps to prevent interference with the reception of the programmes of the two Belgian studios. It is probable that the remaining smaller stations may be made to work on a common wave.

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FRANCE

On the eve of its re-opening for the winter season, the Nice Casino (*Palais de la Mediterranée*) was almost destroyed by fire. It is from this building that most of the Juan-les-Pins outside concert broadcasts have been taken and the programmes of this studio may suffer accordingly. It is stated that an attempt is to be made to link up with Cannes or Monte Carlo pending the necessary repairs to the casino.

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Every Friday, at G.M.T. 21.30, Radio Toulouse relays a performance from the Cirque Medrano, a permanent circus in Paris. It is a well-known centre of amusement, and listeners tuning in to Toulouse at that hour may hear light entertainments provided by clowns of international fame. The broadcast has gained considerable popularity since Radio Paris ceased its Sunday "studio-circus" transmissions.

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Notwithstanding current rumours to the effect that Eiffel Tower will suspend its entertainment broadcasts early in 1934, no signs of the closing down of these transmissions are apparent. According to the Lucerne Plan, France will no longer be entitled to use the 207.5-kilocycle channel, but as no agreement in respect to wavelengths above 1,000 metres was reached at the recent Amsterdam Conference, there is every possibility that for an indefinite period transmitters on the long-waves will maintain their present positions.

In these circumstances, Eiffel Tower will continue to act as a high-power relay of the Ecôle Supérieure broadcasts as hitherto. Separate entertainments from Radio Paris will provide an alternative programme.

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HOLLAND

The bringing into operation of the Kootwijk high-power station has whetted the appetites of Holland's radio programme organisers. As the transmitting hours of this station will only accommodate a limited number of the religious or political bodies who run the concerts, the authorities are considering building another powerful station to work on a medium wavelength.

The divergence of political and religious opinions existing between the independent societies demanding the right to broadcast their views has made it difficult to group them, and consequently more outlets than the two existing transmitters are needed to permit the inclusion of these different programmes.

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The complexity of varying Continental times in respect to our own will be lessened in the near future. In Holland, the Chamber of Deputies has passed a resolution with an invitation to the Government to ascertain the feasibility of coming into line with Great Britain, Spain, Portugal Belgium and France by adopting Greenwich Mean Time.

During the summer months, simultaneously with the British Isles, the clock could be advanced one hour, to coincide with Central European Time. So far, Holland has been twenty minutes in advance of Belgium, and although a summer-time schedule has been adopted, the date of the change-over did not coincide with that of other countries.

HUNGARY

With the bringing into operation of the new 150-kilowatt transmitter on the Island of Csepel, near Budapest, the Hungarian broadcasting authorities have decided to continue transmissions through the present 18.5-kilowatt station for providing an alternative programme.

At the outset, Budapest (2) will only work between G.M.T. 19.00 and 23.00, but later may transmit at other periods of the day. When the high-power transmitter alters its wavelength to 549.5 metres (546 kilocycles) on January 15, 1934, the 18.5-kilowatt station will occupy the channel decreed in the Lucerne Plan, namely, 227.1 metres (1,321 kilocycles).

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ROMANIA

The 20-kilowatt transmitter now nearing completion at Brasov (Romania), which by the Lucerne Plan will use the 160-kilocycle channel (1,875 metres), is expected to carry out tests very shortly. The wavelength in question is one which was used for many years by the Huizen (Holland) station and now adopted by the high-power Kootwijk for the same broadcast programmes.

It is one for which the Dutch authorities have strenuously fought, and its loss was the reason for Holland refusing to accept the Lucerne Plan.

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SPAIN

No notable developments have yet taken place in the scheme put forward to improve the broadcasting system in Spain and in consequence a number of smaller districts have installed their own wireless transmitters. Of these, the latest opened are Tarragona (EAJ33) on 202.2 metres, Bilbao (Radio Vizcaya), Murcia (EAJ17), Gandia (EAJ23), and Onteteniente (EAJ30), all working on 203 metres (1,478 kilocycles) with a power of roughly 200 watts. So far, although many promises have been made by the Government, no further steps have been taken to build the high-power Madrid transmitter.

TESTS OF NEW APPARATUS

Blue Spot Class-B Unit : : R. & A. Alpha Loud-speaker : : Kinva Whistle Filters : Bryce Low-frequency Choke : : Magnavox Moving-coil Loud-speaker : : Bulgin Suppressor Units

BLUE SPOT CLASS-B UNIT

APPARATUS: Class-B adapter.
PRICE: £1 9s. 6d. without valve.
MAKERS: British Blue Spot Co., Ltd.

CLASS-B adapters have recently become very popular as they enable improved results to be obtained from existing battery receivers. They are very easy to fix. The present adapter has been specially designed for use with recent types of Blue Spot loud-speaker, but any type of loud-speaker within reason can be used.

The adapter is built up in chassis form; space and fixing lugs are provided for mounting the loud-speaker. On the chassis are fixed the driver transformer, tone control switch, and the various terminals for the connections.

Facilities are provided for the use of an extension loud-speaker. No output transformer is provided normally with the chassis as many reproducers are equipped with the necessary component. However, in the event of one being required it is available at small extra cost and can be fitted to the chassis.

All types of class-B valve can be used including those requiring a small amount of grid bias; in fact, the adapter is quite universal.

The adapter was tested with both biased and unbiased class-B valves, and was found to be generally satisfactory. The extension loud-speaker facility should be appreciated, but it is necessary to remember that the resultant load imposed upon the class-B valve by the two loud-speakers in parallel must be reasonably close to the optimum value for the valves used, otherwise distortion and lack of sensitivity may result.

R. & A. ALPHA LOUD-SPEAKER

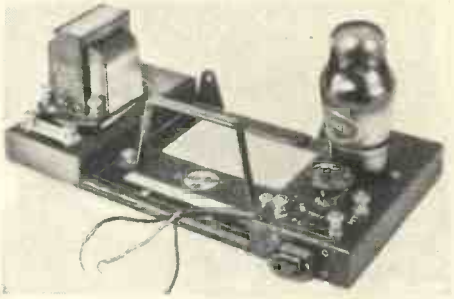
APPARATUS: Permanent-magnet moving-coil loud-speaker.
PRICE: £2 12s. 6d.
MAKERS: Reproducers & Amplifiers, Ltd.

THE construction of this new R. & A. loud-speaker is interesting in that the complete cone assembly can be removed for inspecting and cleaning the magnetic gap. This is a useful feature, as in time dirt invariably tends to collect in the gap and causes rattling and generally upsets the reproduction.

This facility is obtained by mounting the cone assembly on a pressed metal sub-chassis, which is held in position against the main chassis of the loud-speaker by means of a retaining bolt in the centre polepiece. A large permanent magnet of the familiar E shape and bolted to the main chassis is used.

The loud-speaker can be obtained in two types, one suitable for ordinary output stages and the other for use with class-B or Q.P.P. In the first case impedances ranging from 1,500 ohms to 15,000 are available, while in the latter two values of 8,000 and 15,000 ohms are available.

The Alpha tested was of the ordinary type and the various impedances given by the transformer



(Above) The new Blue Spot class-B adapter and (left) the Alpha loud-speaker, a new reproducer by R. & A.

are shown in the table below. When tested with music and speech very good results were obtained, the reproducer being sensitive and capable of handling large inputs without distress.

For the best results it is essential that a fairly large baffle should be employed, otherwise the bass reproduction becomes somewhat thin. This is an excellent loud-speaker and can be recommended.

Terminals		*Impedance*
Red	Blue	1,100 ohms.
Yellow	Blue	1,450 ohms.
Black	Yellow	2,800 ohms.
Red	Yellow	4,700 ohms.
Black	Blue	7,100 ohms.
Red	Black	13,000 ohms.

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KINVA HETERODYNE FILTERS

APPARATUS: Heterodyne filters.
PRICE: Type A3, 13s. 6d.; type D2, 7s. 6d.
MAKERS: Postlethwaite Bros.

KINVA filters, types A3 and D2, have been designed specially

(Above) Two Kinva whistle filters which have given satisfactory results, and (right) the new Bryce low-frequency choke

for use in detector or low-frequency anode circuits but they can be used in almost any required position.

The first filter, type A3, is a two-stage affair and consists of two coils at right angles and one above the other with, of course, the necessary tuning condensers. A large bracket is provided by means of which the filter can be easily mounted.

The second, type D2, is different in construction in that it is completely screened and employs only one tuned circuit, but it has the extra facility that two cut-off frequencies may be obtained.

The filters were tested under actual working conditions and the performance was almost similar to the makers.

The cut-off point in the case of the A3 filter occurs at about 4,000 cycles, which is just slightly higher than the maker's rating. The D2 filter cuts off at 4,500 and 5,000 cycles as against the rated 4,000 and 4,500 cycles. These discrepancies are, however, negligible and the filters are quite satisfactory.

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BRYCE LOW-FREQUENCY CHOKE

APPARATUS: Low-frequency choke.
PRICE: 11s. 6d.
MAKERS: Andrew Bryce & Co., Ltd.

THIS new Bryce choke is a chassis mounting component, that is, it is not provided with terminals but two connecting leads are brought out from underneath the choke.

An interesting constructional point is that it has some of the characteristics of both a gapped and ungapped choke. This is done by using a gapped construction but so arranging that the gaps are shorted out by one lamination each. The obvious result of this, of course, is that with small polarising current the choke behaves essentially as an interleaved component, but as the polarisation is increased, the bridging laminations become very highly saturated and the choke behaves just as though it were gapped in the usual way.

The choke, finished a grey colour, is housed in a metal container, substantial lugs being provided for fixing in position.

The inductance with no polarisation in the winding is very high, being 90 henries, but this value drops very sharply at first and thereafter remains fairly constant up to about 50 milliamperes D.C.

This component can be recommended.

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MAGNAVOX LOUD-SPEAKER

APPARATUS: Permanent-magnet moving-coil loud-speaker.
PRICE: £3 3s.
MAKERS: Benjamin Electric, Ltd.

ONE of the best loud-speakers we have tested recently is the Magnavox type 252. This has a large diaphragm, some 9 in. in diameter, suspended from the outer edge of a pressed metal chassis, which is itself bolted to the magnet. The low-resistance moving-coil is held centrally in the gap by means of a web type centring device located behind the diaphragm.

A tapped input transformer is provided, which is mounted from the metal chassis by a small bracket.

Fine results were given by this Magnavox loud-speaker during recent tests

The transformer has been designed to enable the loud-speaker to be used with all types of output stage including class B.

On test the loud-speaker gave a very good account of itself, the reproduction being excellent on all types of signal. The four different impedances provided by the loud-speaker were measured at 1,000 cycles and found to be approximately as follows : 3,900, 6,200, 8,500, and 15,500 ohms.

In the last two cases a centre tap is provided to enable a push-pull circuit to be used.

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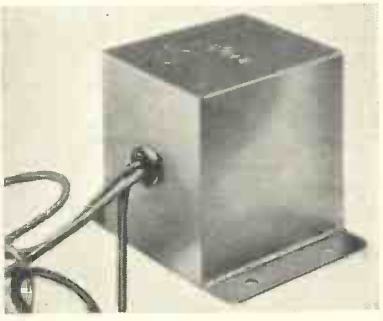
BULGIN SUPPRESSOR UNITS

APPARATUS: Interference suppressor units.
PRICE: Type A20, 2s. 6d.; type A30, 6s. 6d.
MAKERS: A. F. Bulgin & Co., Ltd.

ONE of the most annoying types of interference experienced nowadays is that termed " man-made static." This can be largely eliminated by the use of static-suppressor condensers, and so the range just placed on the market by Bulgin should have a wide application.



The new range of Bulgin static-suppressor condensers have metal cans with the usual fixing lugs

The leads, which come from the top of the condensers, are given different colours to avoid mistakes in connection. The condensers are of the non-inductive type and the containing cans are *not* connected to the centre point of the condensers. This is sometimes a useful feature.

A 2+2-microfarad and .1+.1-microfarad were tested and found to be quite satisfactory and caused considerable reduction in the amount of interference when tested in conditions known to be bad.

The measured capacity of the types tested were sensibly up to the makers' rating and there were no signs of leakage in either case on full working voltage.

HOME TELEVISION SECTION

Operating the Cathode-ray Television Receiver

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

In the two preceding issues instructions were given for building the time bases necessary for the reception of television by cathode rays. This article describes the operation of the apparatus so that pictures can be received

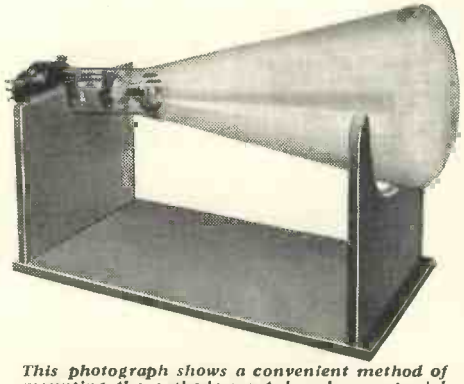
SHORTLY after I received my cathode-ray receiver back from the "Wireless Magazine" I was asked by a friend whether television reception is a practical possibility for the simple man. By way of reply I ran over the controls quite briefly and then allowed him to operate it himself, as a result of which he tuned in the pictures quite successfully, although he had never handled a television receiver before. Readers will find the same freedom from trouble.

The first step is to connect together the time-base unit and power pack and to connect a suitable tuning circuit to the receiver in order to pick up the signals. As I mentioned last month, any circuit which will receive London National at good strength, free from interference, is suitable in this position. In most cases a simple aerial coil with a variable condenser across it is sufficient.

Adjusting the Scanning

The next step is to adjust the scanning. The output from the time base is connected to the tube, according to the circuit given last month. The filament current of the tube is adjusted to the correct value, usually about .8 amp., and the shield voltage is adjusted by means of the potentiometer until a sharply focused spot appears on the screen. Now switch on the time base and allow it two or three minutes to thoroughly warm up.

Turn both the "sweep" potentiometers on the back panel in a clockwise direction as far as they will go. This reduces the sweep to zero and you will still be left with a spot on the screen, although its position may have changed. You should adjust the two "shift" potentiometers also on the back panel until the spot takes up a position towards the bottom right-hand corner of the screen, as shown in Fig. 1 (*a*).



This photograph shows a convenient method of mounting the cathode-ray tube when a special base is not used. It will be evident that the screen can be adjusted so that the scanning is in the proper direction

Now set both the 375 and 12½ controls on the front panel in the mid-way position, and rotate the Y sweep potentiometer (the one at the end nearest the mains cord) in an anti-clockwise direction. The spot will lengthen out into a line and it should do this in an upward direction so that a line is produced at the right-hand side of the tube, as shown in Fig. 1 (*b*). If by any chance the spot lengthens in a *downward* direction and runs off the bottom of the tube, this indicates that the connections to the Y plates are reversed. To correct this, it is simply necessary to change over the two connections to the Y plates on the tube. The length of this line should be adjusted until it is about 3 in. long, and incidentally if the line is not truly vertical you should rotate the whole tube.

Now shut down the Y sweep again and rotate the X sweep potentiometer next to it in an anti-clockwise direction. This should cause the spot to lengthen out into a horizontal line to the left, as shown in Fig. 1 (*c*). If, by any chance, it moves to the right, the connections to the X plates require reversing. Once these connections have been put right they do not require to be altered again.

The production of this line of light is due to the spot moving across the screen fairly slowly and then flying back very rapidly and starting again. I explained last month how this motion was produced. The voltage which causes the spot to move is produced by the relatively slow charging of the condenser which discharges through the gas-discharge tube when it reaches a certain point and the process starts again. Leaving the horizontal line running at a length of about 1½ in., try the effect of

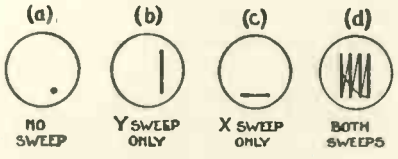
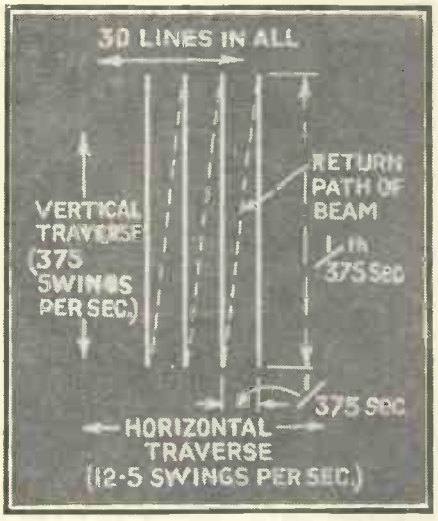


Fig. 1. These four diagrams show how the scanning sweeps are produced by adjustment of the controls

altering the setting of the 12½ potentiometer on the front of the panel. This is the potentiometer on the extreme right at the bottom. You will find that if you move it

round in an anti-clockwise direction, the charging will be so slow that you can actually see the spot move across the screen and then slip back and start again. In fact, you should be able to arrange that you get about one discharge a second or even less.

If you are unable to do this, it is a good plan to remove the connection between the centre point of the 6-volt winding (on the power pack) and H.T.—. Just remove this connection entirely and you will find that the discharge will be appreciably slower. Whether you have to do this or not depends upon the particular gas-discharge tube which you have, as the insulation between heater and cathode varies slightly.



This is how the screen is built up by the movement of the beam in two directions. Only the solid lines are visible

In use, of course, the speed of "flicking" has to be 12½ per second and at this speed you can just notice a certain amount of flicker in the line. Adjust the length of the horizontal line to be 1½ in. approximately by means of the X sweep potentiometer at the back. Then adjust the frequency of the sweep to be 12½ by removing the bottom Y plate connection (at the back of the unit) and touching the end of the lead with the little finger making contact with the metal. This is quite safe and the small capacity pick-up due to one's body will usually introduce a little mains hum on to the Y plates of the tube. The line will no longer appear horizontal but will show up as a series of waves and the frequency of the 12½ potentiometer should be adjusted until there are exactly four of these waves. This occurs when the frequency is one-quarter of the frequency of the mains which is 12½ if 50 cycle mains are being used. If the mains are 60 cycles, of course five waves must be obtained and a corresponding number for any other frequency, but 50 is the most usual frequency in this country.

Getting the Picture Ratio

So much for the X deflection. Replace the Y plate connection and adjust the Y sweep potentiometer at the back of the set. You will immediately get a pattern containing a number of lines and the height of this pattern should be adjusted to be about 3½ in. This gives the correct 7-3 ratio required for a Baird picture. You will now find that the number of lines can be varied by altering the frequency of the 375 potentiometer on the front panel. If this is turned in a clock-wise direction the number of lines will decrease. If you turn it in the opposite direction the number of lines will increase. If you focus the tube sharply, particularly with a small number of lines, you will be able to see a very fine fly-back between the lines which indicates quite clearly what is happening.

The spot of light is moving up from the bottom to the top of the screen and is then flying back and starting again. All the time, however, the spot is moving from right to left due to the X time-base voltage, and therefore when it starts again, it does so a little to the left of its previous position. It goes on in this way building up a series of lines until it comes to the end of the travel of the X sweep. The X sweep then flies back and starts the whole process again, and due to the locking between the 375 and 12½ tubes, which I described last month, the second series of lines is traced out exactly over the first, so that although the whole process takes place 12½ times a second the resulting pattern appears quite steady and clear.

For television operation we require 30 lines and the frequency of the 375 potentiometer should be adjusted to give this number. In making this adjustment the condenser in the top left-hand corner marked "horizontal framing" should be nearly at the zero position, just a little way in. The centre potentiometer marked "vertical framing" acts as a fine adjustment of the frequency of the 375 tube and is helpful in getting the number of lines quite correct.

You should now find that you have an oblong framework consisting of 30 lines which appear quite steady. You will notice a peculiar fly-back effect in the bottom right-hand corner (Fig. 2), due to the fact that the spot of light in travelling from the top left-hand corner of the picture to the bottom right-hand corner has not quite had time to get home before it starts its upward journey again. The existence of this flyback line indicates that the scanning is in the correct direction and you will not find that it interferes with the picture.

Let us now check the modulation. All these scanning adjustments should be carried out with the modulation and synchronising knobs in zero position, *i.e.*, fully anti-clockwise. Tune in a signal on the tuned circuit, preferably from London National, since this is to be used for the actual transmission of vision. For purpose of

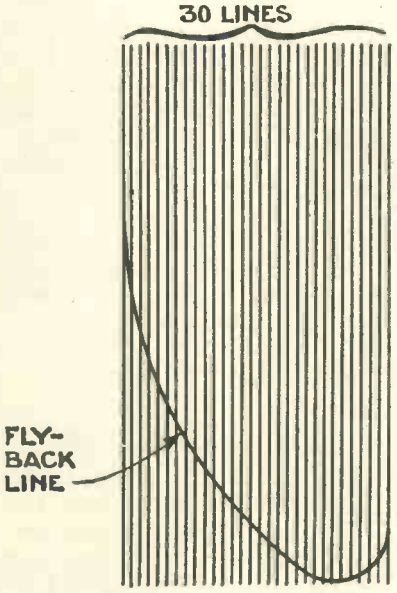


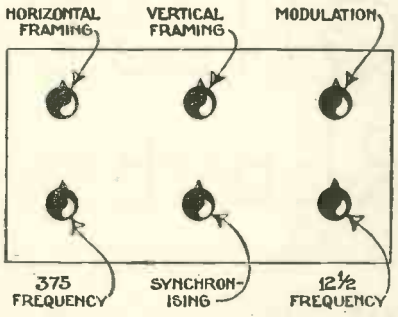
Fig. 2. An illustration of the fly-back effect which takes place between each complete scan

Continued on page 666

OPERATING THE CATHODE-RAY TELEVISION RECEIVER

Continued from page 664

hearing whether you are properly tuned in or not, you can insert a pair of telephones in series with the lead from the terminal marked "shield" on the back of the set to the 2-microfarad condenser. Having tuned in a signal, increase the setting of the modulation potentiometer on the top right of the panel. You will find that this produces all sorts of queer patterns on your framework on the screen. Strong modulations will increase the bias



There are six controls on the front panel and their purposes are indicated in this drawing

on the tube and will cause the spot to black out, and you will get curious zig-zag lines and other effects dancing across the screen, often producing quite regular patterns.

Receiving Pictures

The reception itself is quite straightforward. Having adjusted the tube to give 30 lines, increase the shield bias until the lines are no longer sharply focused, but become blurred and appreciably less brilliant than before, (the ordinary cathode ray oscillograph tube only modulates satisfactorily at relatively small brilliance). With the correct conditions the framework dissolves into a more or less continuous patch of light in which the lines are not very clearly defined. You will probably see some faint dark bands moving slowly across the screen. These bands should be four in number on a 50-cycle supply and should be nearly stationary if the frequency of the 12½ base is correct. They are due to slight hum picked up by the tube, but they will not cause any serious trouble. It should be emphasised, however, that the power unit should be well away from the tube, which was one reason why it was built separately. The time base may be within a couple of feet, but the power unit itself should be kept 4 to 6 ft. away. Otherwise, stray magnetic field from the transformer will affect the tube and will cause distortion.

When the television transmission starts, adjust the modulation potentiometer to be about half-way in and then adjust the centre top knob marked "vertical framing" until the picture appears. This knob is a fine control of the 375 frequency and if your 12½ frequency is approximately correct you will find that the picture will appear moving either upwards or downwards through the frame.

Correcting Swing

You may find that the picture is moving very rapidly from one side to the other or even that you are unable to produce a satisfactory picture, but only a sort of diagonal band. This indicates that the frequency of the 12½ base is entirely wrong and you should adjust it by altering the 12½ potentiometer in the bottom right-hand corner a little bit one way or the other. *Very little movement* of this potentiometer is required.

If the picture is only moving very slowly from one side to the other you will find that you can correct this movement and lock it quite steady by using the control marked "horizontal framing" in the top left-hand corner. This is the locking control between the two time-base tubes and you will find that rotating this in one direction or the other causes the picture to move slowly from one side to the other and ultimately to lock itself in position.

Maintaining Synchronism

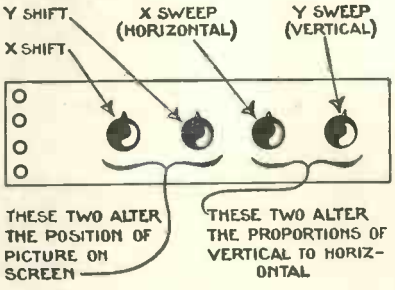
Having got the picture more or less right, apply a small amount of synchronising voltage from the bottom centre control. This need only be rotated between one-eighth and a quarter of a revolution in ordinary practice in order to maintain satisfactory synchronism. It feeds the synchronising voltage sent out by the Baird transmission on to the grid of the 375 tube and ensures that it triggers at exactly the right moment, thereby maintaining synchronism. Too much synchronism will distort the picture so that it should be used sparingly.

Having made these preliminary adjustments you will find that the picture can be held with the minimum of trouble and, in fact, after a little practice the finding of the picture is quite easy. Running through the controls again we have the following effects:

Horizontal framing (top left-hand corner). This moves the picture from left to right or *vice versa.*

Vertical framing (top centre). This moves the picture upwards or downwards. Turning the knob to the right brings the picture downwards from top to bottom of the picture and *vice versa.*

Modulation (top right). This controls the intensity of the modulation. If not enough modulation is provided, the blacks are not sufficiently heavy. If the modulation is too much the blacks are good, but the whites become too bright and



These are the shift and sweep controls which only require occasional adjustment

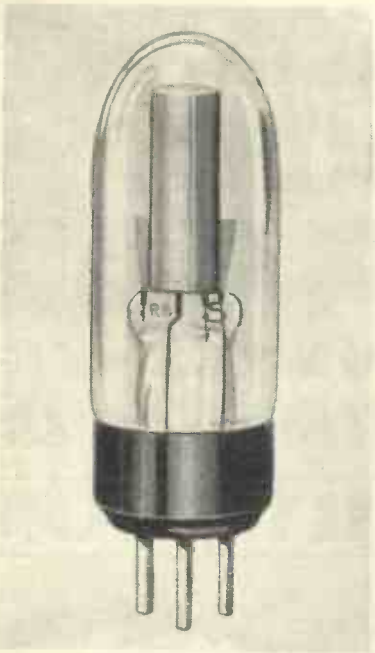
the picture breaks up into lines on the bright portion, giving a distinctly liny effect.

Synchronism (bottom centre). This is for holding the picture steady. The picture should be adjusted to be as steady as possible, with no synchronism applied. The application of a quarter turn on the synchronising knob will then hold it quite steady for long periods.

The other two controls, namely the 375- and 12½-frequency controls, should only be used during the setting up of the scanning and if this is correctly done they will never require to be adjusted during the reception of a picture.

Light Modulation in Television

By H. CORBISHLEY



A crater lamp as used for television. The emission is from a small hole at the end of the cylinder

IN any mechanical system of television reception some means of modulating light is necessary and this provides one of the problems which have not been entirely solved. Modulation of light is a comparatively simple matter, but the percentage of efficiency obtained at present is low, either in the actual modulation or the provision of a light source which is capable of modulation directly.

Direct Modulation

In the latter class comes the neon lamp and its variants which come under the general title of gas-discharge tubes. The most common type of neon lamp is the "beehive," as used for advertising purposes and which, incidentally, is very suitable for use with the simple disc television receiver. Elaborations of this are the flat-plate neon and the crater neon, the former providing an evenly illuminated surface of a few square inches and the latter a point of considerable intensity.

The advantage of the neon and other gas-discharge lamps, such as the mercury-vapour and sodium-vapour lamps, is that the light produced is directly modulated by the input energy, which means that additional apparatus is not necessary. For the smaller types this energy need only be small, which renders it possible to operate a disc television receiver from an average three-valve set without any additional amplifier. A lamp of this type will "strike," or light up, with a voltage of about 185, and the output from any wireless set that will operate a loud-speaker efficiently is sufficient to produce modulation.

The crater lamp, as mentioned before, produces a point of great intensity and requires considerably more input power than the beehive or flat-plate, the voltage necessary being approximately 500 and the power 4 to 5 watts. This type of lamp is very suitable for use in the mirror-drum type of receiver.

Mercury-vapour and sodium-vapour lamps also require considerable input power, and on this account do not find much favour with the average experimenter. The light emitted from the first is bluish white, and from the latter a yellowish white.

Here is the assembly of plates of a Kerr cell. In use the whole unit is immersed in nitro-benzole, and a potential applied to the plates.

Modulating a Constant Light

In the other system a constant source of light is modulated at some point in its path to the screen. This permits of an ordinary projection lamp being used, and the light from this is caused to pass firstly through an Iceland spar prism, then between a series of plates (somewhat resembling a miniature condenser) immersed in nitro-benzole, and then through a second Iceland spar prism. An Iceland spar prism has the property of plane polarising light so that only wave motion vibrating in one direction can get through. The second prism will polarise the wave motion in the other direction so that when the two prisms are placed in certain positions with respect to each other, no light whatever will get through.

Nitro-benzole has the peculiar property of rotating the plane of polarisation of light which is passing through it if it is subjected to either electro-static or electro-magnetic stress, and the effect of this is the equivalent of moving one prism relative to the other so that the light is polarised to a greater or lesser extent according to the amount of stress imposed. This electro-magnetic stress is usually applied via the small metal plates between which the light is caused to pass. The Iceland spar plates are usually termed Nicols, and the combination of metal plates and nitro-benzole a Kerr cell, the complete unit forming a light shutter which has no moving parts.

Kerr Cell Efficiency

The efficiency of a cell of this description is approximately only 10 per cent. and it is natural, therefore, that a great amount of research should have been carried out with the object of discovering some means of increasing this. Some measure of success has been obtained recently by the use of a crystal in place of the Kerr cell. The crystal used is zinc sulphide or, as it is known more commonly, blende, the natural ore of zinc. This gives a light efficiency of about 35 per cent. with a perfect linear characteristic, and it has the further advantages that being a solid it is durable, and not troublesome in use. Unfortunately the crystals are very difficult to obtain in a pure and transparent state, but attempts are now being made to manufacture them artificially.

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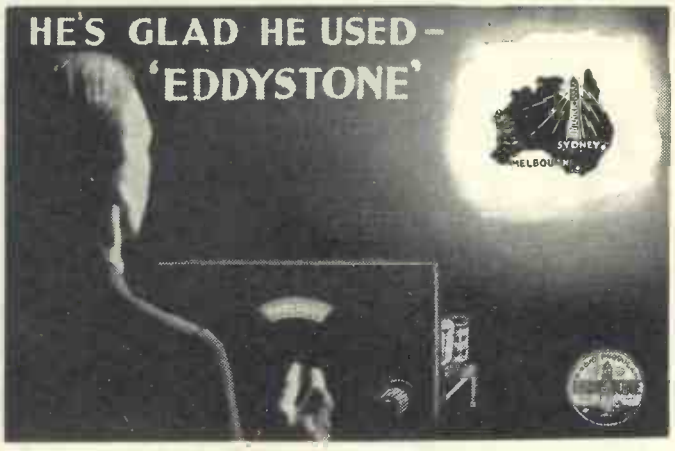

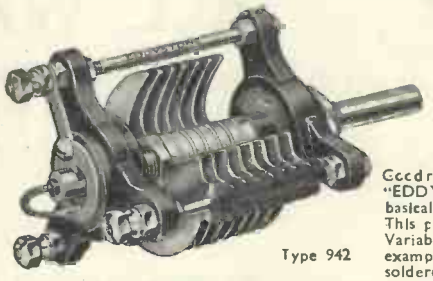

Type 942

"EDDYSTONE" SCIENTIFIC S.W. CONDENSER
35 m.mfd. 6/- 100 m.mfd. 7/-
60 m.mfd. 6/6 150 m.mfd. 7/6
(.00015 mfd.)

SPECIALISED DESIGN — PAYS

Good results always follow good design. "EDDYSTONE" short wave parts are basically sound for their purpose. This patented "EDDYSTONE" S.W. Variable Condenser is an outstanding example. Noiseless bakelite bearings, soldered brass vanes, low self-capacity, non-inductive insulated pigtail, low H.F. resistance and special Isolex end-plates are some of its features. You cannot fit a better S.W. condenser.

STRATTON & CO., Ltd.
BROMSGROVE STREET
BIRMINGHAM
London Service Depot:
WEBB'S RADIO STORES
14, Soho St. Oxford St. W.1.

EDDYSTONE
SHORT-WAVE COMPONENTS

FOR HIRE
FULLY EQUIPPED PUBLIC ADDRESS VAN
Sent anywhere in British Isles, also RADIO, MICROPHONE, & GRAMOPHONE AMPLIFIERS giving exceptional quality and volume, suitable for Dances, Sports Meetings, Fetes, etc. from 15/- per day. McMichael Portable Sets 15/- a week; £2/12/6 a month.

ALEXANDER BLACK, LTD
WIRELESS CONSULTANTS
55, EBURY STREET, LONDON, S.W.1.
ESTABLISHED IN 1925
SLOANE 1655.
Trade Inquiries Invited.

SERVICE
SETS OF ALL TYPES
Supplied, Serviced and Visited in any district, or may be sent for Full Test and Report, at 2/- per valveholder; portables 1/6 per valveholder.

HAVE YOU HAD particulars of the famous "Magnum" Short Wave Adaptor, which is now available for every type of receiver?

Full particulars, with a list of short-wave stations and free trial offer, on request.

BURNE-JONES & CO. LTD. (Dept. M),
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RADIO CABINETS

Send for 16 page Catalogue of modern designs, post free.

FROM **10/-** EACH

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Micromesh
TRADE MARK
THE MODERN VALVE

Literature and prices on request

Standard Telephones and Cables, Ltd., St. Chad's Place, 364 Gray's Inn Road, London, W.C.1. *Terminus* 6255.

SEND NOW FOR THIS NEW RADIO GUIDE
FREE ON APPLICATION

24 PAGES

full of simple, pictorial diagrams which anyone can follow, showing easy alterations to make your wireless set right up to date at minimum cost. Illustrates numerous "gadgets" of use to every set owner and constructor.
Write Dept. "B"

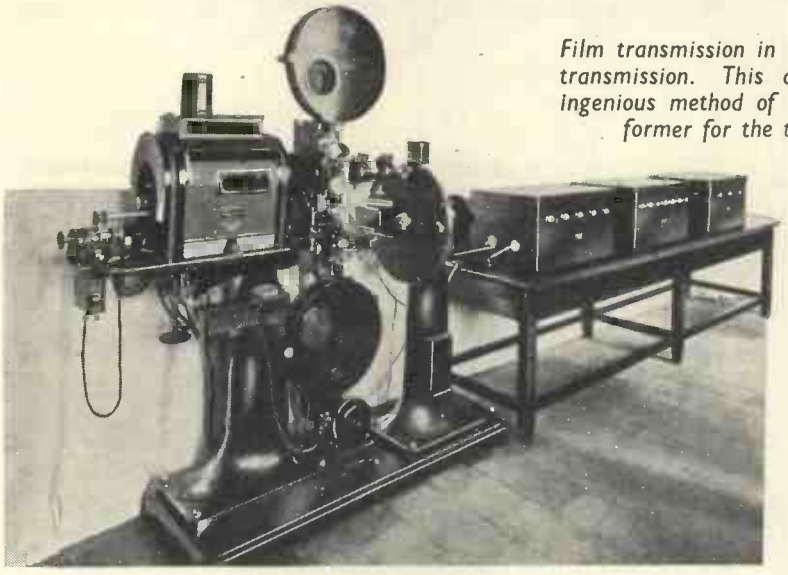
A. F. BULGIN & CO. LTD.
Abbey Road, Barking, Essex.

There is news in the "Wireless Magazine" advertisements

Intermediate Film Television

By G. ARTHUR

Film transmission in television is simpler than direct transmission. This article is a description of an ingenious method of securing the advantages of the former for the televising of topical scenes



This is the Fernseh A.G. film transmitter for 90-line transmissions

GERMAN television development has been greatly aided by the initiative of the German Post Office, which hopes to bring the new technique rapidly up to entertainment standard. It is largely due to the head of the German Post Office Television Laboratories, Dr. Banneitz, that television in Germany stands where it is to-day.

Some years ago all those interested in the development of the new art were asked to co-operate under the leadership of the Post Office and, most important of all, patent rights were pooled—i.e., under this agreement every firm could use the others' patents freely until the moment when television became a commercial proposition.

This moment is now rapidly approaching and under normal conditions it would have been a very difficult matter indeed to sort out the patent rights of each individual firm. But as things stand now in Germany very probably the government will exercise its authority to reach an arrangement under which every firm will get its due without a long fight similar to that experienced in the early days of the talking film.

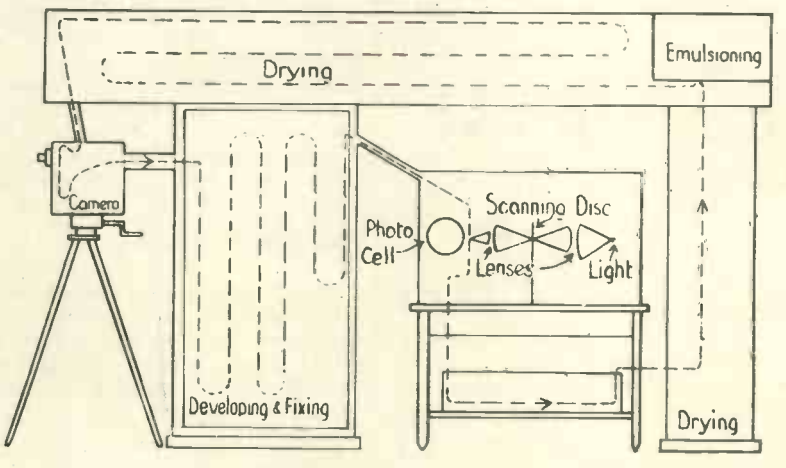
A Unique System

One of the most remarkable television developments in Germany has been the intermediate film system. Very briefly, this system is as follows: In the first place a cinema camera is used to produce a film in the ordinary way. This is developed, fixed and partly dried and then passed through the usual type of cinema film televisor for transmission. The Fernseh A.G., the concern which is responsible for this development, has been able to reduce the time lag for this procedure to something under 10 seconds, so that transmission is well-nigh instantaneous. The idea itself (that of interposing a film between actual happenings and the televising of it) is not new. It would, in fact, be difficult to say who actually had it first. But the first practical solution of the matter is certainly due to Fernseh A.G. and their two engineers Dr. Schubert and Dr. Möller.

Using the Film Over Again

When the intermediate film system was first developed the chief objection made was that it would be very expensive. Now this is quite true, as the amount of film used for a programme of a few hours' duration would be considerable; for that reason Dr. Schubert set himself the task of producing a self-contained apparatus in which a continuous band of celluloid was first emulsioned with light-sensitive gelatine, then exposed, then developed, partly dried and then televised, cleaned off and again

Continued on page 676



Here is a schematic drawing of the intermediate film transmitter, showing the course of the endless film

There is news in the "Wireless Magazine" advertisements

FINE.

THERE could be no surer conviction than that! . . . that the AvoMinor, priced at only 40/-, is supremely ACCURATE! It means more than mere fault finding, more than mere testing. It gives precisely measured evidence of radio faults and efficiency.

It measures TEN *different* ranges of milliamps, volts, and ohms—affording testing facilities combined with positive accuracy which no other instrument at anywhere near its price can give. The AvoMinor is a self-contained moving-coil combination measuring instrument with *a total resistance of 100,000 ohms. Full scale deflection is obtained with a consumption of only 3 milliamps.*

Make any comparison you like. This little brother of the world-famous Avometer does more, and does it more accurately, than any other combination testing instrument priced so modestly. Ask your radio dealer—he knows!

MILLIAMPS

0-6 milliamps.
0-30 ,,
0-120 ,,

VOLTS

0-6 volts.
0-120 ,,
0-300 ,,

OHMS

0-10,000 ohms
0-60,000 ,,
0-1,200,000 ,,
0-3 megohms.

40/-

NOTHING LESS WILL DO

DEFERRED TERMS if desired. Write for particulars

Be satisfied with nothing less, You will prefer the precision of the AvoMinor, Fully descriptive pamphlet,

TEN *TESTING INSTRUMENTS in* **ONE**

BRITISH MADE

The **AVOMINOR** TRADE MARK

TELLS THE WHOLE TRUTH!

Dimensions: 4 in. by 3 in. by 1⅝ in. Complete in handsome case, with pair of leads and interchangeable crocodile clips and testing prods.

The Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, Douglas St., London, S.W.1.
Phone: VIC. 3405-7

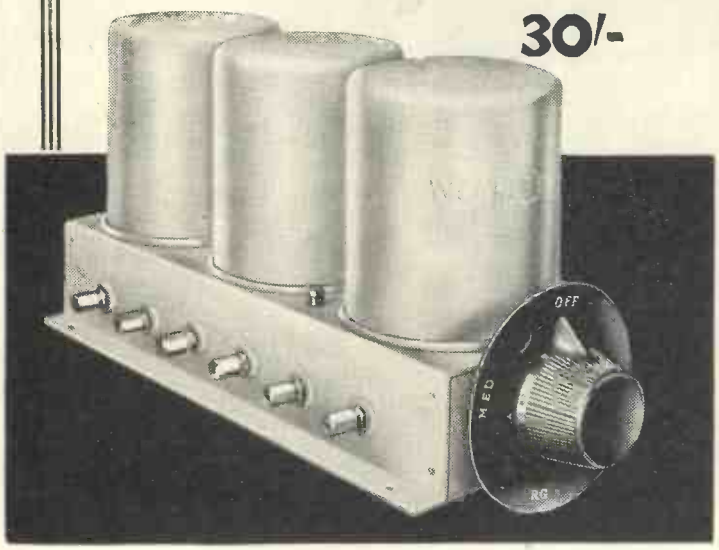
WEARITE

Regd. Trade Mark

Specified for the MERRYMAKER SUPER

The Wearite GN3 Coil Chassis

30/-



The **SPECIFIED COMPONENTS**

One Wearite OT1 Band Filter..... **10/6**

One Wearite OT2 Band Filter..... **10/6**

One Wearite GN3 3-Coil Unit..... **30/-**

1st and 2nd Bandpass and Oscillator Coils, specially designed for Pentagrids.

One Wearite T21A Mains Transformer **25/-**

POST THIS COUPON TO-DAY

To MESSRS. WRIGHT & WEAIRE, LTD.,
740 High Road, Tottenham, N.17.

Please send me Full-size Blueprint and constructional details for building the "Wearite Teamster." Also include copy of your NEW Booklet of Components (M.12) and literature on Class "B" amplification. Three penny stamps are enclosed to cover cost and postage.

Name.....

Address.....

W.M. 1/34.

4180

The scanning disc of the intermediate film transmitter is a massive affair, as will be clear from this photograph

Radio Loewe, who with Dr. Loewe and Dr. Schlesinger are at work on a cheap all-mains ultra-short wave cathode-ray home-television receiver.

TeKaDe of Nurnberg pin their faith to the mirror screw, and have recently developed an entirely new light valve which may take the place of the Kerr cell.

Two individual workers, *Manfred von Ardenne* and *Deres von Mihaly*, are at work on different problems relating to television, the first by cathode rays and the latter with a stationary mirror drum.

passed up for a new coat of sensitive emulsion.

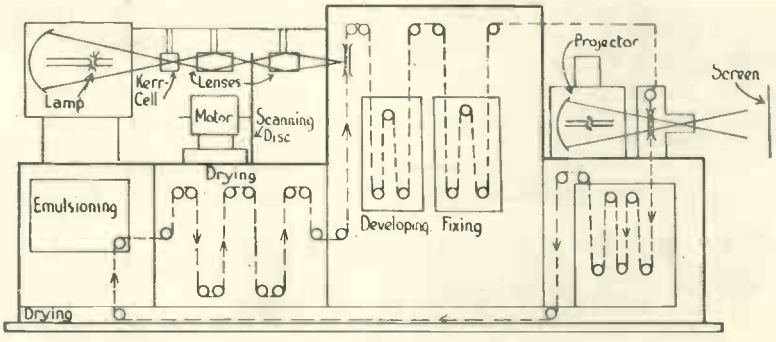
How this is done is shown by the schematic drawings, and the very ingenious method was recently shown in operation, though it was demonstrated on a receiver and not on a transmitter. The time lag for the coating of the raw celluloid, the exposure, the development, fixing, part-drying, the televising of the film and finally the removal of the used emulsion has been reduced to under 30 seconds. Those of my readers who have any idea of photography will realise what has been achieved.

The Fernseh A.G. has supplied film television transmitters both to the German Post Office and to the Italian Broadcasting Company.

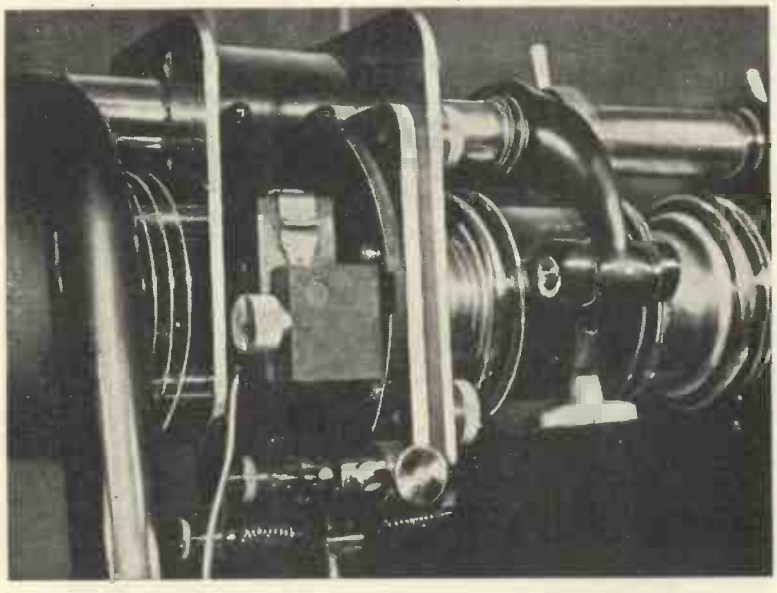
It will be of interest briefly to review the position of television in Germany to-day, and the following outlines the activities of the principal firms.

The Fernseh A.G. have specialised in film transmitters and is developing the intermediate continuous film transmitter and receiver; for home reception it is devoting attention to cathode-ray tubes and mirror screws.

Telefunken, the great German radio firm, is developing cathode-ray tube reception for the home, and together with the I.G. Farben of Ludwigshafen and Professor Karolus at Leipzig, are at work on intermediate film transmission on ultra-short wavelengths.



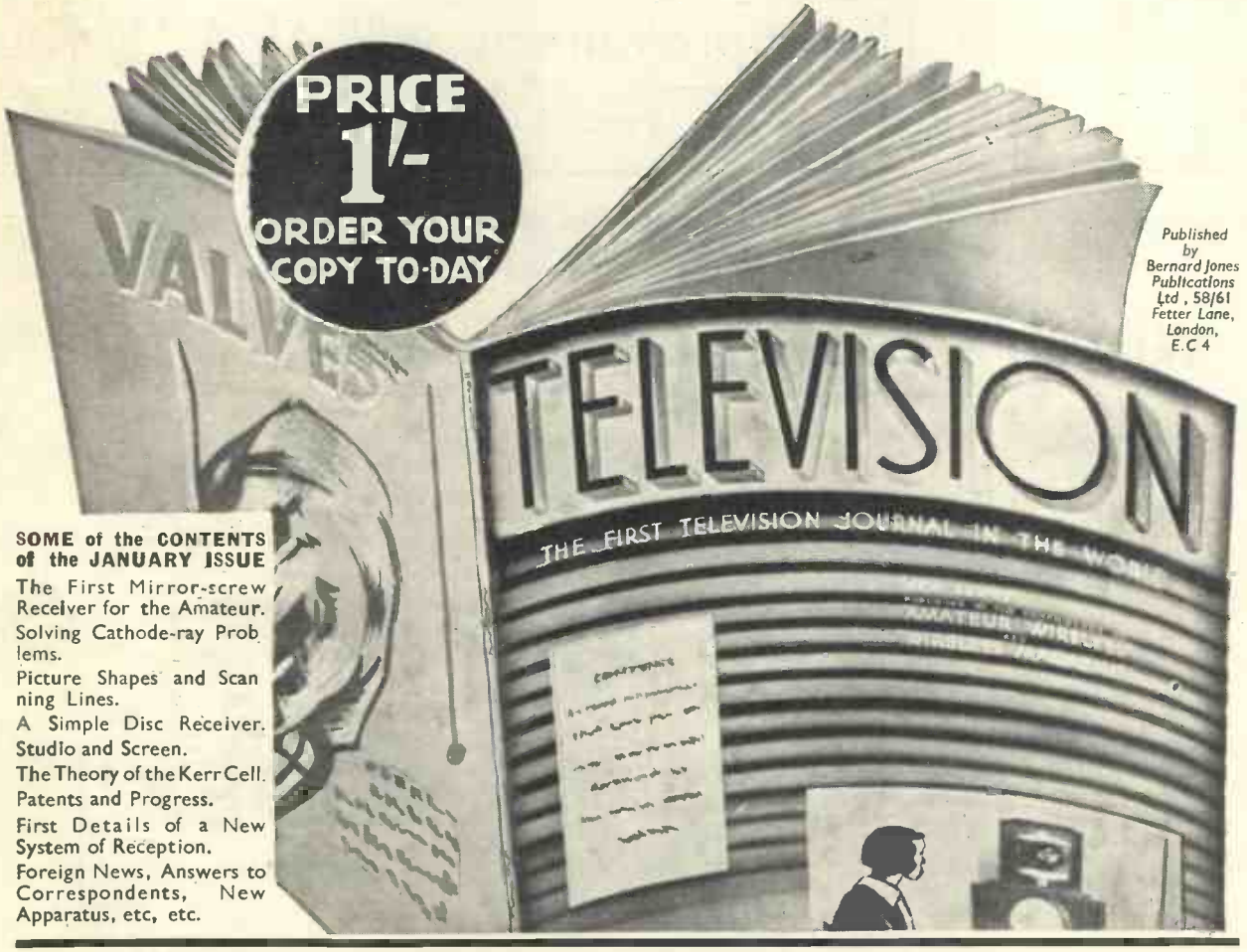
Use is made in the receiver also of an endless film. It will be clear that one of the great advantages of this system is that there is practically no limit to the size of the picture which can be projected



The light cell of the intermediate film receiver

No. 1 of the New Series on sale Wed. Jan. 3

TELEVISION is the only publication entirely devoted to the development of television.
Commencing with the January issue, on sale on Wednesday, January 3, it will appear in an entirely new form. The number of pages will be considerably increased, many new features added, better paper—therefore improved printing and an attractive new cover. Rapid strides are taking place in television and as a radio enthusiast you should keep in touch with these developments.
Order your copy of the new TELEVISION to-day. Price 1/- of all bookstalls and newsagents.



SOME of the CONTENTS of the JANUARY ISSUE

The First Mirror-screw Receiver for the Amateur.
Solving Cathode-ray Problems.
Picture Shapes and Scanning Lines.
A Simple Disc Receiver.
Studio and Screen.
The Theory of the Kerr Cell.
Patents and Progress.
First Details of a New System of Reception.
Foreign News, Answers to Correspondents, New Apparatus, etc, etc.

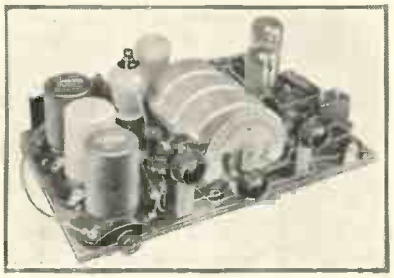
The ONLY *Publication entirely devoted to* TELEVISION

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.

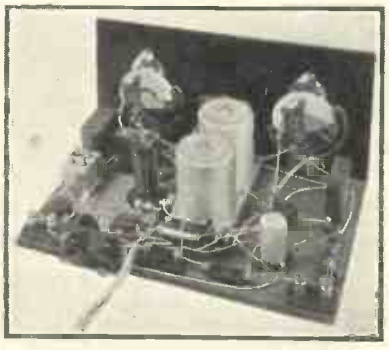
Walthamstow (Essex).—*I wish to commend the "W.M." Short-wave Super. This set is the ninth short-waver I have built, and I am convinced that it is the real "easytune" short-wave set. I did not realise that there were so many languages in the world until I toured on the "W.M." Short-wave Super. The log 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 last page is used before Jan. 31, 1934.

A.C. Transportable (SG, D, Pen.) WM347 ... ... **9d.**

All-wave Three (D. 2LF) WM348 ... **6d.**

1934 A.C. Quadradyne (2 SG, D, Pen.) WM349 ... ... **9d.**

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
Portable Short-wave One AW354
B.B.C. One-valver AW387

TWO-VALVE SETS (1s. each)

A Two for 7 Metres (D, Trans) WM295
New-style Radiogram (D, Trans) WM299
A.C. Quality Gem (D, Trans) WM312
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
Consolectric Two (D, Pen) A.C. AW403

THREE-VALVE SETS (1s. each)

Three-Range Three (SG, D, Pen) WM336
Economy-pentode Three (SG, D, Pen) ... WM337
Simplicity A.C. Radiogram (SG, D, Pen) ... WM338
D.C. Calibrator (SG, D, Push-pull Pen) ... WM328
Tyers Iron-core Three (SG, SGD, Pen) ... WM330
A.C.-D.C. Three (SG, D, Pen) WM332
C.B. Three (D, LF, Class-B) WM333
Duo-tuned Three (SG, D, Pen) WM341
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
A.C. Triodyne (SG, D, Pen) AW399

FOUR-VALVE SETS (1s. 6d. each)

Quadradyne (2 SG, D, Pen) WM273
A.C. Quadradyne (2 SG, D, Power) ... 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. RC, Trans) ... WM316
All-metal Four (2 SG, D, Pen-A. C. Mains) WM329
Self-contained Four (SG, D, LF, Class B) ... WM331
All-progress Four (Battery Super-het) ... WM335
Merrymaker Super (A.C. Super-het) ... WM345
Melody Ranger (SG, D, RC, Trans), with copy of "A.W." 4d. postage AW375
"A.C. Melody Ranger" (SG, D, RC, Trans) AW380
"A.W." Ideal Four (2SG, D, Pen) ... AW402

FIVE-VALVE SETS (1s. 6d. each)

Super-quality Five (2 HF, D, RC, Trans) ... WM320
Ideal Home Super (Super-het) WM280
Easytune 60 (Super-het) WM284
New Class-B Five (SG, D, LF, Class-B) ... WM340
Class-B Quodradyne (2 SG, D, LF, Class-B) WM344
James Short-wave Super (Super-het) ... AW328
Simple Super (Super-het) AW340
The Etherdyne (Super-het) AW406

SIX-VALVE SETS (1s. 6d. each)

1932 Super 60 (Super-het) WM269
1932 A.C. Super 60 (A.C. Super-het) ... WM272
"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
Connoisseurs' Super (A.C. Super-het) ... WM334
James Super Straight Six (2 SG, D, LF, Push-pull) WM339
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 Jan. 31, 1934 (or until Feb. 28, 1934, 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 :—

A.C. TRANSPORTABLE (page 625), No. WM347, price 9d., post paid.

ALL-WAVE THREE (page 650), No. WM348, price 6d., post paid.

1934 A.C. QUADRADYNE (page 595) No. WM349, price 9d., post paid.

INFORMATION COUPON

Valid only until Jan. 31, 1934 (or until Feb. 28, 1934, 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.

Special Notes

This Varley automatic volume control unit can easily be added to sets with one or more stages of high frequency amplification

A SIMPLE way of adding automatic volume control to your set, if it has one or more stages of high-frequency amplification, is to incorporate the new Varley "Nicore" A.V.C. unit. This unit sells at 15s. 6d.

The unit is very simply connected into the set. It is fitted in place of the usual high-frequency choke after the detector valve, or after the second detector in the case of super-het receivers. Only four connections are necessary.

This unit, made by Varley (Oliver Pell Control, Ltd.), of 103 Kingsway, London, W.C.2, limits the volume of the local stations and maintains an almost constant strength level on foreigners. Fading is almost eliminated.

◆ ◆ ◆

On page 628 of this issue in the list of parts for the A.C. Transportable the Rola loud-speaker specified should have read model FR5PM, price at £1 9s. 6d.

◆ ◆ ◆

British Radiophone, Ltd., have just introduced a new battery seven-valve super-het kit called "The Matched Perfection Seven." The set is built around the familiar British Radiophone super-het Radiopak and uses, as well, components of other well-known manufacturers. From a technical point of view this set is a fine achievement and is quite simple to build. British Radiophone, Ltd., are arranging for free blueprints to be distributed.

INDEX TO ADVERTISERS

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