HOW TO BUILD A PORTABLE AND A TRICKLE CHARGER

Wireless Magazine

VOL IX
No 53
JUNE 1929
1/-

1929 CHUMMY

A NEW PORTABLE

BY W. JAMES

45 VARIED HELPFUL FEATURES
SCORES OF ILLUSTRATIONS

Make the Melody

LOUDER and CLEARER

Cossor Valves bring in distant stations with amazing volume—they increase the range of any Receiver. They give enormous volume *and* purity as well. Cossor Valves made possible the wonderful Cossor Melody Maker. They improve *any* Receiver — use them in yours—your Dealer will tell you the types you need.

with

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CA 8314

Editor: BERNARD E. JONES

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

Wireless Magazine

The Best Shillingsworth in Radio

Vol. IX :: JUNE, 1929 :: No. 53

Research Consultant: W. JAMES

Assistant Editor: D. SISSON RELPH

Our Show Window

I AM re-introducing you to an old friend this month—the Chummy, one of the very few portables of last year that made history. So successful was this "four" that we thought it would be an interesting experiment for W. James—who was not a member of our staff when the Chummy was originally designed—to become responsible for a 1929 edition.

The two outstanding features of the new Chummy are (1) it is now suitable for both of the broadcasting wavebands and (2) it has a much lower H.T consumption—either of them a considerable advantage.

The Chummy is our second outstanding portable of the year—the first being J. H. Reyner's Wayfarer, described in detail last month. This, as you know, is a five-valve super-het, and in the present issue Mr. Reyner takes us "On the Road with the Wayfarer through the Southern Counties, and we enjoy ourselves in Devonshire and Cornwall—in imagination.

We have not finished with portables, and in the next issue we shall be describing a highly efficient but cheaper set for use principally with the local station.

Our portables are not our only sets of importance this month. I should like you to look at the Music Player, which undoubtedly sets a standard of performance.

The economical listener will like the Continental Two with its choke-fed intervalve transformer. While only a "two" it gives a performance of which many "threes" might be proud.

The reader who delights in listening to far-distant stations will find his interest centred in the Short-wave Link, a three-valver working on wavelengths of between 16 and 50 metres.

The article by J. Godchaux Abrahams in this issue reminds us that the holiday season will soon be upon us. He advises us to take our portables when we visit the Continent (what about our vaccination certificates?) and says that, generally speaking, the foreign customs departments raise little difficulty to the visitor bringing in with him a wireless set

Our general articles this month are, as usual, of an interesting and entertaining nature, and among them is one by S. F. Edge, the motoring pioneer, which presents a somewhat unusual review of the wireless industry.

C. Whitaker-Wilson continues this month his explanatory articles addressed to the music listener, and on this occasion talks about the "fugue."

Another of our general articles to which readers are sure to turn is "A Trek to the Talkies" in which a correspondent speaks of the lure which the "talkies" have for technically trained men in the world of wireless.

A little piece of apparatus described by W. James in this issue will prove of value to those readers who have the benefit of a mains electrical supply. It is an L.T. charger which can be used for accumulator work (it has a 1-ampere output) or for running a moving-coil loud-speaker direct from the mains.

Altogether a very useful number.

Do Not Overlook the Half-price Blueprint Coupon on Page iii of the Cover

Bernard E Jones

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An All-wave Lodestone Five with Push-pull Amplifier Next Month

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

Valves to Use in Your Set

TWO-VOLT VALVES: Three-electrode Types

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Ediswan	RC2	150,000	30	2	.1
Mazda ...	RC210	86,000	40	2	.1
Cosmos ...	SP16B	70,000	35	1.8	.09
Six-Sixty	210RC	68,000	35	2	.1
Ediswan	RC210	67,000	40	2	.1
Cossor ...	210RC	60,000	40	2	.1
Mullard...	PM1A	51,000	36	2	.1
Marconi...	DEH210	50,000	35	2	.1
Osram ...	DEH210		35	2	.1
Mazda ...	HF210	28,000	20	2	.1
Six-Sixty	210HF	27,000	13	2	.1
Ediswan	HF210	25,000	20	2	.1
Marconi...	HL210	23,000	20	2	.1
Osram ...	HL210		20	2	.1
Mullard...	PM1HF	22,500	18	2	.1
Cossor ...	210HF	20,000	15	2	.1
Six-Sixty	210LF	18,000	8.5	2	.1
Cosmos ...	SP16G	17,000	16	1.8	.09
Mazda ...	GP210	14,000	13	2	.1
Ediswan	LF210	13,000	13	2	.1
Cossor ...	210LF	12,000	10	2	.1
Marconi...	DEL210		11	2	.1
Mullard...	PM1LF		11	2	.1
Osram ...	DEL210		11	2	.1
Mullard...	PM2DX	10,700	13.5	2	.25
Cosmos ..	SP16R	10,000	9	1.8	.09
Six-Sixty	215P	7,300	6.4	2	.15
Mazda ...	LF215	7,000	7	2	.15
Ediswan	PV215	6,600	8	2	.15
Cossor ...	220P	5,000	5	2	.2
Marconi...	DEP215		7	2	.15
Osram ...	DEP215		7	2	.15
Cosmos ...	SP18RR	4,500	6.5	2	.2
Mullard...	PM2	4,400	7.5	2	.2
Cossor ...	220P	4,000	8	2	.3
Six-Sixty	230SP		3.9	2	.3
Mazda ...	P227	2,900	4	2	.27
Ediswan	PV225	2,700	3	2	.25
Mullard...	PM252	2,600	5.4	2	.3
Marconi...	DEP240	2,500	4	2	.4
Osram ...	DEP240		4	2	.4
Cossor ...	230XP	2,000	4	2	.3

FOUR-VOLT VALVES: Three-electrode Types

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Mazda ...	RC407	100,000	40	4	.075
Six-Sixty	4075RC	64,000	34	4	.075
Ediswan	RC410	61,000	40	4	.1
Cossor ...	410RC	60,000	40	4	.1
Marconi...	DEH410		40	4	.1
Osram ...	DEH410		40	4	.1
Mullard...	PM3A	55,000	38	4	.075
Ediswan	HF410	22,000	25	4	.1
Mazda ...	HF407	21,000	18	4	.075
Cossor ...	410HF	20,000	20	4	.1
Six-Sixty	4075HF	16,500	13	4	.075
Mazda ...	GP407	14,000	14	4	.075
Mullard...	PM3	13,000	14	4	.075
Ediswan	LF410	10,500	13	4	.1
Cossor ...	410LF	8,500	15	4	.1
Marconi...	DEL410		15	4	.1
Osram ...	DEL410		15	4	.1
Six-Sixty	410P	8,000	7.3	4	.1

FOUR-VOLT VALVES—*Continued*

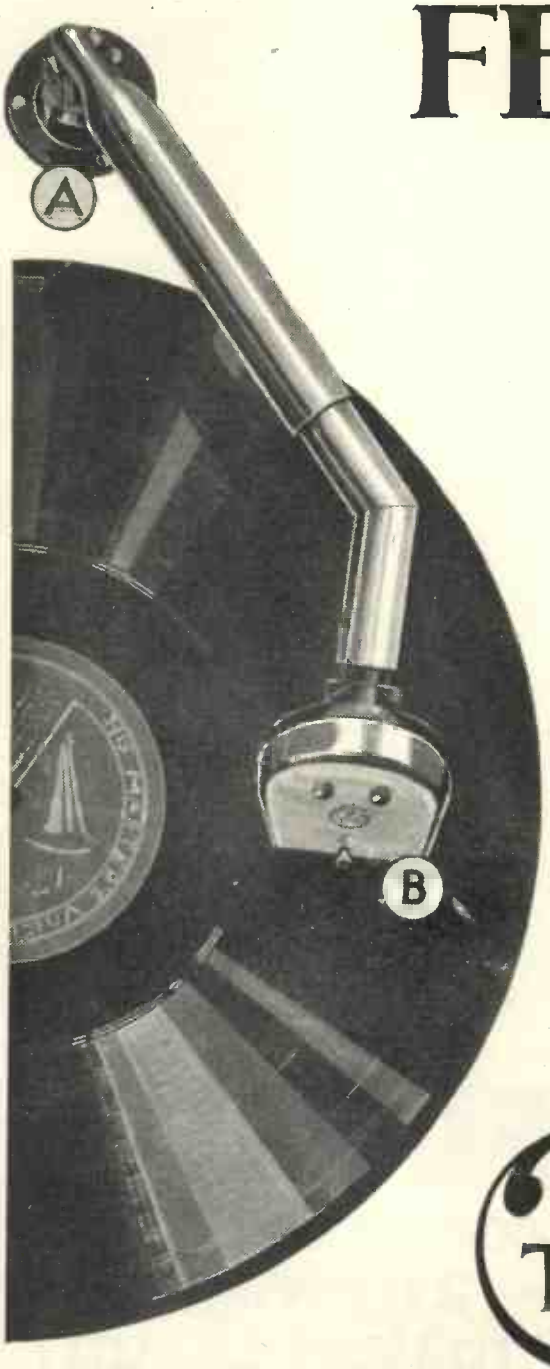
Make.	Type.	Impedance.	Amp. Factor	Fil. Volt	Fil. Cur.
Mullard...	PM4DX	7,500	15	4	.1
Mazda ...	LF407	5,700	8	4	.075
Ediswan	PV410	5,500	5.5	4	.1
Marconi...	DEP410	5,000	7.5	4	.1
Osram ...	DEP410		7.5	4	.1
Ediswan	LF410a	4,500	9	4	.1
Mullard...	PM4	4,450	8	4	.1
Cossor ...	410P	4,000	8	4	.1
Six-Sixty	425SP	3,600	3.2	4	.25
Mullard...	PM254	3,500	3.15	4	.25
Mazda ...	P415	2,900	5.5	4	.15
Marconi...	P425	2,250	4.5	4	.25
Osram ...	P425		4.5	4	.25
Cossor ...	415XP	2,000	4	4	1.5
Ediswan	PV425		3	4	.25

SIX-VOLT VALVES: Three-electrode Types

Make.	Type.	Impedance.	Amp. Factor	Fil. Volt.	Fil. Cur.
Mazda ...	RC607	90,000	40	6	.075
Six-Sixty	6075RC	74,000	37	6	.075
Cossor ...	610RC	60,000	50	6	.1
Marconi...	DEH610		40	6	.1
Osram ...	DEH610		40	6	.1
Mullard...	PM5B	53,000	40	6	.075
Ediswan	RC610	50,000	40	6	.1
Marconi...	HL610	30,000	30	6	.1
Osram ...	HL610		30	6	.1
Marconi...	LS5B	25,000	20	5.25	.8
Osram ...	LS5B		20	5.25	.8
Ediswan	HF610	21,000	25	6	.1
Cosmos ...	DE50	20,000	9	6	.09
Cossor ...	610HF		20	6	.1
Mazda ...	HF607		20	6	.075
Six-Sixty	6075HF		20	6	.075
Mullard...	PM5X	14,700	17.5	6	.075
Mazda ...	GP607	12,500	14	6	.075
Ediswan	LF610	10,000	15	6	.1
Mullard...	PM6D	9,000	18	6	.1
Cossor ...	610LF	7,500	15	6	.1
Marconi...	DEL610		15	6	.1
Osram ...	DEL610		15	6	.1
Marconi...	LS5	6,000	5	5.25	.8
Osram ...	LS5		5	5.25	.8
Six-Sixty	610P		7.2	6	.1
Mazda ...	LF607	5,300	9	6	.075
Mullard	PM6	5,200	7.1	6	.1
Ediswan	PV610	4,200	5	6	.1
Six-Sixty	625SP	3,600	3.2	6	.25
Cossor ...	610P	3,500	8	6	.1
Marconi...	DEP610		8	6	.1
Mullard...	PM256		3.15	6	.25
Osram ...	DEP610		8	6	.1
Ediswan	PV625	3,000	3	6	.25
Marconi...	LS5A	2,750	2.5	5.25	.8
Osram ...	LS5A		2.5	5.25	.8
Mazda ...	P615	2,600	6	6	.15
Marconi...	P625	2,400	6	6	.25
Osram ...	P625		6	6	.25
Cossor ...	610XP	2,000	5	6	.1
Mullard...	DFA9		5	6	.6
Mazda ...	PX650	1,750	3.5	6	.5
Ediswan	PV625A	1,600	4	6	.25
Marconi...	P625A		3.7	6	.25
Osram ...	P625A		3.7	6	.25

(*Continued on page 404*)

TWO NEW FEATURES



A.—Ball-Bearing Swivel Joint, reducing friction to a minimum, thus allowing needle to "track" more easily. By preventing pull on the side of the record groove this feature adds to the life of the record.

B.—Offset Pick-up. By offsetting the pick-up, in respect of the fulcrum of the arm, error in needle tracking is reduced to no more than 3°. The motion of the pick-up armature is always at right angles to the track, also resulting in minimum record wear.

With the addition of the two new features mentioned above the B.T.H. Pick-up and Tone-arm reaches a high stage of mechanical and electrical efficiency. With the new B.T.H. Pick-up and Tone-arm you get better reproduction with a minimum of wear on the record. In a word, your record is being treated fairly and you hear it at its best.

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B T-H

PICK-UP & TONE-ARM

WITH BALL-BEARINGS AND IMPROVED TRACKING DEVICE

3208

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

VALVES TO USE IN YOUR SET—(Continued from page 402)

FOUR-ELECTRODE VALVES: Screened-grid

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Mullard...	PM12	230,000	200	2	.15
Six-Sixty	215SG	220,000	190	2	.15
Cossor ...	220SG		200	2	.2
Marconi...	S215	200,000	170	2	.15
Osram ...	S215		170	2	.15
Ediswan	SG215	140,000	140	2	.15
Mullard...	PM14	230,000	200	4	.075
Six-Sixty	4075SG	220,000	190	4	.075
Cossor ...	410SG	200,000	200	4	.1
Ediswan	SG410	115,000	140	4	.1
Marconi...	S625	175,000	110	6	.25
Osram ...	S625		110	6	.25
Ediswan	SG610	100,000	140	6	.1

FIVE-ELECTRODE VALVES: Pentodes

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Ediswan	5E225	65,000	80	2	.25
Six-Sixty	230PP	64,000	80	2	.3
Mullard...	PM22	62,500	82	2	.3
Marconi...	PT235	55,000	90	2	.35
Osram ...	PT235		90	2	.35
Cossor ...	230QT	20,000	40	2	.3
Mullard...	PM24	28,600	62	4	.15
Six Sixty	415PP	27,000	60	4	.15
Cossor ...	415QT	20,000	40	4	.15
Mullard...	PM26	25,000	50	6	.17

MAINS VALVES: Three- and Four-electrode

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Marconi...	S Point 8	200,000	160	.8	.8
Osram ...	S Point 8		160	.8	.8
Marconi...	H Point 8	55,000	40	.8	.8
Osram ...	H Point 8		40	.8	.8
Marconi...	HLPoint8	17,000	17	.8	.8
Osram ...	HLPoint8		17	.8	.8
Marconi...	P Point 8	6,000	6	.8	.8
Osram ...	P Point 8		6	8	.8
Marconi...	KH1	30,000	40	3.5	2.0
Osram ...	KH1		40	3.5	2.0
Marconi...	KL1	3,750	7.5	3.5	2.0
Osram ...	KL1		7.5	3.5	2.0
Cossor ...	MRC	80,000	50	4	1.0
Ediswan	MI41RC	50,000	45	4	1.0
Cossor ...	MHF	20,000	20	4	1.0
Cosmos ...	AC/G	17,500	35	4	1.0
Ediswan	MI41	9,000	16	4	1.0
Cossor ...	MLF	8,000	8	4	1.0
Cossor ...	MP	6,500	5.5	4	1.0
Cosmos ...	AC/R	3,000	10	4	1.0
Cossor ...	MXP		3.5	4	1.0

A glance through the constructional articles in this issue will give the novice some hints regarding the best valves for the various types of circuits

Speedy replies result from mentioning "Wireless Magazine"

WAVELENGTHS OF THE EUROPEAN STATIONS

IN ORDER OF WAVELENGTH

UNDER THE PLAN DE BRUXELLES

A view in the Grande Place, Brussels

Wave-length	*Station and Call Sign*	*Country*	*Kilo-cycles*
25.53	Chelmsford (5SW)	Great Britain	1,751
211.3	Beziers	France	1,420
219	Flensburg	Germany	1,370
222	Cork (5CK)	Irish Free State	1,350
238	Bordeaux	France	1,260
240	Nürnberg	Germany	1,250
243.9	Newcastle (5NO)	Great Britain	1,230
245	Lille (PTT)	France	1,224
250	Linz	Austria	1,200
	Kiel	Germany	
	Cassel	Germany	
253	Montpellier	France	1,185
255	Toulouse (PTT)	France	1,175
258.4	Leeds (2LS)	Great Britain	1,161
263.2	Cologne	Germany	1,140
265	Kosice	Czecho-Slovakia	1,130
267.8	Muenster	Germany	1,120
268	Strasbourg	Alsace Lorraine	1,118
272.7	Kaiserslautern	Germany	1,100
276	Turin	Italy	1,080
280	Liege	Belgium	1,070
280.4	Königsberg	Germany	1,070
283	Magdeburg	Germany	1,061
	Berlin	Germany	
	Stettin	Germany	
288.5	Dundee (2DE)	Great Britain	1,040
	Hull (6KH)	Great Britain	
	Bradford (2LS)	Great Britain	
	Bournemouth (6BM)	Great Britain	
	Edinburgh (2EH)	Great Britain	
	Sheffield (6LF)	Great Britain	
	Stoke-on-Trent (5ST)	Great Britain	
291.3	Radio Lyons	France	1.030
294	Liverpool (2LV)	Great Britain	
	Swansea (5SX)	Great Britain	
299.3	Bratislava	Czecho-Slovakia	1,000
301	Bordeaux (PTT)	France	997
302.6	Belfast (2BE)	Ireland	991.1
305	Agen	France	982
305.6	Marseilles (PTT)	France	981
311	Aberdeen (2BD)	Great Britain	964
317.5	Dresden	Germany	945
321.2	Breslau	Germany	937
322	Vitus (Paris)	France	930
323	Cardiff (5WA)	Great Britain	928
326.4	Gleiwitz	Germany	919
330	Bremen	Germany	909
333	Naples	Italy	900
	Reykjavik	Iceland	
336	Petit Parisien	France	892
339	Copenhagen	Denmark	883
342	Prague	Czecho-Slovakia	873
346.8	Barcelona	Spain	857
350	Goteborg	Sweden	858
354.2	Graz	Austria	847
358.9	London (2LO)	Great Britain	838
361.9	Leipzig	Germany	829
368	Radio LL (Paris)	France	815
371	Seville (EAJ5)	Spain	
374	Stuttgart	Germany	802
	Helsingfors	Finland	

Wave-length	*Station and Call Sign*	*Country*	*Kilo-cycles*
378	Manchester (2ZY)	Great Britain	793
382.2	Toulouse (Radio)	France	785
391.6	Hamburg	Germany	766
395	Bucharest	Roumania	757
396	Plymouth (5PY)	Great Britain	
400	Mont de Marsan	France	749
401	Glasgow (5SC)	Great Britain	748.3
405	San Sebastian (EAJ8)	Spain	744
406	Berne	Switzerland	739
411	Dublin (2RN)	Irish Free State	730
414	Radio Maroc (Rabat)	France	724
416	Kattowitz	Poland	721
427	Frankfurt	Germany	703
	Madrid (EAJ7)	Spain	
428	Grenoble (PTT)	France	701
428.7	Radio Flandre (Lille)	France	697
432.3	Brunn	Czecho-Slovakia	694
438	Stockholm	Sweden	685
443	Rome	Italy	677
450	Paris (Ecole Sup. PTT)	France	668
	Bolzano	Italy	666
452	Belgrade	Jugo-Slavia	664
455.9	Danzig	Germany	654
456	Wilno	Poland	658
	Klagenfurt	Austria	
	Innsbruck	Austria	
	Salamanca (EAJ22)	Spain	
	Aachen	France	
462.2	Langenberg	Germany	647
468.8	Lyons (PTT)	France	640
476	Berlin	Germany	630
482	Daventry Ex. (5GB)	Great Britain	622
496	Zurich	Switzerland	604
	Oslo	Norway	
504	Milan	Italy	595
512	Brussels	Belgium	586
520	Vienna	Austria	577
537	Munich	Germany	559
548	Budapest	Hungary	548
550	Sundsvall	Sweden	546
566	Hanover	Germany	530
680	Lausanne	Switzerland	441
760	Geneva	Switzerland	395
825	Moscow	Russia	363
1,004	Leningrad	Russia	299
1,073	Hilversum	Holland	279
1,155	Kalundborg	Denmark	259
1,200	Stamboul	Turkey	250
1,350	Motala	Sweden	222
1,395	Warsaw	Poland	215
1,450	Moscow	Russia	207
1,470	Eiffel Tower	France	203
1,504	Lahti	Finland	199
1,562.5	Daventry (5XX)	Great Britain	192
1,650	Zeesen	Germany	182
1,748	Radio Paris	France	171
1,840	Angora	Turkey	163
1,852	Huizen	Holland	162
2,000	Kovno	Lithuania	150

Special Articles on Television and "Talkies" Next Month

IN TUNE WITH THE TRADE!

FETTER LANE'S Review of Catalogues and Pamphlets

Six-Sixty Facts

JUST what "duo-triangular filament suspension" means I am still at a loss to know, but that is the only thing which puzzled me in a new booklet which has just been released, dealing with Six-Sixty glowless valves. Very intriguing is that term "glowless": it makes one think that the advent of the perfectly "cold" valve has advented—if I may use that coined word.

But to come to facts, this Six-Sixty booklet is full of facts, and is particularly helpful, because it gives the details of the whole range of Six-Sixties both in tabular and graphic form. Altogether, a very handy booklet for the amateur who wants to know just how much juice to give his valves in order to get the best out of them.

And if you are unable to follow the accurate characteristic graphs given in this booklet, then you should read your WIRELESS MAGAZINE more thoroughly, because all this has been explained fully from time to time. Get acquainted with "characteristics" *via* the Six-Sixty booklet, publ's ed by the Electron Co., Ltd., 122 Charing Cross Road, W.C.2. **27**

* * *

Competa Catalogued

WE should be grateful to Mr. Bulgin for placing before constructors the best of the world's radio products, for he imports the most fascinating and useful bits and pieces—of the kind guaranteed to make home-constructors glow with pride—direct from all parts of the world.

List No. 125 has just been sent me, and I think it should be in the possession of all who make up their own sets and want the best and most useful of gadgets. Moreover, Competa gadgets are used in very many WIRELESS MAGAZINE receivers, and if you have the Competa list at hand it will save time and trouble when ordering if the correct catalogue numbers can be given.

Speaking for myself, I spent a long time gloating over the neat little switches, connectors, sockets, and clips; not to mention the range of Competa meters and measuring instruments for all purposes.

If you, too, want to gloat, then—write to A. F. Bulgin & Co., at 9, 10, and 11 Cursitor Street, E.C.4, or else make use of my catalogue service. **28**

* * *

Lissen's "Three"

RECENTLY I said that the Friars Lane folk had intrigued me by sending in to your "Fetter" two folders dealing with portable sets and gramophones. Now follows a similar sheet telling about the Lissenola three-valver, which is a complete, ready-made receiver selling at a very moderate figure.

A point that will appeal is that it is sold complete with all batteries, valves, and, indeed, everything except the loud-speaker. If you have any thoughts of buying such a set get this folder, because it shows just how easy is the Lissen receiver to control. Only three knobs, no coil-changing, provision for adding a pick-up and so on and so forth.

But Lissen, Ltd., of Friars Lane, Richmond, Surrey, have published this folder, and it is their business to tell you about the set! **29**

A SPECIAL SERVICE FOR READERS

As a keen wireless enthusiast you naturally want to keep abreast of all the latest developments and this special feature will enable you to do so with the minimum of trouble.

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

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

My name and address are :—

Send this coupon in an unseated envelope, bearing ½d. stamp, to "Catalogue Service," WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. *Valid till June 30*

Ready-made H.T.

THE name Ferranti is fast becoming famous for H.T.-from-the-mains units, just as it was famous for mains-measuring instruments long before wireless was thought much of.

What made me think of this is the fact that I have just had sent me, by Ferranti, Ltd., of Hollinwood, Lancashire, a kind of a book (it really *is* bigger than what I usually term a "booklet"), dealing with an A.C. H.T. unit.

This exists under the type number BEM1, and is suitable for use on 200-250-volt A.C. mains, between periodicities of 40 and 100 cycles. The maximum output is 100 milliamps, which is quite a useful figure! It is particularly worth remembering that Ferranti H.T. units are among the few which comply entirely with the regulations of the I.E.E.

The book gives far more technical data about the units than the average amateur will want to worry about, and it is all precised in the last few pages, where are given the operating conditions for well-known makes of valves in different sets. **30**

* * *

Squire Loud-speakers

THE craze for making up loud-speakers from partly-assembled cone-kits and reed movements is a fairly recent one, but has much to recommend it. Frederick Squire, of 24 Leswin Road, N.16, is specialising in kits of all kinds for loud-speakers of all kinds.

One is quite a giant in its way, having a triplex-woven cone 15 in. in diameter and with a girder-section aluminium frame. Another, for which I think portable-set constructors should clamour, is a light-weight assembly for inclusion in portable and transportable sets.

There are many other types of kit and cone cradles, and they are all described in leaflets which can be obtained from Messrs. Squire. It should be noted that the giant cone is described in a folder of its own. **31**

(*Continued on next page*)

Radio for the Million

I HAVE had sent me Vol. III, No. 1, of the Mullard publication *Radio for the Million*. This gives full details of the Mullard S.G.P. Master Three, which incorporates a screened-grid and pentode valve—hence the designation "S.G.P."

The constructional details are most explicit, and if you feel that a receiver of this type is just what you want, then make a point of putting in an early application for *Radio for the Million*.

The address of the publishers is the Mullard Wireless Service Co., Ltd., Mullard House, Denmark Street, W.C.2. **32**

◆ ◆ ◆

Charge at Home

I AM a motorist, so when I received a leaflet describing the Philips A.C. rectifier for L.T. accumulators, I jumped over the radio technical matter and became thrilled by the announcement that this charger is suitable for juicing up car batteries.

The leaflet gives full details of the type 450 charger, and this will be found suitable for all general needs of amateurs.

Included also is a description of the Philips trickle charger, which incorporates a neat switch for cutting in and out the charging operation. Philips Lamps, Ltd., Philips House, Charing Cross Road, W.C.2, tell you all about both chargers in this leaflet. **33**

◆ ◆ ◆

Just Think . . .

"THINK how your set will look housed in one of these handsome cabinets," is the way you are introduced to Pickett's cabinets in a new catalogue just issued by Pickett Bros., Albion Road, Bexleyheath, Kent.

As you doubtless know, Pickett's cabinets are used with many sets published in the WIRELESS MAGAZINE and, as a matter of fact, with this catalogue is being given a reprint of a page from the WIRELESS MAGAZINE dealing with W. James' Binowave Four—which was housed in a Pickett's product.

The catalogue deals specifically with Radiola cabinets, and with the Radiola Wireless Bureau in particular. If you take my tip, you'll read carefully through the catalogue without taking any notice of the price.

Then look at the price, and a pleasant surprise will await you! **34**

The Secret of Life

in a battery

There is life in the tones of singer, speaker and instrumentalist alike if you use the LISSEN Battery. For it yields its pure D.C. current so smoothly, so silently, with never a sign of ripple in it, never a trace of hum, that the purity of rendition before the microphone is truly preserved.

And the oxygen content of the large cells (due to the process exclusively used by Lissen) is so great that you get months and months of use from every Lissen Battery, and reproduction is delightful, perfectly true and perfectly natural all the time.

The Lissen Battery is obtainable at every radio dealer's—ask firmly for Lissen New Process. If you insist you will be rewarded by a truth of tone in your loud-speaker which was never there before.

DIRECT FROM FACTORY TO DEALERS' SHOPS—
every LISSEN Battery is fresh when you get it!

60 volt (reads 66)	7/11
100 volt (reads 108)	12/11
36 volt	4/6
60 volt, Super Power	13/6
9 volt Grid Bias	1/6
4½ volt Pocket Battery (4/6 a doz.)	5d. each
Single Cell Torch Battery	4½d. each

LISSEN LIMITED, 500-520 Friars Lane, Richmond, Surrey
Managing Director: THOS. N. COLE.

The 1929 CHUMMY

Last Season's Famous Portable Redesigned by W. JAMES

A Four-valver for Both Wavelength Bands

THE design of a four- or five-valve compact self-contained or portable receiver that will provide average results as regards tonal quality, volume, and sensitivity in comparison with other sets of the same class is not a difficult matter.

This is borne out by the large numbers of self-contained receivers marketed at the present time. The majority of them employ the same circuit and give results which are comparable.

Untuned Couplings

Five valves are generally used. The first two are coupled by so-called aperiodic choking coils, or transformers, that do not have to be tuned by adjustable condensers, and the detector is arranged to provide reaction to the frame aerial.

This type of set, which is extraordinarily popular, therefore, has one main tuning control and a reaction control, and there is, of course, a switch for altering the wavelength range of the frame aerial and connecting or disconnecting the filament battery.

Listeners seem to be quite satisfied with a quality of reproduction from a portable set that would be thought only tolerably good were the receiver a three-valver connected to an outdoor aerial. At the same time, the results are acceptable to very large numbers of listeners.

I think this is partly due to the fact that many of those who now listen with a portable receiver have never used any other type of set and are, therefore, not in a position to compare the results. Neither does it greatly matter whether the results are good, bad, or indifferent, as compared with the finest results to be obtained from equipment designed to approach perfection.

It appears that what does matter is, first, the fact that portable receivers are *complete* in themselves and, secondly, that they all put up a certain standard of performance.

I am, of course, speaking generally of the five-valve type of receiver. When one considers the four-valve type having a single stage of high-frequency amplification employing a shielded valve, with two-knob tuning and reaction, one finds that quite different results are obtained.

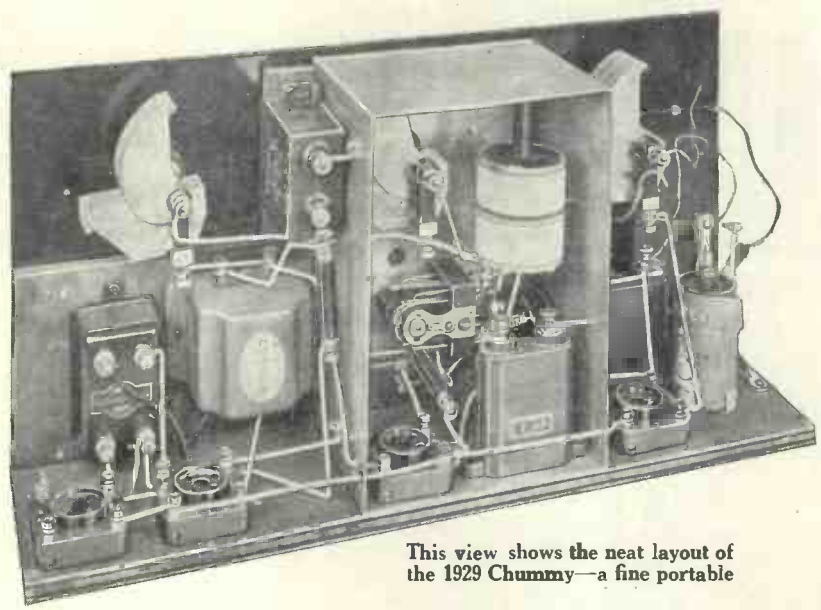
Receivers of this type are usually more sensitive and are, therefore, able to bring in more distant stations than those of the five-valve single-knob tuning type, and because the high-frequency amplification may be more readily controlled, there is every reason to believe that the quality of the reproduction must necessarily be better

No Need for "Forcing"

The user does not have to rely to the same extent upon reaction for sensitivity and, in fact, so far as the local and Daventry stations are concerned, the four-valve sets having a single shielded-grid high-frequency stage do not have to be forced, with the result that the reproduction is generally of the same order as that provided by a similar type of set arranged for open aerial working.

I think it is much more difficult to design a portable receiver having a tuned high-frequency stage. One must provide the maximum of magnification with stability and ease

The 1929 Chummy Four (Continued)



This view shows the neat layout of the 1929 Chummy—a fine portable

of handling. As there will be two controls (excepting when they are "ganged") they must not be critical in any way or tuning will be too difficult, from which it follows that too great selectivity is undesirable.

Factors to be Balanced

The various factors which govern magnification and selectivity have, therefore, to be nicely balanced in order that the set shall not suffer as regards its ease of handling in comparison with the true single-control receiver of which the five-valve sets mentioned above are typical.

In the previous issue of the WIRELESS MAGAZINE I described two or three circuits for portables and explained their advantages. The receiver illustrated here employs a circuit which is based upon them.

Circuit Arrangement

We have, first of all, the two frame aerials wound for the medium and longer bands of wavelengths. They are centre-tapped for stability and selectivity, and are tuned by a .0005-microfarad variable condenser. A switch could be used for connecting them to the tuning condenser, but in the set I have employed plugs and sockets for simplicity.

The two frames are wound in the lid of the receiver with the long-wave winding on the outside of the short-wave winding. Means are provided for short-circuiting the long-wave frame aerial when receiving with the medium-wavelength one, but strangely enough, the best results are obtained on the longer wavelengths with the medium-wave frame not short-circuited.

With the plugs and sockets provided, it is but the work of a moment to effect the change from one wavelength band to the other.

Biasing the H.F. Valve

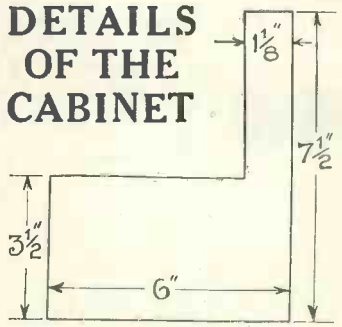
A single cell is used for biasing the grid of the high-frequency valve negatively. This cell gives the grid a bias of 1.5 volts and has the effect of improving the operation of the stage and minimising the anode current. It is not by-passed with a condenser, as it was found that the results were not improved when a condenser was added.

Both sides of the frame-aerial tuning condenser are alive, as neither set of plates is earthed. But hand-capacity effects have not been noticed partly because a slow-motion dial having the minimum of metal in its construction is employed.

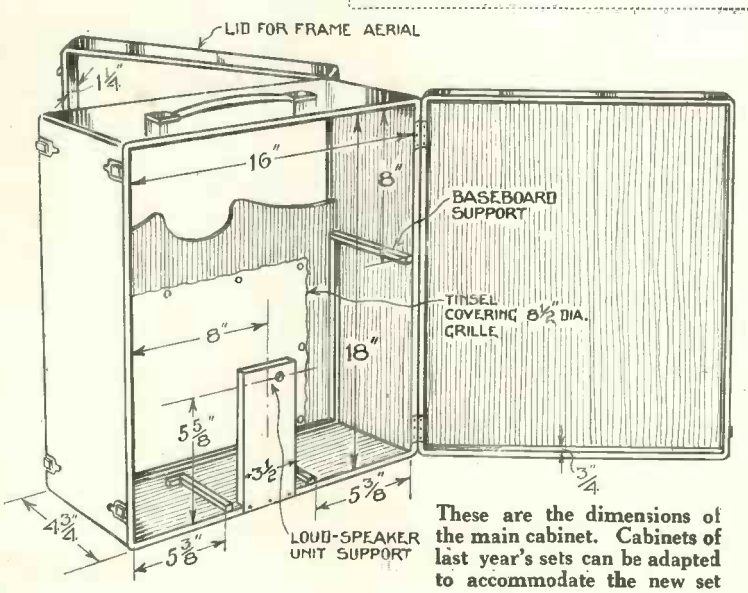
Use the Specified Parts

This point should be remembered as, should an unsuitable dial be fitted, hand effects may be noticeable.

In the interests of stability, the shield grid of the shielded valve has connected to it a fixed resistance



Dimensions of wooden sub-panel



These are the dimensions of the main cabinet. Cabinets of last year's sets can be adapted to accommodate the new set

A Famous Set Re-designed by W. James

of 10,000 ohms and a condenser of 1 microfarad capacity. This combination of resistance and condenser will prevent trouble in this part of the circuit, even though the high-tension battery develops a relatively high internal resistance.

Stopping H.F. Currents

At the same time, the filter acts as a most effective stopper in preventing high-frequency currents from entering the high-tension battery from the screen to the valve.

A resistance of 10,000 ohms is not essential. It may have a value of as much as 50,000 ohms, but one should remember to compensate for the voltage drop in this resistance by suitably connecting the circuit to a point of more than 60 volts on the high-tension battery.

There should be no need to employ the full 120 volts, but as there is a drop across the resistance, several values of voltage should be tried.

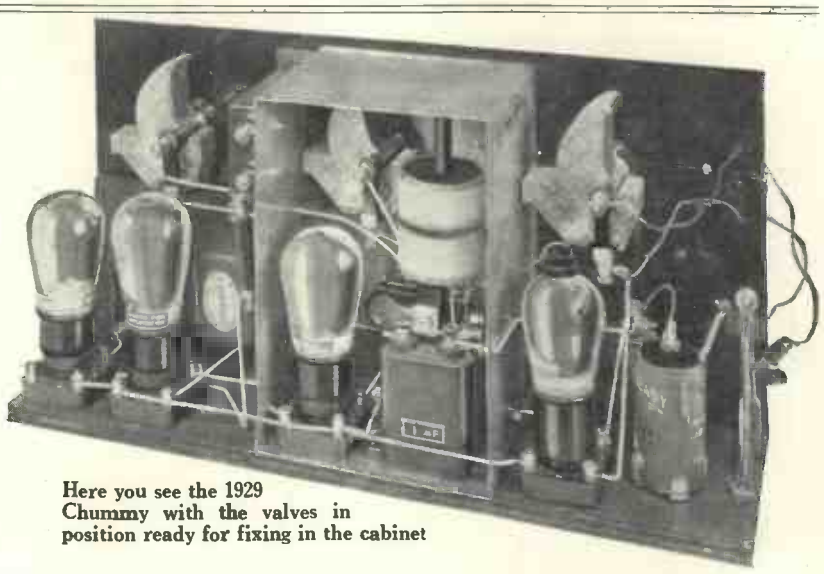
Amplification without Oscillation

Care has been taken to ensure that the high-frequency stage shall amplify without oscillating, and for this reason a high-frequency choking coil is connected in the anode circuit of the shielded valve, whilst a tuned circuit is connected between the negative side of the filament and the anode-stopping condenser. This condenser has a value of .002 microfarad, but I would point out that this is not by any means critical.

A two-range tuning coil of small dimensions has been used and is tuned with a .0005 microfarad condenser. The long-wave section is wound in a slotted former, which is fitted inside the tube carrying the medium-wavelength winding. I have found this arrangement to work very well, but only when the windings are switched as indicated.

Uniform Reaction Control

The coils can be so arranged that when receiving over the medium-wavelength band the two coils are joined in parallel by means of a simple push-pull switch, but my tests have shown the method of switching separately either the long- or the medium-wave coil to the tuning condenser to be preferable. The amplification and selectivity appear to be better, and the single reaction winding arranged in one of the slots seems to allow a more uniform control of a reaction to be obtained with the variable condenser.



Here you see the 1929 Chummy with the valves in position ready for fixing in the cabinet

In asking W. James (Research Consultant of the "Wireless Magazine") to re-design the famous Chummy Four we emphasised the desirability of retaining as many as possible of the components employed in the original model.

The result is that owners of last year's Chummy Four will be able to adapt it to the 1929 design with the minimum of waste, even to the extent of adapting the old cabinet.

Special features of the 1929 Chummy are its adaptability for reception of both wave-bands, materially lower high-tension current consumption, and the inclusion of filter circuits for the sake of increased stability and efficiency.

Many hundreds of listeners built and praised the original Chummy Four, which exactly a year ago was the first portable to be offered to the home-constructor which made use of a screened-grid valve. Now that it has been re-designed by W. James it will undoubtedly be more popular than ever.

For the maximum of sensitivity it is clear that the aerial and anode circuits should be practically oscillating, and it therefore seems desirable so to arrange these two circuits that one does not oscillate very much before the other as the reaction condenser is slowly turned.

Unfortunately, we have a variable factor in the valve—no two valves, even of the same type, are exactly alike and it therefore follows there may be slight differences as between one set and another.

Full Sensitivity for Distance

But this point of properly arranging the aerial and anode circuits must not be overlooked, for even though it is possible to receive local stations when the circuits are not near the oscillating point, it must be recognised that the full sensitivity of the receiver has to be employed for the reception of more distant stations.

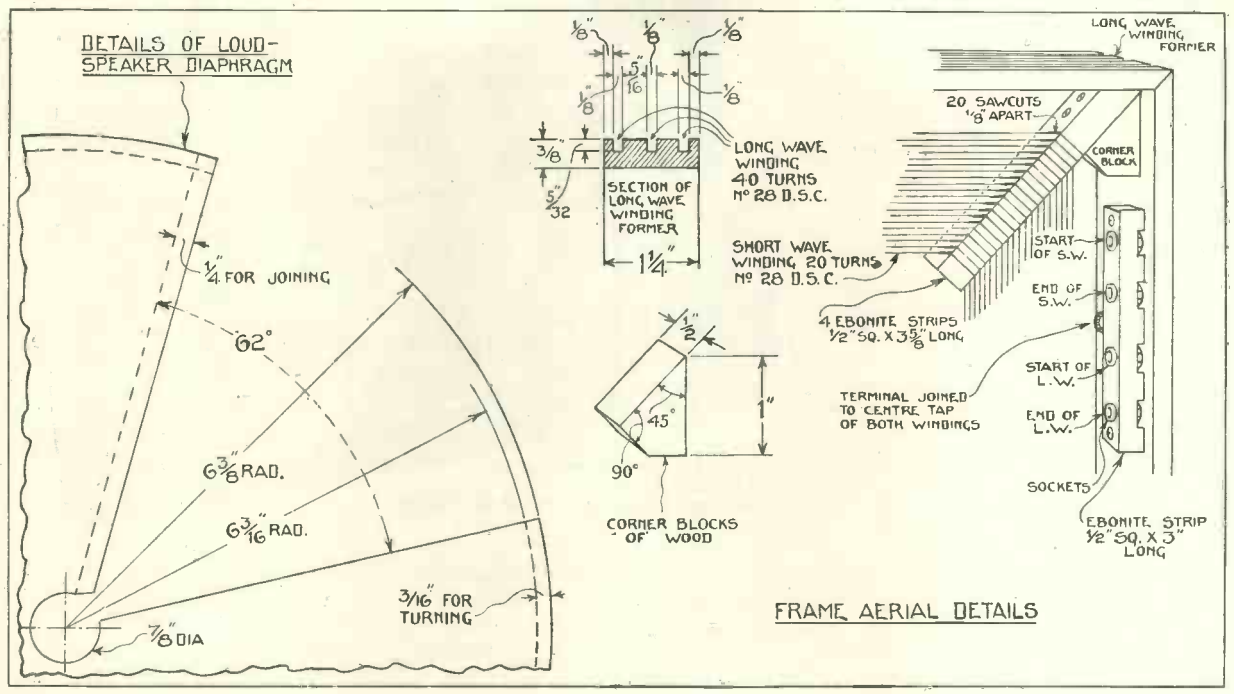
Here in London it is not necessary to employ more than a trace of reaction when receiving 5GB, which is a great advantage, as the quality of the reception is not spoiled.

Additional Filter Circuit

The detector valve is arranged with a grid condenser and leak in the usual manner, and is transformer-coupled to the first low-frequency valve. A filter circuit was found desirable in the high-tension supply to this valve and therefore a 20,000-ohm fixed resistance and a 2-microfarad condenser are included as indicated.

Very few portable receivers have this refinement, but it is well worth while when reasonable quality of reproduction is expected. When this filter circuit is not used there is a

The 1929 Chummy Four (Continued)



tendency for howling to start as the battery ages and after a time, of course, "motor-boating" appears.

No Sacrifice of Low Notes

The howling and motor-boating could have been prevented by using a transformer having a small primary winding or low value of inductance, but as the use of such a component would involve sacrificing the lower notes, it was preferred to employ a good transformer and a high-tension filter circuit, even though this slightly raises the cost.

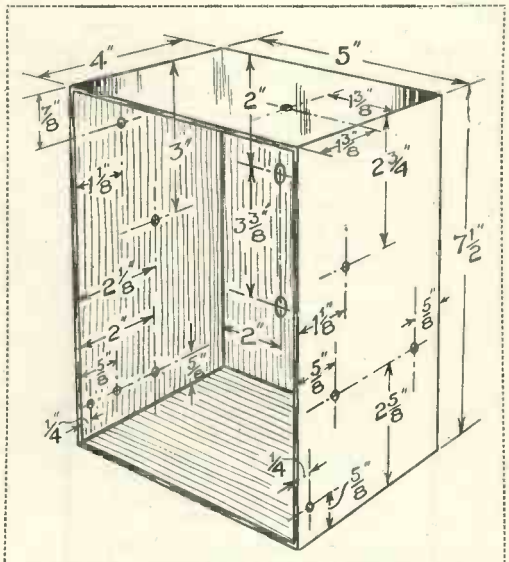
The third valve is resistance-capacity coupled to the last by means of a popular unit having suitable values, and does not need further description.

The circuit of the receiver will be seen from this explanation to be what might be termed a standard one, as no attempt has been made to sacrifice stability or quality of reproduction by the employment of a simplified circuit. As might be expected, the quality is dependent to no small extent upon the construction of the loud-speaker.

Chief Constructional Points

Turning now to more practical matters, let us go over the chief points in the construction. On the front panel, which is of ebonite, are the two tuning condensers, the reaction control and the combined wave-change and filament on-off switch (which, therefore, has three positions), whilst to the left-hand side are three flexible wires that connect the frame aerial to the receiver.

The two aerials are wound in the front cover of the receiver. A wooden framework is used for the long-wave winding; it is provided with three slots having thirteen, fourteen, and thirteen turns respectively, or a total of forty turns, of No. 28-gauge d.s.c. wire.



Details of copper screen for the 1929 Chummy

Frame Aerial Connections

The centre turn is tapped and a wire is taken from it to a small terminal on the ebonite strip fitted in the top right-hand corner of the cover. This strip has four sockets and two of them are connected respectively to the beginning and end of the long-wave winding.

Four pieces of ebonite suitably slotted are employed as supports for the medium-wavelength winding and these are fastened to the front cover, with the result that this winding is smaller in section than the long-wave winding.

Medium-wave Winding

There are twenty turns of the No. 28-gauge d.s.c. in the full medium-wave winding and the centre turn is connected to the terminal on the ebonite strip. Reference must be made to the diagrams for details of these two windings as it is important they are correctly connected.

The receiver itself comprises the

For Reception on Both Wavelength Bands

ebonite front panel and baseboard, complete with the copper shield and the parts mentioned in the list of components.

At the Back of the Set

Looking at the back of the receiver, one sees on the right-hand side the frame-aerial connections, tuning condenser, shielded valve and holder, and single-cell grid battery, together with the 10,000-ohm fixed resistance and 1-microfarad condenser which are joined to the shield of the valve.

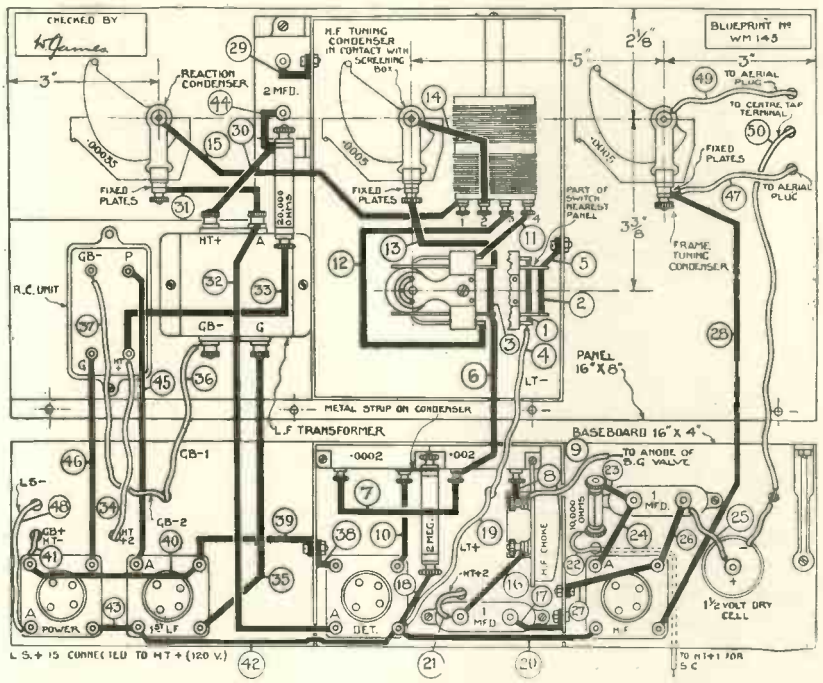
In the copper box itself are the high-frequency choking coil, anode coil, switch, tuning condenser, detector valve, and grid condenser and leak. There is no back to the box, as this was found to be quite unnecessary.

On the left-hand side of the receiver are the reactionary condenser, transformer, resistance-capacity coupling unit, detector circuit filter, and the two low-frequency valves.

Use of Wooden Sub-panel

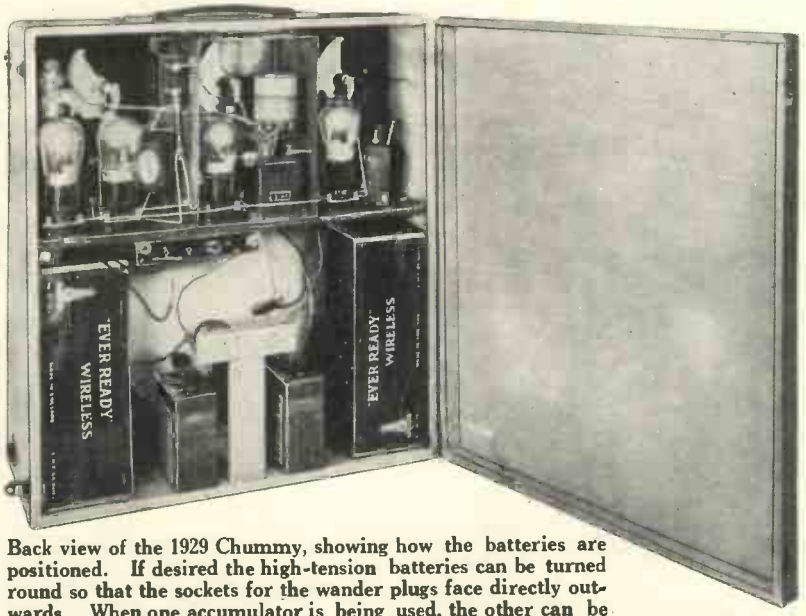
These parts may appear from the illustrations to be rather crowded, but there is, in fact, ample room, although in order to take the fullest advantage of the space available the transformer and resistance unit had to be mounted on a wooden sub-panel.

The batteries are suitably arranged to give the maximum of room for the loud-speaker. First is the grid battery, which is held to the underside of the baseboard by means of clips. The second battery is the high tension, which is divided into two portions, one being fitted on each side of the loud-speaker. Similarly, two small filament accumulators are employed, connected in parallel as indicated in the diagram.



This layout and wiring diagram of the 1929 Chummy can be obtained as a full-size blueprint for half-price (that is, 9d., post free), if the coupon on page iii of the cover is used by June 30. Ask for No. W.M.145. Wire up in numerical order

For the loud-speaker a bracket of wood fastened to the bottom of the container is employed. The position of this bracket is important as the cone of the loud-speaker must be free to move.



Back view of the 1929 Chummy, showing how the batteries are positioned. If desired the high-tension batteries can be turned round so that the sockets for the wander plugs face directly outwards. When one accumulator is being used, the other can be charged up; in this way the set will always be in commisssion and ready for instant use when required

Wiring Up the Switch

Probably the most difficult part of the wiring will be to the switch, but one or two of these wires may be connected to the contacts of the switch before fastening it to the front panel, and it is not difficult to connect all the wires provided the 1-microfarad condenser is temporarily removed from the screening box.

This box is not very rigid and if it is thought there may be a chance of it making contact with any component, a piece of thick paper may be glued over the surface where the danger liesto prevent trouble.

Insulating the Copper Box

There are many suitable loud-speaker units on the market which could be used in this receiver, but it is

The 1929 Chummy Four (Continued)

COMPONENTS REQUIRED FOR THE 1929 CHUMMY FOUR

1—Ebonite panel, 16 in. by 8 in. (Resiston, Parfait, or Becol).
2—.0005-mfd. condensers (Formo de Luxe or Utility).
2—Slow-motion dials (Harlie).
1—.00035-mfd. condenser (Formo de Luxe or Utility).
2—1-microfarad fixed condensers (Dubilier or T.C.C.).
1—2-mfd. condenser (T.C.C., Dubilier, or Ferranti).
4—Antimicrophonic valve holders (Formo).
1—1½-volt dry cell (Ever-Ready type UW1).
1—High-frequency choke (Igranic, Ready Radio, or Wearite).
1—Two-pole two-way barrel switch (Wearite).
1—2-megohm grid leak (Graham-Farish, Edison Bell, or Mullard).
1—.0002-microfarad fixed condenser (Graham-Farish, Edison Bell or Mullard).
1—.002-microfarad fixed condenser (Graham-Farish, Edison Bell or Mullard).
1—Anode coil with support (Ready Radio, Raymond, Parex or Wearite).
1—10,000-ohm resistance (Graham-Farish).
1—20,000-ohm resistance (Graham-Farish).
1—Low-frequency transformer (Cossor).
1—Resistance-capacity unit (Marconiphone type A).
1—Pair panel brackets (Camco, Raymond, or Bulgin).
1—Adjustable loud-speaker unit (Blue Spot type 66K).
2—66-volt high-tension batteries (Ever Ready type W16s)
1—9-volt grid-bias battery (Ever Ready type GB4).
1—Pair battery clips (Bulgin).
2—2-volt accumulators (C.A.V. type 2NS9).
1—Piece of cone paper, 12 in. square.
16—Spring wander plugs, 8 black and 8 red (Igranic, Belling-Lee or Lectro-Linx).
4—Spade tags, 2 black and 2 red (Lectro Linx).
1—Screening box (Ready Radio, Parex, or Raymond).
10—Indicating tabs: L.T.+, L.T.−, H.T.+2, H.T.+1, H.T.−, L.S.+, L.S.−, G.B.−2, G.B.−1, G.B.+.
1—Cabinet with baseboard, frame-aerial and loud-speaker fittings (Ready Radio).
1—Small knob for reaction condenser.
4-oz. No. 28-gauge d.s.c. wire for frame aerial (Lewcos).
10—2 ft. lengths connecting wire (Glazite).
Length of rubber-covered flex (Lewcos).
1—2-volt screened-grid valve (Cossor SG220).
1—2-volt R.C. valve (Cossor RC210).
1—2-volt H.F. valve (Cossor HF210).
1—2-volt power valve (Cossor Stentor Two).
Total Cost (approximately) £14 10s.

necessary to cut a diaphragm to fit. The one employed in the receiver illustrated is cut from two-sheet Bristol board to the dimensions given. A piece of this material should be carefully marked according to the dimensions; the outer edge is then cut and also a section equivalent to 62 degrees, but do not forget to leave ¼ in. for fixing the edges.

Use of Different Unit

It should be understood that the size of the cone is dependent upon the unit and the space available, with the result that it may be necessary to construct a cone having other dimensions if a different unit is employed.

The valves used in this receiver do not have to be carefully chosen or selected ones, but they must be of suitable types. In the high-frequency position is a shielded valve which is supplied with an anode voltage of 120, and a shield voltage of 60 or more according to the type.

Other Three Valves

A high-impedance valve, such as one of the R.C. type, is used for detection, and this is followed by a valve of medium impedance, such as an H.F. type. Naturally, a small power valve is used in the output position.

Grid bias is applied according to the types of valves used, but usually three volts will suit the first low-frequency amplifying valve and nine volts the power valve. The anode current does not exceed 10 milli-amperes for all valves, but there may be slight variations, depending upon the actual valves used.

Tuning is effected in the usual manner, the reaction condenser being turned to put the circuits in a sensitive state, whilst searching. Volume may be varied by altering the position of the frame aerial or by adjustment of the reaction condenser, whichever be the more convenient. Neither method alters the tuning to any marked extent, and considerations of selectivity and the position of the receiver will determine the better way.

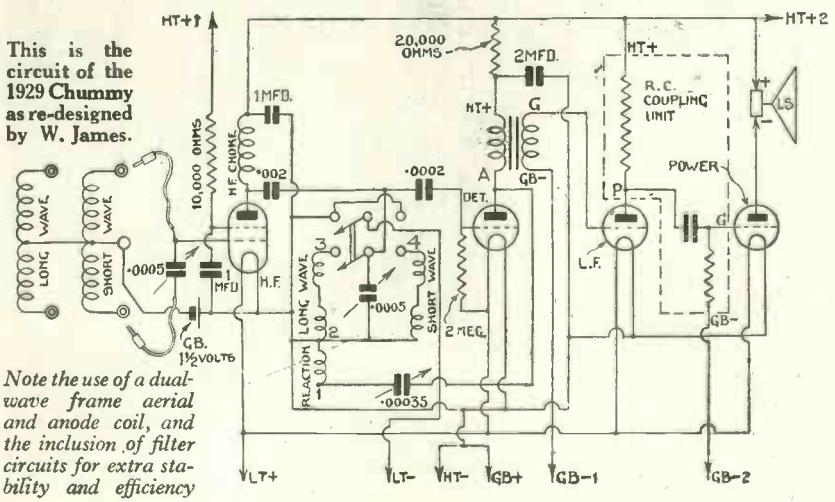
FURTHER PHOTOGRAPHS AND DETAILS OF THE ANODE COIL APPEAR ON PAGE 482

I have not provided for connecting a mains high-tension unit in place of the dry cells; this change-over will, however, easily be effected by anyone having the equipment.

Guided by Last Year's Model

In conclusion, I would add, that I have endeavoured, so far as possible, to be guided by last season's Chummy Four, but have converted it into a dual-range receiver.

This is the circuit of the 1929 Chummy as re-designed by W. James.



Note the use of a dual-wave frame aerial and anode coil, and the inclusion of filter circuits for extra stability and efficiency

Awkward Moments in the Studio!

BY AN EX-ANNOUNCER

When Tallulah Bankhead Fainted :: The Sermon That Ended With "I Don't Think!" :: Norah Blaney in Difficulties :: Balancing the Programme :: A Fly in the "Mike"

THE red light is on, and the double doors shut tight. You are in a world of silence. To cough will deafen millions—to whisper may mean spoiling an entire programme. The stillness is unearthly—it rings in the ears.

The only person who seems thoroughly at ease is the announcer. He, apparently, is used to it. Nonchalantly, he switches on to inform the world that Miss So-and-So will sing three songs. The long names and unpronounceable composers he tackles without turning a hair.

Dangers on Every Side

Yet the announcer is beset by dangers on every side. A hundred and one things may go wrong—through a hundred and one different causes. I speak from experience.

Pronunciation is a common difficulty, and generally comes when a singer unexpectedly changes her songs. The news bulletins are usually read beforehand to make sure of the more difficult words.

Greater problems arise through nervous speakers and artists.

What does the announcer do when an artist faints?

Microphone Fright

This actually happened once, and the fainting one was none other than the charming Tallulah Bankhead. It was her first appearance before the microphone; and she became a victim to microphone fright, a nasty complaint that seizes the best of us at times. Even announcers are not immune.

Miss Bankhead had it badly. The occasion was a Sunday night, and Tallulah was to broadcast a charity appeal. Before we switched on, she complained of nerves, but since that is the cry of nine broadcasters out of ten, we tried to calm her and switched on. Then things started to move.

Tallulah gabbled her speech so quickly that even in the studio we could not distinguish all her words. On and on she went till the end was reached. Then, with a little sigh, she fainted, and slithered to the floor. The public knew nothing of the occurrence. The official who checks the programmes had switched off.

The "mike" does not always go to sleep so correctly. Sometimes it is turned off too late—sometimes too early. Listeners have often heard scraps of conversation in the studio, obviously not intended for them. Usually, they enliven the monotony of the programmes. Sometimes they make them positively uproarious.

Once a well-known cleric had been giving a particularly uplifting sermon, and concluded with the astonishing words: "I don't think!" Listeners did not hear the conclusion of the sentence—"that was too long, was it?"

Incidentally, when speakers go over their time, or a band performs a piece that takes longer than expected, the announcer's worst moment comes. It is necessary that, in order to balance the programmes some future item must be cut out, and choosing on the spur of the moment which item to leave out is a job for twenty announcers!

Cutting the wrong thing may bring in shoals of angry protests from listeners, and even taking out the only possible item is sure to arouse wrath in someone somewhere.

Equally tiresome, if not more so, is the nasty gap that occurs in the programmes when items have ended before their time. Nowadays, an increased knowledge of just how long certain items take have practically obviated this difficulty, but there must be many people who remember the holes in the programmes of earlier days.

Tallulah Bankhead

Such gaps were always dreadful from my point of view because I had to make up some impromptu patter on the spur of the moment; gramophones and mechanical pianos were not always available. When we were giving an early operatic broadcast from Covent Garden, and an interval lasted twenty minutes longer than we had expected, one of my unlucky colleagues had to keep up a stream of words for twenty minutes!

Fun at Manchester

Those early days were well worth while, if only for the fun of the thing. When I was on duty at Manchester, shortly after that station opened, a singer failed to keep his engagement. L. du Garde Peach, the well-known humorist, had supplied the previous item, and so he and the Station Director were called into service. Between them they gave a splendid duet of "John Peel," although neither of them could sing!

It is a rare occurrence for a singer to forget her words, but this once ruined a broadcast made by Norah

(*Continued in third col. of next page*)

Changes in the Country

THE country has been rescued from its solitariness and obscurity. That is one of the miracles of radio. In these days the best concerts, the most eloquent speakers, the best plays, and the most world-renowned artists can be listened to in remote rural places, far away from the madding crowd.

The B.B.C., in conjunction with rural committees, intends bringing the villages still nearer the towns. More, there is a movement by which the village will be organised in its life and thought according to a programme agreed upon. There is only one argument against this new arrangement, and that is that the villages will lose their peculiarities in thought and custom. That, however, loses its value when the gains are taken into account.

Recently a new scheme for rural revival was set afoot by the Hertfordshire Rural Community Council and the B.B.C. A listening set is to be loaned to a series of villages in turn. Some of the villages will loan a set at the same time. They will install the set in the village hall in winter and on the village green in summer, according to the assembled gathering and the weather.

The villagers will then listen to a broadcast talk on some agricultural question, which talk will become the starting point for a debate and discussion. It is believed that this method will help the villagers to discover new ways and means of dealing with their common problems.

A much larger question is opened up, however. There are already more than 150 societies which receive their adult education by forming groups which listen-in to a lecture or talk which becomes a starting point for a discussion. The villages could easily follow suit.

Educational Improvement

From an educational standpoint it would be a vast improvement on the present system of evening and continuation classes, which are sparsely attended and poorly conducted.

A course of talks received could be an inspiration to the villagers, for they would know they were receiving the very best the leading thinkers of the country could give them. Moreover, the gulf in thought and psychological outlook that now exists between town and country could be easily bridged. E. B. R.

FOUND OUT!

(A Peep into the Future)

I hate to go on,
But you're late again, John!
Don't tell me it's due to your missing the train;
Now was it your watch,
Or a "soda and Scotch,"
Or were you detained at the office again?

No! Pause ere you try
To dissemble a lie,
I've something of import to show you, my pet;
Just look over there,
You may very well stare—
It's no less than a neat little "seeing-in" set!

To-night I switched on,
And I saw you there, John,
Disporting yourself at a dance at "The Bat,"
What makes it more shady,
I don't know the lady—
Now tell me, pray, what is the meaning of that!

C. P. P.

AWKWARD MOMENTS IN THE STUDIO!

(Continued from page 417)

Blaney. She started a song, got halfway through the chorus and then stopped.

"I'm sorry," she apologised, "I'll begin again."

She did so, but broke down a second time. Eventually, I had to come to the rescue and suggest she should sing something else.

I shall never forget the sense of humiliation I felt when I had to apologise for a break-down. It somehow seemed to reflect badly on me. To-day, owing to the duplication of parts, break-downs are rare. At one time, they were always liable to occur. Small animals, and even insects, were the bane of the engineer's life. A dead beetle falling on one of the wires would cause trouble.

Once, a moth settled on a condenser. The next day thousands of listeners complained of the tremendous "oscillation."

On another occasion, listeners—to say nothing of the whole of the studio staff—were startled by a loud drumming in loud-speakers and headphones. It proved to be a fly in the microphone. The tattoo had been caused as it moved about the sensitive instrument.

You will probably remember the stoppage caused by a mouse that got into the "works" and was electrocuted. I myself once almost caused a tragedy by wearing new shoes that squeaked as I walked towards the "mike."

The announcer's life is a harassing one. Can you wonder I eventually turned to other spheres, calmer if not quieter?

Pity the B.B.C.

THE B.B.C. is finding a snag in connection with what it shall and what it shall not "put over."

The trouble first arose during holiday time, when an enthusiastic holiday-maker, holidaying for the first time on the Continent, gave his views on Switzerland from the London station.

Well, during the following days the post-bag at Savoy Hill was added to by a number of letters condemning all broadcasts of this type. One correspondent was frank enough to say that no "advertisement" for foreign parts should ever be heard through British microphones! B. M.

Do You Know the "Z" Code?

ANY listener who is familiar with the Morse code can scarcely fail to appreciate the necessity for the use of abbreviations in wireless telegraphy. There are various stereotype questions, replies and remarks which have to be exchanged frequently between wireless operators while on duty, and it is obvious that a great deal of time would be wasted in handling messages if these queries, etc., were tapped out in full.

Avoiding Loss of Time

It is equally evident that such a loss of time could be avoided, and the desired meaning conveyed just as effectively, by using a series of recognised abbreviations.

To meet this need, various standardised abbreviations and signal codes have been devised, among them being the familiar "Q" code, which is, of course, quite well known to most amateurs who have a knowledge of Morse and the "Z" code.

The latter, as its name implies, consists of a series of three-letter abbreviations beginning with Z, and has very probably been a cause of mystification to a good many short-wave enthusiasts and others who happen to have tuned in the telegraphy transmissions from the various commercial high-power stations that handle long-distance traffic.

The "Z" code is a kind of unofficial language used by the operators at these stations to convey the remarks and queries incidental to their work.

Easy Abbreviations

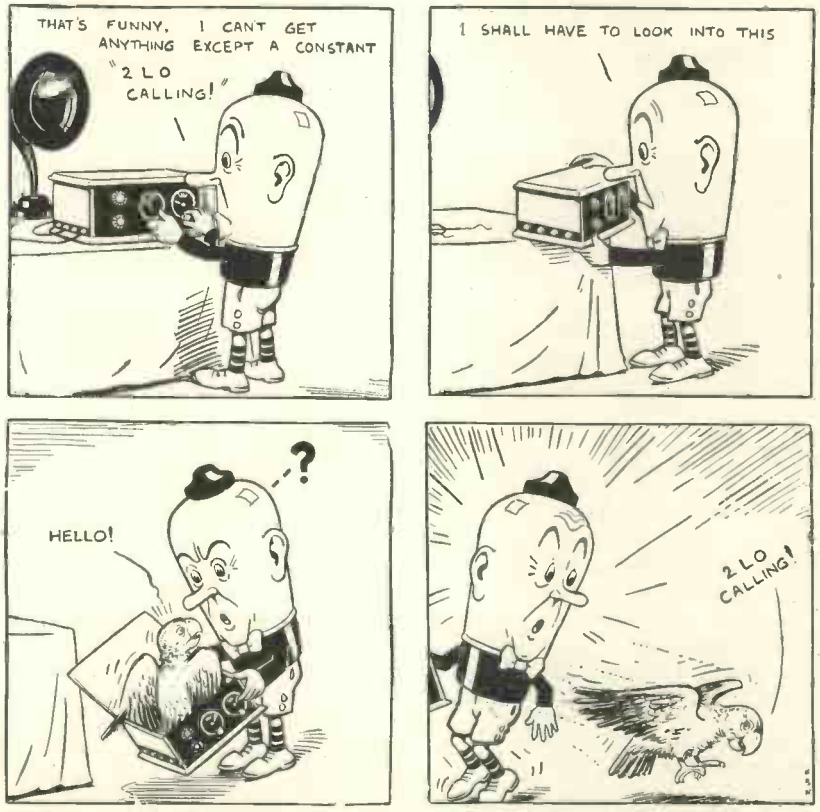
The abbreviations in this code cover a wide range of meanings, but are fairly easy to remember (owing to their logical composition) and perfectly simple—*when* they have been explained to you! But to the uninitiated they must appear enigmatic in the extreme. The two abbreviations that one seems to hear most frequently, perhaps, from the various commercial stations are ZAP, meaning "Acknowledge, please, the receipt of message," and ZHC, meaning "How are you receiving?"

There are numerous abbreviations covering strength of signals and conditions of reception. These include: ZFB, "Your signals are fading badly"; ZFS, "— fading slightly"; ZGS, "—getting stronger" ZGW, "— getting weaker"; ZSU, "— unreadable"; ZWR, "— weak, but readable"; ZPR, "— readable"; ZMR, "— moderately strong and readable"; ZSR, "— strong and readable"; ZVS, "— varying in strength"; and ZSB, "— blurred, not clear and sharp."

The inquiry "ZRO?" means "Are you receiving all right?" while ZOK replies "We are receiving O.K." or ZAN, "We can hear nothing."

Atmospheric disturbances are indicated by ZLS, "We are disturbed by a storm"; ZSH, "Strong atmospherics here"; and ZWC, "Crackling atmospherics here." Necessary instructions regarding transmission are covered by abbreviations such as ZCO, "Send by code each group once"; ZCT, "— each group twice"; ZMO, "Wait a moment"; ZCS, "Cease sending"; ZKQ, "Let us know when you are ready to recommence"; ZHS, "Send high-speed automatic . . . . w. p. m. (words per minute)"; ZPE, "Send everything in plain language"; ZSF, "Send faster"; ZSS, "Send slower," and so forth.

The Adventures of Alec Trode



There are, of course, other abbreviations in the "Z" code, but the foregoing will serve to indicate the lines on which they are constructed. As you will probably have noticed, the second and third letters in each group are generally suggested by the initial letters of the principal words in the interpretation, so that in most cases it is quite easy to guess the meanings of the abbreviations from these letters.

As the "Z" code is an unofficial one adopted by commercial-station operators for their own convenience, it is subject to alterations or additions from time to time if the need for them arises.

W. O.

The Original Loud-speaker

GERMANY recently celebrated the fortieth anniversary of the original loud-speaker, first demonstrated at Berlin on February 28, 1889. An engineer named Karl Frischen, for many years technical manager of the Siemens and Halske electrical works, seized the opportunity given to him by the fêtes in connection with the fiftieth anniversary of the Berlin Polytechnic Society to give an amazed public a demonstration of his new invention.

A Clever Technician

Frischen, a clever technician, proved himself an able lecturer and an excellent showman, inasmuch as in order to enhance the mystery he equipped the stage with a table, a piano, a trumpet, a washing machine, and a bady's cradle, the first of these only being used in the demonstration!

Following a few preliminary words, he bade the trumpet entertain the audience, an order carried out to the amazement of the spectators by the latter automatically playing a street song popular in those days. This was followed by other well-known melodies, no explanations being volunteered by the lecturer.

For his demonstration, Frischen had equipped the table with a loud telephone apparatus connected by hidden wires to a neighbouring room at the back of the stage, in which he had placed a musician of the philharmonic orchestra.

When Frischen died in 1890, he did not realise that the mechanical trick he had shown to his audience would later develop into an everyday accessory, almost indispensable to the radio equipment of the man in the street, some forty years later.

H. CLIFTON.

Station Powers That Puzzle

Difference in Ratings

READERS are frequently puzzled by the fact that whereas in one publication the power of a broadcasting station may be given as 10 kilowatts, in another it is stated to possess an aerial energy of 4 kilowatts only.

No Standard Adopted

For some considerable time no standard had been adopted for expressing the relative power developed by the transmitter, and for this reason, according to where the measurements were taken, there existed considerable discrepancy in the figures given for the individual stations.

With most Continental countries to-day, an agreement has been reached to express the power in standard terms, the measurement to be taken according to a formula established at a recent convention.

Generally speaking, it is well illustrated by the German studios, which in each instance take the power as that of the unmodulated direct electric current to the last valve. Based on this calculation, the actual aerial energy of the German transmitters works out as follows:—

High-power stations: Zeesen, 26 kilowatts; Langenberg, 13 kilowatts.

Main Stations: Berlin, Breslau, Frankfurt, Hamburg, Koenigsberg, Cologne, Leipzig, Munich, Stuttgart, 1.5 kilowatts.

Relays: Aachen, Augsburg, Bremen, Dresden, Freiburg, Hanover, Cassel, Kiel, 0.25 kilowatt; Danzig and Stettin, 0.5 kilowatt; Magdeburg and Flensburg, 0.5 kilowatt; Muenster, 0.4 kilowatt; Kaiserslautern, 1.5 kilowatts; Nurnberg, 2 kilowatts; Gleiwitz, 5 kilowatts.

Multiplied Threefold

The actual power measured at the anode of the last valve,—namely, unmodulated direct current,—is roughly three times these figures.

The above explanation will make clear to readers the reason for which, for example, the Gleiwitz relay transmissions are picked up at greater strength than the mother station, Breslau.

J. A. G.

Another Triumph for the 30-metre Wave

WHEN the American North Pole explorer and aviator, Commander Richard Byrd left the United States on an expedition to the South Pole some four months ago he took with him a crew of eighty men, two ice-breakers, two whalers, and four air- and sea-planes. The Antarctic base has been installed at Walfisch Bay, at the foot of the Ross Barrier,

Several Stations Installed

For the purpose of communication between base, airplanes, and store ships, as well as to maintain touch with the outside world, several wireless stations have been installed, and by means of the equipment possessed by the ice-breakers, the sailing ship *City of New York*, the steamer *Eleanor Bolling*, and the two whalers *Ross* and *Larsen*, Commander Byrd has been able to secure two-way communication with South America and New Zealand.

Experiments made in radio transmissions from one of the airplanes resulted in messages being picked up by station WHD, operated by the New York *Times*, and on January 24 and 25 Byrd, whilst at a height of three thousand feet above the Polar seas, was able to send messages through New York to the American Press.

34 Metres Most Favourable

Tests were made on various wavelengths, but 34 metres appeared to be the most favourable one, and communication on this wavelength was established with Mussel Rock, in the neighbourhood of San Francisco.

During the stay of the Byrd Expedition at the South Pole, a number of American wireless amateurs will attempt to get in communication with the explorer. For the information of readers, the calls and wavelengths adopted are as follows:—

Sailer *City of New York*, WFBT and WFA; three portable transmitters KFK and WF (50 watts), and WFE (7 watts). The *City of New York* will operate on various wavelengths—namely: 22.75, 26.55, 26.78, 34.05, 45. 59, 53.1, 53.57, 68.1, and 91.2 metres. In each case at the beginning and end of transmissions the wavelengths utilised will be definitely announced.

Antarctic Time is five hours in advance of New York Standard Time.

GRIDDA.

Wireless Magazine Gramo-Radio Section

A SPECIAL SUPPLEMENT FOR THOSE INTERESTED IN THE ELECTRICAL REPRODUCTION OF GRAMOPHONE RECORDS—THE FIRST OF ITS KIND TO BE PUBLISHED

Is It Worth While?

ALAS and alack, I am sometimes tempted to think that all the clever things which are written by the Technical Gramo-radio Brains of the WIRELESS MAGAZINE are just so much waste of energy. Forgive me, please, and let me continue.

The other day I went to a public hall wherein quite a super amateur-made electric gramophone was working. Some acquaintance of the proprietor had made it and, practically speaking, it was quite a good job.

Delighting the Heart

It was working from A.C. mains, had an electrically-driven turntable, a mass of volume controls, knobs and dohickeys, and *in toto* was just the thing to delight the heart of one well versed in the technicalities of gramo-radio.

But what a disappointment! The motor commutator must have been dirty or the driving mechanism clogged, for the turntable was running in jerks. Judging by the scratch, the scratch filter must have been out of adjustment or the pick-up needle had long overseen its normal period of life. Added to which a bias battery must have been run down, for the quality was positively awful.

Question of Volume

Another thing which annoyed me nearly as much, taking into account my own personal taste, was the fact that the volume was turned right down and the outfit was playing only *à demi jeu*. I, myself, like ample volume, and this is, of course, one of the advantages you can get from gramo-radio, because, given proper operating conditions, there is unlimited volume on tap.

To refrain from diverting from the original theme, I felt quite grieved at heart to see an admirable gramo-radio outfit so maltreated at the hands of a callous, unappreciative, non-technical ignoramus. A cheap portable gramophone would have served him just as well.

KENNETH ULLYETT

Portabilised Gramo-Radio

WHAT fun there will be when, probably next summer season, portable gramo-radio outfits are just as popular as are portable gramophone and portable radio outfits at present.

You know, just between ourselves, I had some harrowing experiences in the early days of portable wireless sets. I have, shall

IF YOU WANT A REALLY GOOD GRAMO-RADIO SET TURN TO THE DETAILS OF THE MUSIC PLAYER ON PAGE 427

we say, organised a car picnic at the riverside and anticipated a scene just as those which the artists portray on magazine covers during holiday-time.

Rarely has my dream come true. Either the bad suspension of the car has done its "devilist" to the valve filaments; or the acid has come out of the accumulator and mixed with the mayonnaise, or the thermos flask has leaked its contents over the high-tension battery, so that its potential is not high enough just when I want to work the wireless set.

I have had some fun with portable gramophones, too. Either the hamper has rested its inglorious weight on a batch of records; or baby broke the gramophone spring while nobody was looking; or the needles were lost, and subsequently found in awkward places!

As I said, what fun there will be when the joys of these two portable music-makers are combined! But let me not cast a damper on things. There is, above all these petti-fogging disadvantages, which seem inseparable from picnics (*my* picnics, at least), the great advantage that with gramo-radio one can have music, "canned" or otherwise, in unlimited quantity. Which is just what I shall want to make those magazine cover pictures come to life.

QUEUE.

In the Track of the Needle

THE kind of track I mean is not that exemplified by the lines of the carol, "*In my footsteps, good, my page, thread thou in them . . .*' What I do mean is the needle tracking, which should be accurate in order to prevent record wear.

Perhaps not everyone knows that in order to minimise wearing of the grooves the pick-up should follow a straight line direct from the circumference to the centre of the record. This is rarely given by an ordinary gramophone tone-arm which rotates about one point, and thus, as a pick-up can be made to give more accurate tracking, less record wear from this cause is one of the advantages of electrical reproduction.

Accurate Tracking

Many commercial pick-up arms are now available which give practically accurate tracking. One of them ensures absolute accuracy by arranging for the pick-up to slide along horizontal supports which themselves are fixed. One manufacturer of a pick-up arm of outwardly normal design advertises the fact that it works within 3 per cent. of accurate tracking.

B. EVERETT

H. T. BARNETT, M.I.E.E., Discusses This Month

SPEECH REPRODUCTION

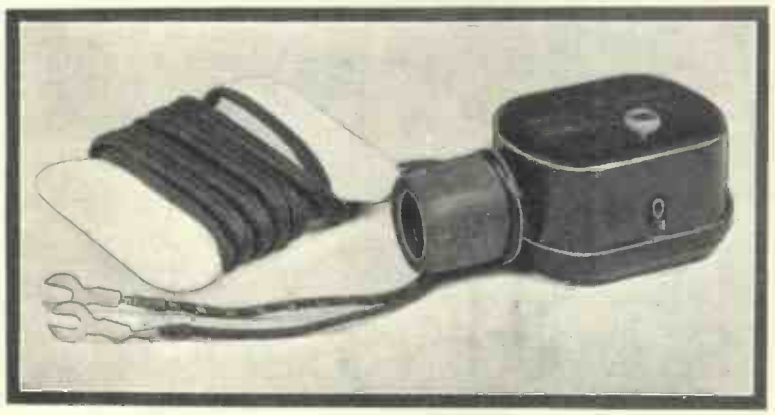
THROUGH YOUR GRAMO-RADIO OUTFIT

THERE are just a few of us who are more interested in reproducing records of speech than of music. The teaching of languages is probably the most important use to which such records can be put, and then, of course, there is the teaching of elocution, and lastly for the few but first for the many comes the reproduction of the large number of comedy-talks obtainable from the various record lists.

Learning Languages

For teaching languages the Linguaphone people have an immense series, all extremely useful. The elementary records have a certain charm of their own, but the advanced courses are really beautiful. Mr. Roston sent me the advanced French course and every record in it is a lesson in elocution as well as in French. The H.M.V. list contains some useful sets.

For English elocution one may choose records by notable speakers from nearly every list; many are excellent, but the majority of them teach what should *not* be done when speaking, either to an audience or to the microphone.



This is the Loewe pick-up, mentioned by the author

On the popular side there are thousands of amusing talks to select from and I find them most useful; they hold a mixed audience (particularly when many ladies are present) in a way music never can do—people's tastes in music are so varied.

Now the technical requirements for the reproduction of speech with the utmost possible clearness of every syllable are somewhat different from those necessary for perfect reproduction of music. In the latter case there must be great amplification of tone, particularly in the middle and at the bottom of the scale, but for the former great amplification of the musical tone in the vowels tends to cloak the sound of the non-musical consonants that form the very soul of word noises.

The explosive, the guttural, the nasal, the hissing noises that constitute speech consonants lie most of them at the top or over the top of the musical scale and in any cavernous lengthy or extended surface such as is essential for reproducing the bass of the scale they become in part absorbed.

Power Without Amplification

For reproducing language records for a big class, of course, we must have *power*, but this projection must *not* be obtained by the use of great amplification. A large cabinet gramophone or an R K. loud-speaker mounted on a large, thin baffle should both be avoided.

The best gramophone unit I can specify for the work would comprise the following parts: a sound-box having great power and with a stylus bar so rigid that no high vibrations shall be lost in it. The Limit (10s. 6d.), 17 Albion Street, N.1, fills this requirement.

The tone arm must be exceptionally clean internally, with its weight disposed in such manner and its points so made as to discourage blast and rattle; and it must be possible to set it for exceptionally good touch alignment so that there shall be no grinding noises.

Best Tone Arm

The Crescent (21s.), 76 City Road, E.C., is the best arm I have yet tried either for a sound-box or a pick-up.

The horn may be anything you please so long as it is not too large—do not exceed the size necessary for a large table machine and take care that all its bends are either gentle or are correct reflex angles and that its surface is smooth internally.

Of course, its neck diameter must be the same size as or but little larger than that of the bottom of the tone arm tube. Most of the big factors carry a stock of such horns; hundreds a day are turned out by the Limit Engineering Co., but I doubt if they sell single ones.

If you want a ready-made machine the best I know for the purpose, of table size, and reasonable in price, is the large Edison-Bell table machine (I forget the exact price), Glengall Road, S.E.15.

Good Portable Gramophone

A good portable is ample for the purpose when it is to be used in an ordinary room, and there is just the right thing on the Micro-Perophone list (76 City Road, E.C.) at £3 17s. 6d. (See page 424.)

For electrical reproduction we must choose a pick-up that will not blast or rattle. The only one of the ten I have tried that does not give the least trouble on any decent record (not necessarily a perfect record) and when using every kind

of needle is the Loewe, and it is the cheapest.

I am now using this pick-up for music in spite of the fact that a friend tells me "it has a cut off just below 100 cycles."

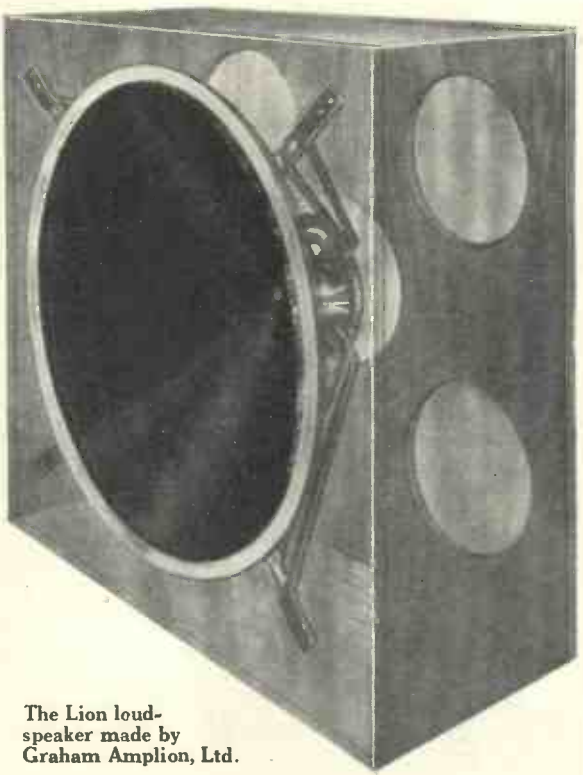
As a matter of fact, there is not much that gets on to even an organ record that *is* below 100 cycles; the deep fundamentals are suggested to us by the groups of harmonics or upper-partials they cause and which can be, and generally are, most adequately recorded.

Suitable Loud-speaker

The loud-speaker to be used, if of the horn type, must follow the rules for a gramophone horn. In a general way the worse it is for the bass of the scale and the drums the better it will be on the consonants in speech.

The cheap ship's ventilator type speakers are excellent and in many cases show the consonants even more clearly than they would be heard if the performers were in the room.

If a loud-speaker is wanted for a large class-room, I should advise using the big Lion entirely free from anything in the nature of a case or baffle; it is quite the cleanest working big speaker I know. Of course you must not use a scratch filter on the set, and an output transformer should be avoided.



The Lion loud-speaker made by Graham Amplion, Ltd.

Importance of Needles

The needle to be used is even of greater importance than for the reproduction of music. It must be a fine needle, in the first place, for the avoidance of surface noise and, secondly, because only a very fine point can follow perfectly the tiny sinuosities that represent on the record the hiss of the letter S.

It must be a rigid needle, otherwise the tiniest vibrations will never get up to the stylus bar.

Fortunately the best needles for showing instrumental characteristics are also the best needles for speech; these are the fine gauge steel grip needles, Sympathetic (2s. 6d. the set), Edison-Bell Ltd., Glengall Road, London, S.E.15, and Euphonic (2s. the set), Murdoch Trading Co., 59 Clerkenwell Road, London, E.C. Do not use a needle more than twice.

Here are some good records. *Gloucester's Soliloquy* from Henry VI and *Hamlet's Soliloquy* by John Barrymore (8s. 6d.), H.M.V. *Getting a Motor* and *Getting a Wife*, by Constance Collier and Ronald Squire (4s. 6d.), H.M.V. *Kate in the Call Box*, by Angela Baddely (4s. 6d.), H.M.V. *A Bedtime Story*, Wish Wynne (3s.), H.M.V. *Impersonation*, Anne Penn (3s.), H.M.V.

Four fine discs by Mabel Constanduros, Nos. 0246, 0205, 0210, 0271. Electron, 3s. each. *The Man in the Ditch.* An Edgar Wallace thriller (3s.), Columbia. *Two Black Crows*, parts 1, 2, and 3 (3s. each), Columbia. *Mrs. Buggins Makes a Xmas Pudding*, Mabel Constanduros (1s. 3d.), Broadcast. *Broadcasting the Nightingale* (2s.), Winner.

"If I Were Bass Deaf"

A reader's comments on the article that appeared under the above title in the April issue

SINCE you invite readers' opinions on the above, I suggest that we have here all the makings of a first-class radio controversy, fully up to the high standard set by our old favourite, Transformer *v.* R.C. coupling.

"Are note fundamentals necessary?" Mr. Barnett, approaching the subject from the gramophone standpoint and also as a power engineer, concludes that fundamentals are relatively unimportant, that most of the bass that we hear is "synthetic," made up from harmonics and harmonic groups and that if it were otherwise no power station would be habitable for ten minutes.

Since our ears were not provided as detectors of electrical vibrations as such, I think he has possibly overstressed the last factor, but the main trend of his arguments—that for "natural" reproduction a great deal can be done by imagination working with harmonics—is certainly sound.

Have we not had with us for years the type of parishioner who "hears" the pedal notes of organ transmissions on a set and loud-speaker (horn), which Noah—very sensibly—left behind when he came out of the Ark?

I think very few people realise how very few sets and loud-speakers—outside laboratory specimens—are capable of reproducing really low fundamentals *at all* under average working conditions.

For one thing, the *power* required to produce a note varies inversely with the square of the frequency or, more crudely, a 25-cycle note requires 100 times the power necessary for a 250-cycle note—work it out.

What hope has John Citizen got with an ordinary power valve, a 15-volt grid-bias battery and 100 volts on his anode? While if his valves will stand the grid-swing necessary, will his ear-drums stand the overall volume produced in average small living rooms?

No, sir, his hand will go to the volume control and the low fundamentals will go with it.

The really marvellous thing is that we can achieve even reasonably natural reproduction at all, considering all the possible sources of attenuation, distortion, resonance, phase interference, sound reflection, etc., present in any given set and its associated accessories and environment.

But at the same time I think there is a limit to the application of Mr. Barnett's theories. He appears to be an organ enthusiast. Now, to me, one of the delightful features of this instrument lies in those low-throbbing notes which are *felt* rather than *heard*. I do not suggest that this effect is impossible on the loud-speaker, but I have yet to experience it.

Does Mr. Barnett suggest it can be "synthethised"?

—G. W. PART (Woking)

A Record Record

By H. T. BARNETT, M.I.E.E.

MOST highly to be commended and deserving of all possible encouragement is the Vocalion Co. for recording a major work for issue at a minor price. In the April Broadcast list and in the 10 in. to 12 in. section, at 2s. a disc, will be found *Greig's Piano Concerto in A minor*, played by Maurice Cole and a symphony orchestra (recorded on three discs) at a total cost, for the whole work, of 6s.

As Long As a 12-inch Record

Of course, in common with all the Broadcast twelves, each side of each disc plays as long as a *long* 12 in. record of any other make.

So far as the performance goes, I like it as well as any I have heard. The orchestra is a good one and includes sufficiently prominent tympani. The placing of the microphone ensures an excellent balance between the piano and the orchestral tone volume.

The work is divided so that the breaks come at excellent points in the music. The recording is true to scale balance, and the engineer has given the piano a little extra brilliance of tone without in any way producing that suggestion of breaking glass bottles which bothers me a good deal in the case of another recording of this concert which I have and which cost me 18s.

Of course, at the present price of shellac one cannot expect a great deal of it in 2s. records, but surface noise in this record and other cheap records need be no bogy if you will use (as I do exclusively) fine gauge steel grip needles.

Building Your Own Gramophone

LAST month in the Gramo-Radio Section of the WIRELESS MAGAZINE we gave details of the construction of a gramophone from a kit of parts—a scheme which undoubtedly appeals to many of our readers who have as yet not interested themselves in the radio set's companion instrument, as the gramophone has proved itself to be.

In the original article it was stated that a Garrard double-spring motor is supplied with the Alestrian kit; this is wrong. The motor is a double-spring model made by "Collaro and His Famous Band of Engineers."

A few back copies of the WIRELESS MAGAZINE, describing this instrument, are available for 1s. 3d. each, post free.

A Good Portable Gramophone

This is the Micro-Perophone portable machine

(See the article by H. T. Barnett on the preceding pages)

Storing Your Records

WHAT a wealth of paper and cardboard is wasted in the sale of a gramophone record! Most dealers, when you hand them 3s., or 4s. 6d., as the case may be, waste at least twopence in (*a*) the normal paper container for the record, (*b*) an external paper bag with dinky little string handles and, (*c*) stray catalogues and pamphlets that seldom serve their desired purpose.

Shopping After Dark

It is the *a* and *b* in which most of us are interested, because although *b* can be used for shopping after dark, when the neighbours won't see, it is a nuisance to keep the records tidily in their paper bags.

I have overcome this difficulty myself by storing the records vertically on the shelves of the record cabinet, a fairly stout sheet of cardboard being placed between each record and the next.

I confess I have not yet taken the trouble to index the cards and to keep a file, which, of course, is the obvious thing to do, but "jazz," "serious," and so on are kept apart. It is only the matter of a few seconds to find any one record. The cards, of course, prevent the grooves of one record from scratching its neighbour.

Cutting Thumb Holes

Two things I shall do in leisure moments and which can be recommended to WIRELESS MAGAZINE readers are, first, to cut thumb holes in the cards so that any one record can easily be pulled out of a bundle, and, second, to attach midget projecting name tags.

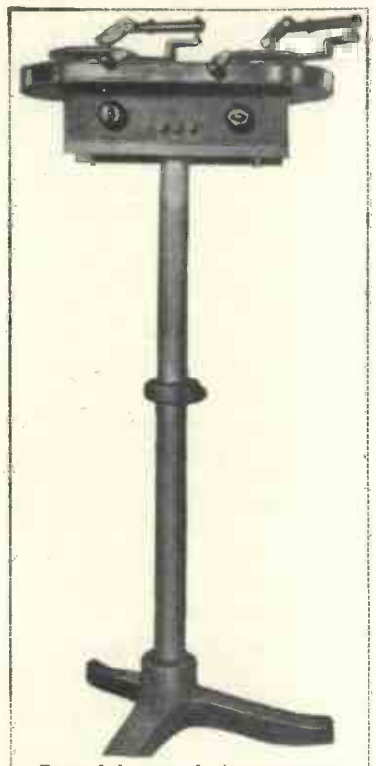
J. JACKSON.

Whatever you want to know about gramo-radio, consult the "Wireless Magazine" Technical Staff. For many months they have kept abreast of this latest development and can reply to any query that may be raised in connection with it.

If your pick-up does not give the results you think it should—if your amplifier is not quite distortionless—in fact, if you are in trouble of any sort, the Technical Staff can put you on the right track.

So that the staff is not absolutely overwhelmed with queries (and to avoid the trouble of answering any of a frivolous nature, which results from a free service) a nominal fee of 1s. is charged for every two questions asked.

Write your query or queries (not more than two can be answered for each reader) on one side of a sheet of paper and send it, together with a stamped addressed envelope, a postal order for 1s. and the coupon from page iii of the cover, to Gramo-Radio Queries, "Wireless Magazine," 58/61 Fetter Lane, E.C.4.

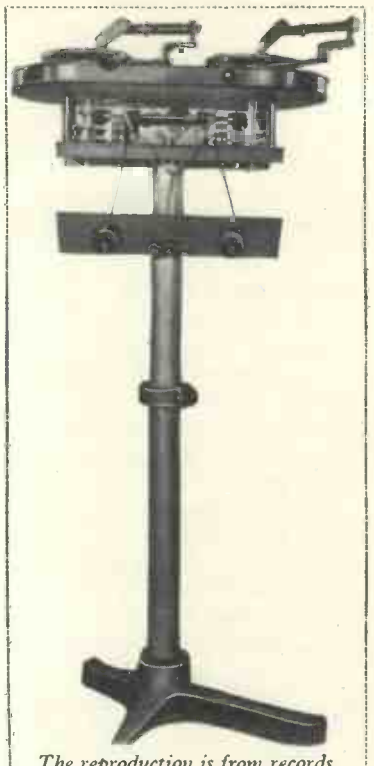


Part of the reproducing apparatus used in the British Phototone "talkie" system

THE TREK TO THE TALKIES

WHAT THE B.B.C. STAFF RESIGNATIONS MEAN

BY A SPECIAL "WIRELESS MAGAZINE" COMMISSIONER



The reproduction is from records. As one finishes the other starts, with complete continuity

THE recent resignations among the B.B.C. staff have attracted much attention for the special reason, we suppose, that for some long time the defection of any B.B.C. official was almost an unknown thing. What, then, accounts for the sudden rush after outside jobs?

Savoy Hill Undisturbed

Savoy Hill (writes a WIRELESS MAGAZINE Commissioner) remained undisturbed by the early secessions among its staff, the feeling of the authorities being that unless an official was loyal enough to stick to the ship without more or less inflated emoluments being necessary for the purchase of his fealty, the B.B.C. would be better off without him.

Further, if a job had to be filled owing to someone's resignation, quite a lot of people would be willing to fill it from outside; but on the other hand a number of resignations would do no harm, as it was not unlikely that after six years some redundant staff had been created.

Hence the withdrawal of certain junior members of the engineering staff did not result in any official expressions of regret.

The move towards an independent attitude was regarded a little more seriously when the senior officer in the lines section, Mr. Attkins, an old Post Office man, who had a good knowledge of the telephone service of the country, went over to the films, for he was one who would have to be replaced.

In other cases such a necessity had not arisen.

The departure of the former dramatic producer, Mr. R. E. Jeffrey, caused a minimum of consternation. For a long time this official had felt that he was not being given an unfettered hand in the directing of radio drama and that he was being subjected to criticism by officials outside his department.

The situation created by the appointment of Mr Val Gielgud as dramatic producer and the transfer of Mr. Jeffrey to a specially created post, that of Director of Dramatic Research, could not pass muster as promotion for R. E. J., and when he decided to throw in his lot with the "movie-talkies," it was a wise step.

A "Manufactured" Job

There was nothing further to hope for from Savoy Hill, where no steps were taken to appoint a successor for a job which had been "manufactured" for him with a flourish of trumpets a few months previously.

Thus the ideas-cum-research aspect of programme presentation reverted to Mr. L. de G. Sieveking, who straightway devised a "British National Programme," which purported to be given from the broadcasting station of a mythical Erewhonia; thereby making many thousands of listeners to weep, even though it may possibly have caused the gods to laugh.

Noises "Off"

Co-incident with the departure of Mr Jeffrey, one of his lieutenants, Mr. K. V. Wright, also made his exit. He had done his job of directing sound effects most conscientiously; but the development of talking pictures furnished an outlet for his energies on more advantageous terms than Savoy Hill could offer him to stay. For the same reason Mr. Mayer, the second in command of noises, relinquished his job and followed Mr. Wright's lead.

Some minor resignations ensued, and then a few weeks ago came, perhaps, the most important of the withdrawals that have yet taken place, namely, Captain A. G. D. West's.

Mr. West had provided a good share of the brains of the engineering department. In the early days of broadcasting he evinced a predilection for technical research by putting

The Trek to the Talkies (*Continued*)

up a transmitter on the roof of a public-house next door to the *Old Vic* in Waterloo Road, London, for the purpose of testing receivers installed at 2LO and the provincial stations.

Transatlantic Relays

He often sat up all night in the hope of receiving Transatlantic broadcasts of sufficient quality and strength to relay to British listeners. He contrived that ingenious broadcast of three years ago from a moving train between Potter's Bar and Hitchin, using the telegraph wires which bordered the permanent way as an aerial—the longest broadcast transmitting aerial in the world. He devised a wireless "pram," to enable Zoo noises to be conveyed to listeners in their own homes by means of a perambulating microphone.

Studio acoustics were also his especial province, his latest experiment in this connection being the provision of a small portable organ, consisting of a row of pipes of different frequencies, designed to give the purest sound output possible. The object was to measure acoustic characteristics in the studios and then to move the organ to outside halls from which broadcasts take place, to enable comparative measurements to be made.

Like most of his work, to which he believed in applying the motto "*festina lente*," Captain West took his time over the development of this device, and it was more than two years before it reached that state of perfection which warranted its practical use.

Outstanding Intellects

One of the outstanding intellects among the engineering staff, Captain West had, it was thought, resolved to devote his life's work to broadcasting, and it came as a surprise to many listeners to learn that he had decided to go over to the Gramophone Company.

How can these resignations be explained and have we seen the end of them? To the latter part of the question the answer is No; there will be several more voluntary departures yet.

As to the explanation, it may be safely hazarded that until the advent of talking-motion pictures, Savoy Hill held something of a monopoly in its staff. Apart from a handful of men specially trained in certain callings, the one body which counted for anything at all outside the B.B.C. were the engineers; and it was rumoured that so far as these were concerned, other likely avenues of activity, such as the radio manufacturing firms, were effectually closed against them. The "talkies" have thus proved to be an open sesame.

In defence of the Corporation, however, it should be pointed out that it is a mistake to compare the position of the B.B.C. with that of a commercial company in its relation to its staff. The business house, very often faced with keen competition, is forced into a species of bargaining for the services of men and women; not always because their services are altogether requisite to the greater efficiency of the concern, but because it is sometimes expedient to prevent an opposition house from securing an individual's services.

LOOK OUT NEXT MONTH FOR A SPECIAL ARTICLE ON "TALKIES" BY AN EX-MEMBER OF THE B.B.C. STAFF.

Further, high-salaried jobs in many business houses serve as valuable publicity to the firm, according to the standing, social or otherwise, of the individual to be engaged. It is not always a matter of value-for-value bartering, that is, the payment of cash for the assessed value of brains.

In the entertainment world, which is, perhaps, more closely aligned with broadcasting than any other interest, definite financial standards are applied. In the mercantile world also salaries are measured to some extent by the terms of service. Everywhere difficulty exists in introducing basic comparisons for application to broadcasting officials.

Not only was the B.B.C. called upon to dig the foundations of a new edifice back in 1922, but it had to fix entirely new standards in connection with employment. In very many cases, apart from all-round ability, it could not define the sort of previous experience which might prove an asset in the new sphere. The policy inclined rather to the engagement of the novitiate who could be trained—moulded would be, perhaps, a better word—to the work for which he was intended.

It is no exaggeration to say that more than 75 per cent. of the B.B.C. staff were paid for work which they had never previously performed, and whatever experience many might have gained with the B.B.C., would have had a cash value only to another broadcasting organisation. Those who were able to sell their services outside to a higher bidder might therefore be influenced by the economic necessities of the time to do the best they could for themselves. Such a step was not unforeseen.

Where the B.B.C. Scored

To this extent, then, there was no difference between the B.B.C. and the ordinary business concern. Where the B.B.C. probably scored was in the retention of a number of enthusiasts for broadcasting who would not easily be tempted away from Savoy Hill and who, with the passage of time, will become specialists in their jobs.

Outside concerns, it is said, are watching these developments and will probably extend their efforts to secure suitable talent from the B.B.C. Is the Corporation likely to combat these moves, or to adhere to an attitude of quiescence? It will almost certainly keep in mind the fact that it is not a profit-making concern, and as the guardian of the public's money, must beware of lavish expenditure on staff.

Future Reductions

It will also keep in view the reduction of effort which will automatically be called for when the regional transmitters replace the present widespread distribution of staff; for the time is coming when fewer people will be wanted to operate the machine.

From present indications, it appears that, unlike the ordinary business organisation, whose success generally spells expansion, the success of the B.B.C. must lead to compression and jobs will ultimately only be available for the pick of the brains now identified with the making of programmes.

THE MUSIC PLAYER

MUSIC AT ANY TIME FROM BROADCASTING OR GRAMO-RADIO

EVEN the most critical listener cannot fail to be pleased with the excellent performance of the four-valver illustrated in these pages. Very great care has been taken in its design by the WIRELESS MAGAZINE Technical Staff to get the maximum efficiency at every stage.

Music at Any Time

The Music Player is intended for those who want music at any time. Not only is it exceptionally efficient for the reception of broadcast stations, but the low-frequency amplifying stages also constitute a distortionless gramo-radio equipment for the electrical reproduction of records.

As a standard receiver for the reception of all the important European broadcasting stations and for gramo-radio work, the Music Player would be hard to beat; it incorporates every modern refinement and a superlative performance is assured.

New Dual-range Coils

Use is made of a new type of dual-range coils which give excellent results. An ordinary three-electrode valve is used for high-frequency amplification and this is neutralised on the split-primary principle. For maximum efficiency, grid bias is applied to the high-frequency amplifier. A rheostat is provided for the control of volume and for ease of neutralisation.

So that the best reproduction is assured, the detector valve is arranged on the anode-bend principle, a small dry battery being mounted inside the receiver for supplying the bias to this valve and also, the high-frequency amplifier.

Between the detector and the first low-frequency amplifier, resistance-capacity coupling is employed, the anode resistance in this case being only 100,000 ohms so that maximum purity can be obtained.

The detector is also provided with the usual "motor-boat" stopper or stabilising device, which consists of a high-resistance (in this case 20,000, 30,000 or 40,000 ohms) in series with the anode resistance and a 2-micro-farad condenser connected to the negative side of the filament.

Of special interest to the discriminating amateur are the following features of the Music Player:—

Straightforward four-valve circuit, with neutralised (three-electrode) high-frequency stage, anode-bend detector, resistance-coupled amplifier, and transformer-coupled power stage with choke output.

Dual-range coils controlled from the panel.

Milliammeter to indicate distortion.

Entire set switched on by movement of loud-speaker plug.

Insertion of pick-up jack switches off high-frequency valve and alters bias on "detector" valve for amplifying.

Two "motor-boat" stoppers are incorporated so that the set can be used without difficulty with mains-supply units.

For Mains Operation

These stoppers are essential in most cases if the set is to be run from a mains-supply unit, but they are also a great advantage when dry batteries are employed. Run-down batteries develop a high resistance which often causes motor-boating and general instability; the inclusion of stoppers in a set means that the batteries can be kept in use longer than would otherwise be the case.

In the case of the Music Player a stopper is also provided in the anode circuit of the first low-frequency amplifying valve as well as for the detector. Here it is in series with the primary of the low-frequency transformer.

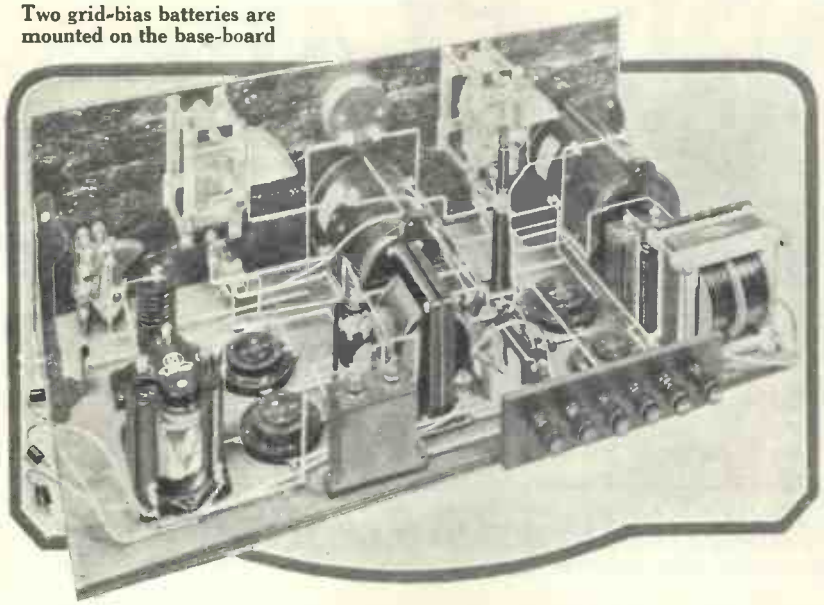
Choke Output Provided

A power valve taking a fairly heavy anode current will probably be used in the last stage, and for this reason choke output is provided. This device prevents the direct anode current from passing through the loud-speaker windings and causing them damage.

Special note should be made of the ingenious system of switching the Music Player. Two jacks are provided, one on the left of the panel

The Music Player (*Continued*)

Two grid-bias batteries are mounted on the base-board



Note the compact arrangement of the Music Player, an extraordinarily efficient four-valver that covers both wavelength ranges without coil changing

and one on the right. When the loud-speaker plug is pushed into the left-hand jack the whole set is switched on.

When the pick-up plug is inserted in the right-hand jack the high-frequency valve is automatically switched off and the pick-up connected in the grid circuit of the detector valve.

Altering the Grid-Bias

In this connection, it should also be noted that the plugging-in of the pick-up alters the grid-bias on the "detector" valve so that it actually amplifies instead of detects. Most valves need a bias of 1½ volts when used as a detector, but this is increased to 3 volts when the valve is needed as an amplifier.

It has already been mentioned that the high-frequency valve rheostat is used as a volume control; this is only available, of course, for broadcast reception, and if a volume control is desired for gramophone reproduction it must be provided externally. Many makers supply such controls with their pick-ups.

Utility of Milliammeter

There are some people who think that the inclusion of a milliammeter permanently in the anode circuit of the last valve is an unnecessary extravagance; that is a matter of opinion. But of the utility of such an arrangement there can be no doubt.

Only by careful watching of the milliammeter can absolutely distortionless reproduction be achieved, and those who really appreciate good music will be glad of the visible indication that the milliammeter gives when things are not quite right. Perhaps the milliammeter is even more important for record reproduction than it is for radio work—the strength of different records varies so considerably.

READ THE GRAMO-RADIO SECTION IN THIS ISSUE — IT WILL HELP YOU TO GET THE BEST RESULTS WHEN USING THE MUSIC PLAYER FOR GRAMOPHONE REPRODUCTION

When the reproduction is distortionless and the last valve is not being overloaded, the needle of the milliammeter will remain steady. This is because the valve is working on the straight part of its curve and the average value of anode current remains constant.

Should the valve be overloaded, however, the valve will not be working entirely on the straight part of its curve and consequently the average value of anode current will fluctuate and the needle of the instrument will flicker backwards and forwards to a considerable degree. When this occurs either the bias on the last valve must be re-adjusted or the input must be reduced.

Using a Volume Control

In the case of radio reception the high-frequency valve rheostat will be used, while in the case of gramophone reproduction the external volume control already recommended will be called into play.

However, if any reader definitely does not want to include the milliammeter and is willing to rely only on his aural susceptibilities to correct distortion, the instrument can be omitted without detracting from the appearance of the set.

Low-geared Slow-motion Dials

With a sensitive and selective receiver such as the Music Player is, the use of low-geared slow-motion dials is essential if the best performance is to be obtained. We attach much importance to the choice of reliable dials and condensers, and believe that the combination employed in this receiver is hard to beat.

As regards controls in general, their arrangement will be clear from the photograph that forms part of the heading to this article. The aerial (left) and high-frequency (right) tuning dials are in the centre of the panel.

Levers for Dual-range Coils

In a line across the bottom are the two levers to operate the internal switches of the dual-range coils and the knob of the reaction condenser, on the extreme right. The makers supply with their coils an indicating plate to be fastened on the panel to show the positions of the levers for long- and short-wave reception.

These we have omitted as, in order to accommodate the milliammeter on the panel, the coils have been

A Dual-range Four-valver of Fine Quality

arranged so that the levers are pivoted from the top, and not from the bottom, as the manufacturers evidently intended. This alteration, of course, in no way affects the efficiency of the coils.

No Need for Screening

While on the subject of coils, we may take this opportunity of discussing screening. Our experience of the particular coils used is that, spaced as far apart as they are in the Music Player, no screening is necessary. The original set is quite stable and no difficulty has been experienced in neutralising it.

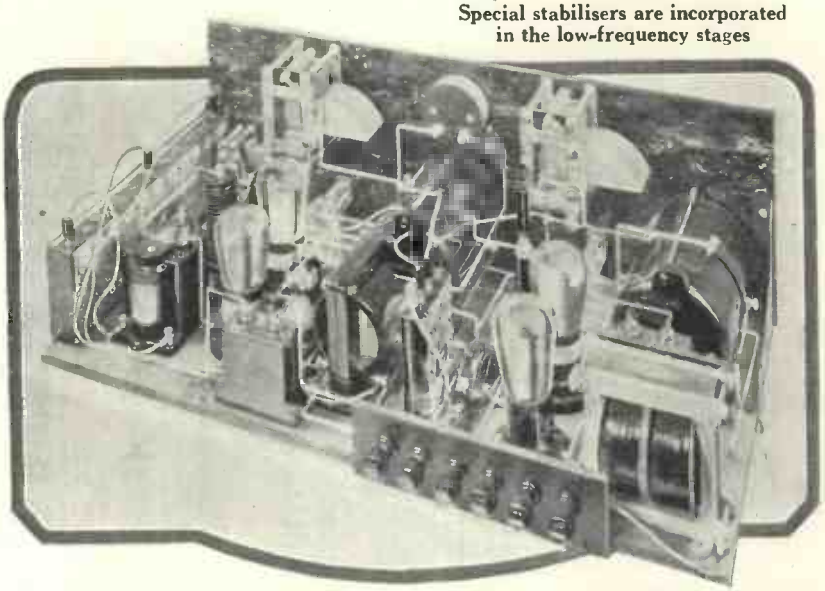
Any constructors who desire to, however, can insert a simple vertical screen between the two coils. This is a precaution, though, which does not seem to be necessary.

Positions of Jack Switches

Along the bottom edge of the panel are arranged the two switching jacks. That on the left accommodates the loud-speaker plug and switches the whole set; that on the right accommodates the pick-up and automatically switches off the high-frequency valve when the set is used for record reproduction.

From the foregoing remarks it will be evident to the reader that the Music Player is indeed what its name implies—a first-class source of musical entertainment at any hour of the day or night, either for broadcast reception or gramophone reproduction.

Special stabilisers are incorporated in the low-frequency stages



The dual-range coils used in the Music Player are of a new type, particularly efficient in performance

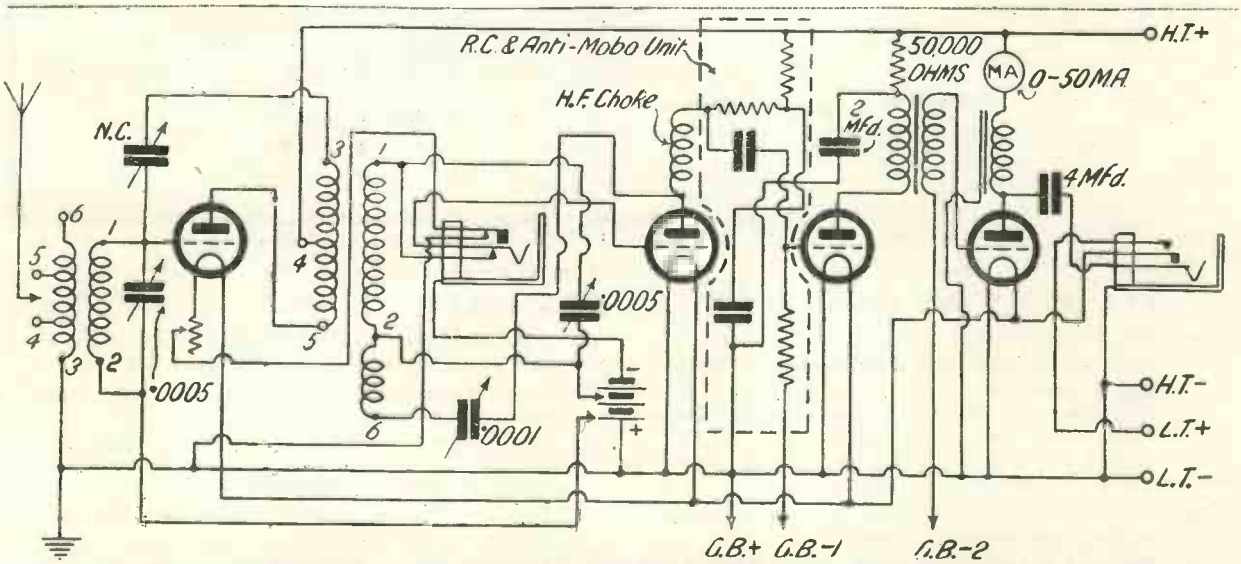
During quite a short test more than twenty stations were tuned-in at a distance of 16 miles north of London on only a 25-ft. aerial—and a corresponding length of wire laid across the lawn to act as an earth connection!

Although the set looks complicated to construct, because of its compact layout, little difficulty will be experienced if use is made of a full-size blueprint.

This shows the positions and sizes of all the holes to be drilled, the arrangement of the components, and the actual numerical order of wiring-up for the best results.

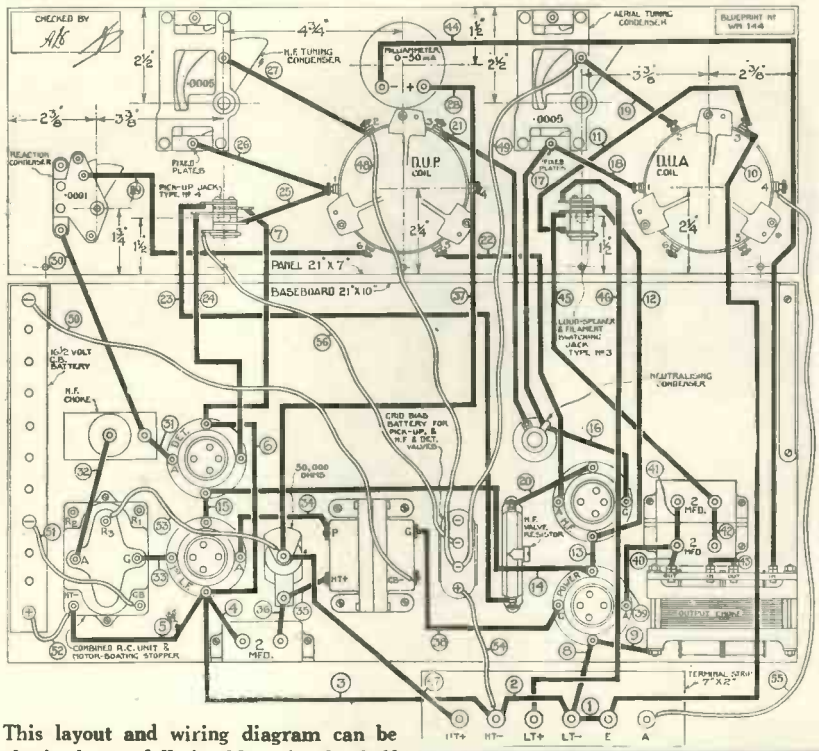
Blueprint for Half-price

The blueprint can be obtained for half-price (that is, 9d., post free), up to June 30, if the coupon on page iii of the cover accompanies the applica-



Here is the circuit of the Music Player. Note that bias is applied to the grids of both the high-frequency and detector valves. Jack switching is employed for the loud-speaker and pick-up

The Music Player (*Continued*)



This layout and wiring diagram can be obtained as a full-size blueprint for half price (that is, 9d., post free), if the coupon on page iii of the cover is used by June 30. Ask for No. WM144. Wire up in the order indicated

tion. After that date the full price of 1s. 6d. will be charged, although an extension of time is allowed in the case of overseas readers.

Address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4: and ask for No. WM144

Laying Out the Components

Little need be said about the actual laying out of the components. There should be no difficulty at all in this respect if full use is made of the photographs and blueprint (or the reduced reproduction of the latter shown alongside).

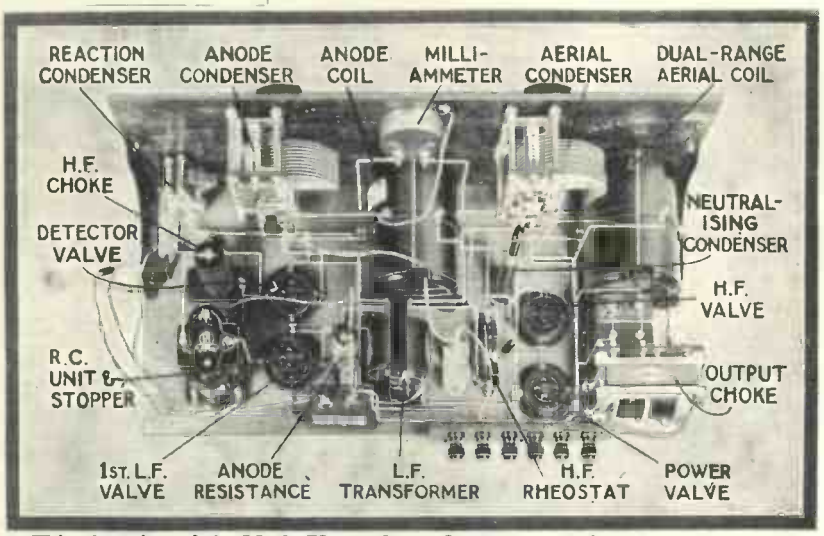
When everything has been screwed properly into position, wiring up can be undertaken. This, again, is comparatively simple if the blueprint is followed. Each wire is numbered separately and the connections should be made in the order indicated.

For instance, first connect up wire No. 1 and then mark that number through on the wiring diagram. Proceed in numerical order until the whole of the wiring has been completed.

Choice of Suitable Valves

Before the Music Player can be used, suitable valves must be obtained. The choice is a matter of some importance, for the use of the wrong types of valves will completely spoil the performance of even the best set.

The high-frequency valve should have an impedance between 20,000 and 30,000 ohms, whatever the filament voltage may be. A complete



This plan view of the Music Player shows clearly how all the parts are arranged

TEN REASONS WHY YOU SHOULD BUILD THE MUSIC PLAYER

- **The efficient neutralised high-frequency stage ensures reception of every important European station.**
- **With the use of the correct valves and the guidance of the milliammeter, distortionless reproduction is obtained from radio or gramophone records.**
- **There are only two tuning controls and the selectivity is of a very high order.**
- **Choke output is provided so that the loud-speaker windings are completely protected.**
- **There are no connections to alter when switching over from broadcasting to gramophone reproduction.**
- **A rheostat associated with the high-frequency valve acts as a volume control and simplifies neutralisation.**
- **The set is equally suitable for use with dry batteries or a mains unit for high tension.**
- **Excellent results can be obtained with an aerial as short as 25 ft., as many as twenty stations being tuned-in during the course of a short test.**
- **The construction is quite straightforward; there is no elaborate metal screening.**
- **All the components utilised are of the very best quality and excellent performance can be relied upon at all times.**

Sets a Standard for Radio or Gramophone Work

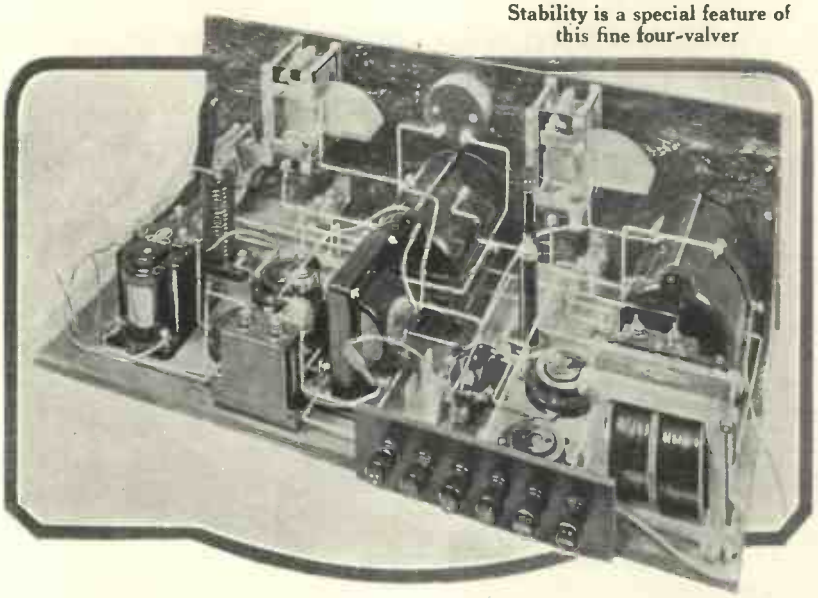
list of valves in order of impedance will be found on pages 402 and 404 of this issue. The actual impedance is not critical and almost any valve of the "H.F." type will do.

Impedance of Detector

The detector valve should have an impedance between about 30,000 and 50,000 ohms, more latitude being permissible here than in the case of the high-frequency valve. The lower the impedance of the detector valve the better will be the quality, but volume will fall off to some extent as valves with low impedances have low amplification factors.

The first low-frequency valve can be of the "L.F." or "first power" type, that is with an impedance between 6,000 and 25,000 ohms. Here, again, the lower the impedance the better the quality, but at the expense of volume.

Stability is a special feature of this fine four-valver



In the Music Player the three-electrode high-frequency is neutralised on the split-primary principle

Ample Volume Obtained

Do not suppose that the use of low impedance valves means that only weak signals will be received; the strength will be adequate for all normal purposes. With high-magnification valves, signals will be of enormous volume.

It is essential to use a really good power valve in the last stage, although the choice of a suitable type should not be undertaken without careful consideration of the source of the high tension to be used with the set.

If a large mains-supply unit (such as the Gecophone A.C. model, with which the Music Player has been tested) is available, then it does not matter how great is the consumption of the last valve, but in the case of dry batteries due consideration should be given to their maximum discharge rate.

However, for use with most modern cone loud-speakers (excellent results had been obtained with the Mullard type H) a valve with an impedance between 2,000 and 4,000 ohms will be about right.

Using six-volt valves, we have obtained good results with the following Ediswan valves: HF610, RC610, LF610, and PV625X. This is a combination that can be recommended, although some people may prefer to use a valve of lower impedance than the RC610 for the detector stage.

Operating the Music Player

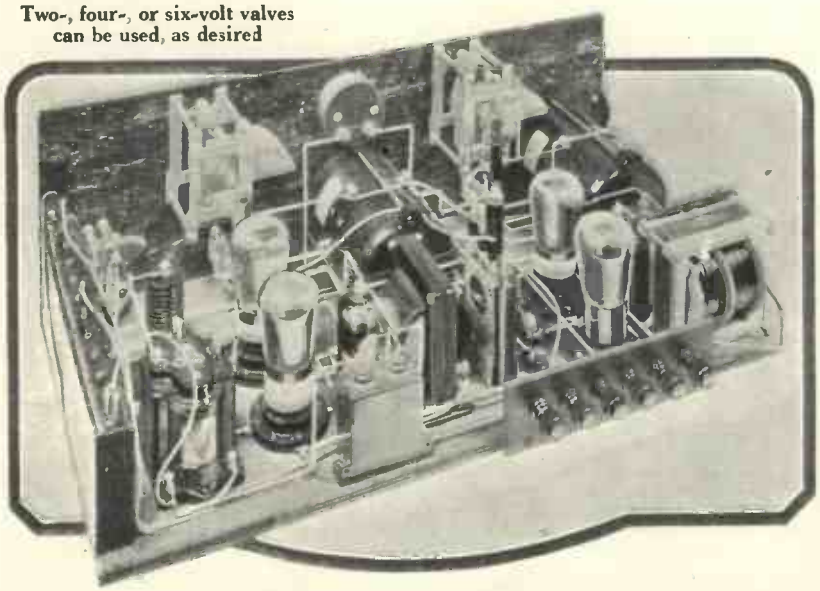
The actual operation of the set is not difficult. Insert the valves in their respective holders and adjust the grid-bias tappings. To the grids of both the high-frequency and detector valves a bias of 1½ volts negative should normally be applied, while the tap for changing the bias on the "detector" for gramophone work should be placed in the 3-volt socket.

The first low-frequency valve will need between 1½ and 4½ volts negative as a rule, while the tap for the power valve will be between 10½ and 16½ volts, with 120 volts high tension.

Use of External Bias Battery

Some power valves will need more than 16½ volts negative bias, in which case an external bias battery should be employed or an extra 16½ volt battery mounted on clips inside the cabinet.

Two-, four-, or six-volt valves can be used, as desired



Another view of the Music Player, in which two "motor-boat" stoppers are incorporated

The Music Player (Continued)

COMPONENTS REQUIRED FOR THE MUSIC PLAYER (FOUR-VALVER)

	s.	d.
1—Ebonite panel, 21 in. by 7 in. (Resiston, Parfait or Raymond)	9	3
2—.0005-microfarad variable condensers (Cyldon, Burndept or Ormond)	20	0
2—Slow-motion dials (Burndept, Ormond or Igranic)	12	0
2—Dual-range coils (Lewcos types DUA and DUP)	70	0
1—.0001-microfarad variable condenser (Cyldon Bébé, Peto-Scott or Bulgin)	5	0
1—0-50 panel-mounting milliammeter (Sifam)	25	0
1—Neutralising condenser (Gambrell, Jackson or Peto-Scott)	5	6
1—15-ohm baseboard rheostat (Burton, Lissen or Igranic)	2	9
1—Grid-bias battery clip (Bulgin)	0	6
1—Low-frequency transformer (Ferranti AF3, Brown or Gecophone)	25	0
1—50,000-ohm resistance with holder (R I. and Varley, Mullard or Dubilier)	5	6
1—Resistance-capacity coupling unit with motor-boat stopper (R.I. & Varley)	25	0
1—High-frequency choke (Lewcos, Wearite or Ready Radio)	9	6
1—Output choke (Parmeko type No. 2, Ferranti or Marconiphone)	25	0
4—Antimicrophonic valve holders (Lotus, Igranic or W.B.)	3	0
3—2-microfarad fixed condensers (T.C.C., Mullard or Dubilier)	11	6
1—Pair panel brackets, one with battery clip (Ready Radio)	2	6
1—Terminal strip, 7 in. by 2 in.		6
6—Terminals, marked: Aerial, Earth, H.T.+, H.T.−, L.T.+, L.T.− (Belling-Lee or Eelex)	3	0
2—Jacks with plugs (Ormond types No. 4 and No. 3)	10	0
6—Wander plugs, 2 red and 4 black (Lectro Linx, Belling-Lee or Igranic)	1	0
1—4½-volt tapped dry battery (Siemens type G1 or Ever Ready)	1	3
1—16½-volt tapped dry battery (Siemens type G3 or Ever Ready)	3	6
Stiff wire for wiring (Glazite)	2	6
Length of rubber-covered flex		4
1—Cabinet with 10 in. baseboard (Pickett)	35	0
Total Cost of Set (approximately)	**£15**	**14** **1**

The 120 volts high tension should be the voltage on load. This is important in the case of a mains-supply unit, where a tapping labelled "120 volts" may give only 100 or less with a 15-milliampere load. A Ferranti valve tester is a good investment for the keen amateur, as with its use he is then no longer working in the dark.

Switching the Set On

When the various voltages have been approximately adjusted and the rheostat controlling the high-frequency valve switched on, the loud-speaker plug should be inserted in the left-hand jack. This switches the whole set on.

Now adjust the wave-range levers on the panel for the range desired. For wavelengths between 250 and 550 metres they should be put to the right; turning them to the left, the set will be adjusted for reception on the band between 1,000 and 2,000 metres.

Get the Local Station First

To begin with it is best to tune to the local station, so adjust the range switch accordingly. Next turn the reaction control until the set just starts to oscillate; this occurs when a rustling or hissing sound is heard from the loud-speaker.

Now turn the two main tuning dials in unison until the station is picked up. The dial readings are approximately the same over the entire wavelength bands. The differences can be seen from the following readings:—

	Aerial H.F. Condenser	
Daventry, 5GB	83	80
London	56 5	57
Toulouse	65.5	63
Gleiwitz	47	45
Radio Lyons	38	36
Kaiserlauten	31.5	28
Huizen	75	73.5
Radio Paris	70.5	67.5
Daventy 5XX	62	57

When the station is picked up tune it in as loudly as possible. Then turn off the high-frequency valve by means of the baseboard rheostat and adjust the neutralising condenser until the signal becomes inaudible. The set will then be balanced.

For gramophone reproduction, simply plug the pick-up into the right-hand jack, leaving the loud-speaker plug in position until it is desired to switch off completely.

Use with H.T. Mains

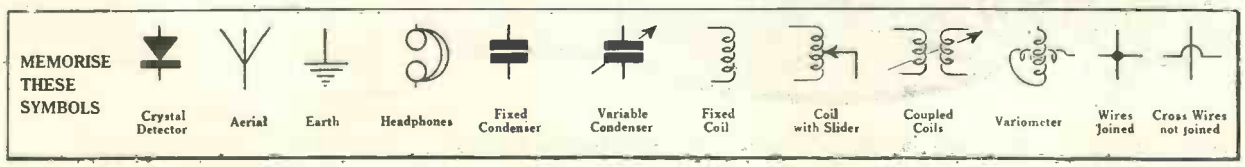
Those who use the set with a mains unit for high-tension supply will be interested in a few remarks on "motor-boating." Mains and units used on them vary so much that it is never possible to tell quite what will happen.

For instance, in the WIRELESS MAGAZINE offices, where direct-current mains are in use, no trouble at all was experienced even when low values of decoupling resistance were employed.

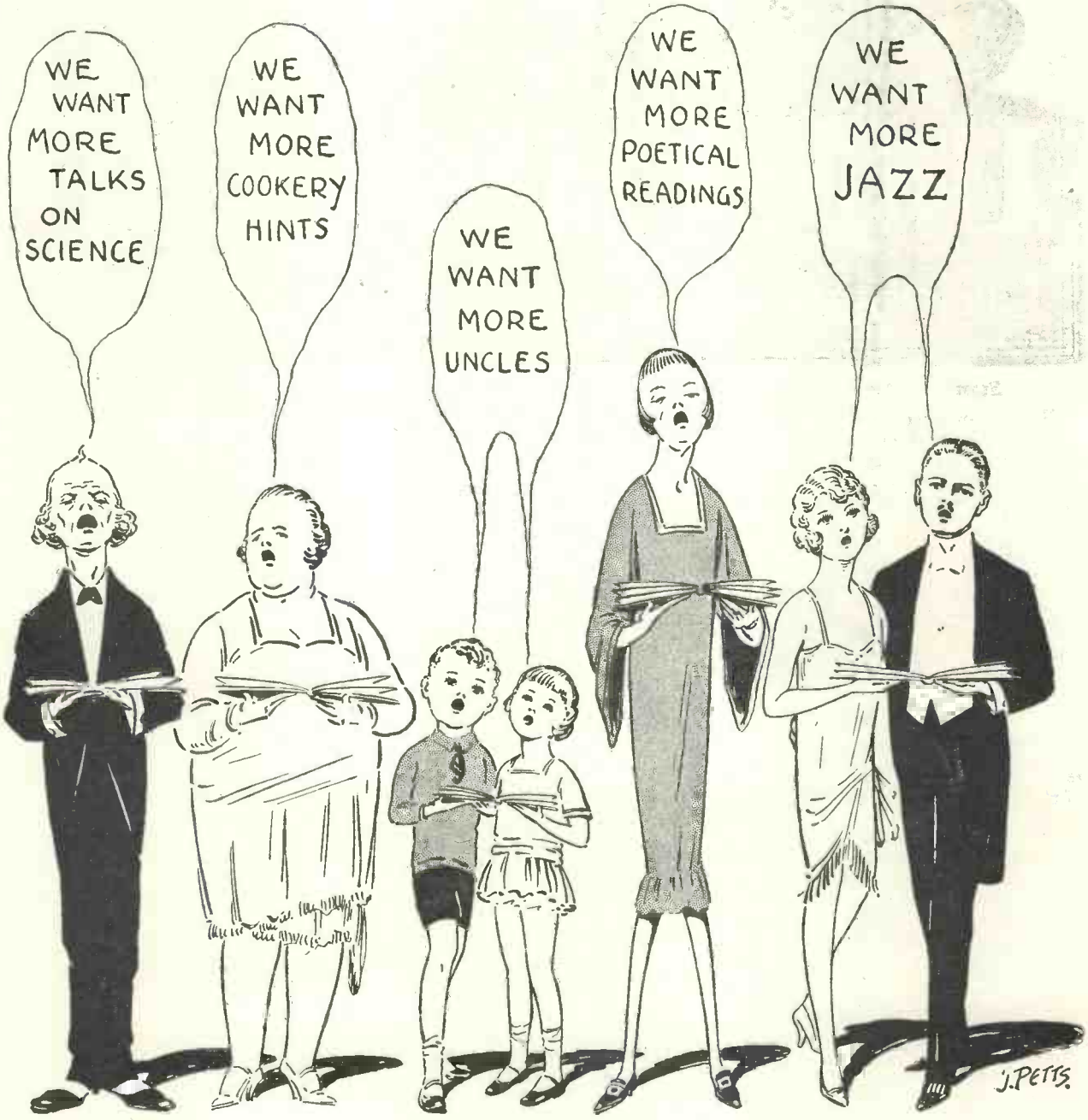
On A.C. Mains

On the other hand, on alternating-current mains in a town north of London it was found necessary to use the R3 tap on the resistance-coupling unit in the detector circuit and a 50,000-ohm resistance in the anode circuit of the first low-frequency amplifier.

If motor-boating is experienced with their values, increase the capacity of the stopper condensers to 4 microfarads



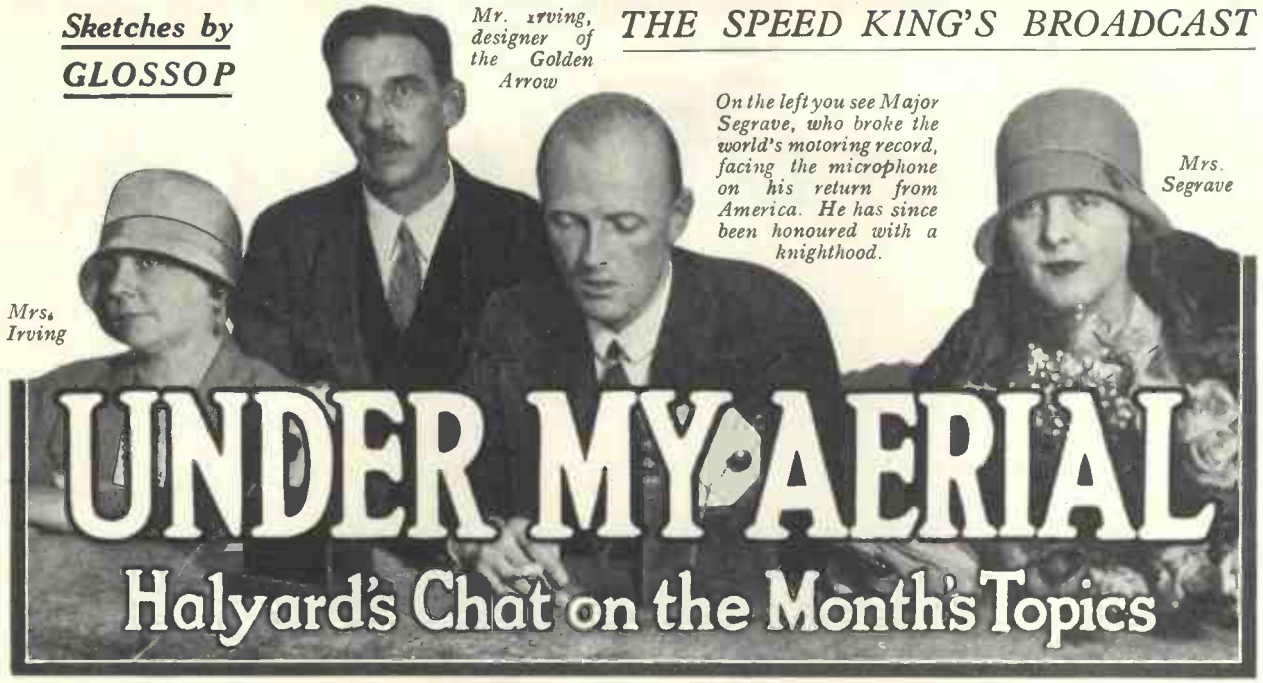
MINOR OSCILLATIONS



BY THE UNOFFICIAL WIRELESS CHORUS!

Sketches by GLOSSOP

THE SPEED KING'S BROADCAST



Mr. Irving, designer of the Golden Arrow

On the left you see Major Segrave, who broke the world's motoring record, facing the microphone on his return from America. He has since been honoured with a knighthood.

Mrs. Segrave

Mrs. Irving

UNDER MY AERIAL

Halyard's Chat on the Month's Topics

Summer Records

HAVE you ever thought of keeping a record of the effects of summer on your wireless reception? Such a record would perhaps not be of any great value if taken for one

The Effects of Summer

year only, but records taken for a few consecutive summers would be of the greatest interest and comparative value.

I have often wondered why one of our wireless societies, or some scientific society interested in wireless, has not enlisted the services of a number of wireless listeners, well distributed over these islands, to take careful observations of summer effects on wireless reception. Such an investigation would lead to valuable conclusions undoubtedly.

For example, it might be possible to find out in this way the change in the screening effect of a tree on an aerial as the tree breaks out into its full summer foliage. It might also be possible to estimate the effect on an aerial of bushes and plants growing directly under that aerial.

Another problem which would lend itself well to observation by listeners is the problem of atmospherics and the effect of atmospherics on different wavelengths. Perhaps the most interesting problem of all would be the effect of advancing summer on distant reception.

You will see from this little list of summer wireless problems that there is any amount of work to be done in summer, and, if you kept a summer record of wireless reception, the chances are that that record would be distinctly useful sometime sooner or later.

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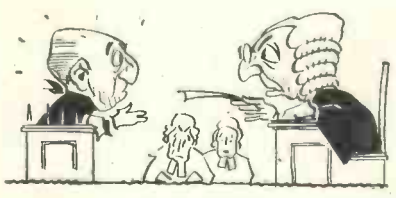
Trying Times

"Bad news to-night," said George as he sat down in the vacant deck-chair in my garden shelter. "One of my wireless neighbours threatens to give up wireless altogether."

"I am sorry to hear that, George. I never like to hear of anybody giving up wireless. What is the reason in this case?"

"Obstruction and lack of encouragement in the home. The poor fellow has only one possible place where he can do his soldering and that is in the kitchen between the fire and the general-purpose cupboard. Just as he has got his soldering bit nice and hot and is about to solder a tricky joint,



Trying Times

somebody wants a cup out of the cupboard and he has to move out of the way.

"Next time he gets his bit hot somebody else wants the sugar basin, next time the pickles, and so it goes on. The poor fellow takes as much as three months to wire up a set."

"How very trying for him. Still, I don't see why he should give up wireless on that account."

"Perhaps not, but he happens to be a very progressive home constructor and it takes him so long to make a set that the whole thing is out of fashion before he finishes it, and so he can never catch up, so to speak."

"Why doesn't he move the cupboard?"

"I suggested that, but he says it isn't his cupboard and it is something that he is allowed to solder in the kitchen at all."

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Television the Alternative?

Perhaps the most interesting speculation with regard to television at the moment is the ultimate effect of television on the twin-wave stations of the new regional scheme. As far as our present limited knowledge goes, it seems clear that a demonstration of television would not be very attractive unless it were accompanied by the simultaneous broadcasting of speech on a different wavelength.

Thus television, in its present stage of development, demands two wavelengths and two transmitters for a

successful transmission. Moreover, it seems likely that television, as it develops, will continue to demand the two wavelengths and the two transmitters.

The Ultimate Effect

You will remember that the P.M.G., in his now famous letter to the Baird Television Company, gave that company what amounted almost to an invitation to employ the B.B.C.'s twin-wave station at Brookman's Park for television experiments outside the usual hours of broadcasting services.

Can the Baird system of television be carried out at Brookman's Park without a considerable amount of addition to and alteration to the ordinary transmitting plant of that station? It will be rather a loss if one of the two transmitters be definitely marked off for television experiments and we lose the alternative programme for which we have waited so long and so patiently.

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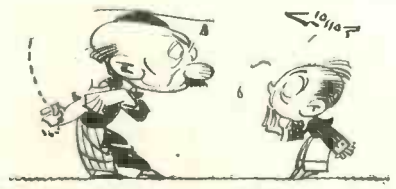
The Wireless Play

What do you think of the B.B.C.'s present policy of suppressing the names of the players who take part in broadcast plays? Do you find yourself better able to concentrate



You Know Absolutely Nothing

on the character presented because you know absolutely nothing of the speaker, not even his name?

There may be something in the theory behind this new wireless play policy of the B.B.C., but I, for one, have begun to wonder if the scheme will work out in practice as it is expected to work out.

If you are anything of a theatre-goer, you will know that it is possible for either the player or the playwright to win your favour. If you are a picture-goer, you will know that the film actor alone has the opportunity of gaining your approval, the scenario writer being almost unknown. Under the new B.B.C. policy, things will again be different.

The players will remain unknown, and it will be the playwright alone who will have the opportunity of making a name with you.

Under conditions then which are so very different from the conditions which obtain in the other and older methods of presenting plays, it is difficult to foretell what will happen. Certainly, the writer of wireless plays now has a unique chance of winning fame and fortune. Let us hope he will make the best of his opportunity.

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Simultaneous Reception

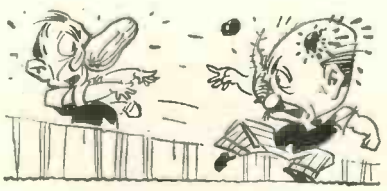
Has someone been indulging in a little gentle leg-pulling, or is the story of our south-coast listeners' latest efforts in home-construction correct? Perhaps some of our southern readers can enlighten me.

The story is that, driven to desperation by their inability to cope with interference from Continental broadcasting stations and spark stations, our listeners on the south coast have abandoned their search for selectivity and are now making sets of maximum unselectivity.

Their determination is that, as they cannot boast of sets which will receive one station and only one station at one and the same time, they will boast of sets which will receive the largest possible number of stations at one and the same time. In other words, they are building simultaneous receivers on the south coast.

The idea of an unselective receiver takes one back to the early days of wireless. I think I could find in my junk room an old receiver the tuning of which would be broad enough to break records on the south coast.

The most unselective set that I ever heard of, however, was made by a wireless friend of mine some little time ago. The set had three huge cylindrical coils, each with twenty tappings. On the panel there were three selector switches, one for each coil, each switch rotating over twenty contact studs connected to the coil tappings. Was the set selective? Well, scarcely. 5XX followed you round the whole of the tappings.



Simultaneous Reception

Good Travellers

From your experience of portable sets, which valves can you recommend to me as good travellers? The reason I ask the question is this: During the last month I have had a curious experience of valves in transit and I am not sure of its significance.

At the beginning of the month I had a new type of portable set brought to my house for test. The wireless engineer who brought the set travelled over fifty miles by train. He kept the set with him the whole journey and he took every possible care of it. When we tried the set we could get nothing from it, and we ultimately found that one of the valves had gone.

Good Travellers

There were three types of valve in the set, H.F., L.F. or detector, power, The valve which had been damaged in transit was one of the first type, H.F.

Towards the end of the month, I had a new portable set sent to me by rail. The set made a journey of something over fifty miles by passenger train. When I tested this set, I found that one of the valves had gone, and again it was a valve of the H.F. type.

Rather a coincidence, wasn't it, that the broken valve in each case was of the same type? Now I am not going to conclude from these two instances that the H.F. type of valve is a bad traveller. Far from it, but I should be very glad to know which valves, in your experience, have proved to be good travellers.

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A Campaign

It still remains the fashion in certain quarters to do nothing but abuse the B.B.C. programmes. Don't you think that those who indulge in this particular form of abuse so tirelessly and tiresomely ought to be made to realise that one good suggestion would be worth a whole bookful of adverse criticism?

Shouting out for better programmes is such an easy thing to do, but when it comes to the question of how to make those programmes better, the

Under My Aerial (Continued)

shouters become as silent as the rest of us.

What we ought to do to counteract the damping effect of this adverse criticism is to start a campaign for the praise of the B.B.C. programmes. There must be well over ten million satisfied listeners in these islands.

It Still Remain.

Suppose each one of us were to send a postcard to Savoy Hill at the end of the month stating which particular item of the month's programmes had pleased us the most, what valuable information it would be! The B.B.C. programme staff would scarcely know how to contain themselves with delight at such a collective expression of our views.

No. I would not suggest that we should also tell the B.B.C. what we disliked the most. I have always had the idea that the B.B.C. need to be told what we like and not what we do not like.

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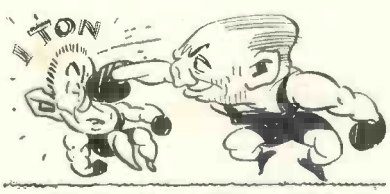
Battery Weight

How much of the weight of a portable set is due to the batteries? Have a guess at the answer. A tenth, a fifth, a quarter, or what fraction?

I have been carrying a portable set about with me a good deal lately and my curiosity has been aroused on the question of its weight. I actually weighed the high-tension battery and the accumulator in order to answer the above query.



Battery Weight

In my portable set, the high-tension battery weighs seven pounds, the accumulator three and a half pounds. The total battery weight is therefore, ten and a half pounds. As the whole set weighs thirty pounds, the fraction of battery weight to total weight is as near as makes no difference to one-third.

Would you have thought it, one-third of the weight of a portable set due to the weight of the batteries? When you think of the lead plates of the accumulator and the carbon, manganese dioxide and pitch of the high-tension battery, you are perhaps not so surprised.

Anyhow, I have been thinking what a huge fortune there would be for the man who could invent a light accumulator and a light high-tension battery. Surely light batteries would be one of the biggest boons to us.

◆ ◆ ◆

Your Own Wavelength

I suppose if I were to ask you your size in hats, gloves, collars or boots, you would be able to tell me immediately. I wonder, though, if you could tell me your size in wavelengths just as quickly.

You know, of course, that the human body can be used as an aerial. Probably you have tried reception on your own receiving set with a finger on the aerial terminal, yourself being the aerial. You may also have tried a "human chain" aerial formed by a number of people holding hands "in series," the person at the "lead-in" end of the chain making contact with the aerial terminal of the set.

Do you know, though, how to calculate the natural wavelength of your own or somebody else's body? According to an American writer, the calculation is a simple one. All you have to do is to multiply the height of the person under discussion by three, and divide the result by

Making Contact

five. The answer gives you the natural wavelength of the person in metres.

Thus, if you are a big fellow of 6 ft. your wavelength would be six times three, eighteen, divide by five, three and three-fifth metres. Should you be an exact 5 ft. in height, your natural wavelength would be an exact three metres.

George says this natural wavelength formula requires a correction according to the degree of stoutness. He says that wavelength depends on inductance and capacity and that, although a fat man and a thin man of the same height may have the same inductance, the stout man would undoubtedly have the greater capacity.

HALYARD.

Radio Lamp Lighting

A Novel Method of Switching by Changing Frequency

ORDINARILY street electric lamps are turned on and off in groups, by men throwing switches in scattered control stations in various parts of the community. Those control stations are expensive to maintain.

To replace the men and stations the Westinghouse Co. in America developed a radio device, which Boston Edison Co. recently began to use on a circuit of seventy street lights. The device utilises the fact that an electric wire can carry several currents of different frequencies.

There are the carrier current and the riding currents. In the base of each of the seventy Boston lamp-posts now is a small radio receiving set. When a special generation at the central station sends waves of 720 cycles a second along the light wires, the receiver moves a switch which connects the individual lamp with the lighting circuit; when the frequency is 480 cycles, the receiver pulls a switch that disconnects the lamp. All lamps in a particular circuit go on and off at the same instant.

For another group of lamps another pair of frequencies would operate the circuit; and so on. The great advantage is that a few men in a central station could handle all of a city's lighting.

F. P.

ON THE ROAD with the WAYFARER!

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

Tea-time music at Tintagel on the Wayfarer, a five-valve portable super-het

I HAVE come to the conclusion that I am a crank because I take a wireless set with me on holiday. I seem to be regarded as an object of curiosity by people who pass us picnicking by the roadside, while if one ventures to produce the set at an hotel in the evening in order to listen to the news or to the programme, one feels rather like the funny little man in Ridgewell's drawings in *Punch*, who inevitably finds himself blushing to the roots of his hair and in a state of terrible confusion.

The fact remains that, having built a portable set, I, at any rate, feel very interested in finding out what it will do in remote parts of the country; therefore, having decided to take a journey to Cornwall for Easter, I took the Wayfarer with me and brought it forth at various places *en route* in order to ascertain what the performance was like when one really got away from the local conditions which prevail around London.

A Wireless Widow?

My good lady raised her hands in resignation on learning of my decision; I suppose she felt that wireless morning, noon, and night was sufficient and that one might, at any rate, have a little relief on holiday.

I am glad to be able to state that before we had gone very far we were playing the other side of the record; in fact, I believe before the end of the tour she positively enjoyed having it with us, and I feel sure that one of the contributory factors was that the receiver always delivered the goods, no matter where we were, and it was always a matter of a few moments only to receive the Daventry programme.

Full constructional details of the Wayfarer—a five-valve portable super-het which can be built for £15—were given in the previous issue of "Wireless Magazine." Back copies can be obtained for 1s. 3d. each, post free. Full-size blueprints are available for 1s. 6d. each, post free. (Ask for No. WM139.)

After nightfall quite a number of other programmes were received, and altogether the set was on its best behaviour.

We took our time over the journey down, halting the first night at Highbridge, in Somerset. Here we obtained quite a surprising number of stations—Radio Paris, 5XX, and Hilversum came in strongly on the long waves. Bournemouth, Cardiff, Radio Toulouse, Langenberg, 5GB, and several other unidentified stations were picked up on the short waves.

A Distinct Advance

I have on other occasions taken other portable sets down to this district, and the present one represented a distinct advance on anything previously used.

The next day we wandered, via the north coast of Devon, over Porlock and Lynton, on to Bideford. One of the photographs accompanying this article shows us having a picnic on the top of Porlock, what time the set provided us with aural entertainment.

Incidentally, the first photograph was taken in the Savernake Forest, just before Marlborough, where we stopped for a few moments and where, indeed, I was surprised to find that London could just be received in daylight, although the distance is some eighty odd miles.

At Bideford, 5GB and 5XX could be received without difficulty, while after dark I also received a station at good strength which, so far as I could gather, was Plymouth. As this was fifty miles away, and as the

On the Road with the Wayfarer! (Continued)

power of Plymouth is only 200 watts, this struck me as quite good reception.

The next day we continued our progress down the north coast, touching at Boscastle and Tintagel, at which latter place we had lunch. This was again of the picnic variety, and the third photograph shows the set again in commission.

On the top of Porlock—lunch improved by the Wayfarer

From Another World

It will be noticed that in this particular instance it was found preferable to keep the frame aerial in its closed position, although in the other two photographs the aerial is shown partly open and in its correct orientation. Daventry was quite comfortably audible in the open air and the lunch-time programme from a London hotel seemed to us almost to be coming from another world.

The journey was continued to Perranporth, just beyond Newquay, where an extraordinary selection of stations was obtainable. 5XX, curiously enough, was rather poor, as he was liable to fade after dark, although the reception in daylight was not too bad. Radio Paris and Hilversum were both good, while on the short waves 5GB, Langenberg, and Radio Toulouse were all excellent.

Land's End and the Lizard

The next few days were spent in wandering down to Land's End and the Lizard, and generally testing the set, preferably during daylight at all sorts of points. Generally speaking, it was found possible to receive Daventry under all circumstances and Radio Paris could also be received during daylight hours.

5GB was just heard during daylight at the Lizard, but one would hardly consider it good reception, and I found a noticeable tailing off in the performance as we got right down to the end of Cornwall. In this district, and in similar remote or badly screened localities, it is probable that a pentode would be of assistance in the last stage.

This can, of course, quite easily be done, as only one L.F. stage is utilised and the power valve at present employed can be replaced with a pentode without any difficulty. The high-tension consumption will probably increase somewhat if this is done; but, in any case, the consumption of the rest of the set is relatively low, so that this is not a serious disadvantage.

On the whole, therefore, I found that the set operated distinctly well. Judging from comments which I was able to obtain locally, it appears that the set is rather ahead of the general standard, for it is no uncommon thing for the average portable set to give nothing at all in some parts of Cornwall.

During the tests the high-tension on the detector was adjusted to bring the set to a condition of satisfactory liveliness. Readers who build this set will find that if the detector voltage is increased too much there is a tendency to self-oscillation, but a value can be found at which the set is comfortably lively without any distortion of quality or straining due to reaction effects.

Those readers, however, who prefer to have some form of control over the sensitivity can do this in a very simple manner by adding a pre-set condenser in addition to the .0001-microfarad condenser across from the anode of the second detector to L.T. negative.

Increasing the Stability

The larger this by-pass condenser is made the more stable the receiver becomes, and in the original set a value of .0001 microfarad was chosen, as this gave good results under average conditions. The connection of a pre-set condenser (.00003 to .00025 microfarad) between the same points, either with the original .0001-microfarad condenser in position or with it removed, according to which works best, will enable a very simple reaction control to be obtained.

Satisfactory Reaction Control

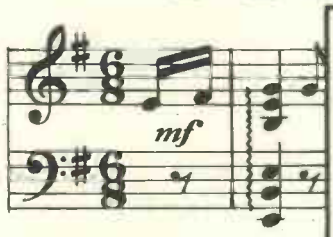
The H.T. voltage on the detector should be adjusted so that with the pre-set condenser screwed down the receiver oscillates. It will then be found that as the capacity of the condenser is increased the receiver ceases to oscillate, and this can be used as a reaction control. Such control has actually been fitted on the original receiver as an experiment and has been found to operate quite satisfactorily.

A suitable position is in between the two tuning controls towards the top of the panel, where there is a space already, and where an extra control can be introduced without destroying the symmetry.

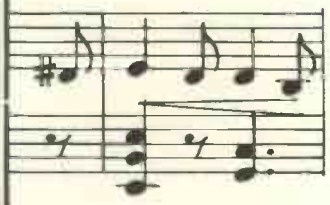
The Wayfarer again in use—this time in Savernake Forest

C. WHITAKER-WILSON Explains in His Second Article the Term FUGUE for

The MUSIC LISTENER



Two Swiss maidens listen to a Brown loud-speaker



LAST month I endeavoured to explain the meaning of the terms *Sonata*, *Symphony*, *Concerto*, and *String Quartet*. There was not room to include an explanation of the term *Fugue*.

We are always hearing a "Prelude and Fugue" announced from London or Daventry: what then, is a prelude and what is a fugue? A prelude is soon explained by saying that it *is* a prelude: in other words, it is an introduction to the fugue which follows.

A Matter of Key

All the same, it would be better to confess at once that the only *musical* way in which it is really connected with the fugue itself is in the matter of the key. If a composer, in the old days, wrote a fugue in, say, F major, he generally preceded it by a prelude in the same key.

In course of time the prelude, though still retaining its position before a fugue in the above sense, became somewhat isolated. In fact, it might almost be said that if anyone wrote a small work for the piano or the organ and had no reason to give it a special title he contented himself with calling it a prelude.

Chopin's "Preludes"

Chopin wrote twenty-four delightful works which he called preludes (but which he might have called anything else): a very well-known example of a lovely prelude in more modern times is, of course, the one in C sharp minor by Rachmaninoff.

A convenient term, covering, seemingly, any musical sins that need it, and yet the title for many beautiful works. So that a prelude is either such in the proper sense, or else a composition with no particular form or design about it.

The fugue is another matter altogether. The word comes from the Latin and Italian *fuga*, meaning flight. And a very good name for such a composition: it certainly has the feeling of being a fugitive!

Perhaps no form of composition has been bound by more rules and regulations; probably no other form in music has had its rules more frequently and consistently broken. Laws in music are the sanest things imaginable: each and all of them can be said to have been the outcome of much thinking and to have been laid down with the greatest reservation; no one minds in the least if and when they are broken—unless by ignorance. No musician has ever tolerated ignorance of his sacred art.

The following sketch of the fugue as a form of musical expression may in no sense be regarded as a guide to *writing* one: the whole of this issue of the WIRELESS MAGAZINE would be required for such a purpose. But it is easily possible to point out to the reader what he should listen for when a fugue is played.

To begin with, a fugue can be written for any instrument—such as the piano or organ—capable of producing harmonies; or it may be written for any reasonable combination of instruments, from the full orchestra downwards.

Fugues are common in string quartet-writing; in fact for any combination of instruments calculated to show off the "works" so to speak.

The most important thing about a fugue must naturally be its chief theme, called the subject. This is given out first of all, by itself. A fugue-subject may be of any length, but a very few bars generally suffice: there is no sense in making the subject unduly long. As soon as it ends—we will suppose, for the moment, at the conclusion of the third bar—it appears again in another part, either higher or lower. This is called the answer.

Not Always Identical

The two, for a technical reason which I need not explain, are not always absolutely identical, but near enough for all practical purposes. What has become of the subject now that the answer has taken its place? The part plainly continues because two voices are heard instead of only one. The answer has to be accompanied by something, of course; thus the subject becomes the counter-subject for the time being.

As soon as the subject re-appears the answer takes on the duties of the counter-subject and the original subject-part is free to wander about by itself, the harmonies by now being in three parts.

Three Harmonies

Perhaps it is scarcely fair to call them harmonies: they are really independent counterpoints because they run counter to each other. At

The Music Listener (Continued)

any rate, by the time the last entry (we are supposing the fugue to be in four parts) has been made every one will have moved up one, so to speak: the last subject-part will have become the counter-subject, the two previous parts will have become free.

Exposition and Episodes

All this is called the *Exposition*, and by the time it is over you will have had enough of subject and answer for the time being and will have become interested in what are called the episodes. Pleasant little turns of melody and harmony—all strangely in keeping with the general style of the work—are now indulged in.

Just when you are really absorbed in what is going on you willbe suddenly aware that the subject has appeared again—and without the slightest warning. There will be no elaborate preparation for its entry, no pause or other obvious device: it is *there*, before you can realise it, or else there is some bad fugal writing!

From now onwards you will find the interest to be cumulative: every possible device is resorted to in order that you shall be entertained right up to the last bar.

The subject will begin in one part and then be over-lapped in another; a deep note may be continuously sounded and the excitement piled up; the answer may appear twice as slowly, or twice as quickly—known as augmentation and diminution: there is no end to the "dodges"—intellectual "dodges" at that!—which will be employed rather than let the interest flag.

It is a time-honoured device, this writing of fugues; and it is perfectly amazing how, in the hands of masters like John Sebastian Bach, real musical emotion has been worked into what might appear to be a somewhat mathematical form of music.

Story of Bach's Works

The most famous preludes and fugues are those written by Bach for the piano—or, strictly speaking, the clavichord: there was no piano in his day, of course. The story of how those amazing works came to be written is by no means out of place here.

For one thing, there will be some amount of interest for readers of the WIRELESS MAGAZINE in that they themselves will naturally be mechanically-minded: the story touches upon the mechanical side of music.

Before Bach's time the keyed instruments were tunes by what has since been named the Unequal Temperament, or Mean-tone System. This was really a case of an attempt to make tuning too perfect. The system was, roughly, this: a note was taken as a standard—usually middle C—and all the C's were tuned from it. It was a simple matter to tune the G's from the C's: violin experience made that possible. So the G's were the next tuned. After the G's, the D's, and so on, by fifths, until the whole gamut had been tuned.

Unfortunately, however, acoustics have ever been deceitful, and it was found that, while the simple keys lying around C sounded well enough;

WHEN YOUR PET LISTENS-IN

As announced last month, we are offering three prizes of two guineas, one guinea and half-a-guinea respectively for the best photographs of pets actually listening-in which are received by June 30. Get your camera out now!

those which were more remote (like B or F sharp major with their respective five and six sharps) sounded harsh and out-of-tune. If C, G, D, A and E were tuned in succession it was found that the E was a different E from one produced by tuning a lower E as a true third from C, and then tuning the octaves of it.

So that, unless you were contented with three sharps or three flats, in those days, you found yourself somewhat restrained and restricted. It was not long before men saw the advantage of going into any key which they thought fit for the sake of the effect which they produced; and it must have been more than annoying because they could do whatever they liked when writing for a string quartet where the instruments were free.

But in writing for the clavichord they found that certain chords were simply not usable.

Then Bach came on the scenes. As soon as his genius began to develop he saw the necessity, not only of *going* into extraneous keys from simple ones, but of *starting* in any key. "If there is a key of C, without either sharps or flats," he said, "there must also be a key of C sharp which will have seven sharps: I intend to use both keys."

Bach's Experiment

As things were, two instruments would have been necessary, one tuned from C and the other from C sharp. But Bach experimented with thirds, fourths, and fifths, until he succeeded in dividing the octave into twelve equal semitones. The system (which we have adopted ever since), was a revelation and a revolution at the same time.

Earlier experiments had been tried with it—it had to come, of course, because Art could not progress without it—but Bach was the first to give a practical demonstration of it. No sooner had he satisfied himself that all was well with his clavier than he gave his opinion of it to the world in a very practical manner.

He took each of the twelve semitones in the octave, made them, in turn, the name-notes of twelve major and twelve minor keys, and wrote twenty-four preludes and fugues, one in each of the twenty-four keys. Subsequently he wrote a second book of them.

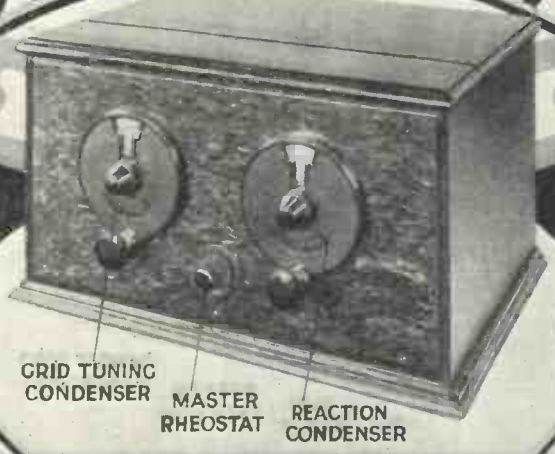
Forty-eight Preludes and Fugues

Thus were born the famous forty-eight preludes and fugues, two in each major and minor key, called in German *Das Wohltemperirte Klavier* —"the well-tempered clavichord." Monuments of the superbest technical beauty, apart from their significance in the mechanical and acoustic sense, they remain the harmonic wonders of the world. It is perfectly amazing what can be extracted out of them: they are as eternal as the pyramids of Egypt.

Such, then, is the story of the prelude and fugue. To those who care to listen intently while a fugue is being played—or sung, for there are vocal fugues—nothing but the keenest intellectual enjoyment is in store. A fugue is the most satisfying thing in music.

The SHORT-WAVE LINK

An Efficient Three-valver for Reception on Wavelengths from 15 to 50 metres



Specially Designed, Built and Tested by the "Wireless Magazine" Technical Staff

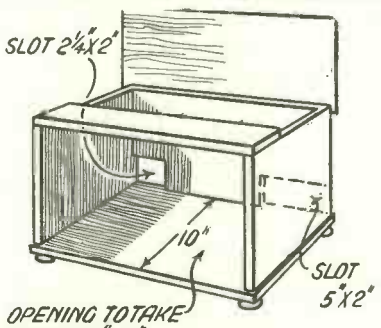
EVEN the hardened listener can get a thrill out of short-wave reception. There is something uncannily fascinating about reception on the waveband between 15 and 100 metres (which this set covers).

We take many scientific achievements for granted nowadays; but still a blasé member of the WIRELESS MAGAZINE Technical Staff can be aroused to enthusiasm in describing the construction of a receiver whilst listening to a programme from WGY, Schenactady, New York, on the loud-speaker !

No Difficulty

A great thing about short-wave reception is that, provided certain simple precautions are taken, it presents no difficulties. It is possible to pick up far distant stations (in the United States), for instance, on one valve if headphones are used—and provided that conditions are favourable.

Further than this, if conditions happen to be unfavourable even a multi-valve set will give no better result in proportion. For loud-speaker reception under normal conditions a three-valver is ample. Such a set is the Short-wave Link Three.



Details of cabinet for the Short-wave Link

From the foregoing it will be appreciated that the detector valve is of great importance and every possible step must be taken to ensure that the maximum efficiency is obtained from it. The question of smooth reaction control is, therefore, of paramount importance.

The Short-wave Link is a three-valve set comprising a detector, one resistance-capacity coupled low-frequency stage, and a transformer-coupled stage. Such a combination gives the maximum efficiency consistent with good quality and low upkeep costs.

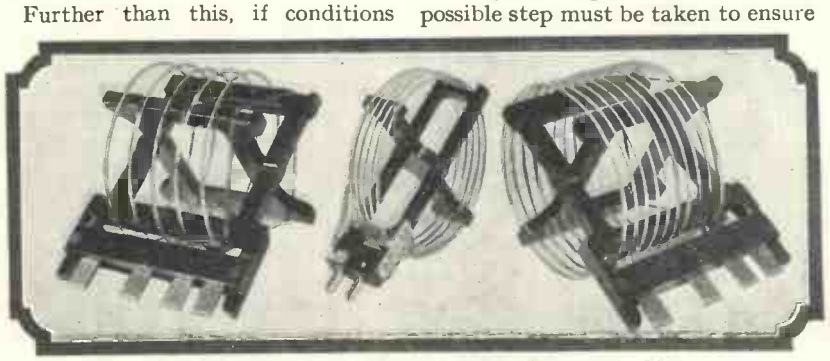
Greater H.T. Consumption

If two transformers were used, for instance, the signal strength would be increased, but, on the other hand, quality would be sacrificed, and the high-tension consumption would also be greater.

In the Short-wave Link great care has been taken to get the best possible reaction control—the secret of success. The leaky-grid principle is used for the detector for the sake of sensitivity; note that the values for the grid condenser and leak in this case are .0001-microfarad and 5 megohms.

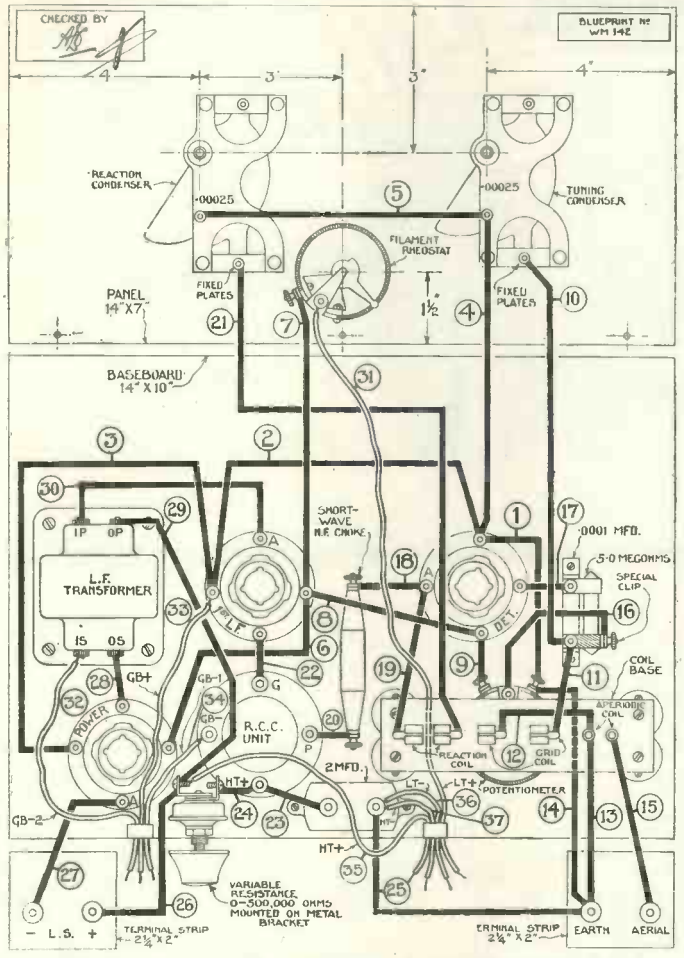
British Short-wave Coils

Use had been made of special short-wave coils manufactured by a British firm of outstanding reputation. There are actually four coils, the first covering a waveband of from 15 to 29 metres and the second the range between 29 and 52 metres. With these coils it is possible to get most of the American broadcasts that matter.

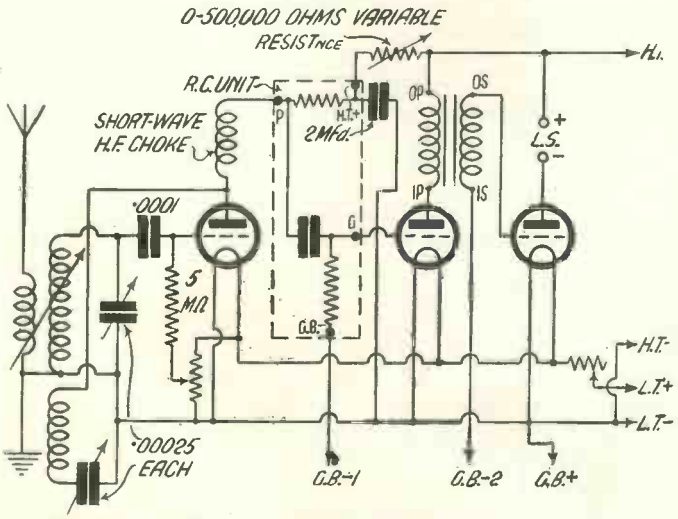


These are the special coils used in the Short-wave Link

The Short-wave Link (*Continued*)



This layout and wiring diagram of the Short-wave Link can be obtained as a full-size blueprint for half-price, that is 6d., post free, if the coupon on page iii of the cover is used by June 30. Ask for No. W.M.142. Wire in numerical order and keep all leads as short as possible



Circuit of the Short-wave Link, which comprises a detector and two low-frequency amplifying stages

Overseas readers will find the set ideal for the reception of signals from the B.B.C.'s experimental short-wave station at Chelmsford, which works on a wavelength of 24 metres.

In detail, the circuit is arranged on the following lines: In the aerial circuit is an aperiodic coil of five turns; this is mounted on a pivoted socket so that its coupling in relation to the tuned grid coil can be varied as occasion arises.

Coils Wound with Bare Wire on Low-loss Former

The grid coil (two are normally used, as explained) is provided with special knife-edge contacts, well separated, so that losses are reduced as much as possible. The grid coil is wound with bare wire, while at one end is provided a reaction winding of insulated wire.

Special short-wave condensers are used in order to obtain the maximum efficiency. Both grid-tuning condenser and reaction condenser have a capacity of .00025 microfarad. It should be noted that the end plates of each are at earth potential, and therefore there are no hand-capacity effects to upset the tuning adjustments.

Stability is a great feature of the Short-wave Link.

Special Short-wave H.F. Choke Essential

In the anode circuit of the detector valve there is a high-frequency choke, as is usual in circuits employing capacity-controlled reaction. It is essential that this choke should be specially wound for the short waves, otherwise difficulty will be experienced in getting reaction at all.

Smoothness of reaction is controlled by two means—there is a potentiometer in the grid circuit so that the grid potential (through the grid leak) can be finely controlled, and there is also a variable resistance in the anode circuit that controls the potential applied to the plate. In this way it is possible to get without trouble the most efficient operating point for the valve—the point, that is, where reaction starts smoothly and can be obtained without overlap.

Those who have had no previous experience of short-wave working, and who intend to build the Short-wave Link should note that oscillation most easily occurs when the slider of the potentiometer is placed at the positive end.

What "Overlap" Really Means

"Overlap," beginners should also note, is the state of affairs when oscillation persists when the reaction condenser is brought back to a lower reading on the dial than that at which it started.

For example, it might be found that oscillation first started when the dial reading was 30 degrees, but on turning the dial back the reaction effect might persist until a reading of 20 degrees was reached; the starting and stopping points obviously overlap, and the control is therefore erratic and irregular.

Build It and Pick Up America Direct!

When the circuit is adjusted properly reaction should start and stop at exactly the same reading on the dial. Moreover, the set should glide into oscillation smoothly and not be in a condition of either not oscillating at all or oscillating fiercely. The importance of this will be realised when it is remembered that a set is in its most sensitive condition *just before it breaks into oscillation*

Extra Stability

In the Short-wave Link the variable resistance in the anode circuit also serves another purpose besides allowing of fine control of the anode potential; in conjunction with a 2-microfarad fixed condenser it acts as a motor-boat stopper, and thus gives the set extra stability in operation. The practical advantage of this is that the high-tension battery can be kept in service much longer than would otherwise be the case.

So much for special features of the circuit, which is otherwise quite straightforward and follows standard practice.

Choice of Components

The choice of components for such a set is also of great importance, and the WIRELESS MAGAZINE Technical Staff only used in the Short-wave Link those it knows from long experience to be especially suitable. The question of coils, special high-frequency choke, and variable condensers has already been discussed.

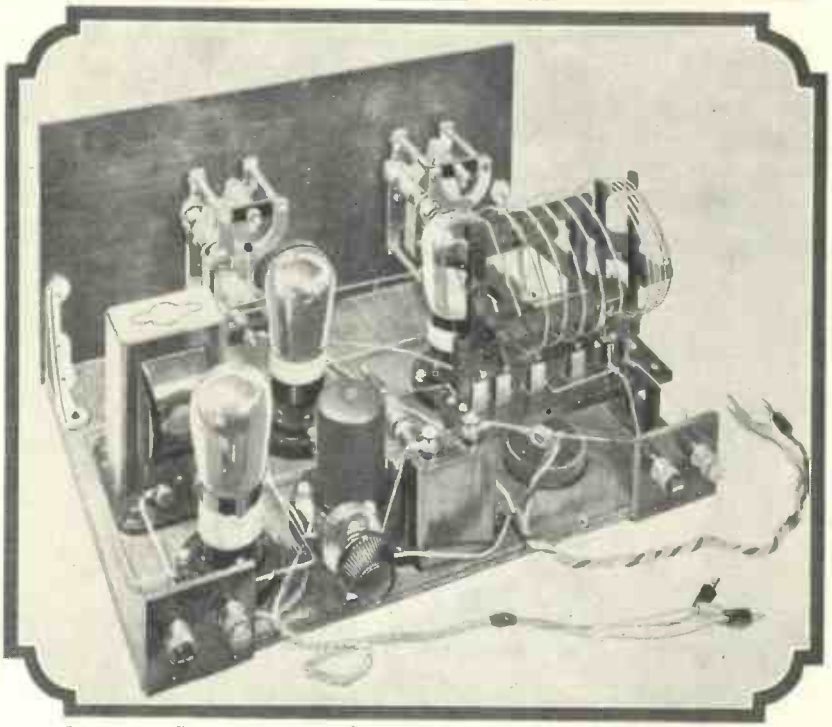
Another most important point is the selection of good slow-motion dials. For short-wave work such dials are essential, because tuning is so sharp that it is practically impossible to get anything at all if ordinary plain dials are utilised.

Dials Free from Backlash

The slow-motion dials used must be of good quality and entirely free from backlash; if they are not the set will be in the same state as if there were bad reaction overlap due to incorrect circuit values.

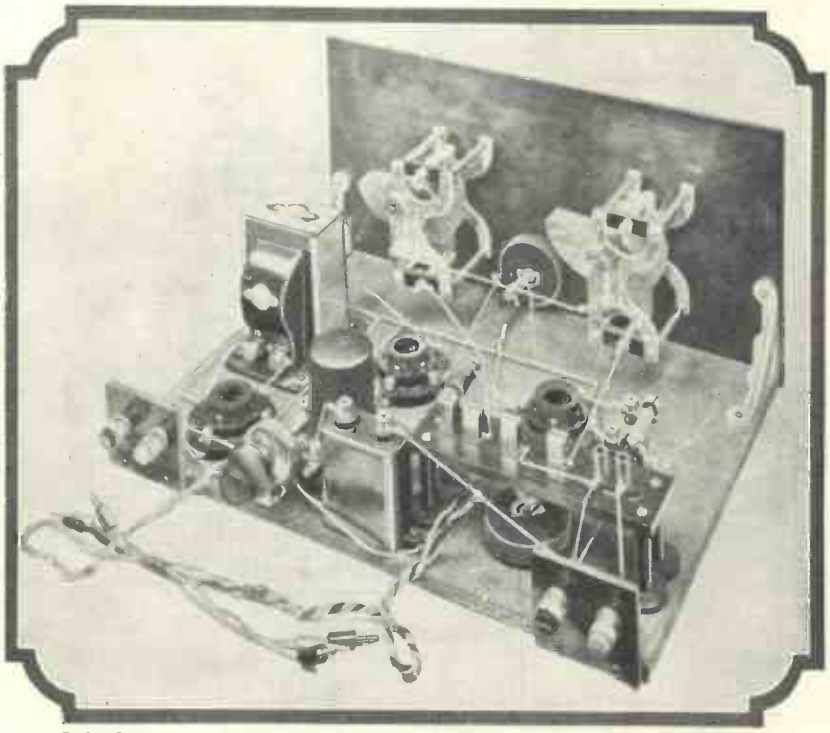
Readers cannot be too strongly urged to use as far as possible the same parts as employed in the original WIRELESS MAGAZINE receiver; only then can they be certain of getting the same excellent results.

Overseas readers who have difficulty in obtaining parts locally should note particularly that a number of advertisers in the WIRELESS MAGAZINE make a speciality of supplying complete kits of all the specified components of any of the sets described in these pages.



Here is the Short-wave Link, all wired up ready for use. Smooth reaction control is a great feature

Construction will present no diffi-



Only the best quality parts are used in the Short-wave Link, a most efficient three-valver which can be adapted for ordinary broadcast reception

The Short-wave Link (Continued)

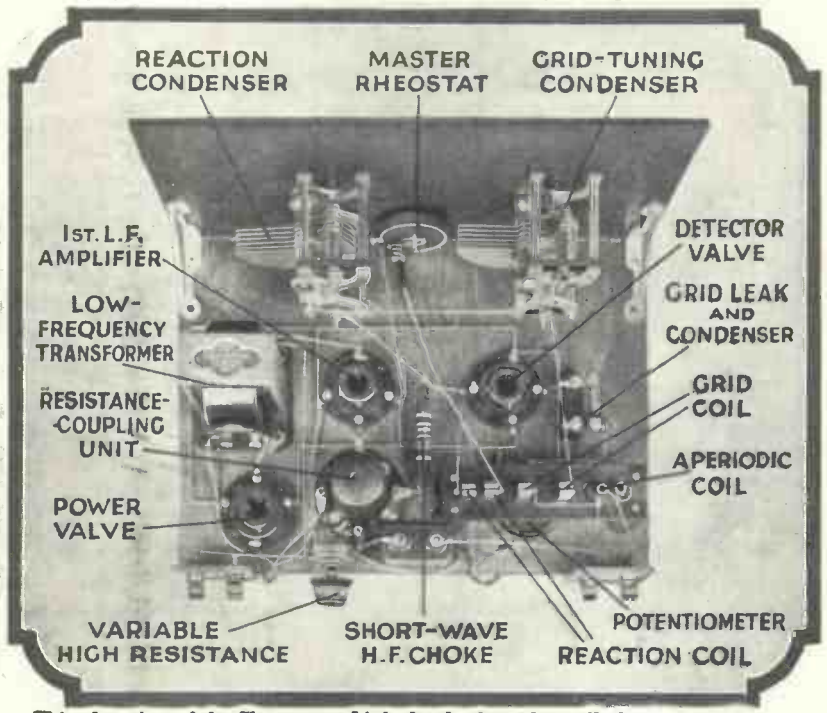
COMPONENTS REQUIRED FOR THE SHORT-WAVE LINK (THREE-VALVER)

	s.	d.
1—Ebonite panel, 14 in. by 7 in. (Resiston, Raymond or Northern Radio)	6	3
2—.00025-microfarad short-wave variable condensers (Cyldon)	25	0
2—Slow-motion dials (Igranic, Formo or Ormond)	15	0
1—30-ohm panel rheostat (Lissen, Peerless or Peto-Scott)	2	6
3—Anti-microphonic valve holders (Wearite, Lotus or W.B.)	7	6
1—.0001-microfarad fixed condenser with insulated series clip (Dubilier)	2	6
1—5-megohm grid leak (Dubilier, Mullard or Ediswan)	2	6
1—Baseboard potentiometer (Lissen)	1	6
1—Set short-wave coils with base, for 16 to 50 metres (Marconiphone)	32	0
4—Ebonite supporting pillars (Bulgin)	2	0
1—Short-wave high-frequency choke (Wearite, Igranic or Rothermel)	4	6
1—Resistance-capacity coupling unit (Mullard)	17	6
1—2-microfarad fixed condenser (Dubilier, Lissen, or T.C.C.)	3	6
1—Variable resistance, 0 to 500,000 ohms (Claude Lyons)	8	6
1—Low-frequency transformer (Igranic type G. Philips or Mullard)	30	0
1—Pair panel brackets (Magnum, Ready Radio or Raymond)	2	6
2—Ebonite strips, 2½ in. by 2 in.		6
1—Cabinet with baseboard, 10 in. deep (Caxton)	27	6
Stiff wire for connecting	1	0
4—yds. thin flex		6
5—Wander plugs, 2 red and 3 black (Lectro Linx)		10
2—Spade tags, red and black (Lectro Linx)		4
4—Terminals marked: Aerial, Earth, L.S.+, L.S.— (Belling-Lee or Eelex)	1	6
Sundries	1	0
Approximate cost of receiver	£9	16 5

RECOMMENDED ACCESSORIES	s.	d.
1—Pair phones (Ericsson)	12	6
1—Loud-speaker (B.T.H. type C2)	45	0
1—2-volt accumulator (Exide, type CZ2)	9	6
2—66-volt high-tension batteries (Siemens Standard type)	22	0
1—16½-volt grid-bias battery (Siemens)	3	6
1—Detector valve (Marconi DEH210, Cossor 210H or Mullard PM1HF)	10	6
1—Low-frequency valve (Marconi DEL210, Cossor 210L or Mullard PM1LF)	10	6
1—Power valve (Marconi DEP215, Cossor 220P or Mullard PM252)	12	6
Approximate cost of accessories	£6	6 0

culty if use is made of a full-size blueprint. Every reader can obtain a copy of this for half-price by using the special coupon on page iii of the cover by June 30; an extension of time will be allowed in the case of overseas readers.

Under the half-price scheme the cost of a blueprint of the Short-wave Link is only 6d., post free. Ask for No. W.M.142, and address your inquiry to Blueprint Department, Wireless Magazine, 58/61, Fetter Lane, E.C.4.



This plan view of the Short-wave Link clearly shows how all the components are arranged. Note how the wiring is kept short and direct

Special Points in Assembly

There will be no difficulty in arranging the parts if full use is made of a blueprint and the photographs reproduced in these pages. There are only two special points to note in the actual assembly of the parts; one end of the grid condenser is supplied with an insulating clip, and the variable high resistance is mounted on the metal bracket supplied with it.

Wiring up needs rather more consideration. The blueprint (and the reduced reproduction of it in these pages) indicates the best order of wiring, and this should be adhered to; for instance, start with connection No. 1 and *make it as short as possible*. Carry on in order, marking through each number on the blueprint with a pencil as the connection is made; in this way there is no possibility of error.

Short Connections Come First

Shortness of wiring is of great importance; and for this reason the leads which need to be specially short are

A Three-valver for Reception on 15 to 100 Metres

numbered so that the most direct connections can be made. The photographs will be of help in this respect.

Constructors can please themselves how long the battery leads are made. It is only necessary to suggest that it is better to have them on the long side than to have them too short.

Suitable Valves for the Set

Before the set can be used suitable valves will have to be obtained. The detector should have an impedance between 30,000 and 80,000 ohms, the first amplifier an impedance between 6,000 and 20,000 ohms, and the last valve should be of the power type, with an impedance between 6,000 and 2,500 ohms.

Two-, four- or six-volt valves can be used. For the reception of WGY on the loud-speaker mentioned in the second paragraph a good combination of two-volters was found to be the Marconi or Osram DEH 210, Mullard PM2 and Mullard PM 252. A valve of considerably higher impedance than the PM2 could, however, be used for the second stage.

How to Operate the Set

It is now time to discuss the operation of the Short-wave Link. But first let the reader clearly understand that great aerial length is not at all desirable. In fact an overall aerial length of 30 to 40 feet will be ample.

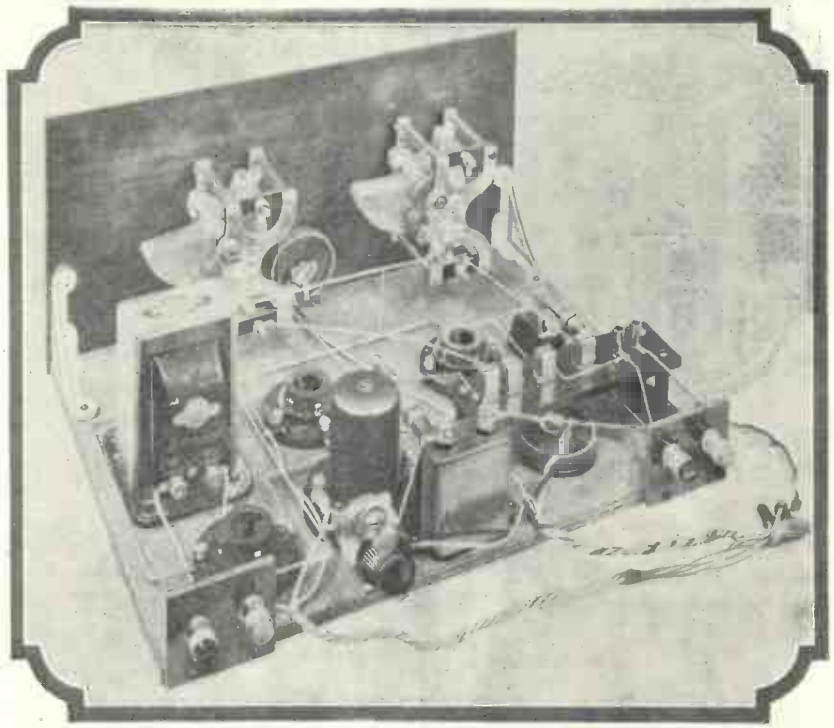
Actually the set has been tested at a distance of fifteen miles from London on an aerial about 25 feet in length, with a corresponding length of rubber-covered flex laid on the ground as an earth connection.

If the aerial to be used is very long a small capacity fixed condenser (say of .00005 or .0001 microfarad) can be placed in series with it to advantage.

Dry-battery H.T. Supply

The high-tension supply is best obtained from dry batteries and the voltage should be about 150 for the best results.

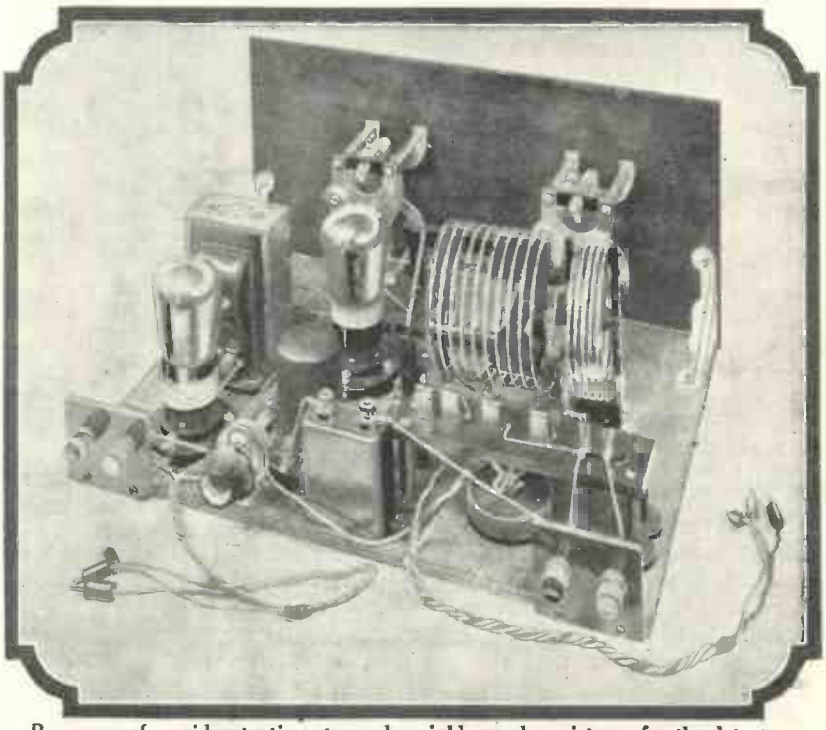
When the set is first used the operator is advised to start with the 29-50 metre coil in circuit. If the aerial is reasonably small the aperiodic coil can be coupled closely to the grid coil, but if it is on the large side the aperiodic coil coupling should be loosened by swinging the coil on its pivot.



Note that special short-wave variable condensers and a short-wave high-frequency choke are used in the Short-wave Link

To start with, place both variable condensers at zero and adjust the high resistance at the back of the baseboard for the minimum resistance, that is, turn the knob as far

(*Continued on page* 447)



By means of a grid potentiometer and variable anode resistance for the detector, very fine control can be obtained with the Short-wave Link

Better Health by Radio!

SPECIAL ARTICLE

Provoking Mental Energy and Providing a Useful Hobby

IS radio any more closely connected with health than is the gramophone, the cinema, or any other kind of entertainment? Three or four years ago there was no reason to suppose that a wireless enthusiast should be particularly healthy either in body or mind.

A Marked Effect

Nowadays, though, I believe that broadcasting is starting to make a very marked, if minute, effect upon the health of our national life. This is happening without many radio enthusiasts being aware of it, and so you may find interesting the reasons for which many medical men feel confident that radio is beginning to play its part in health-giving.

A wireless set is an arranger of a healthful life in an indirect way and in a direct way. The direct result is due to the fact that regular music, restful entertainment, and even light education "on tap" provokes mental energy. The indirect result is owing to the radio enthusiast taking part in a useful hobby of absorbing interest.

A Victorian Failing

Our Victorian age has had many stones cast at it, and I must throw another. We must reproach the Victorians for failing to understand that a healthy body cannot live if the mind which controls it is unhealthy. And a mind must be made healthy if a sick body is to be made well. Before the dawn of this century too much attention was paid either to training the physical side alone or the mental side alone.

How strange it seems to us to-day, that nobody realised that a person can never be really great, or clever, or even simply happy, if his mind is weighed down with an unhealthy body. Radio is helping to put things right.

The craze nowadays is for sunlight and fresh air, and, of course, we cannot have too much of both. So some enthusiasts may say, "Yes, I'm very keen on both the technical and the programme side of radio. I listen-in a great deal and am constantly trying out new circuits. But when I want to feel *really fit* I earth the aerial and then take a round of the links, or fix up a singles at tennis."

That is a very sensible point of view, because one must have exercise in order to live. But it is no argument against radio as a health promoter. Tennis and golf are exercises and entertainments for the body, whereas radio as a hobby is an equally important exercise and entertainment for the mind. As I have said, the demand for exercise and fresh air is a modern craze, particularly among the younger people. So, in

Restful Entertainment Without Worry or Trouble

many cases, I have no hesitation in advising a physically-inefficient man to take up an indoor hobby, because I know that, if for no other reason than to be in the fashion, he will also take up tennis or some similar outdoor occupation. I do not think that everybody takes enough outdoor exercise; some take too much in comparison with the indoor work they do, and some take practically none at all.

The Need for Rest

Second only to the need for outdoor exercise is *rest*. Exercise, physical or mental, means an outgoing of bodily energy, for the body has to work in order to exercise. Occasional rest is very necessary, so that the body may recuperate its strength.

Radio gives rest; for there is surely nothing like settling down in a cosy armchair, there to enjoy broadcast entertainment at ease. All broadcast items are not restful, of course, or the more weary among us would be fast asleep soon after the evening programme starts.

No Effort Necessary

It is the fact that the entertainment provided needs no effort to obtain which makes radio valuable. It is more restful to the brain than even the gramophone, for having once tuned in we let the programme people do the choosing of items. We do not even have to make up our minds which record we would like to put on! And, quite seriously, in settling the minor likes and dislikes

of life we waste a deal of mental energy.

Now I have nothing against the ventilation arrangements and so forth of theatres, cinemas and concert halls. But I cannot help feeling that it is more hygienic for a man to sit in his own home and hear a concert via the radio than to mix with two or three thousand people in a theatre crowd, and so risk infection of 'flu and so on.

Before-breakfast Broadcasts!

When, if ever, we have before-breakfast broadcasts in this country (as, so I understand, are being run with some success at certain American stations) it will be time to consider the advantages of early-morning broadcast physical jerks!

I am just as dubious about any benefits as are the programme officials, who will not sanction such broadcasts at the present.

And even if a typically-military S.M. shouted instructions at us, before breakfast, to "slo' parms," bend at the knees and so forth, it is the mercy of radio that we can shut him off by touching out the L.T. switch. Most people, including myself, would sooner be in the land of nod!

Medical advice is largely a matter of sympathetic understanding, particularly in "nerve" cases. It is an old story that a doctor gets a fabulous fee simply for telling a patient that he isn't so ill as he thinks he is, and that he ought to take up golf!

Physical and Mental Energy

There is a reason, of course, and it is that golf is a game combining large amounts of physical and mental energy; the secret of good golf is to play a little and think a lot. The mental activity needed is just as vital from the health-giving point of view as is the physical satisfaction of making a perfect swing and driving straight and true down the fairway.

Golf is not a game to everybody's taste. Some people prefer walking or gardening, and these are hobbies which, comparatively, demand no great amount of thought. If your tastes run in this direction, don't forget that the brain needs exercise just as much as the body does. Radio as a hobby is a well-nigh perfect entertainment and mental engagement; these two factors are essential for health of mind. A. K. M.

The Short-wave Link *(Continued from page 445)*

as possible to the left. Also put the potentiometer slider over to the positive side of the winding.

In tuning the set remember that the left-hand condenser tunes the grid coil, while the right-hand condenser is the reaction control. The rheostat in the centre of the panel switches the whole set on or off.

For searching, it is a great convenience to use a pair of headphones; indeed, many stations will be missed if an attempt is made to tune them in on the loud-speaker at first.

The procedure is as follows: turn the reaction condenser until a loud rustling noise is heard in the phones; this indicates that the set is on the verge of oscillation and in its most sensitive condition for reception.

The secret of bringing in stations is to keep the set as far as possible just off the oscillation point; this occurs when the rustling noise is loudest. A few minutes experimenting will soon enable the operator to distinguish between the "no oscillation," "verge of oscillation," and "oscillation" points.

When this verge of oscillation point has been found the grid condenser should be tuned. After a few degrees it will be found that the set no longer shows signs of oscillating. When this occurs the reaction condenser should be advanced a trifle. Carry on in this way, keeping the reaction in step with the grid tuning as it were, until a signal is picked up, when both controls should be readjusted for the best results.

If it is found that reaction overlap occurs reduce the voltage applied to the detector anode by turning the knob of the high resistance to the right and try alternating the potentiometer setting. A few minutes adjustment will enable the operator to get a perfectly smooth reaction effect.

Beginners should note that tuning is *exceptionally sharp* in spite of the fact that slow-motion controls are fitted. The dials should be turned very, very slowly when a search is being made for a station.

Varying Aperiodic Coupling

It is advisable to try varying the coupling of the aperiodic coil, as this to some extent controls the reaction effect. For instance, with a large aerial it will probably be found difficult to obtain oscillation unless the aperiodic coil is coupled very loosely to the grid coil. The same remark applies also to a comparatively small aerial where the smaller grid coil is in use.

As far as results go, much depends upon atmospheric conditions over which the operator has no control. In the course of an hour one evening recently WGY (Schenectady, New York, through 2XAF on 31.9 metres) was picked up and held on the loud-speaker for some time at good strength, while Radio Paris and Radio Vitus (37 metres) were heard at good phone strength. A loud Spanish station, not identified, was also heard at good strength.

Those who can read morse will find a station at almost every degree of the tuning dial.

The following morning at about midday an amateur was picked up. His call has not yet been traced and we shall be glad to hear from him should he read this article. His transmission was on the following lines:

Stations Only at Half Strength

"This is G6TocW testing. This is G6TocW testing. I find that conditions are very bad this morning. I find that conditions are very bad this morning. Stations are only coming in at about half their usual strength. Stations are only coming in at about half their usual strength . . ."

There is a great deal of interest in picking up signals of this kind. They would be more interesting still if the transmitters would announce whereabouts they are situated!

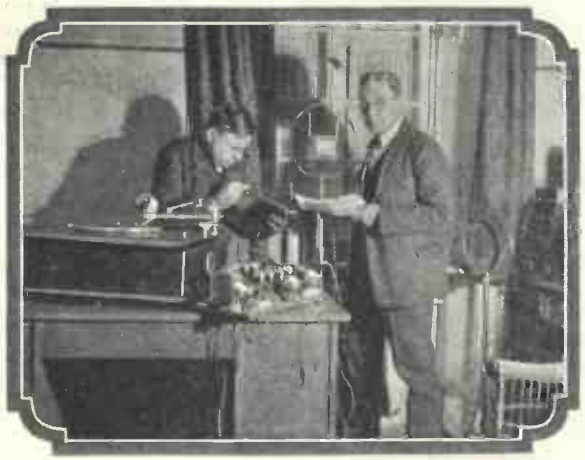
Wireless Magazine, June, 1929

GERMAN Viewpoints Regarding GERMAN

Controversial and Alternative Broadcasts

A Special Interview with Ministerialrat Häntschel of the Reichsinnenministerium, Berlin, Recorded by A. A. GULLILAND

TRY to approach the German Ministers of State—yes, certainly—but try to obtain their opinions on questions relating to broadcasting in Germany—no, certainly not! That was the meaning of the polite answer to my request to interview one of these gentlemen.



The Literaphone, a new invention for sending sound by post, developed in the laboratories of Radio Stuttgart

But the chief of the department responsible for the cultural and political "surveillance" of broadcasting in Germany, Ministerialrat Häntschel, very kindly gave me a host of valuable information regarding the German point of view.

State Control

In Germany, broadcasting is submitted to a certain amount of State "surveillance" regarding the contents of the programmes sent out by the ten broadcasting companies. The men actually responsible for this "surveillance" are nominated locally in the so-called "Ueberwachungsauschuss."

This committee consists of one representative nominated by the Reich and of two nominated by the respective Federated States, such as Bavaria, Prussia, Saxony, Hamburg, etc. The committees have a purely negative and preventive influence, and, I am told, very seldom require to veto a given item.

Apart from this negative committee each broadcasting company has a committee of prominent experts on all the more important phases of artistic and scientific life, which makes positive suggestions as to the formation of the programmes. These committees are styled the "Kulturbeirat." The remainder of the programme organisation is completely in the hands of the individual companies.

Ministerialrat Häntschel replied to my question as to the point of view taken by the authorities in Germany regarding the broadcasting of controversial matter in the following manner:

The different broadcasting companies and the local Ueberwachungsauschüsse have been advised to be as tolerant as possible when passing the usual talks; these, of course, do not, as a rule, touch important controversial themes of a religious or political nature.

Microphone in the large studio at Stuttgart. On the left, "door" for stage effects

As a result of this tolerance several broadcasting companies, among them Cologne and Breslau, have instituted a daily or weekly feature in which some topical event is treated in a manner which is far from non-controversial.

Two Controversial Talks

(Note.—I remember hearing a talk from Breslau demanding a special transmitter for broadcasting parliament speeches, and a talk from Cologne taking a rather one-sided view of an affair relating to Pamela Wedekind, the daughter of the well-known German dramatist and author. —A. G.)

But to exclude political matter from broadcasting, Ministerialrat Häntschel continued, would mean belittling our intelligence as far as broadcasting is concerned.

On the other hand, politics are by no means party politics, even if one or the other political party bears one or the other important question inscribed on its banner. Thus political questions should be allowed time in the broadcast programmes. But also fundamental cultural questions should be discussed.

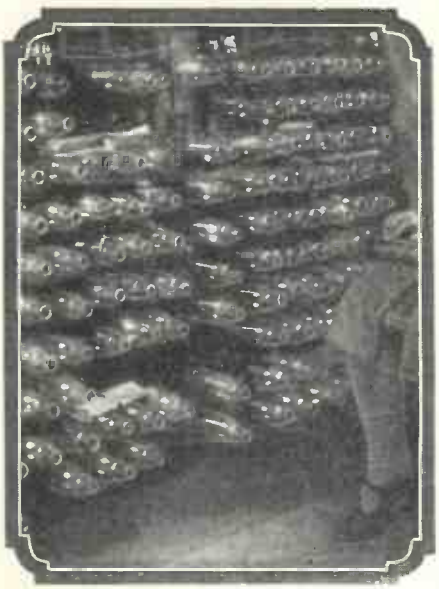
The Reich has, from 1929 onwards, permitted the institution of discussions of political and cultural themes by prominent *experts* known to be of opposite opinion. Thus the listener will hear the very best information on one theme from two extremely reliable sources, but will hear this information from two totally different viewpoints.

Königswusterhausen Debates

The Reich has not, up till now, thought it wise to permit these debates from every station and has restricted them to the "Deutsche Welle," the all-Prussian educational broadcasting company using the Königswusterhausen transmitter. The other stations,

are, of course, at liberty to simultaneously broadcast these transmissions. (The stations, as a rule, make full use of this facility as very prominent men take part in the discussions.)

As examples of themes shortly to be discussed I mention: "For and against prohibition of alcoholic drinks," and "Pro and contra capital punishment." Themes that are



Part of testing rack in the Loewe factory, where all valves are subjected to actual operating conditions before dispatch

generally being discussed in Germany at the moment and themes which also play a certain part in party politics.

But via radio, these themes will be discussed in a manner having nothing to do with one or the other of Germany's twenty-odd political parties. The discussions will undergo a certain amount of censoring, but this will only be to eliminate anything which could be offensive morally.

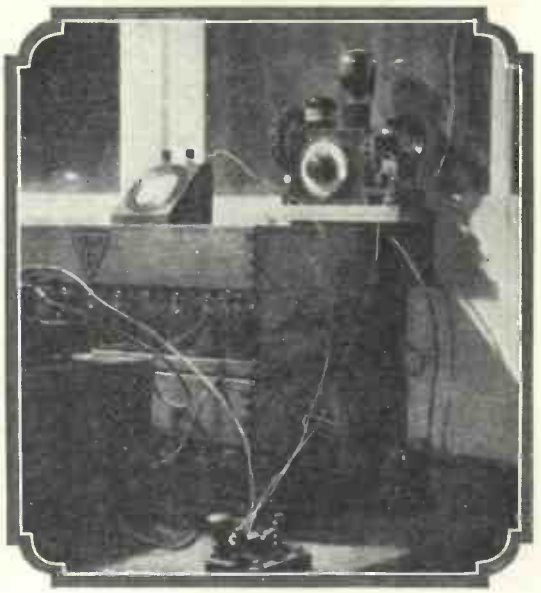
Reichstag Broadcasts

I asked Ministerialrat Häntschel about the broadcasting of the German Reichstag. He answered that the Reichstag itself had objected to being relayed. Also that there were many considerations against the relays.

One must always remember the German parliament is not a hundred years old yet and that, therefore, there is not the same parliamentary tradition as in Britain. Members often use terms in their more heated speeches which never appear in print and which, therefore, should never be broadcast and for the very same good reasons.

Another thing was the question of the interest in these transmissions of the general public, and the equal allocation of time between the twenty or more parties. Every party would wish to speak at the best broadcasting hour.

For the moment the question had been answered in the decisive negative, both by the body most concerned, the Reichstag itself, and by the Ministries. The reasons given here are general considerations which occur on the spur of the moment and not official reasons.



Crystal wavelength regulator for experimental short-wave transmitter at the Loewe works

Third Question

My third leading question to Ministerialrat Häntschel concerned alternative programmes.

It is most interesting to note that Germany already has five alternative programmes for listeners with valve apparatus of even inferior quality. This number is mentioned because at least five different German programmes can be picked up in most every district of Germany.

The reasons are, of course, the diversity of the programmes sent out by the nine different German main stations. Good sets can even receive nine alternative German programmes, but this would be going rather far.

Therefore the urgent need of alternative programmes, much as they could be desired from the point of view of the gently dying crystal-set owner, is not urgent in the case of the valve-set owner or even of the owner of the typical German ultra-cheap loud-speaker local valve set, who can reach out for other German programmes. Much as decentralisation is to be deplored on the administrative side, it is a very boon seen from the programme point of view.

Prohibitive Cost

On the other hand, the cost of an alternative programme service for each of the nine main transmitters would be prohibitive in Germany, in spite of the much larger fees paid (24s. against 10s. in Britain), as each of the nine companies has to supply independently a full programme.

Thus an alternative programme service in our sense of the word seems far off for the German listener, but he is much better off than we are, for he can, provided he has a passable set, reach out and obtain nine different German (that is *national*) programmes at any time of day or night.

Testing valves at the Loewe works, Berlin, to see if any residual gas has escaped the evacuating process

THE LETTERS OF Priscilla Playne-Smythe

Stewcombe Manor,
Little Bodley, Nr. Hurdham.
5/4/1929.

DEAR MR. EDITOR,

I must hasten to tell you of an experience which I have just had and which, I am *sure* you will agree with me, exemplifies the extraordinary powers of the Press. That an old-fashioned, simple, secluded soul like myself should have soared into the *effulgence* of a public character fit to be interviewed by a scientist is entirely due to the prestige of your magazine, and the event has left me just a little breathless and *twittery*.

LIST OF EASTERN BROADCAST STATIONS

Countries	*Call Sign*	*Wavelength (Metres)*	*Power (Watts)*
Shanghai	KSMS	277	50
Tientsin	CRC	280	50
Shanghai	NKS	310	50
Peking	COPK	320	100
Shanghai	KRC	338	250
Japan	JOAK	345	10,000
Japan	JOFK	353	10,000
India	7BY	357	5,000
Japan	JOIK	361	10,000
Corea	JODK	366	10,000
Japan	JOCK	370	10,000
India	7CA	370	5,000
Shanghai	SSC	370	50
Japan	JOGK	380	10,000
Japan	JOHK	390	10,000
Dairen	JQAK	395	5,000
Japan	JOBK	400	10,000
Mukden	COMK	410	2,000
Manila	KZRM	413	1,000
Harbin	COHB	445	1,000
Vladivostok	RL20	480	1,500
Tientsin	COTN	480	500
Nanking	XOW	495	500

Little did I dream, when sending you the artless letters which you have published from time to time, that I was becoming, may I say, famous?

It all happened this way. On Monday last, which you may remember was a Bank Holiday, I was attending to my garden, as is my usual practice when it is quite impossible for really *nice* people to be seen abroad. I was directing the house-boy in the mulching of the herbaceous border, when I was informed that a gentleman wished to see me.

The moment I saw this young man, I knew there was something *apart* about him. He was delightfully unconventional in his attire and united a touch of the self-consciousness of youth with the assurance which marks the truly distinguished.

He introduced himself smilingly to me as Mr. Shortt and added that he was the inventor of the famous circuit which bears his name. Somehow, do you know, I seem to remember reading something about it.

Having seen my letters in your *inestimable* magazine, he felt that he could not possibly come to Hurdham (which he was visiting on a char-a-banc for the day, in order to view the neighbouring ruins of Whiteford Abbey) without calling upon one whom he regarded as a fellow scientist and a pioneer blazing a trail through the jungle of radio.

He added that he had hardly hoped to make my personal acquaintance, because he had felt it to be almost impossible that some *real* person should have written those letters.

In fact, a friend and he had had a small friendly bet about this, my interviewer having wagered that I could not exist at all but had, in fact, been "made up" by your staff.

He was so kind as to add that he had not believed it possible that any one living person *could* have written them, but that having had the honour to meet me in person, he must acknowledge that he had lost his bet, being amply repaid, however, by the pleasure of speaking with me. In short, a most *delectable* young man!

He appeared to be about to take his departure then, but, of course, I rang for tea and he decided to remain, saying that it was not given to him to meet sympathetic fellow-workers every day and that "us scientists must hang together." How refreshingly quaint is the *patois* of the new generation!

During tea, he was *so* interesting. He told me all about his scientific work and assured me that the Shortt circuit which is now in general use was really only the first, almost casual, beginning of his achievements. A difficulty in protecting it had robbed him of almost all benefit from it.

About television he told me some most interesting things. It appears that television is a word compounded of two elements, one of which means "distance" and the other "sight," so that there is really nothing revolutionary or new in it all. It is merely a modern extension of the old science of seeing people *further*.

After having completed the whole of his experiments and research, he had now discovered that the "vision" portion of the subject matter had already been patented, leaving him only the "tele" element which, he assured me, would prove very difficult to protect for the reason that mere distance was at the disposal of *anyone*.

I did not *quite* follow this but, of course, it will be quite plain to *you*, Mr. Editor, and in any case, does it not seem horribly unfair?

To my unbounded delight, he happened to have with him a complete instrument embodying his achievements in this field and this he offered to demonstrate by means of my reception set, so we immediately connected up the two. Although I saw and heard nothing happen, Mr. Shortt assured me that Vienna was diffusing pictures at that time and that his little black box was registering whatever was coming through. And then, do you know, Mr. Editor, a truly marvellous thing happened.

After a few minutes, he opened the lid of the box and inside it, resting upon a miscellany of small devices, was a *perfect* reproduction of Strube's "Little Man," so clear and so beautifully rendered in black-and-white that one would almost have sworn it to be a print.

A second experiment unfortunately produced no result and Mr. Shortt concluded that the Vienna transmission must be over. Had I not seen this thing happen with my very own eyes, I should not have believed it possible!

Mr. Shortt assured me that this was really "nothing to write home about" and that he had done far more remarkable things; in fact, he was in a position to revolutionise the whole of the broadcasting world, were he not, unfortunately, so crippled for lack of capital.

On my sympathising with him and enquiring what sum would be needed to bring his discoveries to their full fruition, he said after slight hesitation that five pounds would greatly help him, but that he would not dream of suggesting that I should become his partner for, after all, he said, we hardly knew each other at all.

If, however, I should care to amuse myself with his televisor during my spare moments and thought it sufficient security for a small loan of, say, ten pounds, then he would gratefully accept it, and would prove his confidence in me by leaving in my hands this absolutely unique model of a new device. Of course, I was only too *pleased* to let him have the money and he left soon afterwards, thanking me for what he described as an *interesting* and *profitable* afternoon.

It seems to me to be a terrible pity that this singularly gifted and promising young man should have to depend upon these *fortuitous* aids to success, and I hope you agree that some Associations (say of really authoritative and competent men like yourself) should illumine the path of progress, as it were, by relieving such pioneers of all *sordid* pre-occupations. I should be *so* glad to hear that you accept my view and that you will act upon it.

Unfortunately I omitted to take Mr. Shortt's address, but he must be well known to you and easily found.

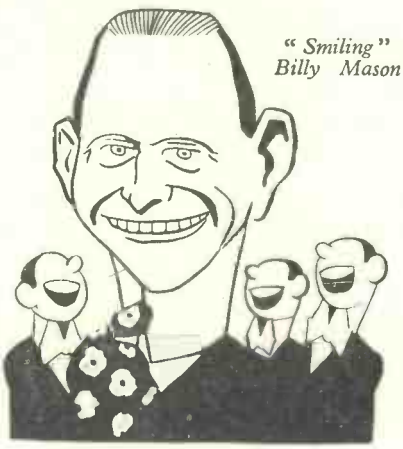
In a few days I hope to let you have a *full* account of the results I have obtained by means of his instrument.

Yours very truly,
PRISCILLA PLAYNE-SMYTHE.

Impressions of Broadcasters

Hugh Wakefield, the actor of "Mr. Park Lane"

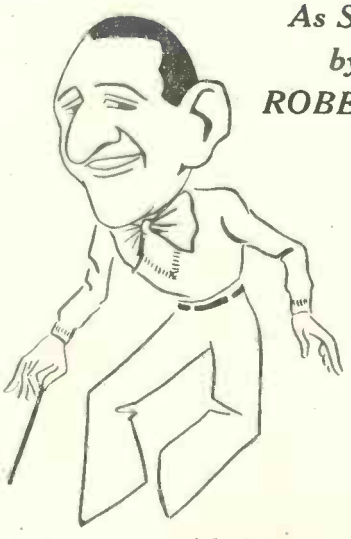
Frances Doble, the stage and screen star



"Smiling" Billy Mason

Stanley Holloway

As Seen by ROBERTS



Abe Lyman, leader of the Californians

Chick Farr, the light comedian

Half-hours with the Professor

MR. PLARZ GETS MAGNETISED!

"DIPPY, you know," said young Amp in a loud whisper to his friend Plarz, the wireman.

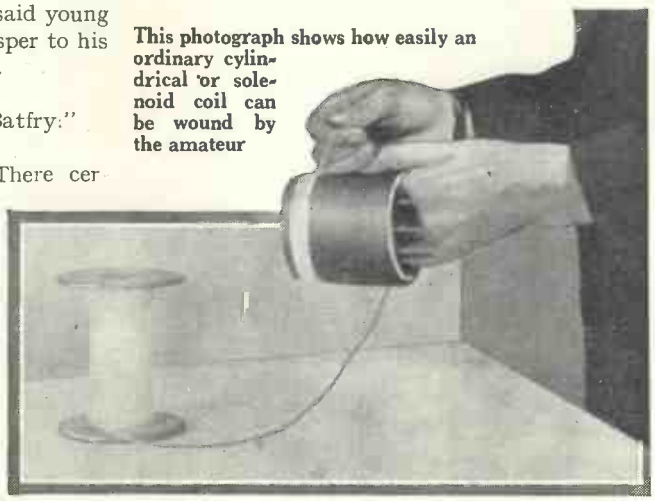
"Whassat?"

"Loopy. Bells in the Batfry."

"Wot, 'im?"

Amp nodded sagely. There certainly did seem to be some excuse for the explanation, for the Professor was standing over a large coil into which he was lowering and raising his watch on the end of a piece of string with an abstracted air.

The two boys watched him in silence as the Professor finally hoisted his queer fish out of the coil, peered at it through his glasses and then, with a grunt of satisfaction, returned it to his pocket. Amp, no longer able to control himself, dived in his pocket and produced a penny.



This photograph shows how easily an ordinary cylindrical or solenoid coil can be wound by the amateur

Baiting the Professor

"Here, Professor," he said, "see if it does the same with this?"

"What on earth are you talking about?" exclaimed Megohm pettishly, noticing the boys for the first time. "What is this for?"

"I don't know," said Amp, "but I thought you might see if it worked the same as your watch did."

"Have you ever seen a watch demagnetised before?"

"Oh, yes," said Amp cheerfully. "I did it myself once and I had enough parts left over to make another watch—oh no, that's wrong, that was disembowelled—I know mother said I wasn't to use the word because it was a horrid one."

Demagnetising His Watch

Megohm snorted. 'Really," he said with some attempt at his lecture room dignity, "you are incorrigible. Unfortunately, the hair spring of my watch had become magnetised through a too close proximity to a moving-coil loud-speaker and I was demagnetising it by putting it under the influence of a powerful alternating magnetic field."

"Wonderful flow of language he's got, hasn't he?" grinned Amp, turning to his friend. "He can do better than that, too, when he tries. Its often quite impossible to understand a word he says."

"Good heavens," said Megohm in disgust, "do you mean to tell me that you cannot understand what I am talking about? Why, I'm sure your friend Plarz could tell you without any hesitation."

Plarz scratched his head. "Well," he said, rather ruefully, "as a matter of fact, sir, I didn't catch very much of what you said. You got rather beyond me in the first sentence."

This month our old friends Professor Megohm, Amp and Mr. Plarz discuss magnetism and inductance—phenomena on which the working of many wireless components are based. Every beginner will find the talk of great benefit. All the photographs illustrating this feature are of apparatus that makes use of magnetic or inductive principles.

"Do you mean to tell me that you don't understand the principles of magnetism and inductance?"

"Born and bred on them," interrupted Amp, cheerfully. "Come off your perch, Professor, and tell us something about it."

Plarz's temperament was by no means as mercurial as Amp's and he invariably seemed bewildered at these passages between Amp and the Professor. He looked at Megohm hopefully, however, as a result of this last sally, for he was rather anxious to understand more about many fundamental principles with which he had to deal in his daily work.

"Oh, all right," said Megohm, moving to his chair. "I think we had better repeat last time's performance and make Amp tell us all about it."

"Anything you say," murmured Amp, modestly, trying to appear unconcerned.

Magnetic Fields

"Well, for a start, suppose you tell us what a magnetic field is."

"Oh er—" Amp hesitated. "I should say," he stammered at length, "oodles of magnetism floating about loose, as it were."

"A particularly bright and lucid description," said Megohm. Amp looked pleased until he happened to catch the Professor's eye, in which there was lurking a nasty gleam. His smile disappeared and he prepared for the worst.

"Disregarding for the moment," said Megohm, "the lax form of English which you choose to adopt in explaining the curious workings of your mind, we will concentrate on the last few words namely, 'floating about loose.'"

Amp in Difficulty

Amp adjusted his tie which appeared to be giving him much trouble.

"If," Megohm continued relentlessly, "if our magnetism is floating about in this unattached condition, I take it that we can collect portions of it and put it into bottles if we wish and to carry it from place to place."

"Er, no," stammered Amp, not by any means so cocksure as he had been originally, "it only exists in the neighbourhood of the force producing it."

"Oh," said Megohm. "Then we

require some force, do we, to produce magnetism?"

"Yes," said Amp. "I mean a coil of wire or something like that."

Megohm picked up a honeycomb coil which was lying on the table and held it up enquiringly to the boy.

"Oh, but you've got to pass a current round it," said Amp.

Dragging It Out

Megohm raised his eyebrows. "We are beginning to drag it out of you," he said. "I don't know what Plarz thinks about it, but I should rather imagine that he is in a more muddled state than ever."

Plarz grinned sheepishly. "Well," he said diffidently, "I'm beginning to get a better idea now."

"Hm," grunted the Professor. "Well, we seem to have established that if we pass a current round a coil of wire, we produce some mysterious quantity called magnetism. You knew that, I take it?" he broke off.

Making a Magnet

Plarz agreed. "Yes," he said, "I've often made a magnet by winding a coil round a bit of iron. Then if you connect it to a pocket-lamp battery, the iron becomes a magnet and it will pick up bits of iron and steel."

Megohm nodded encouragingly. "What do you put the iron in the middle for?"

Plarz cogitated. "I don't know," he said at last. "It doesn't seem to work without."

"The effect will not be so marked," said Megohm, "but nevertheless we shall have a magnetic field even although there is no iron inside. Let us just try that."

Another form of inductance coil—the Dubilier Toroid, which has practically no external field. There are other forms of fieldless coils and the technical name for all of them is "astatic"

He got up, taking the coil with him, and connected it up on the bench to a two-volt accumulator. "Now," he said, "according to Amp, we have oodles of magnetism—I think that is the correct expression—floating about loose."

Amp grinned.

"The statement was subsequently modified," continued Megohm, "to indicate that the magnetic field was actually linked with the coil in some way so that if we took the coil away the magnetic field would move with it. That, I take it, is the idea you wished to convey?"

"Don't be so blinking sarcastic, Professor," exclaimed Amp. "Even if a fellow does make a mistake now and again, you needn't rag him all the time. Anyhow, what I said afterwards was right, wasn't it?"

"More or less," agreed Megohm. "Now our friend Plarz does not appreciate that we have a magnetic field

Tuning coils are inductances. This is a special type of Cosmos coil

here. He is not really convinced that the magnetic field does not vanish as soon as you take the iron away. No, no," he continued laughingly, as Plarz attempted to protest, "it is only my fun, my dear fellow. Still, I want to convince you."

So saying he drew from his pocket a small compass and, having first disconnected the accumulator, he placed the compass near the end of the coil. "Now," he said, "this compass contains a small magnetised needle. As you know, this needle always points towards the north because the earth is really one large magnet and we have all about us a very small magnetic field. It does not have any serious effect on large bodies but if we have a small delicately pivoted needle such as this it sets itself in harmony with the magnetic field, and points to the north.

"You know that, of course," he said, and without waiting for a

A low-frequency transformer works on a magnetic principle. The model shown is an Igranic Type F

reply he continued: "What I am going to do is arrange a local magnetic field of greater value than the earth's magnetic field and this will cause the needle to pull out of its normal position and to take up some other position. If the field is strong enough it will probably move somewhat violently."

A Different Position

So saying, he connected the leads to the accumulator; the needle of the magnet immediately swung round several times, ultimately settling down after much rocking to a position quite different from that which it formerly occupied.

"As you see," he said, "the magnetic field was very strong and caused such a pull on the needle that it went round and round several times. If I now release the magnetism, the magnet will swing back to its original position."

This was immediately verified by disconnecting the accumulator, cutting off the current from the coil and therefore breaking the magnetic field.

Field While Current Flows

"Then," said Plarz, much interested, "you only get the field while the current's flowing?"

"That is so," agreed Megohm.

Plarz thought about it for a few moments. Then he said: "As far as I remember, it didn't make any difference which way we connected up the coil. Is that the same here?"

"We will try and see," said Megohm. So saying he reversed the connections to the accumulator and

Mr. Plarz Gets Magnetised! (Continued)

on connecting up again the needle swung round in the opposite direction.

"Goes the other way," said Plarz.

"He's good, isn't he?" said Amp, unable to keep silent any longer. Plarz gave him a vigorous dig in the ribs, but said nothing. Megohm ignored the interruption and continued his explanation.

Reversing the Magnetism

"Yes," he said, "you see, by reversing the current, we reverse the direction of the magnetism. You would not notice with the piece of iron because a magnetised piece of iron picks up other bits of iron and steel irrespective of the direction of the magnetism or, as we say, the polarity."

"The how much?" interrupted Amp.

"The polarity," said the Professor. "You know that a bar magnet has a north pole and a south pole, the north pole being the one which, if the magnet is suspended, will ultimately point towards the north. Thus we speak of the way round the magnet as its polarity."

Plarz had obviously been turning matters over in his mind. Here he broke in to ask a question. "What effect does the iron have, then?"

"That is a point which we must leave for a future occasion," rejoined Megohm. "It serves to increase the magnetic effect produced by a given current."

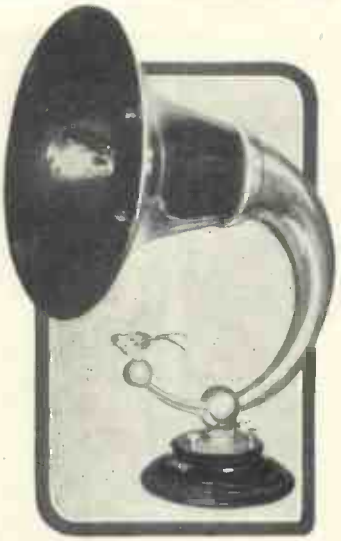
Magnetic Induction

"You know," went on Megohm. "you make use of magnetic effects a great deal in your work, Plarz, just the same as we do in wireless. One of the most valuable properties we have in electrical work is that of magnetic induction. Do you know what that is?"

Plarz shook his head. Megohm looked enquiringly towards Amp, who rose to the occasion.

"Voltages induced from one circuit to another," he said.

"Your comments are altogether too elliptical," exclaimed Megohm in despair. "You obviously have the right idea, but I do not suppose that Plarz, for example, has learned anything at all from your statement. What you wanted to explain is that,



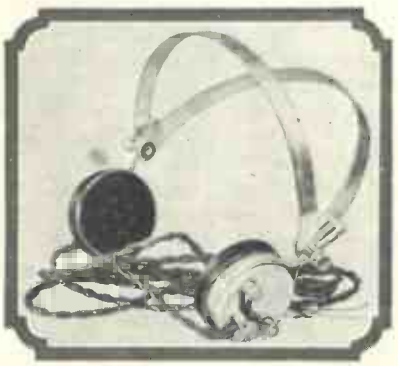
Loud-speakers also work on a magnetic principle. This is the Brown Q model

under certain conditions, the magnetic field produced by one coil can affect another and cause voltages to be produced in it. You deal with transformers in your ordinary work, don't you, Mr. Plarz?" Megohm looked enquiringly at the boy.

"Sometimes."

"Well, here we are going to set up a very simple form of transformer." So saying Megohm took hold of another coil similar to the first, across which he connected a pair of telephones. He then placed the second coil near to the first one. "Now," he continued, handing the telephones to Mr. Plarz, "see if you can hear anything."

The boy listened intently, but ultimately with a puzzled expression shook his head. "No," he remarked, "I can't hear anything at all beyond a faint rushing sort of noise."



Headphones come in the same class as loud-speakers. These are Brown's Featherweight type

"No, you would not," was the reply. "The magnetic field being produced by the first coil is quite steady. I am going to vary the field, however, by switching the current off."

He suited his actions to his words and removed the connections to the accumulator. Immediately there was a click in the telephones which could be heard even by Amp and the Professor. A similar click appeared when the Professor re-connected the wire to the accumulator.

Variation of Magnetic Field

"You see," he went on, "when we make or break the circuit, we cause a sudden variation in the magnetic field and this causes a voltage to be induced in the second coil which gives rise to the click which you hear in the telephones. That is what is known as magnetic induction."

"Then you only get that if the current is varying. Is that it?" asked Mr. Plarz.

"Quite right." Plarz thought for a short time, "But," he objected, "all the transformers I know about have large iron cores."

"That is only to assist the magnetic effect and to make sure that nearly all of the field produced by the one coil passes through the next coil."

Both boys were silent for a few moments. Presently Amp said: "When are we coming to the point, Professor?"

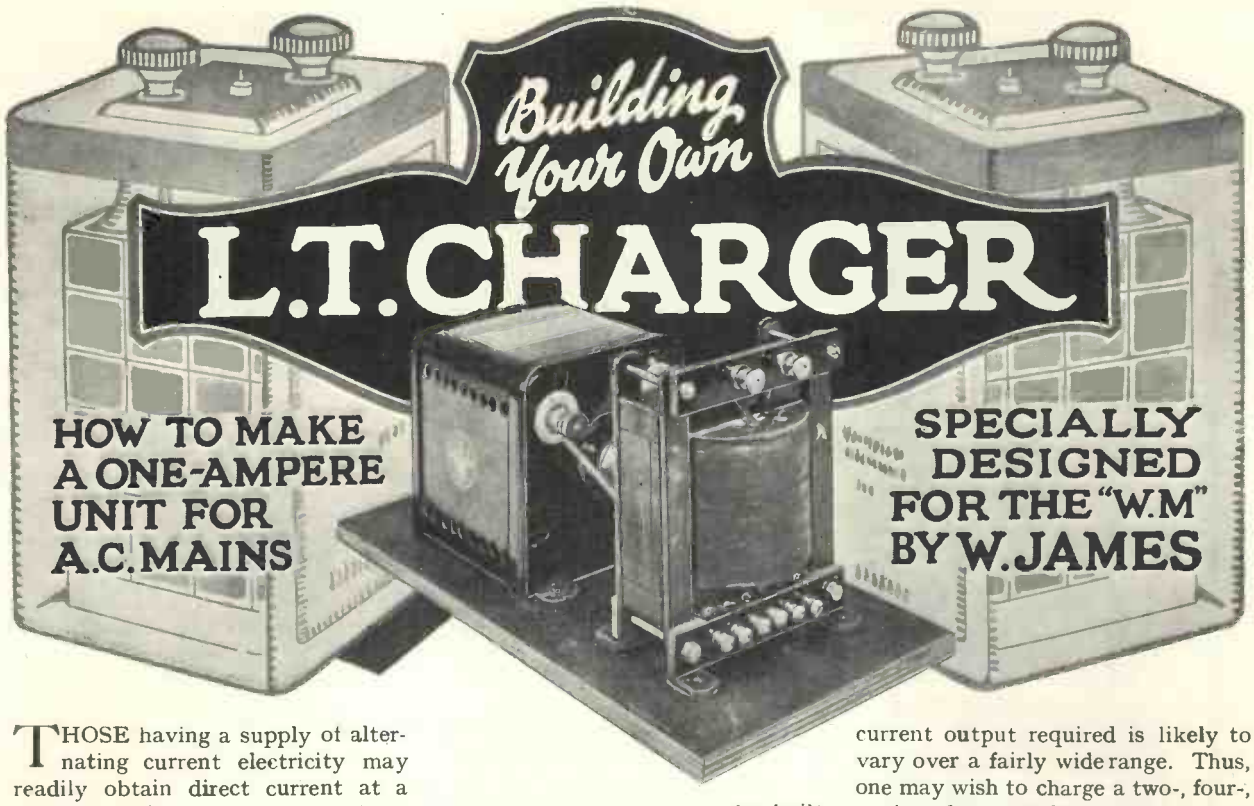
"What do you mean?"

Megohm's Funny Stunts

"You have not told us yet why you were doing the funny stunts with your watch when we came in."

"Oh," laughed Megohm, "that is a very simple one. My watch had become magnetised through too close a proximity to the magnetic field from a moving-coil loud-speaker and I was therefore immersing it in a fairly powerful alternating magnetic field.

"This coil," he went on, pointing to the actual coil which he had been using, "was connected to an alternator supplying a rapidly fluctuating current so that I had a state of magnetic turmoil, as it were, inside the coil. Immersing the watch in this destroyed the permanent magnetism in the air space and restored it to its normal position."



Building Your Own L.T. CHARGER

HOW TO MAKE A ONE-AMPERE UNIT FOR A.C. MAINS

SPECIALLY DESIGNED FOR THE "W.M" BY W. JAMES

THOSE having a supply of alternating current electricity may readily obtain direct current at a suitable voltage for accumulator charging, high-tension circuits, the field winding of a moving-coil loud-speaker, or for grid-bias and other purposes without difficulty.

Essential Components

The essential components required for changing the alternating into a direct current are a transformer and a rectifier. These two parts must be of suitable design for the purpose for which they are required.

Thus, the rectifier must be so constructed that it will provide, without deterioration, a certain amount of current at a given voltage, whilst a transformer must be so arranged that the desired output is obtained from the rectifier. Further, it is important that the transformer be reasonably efficient, have windings of ample current-carrying capacity and be well insulated, in order that the rectifying circuit may not be in direct connection with the mains supply.

Accumulator or Loud-speaker Use

There must be many readers desirous of constructing a low-tension unit suitable for charging an accumulator, or supplying the current for exciting a moving-coil loud-speaker and I therefore propose showing how a unit giving the maximum output of one ampere may be built.

A Westinghouse metal rectifier of the one-ampere type will be employed, and a home-constructed transformer. The rectifier has two pairs of terminals. One pair is marked A.C. and the other pair D.C.+ and D.C.—.

The accumulator to be charged, or the field winding to be excited, is, therefore, connected to the pair of D.C. terminals and the secondary winding of the transformer to the pair of terminals marked A.C.

In this article our Research Consultant describes the construction of a simple unit that will give from alternating-current mains a direct-current output not exceeding one ampere at six volts. Such a unit can be used for accumulator charging or the excitation of a moving-coil loud-speaker at very low cost

This transformer will have a primary winding to suit the voltage and frequency of the alternating current mains supply and its secondary will, of course, be suitably proportioned with respect to the primary to deliver a suitable output to the rectifier.

Now, the amount of the direct current output required is likely to vary over a fairly wide range. Thus, one may wish to charge a two-, four-, or six-volt accumulator at one ampere or less.

It is, therefore, important to provide a means with which the output may be regulated, for it will be clear that if the unit were designed for charging a six-volt accumulator, for instance, an excessive current would flow were a two-volt accumulator connected.

Considerations of Economy

An adjustable resistance having a current-carrying capacity of one ampere could, of course, be employed in the output circuit to regulate the current according to the load attached to the rectifier. But the power absorbed by this resistance would be wasted in heat and it is therefore desirable in the interests of economy to provide a less wasteful form of regulator.

Tapped Transformer Secondary

The simplest and probably the best method is to arrange a number of tappings on the secondary winding of the transformer, because then the actual alternating voltage delivered to the rectifier may be adjusted. In this manner it will be possible, for instance, to charge a two-volt accumulator at a half or one ampere, or a six-volt accumulator or to supply any other circuit that does not take more than one ampere at six volts,

Building Your Own L.T. Charger (Continued)

Plan view of the one-ampere charging unit. The dry rectifier is a Westinghouse type R4-2-2. Transformers already built up can be obtained from the Regent Radio Supply Co., or, if desired, the reader can obtain Stalloy stampings and a bobbin for winding his own transformer from the same firm

which is the maximum output to be obtained from the particular rectifier we are employing.

The circuit of a simple charging unit is given in Fig. 1 and comprises the transformer with its primary winding and tapped secondary winding, together with a one-ampere metal rectifier. There is one point which must not be overlooked when dealing with accumulators and that is the actual voltage of an accumulator when under charge may approximate to 2.8 volts per cell.

When 6 volts Becomes 8.5 volts

A six-volt battery may therefore have a voltage of about 8.5 and the charger must be able to supply one ampere at this voltage.

It is not a very difficult matter to build a suitable transformer. A certain amount of transformer iron or steel will be required for the core and a bobbin or former upon which to wind the primary and secondary windings. The easiest method is to purchase a quantity of suitable transformer laminations and then to provide windings composed of the necessary number of turns of wire of adequate size.

The number of turns required for the primary is dependent upon the size of the iron core and its quality, and also upon the voltage and frequency of the mains.

Proportional Increase

For a given size of core the number of turns will have to be increased in direct proportion to the voltage of the supply. Thus, if it were found that 1,000 turns was a suitable primary for a 100-volt supply we should have to use 2,000 turns for a 200-volt supply of the same frequency.

When the magnetic properties of the iron which will be used as the core are fairly well known, it is an easy matter to determine a suitable number of primary turns from the simple formula:

$$\frac{E = 4.44\ fFT}{10^8} \text{ volts,}$$

where f = the frequency (usually 50 cycles per second)
F = the maximum value of the flux.
T = the number of turns in the primary winding.

In applying this formula we have to make various assumptions according to practical experience and then to check the results in order to determine that the transformer will not overheat and that the materials are being wisely used.

A start may be made by assuming a suitable size of core and flux density, for then we can write down a figure for all the terms excepting the number of turns for the primary winding.

For the voltage E in the formula we write down that of the mains and for the frequency f their periodicity. Experience indicates that a suitable size of core stamping for this type of transformer is the No. 4 Stalloy, which has a central limb 15/16 in. wide, and in order to obtain the figure for the cross section we will assume a sufficient number of stampings will be used to give a central limb of square cross section.

The area of the central limb will, therefore, not be far short of one square inch. If now we allow the maximum flux density of 64,000 lines per square inch and then work out the formula we shall find a winding of about 1,750 turns will be suitable for a mains voltage of 250.

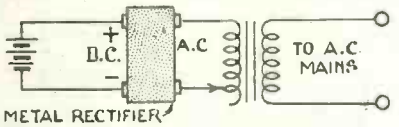


Fig. 1.—Circuit of simple charging unit

For the lower mains voltages fewer turns will suffice. Our 1,750 turns for 250-volt mains amounts to 7 turns per volt, from which it follows that the values given in the table will be correct:—

Mains Voltages.	*Primary Turns.*
250	1,750
240	1,680
230	1,610
220	1,540
210	1,470
200	1,400
110	770

These figures are correct for a frequency of 50 cycles and the particular core described. For a frequency of 25 cycles, exactly twice the number of turns will have to be used or, alternatively, the core will have to be doubled in cross section.

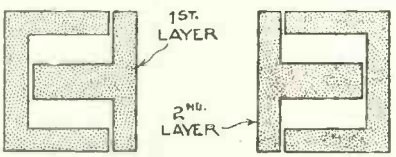


Fig. 2.—Showing how Stalloy stampings are built up

When either of these alternatives does not afford a satisfactory solution a proportionate increase may be made in the number of turns and the size of the core.

No-load Voltage of Secondary

A comparatively small number of turns is required for the secondary and the actual number is dependent

A Special "Wireless Magazine" Article by W. James

upon the losses in the transformer and the nature of the load. Experiments show that a no-load voltage of about 11 is needed in order to charge a six-volt accumulator at one ampere through a metal rectifier and 80 turns are provided in the transformer.

Six Tappings Provided

It may be desirable to charge at a lower rate than one ampere, however, and also to charge two- and four-volt accumulators. This winding is, therefore, tapped at 70, 65, 60, 55, 50 and 45 turns in order that the output may easily be regulated.

Having decided upon the numbers of turns for the primary and secondary windings we have to choose suitable gauges of wire, bearing in mind that the winding space is limited and also that the transformer must not overheat.

It was decided to employ No. 30-gauge enamelled wire for the primary (No. 30 for low voltage mains such as 110), and No. 22 enamelled wire for the secondary and to layer wind.

Enamelled covered wire is perfectly satisfactory, but it is advisable to cover every few layers with a piece of thin paper. Random winding is not suitable.

Insulating the Windings

Care must be taken thoroughly to insulate the primary from the secondary with tape or paper, and both windings from the core, and it is therefore necessary to employ either a suitable former of insulating material or to wind the coils pancake fashion in a separate former and to cover them with tape.

The first step in the construction should be to purchase a sufficient quantity of the No. 4 Stalloy stampings which will build up to give a core about 1 in. thick. These stampings will cost about 4s. A former may then be constructed and will comprise a tube and two end pieces of thin Paxolin or other suitable material.

The primary winding may be put on first and the ends be brought out through small holes. A winder may be rigged up in order to simplify the work of putting on the correct number of turns although, with patience, hand winding is not difficult.

Alternatively, a former may be constructed with a square core and

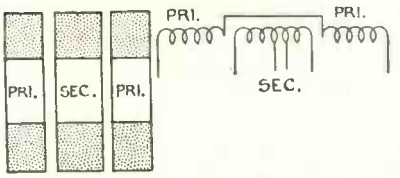


Fig. 4.—Alternative method of arranging windings

the primary winding be wound in two sections. These sections must be properly connected in series after they have been assembled and care must, of course, be taken that sufficient covering in the form of tape be provided in order that the insulation of the wire shall not be damaged.

In the transformer illustrated, a former comprising a circular tube with a pair of circular end pieces was used.

A certain amount of space is therefore wasted, but owing to the ease with which the wire may be wrapped on a former of this

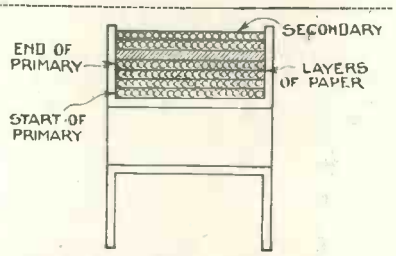


Fig. 3.—How the winding is put on the core

description, readers may prefer to employ one of a similar construction.

It should be remembered that the number of secondary turns is fixed; the number of primary turns should be changed to suit the voltage of the mains and this automatically gives the correct secondary voltage.

The illustrations (Figs. 2, 3, and 4) show how the core is assembled. Notice that a pair of core stampings comprises a T and a U piece and these are fitted in pairs, first in one direction and then the other.

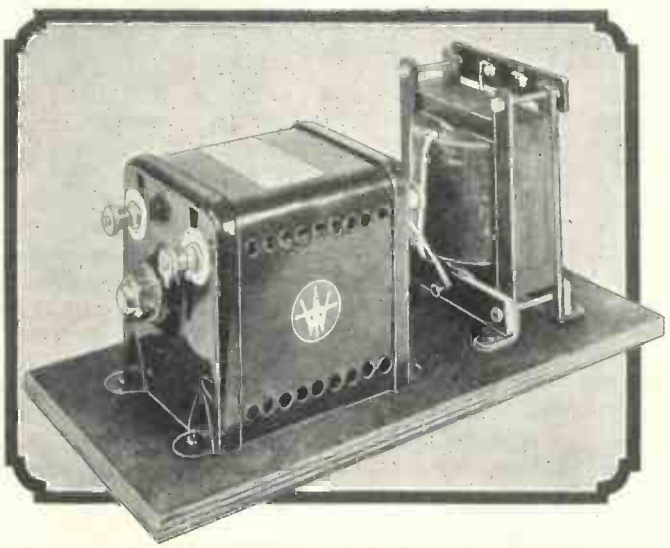
It is necessary to clamp the core to prevent the laminations buzzing and eventually from damaging the windings. A pair of brackets should therefore be fitted on each side of the transformer as illustrated.

Certain of Efficiency

From this brief description the reader who is interested will be able to build his own transformer and he may be certain that it will be reasonably efficient. The windings do not get hot even when delivering full load for a day.

When tested on my own household supply of 240 volts 50 cycles the following charging currents were obtained for two-, four-, and six-volt accumulators :—

Tap.	*6 volt.*	*4 volt.*	*2 volt.*	
1	1.1	1.5	2.0	charging current in amperes.
2	.80	1.05	1.72	
3	.65	.9	1.53	
4	.5	.78	1.31	
5	.35	.65	1.1	
6	.2	.55	.9	
7	—	.35	.7	



Another view of the unit, which can be used for charging two-, four-, or six-volt accumulators, or exciting the field coil of a moving-coil loud-speaker such as the Lodestone

(Continued on page 463)

IF YOU ARE GOING ON THE CONTINENT THIS SUMMER—

Take Your Portable to the Foreign Stations!

Burndept Screened Four

J. GODCHAUX ABRAHAMS EXPLAINS HOW TO DO IT WITHOUT DIFFICULTY

TO-DAY, with the number of efficient portable receivers available to the radio enthusiast, there exist few valid reasons why one should not form part of the holiday equipment, even when a trip to the Continent is the objective.

Few Difficulties Raised

Generally speaking, barring one or two exceptions, but few difficulties are raised by foreign customs departments to the temporary importation of a wireless set, providing it is clearly demonstrated that it is for the owner's use only during his stay and that no attempt shall be made to leave it in the country visited

In order to prevent such an eventuality, some foreign authorities demand a deposit returnable on giving proof that the owner with his imported receiver is crossing the frontier !

Travellers to Belgium on arrival at the port of entry must make a true declaration and will be charged 12 francs per kilogramme, roughly 1s. per pound avoirdupois, for which a receipt is given. Show this document to the customs on leaving the country and the deposit will be refunded. No listening licence is collected

Should you go to Holland, you will find the authorities quite amenable; all they require is a statement to the effect that the importation is a temporary one. They will exact a deposit amounting to about eight per cent, of its value, and you may collect this money on your way back.

In the same manner, Germany allows you to enter her doors with both photographic and radio apparatus "in so far as it is required for the traveller's personal or professional use during his journey through the land." As a guarantee of good faith you will be asked to deposit a sum based on the tariff, namely, 120 marks (say shillings) per 100 kilogrammes (or 220 lb.). This works out at about 6½d. per lb. of wireless set ! Again, the sum is recoverable when the receiver is re-exported.

Both Spain and Portugal afford facilities to tourists provided with their radio equipment, and do not, as formerly, look askance at you or suspect you as a political spy, if you walk up to the customs office with a four-valver camouflaged in an attaché case.

Filling in a Couple of Forms

In the former country you may perhaps be asked to fill up a couple of forms—a habit acquired in most countries since 1914 !—and a deposit of two gold pesetas per kilogramme is exacted; in Portugal no licence is enforced, but a small customs duty is charged.

Italy allows you to stay within its frontiers for a period of three months, providing on entry you hand over an amount proportionate to 240 gold lire per 100 kilogrammes, calculated on the weight of the set. If you take it out again within the period fixed by the authorities, you will get your money back.

France, as usual, is not so lenient, and by a recent law has decreed that you shall pay twenty-two per cent. of the value of your receiver. Moreover, *your* word as to its value may not be taken, but its worth may be estimated by the Douane, at its own sweet will.

Swiss Officialdom

Switzerland, I am afraid, for an unaccountable reason, creates many difficulties, and the exact position would have to be clearer before I cared to present myself at its Customs with any kind of radio hook-up. To be quite in order, before setting out for a visit to that country, you should apply in writing to the Direction Générale des Télégraphes et Téléphones at Berne, the headquarters of the Swiss P.M.G.

He will want to know your full name, home address, nationality, date of arrival, route you intend to take, that is, the frontier town at which the authorities may expect you, where you intend to stay, and for how long you will honour the country with your presence. Appar-

ently when and where you were last vaccinated does not interest them!

When you have received a permit, you show it to the customs on arrival and produce the set. Failing the preliminary application, you will be required to deposit 20 Swiss francs, or if you are touring and have no fixed address, 50 francs; over and above this charge, you will be called upon to pay on the weight of the receiver, based on 60 Swiss francs per 100 kilogrammes. Following these disbursements, you fill up a few forms and on your leaving the country the two sums are handed back to you.

Special Licence for Listening

But bear in mind that the fact that you have made these deposits does not enable you to listen, for before doing so you must present yourself at the post office and after further questions have been fired at you, pay a registration fee of 3 francs, and obtain a special licence for minimum three months, roughly, another four francs Swiss.

Personally, I doubt whether the trouble is worth it unless you intend to stay in the country for at least that period of time. Now, it strikes me that in view of the increasing number of broadcast listeners in European countries and the general desire of the authorities that their transmissions should be heard by foreigners, some means should be found to permit tourists to take portable receivers with them as easily as the average snapshot camera, which the majority of travellers have.

Why Not a Radio Triptyque?

Why not a scheme similar to that adopted by the various automobile associations, which, in exchange for a deposit in your native country, issue a *triptyque* or a customs *carnet* authorising you to take your car through several foreign countries.

A radio association could take this matter up on exactly the same lines with the continental customs authority. In such an eventuality, we might be called upon on this side to deposit with such an authorised body a sum equal to the highest tax enforced by any foreign country we intend to visit. We should be given the necessary papers and on our return home with the receiver, we could secure a refund of the money. It's all so simple, yet why is it not done?

Australian Radio

AUSTRALIA has made a definite move toward actively controlling the quality and calibre of the kind of entertainment put on the air.

The Commonwealth Post Office Department has officially informed the present controllers that it is not satisfied with the programmes now being distributed and has stressed the point that the merit and variety of these programmes are not commensurate with the payment that is being made to them from listeners' licenses.

The Postmaster General has the right to withold certain percentages of license revenue in each State from these broadcasting stations if the Post Office Department certifies that the programmes do not merit full payment being made to the respective stations. While this deduction has not been made up to the present, the Postmaster General now threatens to exercise his right if the programmes are not improved.

The present revenue for the provision of broadcast entertainment apart, from patent and copyright royalties, is about £240,000 annually, derived nearly exclusively from the licensing fee paid by the owners of receiving sets. On the basis of a five shilling fee, a Royal Commissioner in a recent report recommended the payment of a fixed sum of approximately £5,000 per year to each class "A" station.

It is anticipated that, even with the reduction of license fees, there will be in the future a steady income of £250,000 a year for broadcast entertainment in Australia. This income, it is stated in official quarters, will be sufficient to give regular entertainments of the best talent available in the country and also to bring to Australia some of the best British broadcast entertainers. By working in co-operation with the British Broadcasting Corporation there would be, it is argued, a regular interchange of leading artists between Australia and England, thus further cementing the friendly relations.

A demand has also been made by the Government that the first-grade stations establish relay stations in New South Wales and Victoria. The "A" broadcasting companies are asking that before they are compelled to erect these relay stations or to make costly additions to the existing stations, they should be granted another five years' monopoly of the right to provide broadcasting entertainment in the five States they are are at present operating in, namely: New South Wales, Victoria, South Australia, Western Australia, and Tasmania.

Nine Months' Franchise

They maintain that it would be unfair to ask them to go to the cost of establishing relay or subsidiary stations when their present franchise has only nine months' currency.

At the same time, a strenuous effort is being made by the smaller broadcasting stations in Australia to obtain a larger share of the licensing and patent revenue. Appeals have been made over the air by the class "B" stations, which are supported chiefly by advertising, for co-operation of listeners to aid them along this line, accompanied by a demand that there should be a stoppage of advertising or paid publicity from the "A" stations.

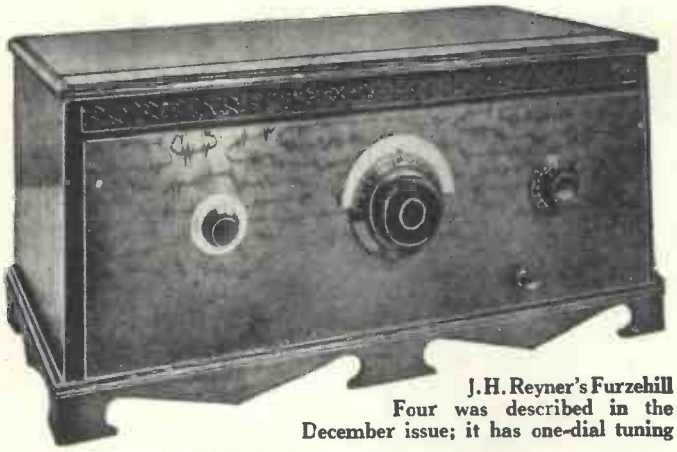
These appeals are said to have the approval of the leaders of the Federal Labour Party which proposes to make this appeal a strong point at the coming elections coupled with the nationalisation of broadcasting in Australia on lines similar to that of the B.B.C. and the government stations of the Irish Free State.

Possible Reduction in Fees

The future of broadcasting is one of special concern to nearly 500,000 listeners in Australia, who will watch with great interest the decision of the Government. It is believed that the general effect of this controversy will probably be either to improve the quality of the broadcasts, or to create a lower level of entertainment with a uniformity in the classification of stations, and a possible reduction in the fees to be paid by listeners.

Whatever the outcome of the Cabinet deliberations may be, the Government is apparently determined to strengthen, rather than release its hold on Australian broadcasting.

F. P.



J. H. Reyner's Furzehill Four was described in the December issue; it has one-dial tuning

What You Can Get with "W.M." SETS

READERS' OPINIONS THAT WILL GUIDE YOU IN THE CHOICE OF A SET

LODESTONE THREE

EVEN though it has no reaction control, W. James's Lodestone Three (WIRELESS MAGAZINE, *March*, 1928) *gives excellent loud-speaker results, as this letter about it from an East London reader proves :*

Being an ardent experimenter, I wish to congratulate Mr. W. James, your Research Consultant, on his excellent design, the Lodestone Three. I have recently completed a model of it and find results exceptionally good.

I tested the set on my workshop aerial, which is badly screened by buildings and a network of telephone cables.

The reception of 5GB in this district is poor; even with an ordinary H.F. stage the detector (anode-bend rectifier) is barely loaded. However, on connecting up the Lodestone, 5GB "came in" so powerfully that "drastic measures" had to be taken with the H.F. volume control! To worry you with a station list is unnecessary.

I find the quality with a moving-coil loud-speaker excellent. May I advise your readers that an L.F. transformer for this set must have a very high primary inductance and impedance. A "cheap" transformer will *not* do.

◆ ◆ ◆

FURZEHILL FOUR

DOUBTLESS because of its one-dial tuning, J. H. Reyner's Furzehill Four (WIRELESS MAGAZINE, *December* 1928) *has been remarkably popular. Here is a Leeds reader's opinion of it :*

Having completed Mr. Reyner's Furzehill Four, I thought you might perhaps like to have my opinion.

Let me say at the outset that I am delighted with it.

The only items in the list of parts recommended that I substituted were the L.F. transformers; and mine are Ferranti AF5's, which in my opinion are *never* an extravagance.

I could not obtain all the parts immediately owing to the demand for certain articles, and so I constructed the set at leisure—carefully and thoroughly—the dual-range coils being the last components to come to hand, and then my troubles (?) began!

Personally, I have never seen this warning in print, and so, for the benefit of future amateur constructors, I feel you would be doing a service if you mentioned this point.

When I screwed down my —— coils to the baseboard through the copper foil I used a bradawl before inserting the screws to make holes large enough to take the fairly large screws necessary for satisfactory holding down, and then applied the screwdriver to the screws and tightened them down.

The wood of the baseboard was somewhat hard mahogany. Testing out time came, and I inserted some old but much respected valves in three of the sockets, and all appeared O.K. The screened-grid valve then went in, and I expected my programme.

Nothing doing until I switched off the L.T., and then—lo and behold!—a "dull" flash. The anode coil I found was slightly warm!

I immediately suspected the possibility of a coil connection touching the copper foil (all the wiring had previously been most carefully tested), and so I took out the coils and noticed that when I commenced to withdraw the anode coil holding down screws the foil moved! That was it! The screw had drawn the foil up and shorted the coil connections.

A repetition has been prevented by cutting away a little of the foil around the screw holes, and that is the tip I wish you to convey to your readers.

My experience cost me 22s 6d. plus three old friends; and I was very annoyed about it, too! Mullard's wouldn't replace that valve, although the filament was intact (emission gone!), and so I did the right thing by them and bought four as specified.

However, after a week-end's test, I found that the PM2D was very microphonic. This they have replaced for me, and now I'm satisfied.

All goes well now except the coil change and, although I have tried repeated adjustments, I have to "fish" for the place where the coils are both changed over—both on the low and high-wave positions. Candidly, I don't like the system.

Mine even now appear to have developed wear, and I am afraid I shall have to substitute them for a pair with a different change.

Perhaps the real trouble is the tandem arrangement, but I cannot see it happening with certain other makers.

Well, now for the performance. I've logged thirty-nine on the low and ten on the high wavelengths, and identified all but four or five.

My local station (I am close) streams in from zero to 20 on an Igranic dial, and I get at least five on the low waves without reaction in daylight.

Selectivity is very fair, considering the single-dial tuning, and it appears to get better higher up the scale. I originally balanced the set on Prague at 50, and it appears to be correct. I have not tried it, but do you think it would be better to balance lower? By the way, the balancing job was very interesting—my anode pre-set condenser being nearly "out."

On the long waves, with the reaction condenser half in, I can, as you said, rotate the tuning dial and one by one they streak in. All except Daventry—which nearly deposits itself in my drawing-room!

Well, I've said really more than I had intended, and I will close by thanking you for a wonderful set. Range, volume, purity, ease of operation are all there, and, last but not least, one of the most interesting sets to make that I have tackled; and I am rather an old hand at the game.

FROM the same reader a few days later we also received the following letter :

Since writing you a few days ago I have had the opportunity of thoroughly trying-out my Furzehill Four, and I am more delighted than ever with it.

I noticed a paragraph somewhere in "W.M." regarding selectivity with S.G. valves, and I find that by turning down the H.F. (volume) control and bringing up strength with the reaction condenser that I can cut out Leeds (my local station, 1½ miles as the crow flies) two or three degrees each side, and I now have not the slightest difficulty in

separating all the low waveband stations which are within a few metres of each other.

On the long waves Daventry does not interfere either with Eiffel Tower or Zeesen, should I particularly desire to hear either of the latter.

Volume is amazing, and the way the set reaches out is a source of incessant wonder to us. Purity is beyond question, and I again repeat my appreciation of the two Ferranti AF5 transformers. Mullard 2-volt valves throughout, with a PM252 (2,600 ohms) for output to my old Amplion AC3 cone, which in my opinion (and others) is every bit as good as cabinet cones we've tested up to 9 guineas.

For H.T. I use two 60-volt C.A.V. accumulators of the old type, which I have always found very reliable.

The only "snag" in the whole set is the coil change-over switch, but even that rather pleases me, because it gives me something to "finnick" with!

I will conclude with renewed thanks for a splendid set and wishes to "W.M." for their (as it is) success.

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THE CRUSADER

RECEPTION of no less than sixty-five stations on the Crusader Two (WIRELESS MAGAZINE, May, 1928) *is reported by a Taunton reader, and we shall be glad to hear from any other listener who can beat this record ;*

Having had the Crusader Two, which appeared in the May, 1928, issue of WIRELESS MAGAZINE, in operation for about four months, I thought you might like to hear of its performance. You probably know that this district is considered good for reception, as the beam stations at Bridgwater and Somerton are near here. My aerial is 40 ft. long, with a biscuit tin as earth.

I have made a few additions to the set—a switch for one valve and a potentiometer in the grid circuit. My variable condensers are Ormond, choke a Peto-Scott, transformer a Powquip, and a Dubilier grid condenser and leak, and I have made the aperiodic aerial coil holder to swing.

The valves are Mullard PM1LF and a PR L.F. valve (2 volts), with about 60 volts H.T. on both valves. I do not use centre-tapped coils, as I can obtain sufficient selectivity without them.

The following are the stations received :

	HIGH WAVES	
Huizen	5 XX	Kalundborg
Radio Paris	Eiffel Tower	Stamboul
Zeesen	Motala	Hilversum
	MEDIUM WAVES	
Budapest	Dublin	Copenhagen
Brussels	Berne	Naples
Vienna	San Sebastian	Gleiwitz
Milan	Hamburg	Cardiff
Oslo	Genoa	Breslau
Zurich	Toulouse	Swansea
5GB	Manchester	Bournem'th
Lyons	Stuttgart	Königsberg
Langenberg	Leipzig	Turin
PTT Paris	London	Cologne
Rome	Graz	Horby
Madrid	Barcelona	Newcastle
Frankfurt	Goteborg	Nurnberg
Katowice	Prague	Cork
Rabat		Flensburg

I have had short-wave coils since January, and using D.X. coils, I have logged the following stations, in addition to a number of British amateurs and unidentified Continental short-wave transmitters :

W8 XK on 62.5 metres.
Dutch telephone station on about 40 metres.
7MK Copenhagen on 32.5 metres.
2 XAF on 31.48 metres.
PCJ on 31.4 metres.
7LO Nairobi on 31 metres.
3LO Melbourne on 31.55 metres.
CJRX Winnipeg on 25.6 metres.
5SW on 25 metres.
8 XK on 25.4 metres.
2 XO on 22 metres.
2 XAD on 19.56 metres.

The Dutch station, PCJ, is particularly loud in the daytime. In conclusion, I would not part with the Crusader for anything.

JUST as remarkable are the results obtained in Victoria (Australia), where another enthusiastic reader got a 12,000-mile distant station on a loud-speaker. Read what he says :

Reading a report of the Crusader in your November number, by a reader in South Africa, I thought perhaps you may be interested in my results.

He stated he got loud-speaker results from a station 1,000 miles away. Well, perhaps the wavelengths differ, but I have had loud-speaker results, loud enough to hear *distinctly* 30 ft. from the loud-speaker, of a station over 12,000 miles away. This station was PCLL.

I have logged this station three times in the last fortnight with this success. They were conducting telephony tests with ANE, which came in almost as well.

I have also had loud-speaker results of 2ME, W2 XAF, W2 XAD, W2 XG, PCJJ, and RFN. Other stations I have logged are 5 SW (about R3 to R4, phone strength), 3LO (which is only twenty miles away), 6AG (Perth, 1,700 air miles), a French station I was unable to identify; also another Russian and Dutch station. Besides these about thirty Australian and New Zealand amateurs (this is telephony only).

On the waveband from 200 to 500 metres I can tune in 4QG (the farthest A class station from me), which is 700 air miles, at loud-speaker strength, but as there is only a difference of 10 metres between 3LO and 4QG, interference from 3LO was bad.

I have built many sets, but for purity the Crusader stands alone, and for a two-valver (three-electrode valves) the range is splendid.

The only departure from the original circuit was to reverse the leads of the reaction coil and the use of a .00015-microfarad reaction condenser in place of .0001 microfarad.

The short-wave coils I wound myself of No. 16-gauge d.c.c. wire. The choke is only a 200-turn honeycomb unmounted coil, and there was no trouble taken over the set. The valves I used were detector A415 and audio A409 (Philips).

Wishing that great journal of yours the success it deserves.

◆ ◆ ◆

FIDELITY FIVE

SO much does a Gerrards Cross reader think of the Fidelity Five (WIRELESS MAGAZINE, *March*, 1928), *that he fears the publication of his letter will lead a member of the staff to demand an increase in salary! His praise, however, is almost sufficient reward :*

I have made up your Fidelity Five and the mains unit you recommended for it.

Of the latter it suffices to say that it is not possible to detect, in the loud-speaker, its existence.

The set is simply magnificent. I compared it with another four-stage set on which I used LS5A valves in parallel on 350 volts H.T. And with half the H.T., and goodness knows how much less L.T. consumption, I get a roundness of tone and a definition that I have never heard elsewhere—and that on my good Celestion, now three years old.

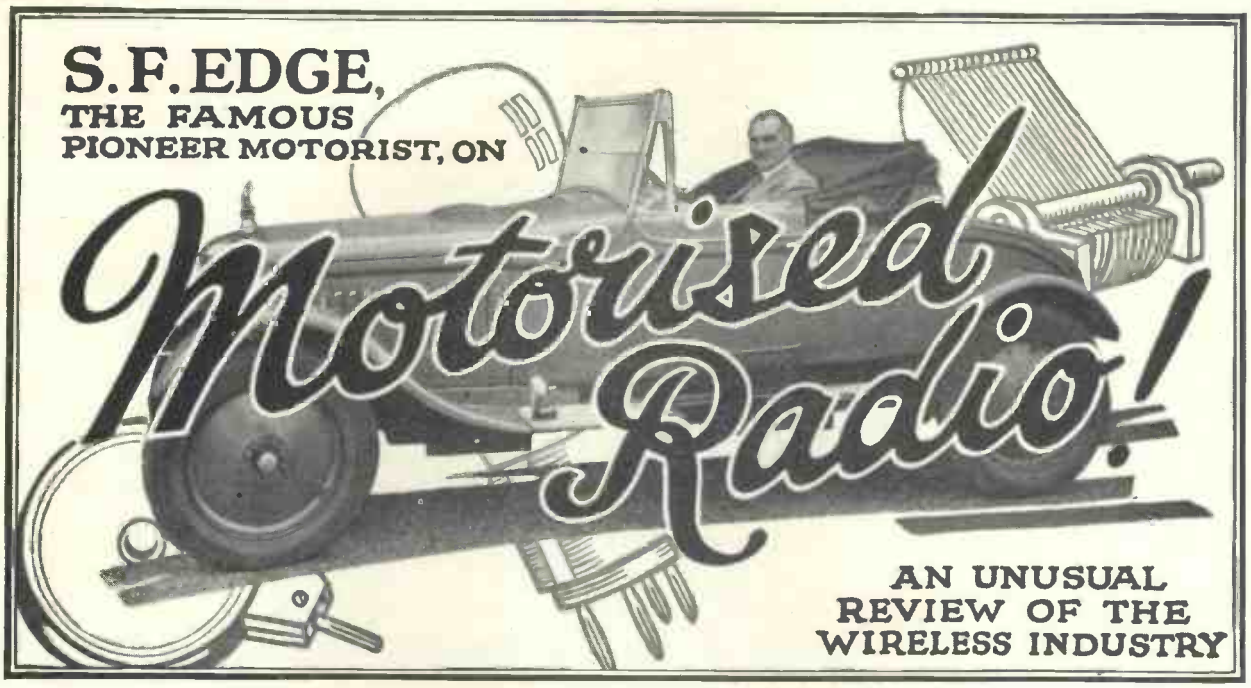
It will tune-in umpteen foreign stations, with careful tuning. But a broadcast receiving set, being a means to an end and not an end in itself, that is no way to appraise a set. The point is that wherever interference, morse, heterodyne whistles, and other delights of foreign listening allow, it brings them in with wonderful quality.

There is on your staff the world's champion godfather : he has "named his child" to perfection. But I should not show him this or he will want his salary raised !

Something more than just praise for the WIRELESS MAGAZINE *are the letters from readers reproduced in these pages—they are a definite help to the amateur who wants to build a new set, for they do give an unbiased view of what each receiver will accomplish in different localities.*

Remember that back copies describing any of these sets can be obtained for 1s. 3d. each, post free, and that full-size blueprints are available as indicated on another page of this issue. Readers are invited to send us photographs of WIRELESS MAGAZINE *receivers they have built; for each one printed we shall pay a fee of half a guinea.*

S. F. EDGE, THE FAMOUS PIONEER MOTORIST, ON Motorised Radio!



AN UNUSUAL REVIEW OF THE WIRELESS INDUSTRY

FIRST, let me make the explanation which is needed before I make any comments on wireless, which is a hobby, an entertainment and almost a necessity for well over two-and-a-half millions of people.

From My Own Pinnacle

I have been interested in radio ever since it first became popular in this country. I am not, as you know, connected with any "tradey" side of wireless, but as a car manufacturer and as any ordinary person just interested in anything electrical or mechanical, I have viewed from my own pinnacle the growth of broadcasting.

Perhaps I am not so keen a listener or radio technician as many other readers of the WIRELESS MAGAZINE, but I do think that, when it comes to comparing radio with motoring, my private opinions may help.

At least, that is how it struck me when I was asked to talk about "motorised radio."

Radio Following Car Practice

Now I don't want to make myself unpopular but "motorised radio" is *right*. Radio is following car practice in so many things that it is strikingly obvious to anyone such as myself, who has to be in intimate touch with every sphere of motoring practice.

You can all see this for yourselves. Do you remember the time when motorists were looked upon as "freaks," and Continental cars were regarded, in lay knowledge, as the best obtainable? I'm talking about the early nineteen-hundreds. I, in common with many whose names are household words nowadays (Col. Charles Jarrott for example), did my bit towards popularising motoring, and I can tell you we had a very hard job of it.

We had to fight red-tape officialdom and, what was just as bad, opposition from just the class to-day which is taking advantage of the cheaper motoring movement. But we did away with the red-flag man, we got roads fit for motoring, and we made motoring cheaper.

Now where does the wireless come in? Well, although the boom started about twenty years later, some hardened folk had to go through just the same pioneering. There was the B.B.C. to found; again there was officialdom to fight; and it was a hard job to make the Post Office look with a kindly eye on broadcast listeners; there were some most difficult technical problems to solve, and they all had to be solved before wireless could become the entertainer for the average man.

Some of my new-motorist friends o-day could never have held an early nineteen-hundred "giant" with a fifty-horse engine doing the same as a modern "twelve" or "sixteen," with high-pressure tyres and with no front-wheel brakes.

Some of my other acquaintances, who are listeners, know *nothing whatever* of the working of their sets; they do not compare with those amateurs who first transmitted and received across the Atlantic, or even with the few hundreds who used to listen to Capt. P. P. Eckersley at "Two-em-toc. Wr-r-r-rittle!"

But enough of *status* comparisons. I see that the radio industry is copying good points from the motoring industry, and I think it is right to do so.

Economical Mass Production

Mass production is the most obvious example. Just after the War, wireless valves cost two or three pounds a piece, and they were wasteful of current. But by means of machinery almost identical with that which has made the mass production of small motor parts possible, valves (and very good ones, too) can be had for only a few shillings each.

Small press work has been developed very largely for car parts, and the adoption of such methods for radio manufacture has cheapened cost beyond all realisation. You will see this for yourself in terminals, the little fittings on components, and in the electrodes of valves and so on.

Cutting Down the Cost

Bigger things are now being mass-produced for wireless purposes, and ordinary listeners, who have no idea of the actual cost of the parts in their sets, would be amazed if they could know how manufacturers strive to cut down cost by quantity and "flow" production in order to sell sets and parts cheaper, and so to get increased sales.

All kinds of instances strike me. I have just been looking at a friend's new three-valver, of which he is very proud; it gets about twenty or thirty stations on the loud-speaker, and I know that this is no exceptional performance. The complete outfit cost about £10 to £12, which is ridiculous in comparison with our £40 to £50 sadly inefficient five-valvers of about five years ago.

Cabinet of Pressed Sheet Iron

The cabinet, which at first glance seems to be an excellent example of the cabinet-maker's work, is actually of pressed thin sheet iron, and the framework is riveted. It is cellulosed to give an imitation wood finish similar to that with which some of my cars are turned out; the cellulose lacquer was obviously sprayed on, as is done when covering car bodies.

The interior of the set is an exhibition of the very best cheap press-work in soft metal, and the wiring is arranged so that it can be done in "flow" production style by a row of operatives armed with electric soldering bits.

Could anything be more "motorised"? But, as I say, this is just as it should be, because the car has taken the brunt of the pioneer work, and can afford to hand on its experience to industries which, like wireless, are following it.

Would you care to think that, if the manufacturer of your set had not followed car practice, it might have cost anything from 25 to 50 per cent. as much again in initial cost?

I can assure you that radio manufacturers will, in the next year or so, follow car practice even closer, and sets and parts will be cheaper in consequence.

Motorists and Listeners

Now there is another aspect which I know you will want me to speak about, and that is the relation between motorists and listeners. A question I am often being asked is: "Will a wireless set ever become a standard fitting with a luxury car?"

This latter development has, of course, already been made in one or two cases. Portable sets with frame aerials, with "juice" supplied by the car battery, have been requested by some wealthy purchasers when ordering a new car, and of course there are many thousands of ordinary folk who take portables with them when bound on motoring picnics.

A year or two ago the technical difficulties associated with portables made their use in cars of necessity very restricted, but with the advent of screened-grid valves many of the "snags" have been overcome. I can't put the credit for that on the car industry! But I do think that in perhaps a year or so you will find wireless sets being actually *built in* cars.

This would make *radio en route* ever so much more popular. Tuning and control panels might be incorporated with the metal facia board of the car itself; the wiring might be carried out direct from the car battery, and in the case of fabric saloons with no metal framework, an ordinary aerial might be hidden in the roof. There is a big scope, apart from entertainment, for this kind of thing.

Many business men and travellers who are constantly on the road in their cars would welcome the opportunity to be constantly in touch with the news bulletins, and I am not one of those who are always striving against Savoy Hill administration and saying that nothing valuable ever emanates over the ether from B.B.C. stations.

It is a comforting thought that, at present, the majority of private car owners are keen on wireless. This, I suppose, is simply because the average motorist (while not such a wealthy person as the Treasury likes to think) is generally able to afford, easily, a wireless set of some sort.

Also it is generally the case that the average motorist takes an interest in anything mechanical or electrical and so the desire to "meddle" with a wireless set is intensified.

Now this is bound to affect the wireless industry. Without considering influence, wireless licences are increasing by leaps and bounds. Since January, 1926, there has been an increase of about *a million* listeners!

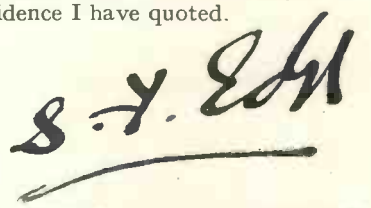
A Boost for Motoring

Everyone knows what a boost to the motoring industry has been given by the small-car movement, and newcomers are flocking to cars which combine a pleasing luxury with low cost.

I know I am not exaggerating when I say that nine-tenths of these newcomers, if not already listeners, will, by reason of their touch with motoring, be brought into very intimate temptation by the pleasures to be had from a wireless set. The buying of a car will tend to make them become both motoring and wireless "fans."

The Listeners' Debt

I have tried to show in what way I think all listeners are indebted to the motoring industry. Perhaps you never had cause to think about this before. Take a look into your own set and see if you can find any of the evidence I have quoted.



SCHOOLBOY'S WIRELESS HOWLER

When asked what Columbus was trying to discover in 1492, the smart reply came that he "was looking for a short-wave hook-up to get India."

If the WIRELESS MAGAZINE *had been published some few years earlier, no doubt his difficulty would have been solved.*

AN OPTIMISTIC READER

Everybody knows that all WIRELESS MAGAZINE *receivers are first-rate. However, we do not advise readers to follow the example of an enthusiast who boasts that he took a six months' language course in order to be able to identify stations picked up on his* WIRELESS MAGAZINE *one-valver!*

Building Your Own L.T. Charger

(Continued from page 457)

Tap number 1 is the 80th turn and tap number 7 the 50th. These figures show that a sufficiently wide range of current is available, but additional tappings could, of course, easily be arranged for. They may be taken to a small terminal strip which may be fastened to the clamps of the transformer. The completed unit may be employed with suitable choking coils and condensers for supplying the filament current for two-volt valves.

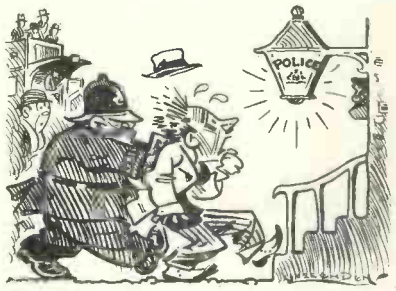
As there is a fall in voltage over the choking coils and in the transformer and rectifiers it is essential that a small regulating resistance be employed in order to adjust the filament voltage.

Overheard at the Charging Station

SOME GOOD ADVICE IN A PALATABLE FORM

I CALLED in at the local charging station yesterday, to collect my accumulator after its fortnightly "feed." Another customer, however, was just before me—a middle-aged man, carrying a two-volt glass cell.

This he handed to the Expert-with-the-Voltmeter who presides over the



I called in at the local charging station

charging station. The E-with-the-V took the cell, held it up to the light, ran a critical eye over the plates, and inquired, "When do you want it back?"

"Oh, there's no hurry," replied the middle-aged man, "Give it a good charge, and I'll call round for it in a few days."

"Right you are," said the E-with-the-V, handing the cell to a waiting

Squeezing the maximum

satellite, who promptly disappeared with it into subterranean depths from which the faint hum of a charging plant was audible . . . "You're not like most of my customers!" added the E-with-the-V.

The middle-aged man looked surprised.

"How not—what do you mean?" he asked.

"Why, this," replied the E-with-the-V. "Most of the people round here simply won't give their batteries a chance. I'm only too pleased to charge them properly, but so many of my customers simply won't let me! They bring in the batteries on Friday night, generally in an over-discharged condition, and come round clamouring for them on Saturday, regular as clockwork!"

"You mean that they won't leave the batteries long enough for you to give them an adequate charge?"

"That's the trouble exactly," assented the E-with-the-V. "And there's no getting them out of it, either. I tell them that hurried charging combined with over-discharging is thoroughly bad for most types of accumulators, but it doesn't seem to convince them.

"All that they seem to care about is getting the cells 'cooked' as quickly as possible, and then squeezing the maximum amount of 'juice' out of them. So they go on paying me to recharge their batteries twice as often as would be necessary under fair treatment."

"Then I should think it must be a profitable business from your point of view!" commented the middle-aged man.

The E-with-the-V shook his head. "Not in the long run," he said, "and I'll tell you why; the battery can't stand up to that sort of treatment for long, and begins to give inferior results. Then the owner gets a friend who is an 'expert' to come round and see what's wrong with the set.

"He pounces on the L.T. battery at once, says its been faultily charged, and asks, 'Where do you take it?' 'Oh,' says the owner, 'I get it charged at So-and-so's.' 'Well, he evidently does it very carelessly. You take my advice and try somewhere else!' says the 'expert,' and so, of course, in that way I lose customers. Therefore, you see, hurried recharging at frequent intervals doesn't really pay me in the long run, and it pays the customers still less, only they don't seem to realise it!"

"But you must surely admit," said the middle-aged man, "that it isn't always the fault of the customer. There are a good many firms adver-

Try somewhere else!

tising that they charge accumulators who do the job badly or carelessly, even when the customer is in no hurry to get his battery back.

"In cases like that, it isn't much use for the customer to leave his battery at the shop for several days. The battery is simply put on one side until there are a sufficient number in to make it worth while to run the plant, and then they are all slung

"Oh, I quite agree"

on together for the shortest possible time—often at an incorrect charging rate."

"Oh, I quite agree," said the E-with-the-V, "but the thing to do is to search around for a really reliable charging station, and then, having found it, to leave your battery there long enough for it to be charged properly."

W.O.

Even the most experienced listener sometimes comes up against a tricky problem that he cannot solve unaided. The "Wireless Magazine" Technical Staff has a special department to deal with such matters.

Just write your queries (not more than two can be asked at a time) on one side of a sheet of paper and send them, together with the coupon on page iii of the cover, a fee of 1s. (postal order, and not stamps), and stamped addressed envelope to:—Information Bureau, "Wireless Magazine," 58/61 Fetter Lane, E.C.4.

The Continental Two

AN ALL-WAVE SET WITH CHOKE-FED TRANSFORMER COUPLING

FOR use in a thickly-populated district, where conditions are none too good, it is usually necessary to use at least three valves in order to get loud-speaker reception of a number of stations. In outlying areas, on the other hand, particularly in places on high ground, it is often possible to get remarkable results with only two valves.

On the Fringes of Big Towns

In giving our readers details of the Continental Two, we have in mind the many thousands of listeners who live on the fringes of big towns and who are, therefore, in the best position to take advantage of a simple two-valver.

This set has only one tuning control, is not critical as regards valves, consumes only about 7 milli-amperes high-tension current and covers without a break all wave-lengths from 200 to 2,000 metres. There are no coils to change and anybody can operate the set after a few minutes' handling of it well enough to bring in a number of stations on the loud-speaker without difficulty.

Above the Average

We wish, moreover, to state quite clearly that the performance of the Continental Two is considerably better than that of the average two-valver as regards volume and quality. One of the reasons for this is that the intervalve transformer is choke-fed from the detector anode circuit.

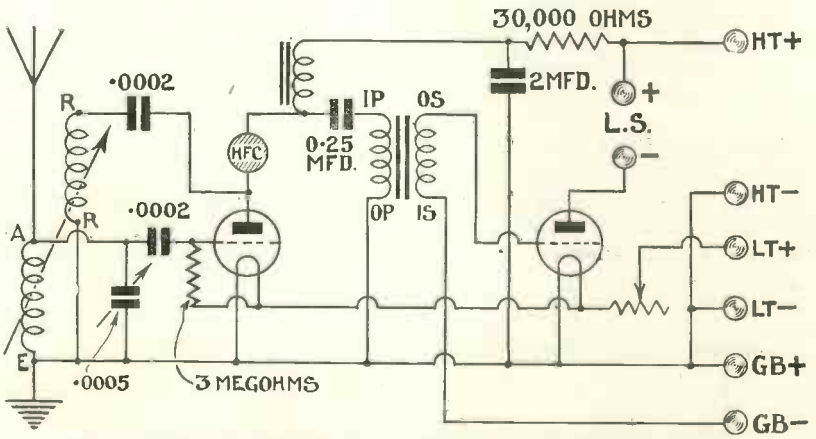
Readers of the WIRELESS MAGAZINE must be well aware of the method of supplying a choke feed (or output) to a loud-speaker in order to prevent the heavy direct current in the anode circuit of the last valve from damaging the windings.

Actually, a low-frequency choke is placed directly in the anode circuit. This allows the passage of direct current from the valve to the high-tension battery but blocks the passage of low-frequency signal impulses. The loud-speaker, therefore, is joined in series with a large capacity condenser (usually 2 microfarads), one side of the latter being connected to the anode end of the choke itself.

The free side of the loud-speaker is taken to the negative side of the high-tension battery and thus a path for the signal currents is formed. The 2-microfarad condenser, of course, blocks the passage of direct current through the loud-speaker.

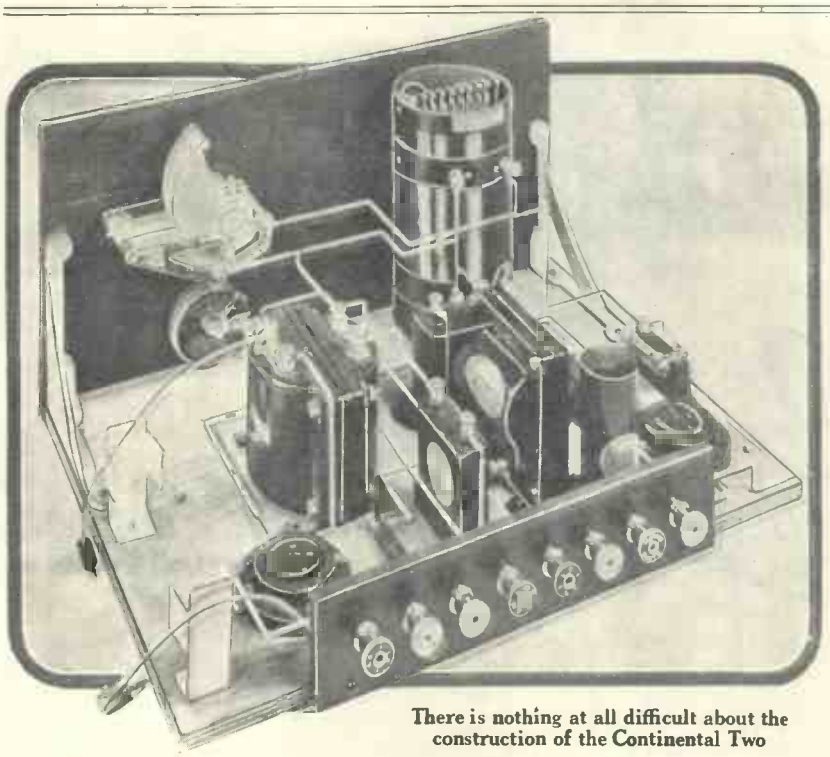
In the Continental Two the same principle is applied to the intervalve transformer, the steady detector anode current not being allowed to pass through the primary winding.

Thus full advantage can be taken of a high-ratio transformer and in this circuit a step-up of 1-6 or 1-8 can be utilised without any sacrifice



Here is the Circuit of the Continental Two. Note the choke feed to the transformer and the "motor-boat" stopper.

The Continental Two *(Continued)*



There is nothing at all difficult about the construction of the Continental Two

of quality as would normally occur if choke-feed were not employed.

Details of the actual circuit will be clear from the diagram on page 465. It will be seen that a form of Reinartz reaction circuit is employed, but instead of the capacity being variable and the coil fixed (as is normally the case with an arrangement of this type) the position is reversed.

Moving Reaction Coil

A small fixed condenser is employed and the coupling of the reaction coil with respect to the grid coil is made variable. A high-frequency choke is included in the detector anode circuit.

The only other particular feature that need be specially noted is the choke-feed arrangement for the primary of the low-frequency transformer.

As has already been briefly explained, a low-frequency choke is placed in the detector anode circuit; this allows direct current from the high-tension battery to pass to the anode of the valve, but blocks the passage of low-frequency signal impulses.

These low-frequency impulses, however, find a path through a large coupling condenser and thence to the primary of the transformer which can have a comparatively high ratio, say 1 to 6 or 1 to 8, if desired.

High Magnification

By preventing the passage of direct current through the transformer in this way, full advantage can be taken of its primary inductance and a high-magnification valve can be used as detector.

It is important, however, that the coupling condenser should be of the value specified and that a transformer with a primary impedance corresponding to that used in the original WIRELESS MAGAZINE receiver should be utilised.

The value of the coupling condenser used in the Continental Two has been carefully calculated by J. H. Reyner, B.Sc., A.M.I.E.E., our Technical Editor, and should be strictly adhered to for the best results.

Although the high-tension current consumption of this set will only be about 7 milliamperes, a "motor-boat" stopper has been provided, so that it can be used with a mains supply unit if desired. A suitable unit for use in this case is the W1B model made by the Regent Radio Co.; it gives 120 volts at 18 milliamperes from 200-volt alternating current mains.

Arrangement of "Stopper"

The actual "stopper" consists of a 30,000-ohm resistance in the detector anode circuit in conjunction with a 2-microfarad fixed condenser, one side of which is connected to the negative side of the detector filament.

COMPONENTS REQUIRED FOR THE CONTINENTAL TWO

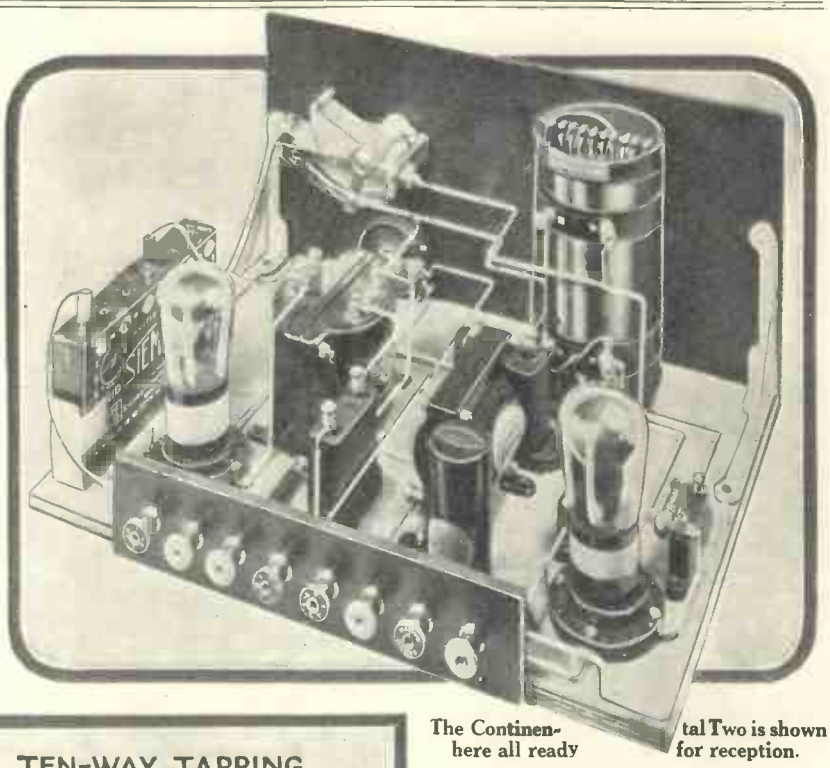
	s.	d.
1—Ebonite panel, 14 in. by 7 in. (Becol, Raymond, or Northern Radio)	8	3
1—All-wave tuner (British General)	18	6
1—.0005-microfarad variable condenser (Jackson, Lotus or Lissen)	11	6
1—15-ohm panel rheostat (Lissen, Igranic or Peerless)	2	6
2—Antimicrophonic valve holders (Lotus, Formo or Peto-Scott)	3	0
2—.0002-microfarad fixed condensers (Trix, T.C.C. or Lissen)	2	6
1—3-megohm grid leak (Peto-Scott, Lissen or Ediswan)	2	6
1—High-frequency choke (Lissen, Wearite or Ready Radio)	5	6
1—Low-frequency choke (Ferranti type B3 or Igranic type F)	14	0
1—.25-microfarad fixed condenser (Lissen, T.C.C. or Dubilier)	2	0
1—2-microfarad fixed condenser (Lissen, Ferranti, or T.C.C.)	3	6
1—30,000-ohm resistance (Graham-Farish, Ediswan or Trix)	2	3
1—Low-frequency transformer (Marconiphone Ideal, 8 to 1 ratio)	25	0
1—Pair grid battery clips (Bulgin)		6
1—Terminal strip, 9 in. by 2 in.		9
8—Terminals, marked: Aerial, Earth, L.T.+, L.T.—, H.T.+, H.T.—, L.S.+, L.S.— (Eelex or Belling-Lee)	3	0
2—Wander plugs, 1 red and 1 black (Lectro Linx, Belling-Lee or Igranic)		4
Stiff wire for connecting (Glazite)	1	0
Length of rubber-covered flex		2
1—Cabinet with 10 in. baseboard (Carrington)	23	6
Total Cost (approximately)	**£7**	**10** **3**

Special Choke-feed to Transformer Primary

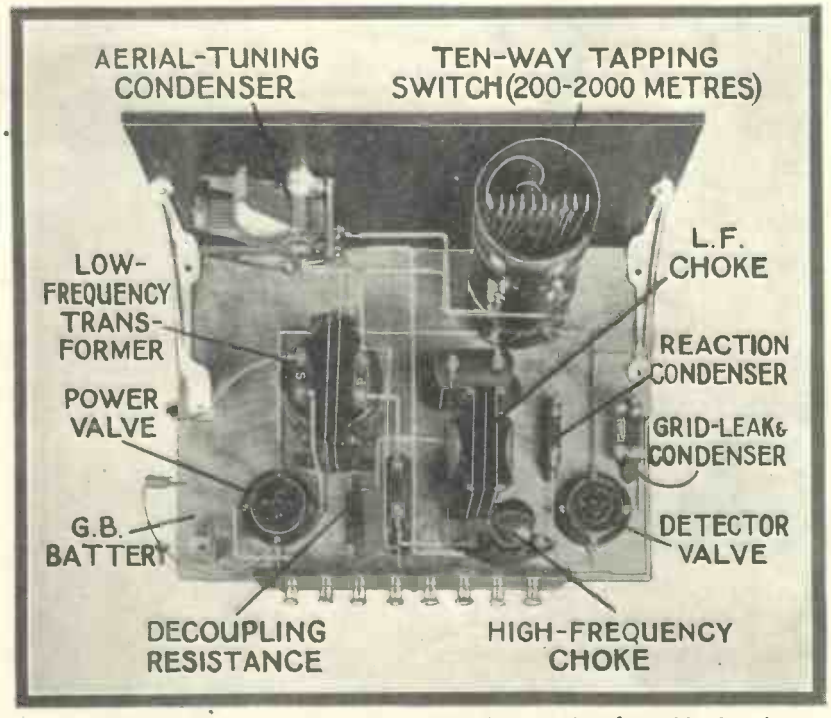
If it is intended to use the set only with dry batteries, this stopper can be omitted; it is really only essential if a mains supply unit is to be utilised. On the other hand, even if dry-battery supply is employed, the stopper can be retained with advantage; its inclusion will usefully lengthen the life of the battery, which can be kept in use much longer without low-frequency oscillation occurring than would otherwise be the case.

Tuner Tappings

There are several special points to note about the actual components used in the Continental Two. In the first place the tuner—which has been previously used in a popular two-valver called the Meteor Two (WIRELESS MAGAZINE, December, 1928)—covers, without any gaps, a wave-band of approximately 150 to 2,000 metres. This is accomplished by a ten-point tapping switch, easily controlled from the front of the set.



The Continental Two is shown here all ready for reception.



The positions of all the parts in the Continental Two are clear from this plan view.

The reaction coil is pivoted (inside) at one end of the main coil, its position being determined by a knob on the panel. The size of the coil is so proportioned that reaction can be obtained without difficulty over the entire tuning range of the set.

As a rough guide to constructors of the Continental Two, we give below the wavelength ranges of the different tappings, and also indicate some of the stations that were obtained at a distance 16 miles from London during a short test one evening. The aerial used was only 25 ft. long :—

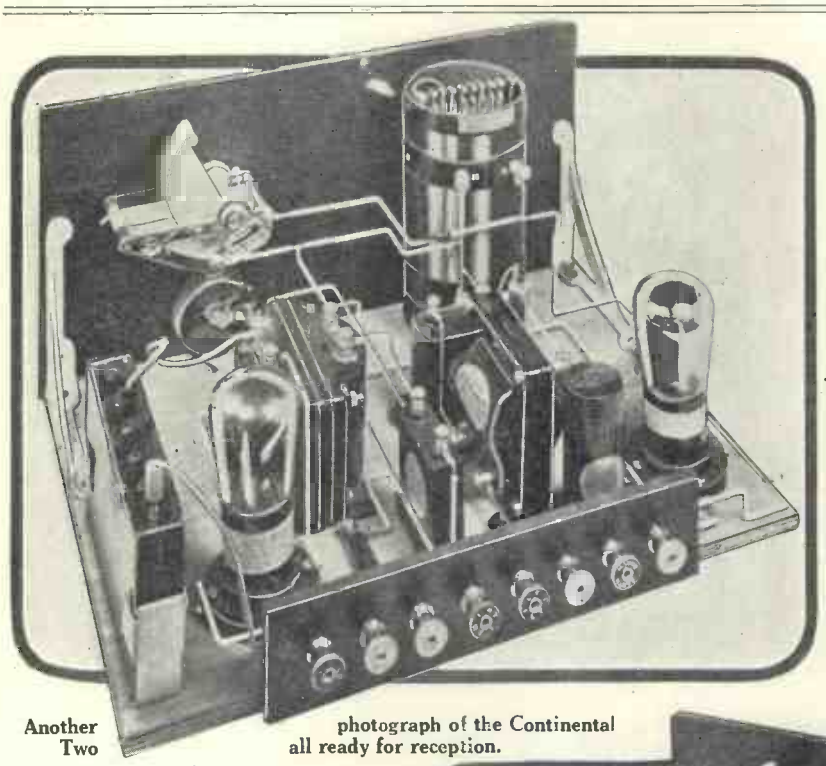
Tap No. 1.—150(?) to 200 metres.
Tap No. 2.—220 to 370 metres. Stations heard : Nurnberg, Bournemouth, London.
Tap No. 3.—300 to 550 metres. London, Daventry Experimental.
Tap No. 4.—350 to 800 metres. London, Daventry Experimental.
Tap No. 5.—460 to 900 metres. Daventry Experimental.
Tap No. 6.—550 to 1,100 metres. Hilversum.
Tap No. 7.—800 to 1,380 metres. Kalundborg, Hilversum.
Tap No. 8.—900 to 1,550 metres.
Tap No. 9.—980 to 1,900 metres. Huizen, Radio Paris, Motala (phones), Daventry Senior, Hilversum.
Tap No. 10.—1,050 to 2,000 metres. Radio Paris, Daventry Senior.

It is important for the best results that the same low-frequency transformer should be employed as is utilised in the original WIRELESS MAGAZINE set.

Full-size Blueprint Available

There is nothing difficult about the construction of the set, especially if a full-size blueprint is used. A blueprint can be obtained for half-price, that is 6d. post free, if the coupon on

The Continental Two *(Continued)*



Another photograph of the Continental Two all ready for reception.

page iii of the cover is used by June 30. Ask for No. WM143, and address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4.

Mounting the Components

After drilling the front panel, mount thereon the components as indicated by the photographs and blueprint (or the reduced reproduction which appears on page 469).

Next, fix the panel to the baseboard and place the remainder of the parts in position. When everything has been properly laid out, wiring up can be started. At this stage a full-size blueprint will be invaluable.

A glance will reveal that every wire is numbered. This numbering is not a haphazard scheme; if the connections are made in the order indicated, the wiring will automatically be built up in the most efficient way. As each connection is made, the corresponding number on the wiring diagram should be crossed through. In this way there is no possibility of error.

Suitable Valves to Use

Before the set can be used, suitable valves must be obtained. In our tests of the set excellent results were obtained with two four-volters—a Mullard PM3A (the characteristics of which have been recently improved to an impedance of 55,000 ohms and an amplification factor of 38) and a Cossor Stentor Four.

Actually, any valve with an impedance between 15,000 and about 60,000 ohms can be used as the detector, while the power valve can have an impedance between 2,000 and 6,000 ohms. The higher the impedance the higher will be the total magnification obtained, although if too high a value is used for the last stage, quality may suffer to some extent.

A Selection of Two-volt Valves

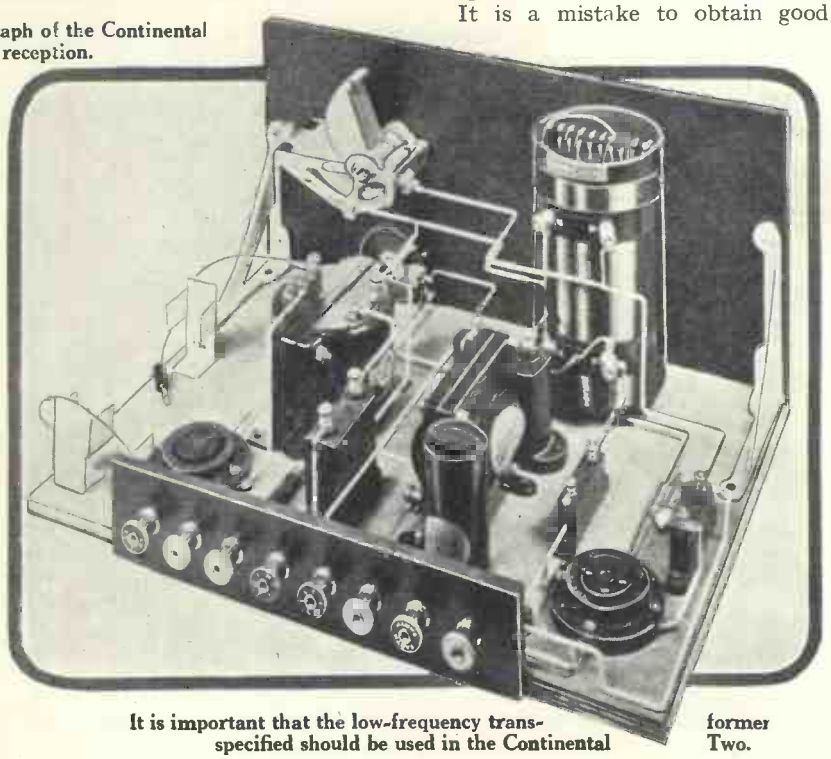
Below we give a list of two-volters that may be tried in the Continental Two :—

Detector : Cossor 210RC, Mullard PM1A, Marconi DEH210, Osram DEH210, Mazda HF210, Six-Sixty 210HF, Ediswan HF210.

Power : Mazda LF215, Ediswan PV215, Cossor 220P, Marconi DEP215, Osram DEP215, Mullard PM2, Six-Sixty 215P.

For other valves in the four- and six-volt ranges see the complete lists on pages 402 and 404 of this issue.

It is a mistake to obtain good modern valves and then not to give them sufficient power to get the maximum efficiency. In other words, do not be afraid to use a full 120 volts on the anodes. Many listeners still only use 60- or 90-volt batteries and wonder why their reception is not so good as it should be.



It is important that the low-frequency transformer specified should be used in the Continental Two.

Powerful Enough to Tour Europe !

Do not forget that there is always a voltage drop in loud-speaker, choke, and transformer windings, and that even when 120 volts is applied to the H.T. terminal of the set, all of this voltage is not available for the valve anodes. It pays in results to use a high-voltage battery of ample capacity.

Operating the Set

To operate the Continental Two (having connected up the necessary batteries as indicated, and inserted the valves in their holders), turn the knob of the filament rheostat as far as possible in a clockwise direction; this will switch the set on.

Next, adjust the tapping switch of the tuner for the reception of the local station. The list of wave-lengths already given will act as a rough guide—with most aerials, for instance, London and Daventry Experimental will be received on tap No. 4.

Turn the knob controlling the reaction coil until the set just starts to oscillate, this state is indicated by a slight rustling or hissing sound heard in the loud-speaker. Adjust the knob of the main tuning condenser until the desired signal is heard; then readjust the reaction for the best results.

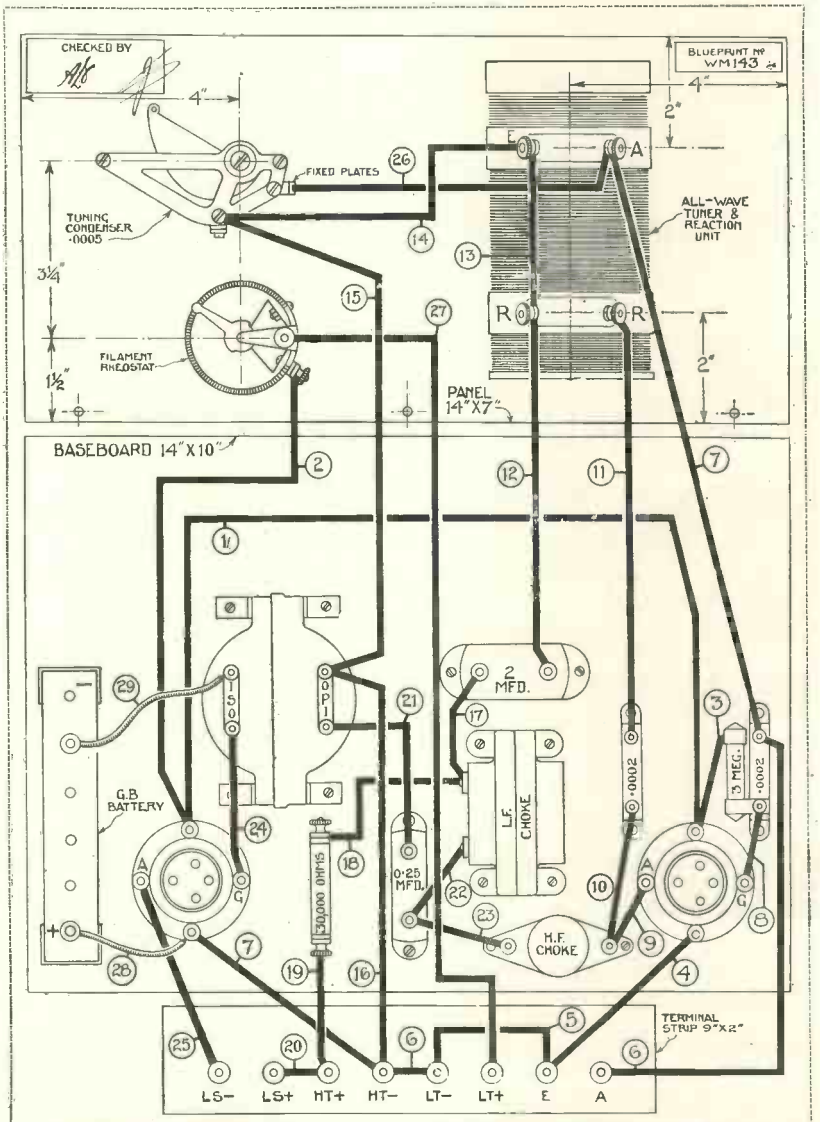
If Reaction is Too Fierce

If reaction is found to be fierce with the particular detector valve used, then increase the value of the anode resistance from 30,000 ohms to 50,000 ohms or even more.

It will be found that the results depend to a large extent on the fine control of reaction and, although this state of affairs is by no means ideal, it is inevitable if good results are to be obtained from two valves. The list of stations already given is some indication of what can be accomplished.

Affect on Selectivity

Beginners should also note that the proper use of the reaction control also affects the selectivity of the set. For instance, if it is found that a powerful station comes in over a large section of the condenser dial, the application of reaction will considerably sharpen the tuning and enable an undesired station to be tuned out.



This layout and wiring diagram can be obtained as a full-size blueprint for half-price, that is 6d, post free, if the coupon on page iii of the cover is used by June 30. Ask for No. W.M.143. Wire up in numerical order.

Those who wish to take particular precautions with their loud-speaker and phones (the Continental Two is ideal for really long-distance phone reception) will like to use some kind of output unit external to the set.

For this purpose a 1-to-1 ratio output transformer, such as the Ferranti OP1, or a choke-output unit, such as that made by Igranic, is to be recommended. With either of these devices all danger of damage to the loud-speaker or phones is definitely removed and the maximum efficiency will be obtained from them.

This concludes our comments on the Continental Two. It now only remains for you to avail yourself of the work of the WIRELESS MAGAZINE Technical Staff and enjoy broadcasting to the full. Just one more word, though—when you have built the set will you write and tell us what it will do?

Such information about sets as is contained in letters such as those published on pages 460 and 461 is invaluable to your fellow-constructors and is appreciated by WIRELESS MAGAZINE readers the world over.

TELEVISION IN THE U.S.A.

Regular Programmes Expected Soon

REGULAR television programmes soon will be available to the American radio public following the recent action of the Federal Commission at Washington in granting experimental licences to seventeen stations. Some already have been built, and others are under construction.

For Six Months Only

The licences are for six months, and call for operation in two channels, one between 2,000 and 2,200 kilocycles, and the other between 2,750 and 2,950, corresponding to wavelengths of 136.3 to 149.9 and 101.6 to 109 metres.

Television broadcasts are no longer permitted on regular broadcast bands except between 1 and 6 a.m.

The following stations received authorisation for picture transmissions :—

W2XBW and W2XBV, Radio Corporation of America, owned in New York and New Jersey.

W3XK, Jenkins Laboratory, Inc., Washington.

WAAM, Newark, Westinghouse Electric and Manufacturing Co., four stations in East Pittsburgh, Pa., and Springfield, Mass.

General Electric Co., two stations, Schenectady and Oakland, Cal.

Pilot Electric Co., Brooklyn.

Chicago Federation of Labour.

Aero Products, Inc., Chicago.

Lexington Air Service, Lexington. Mass.

William Justice Lee, Winter Park, Fla.

B. P.

EMERGENCY NEWS BY RADIO

Scope of Army-amateur System Increased

THE emergency news service rendered by members of the American Radio League in co-operation with the United States Army Signal Corps has proven so valuable in the past that officials of these organisations have decided to increase its scope.

Proving Their Worth

During the past three years this amateur radio transmitting group has proved its worth in broadcasting. emergency reports of tornadoes, floods and other disasters in which ordinary land wires were rendered useless.

"Three years of operation under the original plan have demonstrated the advisability of reviving that plan to provide for an expansion of the system to cover more thoroughly all parts of the United States," says Major General George S. Gibbs, chief army signal officer.

The present plan, which recently went into effect, calls for the banding together of amateur operators in what is known as the Army Amateur Radio Net. This is composed of one station in each army corps area, of which there are nine in America, and in each department in which amateur activities are permitted. The control station of this system is at Fort Monmouth, New Jersey.

Each corps area has its own amateur radio net, taking in one station in the capital of each of the states in the area. This network is subdivided into approximately five geographical areas, known as state amateur radio nets, with the state capital having the net control station.

Connected with the state amateur radio nets will be the district amateur radio nets, situated in each state so as to give the best possible service.

The last division of this large network is the local amateur radio net, which is composed of all amateurs in local areas.

At the head of this league is the chief army signal officer. Other officials are corps area signal officers. These officers will appoint an officer to act as corps area liaison agent between representatives of the transmitting radio amateurs of that corps area and the corps area signal officer.

One amateur, known as the "Radio Aide," will represent amateurs of each corps area. A "Chief Radio Aide" will act as army representative of all transmitting amateurs of the United States.

In Charge of All Material

The army amateurs net control station at Fort Monmouth, New Jersey, will have charge of the dissemination of all material to amateur stations.

Code instruction will be sent amateurs to enable them to encode and decode government messages at all times.

F. P.

"RE-SHUFFLING THE WORLD'S CALL-SIGNS"

To the Editor, WIRELESS MAGAZINE.

SIR,—Those of your readers who have followed the changes under the Washington Radiotelegraph Regulations, dealt with in my article "Re-shuffling the World's Call-signs" (WIRELESS MAGAZINE for February, 1929), may be interested in one or two further points regarding these changes.

I mentioned that alterations would be necessary in the case of the call-signs commencing with B, used hitherto by British Naval stations. These stations, in future, will use call-signs commencing with G, but in a good many instances the necessary change has been effected by merely substituting a G for the B, the original second and third letters being retained. For example, BYA, the call-sign used by the Admiralty station at Whitehall, has now become GYA.

Amateur Call-signs

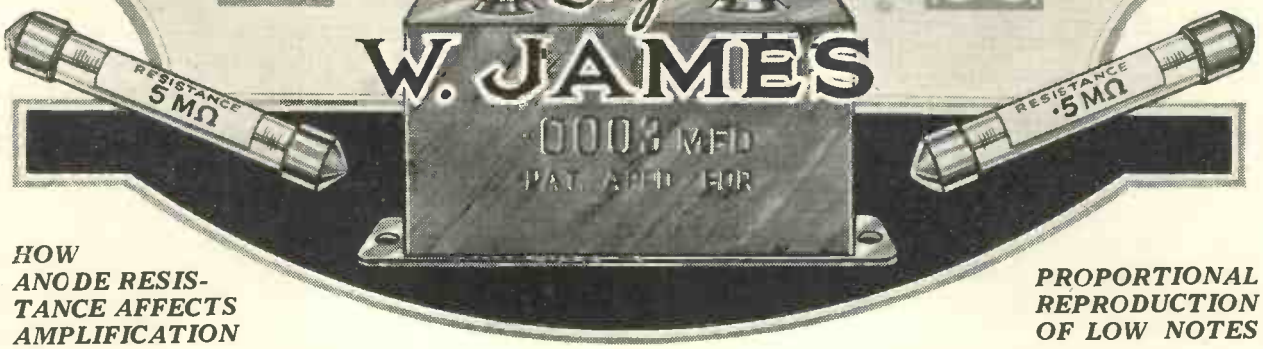
As regards amateur call-signs, the definite adoption of the new nationality prefixes is necessarily a rather slow process, and from the latest available information it appears that relatively few countries have come to a decision so far. Of these, some have agreed to the prefixes provisionally recommended by the Washington Convention (which consisted almost without exception of the first letter or first two letters in the series of call-letter combinations allocated to each country), and some, again, have decided on other prefixes drawn from the series of combinations at their disposal.

I understand, however, that the majority of the countries concerned have not yet definitely allotted any new prefixes to their amateurs, and so affairs in this direction are still "in the melting-pot." It should, of course, be borne in mind that the new prefixes, unlike the old unofficial "intermediates," will really form an integral part of the amateur stations' call-signs.

W. OLIVER.

Get Your Grid Leak and Condenser Right!

Says W. JAMES



HOW ANODE RESISTANCE AFFECTS AMPLIFICATION

PROPORTIONAL REPRODUCTION OF LOW NOTES

WE are able to purchase valves of many different types and for convenience they are arranged in classes according to their electrical characteristics. There are valves of low impedance and others of high impedance, all of which were designed for special purposes.

Working Conditions

A particular valve for resistance amplification might, for example, have an amplification factor of 20 and an anode impedance of 20,000 ohms when the high-tension voltage is 100 and the grid-bias is zero. This information about the valve is, of course, of great importance, but one should not make the mistake of thinking these values of amplification factor and impedance are necessarily correct under all working conditions.

Increased Impedance

Thus, one might employ a negative grid bias of 1.5 volts and an anode voltage of 100. The impedance of the valve would then be greater than 20,000 ohms. Further, if the grid bias were increased to 3 volts negative, the impedance would once again have risen in value.

Similarly, a reduction in the actual voltage on the anode would result in the impedance being increased.

Now let us consider the curve of Fig. 1, for I wish to explain the principles of resistance amplification in a very few words. This curve is an ordinary valve curve taken with a high-tension voltage of 100 and, because the resistance included in the battery circuit is negligible, the anode voltage is also 100 for all values of current.

If, therefore, we vary the grid voltage, Fig. 2A, we only succeed in changing the anode current. The anode voltage does not vary and, as a result, there is no voltage amplification. In other words, if the grid circuit of a further valve were connected to this first valve the signal would not affect the second valve in any way.

Obviously, what we have to do is to connect in the anode circuit a piece of apparatus in order that a voltage may be set up across it when the grid voltage is varied, for then the second valve will receive in its grid circuit a magnified voltage.

We must remember, however, that the anode current can also be varied by altering the anode voltage. In fact, if the current is varied a certain amount by applying a small alternating voltage to the grid circuit, an equal current change will be produced by including in the anode circuit an alternating voltage of M times the grid voltage. The quantity M is the amplification factor of the valve.

In this article W. James, our Research Consultant, explains several points about the design of resistance-capacity amplifiers that will be new to a large number of readers. If your set is not giving the quality you think it should, this article will enable you to put matters right.

Equal Anode Currents

We may, therefore, represent the valve of Fig 2A as in Fig. 3, for the alternating anode current will be equal in both circuits, always remembering that the voltages must not be so great as to overload the valve.

Let us now connect a resistance in the anode circuit of the valve as in Fig. 4. This resistance is marked R1 and there will be a certain fall in voltage across it, with the result the anode current and anode voltage will be reduced.

Effect of Bigger H.T.

The impedance of the valve will, therefore, have increased, but an increase in the voltage of the high-tension battery will bring the anode current back to its former value and also the anode impedance of the valve.

This circuit may be re-drawn as in Fig. 4B, where R2 represents the anode resistance of the valve and R1 the resistance connected to the valve.

A small alternating voltage may be applied to the grid as before, or,

Get Your Grid Leak and Condenser Right! (Continued)

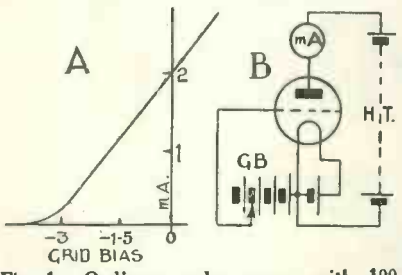


Fig. 1.—Ordinary valve curve with 100 volts on anode

alternatively, an alternating voltage M times greater to the anode, for the resulting alternating current produced will be equal in the two instances. But this current will set up an alternating voltage across the anode resistance. Its actual value in volts will be numerically equal to the resistance connected in the anode circuit in ohms multiplied by the alternating current in amperes. Thus with a resistance of 10,000 ohms and a current of 1/10 milliampere, the voltage will be 10.

Amplification of Single Stage

If we assume that the whole of the alternating voltage set up across the anode resistance is passed to the grid of the next valve, the amplification of a single stage is the ratio of this anode voltage to the grid voltage or E2/E1, Fig. 5. It cannot exceed the value M, which is the amplification factor of the valve and will only approach this value, because part of the alternating voltage is set up across the valve itself.

This will be clear upon referring to Fig. 4B and it is, in fact, easy to see from this diagram that the actual amplification is dependent upon the ratio of the two resistances. If they have equal values, the amplification will be exactly one half of the amplification factor of the valve.

A Simple Formula

As the external resistance is increased in value and the high tension voltage corrected in order to maintain the impedance of the valve, the amplification will increase. Thus, when the value of the resistance is twice that of the valve, two thirds of the amplification will be obtained. These points may be expressed in the following simple form :—

$$\text{Amplification} = M \times \frac{R_1}{R_2 + R_1}$$ where

M=Amplification factor of the valve.

R1=Value of the resistance connected in the anode circuit; and

R2=Anode resistance of the valve.

As an example, one might use in practice a valve whose amplification factor is 20 for an anode impedance of 20,000 ohms (with 100 volts on the anode and zero grid-bias). Therefore, the impedance of the valve when included in a circuit with grid-bias and an anode resistance would probably be 30,000 ohms. A resistance of 100,000 ohms would be

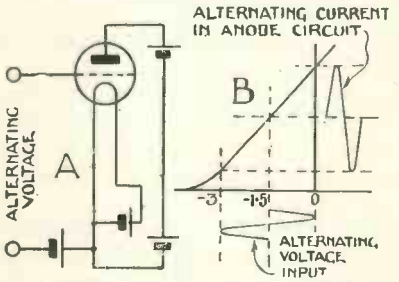


Fig. 2.—Effect of varying grid voltage

suitable for a valve of this type, resulting in an amplification of 15.

If a higher resistance were used, a little more magnification would be obtained, but it is important to remember that for a given value of high tension the impedance of the

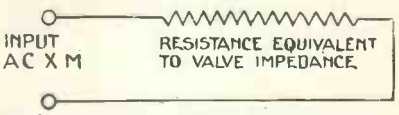


Fig. 3.—Another method of representing valve conditions

valve will go up as the resistance connected to the valve is increased.

A grid condenser and leak C,R3 (Fig. 5) are employed to pass the magnified voltages to the grid of the next valve and they have to be so proportioned that the signals are not unnecessarily weakened.

Now the impedance of a condenser increases as the frequency of the current is reduced, with the result there is a tendency for the lower notes to be weakened. The essential factors are the resistance of the grid leak, which is in parallel with the grid-filament part of the valve, and the capacity of the condenser and what we have to determine is the relationship which exists between them.

We may start by fixing upon a grid leak whose resistance is several times that of the anode resistance and then determine the capacity of a condenser which will result in notes having a frequency of, say, 50 cycles, being passed to the extent of a given percentage of the middle frequencies.

Strength of 50-cycle Note

We may decide that a 50-cycle note shall have about 70 per cent. of the maximum possible strength, or if we desire very good quality of reproduction, the percentage may be 90.

Having fixed these points, it is an easy matter to estimate the capacity of suitable condensers. Let us assume a grid leak of 500,000 ohms to be suitable when the anode resistance is 100,000 ohms. Then a condenser of practically .015 microfarad will have to be used to give us 90 per cent of the full amplification or one of .006 microfarad for 70 per cent.

These grid condenser and leak resistance values may be varied in proportion, always remembering that if the grid leak is increased in resistance, the capacity of the condenser should be proportionately reduced.

Thus, if we have decided to employ a grid leak of 2 megohms we should have had to use grid condensers of one fourth of the above value of capacity.

Loud-speaker Response

When an ordinary loud-speaker is used the grid condenser and leak may be so proportioned that a 50-cycle note has 70 per cent. of the strength of the higher notes. No benefit would result by providing for stronger low tones, as in all probability the loud-

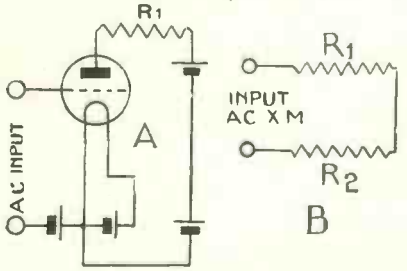


Fig. 4.—Resistance in anode circuit

A Special "Wireless Magazine" Article by W. James

speaker would not respond and motor-boating would be more likely to occur.

We have assumed grid bias to be employed with valve V2 (Fig. 5) in order to prevent grid current. Overloading must be avoided or distortion

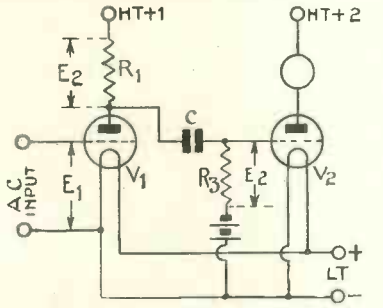


Fig. 5. Application of grid bias

will be produced by the condenser becoming charged and the effective resistance of the grid circuit becoming less than that of the grid-leak taken by itself.

Low Anode Resistance

When the resistance-coupled stage is connected to a large power valve, it is advisable to fit a wire-wound grid leak of fairly low value, such as 100,000 ohms. A coupling condenser of approximately .07 microfarad would then have to be used in order to obtain 90 per cent. of the full amplification at 50 cycles and, because the amplifying valve is connected to the power valve, it will have to be one of the type with a fairly low impedance. The valve will, in fact, be of the semi-power type and a fairly low value of anode resistance will be suitable.

The coupling condenser must have a high value of insulation resistance. This is particularly important when high resistances are used, as a leakage current may materially alter the grid bias of the valve to which the grid leak is connected. Similarly, the valve itself must be perfectly hard, that is, there must be no trace of reverse grid current.

Stray and Self-Capacities

In this short article I have not mentioned the effects of stray circuit capacities and the self-capacity of the amplifying and power valves. They usually reduce the amplification of the higher frequencies, but provided the values of the anode resistance and grid leak are not too great, the effect will not be serious.

The points I particularly wish to emphasise are, first, the amplification is dependent upon the value of the resistance connected in the anode circuit, the anode impedance of the valve and its magnification factor; secondly, for a given proportion of low notes the grid condenser must have a certain size dependent upon the resistance of the grid leak.

The condenser and grid leak in series with the grid of the following valve connected to the junction of the condenser and leak, is a combination which tends to reduce the relative strength of the low notes and it is therefore necessary that these two parts be correctly chosen.

It is the best practice to employ a grid condenser which is much larger in proportion than any of those mentioned above. A condenser of .5 microfarad could, for example, be used with a grid leak of .5 megohm, in order to make certain that none of the low notes present at the beginning of the amplifier shall be lost. A combination such as this has other advantages, but there is also the disadvantage that complete anode circuit filtering is essential.

AVIATION CALL-SIGNS

[*Special notes on the article "When Air-liners Talk by Radio!" which was published in the April issue.*]

THOSE readers who are interested in reception of the inter-aerodrome wireless-telegraphy messages on 1,400 metres, dealt with in my article entitled "When Air-Liners Talk by Radio!" (WIRELESS MAGAZINE, April, 1929), should note that since this article was written certain of the aerodrome station call-signs and aircraft markings have had to be changed in accordance with the new Radiotelegraph Regulations of the Washington Convention.

As regards nationality marks for aircraft, the letter M has been allocated to Great Britain in addition to G, while France will continue to use F, Italy I, and Japan J; the United States have the choice of K, N, or W.

Nationality marks used by other countries will in future comprise the first *two* letters of the call-sign, the new marks for some of the nearer European countries being as follows:

Belgium, ON, OO, OP, OQ, OR, OS, or OT;
Denmark, OU, OV, OX, OY, or OZ;
Irish Free State, EI;
Portugal, CS, CT, or CU;
Sweden, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, or SM.

Marking on Aircraft

In the case of the actual markings on the aircraft, the hyphen separating the nationality marks from the registration marks will, of course, be placed after these first two letters. The hyphen is omitted in the wireless call-sign, which is otherwise identical with the lettering on the aircraft.

In the official table of the new aircraft markings, issued recently, there is no mention of Holland or Germany, but I find from wireless messages received that the Dutch 'planes are now using call-signs commencing with PH, while the German ones are apparently retaining, for the present at any rate, their old call-signs consisting of the letter D, followed by numerals. Presumably the latter will eventually be brought into line with the five-letter call signs which are the rule for aircraft of other countries.

The alterations in the aerodrome call-signs are not very extensive, except in the case of Germany, where those of all civil aerodrome stations have been altered so as to begin with DD instead of AE.

Rotterdam's Change

The call-letters of the Rotterdam aerodrome station (previously PCR) are now PHW, and evidently this change was effected in order to avoid confusion with PCR, Kootwijk, the short-wave commercial transmitter which used to be known as PCRR, but has recently altered its call-sign to a combination of three letters in conformity with the new regulations (one of which provides that land stations shall use three-letter call-signs) by dropping the final R.

Probably the last letter in the new Rotterdam call-sign was suggested by the initial of Waalhaven, the place where the aerodrome for Rotterdam is actually located. W. OLIVER.

REVIEWED BY STUDIUS

BROADCAST MUSIC OF THE MONTH

Gwen Lewis at the piano

AS the so-called "merry month of May" is supposed to be the forerunner to summer, a little lighter fare might well be hoped for in the musical programmes. From an orchestral standpoint, the only concerts of note have been those given at the People's Palace, Mile End, the concluding one of the series given this week being one of the best of the whole number, as most representative of popular and, at the same time, classical music.

Two Items That Create Enthusiasm

Liszt's "Hungarian Fantasia" and Dukas' tone-poem "L'Apprenti Sorcier" can always be relied upon to create enthusiasm, and the two conductors, Sir Landon Ronald and Percy Pitt, were well represented by their own respective works, "Adonais" and "An English Rhapsody," the latter a trifle dull, but perhaps, therefore, thoroughly characteristic of its theme.

There is no doubt that these concerts, built on the same lines as the other Queen's Hall Proms., undoubtedly fill the same purpose, and it is a pity not to give a similar series even when the real Proms. commence in August.

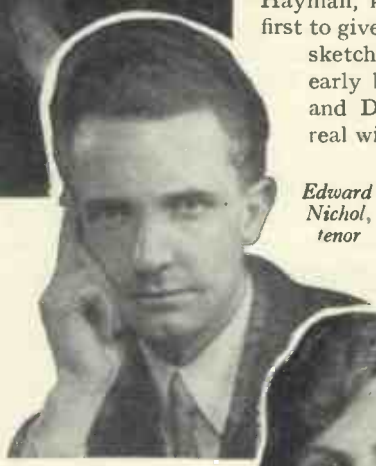
Better Vaudeville Programmes

There has been a great increase in vaudeville broadcast activity and also, one is glad to note, an improvement in the material used, due largely to the fact that experienced and known artistes are being utilised. One is always ready to welcome newcomers to any art, and no doubt the B.B.C. have made many interesting "discoveries"; but for general entertainment purposes one learns to rely upon trained artistes already known to the great masses of the public.

Amongst the stars of the month may be considered Albert Whelan, the Australian entertainer, and Percy Honri, one of the first players of the concertina after "Dutch Daly" had introduced this instrument to the "halls." Mr. Honri makes his début in broadcast, and on May 14 was associated with Julian Rose, Scott and Whaley, and Mabel Marks.

Some Famous Vaudeville Artistes

Joe Hayman and his wife, Mildred Franklin, are also amongst the famous vaudeville artistes. Mr. Hayman, known all over America, was one of the first to give us the comic "Cohen on the Telephone" sketches over here. Norman Long, another early broadcast star, Jack Morrison, Clapham and Dwyer, and "Stainless Stephen" are all real wireless stars.

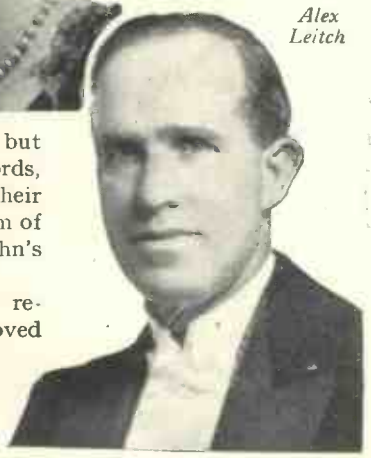


Edward Nichol, tenor

"The Radio-activities"

Mabel Constanduros has formed, in addition to her broadcast work, a little company called "The Radio-activities," and apparently from their seaside reports have done very well. The members include Olive Groves, Harold Kimberley, Claude Chandler, and a fine violinist, Peggy Cochrane, heard early over the ether, and known throughout the country not only for her concert solos, but the fine Vocalion records, and just recently in their Broadcast series a gem of playing in Mendelssohn's Concerto.

Juliette McLean, soprano

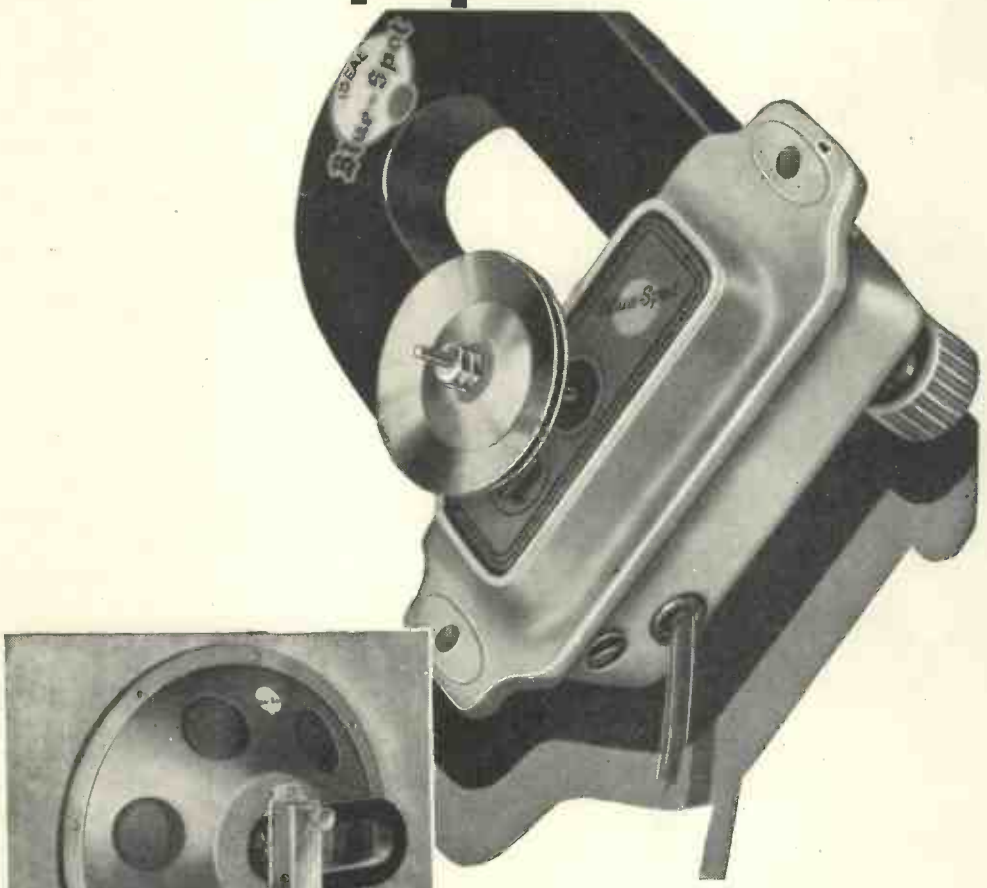


Alex Leitch

Some of the radio revues also have proved successful, one of the latest being

(*Continued on page 476*)

The ever popular 66K unit



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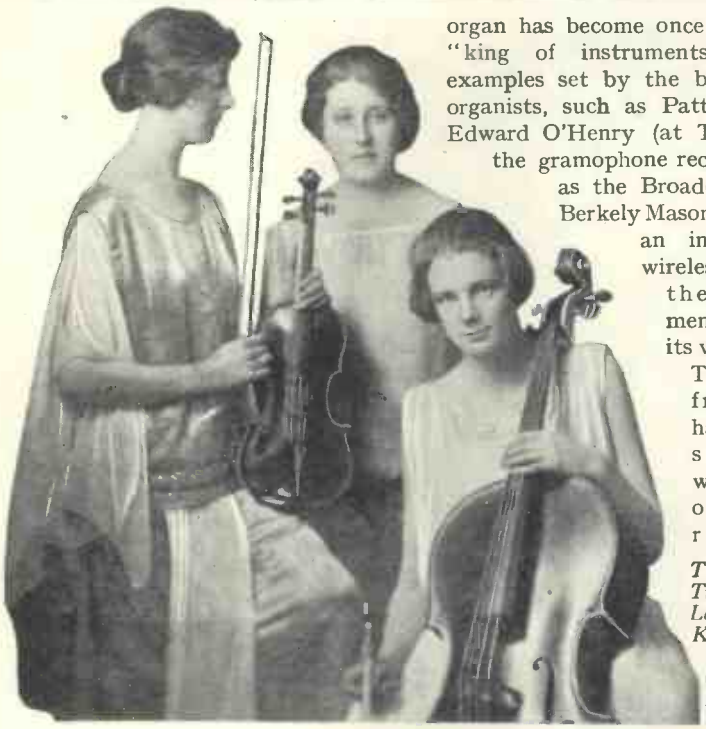
Broadcast Music of the Month (Continued from page 474)



The Doris Trio—Enid Lewis (piano), Kathleen Washbourne (violin) and Pauline Taylor ('cello)

A Year in An Hour, written by Ernest Longstaff, with a cast that included the names of Jack Morrison, Anona Winn, and Harry Pepper and Doris Arnold.

Excerpts from musical comedies also are always well liked, and still more the occasions when a whole play is broadcast. Owing to copyright restrictions, and these are not always easy to overcome, *The Island Princess* announced for May 11, promised excellent fare; also a special 5GB programme which reversed the musical order of things by "Jazzing the Classics," first turning classical numbers into modern syncopation, and then the modern type of dance after the style of old masters. Ideal artists were found in the persons of Toni Farrell, Jean Harley, and George Barker with the Birmingham Studio Orchestra.

King of Instruments

At one time restricted only to church uses, or occasional wheezings on old American organs and harmoniums in stray families, of late, the organ has become once more the "king of instruments." With examples set by the big cinema organists, such as Pattman, and Edward O'Henry (at Tussaud's), the gramophone records, such as the Broadcast with Berkely Mason, and now an increase in wireless relays, the instrument reveals its value.

This month from 5GB has seen a series of weekly organ recitals relayed from St. Michael, Coventry, now known as Coventry Cathedral, and given by Dr. Harold Rhodes, at one time assistant to Sir Walter Parratt at St. George's Chapel, Windsor. Several organists also of international fame have been heard, including Joseph Bonnet, known on the Continent and in America and Canada, also Gunther Ramin, organist of St. Thomas Church, Leipzig. Playing with Licco Amar, the violinist, a special relay was made from the Bishopsgate Institute on May 15.

Experience proves that the smaller stringed orchestras and quartets broadcast better than when large orchestras are employed, especially in the studios. Certainly the month has heard some very pleasant work of both types from the restaurant orchestras, such as those of Albert Sandler and Moschetto, and the small classical bodies, such as the J. H. Squire Celeste Octette, the Gershom Parkington Quintet, the Olof Sextet, the Spencer Dyke Quartet, and The Dorian Trio and Gladys Noon Trio, and the Intime Trio which consists of three famous artists, Suzanne de Livet, Cecil Bonvalot, and Cedric Sharpe.

Famous Individual Soloists

The individual soloists, too, have included world-famous stars, Albert Sammons, Beatrice Harrison and Arnold Trowell amongst them, while favourite broadcasters, too, are Norris Stanley, Frank Cantell, Kathleen Moorhouse, and Edith Lake.

England's so-called "national instrument," the piano, has had many good exponents. One of the finest for all broadcast purposes is Mr. Victor Hely Hutchinson; the art of broadcasting is not given to all artistes, though it would be hard to convince them that their broadcast results are not always on a par with

(Continued on page 478)

Morava, violinist

The Coburn Sisters

Glyn Eastman

Broadcast Music of the Month (*Continued from page 476*)

their concert platform interpretations. It is here where Mr. Hutchinson scores.

Amongst the classical pianists noted are Gordon Bryan, Borowsky, whose recital took place recently, Edward Isaacs and Howard Jones, while on the lighter side we have Billy Mayerl and Patricia Rossborough, whose excellent Duophone records have also just been issued.

Some Fine Voices Heard

Vocalists attract by sheer force of numbers, and although in some few cases diction leaves room for improvement, we still hear "gel" for girl and "loove" for the tender passion, still some fine voices have been heard, quite apart from the stars of the opera such as Miriam Licette, Denis Noble, Noel Eadie or Heddle Nash.

One can always rely upon artistes such as Megan Foster, Vera Gilman, Dorothy Kitchen, the Coburn Sisters, and Olive Kavann to give artistic interpretations and good choice of work. Unique interest, too, was lent also to a recent Belfast concert of Russian music, when Morava, a brilliant young singer, was heard in

REMEMBER THAT YOU CAN GET A FULL-SIZE BLUEPRINT OF ANY SET CONSTRUCTIONALLY DESCRIBED IN THIS ISSUE. CAN BE OBTAINED FOR HALF-PRICE IF THE COUPON ON PAGE III OF THE COVER IS USED.

Russian folk songs. He gave Russian gypsy songs and songs of the Ukraine.

Much time, almost one might say over-much time, has been spared for dramatic performances, and one cannot entirely commend the choice of August Strindberg's gloomy work *There Are Crimes and Crimes* for the ninth of the B.B.C.'s great plays.

A Barrie Play

We understand that Sir James Barrie has given permission for his play *The Old Lady Shows Her Medals*, to be included among the special play broadcasts to Scottish schools, early in the summer term. The broadcast will be given by the Ardrossan and Saltcoat Players, who won the Scottish Community Festival with this work.

Those who remember the play *Kaleidoscope*, given last September, which depicted in novel form the whole life of an ordinary man, will be interested possibly in the performance on May 31 of a feminine *Kaleidscope*, in which the author will deal with a woman's life, employing similar methods.

Fight Between Big U.S.A. Radio Companies

INSISTENT has been the rumour of a merger between the Radio Corporation of America and the Western Union Telegraph Company. Presidents of both companies have admitted "conversations," but denied merger plans.

Recently it became apparent that at least one current merger denial was supported by facts. Abruptly R.C.A. threw down the gauntlet to the Western Union and announced the birth of Radio Corporation of America Communications, Inc., to compete directly with United States telegraph companies.

Two Giants in the Field

It is generally known Western Union and Postal Telegraph (International Telephone and Telegraph subsidiary) are the two giants in the field. Mr. Newcomb Carlton, as President of the super-giant, Western Union, took up R.C.A.'s challenge.

Unimpressed by the wireless threat he snapped: "The Radio Corporation has nothing we now wish to use, and if we ever need anything they have, we can get it from other sources. For the time being, at least, we will view the disposal of the Radio Corporation as an interesting scientific development."

If war there is to be, the telegraph companies now appear to have the whip hand. R.C.A. radio circuits terminate at New York on the East Coast and San Francisco on the West Coast, devoid of any stations in the whole interior. Not only can it transmit no domestic messages, but all messages from the interior for radio transmission abroad must be relayed to the coast over Western Union wires.

Tentative and temporary are R.C.A.'s "agreements" with these companies; therefore, to escape this bondage, R.C.A. Communications has applied to the Federal Radio Commission for 66 wavelengths to be used in domestic service. It will mean extending to 31 inland centres radio service by R.C.A. Communications.

Two radio rivals to the newborn company have already appeared. Earliest of all in the field was Universal Wireless Communications Co., of Buffalo, which obtained last year from the Federal Radio Commission a generous helping of wavelengths.

Postal Telegraph itself is the other rival; it has also applied to the Commission for domestic wavelengths.

F. P.

Keeping Batteries Good Indefinitely

HOW radio set owners in the Arctic maintain their batteries is described by George Wendt, who arranged special KDKA broadcasts to the Arctic and Antarctic, as follows:

"In the first place, all radio sets in the Far North are operated from dry cells, both H.T. and L.T., as there is no possible means whereby they can charge storage batteries. In the early days it was found that the shelf life of the dry batteries was too short to last throughout the season.

Thawing Out!

"Experimenting for a season or two showed them that by freezing the dry batteries they would remain indefinitely inoperative, and so this practice has been universally adopted throughout the Far North. When they are ready to use batteries they bring them into winter quarters and gradually have them thawed out.

"This practice is common throughout the Far North and has been used successfully for several years."

B.T.

Linking 200 Local Stations by a New System

A NEW process of broadcasting by short-wave synchronisation, after two years of laboratory work, is being exploited by the Continental Broadcasting Corporation of New York.

Linking 200 Local Stations

According to Mr. P. M. Titus, vice-president of the company, the plan is to link 200 local broadcasting stations on a single channel by means of a new process of short-wave synchronisation—by the employment of two short waves of 7,000 kilocycles and 7,900 kilocycles, which differ in frequency to create a broadcasting frequency falling about 900 kilocycles or within the broadcast band.

By local modulation of the waves at each station on the chain, the high-frequency waves emanating from the two proposed super-power key stations would be picked up by the scores of small stations on the channel and amplified to sufficient signal strength to service the particular community.

There would be no programmes broadcast from the two 50,000-watt key stations; these stations would merely "manufacture" the carrier wave, and the local stations on the channel would amplify this wave and broadcast their programmes in synchronism.

Commissioner Caldwell of the Federal Radio Commission is in favour of granting licences for two short-wave stations at Fredericksburg, Va., and one each for broadcasting stations at Richmond and Alexandria, Virginia.

Method in Their Madness!

The Union of Married Wireless Enthusiasts

THE average wireless enthusiast is a most unmethodical fellow. He keeps his coils in the knife-drawer, his valves are carefully wrapped in cotton wool, and placed in the best mantelpiece vases, terminals lurk behind the clock, odd wire and odd gear mysteriously appear in the teapot, and—but ask his wife!

My New Union

So I propose the Union of Married Wireless Enthusiasts. It shall have a central head office, which will be staffed by experts in forms—ex-income tax collectors, if possible. They shall be responsible for visiting members' houses and inspecting the disposal of apparatus. A prize of, say, a moving-coil loud-speaker, complete with illuminated certificate of merit, shall be presented each month to the member who stows his gear to the approval of a committee of married women.

Fines for Carelessness

Members who are found to be careless with such precious components as valves or accumulators shall be fined £5, or a month's N.E. (no experimenting). Habitual offenders shall be debarred, for one year, from constructing a new set.

Each member will be required to complete a monthly return, in triplicate, somewhat on the following lines:

1. How many spare valves have you? (Burnt-outs must be included).
2. Where are they?
3. Describe the location of your set, batteries, loud-speaker and spare coils.
4. Where are your screws, terminals and wire?
5. What apparatus have you discovered about the house during the month? (Your official wireless den is exempted.)
6. What gear have you missed lately?

And a large space for remarks.

Questions 2, 4 and 5 will, of course, be answered by the members' wives, who, also of course, are responsible for enrolling their husbands.

The annual subscription will be—but excuse me a moment, one of my household has just discovered a valve of mine in the coal scuttle.

W. M. G.

RADIO NOT TO BLAME

ENGLAND is not to be excluded from the regions of the earth that have been visited by an unusual amount of rainfall in the last six years. These have been particularly wet, some of the heaviest and most persistent rains occurring during the summer months.

If there are still some who believe that radio is responsible, the Royal Meteorological Office comes forth with final facts and figures settling this point for ever.

Some Statistics

Figures produced in this report show that although rainfall has been high from 1921 to 1927, it was still higher in the period from 1911 to 1920, when radio was much less in use, and considerably higher from 1871 to 1880, when practically nothing was known of radio waves.

"It is true," the report asserts, "that electrical phenomena are often associated with rain, and that in some experiments artificial clouds have been formed by electrical means, but the electric discharges in these experiments are of an entirely different nature from wireless."

The meteorologists point out there should be more rain around broadcasting stations, where radio waves are concentrated, than elsewhere—if radio has anything to do with rainfall. The facts, however, show otherwise.

No Worse Near Transmitters

"The heavy rainfall of the past few years," the report states, "has not been in any way more remarkable near the great wireless stations than in other parts of the country, but that radio, becoming so prominent at the same time, has anything to do with this rainfall is absurd." F. P.

A DIFFERENCE OF A FEW YEARS

TIMES have certainly changed—five years ago a wireless amateur would say to one of his colleagues:

"Your new wireless receiver is very fine, old man, it sounds almost as good as a gramophone."

To-day that same wireless enthusiast would remark to his friend:

"That new gramophone of yours is really excellent—it reproduces music and the voice almost as well as your radio set!"

Musical Background and the Broadcast Play

THE average broadcast play labours under many disadvantages, most of which are obvious to listeners. The players have to depend on their voices entirely for effect, there is no scenery or action, so "incidental music" is introduced in order to assist "atmosphere" as far as possible.

How dull and drear a movie picture seems if there is no music, no matter how exciting the plot, how speedy the action; every picture story is better told on the screen if it has a suitable and effective musical background. This background and accompaniment must needs be efficient and suitable, however, or its object is lost entirely.

In a First-class Cinema

Just lately we witnessed a picture which had for its subject the downfall of Tsardom and Bourgeoisie; this was shown in a first-class cinema in a large provincial town.

The customary orchestra was of at least twelve performers, but when we were present the music was being supplied by a lady pianist who thumped and rattled the 1812 Overture of Tschaikowsky *for nearly two hours on end.*

Words are not invented which could possibly express the tiresomeness which this constant repetition caused to the ear; the thing was nothing short of ridiculous and utterly ruined what was, after all, not a bad picture.

Unsuitable Music

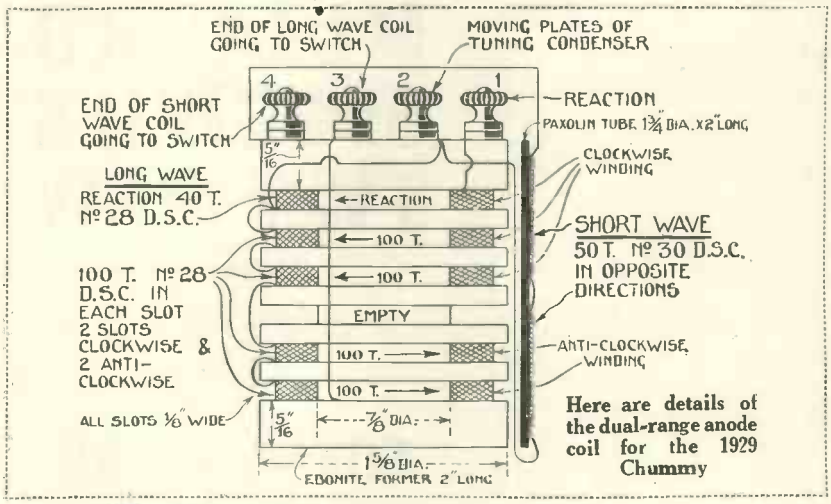
It is not for a moment suggested that the B.B.C. have ever carried matters to such an extreme as this, but not once, but on several occasions we have listened to a broadcast play wherein the "incidental music" was quite unsuitable for the spoken play.

It is obvious, especially to a trained musician, that some of the music arranged for broadcast plays has been treated in the manner of an afterthought instead of a thing of importance, and a considerable step-up will be made when more attention is given to the musical background of plays.

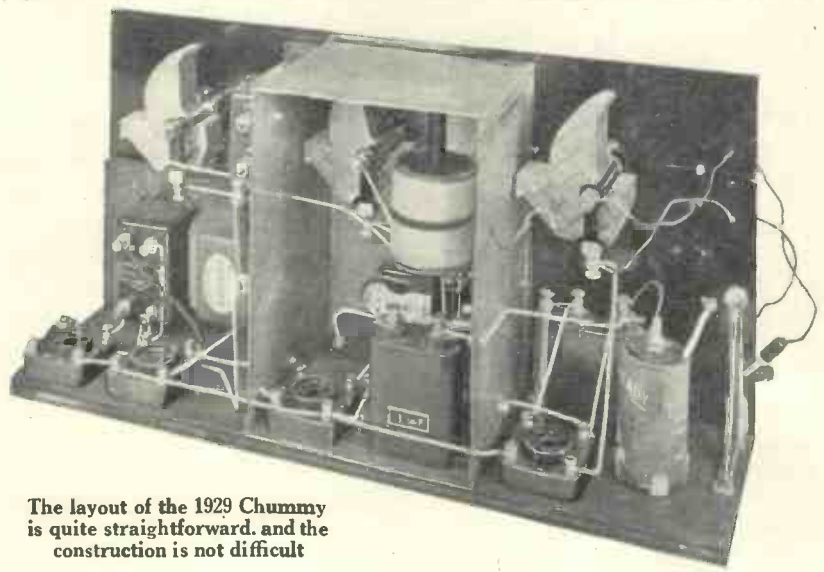
(*Continued on next page*)

The 1929 Chummy (*Continued from page 416*)

This view of the 1929 Chummy clearly shows the arrangement of all the parts



Here are details of the dual-range anode coil for the 1929 Chummy



The layout of the 1929 Chummy is quite straightforward. and the construction is not difficult

MUSIC AND THE BROADCAST PLAY

(*Continued from preceding page*)

If we consider for a moment the tremendous number of operas which have been written, serious and light, the amazing thing is that so very few have retained their hold on the public. If we analyse why this should be so, we will find that in practically every case of the survivals music and libretto are absolutely wedded to one another.

Gilbert and Sullivan

It seems, in fact, as if one could not exist without the other, the Gilbert and Sullivan Operas being good examples of this.

Music can suggest every possible human emotion; it can also provide a fitting prelude to any train of events which may occur, and it can supply a suitable accompaniment to what is being spoken.

The music accompanying a broadcast play need not necessarily be "descriptive"; we do not wish to go back to Victorian days with the *Battle March of Delhi* and *Battle of Prague* style of descriptive pieces in which the poor piano was supposed to give faithful imitations of horses galloping, guns firing, moans of the dying, etc., etc., *ad nauseam*.

Closer Study of the Text

But there appears to be no reason why a closer study should not be made of the text of a play, and then have appropriate music selected which should not only accompany but also "suggest" what follows in the play.

Even if this does not bring perfection, it will at least assist and remove what is often unnecessary and inartistic.

DOC PAGE.

A number of readers have recently assumed that the information coupon which always appears on page iii of the cover can be sent instead of a fee of 1s. when questions are being asked.

This is not so, however, and all questions sent to the WIRELESS MAGAZINE Technical Staff must be accompanied by a postal order for 1s. (a purely nominal fee to check the tendency to frivolous queries which results from a free service), a stamped addressed envelope, and the special information coupon (the last to ensure that only *bona fide* readers shall make use of the service).

LEAVES FROM A LISTENER'S LOG

Recorded by Jay Coote

THAT an interval signal is a useful item is proved by the fact that although the Italian authorities were not in favour of it, they are now carrying out experiments at two of their stations. At present—temporarily, I believe—Naples transmits the morse symbol E (one dot) and Milan a T (one dash) at intervals of seven seconds.

It was at first thought that the initials of the city or the call letters of the station could be used, but later it was decided that the simpler form of signal would be more effective, and in view of its not too rapid reiteration, less wearisome to local listeners. If the idea meets with general approval, an individual signal will be given to the other Italian studios.

Radio utilised for Communist propaganda

Copenhagen's Low-note Buzz

By the way, Munich is not the only city which now uses a hooter preceding the call; I find that Copenhagen invariably gives out a low-note buzz at the opening of its broadcast. Moreover, when the entertainment finishes earlier than the hour at which the time signal is relayed from the Civic Hall Tower, namely, midnight B.S.T., you will hear three short hoots, and the carrier wave is switched off without any further announcement.

◆ ◆ ◆ ◆

Just as virtue has its own reward, so patience should be allotted a compensating prize—and I claim it. For some weeks I have gone all out for the Finnish high-power station so unfortunately placed in close proximity in the long-wave band to Eiffel Tower.

When I Caught Eiffel Tower Bending

Regularly every evening, for more nights than I care to record, I have endeavoured to disentangle these two transmissions, and as luck would have it, a day or so ago, by a mere fluke I caught FL bending. The Paris transmitter had moved down slightly, and a turn of the frame aerial gave me on three nights excellent reception of the Helsingfors concerts.

The difference in frequency was not great, I admit, and I had all my work cut out to avoid the Frenchman, but the directional properties of a small frame aerial overcame the difficulty and from this relatively clear broadcast I gleaned a lot of information.

The male announcer gives out the call, at regular intervals, sometimes at full length, at others in an abbreviated form: "*Huomio ! Huomio ! Suomen Yleis Radio Lahti Helsinki.*" The first word repeated twice is synonymous to the German "*Achtung !*" or the French "*Allo !*"

Calling in Swedish

Now, on Tuesdays and Fridays, the broadcasts are made in Swedish (on Tuesdays through Helsingfors only), and on these days the call is in that language, namely: "*Giv akt ! Giv akt ! Finlands Rundradio Lahti Helsingfors.*" As a rule, you will find that the station closes down at an early hour; it is seldom that it is on the air later than 9.30 p.m. B.S.T., although on some opera nights the transmission may be extended.

Daily at 8.45 p.m. a news bulletin is broadcast in both the Finnish and Swedish languages; they are not much alike, and your reception of the latter might lead you to believe that you had picked up a Scandinavian, but listen for the call; it will put you right.

The signals from Lahti are powerful, and but for the fact that unless you possess a very selective set, FL will interfere with you. I do not doubt that they would be received in the United Kingdom as easily as the broadcasts from Motala. Bear in mind, however, that the Eiffel Tower, for the present, closes down at 9 p.m. and may thus, on certain nights, give you the long-wished-for opportunity of reaching out to Finland.

◆ ◆ ◆ ◆

More stations to log ! Have you picked up the call: "*Radio Beograd,*" put out by the new Belgrade (Jugo-Slavia) transmitter? Although not a giant, its power is about equal to that of 2LO. When it can be disentangled from its neighbours, in the region of 450 metres, it can be heard fairly well in the British Isles towards the later part of the evening. Try for this station towards 11 p.m. B.S.T., when almost daily it comes on the air with a jazz band or a popular orchestral concert.

In view of the fact that but few foreigners can understand the Serb or Slav languages, announcements are

(*Continued on next page*)

LEAVES FROM A LISTENER'S LOG *(Continued from preceding page)*

made in French, Italian, and Magyar; at times during the evening, you will also hear an English and German call.

A New 12-Kilowatter

On another wavelength, namely 277.8 metres, in the immediate vicinity of Milan, you are sure to pick up the words *Radio Feriby*. This, you may care to know, is the cry of the new 12-kilowatter recently installed in the neighbourhood of Bratislava (Czecho-Slovakia). Here, again, to facilitate identification, details of the items broadcast are given out in some five to six languages.

Neither of these two new stations has adopted, up to the present, an interval signal, but the announcements and calls are put out so frequently that they should leave no doubt in your mind regarding the nature of your capture.

Budapest on the Loud-speaker

By the way, a short stay I made recently at a popular South Coast resort gave me nightly opportunities of receiving the Budapest programmes at full loud-speaker volume. One fact I noticed among others was that in every instance French was used as an alternative language to Magyar; in fact, several political talks were presented in that language. The musical programmes from Budapest on most nights are very good, and, believe me, when the studio takes you over to the Cafe Spolich or to the

(Continued on next page)

Leaves From a Listener's Log (*Continued*)

Hotel Britannia for the gypsy bands, the broadcast is so interesting that you will find some difficulty in dragging yourself from the receiver. These transmissions frequently last until well after midnight.

Not the Title of a Film!

The Battle of the Giants! No, this is not the title of a film, but a forecast of the near future as it affects the broadcasting world.

Look at the list of big transmitters already in existence, under construction, or proposed by many European States. What do we find? Moscow, Motala, 5XX, Zeesen, and Eiffel Tower working daily. According to a German report, the authorities seriously contemplate increasing the power of Zeesen to 200 kilowatts; Eiffel Tower, still on 15 kilowatts, is to be boosted up to 100 kilowatts. To this we must add the early advent of Oslo with 60 kilowatts in the aerial and Bucharest with 24 kilowatts (actual). Sweden, not to be outdone by Norway, has also placed an order for the supply of a super-power station.

Italian 50-kilowatter

When Turin was officially opened, it was definitely stated that the station would eventually become one of the most powerful on the Continent, yet Rome has laid down plans for the erection of a 50-kilowatter!

Turn to Poland, where the Polskie Radio has decided to install in the neighbourhood of Warsaw a "super" capable of putting 50 kilowatts in the aerial, or to Czecho-Slovakia, which has stated its intention to proceed with the construction at Prague of a station normally working on an equal power.

Again from France comes the news that the P.T.T. authorities, as a counterblast to Stuttgart and Freiburg, which at present are the transmissions best heard in Alsace-Lorraine, has formulated a scheme for the erection of a big station at Strasbourg, and to this we add Switzerland, which favours a proposal to build two semi-giants at Gros de Vaud and Suhrental with a small net-work of relays.

Re-equipment for High Power

All such probable additions to the medium- and long-wave band are over and above the re-equipment at increased power of such cities as Graz, Goeteborg, Hoerby, Bratislava, Brussels, and the shortly to be expected newcomers such as Mahrisch-Ostrau (Czecho-Slovakia) and other stations coveted by more recent adherents to broadcasting systems.

Disarmament!

Visualise all these giants on the air at the same time, during the day and evening; such a struggle for supremacy may lead to possibilities unforeseen. We have heard so much about the Disarmament of the Powers that I am seriously wondering whether in a more or less distant future we may not read of conferences relating to the Disarmament of the *Super*-Powers!

Radio Helps the Indian Air Service!

THE wireless organisation for the air mail service to India, which was recently opened, is such that the aircraft engaged will be in touch with aerodrome groundstations throughout the 4,700 air miles of the journey.

On the London to Basle section, the present wireless organisation for Continental aviation will be employed. The aircraft are fitted with Marconi sets of 150 watts power (type AD6), adapted for communication over distances of 200 to 300 miles by telephony or morse.

Three Flying Boats

From Basle the night train to Genoa makes the connection with the second section of the air route, from Genoa to Alexandria, operated by three Calcutta flying boats fitted with the more powerful Marconi type AD8 sets.

These sets are also adaptable for telephony or morse, enabling the pilot to keep in touch with Italian and British Air Ministry wireless stations until arrival at Alexandria.

In addition Imperial Airways, Ltd., which is conducting the London-Karachi service, has stationed a depot ship in the Greek Archipelago. This has been fitted with a Marconi valve transmitter of ½-kilowatt power (type U) and suitable receiving equipment (Marconi type RG19 Receiver), and will be capable of communicating with Malta, Alexandria, and other stations concerned with the service.

At Alexandria a change is made to aeroplane again for the final section of the route, through Basrah and over the Persian Gulf to Karachi. Part of this section has been in operation for some time, employing De-Havilland aircraft fitted with Marconi AD6 apparatus and communicating with R.A.F. stations and a ½-kilowatt station at Rutbah Wells.

Two Marconi Stations

During the flight from Basrah to Karachi, the machines will be in touch with two Marconi stations in Persia, at Chabar and Bunda Abbas. The terminal wireless station at Karachi is one of the most powerful aerodrome stations.

Summer Time

FROM Sunday, April 21, Great Britain, France, Belgium, and Spain, which habitually use Greenwich Mean Time, advanced their clocks sixty minutes, thus bringing the hour forward to correspond with the time adopted by the Central European States.

The Continent is roughly divided into three belts, different in time by sixty minutes for each fifteen degrees of longitude, East or West of Greenwich; and this indicates local mean time for the zone extending seven and a half degrees on each side of the meridian, but in practice, the belt may be extended to cover the boundaries of states or provinces. Thus, actual local time of a city or town may vary by several minutes from the standard time adopted by the country in which it is situated.

Central European Time

Central or Mid-European Time covers such countries as Germany, Austria, Hungary, Czecho-Slovakia, Denmark, Italy, Jugo-Slavia, Lithuania, Luxembourg (Grand Duchy), Norway, and Sweden. Finland, Greece, Poland, Roumania, Esthonia, Western Russia, Latvia, and Turkey work on Eastern European Time, or one hour in advance of B.S.T. Winter Time is standard throughout, and no summer change is effected.

Holland, normally twenty minutes in advance of us during the G.M.T. period, becomes forty minutes behind us when our Summer Time reigns; later, usually in May, she alters her clocks, in the same manner by sixty minutes, and again remains twenty minutes ahead of us.

No Alteration in Morocco

It will be found that the transmissions of both the Algiers and Rabat (Morocco) stations do not coincide in time with ours, for that portion of North Africa is comprised in the G.M.T. belt, and no alteration is made.

On the other hand Russia advanced her clocks by one hour on March 31 last, so with our alteration there still remains between the United Kingdom and that country (e.g. Moscow and Leningrad), inasmuch as it affects the Soviet broadcasting stations, a difference of two hours.

As already stated, no alteration is carried out in Central Europe.

Wireless Magazine. June, 1929

A NEW SET TESTED

By J. H. REYNER, B.Sc., A.M.I.E.E., at the Furzehill Laboratories

The Philips All-Electric Two-valver

IN the early days of broadcasting, the use of A.C. mains for eliminating the high-tension battery was regarded as an experiment, since it often brought in its wake such troubles as unpleasant hum and distortion in the amplifier. Yet, in spite of these disadvantages, the economy of the system was such that it was utilised by many experimenters.

Practical Development

As the science of wireless progressed so was the H.T. eliminator perfected, until it has proved itself, without a doubt, to be the most economical and reliable form of H.T. supply. Not, however, until comparatively recently has the all-mains receiver developed from the experimental to the practical stage.

A Wonder Box

Any doubt on the subject of all mains-operated receivers must surely be completely dispelled by a demonstration of the new Philips two-valve set. One might imagine that a two-valve receiver including an H.T., L.T., and grid-bias eliminator would be a rather bulky article, but this little Philips set has overall dimensions of only 10 in. by 7 in. by 6½ in., and is certainly what one might term a wonder box. Yet, in spite of its compact dimensions, our examination revealed that many up-to-date contrivances and refinements are fitted.

The entire receiver is housed in a metal case, one end of which may be removed for inspection of the valves, of which there are three—a detector, a pentode, and a rectifier for the H.T. supply.

The controls are placed on a panel at the other end of the set. In the centre of the panel there are a number of sockets, into one pair of which a plug is fitted. This varies a series capacity in the aerial circuit, which enables the selectivity to be adjusted to suit local conditions.

The top right-hand knob gives a slow-motion control for a drum-drive variable condenser, the scale of which can be inspected through a window on the top of the set. Smoothness of operation is ensured by a spring-loaded pulley working in a slot of the drum control.

In the centre of the panel we have the reaction control, which again is pleasant to operate on all wavelengths and, moreover, requires only slight alteration when tuning from one end of the scale to the other—a very useful feature.

This view of the Philips two-valver shows the back of the set with the cover removed for inspecting the valves

At the top left-hand side of the panel there is a range switch having three positions, one for the short waves from 200 metres, another for the medium wavelengths, and the third for the high wavelengths up to 2,000 metres. No other adjustment is necessary when changing from one wavelength range to another.

A plug and socket for loud-speaker, a second one for inserting a gramophone pick-up, and aerial-earth terminals are placed at the other end of the set beneath the valve panel. Thus there is no necessity for the external leads to be visible when controlling the set.

Its Performance on Test

It was with no little interest that we placed the set on test. After connecting up the aerial, earth, and loud-speaker, the plug was inserted in the 240-volt 50-cycle A.C. mains: a brief time elapsed and then the set burst into life—not as one might have expected with the usual 50-cycle hum, but just the pleasant breathing noise which comes from an accumulator-operated set.

Adjustment of the range switch and alteration of the aerial tapping brought in the local station at surprising volume and clarity. Adequate strength could be obtained with ease on such stations as 2LO at 12 miles, 5GB and 5XX at 70 miles.

Above Normal

The results, both as regards strength and clarity, are certainly better than can be obtained with a normal two-valve set, because in the first place the mains-operated detector valve is more efficient than the normal type and, secondly, a pentode output valve is employed with adequate H.T. potential.

On foreign stations, the set behaved in an exemplary manner: due to the smoothness and constancy of reaction one could tune-in quite a number of

(*Continued on next page*)

A NEW SET TESTED

(Continued from preceding page)

stations without so much as moving any control other than the tuning condenser. Naturally, with a set of this type, the strength from distant stations is not very powerful but, at the same time, a number may be obtained comfortably without overdoing the reaction adjustment.

Quite Shock-proof.

We have already remarked upon the good quality reproduction obtainable from the set: this is no doubt due to the care taken to eliminate any tendency for back-coupling to occur in the high-tension, grid-bias, and loud-speaker leads. Another point worthy of mention is the marked absence of hum, even when receiving distant stations. Finally, one may observe that both aerial and loud-speaker are completely isolated from the mains and are, therefore, shock-proof.

At a price of £12 10s., this two-valve receiver represents excellent value and can be recommended without hesitation. The makers are Philips Lamps, Ltd., 145 Charing Cross Road, W.C.2.

Readers of the "Wireless Magazine" who would like to see test reports of any particular commercial receivers are invited to communicate with us. Every effort will be made to meet . . . their needs in these pages. . .

Junit Valve Holder

THE popularity of four- and five-electrode valves has increased to a large extent during the past year, and it has therefore been necessary to adapt them for use with the normal valve holder, although this latter component is not always most convenient for these types of valve.

A valve holder made by the Junit Manufacturing Co. has been designed specially for use with the new four- and five-electrode valves. It may be mounted either in a horizontal or vertical position, and will therefore hold a screened-grid valve in the correct plane for screening.

An additional terminal is fitted to the holder and serves as a junction for a flexible lead to the extra terminal on the pentode and a rigid connection to H.T. positive.

The four sockets of the holder are mounted on a small square moulding and the connections are taken out to four terminals at the corners. Holes are drilled in the moulding for mounting the holder in two separate planes. The component, which is well finished, should prove useful to set builders.

Short-wave Channels

THE agreement between the United States and Canada for the division of short-wave radio channels on the North American continent, which recently went into effect for a term of three years, is as follows:

For mobile services, 190 channels; to amateurs, 124; for experimental visual broadcasting, 84; for general experiments, 3; for general communication services, 228; making a total of 639 short waves.

Division by Countries

The appointment by committees is as follows: The United States, 112 exclusive channels and 34 shared with Canada and Newfoundland; Canada, 38 exclusive channels and 48 shared with other countries, principally Mexico and Cuba; Newfoundland, 11 channels shared with the United States; Cuba, 15 channels shared with Canada, and 5 for exclusive long-distance communication; other nations, including Mexico, 16 channels shared with Canada, and 8 exclusive frequencies. F. P.

Nippy's Loud-speakers

ALTHOUGH it is a sorry fact that loud-speakers should have to utter such mundane things as "two sausages and mash," or "steak and kidney pudding," it is nevertheless true.

It came as somewhat of a surprise to me to learn that J. Lyons & Co., Ltd., have installed loud-speakers in many of the kitchens of their bigger restaurants, and these are used as a room-to-room communicator in order to keep the kitchen organisation in touch with consumers.

250,000 People Daily

The same kind of apparatus is employed as in some of the daily paper machine rooms and the necessity for loud-speakers in, say, a Corner House, will be understood when it is realized that in the famous Coventry Street Corner House alone a quarter of a million people are daily served with food and drink.

Were it not for the loud-speakers by means of which waiters and waitresses can order dishes just when they are wanted, many iced and other cold dishes would be ruined were they brought out of the ice safes into the great heat of the kitchens before absolutely necessary.

The mechanism employed in the loud-speaker devices is very similar to that encountered in everyday wireless practice. F. TUP.

Wireless Echoes

AT the Academy of Science at Oslo, recently, Professor Stoermer lectured on the much discussed echo phenomena in connection with short-wave signals from the wireless station at Eindhoven, Holland, which were observed last October. A close watch was kept from Norway to Spitzbergen, but no further echoes were heard until the latter part of February, when they

were heard in Norway, England, and Eindhoven.

The time between the dispatch of a signal and the echo varied from eight to twenty-five seconds, and it is now taken for granted that whatever the explanation may be the phenomenon is genuine and not imaginary.

F. P.

Dynamic Reproducers

FOR the present, at least, the American home-constructor finds great difficulties in building loud-speakers of the moving-coil type; if he desires to construct them, he can do so only by obtaining a complete set of iron castings specially made to order, and the demand for such castings is not yet sufficiently heavy for manufacturers to produce them as a stock line.

For this reason, the enthusiastic experimenter in the United States is either forced to obtain the complete kit for building the moving-coil loud-speaker from Europe, or must buy a finished model at a much higher cost.

While on the subject of moving-coil loud-speakers, according to an American wireless journal, the correct definition for that type of instrument as adopted by the American Radio Manufacturers' Association is as follows:—

"A dynamic loud-speaker is one in which a portion of the conductor carrying the alternating signal current is a part of the moving system, the force producing the motion being due to the location of this conductor in a magnetic field."

It seems to me that it would be very useful if the British Manufacturers' Association were to issue a handbook giving definitions of every wireless component. GRIDDA.

Multi-diaphragm Loud-speakers

NOT content with attempting to get the low notes with the aid of "super" large diaphragms, the inventive genii are turning their attention towards loud-speakers which cover a wider frequency range than normal by the use of more than one diaphragm connected to the driving unit of the reed or moving-coil type.

A Dozen Diaphragms

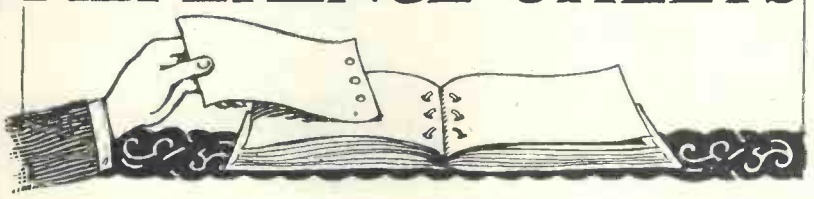
One multi-diaphragm loud-speaker recently patented incorporates about a dozen diaphragms of differing sizes, the whole bonded together in a kind of umbrella-shaped diaphragm unit, with the apexes of each one taken to the driving rod of the reed mechanism.

The idea, of course, is that the smaller diaphragms respond more readily to the high notes, while the bass is "kicked out" by the larger discs. A similar effect is the result of the joining together of the two sheets of a linen-diaphragm instrument, but it is a little difficult to see what advantage is gained by taking things to extremes and having a batch of diaphragms all connected to one driving unit.

Secret of Success

For experimenters who want to carry out tests of multi-diaphragm home-made jobs it need only be hinted that success usually lies in the direction of having as small a moving mass as possible between the driving unit and the driven member. S.

"Wireless Magazine" REFERENCE SHEETS



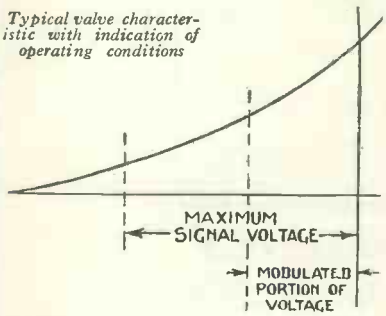
Compiled by J. H. REYNER, B.Sc., A.M.I.E.E.

Month by month these sheets can be cut out and filed—either in a loose-leaf folder or on cards—for reference. The sequence of filing is a matter for personal choice. In a short time the amateur will be able to compile for himself a valuable reference book.

WIRELESS MAGAZINE Reference Sheet No 126

Power Rectification

Typical valve characteristic with indication of operating conditions



FOR effective distortionless rectification a modified form of anode-bend rectification may be employed. This method, however, makes use of the straight portion of the valve characteristic and should not, strictly speaking, be known as anode-bend rectification.

The method is based on the fact that modern telephony transmitters do not utilise a high degree of modulation, some 30 per cent. to 50 per cent. being the limit for all ordinary purposes. This gives a factor of safety on sudden increases of signal strength which would otherwise tend to produce blasting. This being the case, the high-frequency carrier received does not vary in intensity below from 0.7 to 0.5 of the maximum value.

The method of rectification employed consists in utilising a valve having a relatively large straight portion to its characteristic, such as a power valve of a suitable type. This is biased to such an extent that approximately one-half of the characteristic is curved, the remaining half being straight.

If signal voltages are applied to the valve biased in this condition, the maximum portions of the signal will lie between the zero point and the beginning of the curved portion. Thus, all the variations produced by the modulation will lie on the straight portion of the curve and substantial linear rectification will result.

In order to arrange for this form of rectification it is necessary to choose the value of grid bias somewhat critically. Too little grid bias does not give rectification and too much grid bias does not give sufficient straight portion to the curve.

WIRELESS MAGAZINE Reference Sheet No. 127

Choke Output Circuits, Current In

IT is sometimes of value to know the approximate alternating current likely to pass in the choke of a choke-coupled output circuit. The effective inductance of a choke or transformer depends essentially upon the alternating current flowing in addition to the polarising effect produced by any steady current which is passing. (See Sheet No. 111.)

Tests were therefore made at the WIRELESS MAGAZINE Laboratories in order to determine the approximate order of alternating current likely to be flowing in a choke-output circuit. For this purpose, an alternating-current meter was arranged in such a position that it would indicate the alternating current flowing in the circuit without being affected by the direct current. This steady current was of the order of 15 milliamperes, a super-power valve preceding the choke-output stage.

Voltages of varying frequency were applied to the input of the amplifier and the signal strength was adjusted to give what was considered a good loud-speaker strength in an average-sized room. The voltage on the input of the amplifier was then kept constant at this value irrespective of the frequency. The characteristic of the amplifier had already been pre-determined and it was known that there was little variation in the amplification over the whole range of frequencies.

The test indicated that the current in the choke-output circuit varied in accordance with the frequency of the current, tending to increase in value as the frequency was reduced. This is what one would expect, since the effective impedance of the choke decreases as the frequency falls so that more current would be passed through the choke by the alternating voltages existing in the circuit. The table below gives the approximate order of current obtained as a result of these tests.

It must be remembered that these tests are more an indication than a definite measurement, since they only apply to one particular set of conditions. The inductance of the choke in question was 20 henries and the valve preceding it was a Mazda P227.

Frequency (cycles/sec)	*Alternating Current in Choke (milliamps)*
64	0.57
128	0.52
256	0.46
512	0.39
1,024	0.33
2,098	0.27
4,096	0.21

WIRELESS MAGAZINE Reference Sheet — *No. 128*

Litz Wire, Use of

LITZENDRAHT wire, usually termed Litz, is a high-frequency cable specially designed to minimise high-frequency resistance. The wire, instead of being solid, is constructed of a number of strands, all of which are insulated one from the other and each of which in turn comes to the surface of the cable.

If a wire is employed which is solid over the whole of its area, the currents are forced towards the outside of the wire by the magnetic field existing in the wire itself due to the presence of the high-frequency currents. If the cable is made up of a number of strands all insulated one from the other, however, this is not possible so that the whole of the copper in the wire is effective in carrying current.

Litzendraht wire is made by twisting thin strands of insulated wire into cables consisting of groups of three. Thus, for example, a nine-strand cable would not be made up of nine wires stranded in the ordinary manner. Three wires would first be stranded to form a triple cable and the nine-strand cable would be made by taking three three-strand cables and braiding them up together. Similarly by taking three nine-strand cables, we obtain a twenty-seven strand cable, this being the largest size used for ordinary winding purposes.

For special requirements, more elaborate cables still have been used consisting of three twenty-seven-strand cables stranded together, and so on, but a limit is reached where the loss in the actual dielectric formed by the insulation on the wire begins to overcome the slight gain caused by a further sub-division of the wire into strands and it is only in exceptional circumstances that such extremely multiple cables are employed.

The purpose of building the wire up into groups of three in this manner is to ensure that each strand in turn comes to the outside of the cable. With ordinary methods of stranding certain wires lie in the centre of the cable the whole time and are thus no better than a solid core. It is necessary to ensure, therefore, that any wire used as Litz is really stranded in this manner and is not just a number of twisted wires. In particular, it is absolutely essential that each individual strand of the wire should be separately insulated in addition to any overall covering on the cable if any benefit is to result.

The table given in Sheet No. 129 indicates the general types of Litz wire in use for wireless purposes and the approximate corresponding gauges of solid wire to give equal copper area (equal D.C. resistance), and equal overall diameter.

WIRELESS MAGAZINE Reference Sheet — *No. 129*

Litz Wire, Sizes of

IT is often useful to be able to estimate rapidly the approximate gauge of Litz wire required to wind a particular coil within given dimensions. The table given here indicates the various classes of Litz wire commonly employed for wireless work and the corresponding gauge of solid wire having the same D.C. resistance.

The third column indicates the approximate equivalent gauge of D.S.C. wire, assuming the Litz to be of the type in which each strand is enamelled and the whole cable is double-silk covered.

Size of Litz Wire	Equivalent gauge of wire to give same D.C. resistance	Equivalent D.S.C. to enamelled and D.S.C. Litz
9/36	23	21
27/36	19	17
9/38	26	23
27/38	21	19
9/40	28	25
27/40	23	20
9/42	30	27
27/42	25	22
9/44	34	31
27/44	27	24

WIRELESS MAGAZINE Reference Sheet — *No. 130*

Pick-up Control

IT is necessary to fit some form of volume control with a gramophone pick-up in order to adjust the strength to one's own requirements. Different records give varying strengths of signal and it is necessary to have some form of control over the volume of sound produced.

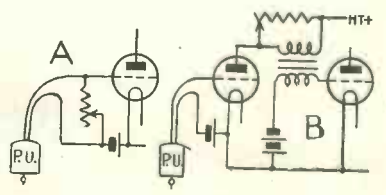
It is further desirable to control the input to the amplifier rather than the output, as too strong an input will cause overloading on the valves with consequent distortion.

One method is to place a volume control across the pick-up itself. In the early days this was made a simple variable resistance, but it is now recognised as preferable to utilise a high-resistance potentiometer. This should have a value of about 500,000 ohms and should be connected up as shown at A.

A method which is rapidly gaining favour, however, is to use a valve in the first stage of the amplifier which can handle the maximum voltage delivered by the pick-up without any tendency to distortion and to control the volume beyond this valve. The advantage of this scheme is that it is easier to obtain a volume control in this manner which does not alter the frequency response.

The method shown at A, even under the best conditions, tends to cut off the high frequencies as the volume is reduced. If the pick-up is applied directly across the grid of the first valve, then any of the well-known methods of volume control may be used with the coupling device following the first valve.

One very useful method, shown at B, is that of connecting a variable resistance across the primary of the transformer. As this resistance is reduced in value so the amplification is progressively reduced and this method has the advantage that instead of cutting off the high frequencies, it tends to accentuate them, which in many instances is a desirable feature since the majority of pick-ups cut off towards the upper end of the scale.



Two methods of pick-up control

FULL-SIZE BLUEPRINTS FOR EVERY REQUIREMENT

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 all these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

CRYSTAL SETS

All these 6d. each, post free.

Two-programme Set	WM25
Centre-tap Set	WM50
Super Set	AW 64
"Best-yet" Set	AW114
1929 Crystal Receiver	AW165
A Daventry-Local Crystal Set	AW185

ONE-VALVE SETS

All these 1s. each, post free.

Long-range Hartley	WM54
Reflexed One for the Loud-speaker	WM66
Special One	WM116
Reinartz One	WM127
All-wave Reinartz	AW 2
Hartley DX	AW 27
Economy One	AW 71
Loud-speaker Special	AW 78
Ultra-sensitive Hartley One	AW103
Fan's Short-wave One	AW119
Super Reinartz One	AW127
Beginner's One-valver	AW140

TWO-VALVE SETS

All these 1s. each, post free.

Two-programme 2 (D, Trans)	WM56
Q-coil 2 (D, Trans)	WM62
Crusader (D, Trans)	WM69
Flat-dweller's 2 (HF, D)	WM76
Two-Daventry Two (D, Trans)	WM97
Tetrode Short-wave Two (SG, D)	WM99
Key-to-the-Ether Two (D, Pentode)	WM107
Meteor Two (D, Trans)	WM114
Clipper Two (D, Trans)	WM135
Twinflex (Reflex)	WM138
★**Continental Two (D, Trans)**	**WM143**
Rover 2 (HF, D)	AW 53
General-purpose 2 (D, Trans)	AW 55
Yule (D, Trans)	AW 59
30/– 2 (D, Trans)	AW 61
Economical 2 (D, RC)	AW 66
Two-wave (D, Trans)	AW 83
Ultra-selective Hartley (D, Trans)	AW 90
Oceanic Short-wave (D, Trans)	AW 91
Trapped Reinartz (D, Trans)	AW 92
"Q" 2 (D, Trans)	AW 99
Long Distance Two (HF, D,)	AW110
Three-waveband Two (D, Trans)	AW112
DX Headphone Two (HF, D)	AW134
Ace of Twos (D, Pentode)	AW143
Home Two (D, Trans)	AW146
Chapman-Reinartz Two (D, Trans—4d. with copy of "A.W.")	AW148
Globe DX Two (SG, D,)	AW157
East to West Short-wave Two (D, Trans)	AW159
Beginner's Two (D, Trans)	AW171
Auto Two (D, Trans)	AW174
All-Main Two (D, Trans)	AW180

THREE-VALVE SETS

All these 1s. each, post free.

Five-guinea 3 (HF, D, Trans)	WM29
Metropolitan (D, 2 LF)	WM48
Everyday (D, 2 Trans)	WM52
Music Charmer (D, RC, Trans)	WM60
Britannia (D, RC, Trans)	WM67
Pole-to-Pole Short-waver (D, RC, Trans)	WM89
Glee-singer Three (D, 2 RC)	WM92
Aladdin Three (HF, D, LF)	WM95
Inceptor Three (SG, D, Pentode) *Price 1s. 3d. with copy of "W.M."*	WM105
All-wave Screened-grid Three (HF, D, Pentode)	WM110
Gramophone Three (D, 2RC)	WM115
Standard Coil Three (HF, D, Trans)	WM117
Festival Three (D, 2 LF-Dual Imp)	WM118
Wide-world Short-waver (SG, D, Trans)	WM120
New Year Three (SG, D, Pentode)	WM123
The Q3 (D, RC, Trans)	WM124
Lodestone Three (HF, D, Trans)	WM129
Simple Screen Three (HF, D, Trans)	WM131
Dynamic Three (SG, D, Trans)	WM136
At Home Three (D, 2RC)	WM141
★**Short Wave Link (D, RC, Trans)**	**WM142**
Split-primary (HF, D, Trans)	AW 24
Modern Tuned-anode (HF, D, Trans)	AW 35
Tetrode 3 (HF, D, Trans)	AW 36
Special (D, 2LF)	AW 44
Economy 3 (D, 2RC)	AW 48
Short-wave (D, RC, Trans)	AW 50
Ether-searcher (D, RC, Trans)	AW 52
Standard (D, 2 Trans)	AW 56
Hartley DX (D, RC, Trans)	AW 63
Broadcast 3 (D, RC, Trans)	AW 76
Selectus 3 (HF, D, Trans)	AW 81
Q-coil 3 (D, RC, Trans)	AW 84
British Station Three (HF, D, Trans)	AW122
Optional Two-three (D, 2LF)	AW124
"Simpler Wireless" Mains Three (D, 2LF)	AW126
Simplicity Screen-grid Three (HF, D, Trans)	AW132
"Proms" Three (D, 2 RC)	AW137
Adaptable Three (D, 2 Trans)	AW139
New-style Baffle Three (D, RC, Push-pull—Price 1/6)	AW141
All-wave Mains Three (HF, D, Trans, Rectifier—Price 1/6)	AW144
All-purpose Short-wave Three (D, RC, Trans)	AW147
Screen-grid Q-Coil Three (HF, D, Trans)	AW150
New-style Mains Three (HF, D, Trans—Price 1/6)	AW151
All-Round Three (D, RC, Trans)	AW155
James Special Three (HF, D, Trans)	AW156
All Britain Three (HF, D, Trans)	AW158
Bantam Three (D, RC, Trans)	AW160
Hartley Dual-range Three (D, RC, Trans)	AW166
Listener's Three (HF, D, Trans) Price 4d. free with copy of "A.W."	AW169
Binowave Three (D, RC, Trans)	AW172
Clarion Three (SG, D, Trans)	AW175
1929 Favourite Three (D., R.C. Trans)	AW179

FOUR-VALVE SETS

All these 1s. 6d. each, post free.

Revelation (HF, D, RC, Trans)	WM24
Simplicity (HF, D, 2 Trans)	WM49
Gramo-Radio 4 (D, RC, 2 Trans Push-pull)	WM70
Screened grid 4 (HF, D, 2RC)	WM77
Five-pounder Four (HF, D, RC, Trans)	WM91
Frame-aerial Four (HF, D, 2RC)	WM85
Touchstone (HF, D, RC, Trans)	WM109
Reyner's Furzehill Four (SG, D, 2 Trans)	WM112
Economy Screen-grid Four (SG, D, RC, Trans)	WM113
Binowave Four (SG, D, RC, Trans)	WM119
Standard-coil Four (HF, D, 2RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
The Drum Major (HF, D, RC, Trans)	WM137
★**Music Player (HF, D, RC, Trans)**	**WM144**
All-purpose 4 (HF, D, RC, Trans)	AW 43
Special 4 (HF, D, 2LF)	AW 70
"Q" 4 (HF, D, RC)	AW 98
Explorer Four (HF, D, RC, Trans)	AW120
Summertime Searcher (2HF, D, Trans)	AW128
Overseas Shortwaver (HF, D, 2 Trans)	AW133
Ranger Four (SG, D, RC, Trans)	AW145
Facility Four (HF, D, 2 RC—Q-coil)	AW154
Broadcast Picture Four (HF, D, 2RC)	AW163
The Orchestra Four (D, RC, Push-pull)	AW167
All Europe Four (2HF, D, Trans)	AW173
Stability Four (HF, D, RC, Trans)	AW182

FIVE-VALVE SETS

All these 1s. 6d. each, post free.

Exhibition 5 (2HF, D, RC, Trans)	WM33
Phœnix (2HF, D, 2LF)	WM42
1928 Five (2HF, D, 2 Trans)	WM46
All-the-world 5 (2HF, D, 2RC)	WM63
Cataract 5 (HF, D, RC, Push-pull)	WM79
Empire Five (2SG, D, RC, Trans)	WM96
Fidelity Five (HF, D, 2RC-parallel)	WM130
Individual 5 (2HF, D, 2 Trans)	AW 25
School 5 (HF, D, 2RC)	AW 85
"Q" Gang-control Five (2HF, D, 2 Trans)	AW161

SIX-VALVE SETS

1s. 6d. each, post free.

Nomad (2HF, D, RC, Push-Pull, Trans)	WM
Connoisseur's Six (2HF, D, RC, Push-pull)	WM 88
Eagle Six (3HF, D, RC, Trans)	WM106
Short-wave Super-6 (Super-het, Trans)	AW 67
Adapter for above (see miscellaneous list)	AW67A

SEVEN-VALVE SETS

1s. 6d., post free.

Simpladyne (Super-het)	WM22

PORTABLE SETS

	Price	Post Free
Springtime 2 (D, Trans)	WM12	1/–
Countryside 4 (HF, D, 2 Trans)	WM17	1/6
Chummy 4 (HF, D, RC, Trans)	WM80	1/6
Chummy 4 (with modification for LS and HT)	WM80a	1/6
Pilgrim Portable (D, Trans)	WM94	1/–
Wayfarer Portable (Super-het)	WM139	1/6
★**1929 Chummy (SG, D, Trans, RC)**	**WM145**	
Holiday 3 (D, 2 Trans)	AW32	1/–
Table Grand 4 (HF, D, 2RC)	AW93	1/6
Attaché Portable 2 (HF, D)	AW96	1/–
Daventry Portable (D, Trans)	AW105	1/–
Daventry Loud-speaker Portable (2HF, D, RC, Trans)	AW107	1/6
Town and Country (HF, D, RC, Trans)	AW111	1/6
House and Garden (SG, HF, D, RC, Trans)	AW116	1/6
"Best-yet" Portable (SG, D, 2 Trans)	AW136	1/6
House Portable (SG, D, RC, Trans)	AW168	1/6
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Arcadian Linen-diaphragm Loud-speaker (full-size)	AW177	1/–
D.C Unit (H.T.)	AW178	1/–
Short-wave Adaptor (IV.)	AW183	1/–

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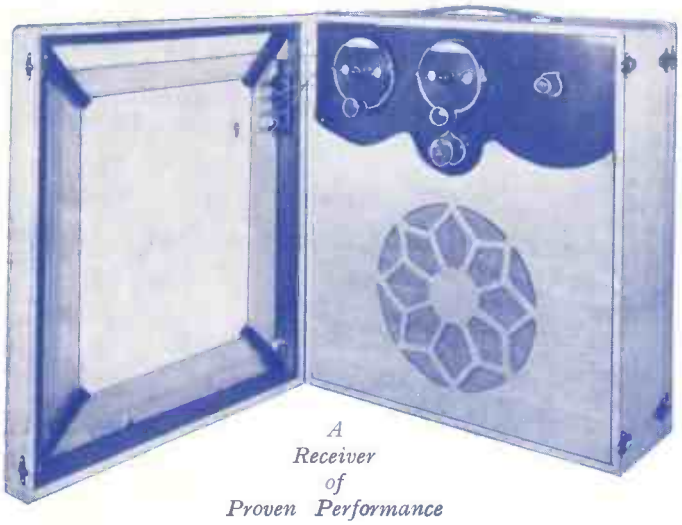

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