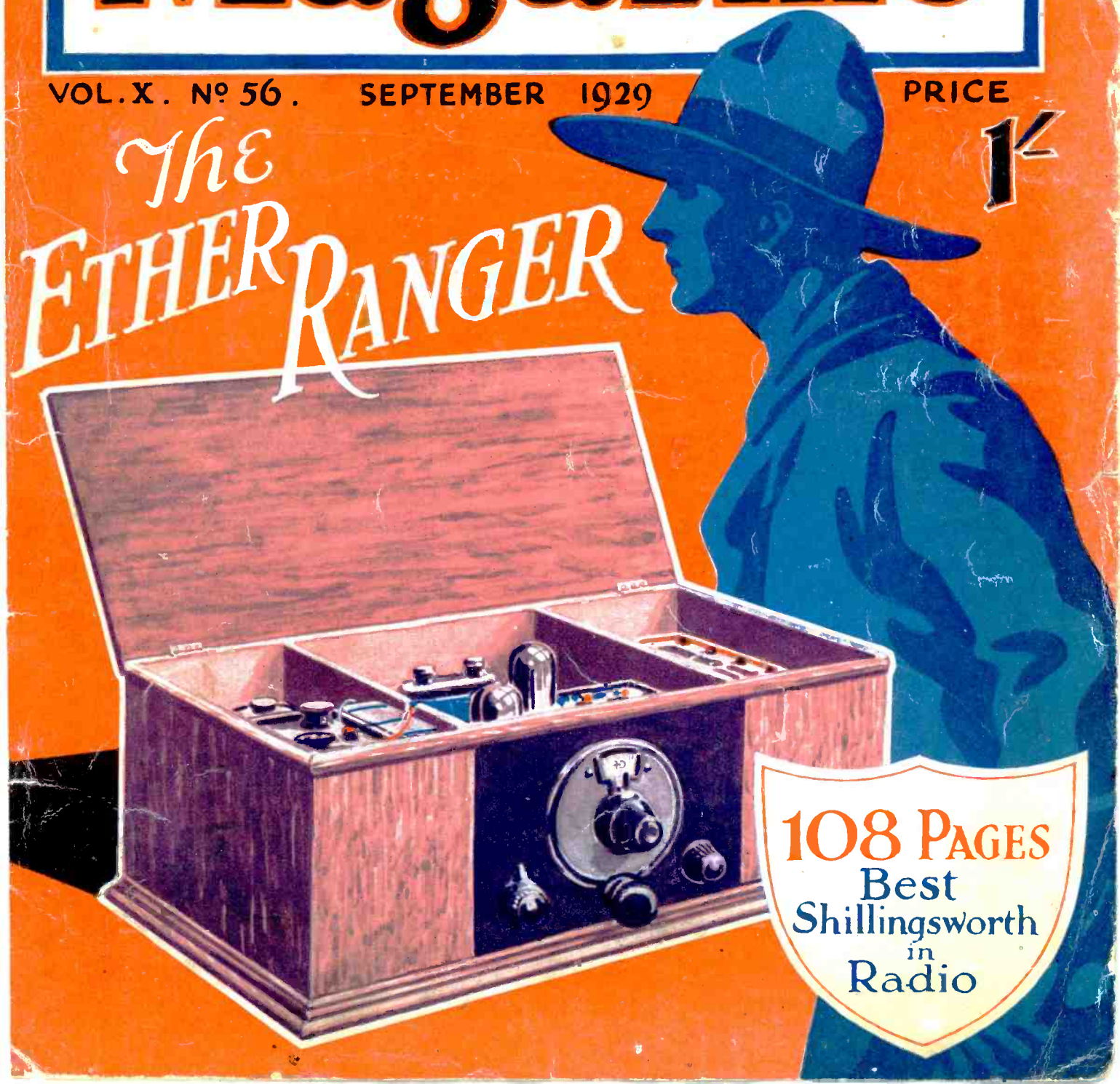
PAGE 101 : OUR NEW SERVICE FOR LISTENERS

Wireless Magazine

VOL. X. No 56. SEPTEMBER 1929 PRICE 1/-

The Ether Ranger



108 PAGES
Best Shillingsworth in Radio

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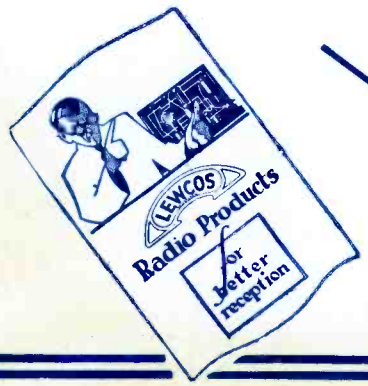

—fit

Leading radio experts everywhere have recommended LEWCOS coils for their supreme reliability in receivers of all descriptions. Take their advice and get more enjoyment out of your set.

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

Wireless Magazine

The Best Shillingsworth in Radio

Vol. X :: SEPTEMBER, 1929 :: No. 56

Research Consultant:
W. JAMES

Assistant Editor:
D. SISSON RELPH

Our Autumn Developments

I HAVE been very busy preparing a new department. You will not be surprised to learn that with the ever-increasing popularity of WIRELESS MAGAZINE, *an extension of our premises has become absolutely inevitable, and it follows that, during the last six weeks or so, I have been doing little else than planning and supervising the fitting up and equipment of a brand new testing and constructional department.*

Special announcements in our pages this month will acquaint you with what we have in mind: briefly, while maintaining to the full our keen interest in all constructional matters, we shall in the future devote space regularly to reviews, descriptions and test reports of manufactured receivers, recognising that so great will be the number of different sets produced this coming season that non-technical people will need independent advice in making a proper choice.

I am proposing also to make our Gramo-Radio Section more helpful in every way, to which end it will in future contain reviews of the best of the gramophone records and will present regularly more or less complete lists of new records.

In our next issue—which I have reason to believe will be the best I have ever presented to the public—readers will be able to see for themselves the extent of the new service which we are offering. Will you particularly make a point of this next issue which, in addition to reviewing the chief exhibits at Olympia, will contain features unequalled in any other radio monthly.

This present issue, September, gives a taste of our quality. Alan Hunter, who with the Head of our Constructional Department, J. Sieger, recently enjoyed an opportunity of acquainting himself with American radio matters, contributes a brief account of some of the things he saw and some of the people he met on the other side of the Atlantic.

The set to which our cover design is devoted—The Ether Ranger—is capable of fine results, and I should like you to turn over our pages to the article entitled "The Modern Magic Carpet—1929 Model," in which W. Oliver makes a world tour by radio and shows what a set of the Ether Ranger or Clipper Two type is capable of achieving.

The Fanfare Three meets up-to-date requirements, its two transformer couplings giving both convenience and quality for radio or gramophone reproduction.

The Arrow Four, so called because its selective tuning is never "beside the mark," uses a new H.F. combination consisting of the S.G. valve with an ordinary neutralised H.F. valve. Finally, for that 40 per cent. of householders who have the advantage of mains supply, there is the Stay-put Two, J. H. Reyner's special contribution to this issue; it is an all A.C. set, small but good, and uses the new type "Q" coil.

Our special correspondent, Dr. Alfred Gradenwitz, who carefully watches Continental radio on our behalf, describes in this issue how the Berlin Academy of Music provides musical instruction via ether.

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

Bernard E. Jones

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On September 20 Our Enlarged Exhibition Issue Will Be On Sale

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

Valves to Use in Your Set

TWO-VOLT VALVES

Three-electrode

Make	Type	Impedance	Amp. Factor	Anode Volt.	Fil. Cur.
Cossor ...	210RC	60,000	40	120	.1
Dario ...	Resist.		30	150	.1
Mazda ...	H210	59,000	47	150	.1
Six-Sixty	210RC	55,500	39	150	.1
Mullard ...	PM1A	51,000	36	150	.1
Marconi ...	H210	50,000	35	150	.1
Osram ...	DEH210		35	150	.1
Triotron ...	WD2	46,000	46	150	.07
Six-Sixty	210HF	25,000	19	150	.1
Marconi ...	HL210	23,000	20	150	.1
Osram ...	HL210		20	150	.1
Mullard ...	PM1HF	22,500	18	150	.1
Mazda ...	HL210	21,000	26	150	.1
Dario ...	Super HF		25	150	.18
Cossor ...	210HF		15	150	.1
Triotron ...	T10	20,000	9	120	.2
Triotron ...	HD2		16	120	.07
Six-Sixty	210LF	12,500	10	150	.1
Marconi ...	L210		11	150	.1
Mullard ...	PM1LF	12,000	11	150	.1
Osram ...	DEL210		11	150	.1
Cossor ...	210LF		10	150	.1
Triotron ...	TD2	11,400	8.5	120	.06
Six-Sixty	225D	11,000	13.5	150	.25
Mullard ...	PM2DX	10,700	13.5	150	.25
Mazda ...	L210	10,000	15.5	150	.1
Dario ...	Univ.		9	150	.1
Triotron ...	SD2	6,250	5	120	.1
Marconi ...	P215	5,000	7	150	.15
Osram ...	DEP215		7	150	.15
Six-Sixty	220P	4,800	7.2	150	.2
Dario ...	SP	4,500	9	150	.15
Mullard ...	PM2	4,400	7.5	150	.2
Cossor ...	220P	4,000	8	150	.1
Triotron ...	UD2	3,750	6	140	.2
Mazda ...	P220	3,700	12.5	100	.2
Six-Sixty	230SP	2,750	5.5	150	.3
Dario ...	Hyper	2,700	5	150	.3
Mullard ...	PM252	2,600	5.4	150	.3
Marconi ...	P240	2,500	4	150	.4
Osram ...	DEP240		4	150	.4
Cossor ...	230XP	2,000	4	150	.3
Mazda ...	P240	1,900	7	150	.4

Screened-grid—Four-electrode

Dario ...	SG	250,000	250	150	.15
Mullard ...	PM12	230,000	200	150	.15
Six-Sixty	215SG	220,000	190	150	.15
Marconi ...	S215	200,000	170	150	.15
Osram ...	S215		170	150	.15
Cossor ...	220SG		200	150	.2
Mazda ...	215SG	—	300	150	.15

Pentodes—Five-electrode

Six-Sixty	230PP	64,000	80	150	.3
Mullard ...	PM22	62,500	82	150	.3
Dario ...	Pent.	55,000	100	120	.3
Marconi ...	PT240		90	150	.4
Osram ...	PT240		90	150	.4
Cossor ...	230PT	20,000	40	180	.3

FOUR-VOLT VALVES

Three-electrode

Make	Type	Impedance	Amp. Factor	Anode Volt.	Fil. Cur.
Dario ...	Resist.		30	150	.075
Marconi ...	H410	60,000	40	150	.1
Osram ...	DEH410		40	150	.1
Cossor ...	41 RC		40	150	.1
Six-Sixty	4075RC	58,000	37	150	.075
Mullard ...	PM3A	55,000	38	150	.075
Triotron ...	WD4	46,000	46	140	.07
Dario ...	Super HF	21,000	25	100	.075
Cossor ...	410HF	20,000	20	150	.1
Mullard ...	PM3	13,000	14	150	.075
Triotron ...	AD4		13	120	.07
Six-Sixty	4075HF	12,500	13.5	150	.075
Dario ...	Univ.	10,000	10	150	.075
Triotron ...	RD4	9,000	9	140	.07
Marconi ...	L410	8,500	15	150	.1
Cossor ...	410LF		15	150	.1
Osram ...	DEL410		15	150	.1
Triotron ...	SD4	7,700	15.5	140	.14
Mullard ...	PM4DX	7,500	15	150	.1
Six-Sixty	410D	7,250	14.5	150	.1
Marconi ...	P410	5,000	7.5	150	.1
Osram ...	DEP410		7.5	150	.1
Dario ...	SP	4,500	9	150	.1
Mullard ...	PM4	4,450	8	150	.1
Six-Sixty	410P	4,200	7.7	150	.1
Cossor ...	410P	4,000	8	150	.1
Triotron ...	UD4	3,750	6	140	.1
Dario ...	Hyper P	2,700	5	150	.15
Triotron ...	SD4	2,500	4.5	140	.15
Marconi ...	P425	2,300	4.5	150	.25
Osram ...	P425		4.5	150	.25
Triotron ...	XD4	2,200	6	140	.15
Six-Sixty	420SP	2,000	4	150	.2
Mullard ...	PM254		4.2	150	.18
Cossor ...	415XP		4	150	.15

Screened-grid—Four-electrode

Dario ...	SG	250,000	250	150	.075
Mullard ...	PM14	230,000	200	150	.075
Six-Sixty	4075HF	220,000	190	150	.075
Osram ...	S410	200,000	180	150	.1
Cossor ...	410SG		200	150	.1

Pentodes—Five-electrode

Dario ...	Pent.	55,000	100	120	.15
Mullard ...	PM24	28,000	62	150	.15
Six-Sixty	415PP	27,000	60	150	.15
Cossor ...	415PP	20,000	40	180	.15

SIX-VOLT VALVES

Three-electrode

Make	Type	Impedance	Amp. Factor	Anode Volt.	Fil. Cur.
Marconi ...	H610	60,000	40	150	.1
Osram ...	DEH610		40	150	.1
Cossor ...	610RC		50	150	.1
Six-Sixty	6075RC	58,000	42	150	.075
Mullard ...	PM5B	33,000	40	150	.075
Marconi ...	HL610	30,000	30	150	.1
Marconi ...	DE5B		20	150	.25
Osram ...	HL610		30	150	.1
Marconi ...	LS5B	25,000	20	400	.8
Cossor ...	610HF	20,000	20	150	.1
Six-Sixty	6075HF	15,200	17	150	.075

(Continued on page 92)

Valves to Use in Your Set (Continued)

SIX-VOLT VALVES—Three-electrode (Cont'd.)

Make	Type	Impedance	Amp. Factor	Anode Volt.	Fil. Cur.
Mullard ...	PM5X	14,700	17.5	150	.075
Mullard ...	PM6D	9,000	18	150	.1
Six-Sixty	D610	9,250	18.5	150	.1
Marconi ...	L610	7,500	15	150	.1
Osram ...	DEL610		15	150	.1
Cossor ...	610LF		15	150	.1
Marconi ...	DE5	7,000	7	140	.25
Marconi ...	LS5	6,000	5	400	.8
Osram ...	LS5		5	400	.8
Six-Sixty	610P		7.2	100	.1
Mullard ...	PM6	5,700	7	150	.1
Marconi ...	DE5A	4,000	3.5	120	.25
Marconi ...	P610	3,500	8	150	.1
Osram ...	DEP610		8	150	.1
Cossor ...	610P		8	150	.1
Marconi ...	LS5A	2,750	2.5	400	.8
Marconi ...	P625	2,400	6	250	.25
Osram ...	P625		6	250	.25
Mullard ...	DFA9	2,000	5	250	.6
Cossor ...	610XP		5	150	.1
Mullard ...	PM256	1,850	6	180	.25
Six-Sixty	625SP	1,780	5.8	180	.25
Marconi ...	P625A	1,600	3.7	180	.25
Osram ...	P625A		3.7	180	.26
Marconi ...	LS6A	1,350	2.5	400	1.6
Osram ...	LS6A	1,300	3	400	1.6

Screened-grid—Four-electrode

Mullard ...	PM16	200,000	200	150	.075
Osram ...	S610		210	150	.1
Cossor ...	610SG		200	150	.1
Marconi ...	S625	175,000	110	180	.25
Osram ...	S625		110	180	.25

Pentodes—Five-electrode

Mullard ...	PM26	25,000	50	150	.17

MAINS VALVES

Make	Type	Impedance	Amp. Factor	Anode Volt.	Fil. Cur.
.8 Volt .8 Ampere					
Marconi ...	S.8	200,000	160	150	.8
Osram ...	S.8		160	150	.8
Marconi ...	H.8	55,000	40	150	.8
Osram ...	H.8		40	150	.8
Marconi ...	D.8	21,000	14	150	1.6
Osram ...	D.8		14	150	1.6
Marconi ...	HL.8	17,000	17	150	.8
Osram ...	HL.8		17	150	.8
Marconi ...	P.8	6,000	6	150	.8
Osram ...	P.8		6	150	.8
3.5 Volt 2.0 Ampere					
Marconi ...	KH1	30,000	40	150	2
Osram ...	KH1		40	150	2
Marconi ...	KL1	3,750	40	150	2
Osram ...	KL1		7.5	150	2
4 Volt 1 Ampere					
Mullard ...	S4V	1,330,000	1,000	150	1
Cossor ...	MSG41	200,000	400	150	1
Cossor ...	M41RC	20,000	35	180	1
Cossor ...	M41HF	14,000	25	180	1
Mullard ...	354V	14,000	35	180	1
Cossor ...	M41LF	7,900	15	180	1
Mullard ...	164V	6,650	16	180	1
Cossor ...	M41P	5,000	10	180	1
Mullard ...	104V	2,850	10	180	1
Cossor ...	M41XP	2,000	4	180	1

Relayed Aeroplane Talk

SOMETHING new in broadcasting has just been accomplished between America and England. While riding in an aeroplane above Hadley Field, New Jersey, recently, four news-agency representatives held telephonic communication with members of their London staffs, in a test conducted by the American Telephone and Telegraph Co.

The representatives were W. W. Chaplin, of the Associated Press; Julius Frandsen, of the United Press of America; H. H Metz, International News Service, and B. Rickettson Hatt, of Reuters.

In A Specially Equipped Plane

They were taken up two at a time in a specially equipped plane. The calls were picked up by the Whippany, New Jersey, experimental station, and the plane radio was linked with the land telephone system and thence to the trans-Atlantic radiophone service.

Those at the receiving end were gathered in the London office of the American Telephone and Telegraph Co. Chaplin talked with Miss Martha Dalrymple, of the A. P. London staff; Frandsen to Webb Miller, U.P. Assistant European Manager, and Metz to Harry Flory, manager of the I.N.S. in London, and also to Paul Hampton of the London *Evening Standard*.

The return conversation was picked up at Belfast, Me., sent to New York, and thence to the aerodrome.

Each reporter talked several minutes. The U.P. man exchanged news items, Frandsen relaying the despatch of the death of Strongheart, the movie dog star, and Miller replied with a report on the British Air Ministry's investigation of the English Channel aeroplane accident in which seven persons lost their lives.

The I.N.S. conversation was mostly in the form of a message from Amelia Earhart, trans-Atlantic woman flyer, who heralded the feat as a great event. Chaplin and Miss Dalrymple took up their time discussing the weather.

The aeroplane first took off at 9.15 in the morning, but came down later, because the London members were out to lunch. The conversation was reported to be very clear, although a trace of fading was reported from London.

REMIND ALL YOUR FRIENDS TO LOOK OUT FOR OUR SPECIALLY ENLARGED EXHIBITION NUMBER ON SEPTEMBER 20

Broadcasting in Rumania

RUMANIANS are taking more and more interest in broadcasting. Something like 225 receiving set permits are now being issued weekly by the Post Office Commission in order to authorise their owners to listen to the programmes being broadcast twice daily by the station newly established at Bucharest and to programmes coming from other countries.

Cheap Scale of Licences

The Rumania station, equipment for which has been loaned by the British Marconi Company, began regular operation last November 1. Up to October, about 10,000 receiver permits had been issued, and it was reported that many more persons are operating sets without permits. The licences range from about threepence for crystal sets to six shillings and sixpence for four valves or more.

Establishment of the Bucharest station and the gradual elimination of high import duties on radio apparatus, added to the modification of restrictions on obtaining licences for home installations, will stimulate broadcasting considerably in all cities.

Interlocked construction makes Cossor the strongest and most dependable Screened Grid Valves ever produced. Even the hardest blow cannot disturb the perfect alignment of their electrodes. These wonderful new Cossor Screened Grid Valves are shock-proof, noise-proof, and break-proof. Every Wireless Dealer sells them.

Made in 3 types for use with 2, 4 and 6-volt Accumulators.

Technical Data.

Filament Amps. .1, Max. Anode Volts 150, Impedance 200,000, Amplification Factor 200, Grid Bias 1·5 volts at max. anode Volts. Price (either type) **22/6**

A. C. Cossor, Ltd., Highbury Grove, London, N.5.

Cossor
Screened Grid

BRITAIN'S FINEST S.G. VALVE

9689

WAVELENGTHS of the EUROPEAN STATIONS Under the Prague Plan

A photograph of Prague, reproduced by courtesy of the Czechoslovak Travel Bureau

Wave-length	Name of Town	Country	Kilo-cycles
25.53	Chelmsford (5SW)	Great Britain	11,751
31.4	Eindhoven (PCJ)	Holland	9,554
200	Leeds (2LS)	Great Britain	1,500
218	Flensburg	Germany	1,373
221	Helsingfors	Finland	1,355
223	Luxemburg	Grand Duchy	1,346
225	Cork (1FS)	Ireland	1,337
227	Cologne	Germany	1,319
231	Malmo	Sweden	1,301
234	Wilno	Poland	1,283
	Muenster	Germany	
238	Bordeaux (Sud-Ouest)	France	1,260
239	Nurnberg	Germany	1,256
242	Belfast (2BE)	Ireland	1,238
246	Cassel	Germany	1,220
	Linz	Austria	
253	Breslau	Germany	1,184
255	Toulouse (PTT)	France	1,175
259	Leipzig	Germany	1,157
261	Newcastle (5NO)	Great Britain	1,148
265	Lille (PTT)	France	1,130
268	Barcelona (EAJ13)	Spain	1,121
270	Kaiserslautern	Germany	1,112
274	Turin	Italy	1,094
276	Koenigsberg	Germany	1,085
279	Bratislava	Czecho-Slovakia	1,076
281	Copenhagen	Denmark	1,067
283	Berlin (E)	Germany	1,058
288.5	Swansea (5SX)	Great Britain	1,040
	Sheffield (6LF)	,, ,,	
	Plymouth (5PY)	,, ,,	
	Liverpool (6LV)	,, ,,	
	Hull (6KH)	,, ,,	
	Edinburgh (6EH)	,, ,,	
	Dundee (2DE)	,, ,,	
	Bournemouth (6BM)	,, ,,	
	Bradford (2LS)	,, ,,	
	Stoke-on-Trent	,, ,,	
292	Lyons	France	1,028
300	Huizen	Holland	1,002
301	Aberdeen (2BD)	Great Britain	995
305	Agen	France	982
307	Zagreb	Jugoslavia	977
309	Paris (Vitus)	France	970
310	Cardiff (5WA)	Great Britain	968
313	Cracow	Poland	959
314	Oviedo (EAJ19)	Spain	956
316	Marseilles (PTT)	France	950
319	Dresden	Germany	941
324	Almeria (EAJ18)	Spain	926
325	Gleiwitz	Germany	923
332	Naples	Italy	905
335	Posen	Poland	896
336	Paris (Petit Parisien)	France	892
339	Bremen	Germany	887
342	Brunn	Czecho-Slovakia	878
349	Barcelona (EAJ1)	Spain	860
351	Leningrad	Russia	855
	Algiers	N. Africa	
352	Graz	Austria	851
356	London (2LO)	Great Britain	842
360	Stuttgart	Germany	833
368	Seville (EAJ5)	Spain	816
	Paris (Radio LL)	France	
372	Hamburg	Germany	806

Wave-length	Name of Town	Country	Kilo-cycles
377	Manchester (2ZY)	Great Britain	797
381	Toulouse	France	788
390	Frankfurt	Germany	770
394	Bucharest	Roumania	761
399	Glasgow (5SC)	Great Britain	753
400	Madrid (Radio Espana)	Spain	750
403	Berne	Switzerland	743
405	San Sebastian (EAJ8)	Spain	740
408	Kattowitz	Poland	734
413	Dublin	Ireland	725
418	Berlin	Germany	716
424	Madrid (EAJ7)	Spain	707
427	Kharkov (NKO)	Russia	702
431	Belgrade	Jugoslavia	694
436	Stockholm	Sweden	689
	Radio Flandre (Lille)	France	
441	Rome	Italy	680
447	Paris (Ecole Sup. PTT)	France	671
450	Bolzano	Italy	666
	Danzig	Germany	
453	Klagenfurt	Austria	664
	Salamanca (EAJ22)	Spain	
456	Aachen	Germany	657
459	Zurich	Switzerland	653
468	Lyons (PTT)	France	640
473	Langenberg	Germany	635
479	Daventry (5GB)	Great Britain	626
483	Homel	Russia	621
487	Prague	Czecho-Slovakia	617
493	Oslo	Norway	608
501	Milan	Italy	599
509	Brussels	Belgium	590
517	Vienna	Austria	581
525	Riga	Latvia	572
533	Munich	Germany	563
542	Sundsvall	Sweden	554
550	Buda-Pest	Hungary	545
560	Hanover	Germany	536
572	Ljubljana	Jugoslavia	527
678	Lausanne	Switzerland	442
760	Geneva	Switzerland	395
825	Moscow (PTT)	Russia	364
1,000	Leningrad	Russia	300
1,010	Basle	Switzerland	297
1,070	Scheveningen-Haven	Holland	280
	Huizen (AVRO)		
1,153	Kalundborg	Denmark	260
1,200	Boden	Sweden	250
	Stamboul	Turkey	
	Reykjavik	Iceland	
1,304	Kharkov	Russia	230
1,348	Motala	Sweden	222
1,411	Warsaw	Poland	212
1,460	Eiffel Tower	France	205
1,481	Moscow	Russia	202
1,553	Daventry (5XX)	Great Britain	193
1,635	Zeesen	Germany	183
1,725	Radio Paris	France	174
1,796	Lahti	Finland	167
1,875	Hilversum	Holland	160
1,935	Kovno	Lithuania	155
2,100	Norddeich	Germany	142
2,290	Norddeich	Germany	131

IN TUNE WITH THE TRADE!

FETTER LANE'S Review of Catalogues and Pamphlets

Regentone and Mains

WHEN it comes to settling on the H.T. supply for a receiver and a mains eliminator is decided upon, it seems to me that the question of cost is very important. In hard cash, I mean that by using a medium-priced eliminator with a guaranteed performance one has the maximum amount to spend on the receiver itself. Regentone eliminators just fill this need.

There is a wide range for every purpose, and the prices are certainly "to fit the pocket," as they say in the weekly-payment advertisements. If you want to know just how comprehensive is the whole range of Regentone units and, if you want to find the unit to supply your particular needs, then get the folder which has just been issued by the Regent Radio Supply Co., 21 Bartletts Buildings, Holborn Circus, E.C.4.

And don't forget that, no matter whether you want to have H.T. or L.T. from the mains, the Regentone people can supply a suitable eliminator. **46**

◆ ◆ ◆

H.A.H.

A good many years ago I had a little voltmeter, bearing the letters H.A.H. arranged "skew-wiffley" on the dial, and it functioned with a satisfying degree of precision, until somebody to whom I had lent it kept it so long that I forgot where it went to!

However, this bit of personal history won't interest you nearly so much as a booklet bearing the imposing title, "Hunt's Electrical Measuring Instruments," which I have received from (need I say it?) H. A. Hunt, Ltd., Tunstall Road, East Croydon.

Whilst I won't say that this is arranged in the ultra-modern artistic fashion, with big pictures, which generally mean very little but only look pretty, it is a booklet and price list which shows the whole range of H.A.H. "dials," and there are tables which make it easy for you to see the type, reading range, and price of any meter you may want.

Take my tip and get this booklet (No. 133B) and keep it on hand. **47**

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De Luxe Push-pull

MY old friends, Claude Lyons, Ltd., are at the moment making a speciality of a very "hot" line in amplifiers. This is a two-stage push-pull gramo-radio amplifier contained in a neat cabinet, for addition to any other gramophone or radio apparatus. It is entirely British built at the Liverpool factory, and I presume the reason for its introduction is the popularity which is enjoyed by push-pull amplification in the U.S.A., and which is equally well deserved over here.

Probably stupid convention is the only reason why the average amateur set in this country does not have push-pull amplification, when working under ordinary conditions; if the Claude Lyons amplifier can do anything to dispel this convention, then it will be all to the good.

I won't delve into the technicalities, except to say that from a brief glance at the specification the very best parts are used. The amplifier is fully described in a leaflet which can be obtained from Claude Lyons, Ltd., 76 Old Hall Street, Liverpool. Need I say more? **48**

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G.E.C. Catalogue

IT always seems to me that the radio amateur benefits by the trust he can put in the purchase of goods from a firm having giant ramifications, such as the G.E.C. I have at hand at the moment a complete catalogue of the company's components and complete receivers, and you can get a similar copy on application to the G.E.C., Magnet House, Kingsway, W.C.2.

In the brief space available, it is hardly possible to précis the contents. I can only say that if you want any kind of complete set, you will find it in this book, thoroughly illustrated and described, and if you want any component for your own set, from a grid leak up to an A.C. mains eliminator, then you will find, too, that the G.E.C. has it. **49**

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"Mainten" Your Set

EXCUSE the pun; but I have just received a most interesting booklet of Mainten mains eliminators and other gadgets from the Mainten Manufacturing Co., of 126 Portland Road, Hove, Sussex. Mainten make some very well-made looking eliminators for D.C. and A.C. at various voltages. What pleases me, too, is the fact that the prices are most reasonable.

Take the simplest Mainten D.C. eliminator, which has two voltage tappings; a convincing little job, suitable for a three-valve set, and priced at only 30s. Then there are A.C. eliminators from £4 15s. and upwards, and this cheapest model is suitable for the average four-valver and has three voltage tappings.

Mainten make speakers and metal cabinets. These cabinets are most attractive in appearance and I think, as they are obtainable in many sizes, they are worthy of consideration by every set constructor who wants to climb a little out of the rut. As you know, a metal cabinet gives an automatic degree of screening. **50**

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 five 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 unsealed envelope, bearing ½d. stamp, to "Catalogue Service," WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. *Valid till Sept.* **30**

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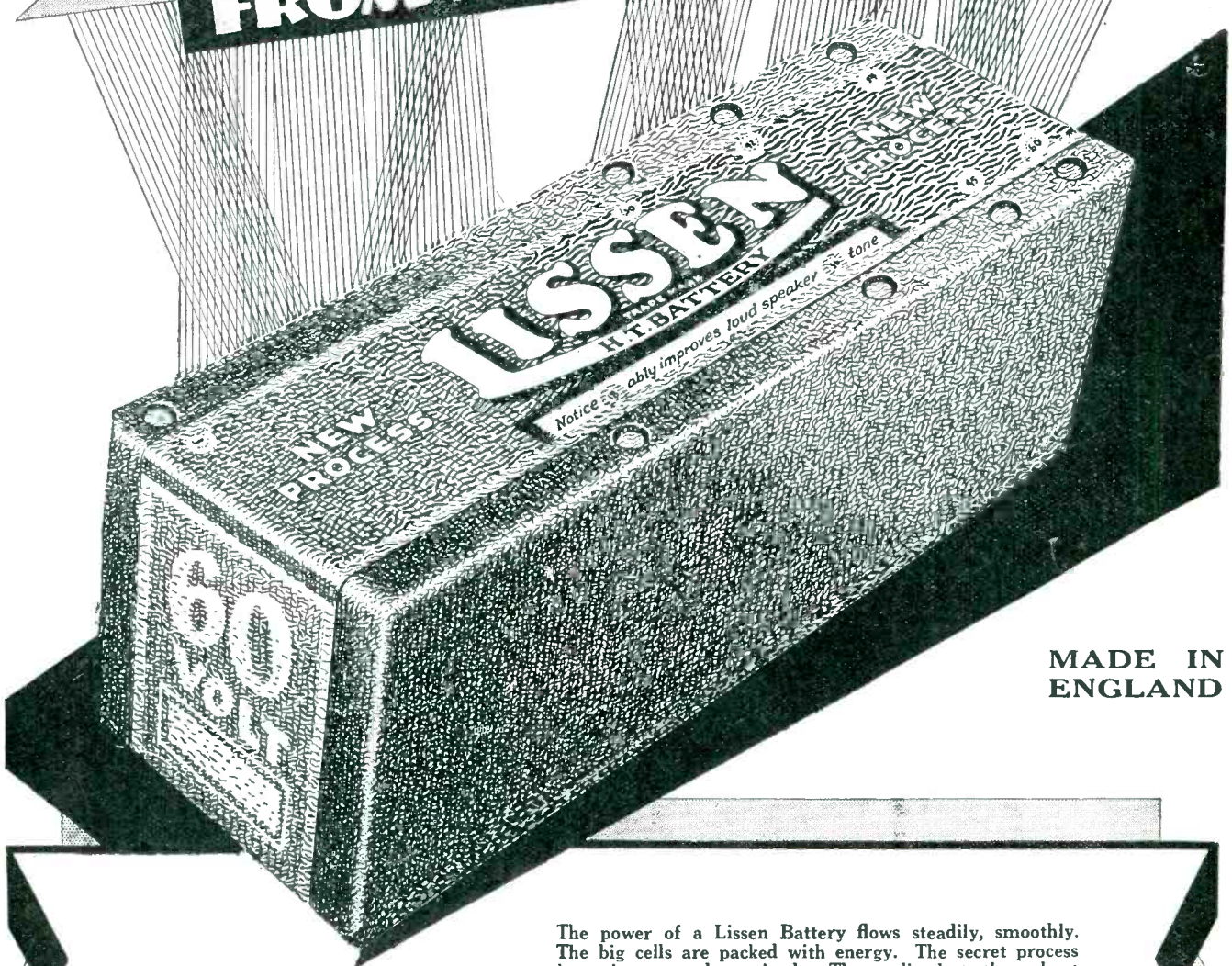

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My U.S. Radio Diary

Compiled During A Recent Tour by ALAN S. HUNTER

ALMOST unbearable heat greeted our arrival at New York on the afternoon of June 18, and interest in everything, including radio, was lost in a feverish effort to get cool once again.

After a lengthy session under the shower bath, followed by the consumption of, literally, some gallons of ice water thoughtfully provided "on tap" by the hotel we were staying at, I was able to take a little interest in the activities of J. Sieger, my "W.M." Colleague.

A British Portable

He was holding a large piece of ice to his brow as he twiddled the dials of the portable set we had brought across the Atlantic; he was muttering something about the heat warping his control panel, so I kept well in the background.

Personally, I was very greatly surprised—and I think my companion was, too—when the set brought in about ten stations in quick succession.

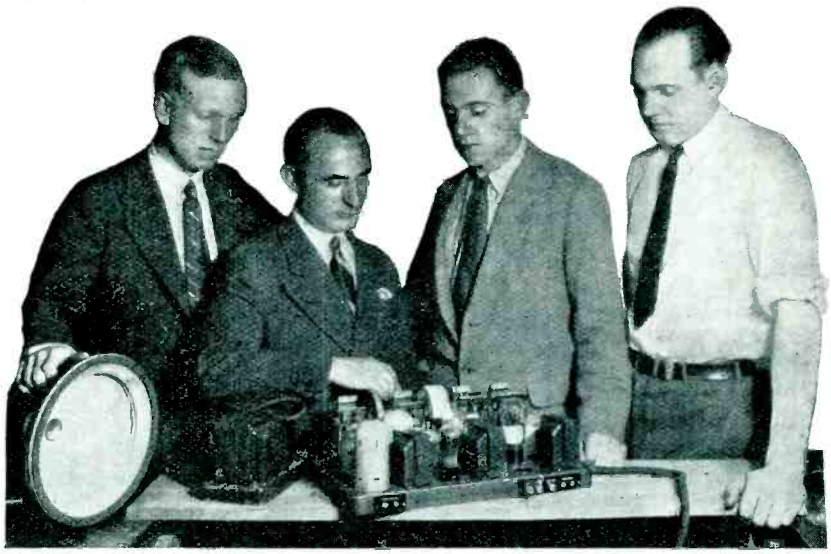
True, we might have saved ourselves a little manual labour in knob turning, in that most of the stations seemed to be in one of three stages: (*a*) starting to broadcast "I've got a Feeling I'm Falling;" (*b*) in the middle of broadcasting "I've got a Feeling I'm Falling;" or (*c*) finishing a broadcast of "I've got a Feeling I'm Falling"!

In the Thick of It

Still, it was quite exciting to be in the thick of New York's radio, instead of 3,000 miles away from it all. In the middle of the above mentioned tune, which we eventually left to WJZ to interpret for us as we dressed for dinner, the phone tinkled—Eric Palmer, of Fada Radio, was waiting to show us around.

What he showed us had little to do with radio, unless the extraordinary good quality of reproduction of a talking film at the Paramount Theatre is excepted. Even at the back of this huge theatre the accents of Maurice Chevalier could be heard with amazing clarity.

Early next morning our good friend, Mr. Palmer, was conveying us over the Queensborough Bridge to Long Island City, where, at Jackson Avenue, the Fada factory is situated. F. A. D. Andrea, the president, extended to us a cordial invitation to see how Fada sets are made.



"John Bull, who is quite a radiobug himself, having heard so much about what Uncle Sam is doing nowadays with screened-grid tubes in the new receivers, has sent emissaries across the Atlantic to report. The photograph depicts two youthful British radio experts, Alan S. Hunter and Joshua Sieger, of London, welcomed to the prohibition side of the ocean by F. A. D. Andrea and shown the chassis of a 1929-1930 model set in the Fada factory in Long Island City." This is the caption supplied by the American photographer.

Before this I had been acquainting the Fada news bureau with all the latest tit-bits of British radio news; they seem very interested in the regional scheme and the Prague allocation of wavelengths.

Extraordinary as it may seem, American radio engineers are still debating whether screened-grid valves are worth while—as for pentodes, they haven't even *seen* one as yet!

Recently two members of the "Wireless Magazine" staff visited the United States to see for themselves how American practice differs from our own. In these pages one of them describes his adventures—which will be read with interest by all British listeners.

Readers will be glad to know that the portable set, built in the "W.M." laboratory, referred to in these notes, more than held its own with any American receiver of similar type.

Fada are very progressive, and we were able to hear some remarkably fine reproduction from a new Fada set embodying three screened grid valves. Running direct from A.C. supply, this set has a single dial for tuning and a built-in moving-coil loud-speaker.

Eliminating Faults

In spite of the immense heat we were able to take an interest in the factory—though I could not repress a smile when our attention was directed to a humidity cabinet! Most interesting of all at Fada's is the system by which faults in manufacture are tracked down and finally eliminated.

We had told Mr. Palmer that our stay in New York was limited; he took us very literally, so that we were rushed off in true American hustle style, to see Mr. Dunlop, Jnr., who is the well-known radio editor of the *New York Times*.

He was busy, but turned us over to an assistant who explained the workings of the short-wave set used to keep in touch with the Bird Expedition.

My U.S. Radio Diary (Continued)

Lunch with Lloyd Jacquet, the radio editor of the *Herald Tribune*, was wedged in between whiles, after which we were headed for 711 Fifth Avenue, where the National Broadcasting Company has its head offices and studios.

Two Big Chains

In parenthesis, I should explain that nearly all American radio stations of any consequence belong to either of two big chains, the N.B.C. and Columbia systems. A third chain was in process of organisation while we were in the U.S.A., but so far this scheme has not reached maturity. The rival chains sell broadcasting time to advertising clients representing nearly all branches of industry and commerce.

A fine example of modern American studio decoration; this is one of the studios used by the N.B.C for its great chain of broadcasting stations

William Burke Miller, the assistant manager of the Press Department of the N.B.C., went to a considerable amount of trouble to ensure our visit being a success—it was. We roamed in and out of some wonderful studios, notable for their decoration.

Condenser Microphones

One significant feature was the universal adoption of the condenser type of microphone, which I believe has much to do with the good quality of the WEAF and WJZ transmissions. One studio—the Cathedral—was an immense affair.

Thinking that we were perhaps a little homesick, a kind-hearted official led us into his sanctum to hear 5SW, Chelmsford. This was late in the afternoon (June 19) so, allowing for the five hours difference between New York and London time, we were just in time to hear a typical programme in progress; the piano tinkle tinkle, followed by a pleasantly boring talk, rounded off by a further tinkle tinkle ! We didn't feel very proud of the B.B.C. at that moment.

Americans are surprisingly interested in the idea of interchanging programmes between England and the U.S.A., but it was brought home to us very clearly that, although in a technical sense the idea is rapidly approaching a practicable stage, some difficulty will be experienced in choosing programme matter of common interest.

The preponderance of light jazzy programmes in America is in striking contrast to the somewhat heavy type of programme favoured by the B.B.C.

At 113 West 52nd Street, we found William A. Schudt, Jnr., Columbia press representative, anxious to give us a good impression of his system. This rival to the N.B.C. has been in existence for two years; it serves about fifty-three stations in forty-nine cities.

A new building is rapidly approaching completion at Madison Avenue. This new headquarters will have fifteen modern studios. WCAU in Philadelphia is on the Columbia chain, and may achieve fame if, as is projected, it is used to exchange programmes with Europe during the forthcoming season.

In a suburb of Philadelphia countrified little residential quarter called Summertown, I had an opportunity to see radio from a more normal angle than had been possible in our whirlwind tour of New York's radio peaks. On the family's eight-tube Radiola set I had no difficulty in getting a bag of seven exceedingly loud transmissions, some locals and some 90-mile distant New Yorkers. These were all as reliable as 5GB is in London.

Victor Talking Machines

The factory of the Victor Talking Machine Co. is out at Camden, Philadelphia, where we spent an interesting, if slightly over-heated, afternoon. Eldridge R. Johnson started this concern in 1900—and it failed. Re-organised, it became a success, and in 1926 a group of bankers acquired its interests for 26 million dollars.

Barely two years later the Radio Corporation of America paid 68 million dollars for the Victor Company, a good illustration of the phenomenal increase in value that businesses in the States sometimes acquire. Twenty-six years it took to build up that business—and only two more years to nearly treble its value !

A Startling Difference

A Victor record made in 1902 was played for us on an instrument dated 1900. The same record was then played through the newest Victor machine; the difference was startling. This little demonstration brought out the interesting fact that the technique of reproduction has undergone a much greater development than the technique of recording.

Much of what has been actually recorded on these old discs has been lost to listeners owing to this discrepancy in the effectiveness of the recording and reproducing systems.

Defending the American System

Thomas Hawkins, president of the William Penn Broadcasting Company of Philadelphia, is a busy man, but not too busy to welcome British radio men; this genial president had a lot to say in defence of the American system of broadcasting. He rather scorned our own system, though he

(*Continued on page* 183)

Our New Service for Listeners!

Special Tests of Commercial Sets and Kits—Advice on the Choice of Receivers—Reviews of Gramophone Records by Experienced Critics—Service for Tracing Records

SEPTEMBER 23—the date of the opening of the Radio Exhibition at Olympia—marks the beginning of a new season's wireless activities. Manufacturers all over the country are preparing to give listeners of all classes yet better value for their money, and the WIRELESS MAGAZINE is also getting ready to give even more practical advice to its readers during the coming months.

Set Tests and Record Reviews

Our new service will be of equal value to non-technical listeners and advanced experimenters. In the first place we are arranging to publish the results of practical tests of complete commercial receivers and kits and, secondly, to review gramophone records, both from the technical and musical view-points.

Up to now there has not been available to listeners wishing to buy —as distinct from those who wish to build—any impartial source of information regarding the commercial receivers on the market. That gap the WIRELESS MAGAZINE is preparing to fill. Beginning with next month's specially enlarged exhibition issue, we shall publish every month authentic and practical test reports of every type of commercial set.

Greatest Enjoyment

By following these reports from month to month, the reader will in a short time be able to discriminate for himself, thus ensuring the best value for money and the greatest enjoyment from broadcast entertainment.

This service is not only of value to those who do not themselves wish to delve into the deeper technicalities of radio, for although the reports will be written in language that can be understood by everybody, they will also indicate to the advanced technician all the latest developments in commercial practice.

It will at once be appreciated that this new service necessitates considerable organisation, so to cope with the new conditions the WIRELESS MAGAZINE has more than doubled its laboratory accommodation. An extension of staff has also been necessary and a great deal of new testing equipment is being installed. Nothing will be missing that can make our tests of the utmost value to the reader.

Moreover, apart from having the benefit of reports of sets in each issue, the reader will be able to ask our advice on the choice of any particular kind of receiver that he or she may desire—and this advice will cost only the 1½d. stamp needed for a reply.

What We Can Do for You

For instance, if you have a set that is now getting obsolete and wish to replace it with an up-to-date model, we shall be glad to give you an impartial recommendation—based on actual experience in the handling of the sets, remember—of a number of sets that will best meet your needs.

To take advantage of this offer readers have only to indicate their desires on the following points:

1. What is the maximum price?
2. Where will the set be used?
3. What particular stations are specially desired?
4. Is an external aerial or self-contained aerial required?
5. Will the set be run from mains-supply equipment or from batteries?

There is no doubt that thousands of listeners and prospective listeners all over the country are in need of authentic and disinterested advice on the choice of suitable equipment. If you are one of those who always builds his own set you will be doing a service to your non-technical friends by bringing this offer to their notice.

The only rule to be observed is that each query must be accompanied by a stamped and addressed envelope.

The second part of this service—notes and reviews of all the records published monthly by the big gramophone companies—will also be of inestimable value to our readers.

Whilst technical requirements for gramo-radio reproduction will not by any means be overlooked, we shall take special care to indicate the respective musical and entertainment values of all the records we review.

Special "W.M." Critics

This scheme, of course, also needs the most careful and complete organisation. Members of the WIRELESS MAGAZINE staff do not pretend to be music critics, and we are therefore obtaining the services of a number of musicians—all of them specially experienced in the criticism of gramophone records—to undertake this part of the service.

As far as possible we shall publish a complete list of the records issued month by month, and we shall also be prepared to tell readers where they can obtain any particular record. For instance, you may hear at a concert some musical composition or song that takes your fancy so much that you would like a record of it to play at home; if you write to us, giving as much revelant information as possible, of course, we will do our best to trace the record for you, if one exists.

Of Greater Value Than Ever

We have no doubt at all about the popularity the new service will enjoy. We are putting a great deal of hard work into it, so that it will be as perfect as possible—it only remains for you to make better use than ever of your WIRELESS MAGAZINE. On no account miss the special exhibition issue, which will contain a number of pages printed in colours; it will be on sale everywhere on September 20, the Friday before Olympia opens for the great show.

Stabilising Your Screened-grid Valve

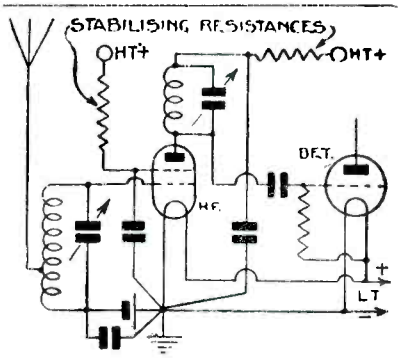
A GOOD many troubles in reception may be traced to the use of a high-tension supply, such as a dry battery, having so much resistance which is common to the various circuits that they are coupled.

One should not make the mistake of imagining that all is well because there is no motor-boating. The quality of the reproduction, and the stability of the receiver are both likely to be affected by a high-tension supply having a common resistance which is, however, not quite sufficient to produce low-frequency oscillations.

Stabilising Resistances

When a shielded valve is used for high-frequency magnification particular care is necessary. Sometimes it is sufficient to include resistances of a few hundred ohms in the supply wires to the shield of the valve, and to the anode circuit, as these will limit the amount of the high-frequency current that may enter or leave these circuits via the H.T.

But it may be necessary to employ resistances of a few thousand ohms for the purpose of preventing low-



Positions of stabilising resistances in screened-grid valve set

frequency reaction. These resistances, incidentally, also act as high-frequency stoppers.

There is a fall in voltage across them, however, and while this may not matter in the least so far as the shield circuit of the valve is concerned, it may be serious in the anode circuit. A resistance of 10,000 ohms drops 20 volts, for example, when the current is 2 milliamperes. The anode voltage is, therefore, 20 volts less than that of the supply.

This is of no account when there is an ample high-tension voltage available, because it is only necessary to increase the voltage applied to the valve by 20 in order to compensate for the loss in the resistance. In many instances the battery has the maximum voltage of only 120, and the result of employing the resistance would be that the anode would have a voltage of as little as 100.

A shielded valve should generally be supplied with at least 120 volts to its anode, and if allowance is made for a 20-volt drop in the stopping resistance the battery voltage would have to be 140.

STAN MOORE.

Magnification from An L.F. Transformer

ONE is often advised that the amount of the current flowing through the primary winding of a transformer should be limited to a few milliamperes. As a result, one sometimes hears it said that if this particular value of current is exceeded the transformer will be damaged. This is not true.

The reason for recommending that the amount of the current be not more than a certain value is that the inductance of the transformer is dependent upon the current flowing and falls off as it is increased. Now the amplification, particularly of the lower notes, varies with the inductance. The amplification actually increases with the inductance, and it is necessary that the inductance be not less than a certain amount.

This point will be more clearly appreciated if the formula for amplification is considered. This formula is as follows :—

$$\text{Amplification} = \mu \times \sqrt{\frac{\text{Ratio} \times Z}{Z^2 + R^2}}$$ where

μ = the magnification factor of the valve.

R = the anode impedance of the valve.

Z = the impedance of the primary winding of the transformer.

It is Z which varies according to the inductance and the frequency. If we neglect the resistance of the transformer, we may write, $6.3 \times f \times L$ for the quantity Z, where F is the frequency and L the inductance of the primary winding.

Further Simplification

In order further to simplify, let us fix the frequency at 50 cycles; then Z becomes equal to the inductance multiplied by 315.

Let us assume the amplifying valve used has a constant magnification factor of 20 and an anode impedance of 20,000 ohms, and that the ratio of the transformer is 3.

If we now write the values in the above formula we shall obtain the magnification at the frequency of 50 cycles for a given value of inductance.

In a particular L.F. transformer, when the direct current flowing through the primary is 1 milliampere, the inductance is about 110 henries. For a current of 2 milliamperes the inductance is 90 henries, and for 5 milliamperes is only 60 henries.

Results Tabulated

We may therefore tabulate the results as follows :—

Current through primary winding	*Inductance henries*	*Value of Z ohms*
1 ...	110 ...	35,000
2 ...	90 ...	28,000
3 ...	80 ...	25,000
4 ...	70 ...	22,000
5 ...	60 ...	19,000

If we now put down all the known values, the actual amplification may be worked out. We have, when 1 milliampere is flowing, for example, this sum to work out :—

$$\text{Amplification} = 20 \times 3 \times \sqrt{\frac{35{,}000}{35{,}000^2 + 20{,}000^2}}$$

$$= 52.5.$$

Exact Effect of Anode Current

By writing in the formula the various values of Z as given above and calculating to determine the amplification, we shall see the exact effect of the anode current. For convenience the results are tabulated :

Current through primary winding	*Magnification of a 50-cycle note*
1 ...	... 52.5
2 ...	... 49.4
3 ...	... 47
4 ...	... 44
5 ...	... 41

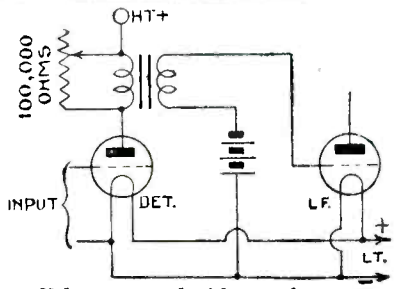
This table clearly shows that the magnification of a low note, actually one of 50 cycles, is reduced as the anode current is increased.

P. H.

Controlling the Volume of Your Set

THE majority of receivers having a stage of high-frequency amplification are fitted with a volume control in order that the strength of the oscillations applied to the detector may be regulated.

It is, in fact, hardly possible to



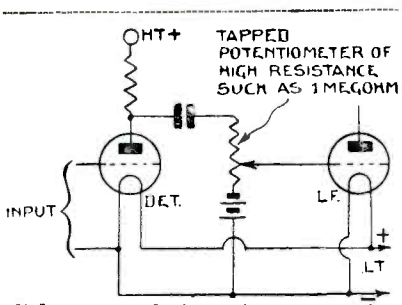
Volume control with transformer coupling

obtain satisfactory working when a volume control of this type is not fitted, for the stronger signals would tend to overload the detector. There are occasions, however, when a second regulator is necessary and, as an example, I will refer to a set having an anode-bend detector with one high-frequency and two low-frequency amplifiers that is also employed for playing gramophone records.

Gramophone Reproduction

A volume control must be used to enable the strength of gramophone reproduction to be adjusted and is, therefore, a purely low-frequency control. It may be fitted directly across the pick-up or, when the circuit is suitable, across the first amplifying stage.

The circuit would be suitable when



Volume control with resistance-capacity coupling

the valve, to which the pick-up is connected, is of a type that will take a grid bias of about 3 volts negative with normal high-tension. If the valve is of a type that will not stand a grid bias of more than negative 1.5 volts, there is a little danger should the pick-up be of the most sensitive type and be playing a loud record.

This control may take the form of an adjustable resistance or a potentiometer, according to whether the first valve is transformer or resistance coupled to the second valve.

The advantage of employing a volume control connected as shown in the figures is that it is available for broadcast. One is, therefore, able fully to load the detector valve, but to avoid overloading it, and then to control the amount of the low-frequency amplification.

It is well-known that an anode-bend detector distorts when the input is too little, but the volume may happen to be too great when the input is raised in order to maintain the quality. The low-frequency control may be employed to correct this.

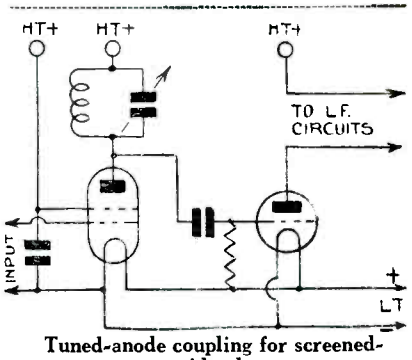
Modern practice is against too many controls assembled on the front panel, but the provision of the two volume regulators described is sometimes essential. A. TALBOT.

"Tuned Anode" and the S.G. Valve

ONE of the advantages of the shielded high-frequency valve is that a plain tuned-anode circuit may be employed with good results as regards magnification and selectivity. The coil may, of course, be tapped in order to obtain more magnification and better selectivity than when the whole coil is included in the anode circuit, but this does not alter the principle of the circuit.

As it stands, it has one drawback. It provides a connection between the grid of the detector and the low-frequency valves, with the result that low-frequency howling or even motor-boating is particularly liable to occur.

A resistance-capacity filter may, of course, be included in the high-tension wire to the anode circuit and will prevent howling and distortion. The circuit is, nevertheless, a dangerous



Tuned-anode coupling for screened-grid valve

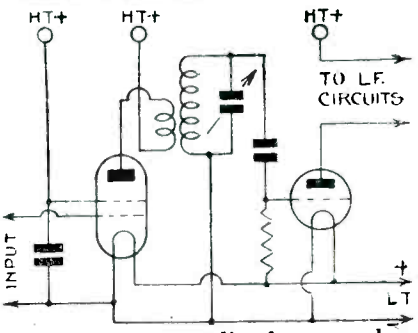
one, although it gives excellent results in many instances, and the question arises regarding how an improvement may be effected.

The obvious answer to the question would be by preventing a direct connection between the anode circuit of the shielded valve and the detector circuit. This may be accomplished by employing a high-frequency transformer coupling instead of the tuned anode.

L.F. Reaction Eliminated

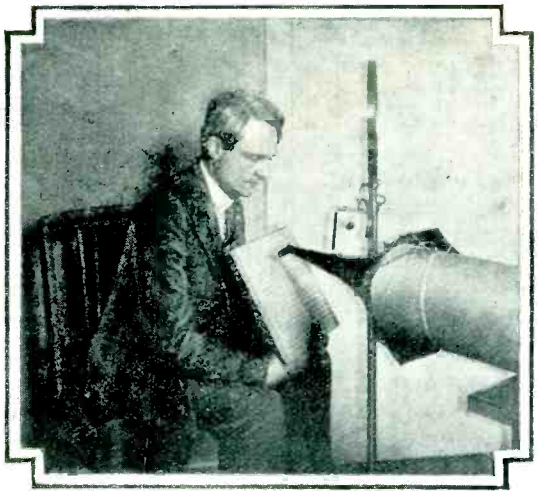
From the connections given in the figure it will be clear that low-frequency reaction is eliminated by this means, as the grid is coupled to the anode circuit by a transformer which transmits only high-frequency oscillations.

A transformer is, unfortunately, a rather more expensive component than a tuned-anode coil and unless it is properly constructed the performance may not be quite so good. The selectivity and magnification



Transformer coupling for screened-grid valve

may, however, be made almost identical with that to be obtained from a suitably tapped anode coil. Theoretically, a tapped anode coil and a transformer give identical results, but in practice the transformer must be just a little inferior. There is very little in it when the transformer is a good one. S.M.



Teaching Music by Radio

By DR. ALFRED GRADENWITZ

WHEN recently calling at the radio station of the Berlin Academy of Music, where a successful attempt has been made at utilising the manifold resources of the wireless art in the service of music teaching, I found that interesting developments had occurred since, about a year ago, this unique institution was first put into operation.

Co-operation

It will be recalled that this is a sort of central station where musicians, on the one hand, and radio engineers, on the other, are given an opportunity of co-operating in an investigation of certain important problems of radio broadcasting and of exchanging their personal views and experiences.

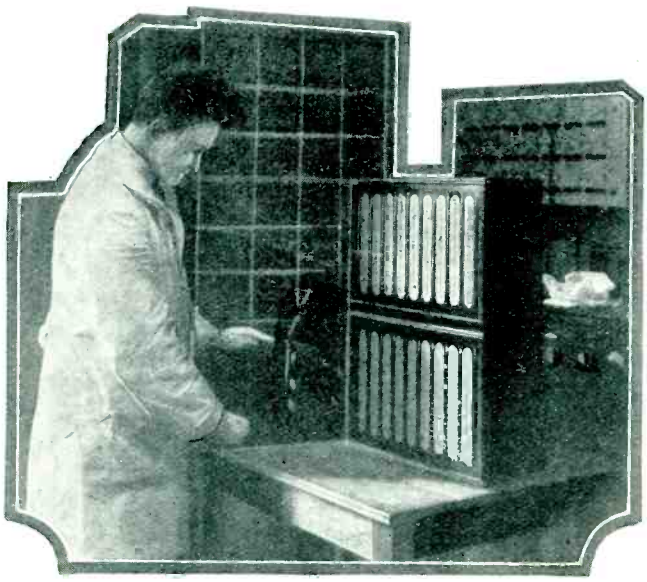
All the halls and auditoriums of the Academy, as well as the laboratories forming part of the radio stations, have been equipped with wonderfully efficient microphones, receiving sets, and loud-speakers.

Direct current of variable voltage and intensity is made use of to operate the amplifiers and loud-speakers, and is derived partly from accumulator batteries and partly from special machine sets.

System of Communication

The amplifier-room comprises large switchboards whence the electrical energy is properly distributed; moreover, each room connected up to the plant has its own small switchboard, to which either microphones or loud-speakers, as the case may be, are connected.

Finally, each room communicates by a direct telephone line with the amplifier-room, so that the operator in charge of it can at any time be given all necessary instructions.



Testing the acoustic qualities of a wall-lining material. Dr. Fischer's assistant in another room compares the reflected with the original sounds

The studio comprises not only the usual removable draperies serving to damp any echo, but elastic wooden linings on the walls. Also, provision has been made for ascertaining the best conditions to give satisfactory acoustics.

The principal innovations based on the use of radio which have been adopted at the Academy of Music are briefly enumerated as follows:—

Remote teaching of singing has been found thoroughly practicable and is largely made use of. The pupil, according to this scheme, stays in his or her own dwelling, while the teacher from his study, which might be in a far-distant place, providing that a satisfactory connection can be established, gives instruction as he would be expected to give in the case of an ordinary lesson.

All that is required to this effect, of course, is that a duplex telephone connection between the two rooms be possible.

Remote conducting is another practice which has been adopted at the Academy. The various members of an orchestra or choir are placed in various rooms having no mutual connections, but communicating with the study of the conductor, who is seated at his piano, the rhythm of which is transmitted by radio to each of the musicians.

Broadcast Players

In connection with a forthcoming Swiss festival it is expected to conduct the play of an orchestra from Berlin, the various players being located in Berlin and various towns of Germany, France, Italy, and Switzerland respectively.

When I called the other day a young Russian student was just having her voice checked by means of the steel-wire voice recorder. This

apparatus, invented by Dr. Stille, is based on the variable magnetisation of a steel wire or band passing in front of the poles of an electromagnet actuated by microphone currents.

When reversing this process—that is, causing the magnetised wire or band to pass in front of the same or a similar electromagnet—currents corresponding to the original microphone currents will be induced in its circuit, so that a remarkably faithful reproduction of the speaker's or singer's voice is heard in a headphone or loud-speaker connected up to the electromagnet.

Students Check Their Voices

This apparatus is freely made use of by students to check any defects of their own voices; it is even resorted to by professors in more thoroughly gauging their pupils' achievements.

When first hearing the reproduction of a record thus taken, I had the impression of listening to an excellent gramophone record of a first-class artist, and I was rather surprised that the voice should be that of a highly gifted pupil.

Dr. Erich Fischer then gave me a demonstration of his method of ascertaining the acoustic qualities of wall linings. A tube about 25 centimetres in diameter and 2 metres in length contains in its interior a miniature loud-speaker which produces a standard sound effect.

The tube terminates at one of its ends in a reversed funnel, at the end of which the emerging sound strikes a plate of the material to be tested.

The reflected sound waves are picked up by a microphone communicating with the loud-speaker or headphone in another room, where comparative tests are made, another loud-speaker or headphone, inserted in the same circuit, being adjusted until equal loudness is obtained.

This method enables the sound reflecting properties of various maerials to be ascertained with great accuracy.

A singing student testing her own voice on a Stille steel-wire recorder

"Canned" Noises Off

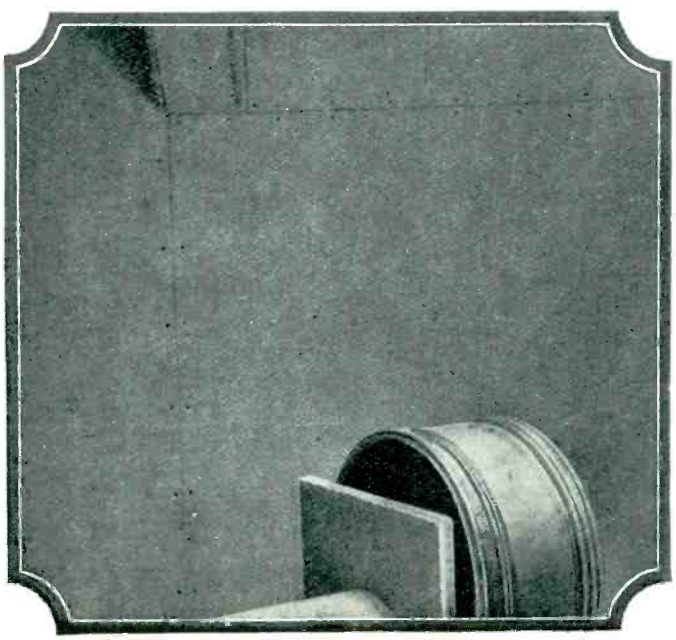
IN Shakespeare's time the "noises off" in a play were simply written as asides—*clock striking* (in Roman times !), *alarums*, *murmuring*, and sometimes just *noises off*, the latter leaving quite a deal to the audience's imagination !

We are so much more precise nowadays. We have the noise machine at Savoy Hill, the dramatic control panel, the echo room, the noise-making "supers" and the gamut of the artificiality-creating devices.

And now comes news that the B.B.C. Effects Chief has had made a number of gramophone records of noises and sound effects which will come in handy for radio dramatic performances. These records are costly, but it is estimated that the reproduction and imitation of such things as crowd noises, wind, sea-side sounds and so on, can be much better done by means of a record than with the present "fake" methods.

Indeed, considering the ease with which gramophone music and effects can be "faked" over the microphone, it is surprising that greater use has not previously been made of records. But perhaps this use *has* been made, without listeners being aware of it !

J. RANKIN.



The opposite end of the tube containing the standard loud-speaker by means of which acoustic qualities are gauged (see the article "Teaching Music by Radio," by Dr. Alfred Gradenwitz, on the opposite page)

When Water Is Scarce

SIAM? About the only thing most of us know about this distant part of the world is the schoolboys' version of the Siamese National Anthem (alleged, and to be said quickly) "Oh, War Tar Nar Siam." But that is poles apart from radio !

And now Siam has a radio interest, for the short-wave station at Bangkok is "going strong." It is pushing out with a power of 20 k.w., and with regularity, and there are two beam aerials and all the latest equipment for a world-wide short-waver.

One gadget is of particular interest. Owing to the hot climate, there is always a danger of water becoming scarce, and water is wanted at the radio station for the water-cooling systems of the valve anodes. So there is a device which automatically switches off the H.T. supply if the cooling water becomes exhausted. If this were not done, then the valves might be ruined.

B. I. M.

Wireless Magazine, September 1929

Finding New Voices for the Ether

BY FRANK ROGERS

NEW voices are always needed in the B.B.C.'s studios; not only do artists unaccountably lose that extra quality which secured them their bookings, but the public continually cries out for variety.

It is no surprise, then, that the B.B.C. is continuously searching for talent. To-day its efforts are more efficient and less wasteful than formerly. When broadcasting was a struggling child there were few names which could be used as a foundation for programme building, as there are to-day.

Early Difficulties

Furthermore, the wireless inventors had not yet provided a good microphone. As a matter of fact, it was necessary in the very early days to use as many as four of them at once, because no single microphone was capable of reproducing the complete range of frequencies. And, then, they were often tinkered about with buttons, sixpences, and odd pieces of wire. Consequently, there was a smaller proportion of voices giving good quality transmission.

But voices had to be found, and while Captain H. J. Round and his colleagues were experimenting with the microphone the musical staff were searching frantically for performers. As many as five or six would be holding auditions practically every day of the week.

One member told me he used to hear one hundred and fifty people per week, out of which he might get only ten or a dozen of any use to him. Maybe, then, a further test would whittle this number down to a mere half-dozen.

Microphone Flattery

Gradually, however, a nucleus of dependable artists was built up and the auditions could be cut down to more reasonable limits. In time, too, the microphone problem was solved and other technical changes brought about, until to-day a state has been reached where any normally good voice not only "gets over" well, but is flattered into the bargain.

The method adopted by the B.B.C. musical audition department is something like this. They receive roughly seventy applications per week. In reply they send a form on which to enter particulars as to qualifications and recommendations.

Anyone who can fill up this form satisfactorily is offered an audition. Conversely, no one can hope for one if their answers do not bear examination.

Strange though it may appear, there are numbers of totally unqualified and musically uneducated people who think they can sing or play "good enough for the wireless." Unless, however, they can show that they have been trained and can produce a second person of standing to vouch for their capability they will not be granted an audition.

In spite of this precaution, the percentage of successful applicants is not much over five. During one afternoon between two and half-past four I saw sixteen people "do their stuff" before a microphone. Of these, one was so good that she "walked through."

One Out of Sixteen!

I sat not in the listening box, but in the studio itself, so that I might hear the natural voice as well. And I could not help being struck by the assistance given her by the microphone. Before I pulled the earphones tightly over my ears I had said to myself, "This girl is good." When I listened-in to her it was all I could do to stop myself shouting it.

Of the remaining fifteen I could only find two that so much as approached satisfaction. As one seemed far too low a number, I mentioned these two to the official in charge with considerable timidity, but he, however, ruled them out at once, and when I suggested that one out of sixteen was a poor result he answered that it was neither more nor less than he anticipated.

In a second studio vaudeville turns were being tried over. There is far more scope here and a successful newcomer will not be long waiting for an engagement. But vaudeville is no easy art to master and auditions do not produce many "discoveries." As listeners know, the majority of the best turns are provided by performers of established reputations.

Of course, there are plenty of concert-party artists ready to try their luck in the studio, and numbers of them succeed. The concert-party platform is, in point of fact, a well-known training ground for performers of all kinds, and scores of popular people served their apprenticeship there.

Musicians are always in fairly steady demand, but a high standard of execution is asked for. The range of pieces played in the course of one week alone is so vast that only a good instrumentalist can cope with it.

Different Auditions for Talks

Auditions for talks are of an entirely different nature, since the B.B.C. has previously ascertained that an applicant has something interesting to tell its public, and has therefore every reason for passing him through the test. As long as he has a normal voice and can talk reasonably well he will be passed through the first stage into the next.

Here he will receive some instruction in microphone technique under the guidance of an experienced official. This "finishing" has lately been adopted for certain applicants in the other classes. Formerly a would-be soloist either failed or passed. There was no half-way house.

Now, however, arrangements have been made to help those who are musically educated, and who really can sing, to adapt themselves to the special technique of the studio.

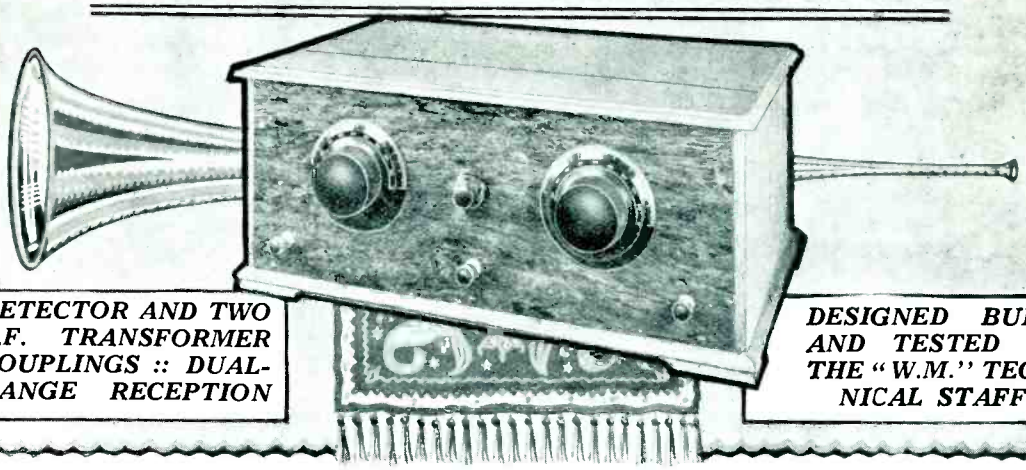
A Private Half-hour

They have a private half-hour or so with an official who is no longer the cold disinterested tester, but a coach desirous of bringing his subject up to the mark. This scheme has been attended with every success and is helping the B.B.C. very considerably to "lay in a stock" of first-class artists.

As far as actual results are concerned, however, the B.B.C. spends more time and money than may seem necessary. Almost any musically trained person can obtain an audition, in spite of the fact that it is overwhelmingly certain that from all classes only one out of every ten is likely to be of real use.

The FANFARE THREE

FOR RADIO AND RECORDS



DETECTOR AND TWO L.F. TRANSFORMER COUPLINGS :: DUAL-RANGE RECEPTION

DESIGNED BUILT AND TESTED BY THE "W.M." TECHNICAL STAFF.

DURING the last two years low-frequency transformers have been somewhat at a discount on the score that they could not compare with resistance-capacity couplings for purity of reproduction.

The general practice has been to use a transformer in combination with a resistance-capacity coupling to give a balance between volume and purity.

Proof of Popularity

Such a combination does give ample volume for all normal purposes and, if the values are properly proportioned, the order of purity is very high. The popularity of the arrangement is sufficient proof of its worth.

But recent advances in the design of low-frequency transformers made more than one designer wonder whether the use of two of these instruments is not again justified.

There is no doubt that the combination of two transformers does give a very high degree of amplification and, with their improved characteristics, the quality of reproduction is of a very high order indeed.

Against the extra volume that can be obtained by this method, however, must be set the increase in high-tension current consumption which results. The low-impedance type of valve used with a transformer coupling takes two or three times the current consumed by the high-impedance type required with a resistance coupling. As in everything else, there is a price to pay in radio also !

Two transformers were employed very successfully by J. H. Reyner early in the year in his Furzehill Four, and it is, in fact, in response to many requests from readers that we now offer particulars of a three-valver using the same combination.

Modern Refinements

It is desirable that we should make quite clear, however, that this set is not to be classified with the old type of three-valver employing two transformers; there are a number of refinements in the circuit that ensure considerably better reproduction than could possibly be obtained three or four years ago.

This receiver, which we have appropriately called the Fanfare Three, has been designed as a dual-wave broadcast receiver which can also be employed for the electrical reproduction of gramophone records.

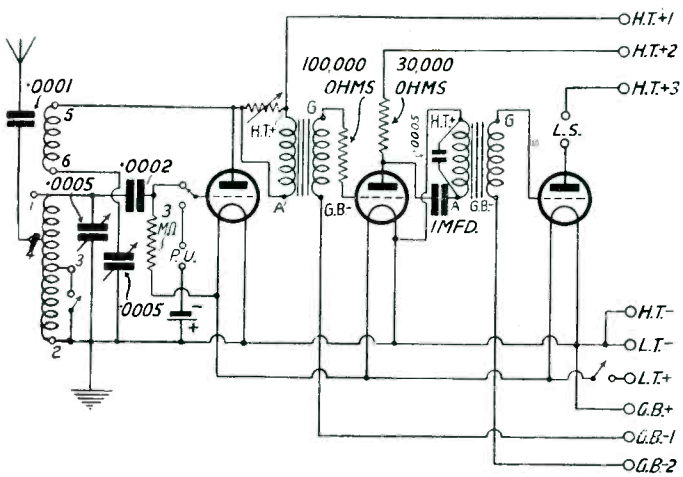
Three special features of the receiver are :—

(1) The use of a dual-range tuner which obviates the need for changing coils.

(2) The provision of a volume control, which enables overloading of the last valve to be avoided during the reception of a local station, or the playing of a loud record.

(3) Resistance-capacity feed to the second

THIS SIMPLE RECEIVER INCORPORATES A NUMBER OF MODERN REFINEMENTS



Circuit of the Fanfare Three, for broadcast reception or gramophone-record reproduction

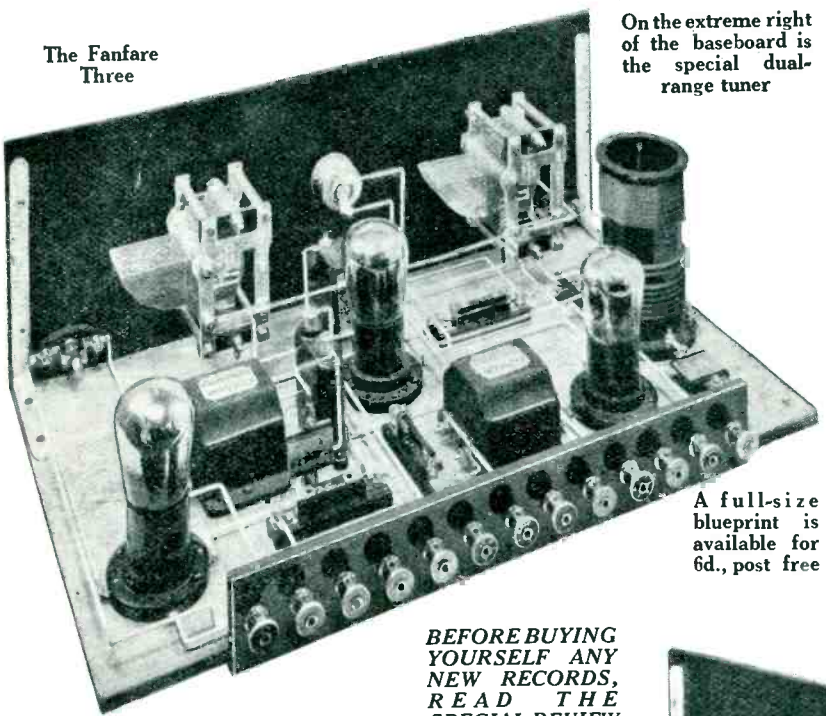
The Fanfare Three (Continued)

transformer also ensures the best quality of reproduction whatever may be the high-tension current passing.

These refinements complicate the construction of the set very little, and are well worth incorporating. The accessible layout will be clear from the photographs reproduced in these pages.

Associated with the detector valve is a .0002-microfarad grid condenser and 3-megohm grid leak. This combination gives better selectivity than the combination of .0003-microfarad grid condenser and 2-megohm grid leak.

Provision is made for inserting an electromagnetic pick-up in the detector-valve gridlead when it is desired to reproduce gramophone records through the medium of the loud-speaker. The use of a pick-up, of course, means that the "detector" valve is no longer needed as a rectifier when gramophone records are being reproduced, and the circuit is so arranged that it is biased for amplifying.



The Fanfare Three

On the extreme right of the baseboard is the special dual-range tuner

A full-size blueprint is available for 6d., post free

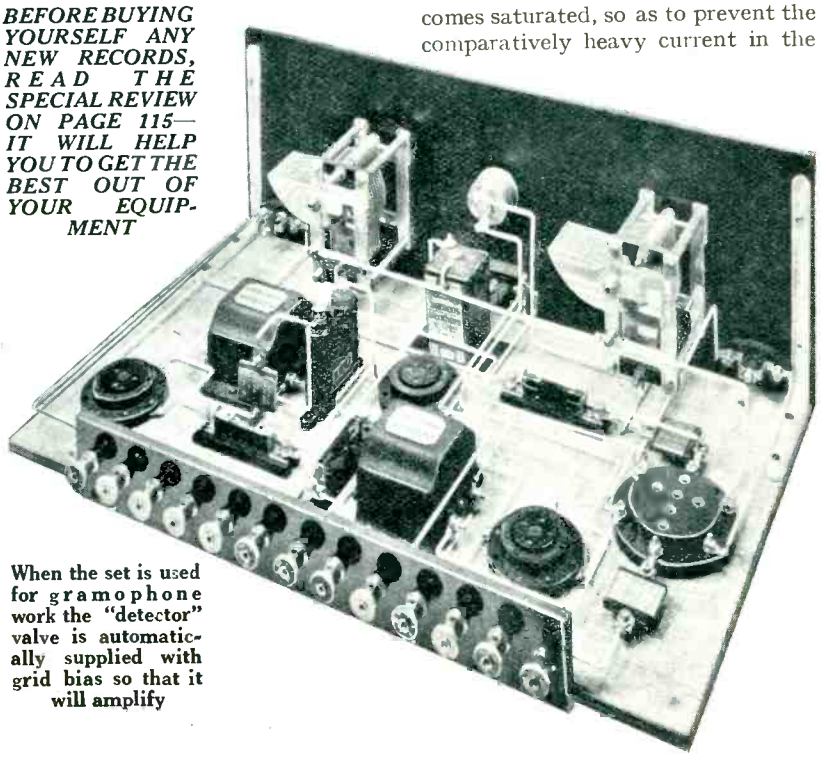
A glance at the circuit diagram will show the theoretical arrangement of the parts. For the sake of selectivity (which will be more important than ever when the new station at Brookman's Park begins operations) a series condenser of .0001-microfarad capacity is included in the aerial lead.

Tappings for Selectivity

Moreover, the aerial tuner is itself tapped at two points (Nos. 1 and 4 on the diagram) to give extra selectivity. The aerial lead can be connected to either of these points.

It will also be seen that the portion of the coil between points 2 and 3 can be short-circuited when it is desired to receive on the short wavelengths (250 to 500 metres). The short-circuiting switch is the simple push-pull type, and is mounted in the bottom left-hand corner of the panel. When the knob is "in" the set is adjusted for long-wave reception.

BEFORE BUYING YOURSELF ANY NEW RECORDS, READ THE SPECIAL REVIEW ON PAGE 115—IT WILL HELP YOU TO GET THE BEST OUT OF YOUR EQUIPMENT



When the set is used for gramophone work the "detector" valve is automatically supplied with grid bias so that it will amplify

Putting the Pick-up into Circuit

The pick-up is put into circuit as required by means of a push-pull jack-type switch mounted in the centre of the panel.

There is no high-frequency choke in the circuit although a form of Reinartz reaction is used. High-frequency currents are effectively prevented from passing through the low-frequency circuits by the 100,000-ohm resistance placed directly in the grid lead of the second valve.

Directly across the primary of the first transformer is placed a high variable resistance, which acts as a volume control. As this resistance is lowered in value, of course, more current passes through it instead of through the transformer primary winding and, therefore, the volume is decreased.

Quality of reproduction is affected if the iron core of the transformer becomes saturated, so as to prevent the comparatively heavy current in the

Includes Two Transformer Couplings for Power

anode circuit of the second valve from passing through the primary of the second transformer, use is made of resistance-capacity feed.

This is similar in effect to the choke-capacity output often used in conjunction with loud-speakers. The anode current passes through the resistance but is prevented from passing through the primary winding by the coupling condenser. Signal impulses can, of course, pass through this condenser without difficulty.

Best Performance

It will thus be evident that every precaution has been taken to ensure the best possible performance from the transformers—modern transformers have excellent characteristics and the best is obtained from them in the Fanfare Three.

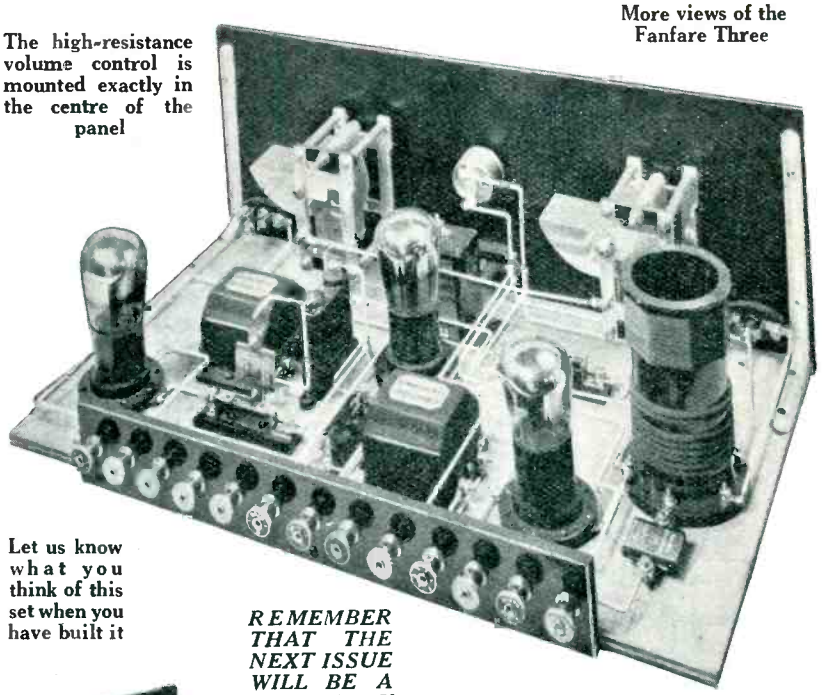
Apart from the technical efficiency of the receiver, we wish also to draw attention to its practical arrangement. Every part is accessible and there is no crowding. Even the beginner will find no difficulty in the construction.

Those who desire one—and it will save time and trouble—can obtain a full-size blueprint for half-price (that is, 6d., post free), if the coupon on page iii is used by September 30. Send your inquiry to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4, and ask for No. WM157.

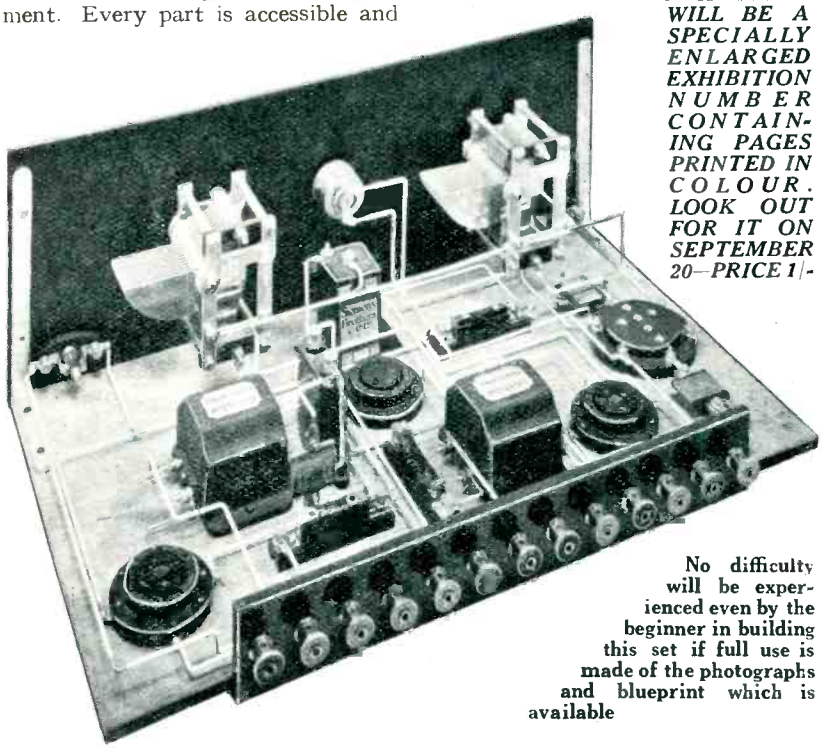
All the constructional details will be clear from the blueprint or the reduced reproduction of it that appears on page 110.

More views of the Fanfare Three

The high-resistance volume control is mounted exactly in the centre of the panel



Let us know what you think of this set when you have built it



No difficulty will be experienced even by the beginner in building this set if full use is made of the photographs and blueprint which is available

REMEMBER THAT THE NEXT ISSUE WILL BE A SPECIALLY ENLARGED EXHIBITION NUMBER CONTAINING PAGES PRINTED IN COLOUR. LOOK OUT FOR IT ON SEPTEMBER 20—PRICE 1/-

When wiring-up, the blueprint will be found of particular value. It will be seen that every wire bears a number; these numbers denote the best order of making connections and should be carefully followed. This method of assembly makes a mistake almost impossible.

Before the set can be used, three suitable valves must be chosen, and for a set of this type this is not a difficult matter.

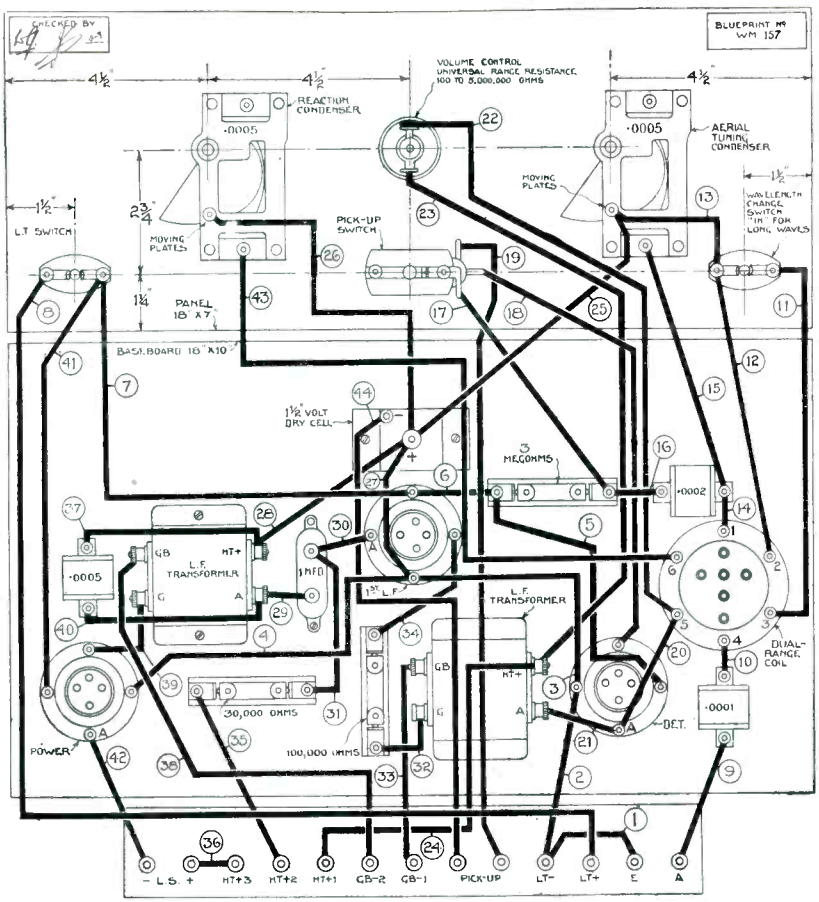
Permalloy Core

Both the transformers used have the new permalloy core which gives them a high inductance for a comparatively small winding. Consequently, it is possible to use a valve of comparatively high impedance in the detector stage.

The type known as "H.F." will give satisfactory reproduction and considerable amplification. Any valve with an impedance of 20,000 or 30,000 ohms can be employed. It must be borne in mind, however, that the valve will be used as an amplifier and not as a detector when the set is arranged for gramophone work.

Except for the fact that it would have too small a grid swing and would be easily overloaded, a similar valve could be used in the second position.

The Fanfare Three (Continued)



This layout and wiring diagram of the Fanfare Three 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 September 30. Ask for No. WM157. Connect up in numerical order

But for purity it is desirable to use a valve of lower impedance, something in the neighbourhood of 10,000 to 15,000 ohms, say.

The choice of a power valve for the last stage will present the greatest difficulty as this immediately raises the question of high-tension supply. It is most uneconomical to run some power valves direct from dry-cell batteries and a mains high-tension is, of course, a great boon where one can be used conveniently.

Impedance of Power Valve

However, it can be said that the power valve should have an impedance of approximately 2,500 ohms, such for instance as the Marconi P625 or Cossor 230XP.

The high-tension and grid-bias voltages, of course, depend entirely on the actual valves used. Separate terminals are provided for the anode supply to the three valves, so that each can be given the best working voltage.

For the detector, 60 to 90 volts will be satisfactory with, say, 100 volts for the second valve, and 120 or 150 for the power valve.

The grid bias required by the "detector" valve when the set is used for reproducing records is provided automatically when the pick-up is put into circuit.

Grid Bias on L.F Valves

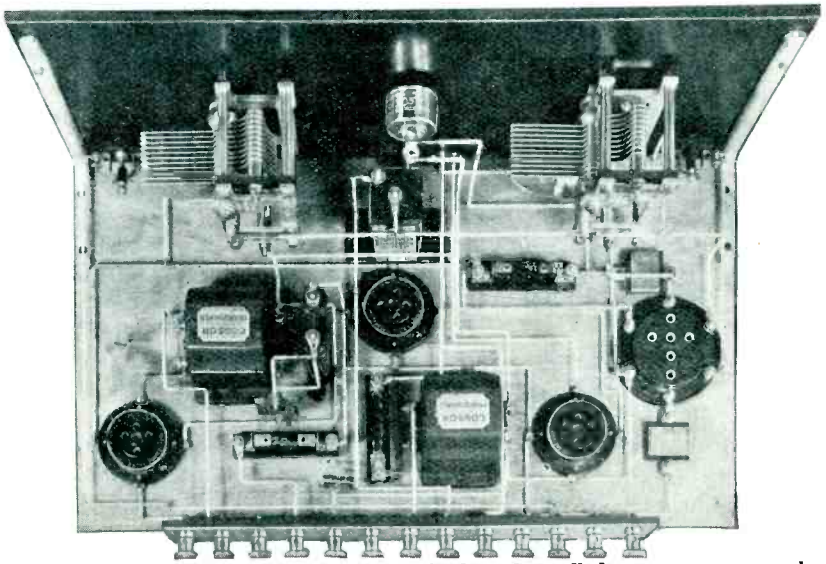
The first low-frequency valve will normally need a negative bias of 1½ to 3 volts, and the last valve anything from 6 to 24 volts, depending upon the type used.

When the set has been connected up it can be tested out. For short-wave reception, pull out the knob of the wave-change switch (on the left of the panel), while for the reception of long-wave stations it should be pushed in.

Position of Pick-up Switch

The set is switched on by pulling out the knob of the filament switch (on the right of the panel). Before trying to tune in a station, see that the knob of the pick-up switch (in the centre of the panel) is in and that the volume control is turned as far as possible to the left—its position of maximum resistance.

Next, adjust the reaction condenser (on the right of the panel) until a slight rustling or hissing sound is heard from the loud-speaker; this indicates that the set is on the verge



This plan view of the Fanfare Three clearly shows how all the parts are arranged

For Radio or Record Reproduction

of oscillation and, therefore, in its most sensitive state for reception.

As soon as this state is obtained, carefully turn the knob of the main tuning condenser (on the left of the panel) until a station is picked up.

When once a transmission has been roughly tuned in the anode and grid-bias voltages should be readjusted for the best results.

The operation of the set as a gramophone amplifier is simple in the extreme. Once the pick-up has been connected to the appropriate terminal it is necessary only to pull out the knob of the pick-up switch.

If the set is used very close to a broadcasting station, it may be necessary to detune the main condenser.

Suitable Pick-ups

There are many electromagnetic pick-ups on the market which can be placed on the gramophone tone-arm in place of the ordinary sound-box. Amongst those that we have tested and can recommend are the Varley, Igranic, B.T.H., Brown, Celestion, Philips, and Loewe instruments.

One of the chief advantages of playing records electrically is that greater volume is obtained—a great convenience to members of a family who are fond of dancing.

Moreover, better reproduction is obtained from many electrically-produced records, particularly in the case of bass passages. Such instruments as the drums, bass viols are very much better heard.

Many listeners prefer a combined set of the type of the Fanfare, because, to a large extent, it makes them independent of the broadcast programmes. During the transmission of an item in which they are not interested, they can entertain themselves with a few favourite records—without having to do anything to the set except move a single switch!

COMPONENTS REQUIRED FOR THE FANFARE THREE

Panel	1—Ebonite panel, 18 in. by 7 in. (Parfait, Trolite, or Keystone). 1—Terminal strip, 13 in. by 2 in.
Coil	1—Dual-range tuner (Formo). 1—Six-pin coil base for above (Formo, Lissen, or Cossor).
Variable Condenser	2—.0005-microfarad (Cyldon, Lotus, or Formo).
Fixed Condensers	1—.0001-microfarad (Cosmos, Graham-Farish or Trix). 1—.0002-microfarad (Cosmos, Graham-Farish, or Trix). 1—.0005-microfarad (Cosmos, Graham-Farish, or Trix). 1—1-microfarad (Dubilier, T.C.C., or Lissen)
Valve Holders	3—Antimicrophonic (Lotus, Wearite, or Marconiphone).
Resistances	1—30,000-ohm fixed (Cosmos, Varley, or Graham-Farish). 1—100,000-ohm fixed (Cosmos, Varley, or Graham-Farish).
Resistances	1—3-megohm (Cosmos, Varley, or Graham-Farish). 1—Variable resistance (Clarostat Universal).
Transformer	2—Low-frequency (Cossor, Varley, or Ferranti).
Switches	2—Push-pull on-off (Lotus, Lissen, or Benjamin). 1—Jack-type switch (Lotus No. 7).
Terminals	13—Marked:—Aerial, Earth, L.T.+, L.T.—, Pick-up (2), G.B.—1, G.B.—2, H.T.+1, H.T.+2, H.T.+3, L.S.+, L.S.— (Eelex or Belling-Lee).
Cabinet	1—Upright type with 10-in. baseboard (Pickett, Ready Radio, or Peto-Scott).
Sundries	1—1½-volt dry cell (Siemens G.T., or Ever-Ready). Stiff wire for connecting (Glazite). 1—Pair panel brackets (Bulgin, Raymond, or Omnora).

Chinese Find Wireless Dull

WIRELESS broadcast programmes as supplied by the Nationalist Government in China are reported to be a trifle dull, so states a Peking dispatch. Propaganda was the object of the Government in encouraging the use of wireless, and propaganda is issued in large doses in China.

However, the Chinese listener switches over to Japan and Vladivostok and listens to music. He even listens to speeches in Russian rather than those in Chinese.

Nanking, the Chinese capital, is the centre of the broadcasting campaign. Until the Nationalists gained control in China it was illegal to own receiving sets. Now regulations similar to those in Western Europe prevail.

At present not one person in a thousand can afford a set, but hundreds gather round the big shops and listen-in.

Radio Cures Laziness

STRAINS of music from the radio, piercing the quiet and solitude of Tahola, Washington, an Indian reservation hamlet miles from civilisation, has put pep into the Indians.

It seems that the Indians are very slow about pulling in their nets during the fishing season.

Mr. G. P. Halfery, salmon packer, has a fish house and buys fish from the Indians. But Halfrey could not get action out of the redskin fishermen. He found their laziness annoying and costly, entailing much delay. So he installed a radio.

Popular Jazz Tunes

Now, when the strains of "She's My Baby" and "That's My Weakness Now" or some other popular jazz piece go roaring out of the fish house and out on to the waters, the Indians leap frantically in their canoes, pull in their nets and catch and head for the fish house.

Halfrey experiences no trouble now getting his fish as long as the radio holds out.

Wireless Magazine. September 1929

—WHY WE NEED AN— INTERNATIONAL RADIO LANGUAGE

WE live in an international age. At least, we pride ourselves that we do, and constantly point to all sorts of advantages which modern conditions give us over our immediate predecessors.

The ease and speed of international travel, the convenience of international banking, the great boon of the international post, the marvellous ramifications of international trade—all these things are cited, separately or in the aggregate, as examples of what the modern understanding between nations has given us.

International Broadcasting

Perhaps it is inevitable that finally, in the same spirit of self-congratulation, we should find similar cause for pleasure in the coming of international broadcasting.

Broadcasting, it might be said with a considerable degree of truth, has provided a new medium—in many ways the most valuable of all—for the definite expression of the spirit of that international outlook which, during recent years, we have been at such pains to cultivate.

This cannot be said, however, with complete truth, because although nation may speak unto nation through a medium which can cross all frontiers, generally speaking, nation is still unable to understand nation. Before broadcasting can be truly international, before it can wield a real world influence, there must be a common link of understanding. That link can only be provided by the use of an international language.

Identifying Foreign Stations

In the purely technical sense, world broadcasting is an accomplished fact. Talks from stations all over Europe can be heard any evening of the week by anyone who possesses an ordinary receiver. But it is doubtful if more than 1 per cent. of listeners can really understand any language but their own.

Here, then, is a valuable and highly useful field for such an auxiliary language as Esperanto, which, it is interesting to note, is being used by an increasing number of broadcasting stations. In fact, the progress which this language is making in the wireless sphere warrants an examination of the manifold advantages that would accrue from an extension of its radio uses.

To-day the chief problem of foreign transmissions affecting the ordinary British listener who is not a linguist is that of the identification of stations. They tend to increase in number almost every month and many are received in this country at quite

Jean Melville, B.B.C. pianist and accompanist

good loud-speaker strength on a conventional three-valve set. But only the skilled amateur possessing a reliable wavemeter can definitely identify every station that he hears.

A simple announcement in the international language following the national announcement by each station would completely solve the problem, over which radio experts have been wrangling since broadcasting was introduced.

The Union Internationale de Radiophonie has already realised this fact and has recently recommended all stations to announce their identity in Esperanto. Several—notably Brussels, Breslau, Danzig, Königsburg, Stuttgart, Zurich, Kaunas, etc.—are already doing so. Some have gone even farther and give a talk in Esperanto once a week on the features of their programmes for the following week.

Esperanto Easy to Learn

It will be argued, of course, that the usefulness of these international-broadcasting arrangements is restricted by the number of listeners who understand the language, but Esperanto is so easy to learn that the value of the short cut it offers to effective universal broadcasting cannot be discounted in this way. It is the number of Esperantists in Continental countries that has led to the decision of the Union Internationale de Radiophonie in supporting the radio use of the language.

These considerations, however, merely touch the fringe of the possibilities connected with the use of an auxiliary language for international broadcasting. One of the next developments must inevitably be the coming of the international news bulletin. The news summaries are undoubtedly one of the most interesting features of all broadcasting programmes. We can hear many of the foreign news bulletins just as easily as we can hear those from our own stations, but cannot understand them.

A World News Bulletin

A multiple-language bulletin is, of course, possible, but it would occupy too long in the transmission. The only practicable bulletin of international appeal would be one in an international language. This could be broadcast from the chief centres of Europe at different times, so that listeners might switch from one capital to another and hear a brief summary of the day's happenings in each of the principal countries.

There can be little doubt that the provision of such a bulletin—one

(*Continued on page* 120)

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

More About Bass Reproduction

H. T. Barnett Replies to W. James' Comments

MR. JAMES' article on this subject in the August issue is a most valuable contribution to the discussion. It shows the point of view several of my correspondents have taken. I regret to have to say that, in common with their letters, it shows that I did not sufficiently emphasise certain points I was trying to make, and I am glad of this opportunity to say a little more.

Ideal Combination

Now, a moving-coil speaker with its coil wound on a frail cylinder, with its diaphragm attached to the coil, the periphery of the diaphragm borne on a frame and the frame attached to a baffle or casing, *the whole contained in a room*, is almost an ideal combination for generating audible harmonics suggesting a low fundamental when subjected to mechanical or air vibrations of the low fundamental rate.

A room is a wonderful thing acoustically. Just as my drawing-room, with its varnished floor, panelled walls and enamelled walls and ceiling will re-develop the low fundamental (so that you may *feel* it) from the group of harmonics representing it, which is almost all that one can get out of a gramophone record in which the note occurs, so also will any room when subjected to air waves of low fundamental rate develop quite vigorously the audible harmonics suggesting that fundamental.

Energising Two Coils

If Mr. James can get, well out in the open air, from two rigid coils energised as vigorously as he may please, one with direct current and one with alternating current of, say, 60 cycles an audible effect commensurate with the energy being expended on the air, then (but not till then) will I own I am more bass deaf than my fellows.

Of course, the support from which the coils are hung must be a stiff thing, and it should not be mounted on a soap box!

I know there is a physical appreciation of deep musical tone as well as the aural impression. If I go into our A.C. power station every muscle and bone in my body thrills to the 60 cycles more fully than if I were listening to the same note on the Portsmouth Guildhall organ, and yet the aural impression is so faint that it would be almost negligible compared with the same note played on a bass saxophone with a millionth part of the energy expenditure.

When one can obtain the physical in combination with the aural effect of deep organ tone, then the total impression becomes more convincing. But in my opinion this argument hardly applies to orchestral tone; I believe the proportion of deep *fundamental* tone from an orchestra (even from the wonderful ten double basses of the Philadelphians) to be almost negligible by the time it reaches the audience.

A Good Gramophone

Some gramophones are much better able to reconstitute the low fundamentals from their harmonic groups than others. My Perophone, with its three piano-like sound boards connected together, to the flare of the horn and to the cabinet (a sensitive one), is a case in point.

I have just mounted a large Lion speaker in a very similar resonator, and it is enormously more convincing in the bottom octave of grand organ tone (derived either from gramophone or radio) than a Lion in its ordinary chassis casing.

A New Celestion Model

I have just been trying the new, big Celestion C14 chassis (most conveniently wound to 2,000 ohms). On a 4-ft. five-ply baffle it is much like a moving coil for tone volume, but its definition is clearer, and it uses a good deal less energy, and, of course, needs no pot excitation. I expect startling results from it when I put it into the case in which I now have my Lion.

As soon as I have obtained the best results I can get with the combination I will send the Editor sketches of the resonator and case work and mounting, so that any reader may, if he wishes, repeat my experiment.

Hearing Light & Seeing Sound

John Bellamy Taylor with the transmitting apparatus

SOUND becomes visible and light is made audible by means of an equipment developed by John Bellamy Taylor, consulting engineer of the General Electric Company of New York, at Schenectady, N.Y.

Musical Light Beam

A beam of light travels silently about the room, only to break into music when it hits a mirror target. When the light leaves the target or when it is intercepted the music stops. Mr. Taylor has chosen to call this "narrow-casting" to distinguish it from radio-broadcasting.

The equipment is a photophone built on old principles, but utilising the perfected photo-electric cell, magnetic pick-up, and newly developed amplifiers and sound reproducers. The idea of sending music over a beam of light was demonstrated by Alexander Graham Bell fifty years ago.

Use of Gramophone Records

In demonstrating the photophone Mr. Taylor uses gramophone records with the sending apparatus. The energy is sent over the light beam to the transforming and reproducing elements, mounted on a tripod some distance away. When he holds his hand in the path of the light beam the music stops; but as he allows the light to filter between his fingers the sound begins and increases in volume.

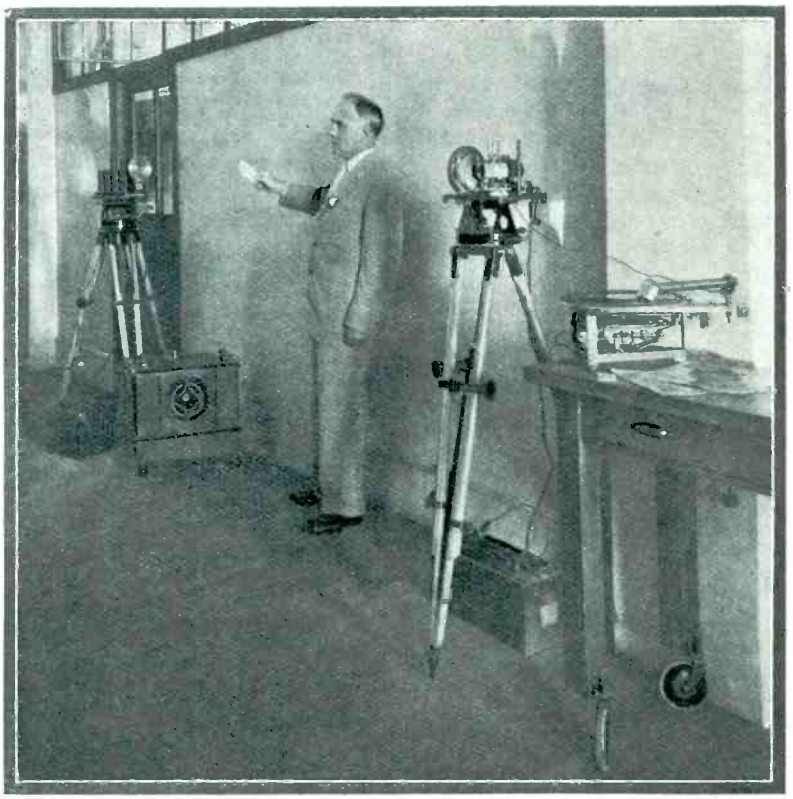
A cardboard disc, with holes of various sizes from a pin hole to one of an eighth of an inch in diameter, gives varying degrees of sound volume when it intercepts the light beam.

The light of a burning match can be changed into sound by the reproducer. When the match is struck there is a rattling, crashing sound lasting during the combustion of the chemicals. The burning wood gives off little sound. Similarly the varying light from a small dynamo-driven flashlight sounds like a siren.

A gramophone record or a speaker at a microphone can serve as the sound source, Mr. Taylor usually employing a gramophone with magnetic pick-up, by means of which the recorded music is transformed into electric current.

Magnetic Mirror

This energy is led to a mirror, one-thousandth of a square inch in area, delicately suspended in a magnetic field by means of wires. At one side is placed an ordinary automobile headlight lamp, the light from which is focused on the tiny mirror.



John Bellamy Taylor holding his hand in the path of the music-carrying light beam. To the left is the receiving apparatus and loud-speaker; to the right the electric equipment. By varying the amount of light permitted to pass, the operator can control the intensity of the reproduced sounds

The mirror, quivering in time with the electric current, focuses the light by a lens into a narrow beam, which, pulsating at the frequency determined by the music on the record, is projected through space to the light-collecting mirror or lens of the receiving apparatus.

Another Transformation

At this point another transformation must take place; the light must be converted to sound. The mirror or lens condenses the light on the photo-electric cell, which responds instantaneously to every variation in light intensity. The photo-electric cell translates the light into electric energy, and this after amplification passes to the loud-speaker.

The difference between sending sound over a beam of light and by way of radio is simply one of degree. The physical transmission in both cases is the same, except that different transmitting and receiving devices are used. In the case of light, frequencies of several hundred trillions per second give wave-lengths of the order of a fifty-thousandth of an inch. Broadcast waves are normally from 600 to 1,500 ft. in length.

The long wave of comparatively low frequency spreads out in all directions, but the beam of the light is essentially a straight-line affair and with a suitable forming lens or reflector can be conserved and sent over considerable distances without a substantial spread.

Waves That Bend

Broadcast waves will bend around obstructions and pass through walls, but the light wave will not bend, since the wave is so short in comparison with the size of the obstruction. It will pass through only such solids as are transparent.

Uses for the photophone have not been indicated. Mr. Taylor has been able to pass a light beam during daylight across a street from one office to another. At night the beam may be projected three or four miles, provided a sufficiently strong light source is used

War-time use of the light beam as a system of communication between fixed points suggests itself.

RECORDS FOR YOUR RADIO GRAMOPHONE

NO striking advances to compare in importance with, say, the introduction of electrical recording have recently been made in the production of gramophone records, but to the close observer systematic progress is evident in the latest products of all the leading companies.

Better and clearer recording of the bass frequencies is perhaps the most noticeable. By far the biggest step in this direction was made when recording was changed from the horn method to the electrical one, but even with the early electricals the drum, for instance, was there all right, but tone was unreal and the recording was more probably that of a harmonic of the drum rather than the true sound itself. Later records indicate that recordings now more nearly approach the true drum tone.

Good Drum Records

Any of the following records, which all have plenty of drum, will demonstrate what I mean: "Legere Artillerie," played by Orchestre Royal des Guides Belges (H.M.V., B2865); "Le Vieux Grenadier," a fanfare of trumpets (Columbia, 5139); and "Our Marines," played by a massed military band (Parlophone, E6112).

For some time my best demonstration record for showing the clearness with which the tambourines, castanets, and side-drum can be recorded and reproduced has been the "Carmen Entr'acts," played by the Band of the Garde Republicaine of France (Columbia, 9504). The latter part of the first side of this record has some crisp recording of the side-drum, and the tambourine and castanets are clearly heard at intervals on both sides.

Now I have another record which will also serve for demonstrating the tambourine and castanets. In "Le Cid Ballet Music," played by the New Symphony Orchestra (H.M.V., C1638-9), these instruments are effectively recorded. In particular, the first record part —(*b*) "Aubade"—has some bright, typical Spanish music introducing them. "Madrilene," on the second disc, has a beautifully recorded clarinet passage with harp accompaniment.

Rhythm Dependant on Bass

The recording of the castanet points to the more effective recording of the bass frequencies mentioned at the beginning of these notes. Although practically every radio enthusiast has heard the big difference in sound quality between the output from a horn speaker and a cone or moving-coil speaker, and appreciates that the difference is really due to better reproduction of the bass, I do not think the world in general realises how much the rhythm, and also the actual tone and sonority, of an orchestra is due to the bass instruments.

Composers would not have bothered to score for bass fiddles, bassoons, tympani, and all the rest of the instrumentalists who sit round the back of the orchestra if they did not think that the sound of these instruments was of material importance.

An Unkind Greeting

Still, on the last occasion on which I dismantled the family radio set I was greeted with the remark, "Who wants it, anyway?" when I explained that the alteration was designed to reproduce the bass more effectively.

The Philadelphia Symphony Orchestra recording, quite apart from the precision of its playing, owed a lot of its success to the concert-hall echo which is to be heard on most of the records. No doubt, you remember that in parts of "The Blue Danube" waltz (H.M.V.,

Records for Your Radio Gramophone (Continued)

D1218) the echo of the hall is very plain and makes the general tone of the orchestra sound more real.

The B.B.C. have also made many experiments with echo-rooms and with studios of different "reverberation periods." The gramophone companies appear to be endeavouring to secure more natural and more brilliant reproduction by experimenting with echo effects.

Good Orchestral Records

While I was playing through a recent Columbia issue I noticed the final disc of "Mozart's Symphony No. 34," played by the Royal Philharmonic Orchestra under Sir Thomas Beecham (Columbia, L2220-2), showed that a nice balance had been struck between the first sound, the echo, and the time interval separating the two. This symphony is one of the best to date of the Columbia Company's recordings of serious music.

The Gramophone Company have several of the most famous American orchestras on their list. In a recent list the San Francisco Orchestra had a delightful recording of "The Funeral March of a Marionette" (H.M.V., D1286), and later the same orchestra had Mendelssohn's "Wedding March" (H.M.V., D1568), in which they showed that they were quite up to the American standard of precision and size of orchestra.

From the Continent

The Columbia Company concentrate on Continental orchestras. Some time ago records by the Madrid Symphony Orchestra, the Basle Symphony Orchestra, Orchestre Symphonique de Paris, and the Lucerne Kursaal Orchestra all appeared. The overture to "Orpheus in the Underworld," played by the last-named orchestra, is a lively performance of a very popular air. The recording is brilliant and effective. (Columbia, 9646.)

My early collection of vocal records gave me very considerable pleasure, and I do not think that electrical recording has changed the character of these records very much. To illustrate this, play over a Caruso record and then a record of a modern tenor—say, Martinelli. You will not notice a tremendous improvement except for the fact that the new system of recording by its possibilities of amplification turns tenors of moderate power but good voice into singers having a tremendous carrying power.

It is in records of the ensemble type—massed choirs, operatic finales, and musical comedy concerted numbers—that I find improvement most marked. The series of "Vocal Gems" is a case in point, and the following may be quoted as being exceptionally good records: "Mignon," vocal gems sung by a grand opera company (H.M.V., C1641); "Merry, Merry," vocal gems by the Light Opera Company (H.M.V., C1624); "The Pirates of Penzance," vocal gems by the Columbia Light Opera Company (9622); and "Faust," vocal gems sung by British National Opera Company artistes (Columbia, 9555).

IF YOU WANT A CHEAP YET POWERFUL GRAMO-RADIO SET TURN TO DETAILS OF THE FANFARE THREE ON PAGE 107

I would like to point to the record of the King's speech at the opening of the Tyne Bridge as a standard of English pronunciation. The King's voice is clear and manly, and is entirely free from any trace of accent which in persons of less exalted rank would be regarded as affectation. The recording is extremely good, and the atmosphere and the timbre of the voice so real that I had difficulty in convincing a chance visitor who heard it that it was not a broadcast item. The profits from the record go to two Gateshead hospitals. (Columbia, 9414.)

Music of a lighter nature than the symphony class has a wide appeal. In this group "The Selfish Giant," a tone poem by Eric Coates, is played most effectively by Julian Fuh's Symphony Orchestra (Parlophone, E10806); "Memories of Mendelssohn," played by J. H. Squire Celeste Octet (Columbia, 9649); and "The Merry Widow" selection, played by De Groot and his Orchestra (H.M.V., B2945) are all capital records.

Dance records are interesting, quite apart from their actual value as dance music, in so far as the different syncopated bands have very different methods of treating a tune. If Jack Hylton, Paul Whiteman, Ambrose and his Orchestra, Ray Starita, Debroy Somers, the Dorsey Brothers, or Rae de Costa all played the same tune the regular dance-record enthusiast would not have the slightest difficulty in picking out each band. Their methods of attack, orchestration, and instruments employed would easily give you the clue to which band was playing.

Popular Dance Issues

Selecting the best records from the most recent issues, Ambrose and his Orchestra give a precise and balanced performance of "Me and the Man in the Moon" (H.M.V., B5605). "Jo-Anne," which is played by a band new to me —Edwin J. McEnelly's Orchestra— is tuneful and has a good rhythm (H.M.V., B5584). Debroy Somers never tries any experiments in complicated rhythms, but what he does is done well; he knows his own particular public, and "A Community Medley" (Columbia, 9623), played in a quick, crisp, melodious style, is quite as effective as his earlier well-known Scottish and American medleys.

As Good As American Bands

Ray Starita and his Ambassadors Band are always very up-to-date, and his two numbers, "Spread a Little Happiness" and "Ev'ry Little Moment" (Columbia, 5228), from *Mister Cinders*, show that Ray Starita, in common with Jack Hylton, can turn out records as good as those of American bands.

The Parlophone Company have several good bands on their lists, and of them I think the Dorsey Brothers and their Orchestra in "Dixie Dawn" (R280) and Rae da Costa's "Glad Rag Doll" (R276) are the pick of the particular issue. The recording is good, particularly the tone of the trumpet in "Dixie Dawn." NEEDLE-POINT.

Why I Have Designed A New Type of Tuning Coil

A Special Article by W. JAMES

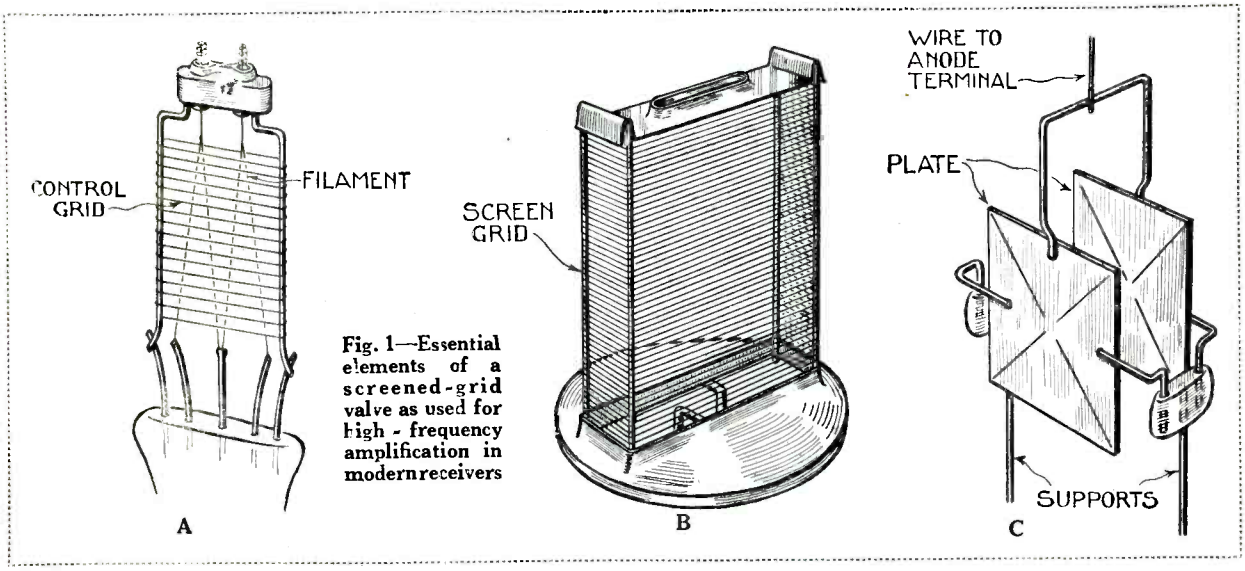


Fig. 1—Essential elements of a screened-grid valve as used for high-frequency amplification in modern receivers

A SHIELDED valve is simply an ordinary receiving valve, but having a wire-mesh screen fitted over the grid. Thus, both have a filament, a grid, and an anode that must be properly connected to the circuit.

Screen Round Grid

These parts may not be identical in size, because of constructional considerations, and differences in electrical characteristics. But the essential point to note is that the shielded valve has a wire screen fitted round its grid.

The parts are indicated in Fig. 1, which shows in sketch A, the foot of a valve carrying a filament and grid. In sketch B, we have the shield by itself. It comprises essentially a winding over four stiff wire supports and a bottom flange. Notice how close the wires of the screen are together; they are, of course, welded to the supports in order that the completed element shall be strong and of the correct shape. The anode of the valve, sketched in C, is composed of two rectangular plates, with a wire bridge and a connecting wire, which is joined to the terminal fitted to the top of the bulb.

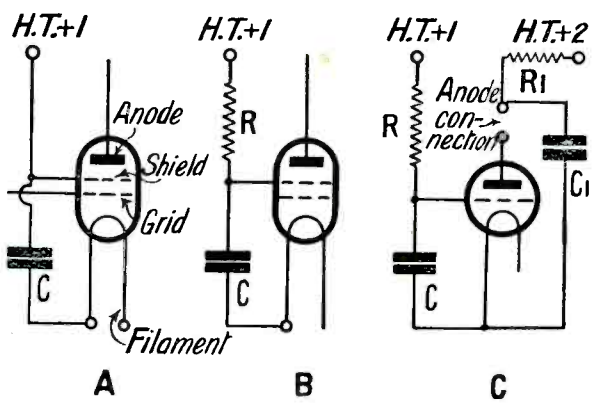


Fig. 2.—Arrangements of grid and anode filters

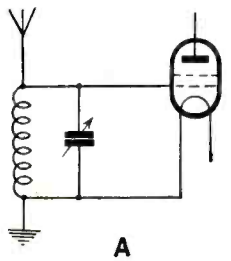
In practice, the shield is provided with a positive potential with respect to the filament, but it must be connected, in effect, to the filament, so far as high-frequency currents are concerned. A positive potential is applied to the shield in order that the valve shall have desirable electrical characteristics and they may be varied by adjustment of the voltage.

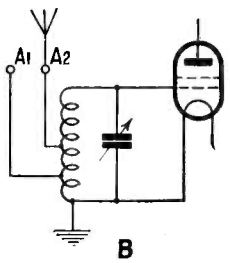
This must not change during reception, however, and it is therefore necessary to provide a fixed condenser C (Fig. 2a). This condenser provides a path of low resistance to the filament for high-frequency currents that may flow in the screen circuit and also tends to minimise the passing of high-frequency currents through the high-tension battery or other supply. A usual value for the condenser is .1-microfarad, but, of course, larger condensers may be used.

Uniform Screen Voltage

There are times when a condenser by itself is not sufficient, however. A screen filter or stopping resistance

Why I Have Designed A New Tuning Coil (Continued)





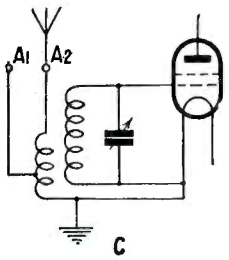
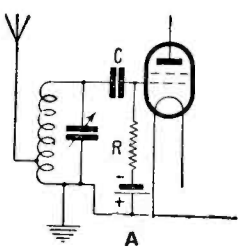
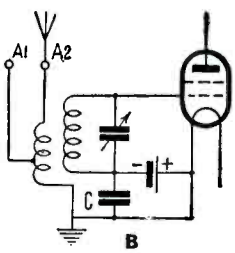


Fig. 4





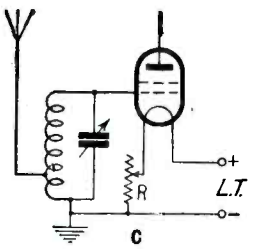


Fig. 5

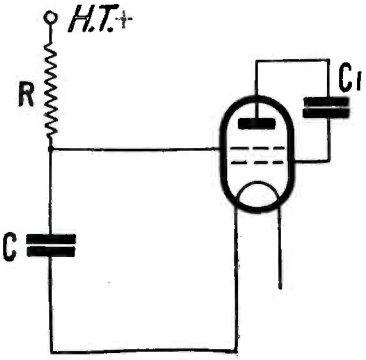


Fig. 3

Fig. 3.—Illustrates capacity of shielded valve

Fig. 4.—Methods of connecting aerial circuit

Fig. 5.—Methods of connecting grid bias

may then be included as at R (Fig. 2b). This resistance, in association with the condenser C, still further reduces the tendency of high-frequency currents to pass through the source of high tension, and therefore assists in maintaining the screen voltage at a perfectly uniform value. The resistance may be of 500 ohms or more, the value not being critical.

Important Components

Resistance R and condenser C connected to the screen of the shielded valve, therefore, have important parts to play and both should usually be included.

To assist matters still further, a similar arrangement of resistance and condenser may be included in the anode circuit, as at R1 C1 (Fig. 2c). No anode circuit coupling is indicated, as the figure is only for the purpose of showing how a simple filter is connected.

The factor which limits the amount of straightforward amplification to be obtained when an ordinary valve and a tuned circuit are used is the self-capacity of the valve, by which is particularly meant the capacity of the condenser formed by the grid and anode.

In fact, in order that stable amplification may be obtained, high-frequency transformers or other coils are used with a neutralising or balancing condenser. When the circuit is of good design, and the condenser is set, the amplifier will be stable over its whole range.

The shielded valve is, of course, the result of an attempt to minimise the value of this harmful capacity. But, owing to the spaces between the wires forming the shield of the valve, the anode is not perfectly screened from the grid. As a consequence, these two elements (the grid and anode) form a very small condenser, having a capacity of the order of .02-micro-microfarad. (Fig. 3.)

This value of capacity is very much smaller than that of ordinary valves, and shows how successful the manufacturers have been in reducing the size of this harmful condenser. But the fact remains, the capacity, small though it is, is sufficient to give an endless amount of trouble unless it is allowed for.

Effect of Capacity

The presence of this condenser means :—

(1) That for a given grid circuit, the amplification in the anode circuit cannot exceed a certain amount for stability at a particular frequency.

(2) For higher frequencies, the circuit will probably oscillate.

(3) For lower frequencies the amount of the reaction effect will be reduced.

Tuned circuits as ordinarily constructed, vary in their dynamic resistance with frequency. This dynamic resistance may be calculated from the simple formula $\frac{L}{CR}$, in which

L is the inductance of the coil or circuit,

R its resistance, and

C the capacity in the circuit.

A Practical Example

As an example, the coil may be of 200 microhenries, the resistance 5 ohms, and the capacity .0002-microfarad for a wavelength of about 380 metres, or a frequency of 790,000 cycles. Then the dynamic resistance of the circuit at this frequency is 200,000 ohms.

At a higher frequency, or shorter wavelength, the resistance of the circuit is greater and the capacity is, of course, less and the dynamic resistance is usually greater. The reverse is true at longer wavelengths.

Now, amplification is dependent upon the dynamic resistance of the circuits and we may therefore conclude that the amplification falls off as the wavelength is increased.

If now, for a given grid circuit, the anode circuit is so adjusted that the grid circuit is *just not oscillating* at its highest frequency, we see :—

A Special Article by W. James

(1) That at this frequency the combined magnification due to feed-back and valve amplification is the maximum.

(2) As the wavelength is increased, the combined magnification falls off because the feed-back is reduced, and so is the valve magnification.

When An S.G. Set Oscillates

Everyone who has used a set having a stage of high-frequency amplification using a shielded valve can check these points. When such a set oscillates, it is at the lower wavelengths.

Let us now proceed a step further. We will assume that we have been using a grid circuit, such as that of Fig. 4a, having fairly large losses and that the anode circuit was so adjusted that the grid circuit was just not oscillating at the shortest wavelength. Let us alter the grid circuit from Fig. 4a to Fig. 4b or 4c. Then, because the damping of the grid circuit has been reduced, it will oscillate.

The oscillation can be stopped by attention to the anode circuit. Obviously, the magnification in the anode circuit must be reduced, for then the difference in voltage of the anode and grid will be lowered and so will the current feed-back. The two points to remember are :—

(1) That for a given anode circuit, the tendency to oscillate increases as the grid circuit is improved; and

(2) Stability may be maintained when the grid circuit is improved by lowering the anode circuit magnification.

From these remarks it will be seen that the shielded-valve amplifier is not quite so simple as it looks. There are many difficulties to be overcome before satisfactory results can be obtained.

Poor Magnification

One could, of course, use a coil having large losses in the grid circuit, and another in the anode circuit. The amplifier would be stable, but the magnification would be poor, and so would the selectivity. Clearly, the correct procedure when designing a high-frequency stage is first of all to provide a good aerial coil.

This coil should have low losses, and be so connected that the maximum of signal strength is applied to the grid of the valve. A small amount of negative bias should be applied to the valve, and as the coil is a good one, the aerial will be connected to a point on the coil or to a separate primary winding and not to the top of the coil. The selectivity of the circuit will then be good.

Applying Grid Bias

Methods of applying grid bias are indicated in Fig. 5. In sketch A, a stopping condenser C of about .001-microfarad and a grid leak R of 1 megohm are used with a single cell.

A different method is shown in Fig. 5b, the condenser C being optional.

Probably the most simple method is that sketched in Fig. 5c, which shows a filament resistance R in the negative side of the filament circuit.

Fig. 6.—Three typical anode circuits

Fig. 7.—Couplings with various arrangements of coils

Fig. 8.—High-frequency connections for use with the new dual-range coils

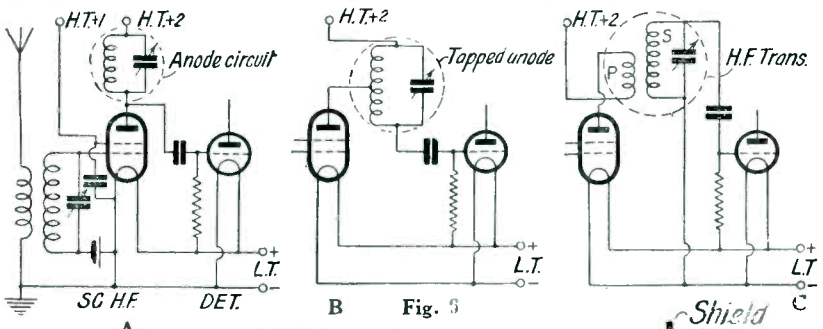


Fig. 5

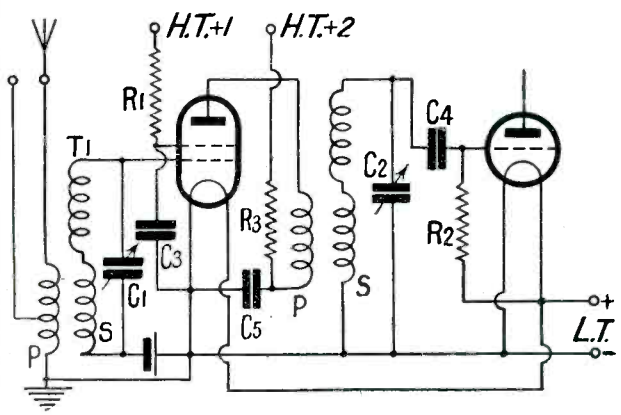


Fig. 8

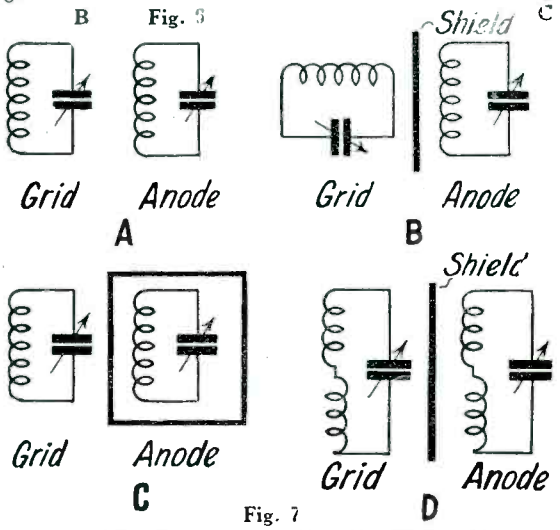


Fig. 7

Why I Have Designed A New Type of Tuning Coil (Cont.)

Having fitted a good grid circuit, an equally good coil should be provided for the anode circuit. These coils need not, of course, be of identical construction, although often they will be.

If the anode coil is connected as in Fig. 6a (tuned anode) the amplifier will oscillate. Further, the anode circuit will tune broadly. This is a bad state of affairs, but fortunately there is a simple remedy. The anode of the valve may be connected as in Fig. 6b (that is, to a point on the coil).

Three Advantages

Let us imagine it is joined to the centre point. Then three advantages are obtained :—

(1) Because the effective resistance connected to the anode has been quartered, the anode voltages are less and the stage may be stable.

(2) Owing to transformer action, the anode circuit voltage is practically doubled and it is this voltage which is applied to the next valve.

(3) The selectivity is better because valve damping there is less.

If the circuit is not stable, and unless one knows the characteristics of the valves, grid circuit and anode circuit calculations cannot be made. a lower tap must be tried. The anode must be connected further away from the grid end of the coil and eventually a position for the tap will be found where the arrangement is quite stable.

If the adjustment happens to be so accurately made that the grid circuit is just about to oscillate, the magnification will be the maximum.

Instability of "Tuned Anodes"

Tapped tuned-anode circuits are all very well. They are easily constructed, comprising, as they do, an ordinary winding with a tap for the anode. But there are times when the circuit is not stable, because a high-resistance high-tension supply is used. Further, the tuning condenser is connected to the high tension, which is a disadvantage when a metal-box shield is used.

These difficulties are removed when the anode is connected to a separate winding and the anode coupling then becomes a transformer, Fig. 6c. Its secondary may be identical with the whole tuned-anode coil, and the primary winding will have approximately as many turns as are included between the tap and high-tension end of the anode coil.

In this discussion, I have assumed the only coupling that exists to be the condenser formed by the anode and grid of the shielded valve. This is a perfectly fair assumption as in practice one circuit is shielded from the other.

If the grid and anode coils were fitted in the same place, as in Fig. 7a, they would couple, and the circuit would be useless. One coil may be fitted at right angles to the other, however, and a simple screen be fitted, as in Fig. 7b. This arrangement is usually satisfactory.

A further method sometimes adopted is shown in Fig. 7c, one of the circuits being included inside a metal box. In Fig. 7d two practically astatic coils are indicated and, with care in the arrangement, and a plain shield, this combination is very good.

In the complete circuit of a high-frequency stage, given in Fig. 8, transformer couplings are used as they are clearly the best coupling for a shielded valve. The aerial transformer T1 has a primary P and a secondary S tuned by condenser C1. In the anode circuit is the primary coil P of transformer T2, which has its tuned secondary connected to the detector valve. Condensers C3 and C5 are of 1 microfarad each and C4 of .0002.

Coils Most Important

Probably the coils are the most important part. From what has been said about them it will be clear they must be carefully designed, in order that the maximum magnification and sufficient selectivity may be obtained.

But if they can be so arranged that the amplification is practically uniform over their tuning range, they will have great advantages over existing coils. Next month I will describe a new arrangement for shielded valves.

Why We Need An International Radio Language (*Continued from page 112*)

of which, by the way, is already being broadcast in Esperanto from a German station—would prove a great incentive to a large number of interested people to expend the relatively small effort needed to learn the language.

From such a beginning it is easy to see the uses to which a world-broadcasting language could be put and the great benefits it would confer upon listeners. From time to time the principal foreign stations, as well as our own, would be able to give special talks in the language by some of their own eminent statesmen and scholars, who would thus find themselves able to address an international audience. In this way broadcasting would take on a new importance as an educative force through which new scientific discoveries could be described for the benefit of the world at large, and new lines of thought could be explained by those who had broken the new ground.

A valuable extension of this aspect of international broadcasting would be in the direction of special transmissions to schools by teachers eminent in some special field of study, who would thus be able to establish a direct link with pupils in at least half a dozen different countries. Of course, these developments would take time, but the realisation is not so far removed from possibility as many people might think. Five years' teaching of an international language in all the schools would make the next generation a bi-lingual one. From this point international interchange of opinion and intercourse on lines never before achieved would continue as a matter of commonplace simplicity.

Language the Only Barrier

Language is to-day the only barrier which stands in the way of effective broadcasting development in the international sense. The broadcast programmes in our own country and most of the big countries on the Continent are happily varied. More and more it is being realised that in the educational sense the real value of broadcasting lies in the talks. One great German writer has gone so far as to say unreservedly that the future of broadcasting lies in this direction. CLARENCE F. CARR.

The ETHER RANGER

A FINE TWO-VALVER

A number of alternative programmes can be received on the loud-speaker with this excellent self-contained receiver, which covers (with only a few breaks) the entire waveband from 20 to 2,000 metres with the use of four interchangeable coils. With headphones the number of stations which can be heard is legion.

IT has been remarked a number of times in these pages that the popularity of portable sets lies not so much in their portability as in their self-containedness. But whilst a receiver with a self-contained aerial and loud-speaker is often a convenience, it also has its drawbacks.

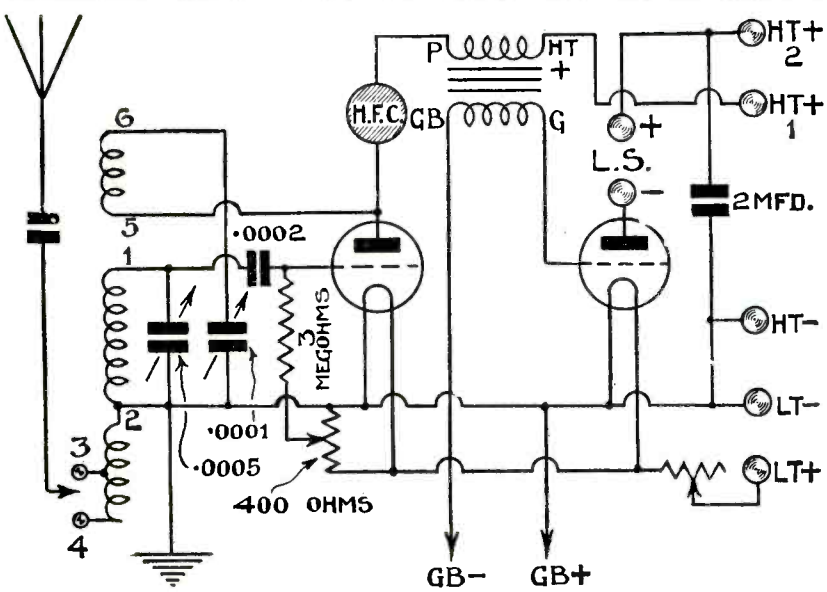
Restricted Range

The small frame aerial means that, for a given number of valves, considerably less range is attained than would be available if an outdoor aerial was employed. Moreover, the directional properties of the frame aerial are not always an advantage to the user, who may have to turn the cabinet so that the loud-speaker is not directed at the best angle.

For general home use, there is much to be said for the type of set which has self-contained batteries, but which employs an external aerial and loud-speaker. A given number of valves will put up a much better performance and the loud-speaker can be shifted about as desired.

In the Ether Ranger we offer WIRELESS MAGAZINE readers a particularly efficient self-contained two-valver which, besides giving excellent results, also meets the needs of many listeners who want a receiver more compact than the average.

The cabinet is designed to accommodate all the batteries and also the coils which are not actually in use—for the Ether Ranger, by the use of suitable coils, can be used to receive on nearly all wavelengths between 20 and 2,000 metres.



Circuit of the Ether Ranger, a simple two-valver

Nothing Overlooked

It will thus be apparent that in the design of the Ether Ranger nothing has been overlooked—the circuit and components used ensure more than average results in the way of distant reception, while the general layout, besides making the construction simple, also gives great utility.

Those who want to receive only the local station need not use more than one coil, so that unless short-wave reception is especially desired, the cost of construction can be considerably reduced. Many readers will doubtless start with the coils for the ordinary broadcast band and buy the short-wave coils when they have seen how the set shapes.

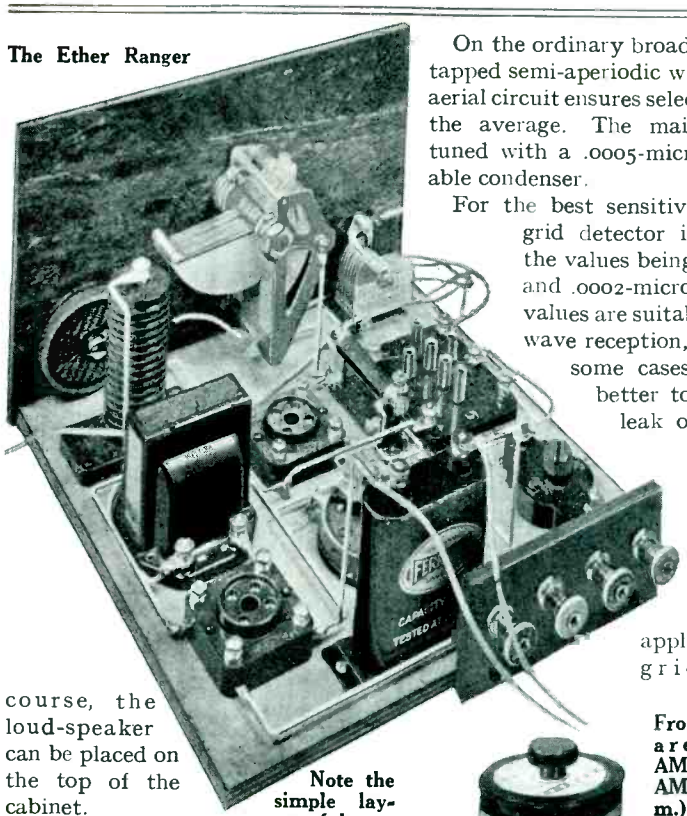
Excellent for Beginners

A feature of the set is its simplicity of operation, which can be undertaken even by the beginner. There is only one tuning control and this can be easily manipulated.

The neat appearance of the complete set can be judged from the photograph which forms part of the heading to this article. If desired, of

The Ether Ranger *(Continued)*

The Ether Ranger



Note the simple lay-out of the set

On the ordinary broadcast bands a tapped semi-aperiodic winding in the aerial circuit ensures selectivity above the average. The main circuit is tuned with a .0005-microfarad variable condenser.

For the best sensitivity a leaky-grid detector is employed, the values being 3 megohms and .0002-microfarad; these values are suitable for short-wave reception, although in some cases it may be better to use a grid leak of 1-megohm resistance on the band from 20 to 100 metres.

The potential applied to the grid, which controls the sensitivity of the detector valve, can be varied by means of a potentiometer connected across the low-tension battery.

Reaction is obtained in the usual way and the amount of feed-back is controlled by a .0001-microfarad variable condenser. The single high-frequency employed gives adequate reaction on all wavelengths from 20 to 2,000 metres.

Grid bias is of course applied to the grid of the power valve through the secondary winding of the low-frequency transformer, which has a step-up ratio of 5 to 1. Separate terminals are provided for supplying high-tension to the two valves, so that the detector can be adjusted to the point of maximum sensitivity.

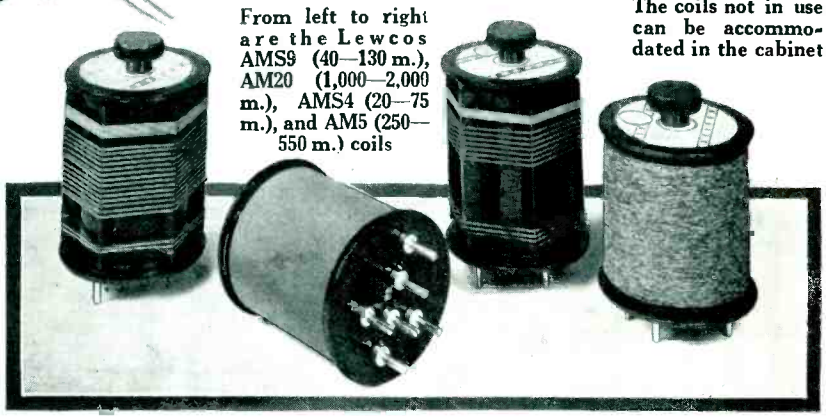
Wavelength Ranges

The four coils used cover the following wavelength bands :—

AMS4: 20 to 75 metres.
AMS9: 40 to 130 metres.
AM5: 250 to 550 metres.
AM20: 1,000 to 2,000 metres.

The coils are provided with six pins each and fit a standard six-pin holder. If desired the binocular type of coil can be used for reception on the ordinary broadcast bands. The coils actually needed are illustrated on this page.

The remainder of the components are all the products of well-known manufacturers and are of the best quality, thus ensuring that the Ether Ranger shall be high class in every respect.



From left to right are the Lewcos AMS9 (40—130 m.), AM20 (1,000—2,000 m.), AMS4 (20—75 m.), and AM5 (250—550 m.) coils

The coils not in use can be accommodated in the cabinet

course, the loud-speaker can be placed on the top of the cabinet.

With an ordinary loud-speaker it should always be possible to obtain a fair number of alternative programmes at good strength. Loud-speaker reception of American short-wave stations will also be possible under favourable conditions, but for ordinary purposes a pair of headphones should be provided.

What the Set will do

Newcomers to radio who are not aware of what different types of sets will accomplish should read the article "The Magic Carpet—1929 Model" which appears on page 127 of this issue.

We have no hesitation in recommending this set to those who want a cheap receiver that is above the average in performance. Only components of the highest quality have been used throughout.

Full-size Blueprint Available

The actual circuit appears on page 121, but the inability to understand this will not prevent the non-technical reader from building the set, for a full-size constructional blueprint is available.

NO BEGINNER WILL HAVE ANY DIFFICULTY IN BUILDING THIS EXCELLENT SET IF USE IS MADE OF A FULL-SIZE BLUEPRINT WHICH IS AVAILABLE FOR 6d., POST FREE.

No Difficulty in Construction

As regards the actual construction, this can be undertaken even by the beginner without any difficulty. In these pages there are six photographs and a full-size blueprint is also available for half-price (that is 6d. post free), if the coupon on page iii of the cover is used by September 30.

This blueprint shows clearly the position of every component, acts as a template for the drilling of the panel, and also shows the wiring in a way that can be easily followed.

A glance at the reduced reproduction

For Ultra-short Waves and Broadcast Reception

of the blueprint on this page will show that every wire bears a number; these numbers indicate the best order in which the connections can be made.

Start with No. 1 and carry on until every point has been connected. It this system is followed there is no possibility of making errors.

When the battery leads are connected care should be taken to see

> THERE ARE NO UNTIDY OR STRAGGLING EXTERNAL CONNECTIONS ASSOCIATED WITH THE ETHER RANGER. THE ONLY OUTSIDE LEADS ARE FOR THE AERIAL, EARTH AND LOUD-SPEAKER

that the flex is left long enough to reach the batteries placed at either end of the cabinet.

Batteries That Fit

It is desirable to use batteries identical with those specified and employed in the original set, for alternatives may not fit. The chief feature of the set is lost if the batteries cannot be accommodated in the cabinet.

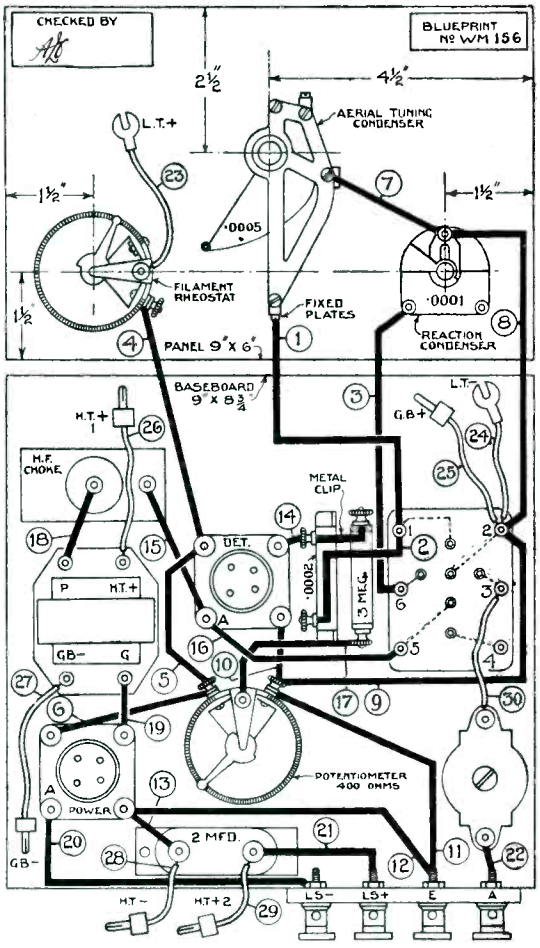
On page 125 there is a photograph which shows how the batteries and coils are accommodated. In the left-hand compartment will be seen the three spare coils, the low-tension accumulator and a 9-volt grid-bias battery placed on its end. As the size of the accumulator is necessarily restricted, it is a good plan to obtain two, so that one can be put on charge whilst the other is in use.

Two 60-volt high-tension batteries are placed in the right-hand compartment, one above the other. Remember to connect the positive end of the bottom battery to the negative end of the top battery. It is then possible to tap off any voltage between 60 and 120 for supplying to the valve anodes just by lifting the lid of the cabinet.

The question of suitable valves for the set needs careful consideration if really good results are to be obtained. So many types are now available that the choice of a particular make is not always easy.

For the detector stage, choose a valve with a medium impedance, something in the neighbourhood of 20,000 ohms. The impedance of the valve, of course, must bear some relation to the impedance of the transformer primary, which agains depends upon the step-up ratio.

In the case of the Ether Ranger, we have used a transformer with a step-up ratio of 5 to 1, but the same manufacturers also make an instrument with a step-up of 3.5 to 1. If the latter value is used, a valve with a slightly higher impedance could be used without appreciably affecting the quality of reproduction.

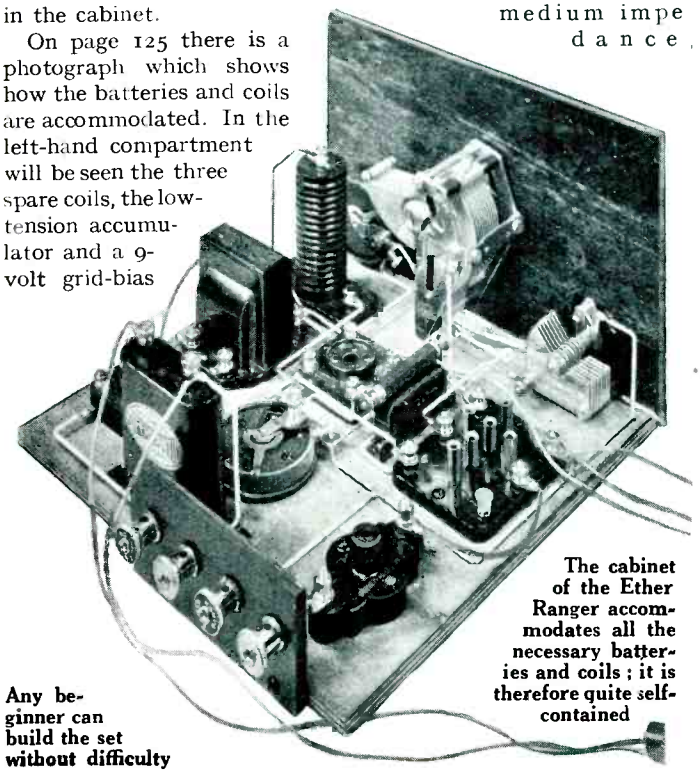


This layout and wiring diagram of the Ether Ranger can be obtained for half-price (that is, 6d., post free) if the coupon on page iii of the cover is used by September 30. Ask for No. WM156. Connect up in numerical order

Found Satisfactory on Test

Before going to buy a valve, carefully look through the list on page 90 and choose a suitable detector. We have found the Cossor 210HF to be specially suitable in this particular set.

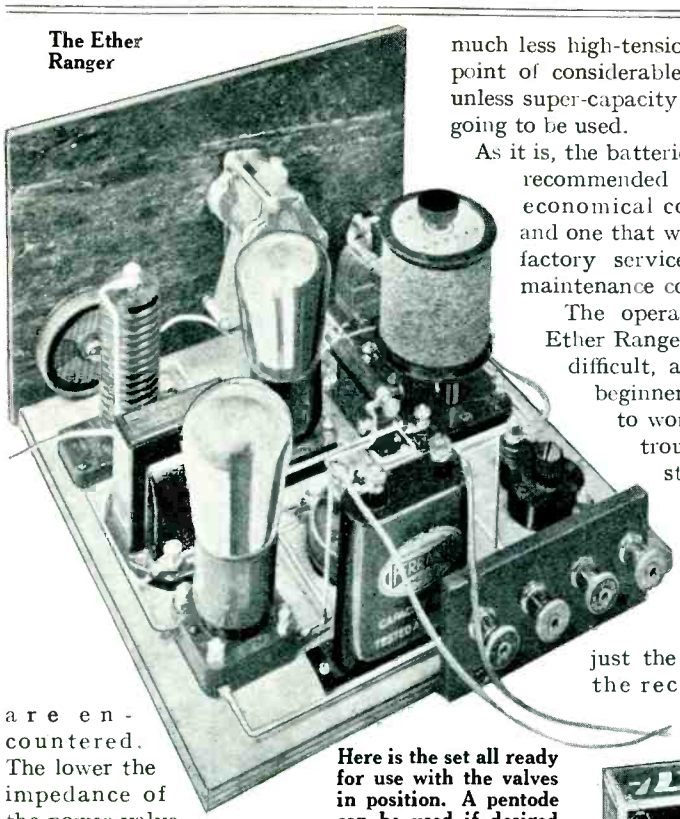
Theoretically, the choice of a power valve is much simpler than the choice of a really good detector, but in practice a number of difficulties



Any beginner can build the set without difficulty

The cabinet of the Ether Ranger accommodates all the necessary batteries and coils; it is therefore quite self-contained

The Ether Ranger (Continued)



The Ether Ranger

are encountered. The lower the impedance of the power valve (within limits, of course), the better is the quality of reproduction.

Keeping Amplification High

Against this, however, must be set the fact that a lower impedance also results in a lower amplification factor and, therefore, weaker signals. In the case of a three- or four-valve set one can sacrifice a little amplification for the sake of increased purity, but with a two-valver it is desirable to keep the amplification as high as possible.

For this reason, a valve with an impedance of 5,000 or 6,000 ohms can be used satisfactorily. Such a valve has nearly double the amplification factor of a valve with an impedance of 2,500 ohms.

Two Suitable Valves

Two valves that can be specially recommended are the Marconi DEP215 and the Mullard PM2. The use of either will keep up the signal strength and the grid swing is sufficient to maintain good quality of reproduction.

Another greater advantage of using a power valve with a fairly high impedance is that it will consume much less high-tension current—a point of considerable importance, unless super-capacity batteries are going to be used.

As it is, the batteries and valves recommended form a most economical combination, and one that will give satisfactory service for a small maintenance cost.

The operation of the Ether Ranger is not at all difficult, and even the beginner will be able to work it without trouble from the start.

Before doing anything else, connect up the batteries and adjust the tappings to the recommended values. To H.T.+2 (the tap for supplying the anode of the last valve) apply the full 120 volts of the two high-tension batteries, and to H.T.+1 (for the detector) a voltage between 60 and 90.

Applying Grid Bias

Grid bias should also be applied to the power valve as recommended by the makers.

Next, put the valves in their respective holders, making sure that the filament rheostat on the right-hand side of the panel is in its "off" position (that is, turned as far to the left as possible), before so doing.

Appropriate Coil

Now pick out the appropriate coil for the reception of the local station—the AM5 for the 250–550 metre waveband or the AM20 for the 1,000–2,000-metre band. Insert this in the six-pin base.

Here is the set all ready for use with the valves in position. A pentode can be used if desired

Batteries recommended for use with the Ether Ranger

It matters not whether your knotty problem is a theoretical or a practical one—in either case the Technical Staff of the "Wireless Magazine" is ever ready to help you out of the difficulty.

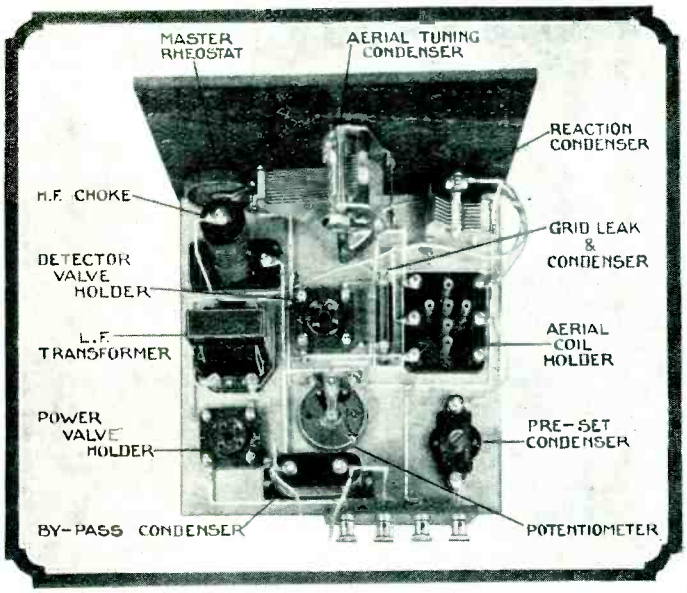
Just write your query out on one side of a sheet of paper (this small point saves us time and enables us to send an answer quicker) and send it with the coupon on page iii of the cover, a stamped addressed envelope and a fee of 1s. (postal order, not stamps) to: Information Bureau, "Wireless Magazine," 58/61 Fetter Lane, E.C.4.

Switch on the set by slowly turning the rheostat knob as far as possible to the right; then adjust the reaction condenser (on the left of the panel) until a slight rustling or hissing sound is heard in the loud-speaker. This sound indicates that the set is on the verge of oscillation and in its most sensitive condition for reception.

Picking Up the Local

Turning the main tuning control (in the centre of the panel) will now result in the local station being picked up. It should be noted that as the main tuning condenser is adjusted, it may be necessary to alter the setting of the reaction condenser slightly.

Compartments for All the Batteries and Coils



In other words, the lower the reading of the main tuning condenser less capacity is needed in the reaction condenser to put the set on the verge of oscillation; but as the main tuning condenser is put further into mesh it will be necessary to increase the setting of the reaction condenser.

Effect of Potentiometer and Anode Voltage

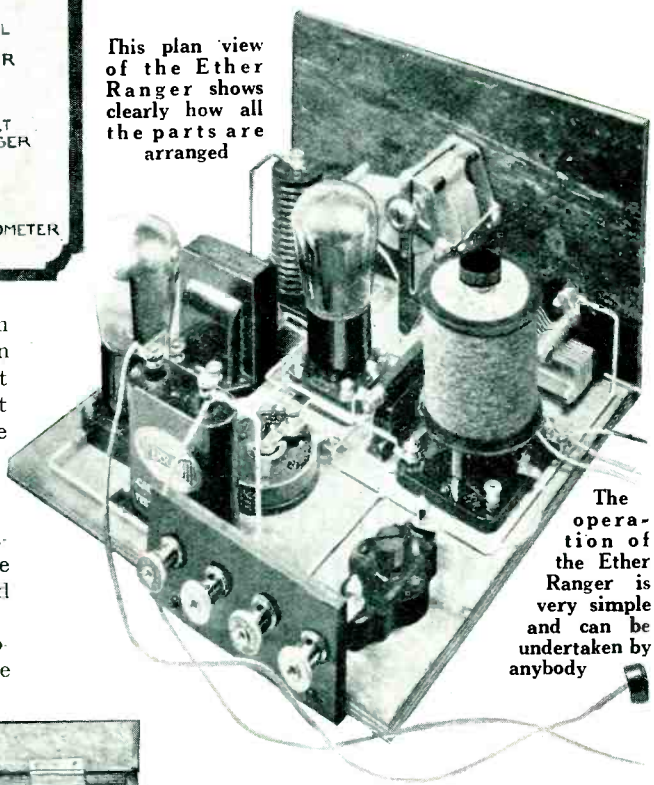
It should also be noted that the degree of oscillation can be controlled by altering the setting of the baseboard potentiometer and the anode voltage applied to the detector.

When a station has been tuned in, move the potentiometer slider until the best results are obtained. Reduce the voltage applied to the detector to as low a value as possible without decreasing the signal strength.

If the adjustments are made properly, the set will glide into oscillation quite smoothly and without any perceptible "plop." This condition is almost essential for successful reception on the ultra-short waves.

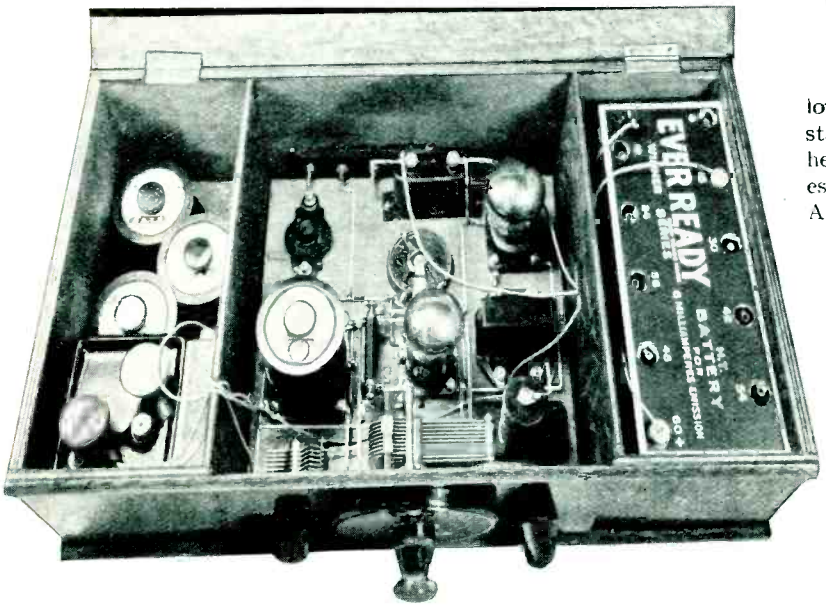
Before changing coils at all it is a good plan always to switch off the set first—to avoid accidental short-circuits which may damage the valves.

Although the Ether Ranger will give excellent loud-speaker results from a number of stations, it is desirable also to use a pair of headphones to get the best out of the set—especially on the very short waves. Although when conditions are favourable it is often possible to get American stations on the loud-speaker, it is almost essential to use phones for searching at first.



This plan view of the Ether Ranger shows clearly how all the parts are arranged

The operation of the Ether Ranger is very simple and can be undertaken by anybody



This photograph shows the batteries and spare coils in position in the special compartments provided for them

Results on Test

Used on an indoor aerial twelve miles north of London, the Ether Ranger gave exceptionally good loud-speaker results from both the Daventrys and London. Music was loud enough to be heard comfortably in several rooms of a large house, whilst on the phones the number of foreign stations received was almost infinite.

The Ether Ranger (Continued)

COMPONENTS REQUIRED FOR THE ETHER RANGER TWO-VALVER

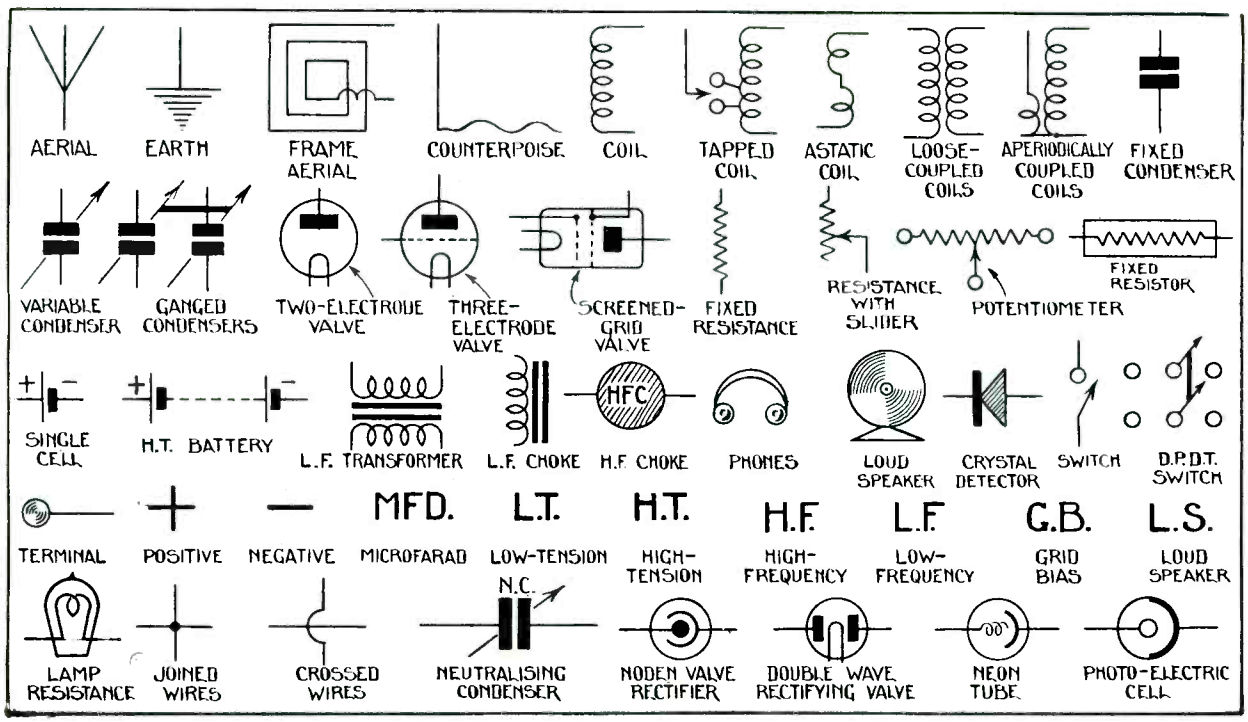
Panel	1—9 in. by 6 in. (Becol, Parfait, or Raymond). 1—4 in. by 2 in. terminal strip.
Variable Condensers	1—.0005-microfarad (Jackson, Lotus, or Lissen). 1—.0001-microfarad reaction (Bulgin, Peto-Scott, or Lissen).
Fixed Condensers	1—Pre-set, .00003—.00027-microfarad (Igranic). 1—.0002-microfarad (Graham-Farish, Lissen, or Trix). 1—2-microfarad (Ferranti, Lissen, or T.C.C.).
Coils	4—Six-pin coils (Lewcos AMS4, AMS9, AM5, and AM20).
Valve Holders	2—Antimicrophonic (Formo, Lotus, or Benjamin)
Grid Leak	1—3-megohm (Graham-Farish, Lissen, or Mullard).
Choke	1—High-frequency (Lewcos or Wearite).
Transformer	1—Low-frequency, ratio 5 to 1 (Lotus, Lissen, or British General).
Rheostat	1—15-ohm, panel type (Lissen, Peerless, or Gecophone).
Potentiometer	1—Baseboard type (Lissen).
Slow-motion Dial	1—4-in. dial (Indigraph, Ormond, or Burndept).
Terminals	4—Marked: Aerial, Earth, L.S.+, L.S.— (Eelex or Belling-Lee). 5—Wander plugs, marked: H.T.+1, H.T.+2, H.T.—, G.B.+, G.B.— (Belling-Lee). 2—Spade tags, red and black (Lectro-Linx)
Cabinet	1—With 8¾ in. baseboard and battery compartments (Pickett, Camco, or Caxton).
Sundries	Stiff wire for connecting (Glazite). Rubber-covered flex for battery leads.

RECOMMENDED ACCESSORIES

Batteries	1—2-volt accumulator (Oldham type OVD, C.A.V., or Exide). 2—60-volt high-tension batteries (Ever Ready Winner). 1—9-volt grid-bias battery (Ever Ready, Siemens, or Columbia).
Valves	1—Detector valve: Cossor HF210, Mullard PM1HF, or Marconi HL210. 1—Low-frequency valve: Mullard PM2, Cossor 220P, or Marconi DEP 215 **OR** 1—Pentode: Six-Sixty 230PP, Ediswan SE225, or Mullard PM22.
Loud-speaker	1—Small cone (Amplion, Brown, or Blue-Spot).
Phones	1—Pair 2,000 ohms (Ericsson, Brown, or B.T.H.).

A Beginner's Guide to Wireless Symbols

All the conventional symbols used in ordinary circuit diagrams are explained below. Start memorising them at once if you do not already know them



The Modern Magic Carpet 1929 Model

Making a World Tour by Radio :: By W. Oliver

"I'M going for a tour round the world," I told Harold one evening. "Like to come with me?"

"Ra-*ther*!" replied Harold with evident enthusiasm. "But you know perfectly well that *I* can't afford luxuries of that sort! Just think of the railway fares and——"

"But," I interrupted, "there will be no railway fares in this case, nor steamship passages, nor hotel expenses—in fact, no such alarming things."

Harold looked at me incredulously.

"You see," I continued, "I meant a tour by radio! You can travel all round the world nowadays—in spirit, at any rate—with the aid of a little imagination and a valve or two! So let's start right away, shall we?"

"Right-o!" said Harold. "I must admit that the prospect of, say, crossing the Atlantic without the usual unpleasant consequences is certainly an attraction for anyone like me, who—well, doesn't exactly shine as a sailor!"

No Gales and Rough Seas

"Yes," I laughed, "that *is* one advantage of a radio tour—one doesn't need to worry about gales and rough seas! Now, which shall we have, headphones or loud-speaker?"

"Loud-speaker—no, I vote for headphones," said Harold. "I always think that it's easier, somehow, to imagine that you are really in the places that you're listening to if you have phones on."

Harold thereupon tucked his ears snugly into a spare pair of headphones, and settled himself into the luxurious depths of an armchair. I did the same, and connected up both our pairs of phones to a simple but efficient two-valve receiver of a type recently described in the WIRELESS MAGAZINE.

Meanwhile, Harold had been consulting his watch and glancing through the foreign programmes.

Opera from Sweden

"It's just after seven," he said, "and I see that Stockholm and Motala are going over to the Royal Opera House at Stockholm in a few minutes for *The Barber of Seville*. Copenhagen is going to relay *The Merry Widow* from the Casino at about the same time, and we ought to be able to get that well through Kalundborg. Shall we try now?"

By way of reply I plugged in a long-wave coil and twirled the little vernier knob on the slow-motion dial of the aerial tuning condenser. We were off! Passing over the monotonous I.C.W. notes of the radio-beacons operating on 1,000 metres, we glided with a gentle "swish" on to the crest of a carrier-wave. The scene changed . . . at least, to the casual observer it might still have appeared to be the interior of a suburban drawing-room. But not so to us. Lying back in our easy-chairs with our eyes shut, the better to enjoy what we were about to hear, Harold and I had been whisked away over nearly six hundred miles of land and sea, and had taken our places in imagination among the audience in the Casino at Copenhagen. We could hear the murmur of conversation in the building, combined with the thrills of orchestral instruments as their players tuned them up. Then the sounds died down into silence, and after a moment's pause the orchestra struck up the opening bars of the overture, interwoven in which we recognised many of the tuneful melodies from the musical comedy.

The overture ended, there came the roar of applause from the audience. Then, after a brief pause, the orchestra struck up again, the curtain rose (presumably), and the show proper commenced. After we had listened for some minutes to the melodious, lilting music, Harold said, "What about Motala?" and we decided to push on and see whether that station was relaying from the Royal Opera House according to schedule.

A few turns of the aerial condenser knob and a slight adjustment of the reaction condenser brought in Motala at good strength. An orchestra was playing what was evidently the overture to the opera, and we stopped to listen for some little time. Then, tiring of Stockholm's programme, we changed coils and began to "search" the medium waveband.

Alighting in Italy

After the usual ceremony of knob-twirling, we alighted, so to speak, in the north of Italy—to be more precise, in Milan—and listened while the Signorina who usually presides over the studio of the Stazione Radiofonica di Milano chatted to us in voluble Italian.

"'Fraid that my knowledge of Italian isn't all that it might be,"

The Modern Magic Carpet—1929 Model (Continued)

remarked Harold, opening his eyes and turning to me. "Can you enlighten me as to what on earth this lady is talking about?"

"Well, just at that moment," I replied, "she was asking us to stand by for the *segnale orario*—that is, the time signal—for twenty-thirty. As the standard time in Italy is one hour fast on Greenwich, that corresponds to nineteen-thirty G.M.T., or, in other words, half-past seven."

Every Tenth Second

After a moment's pause the Italian lady started counting, slowly at first, calling out every tenth second, and then rapidly, counting the last five seconds before the exact time of the signal.

"*Meno cinquanta*" (less fifty seconds), she said, "... *meno quaranta* ... *meno trenta* ... *meno venti* ... *meno dieci* ... *meno cinque, meno quattro, meno tre, meno due, meno uno.*" A bell sounded once, the signorina reminded us that the time was *ventitrenta*, and then followed some rather elaborate chimes on what sounded like tubular bells. Then the Italian lady informed her unseen audience that they were listening to "*EIAR, Radio Milano!*" and made an announcement about the next item.

Just a slight turn of the condenser knob carried us on to Brussels, where the Radio Chronique was in process of transmission. The Radio-Belgique carrier wave was getting the worst of an encounter with a morse harmonic from GFA, one of the Air Ministry high-power stations, which was sending meteorological messages in code, and as the Belgian signals were not very strong—the old 1-kw. transmitter was in use that evening—speech was not particularly easy to follow; so, after pausing to hear one or two announcements about forthcoming "radio-concerts," we decided to abandon Brussels for the time being.

Melbourne Programme

"The Melbourne programme is being radiated by VK3ME on the short waves from seven till eight this evening," I reminded Harold. "Shall we see if we can tune it in?"

"Splendid idea!" agreed Harold. "We shall be in time to hear the last fifteen minutes of the programme, anyway."

I plugged in a set of short-wave coils, and as I twirled the knobs once more we passed over the transmission from W8XK of Pittsburgh (the short-wave station linked with KDKA, which was relaying a Roxy symphony concert from New York) and a large number of commercial morse stations. Then suddenly we located a strong carrier wave.

"Is that Melbourne's carrier?" asked Harold, and, as if in answer to his question, a voice in our phones said:—

"3LO Melbourne, Australia, broadcasting on a wavelength of thirty-one point five-five metres!"

Then the Australian announcer went on to say that the next number on the programme would be a record by a church choir. Although the signal strength and speech quality were quite good, there was some quick fading, on account of which we were not able to catch the name of the item, but when it commenced we soon recognised it as the "Hallelujah Chorus" from Handel's *Messiah*.

News Items and Records

After this record the announcer read one or two short news items, and then put on two records of songs sung by a tenor well known to broadcast listeners in this country.

"These songs are coming over well," Harold commented, "but I can hear some morse interference in the background—can't you?"

"Yes," I replied, "that's a 'CQ' call from a station signing itself LGB. Evidently it is situated somewhere in Norway, as all call-signs within the group LAA-LNZ belong to stations of Norwegian nationality."

After making a further announcement, the Melbourne announcer put on, as the concluding item of the programme, a selection played by the band of H.M. Coldstream Guards. This record came over so clearly and at such excellent strength (apart from high-speed fading) that anyone picking up the phones casually might well have thought that it was being played at a station a few miles distant instead of "down under"!

The music ceased, and after a moment's pause came the closing call from 3LO:—

"Hallo, hallo, hallo! This is 3LO Melbourne, Australia, broadcasting on a wavelength of 31.55 metres. That concludes the short-wave programme from 3LO Melbourne. It is now just three and a half minutes past six Melbourne time on Monday morning, corresponding to three and a half minutes past twenty Greenwich Mean Time on Sunday."

Next Transmission

The announcer went on to say that the next short-wave transmission from 3LO would take place between 5 and 6 o'clock, Melbourne time, on Monday morning next, corresponding to 19.00 to 20.00 G.M.T. on Sunday. He then thanked listeners for their letters reporting on reception of these short-wave transmissions, and stated that "3LO Melbourne is now closing down" (as far as short-wave work was concerned) "until five o'clock Melbourne time next Monday morning. Good morning, everybody!"

This was followed almost immediately by another call:—

"Hallo, hallo, hallo! 3ME, the Melbourne short-wave station of Amalgamated Wireless, Australasia, Limited! The programme you have just heard was from 3LO Melbourne, Australia. 3ME Melbourne now closing down. Good morning, everybody!"

Harold looked mystified. "Why the *two* announcements?" he asked.

"Well, you see, Melbourne transmits daily on a medium wavelength through station 3LO. Once a week, however, a special programme is given through the short-wave station on 31.55 metres, which uses the call-sign 3ME.

Direct from Short-wave Station

"I imagine, therefore, that the first announcement was made from the 3LO studio in the ordinary way, and the second was made direct from the short-wave transmitting station. One hears a similar procedure when our own short-waver, 5SW, of Chelmsford, is relaying the London programmes."

"Yes, I've noticed that. ... Well, now what do you say to leaving

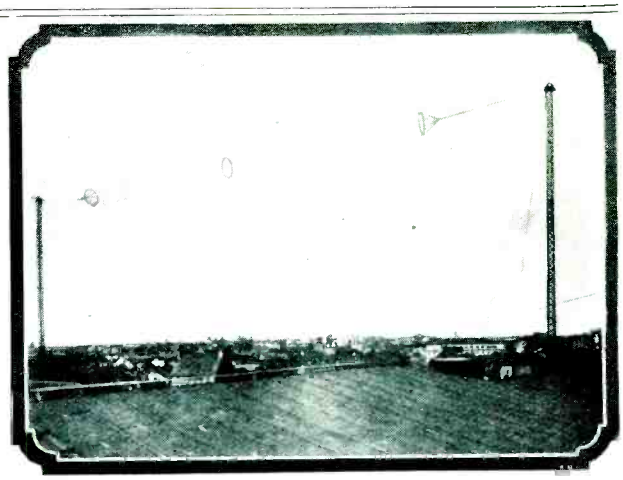
A World Tour You Can Make by Radio

these wonderful short waves and going back to the medium waveband for a while?"

"I'm agreeable," I consented, and changed coils. As it was now past 8 o'clock, 2LO was "on the air" and causing rather bad interference in the neighbourhood of its wavelength, so I coupled a parallel absorption wavetrap to the aerial coil and—hey presto!—2LO ceased to exist as far as we were concerned, enabling us to tune in foreign stations in comfort at full strength without local "QRM."

To the South of France

A turn of the tuning control carried us away to the south of France, where we found ourselves listening to the "*emissions de la Radiophonie du Midi.*" The announcer at Radio Toulouse was just in the middle of reading the news when we "arrived" there, so to speak, and we were in time to hear an item headed "Washing-*ton*" about "pro-he-bis-eeong," followed by one from *Londres* about "*les elections anglaises.*" Then came several local announcements, including one about a "*belle exposition*" that was shortly to be held. Signal strength from Toulouse was really excellent, apart from rather bad fading at long intervals. Speech was, in fact, so loud and clear that we found it almost impossible to realise that the announcer was speaking five hundred and fifty miles away!



A fine view of the Stockholm station's transmitting aerial

Working upwards in wavelength, we passed over Hamburg, which was just commencing a "Spring Programme"; Glasgow, which was taking the St. Martin's service from London; Frankfurt, where the announcer was reading some competition entries; Madrid, which was broadcasting a dance programme; and one or two other stations which were too faint to be identified, and came to Rome. Radio Roma, appropriately enough, was giving an evening of Italian opera — *Falstaff*, by Verdi. Both the singing and orchestral accompaniment were very fine, but as Harold likes opera in small doses only we pushed on further afield, after hanging on to Rome's carrier wave for a few minutes, and soon picked up Langenberg at excellent strength.

From the Westdeutsche Rundfunksender we heard operatic music of a lighter kind, followed by dialogue which was greeted with peals of laughter from the audience in the building from which it was evidently being relayed.

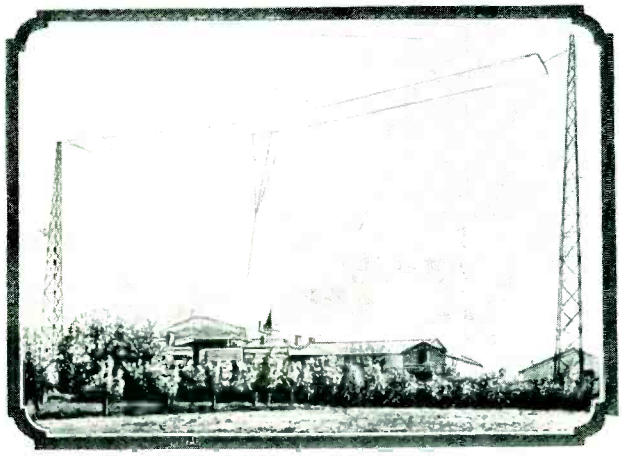
A Comic Opera

"They seem to be tickled about something," remarked Harold. "Let's have a look at the programme and find out what it is. Yes, here we are—Langenberg, *Czar and Carpenter*, comic opera in three acts. Well, it's evidently comic enough, but I'm afraid I don't know enough German to appreciate the humour of it. And therefore I vote that we move on."

Obediently I manipulated the knobs once more, and after gliding over some very distorted speech (which evidently originated from the PTT transmitter at Lyons) we found ourselves in Birmingham Cathedral, from which a service was being relayed by Daventry 5GB.

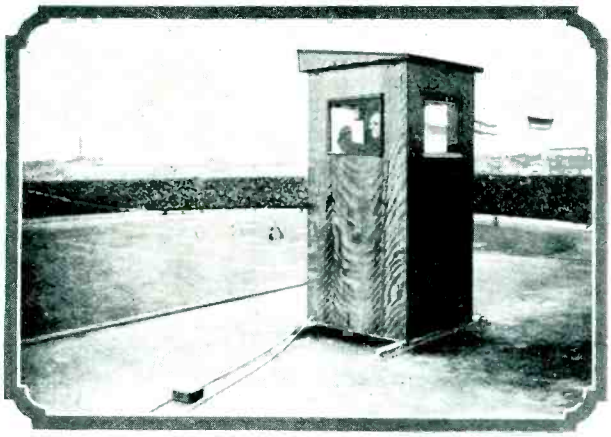
Dance Music from Madrid

After awhile we commenced "searching" again, and soon picked up Madrid, where the concluding item on the dance programme—a waltz which was very popular in this country some months before, and now apparently had found its way to Spain—was just being played. It was followed by an announcement to the effect that the station was closing down till 10 o'clock, and then, after



Radio Toulouse has an aerial that is quite unobstructed by surrounding buildings

The Modern Magic Carpet—1929 Model *(Continued)*



Special box used in Germany for broadcasting comments on a football match from the Westdeutsche Rundfunk station

the band had played one verse of the National Anthem with due solemnity, Unión-Radio "went off the air."

"*Hallo! Hallo! Polskie Raadjo Varschava!*" called the lady announcer at Warsaw when, as the result of further knob-twirling, we had landed at Katowice, which station was relaying a concert from the Polish capital.

Morse Interference

Morse interference completely drowned the rest of the announcement, and in making adjustments to try to reduce the "QRM" I lost Katowice momentarily. On picking it up again we heard what sounded like four whistling solos with piano accompaniment. We recognised the third one of the group as Solveig's song from Grieg's "Peer Gynt."

A slight adjustment of the tuning control whirled us south-westwards to Switzerland, where we found that at Radio Berne the theme of the evening programme was "*Spring has come!*" Harold remarked that he failed to see that there was any particular connection between spring and the variety items of which the programme was composed; but possibly that was due to his scanty acquaintance with the language!

Jubilee Concert from Vienna

Whilst we listened to Berne, Harold had been consulting the foreign programmes once more, and suggested that we should tune in Vienna to see whether the Jubilee Concert by the First Vienna Mandoline Orchestra was still in progress. So I twirled the knobs once more and our "magic carpet" carried us over the frontier into Austria just in time to hear the announcer call:—

"*Hallo! Hallo! Radio Wien!*" He intimated that the mandoline concert had concluded, and read out a list of the items that had been played, which included Solveig's song, a potpourri of Verdi's operas, the overture to *Cavalleria Rusticana*, a gavotte and Spanish waltz, a Glockenspiel intermezzo, and "Toreador and Andalouse," by Rubenstein.

"And quite a nice programme," commented Harold. "I'm sorry we missed that concert. Is there anything else of interest around this wavelength just now?"

I juggled with the controls again and we sampled the transmission from Budapest, which consisted of a folk play; from Oslo, where a Norwegian gentleman was delivering recitations (which would doubtless have interested us greatly but for the regrettable fact that we were quite unable to understand a word of them); from Zurich, where the announcer informed us that the concert had just ended; and lastly from Milan, where we paused to listen for a while to a very tuneful chorus in an opera which was being relayed from La Scala there.

When, having tired of the opera, we began to travel down the wave band once more, we suddenly encountered the voice of a French announcer on a wavelength a little below that of 2LO. He invited us to "*ecoutez maintenant*" to "*une selection, 'Lakme,' par Delibes.*" And so listen we did, until the end of the selection; then we boarded our "magic carpet" again and by dint of more knob-twirling we travelled on to Nürnberg, which, as usual, was relaying Munich—or München as they call it in that locality.

"Heavens!" exclaimed Harold as we glided on to the crest of Nürnberg's very substantial carrier wave "what's this—a revolution?"

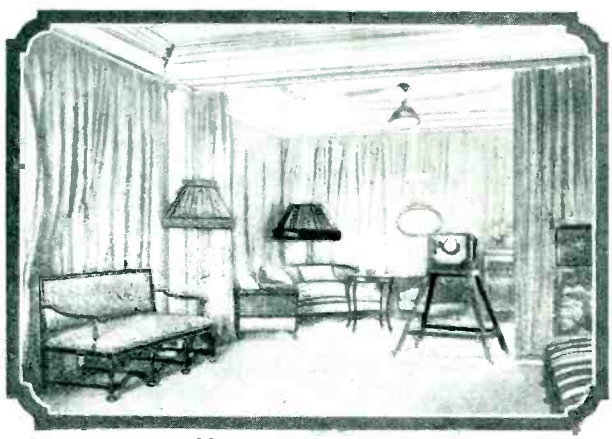
Audience Applauding

"I hardly think so!" I laughed. "I should imagine that it is only an enthusiastic audience applauding something."

"Well, there's certainly no question about their enthusiasm," replied Harold, as the microphone was nearly shattered by colossal roars of applause, frenzied clapping, cheers and yells of acclamation. After a few minutes of this the relaying microphone was switched off and the announcer stated that a performance of "*Tannhäuser*, von Richard Wagner," had just been relayed from the National Theatre. He then read out a list of the principal members of the cast. This was followed by a pause of some minutes' duration, and then we heard the loud "plank, plank, plank, plank, plank, plank!" of the wooden-sounding metronome which provides the interval signal for the transmissions from the four stations of the Bavarian group.

Monotonous Metronome

The metronome continued to beat its monotonous tattoo for about five



Very artistic and homely is the furnishing of this studio at the Madrid station

W. Oliver Conducts A Two-valve World Tour

minutes, then it ceased abruptly, and was followed by a deafening blast on a siren with a deep G note, which made us jump.

"Oh, my poor ears!" gasped Harold. "*Didn't* that hurt!"

"It certainly did," I agreed. "I should think that all the wireless enthusiasts in Bavaria must suffer from chronic earache! If it deafens us at a distance of about five hundred miles, what must it be like at short range?"

Shus-s-sh!

"One trembles to think!" replied Harold. "But shus-s-sh—we're interrupting the announcement. . . ."

"*Hier Deutsche Stunde in Bayern! Sender München, Nürnberg, Augsburg, und Kaiserslautern,*" said the announcer, and went on to inform his "*Damen und Herren*" that he was about to read the news.

"I'm afraid," said Harold, "that I can't arouse much interest over news about places that I've never been to, in a language that I don't understand properly—so please crank-up our magic carpet again!"

As we continued our "tour" of the ether, we tuned in Hörby at great strength, then listened to a baritone singing with orchestral accompaniment from the Cologne *Sender* of the Westdeutsche Rundfunk, which was very loud and clear; and afterwards to some orchestral music from Kosice, which would have been very fine had it, too, been loud and clear; but, unfortunately, it was neither, owing to the distance of the station and the presence of an appalling heterodyne from the powerful Cologne transmission a couple of metres below.

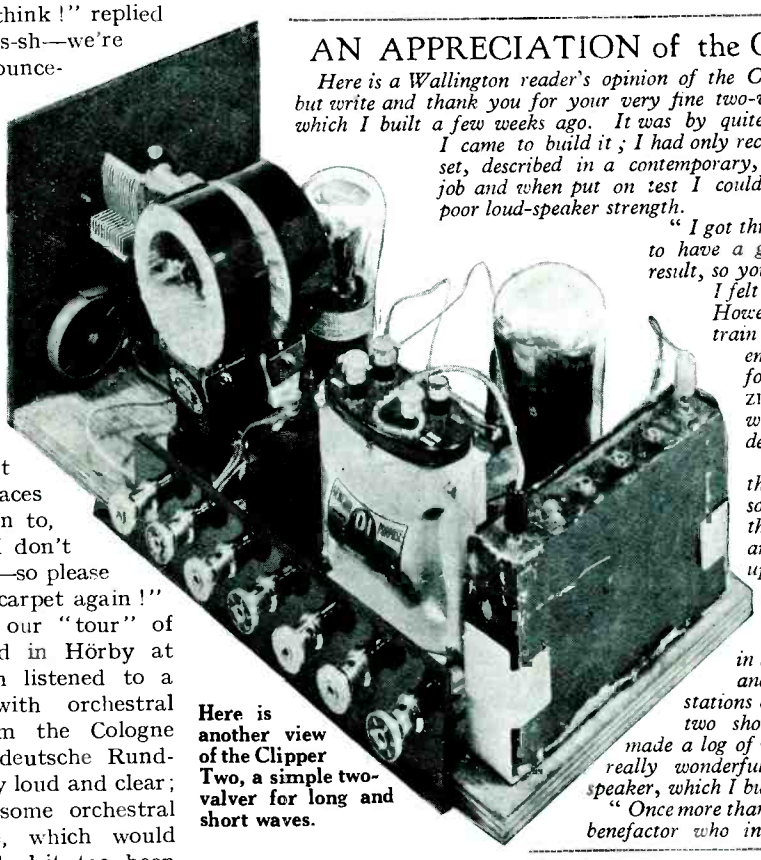
At Radio Torino

Our next "stop" was at Radio Torino, the *stazione* of the *Ente Italiano per le Audizioni Radiofoniche* (or EIAR, for short!) in Turin. Here, again, we encountered orchestral music, but this time at really amazing strength and with wonderful clarity.

"Marvellous!" was Harold's comment. "Sounds as if the orchestra were actually in the room with us, instead of being nearly six hundred miles away."

"Now suppose we go back to the short waves," I suggested, "and see if we can pick up W8XK again, or perhaps W2XAD."

"I'm agreeable," replied Harold; so I removed the wavetrap and the medium-wave coil, and substituted the set of short-wave inductances.



Here is another view of the Clipper Two, a simple two-valver for long and short waves.

AN APPRECIATION of the CLIPPER TWO

Here is a Wallington reader's opinion of the Clipper: "I cannot help but write and thank you for your very fine two-valver, the Clipper Two, which I built a few weeks ago. It was by quite a stroke of luck that I came to build it; I had only recently constructed another set, described in a contemporary, which is rather a costly job and when put on test I could only get 2LO at very poor loud-speaker strength.

"I got three of my wireless friends to have a go at it, with the same result, so you can no doubt guess how I felt about wireless as a whole. However, going home in the train one evening, I got into an empty carriage and there found a WIRELESS MAGAZINE *left behind by someone which had the Clipper Two described in it.*

"The more I looked at it, the more I liked it, so that soon after I reached home, the other set was scrapped and from the parts I made up the Clipper Two.

"This really 'beat the band,' for with the greatest ease I am able to tune in the main English stations and one or two Continental stations at any time; also one or two short-wavers, but have not made a log of what I have got. I think it really wonderful—all on the linen loud-speaker, which I built from your description.

"Once more thanking you and my forgetful benefactor who introduced me to the set."

We searched for W2XAD, but without success; apparently it was not "on the air" that evening.

With the aid of a little careful tuning, however, we were wafted across the Atlantic on our magic carpet of radio, and landed safely, so to speak, at W8XK, the short-wave relay of KDKA, the well-known Pittsburgh station. Instrumental music was being played, interlarded with short chats consisting mainly of artistically veiled advertisement matter; so evidently it was a programme "sponsored" by a firm of manufacturers in the States.

After a final item by the small orchestra assembled in the studio, we were told that there would be "a brief pause for station announcements."

An Item from KDKA

A moment later a voice said, "This is KDKA, the Westinghouse Electric Company's station at East Pittsburgh," and went on to inform us that the next item on the KDKA programme would be a vesper service. In a second or so the engineers had switched over to the church, and the evening service commenced—at 10 p.m. by Greenwich time!

The Familiar Voice

And so, after a while, we changed coils once more and came back to London in time to hear the familiar voice of the 2LO announcer say ". . . . and the Epilogue will follow. . . . Good night, everybody! *Good* night!"

MY RADIO AIMS: By ALBERT de COURVILLE

In An Interview

MY chief radio aim is expressed in one word, "Entertainment." That sounds simple. Actually, it is a very complicated matter.

We are always hearing about how large and varied the wireless audience is. In that, however, I do not believe. Large, certainly. Varied, no. The wireless audience is largely the same as one meets in a theatre, with the exception that the majority are, for various reasons, unable to visit theatres and wholly dependent upon the wireless set for entertainment.

Making My Hours Pleasant

I aim at making my hours pleasant. I believe the matter broadcast should be not only on as high a level as anything offered in the theatre, but should also have the same popular appeal. No sane theatre manager expects to draw an audience to a highbrow play for long. Why should the B.B.C. hope to do so even for an hour?

I am aware that the authorities argue such things would never be heard unless they produced them, but the highbrow is invariably a rich man. He can afford to go to expensive little private theatres and clubs to hear the works of his choice.

When anyone listens in, it is for relaxation. Listeners want to be entertained purely and simply, and not educated. It is this entertainment that I am out to supply.

My greatest difficulty lies in the fact that the wireless audience is potentially blind. It has ears to hear but not eyes to see. Although the B.B.C. are shortly to experiment with television, it is not yet here. Everything must be expressed in sound. The average music-hall sketch may be splendid in a theatre when it is aided by the gestures and make-up of the actors, but on the wireless it often falls flat. The ideal radio sketch demands wit in every line, and sketches like that are hard to find.

Preparing a revue for radio production is harder than preparing one for the stage because of this. Then again, with the stage play, one has the satisfaction of knowing it will play for two or three hours every night and please people for months afterwards. With the wireless revue this satisfaction is lacking.

Hard Work to Make Good

Though it only lasts for an hour and is extremely unlikely to be repeated, I have to work just as hard in making it as good as possible.

Another snag is that the audience of a theatre is limited and ever-changing. In consequence, the jokes are always fresh. Try one twice through the microphone and, as likely as not, there will be several letters of complaint by the next post. Yet the broadcast joke can be, and is, copied by hundreds of private entertainers, concert parties, etc.

Not that broadcasting is thankless work. It isn't. I am amply repaid by the pleasure I derive in reading the letters I receive from listeners. Even the letters written in complaining vein are enjoyable.

A Discontented Husband

The writers are often unconsciously humorous. Sketches about domestic troubles are reviled as "nasty sex stuff." One wife wrote to say that they were having the effect of making her husband discontented. I am asked: "Why isn't the hour twice as long?" By the next mail a dancer may complain, "How dare you hold up the dance music by taking five minutes over your time?"

And so on, *ad infinitum*. Broadcasting has taught me too many people are intolerant of others. Too many want what they like, forgetting that enough is as good as a feast.

On the other hand, it has taught me that there are many leading grey and cheerless lives who are grateful for anything. Their letters touch my heart, making me feel thankful that I have been able to help someone a little bit. Can you wonder that it is these whom I wish to serve?

Chicago Catches Its Criminals by Radio

FOR some time past in Chicago considerable use has been made of the broadcast SOS in an endeavour to cope with the car bandits and other armed criminals for which that American city holds an unhealthy record.

Thrills in Listening

Throughout the middle West, wireless listeners have adopted the habit of listening at odd times during the day to the transmissions made by the 25-kilowatt station WGN, situated on the roof of the Drake Hotel, as many thrills can be obtained from the impromptu announcements made—following a preliminary four strokes on a gong, they may interrupt a programme at any moment.

By arrangement with police headquarters, within a few seconds of a call being made for a flying squad from any part of the city or suburbs, the message is relayed by direct landline to the studio which, in its turn, transmits the official orders. These are picked up by the patrol cars, which have been equipped with specially constructed receivers, installed at the cost of the broadcasting company, with the object of demonstrating to the officials that wireless can be successfully used in the capture of criminals.

As soon as a call has been picked up, the police drive quickly to the address given, and lay in watch for men or cars answering to the particulars broadcast. Many arrests already effected have been due to this new service, and considerable interest has been aroused by the method employed.

Feeling of Security

Generally speaking, it has given the public a feeling of added security inasmuch as it is realised that wireless may be a powerful factor in the constant battle waged in Chicago against the burglar, the bandit, and the unscrupulous gunman.

CLIFTON HILL.

Fifty Loud-speaker Stations on A Four-valver!

More Reports on "W.M." Sets from Seven Enthusiastic Readers

The Screened-grid Four made by a Londonderry reader (see first letter on this page)

SCREENED-GRID FOUR

FORTY stations in half an hour or so is the result obtained by a Londonderry reader with the Screened-grid Four (WIRELESS MAGAZINE, *June*, 1928) :

As a constant reader of your wonderful paper, I have made up several sets. Before going into the matter, I should like to draw your attention to the Screened-grid Four published in WIRELESS MAGAZINE, June, 1928, being in my fancy the most interesting of the lot.

I have just completed this set, and as I am a photo-artist and process engraver, I endeavoured to complete two photos. They are not intended as an art study; only rushed through so as to make them look a little more distinct.

At the time of writing I turn the dials —stations rolling in; London, tremendous volume and purity; no time to wait. Here again : clanging of bells or something. The volume of this is tremendous.

I keep going from one to the other. I think I have counted for twenty minutes thirty to forty loud-speaker stations of good volume and quality. The object of this rapid test is simply that I am anxious for quantity as well as quality. This is on the medium wavelengths. Daventry is exceedingly loud.

The design and circuit are certainly a masterpiece of radio skill and I recommend this wonderful set to all your readers. All parts as far as possible as specified, with exception of dials.

My aerial is an indoor one, slung round the room, and these tests were made on it. I am extremely anxious to try a good outdoor one.

I am sorry that I had no time to give your set a better test, but you will see that in the time I had at my disposal I have done exceedingly well. Wishing you and your expert staff every success.

P.S.—I am now working on the Fidelity Five.

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ALL-WAVE SCREENED-GRID THREE

ANOTHER heading to the letter published below from a Lambeth reader about the All-wave Screened-grid Three (WIRELESS MAGAZINE, *November*, 1928) *might be "A Sceptic's Conversion." Read the following and you will understand why :*

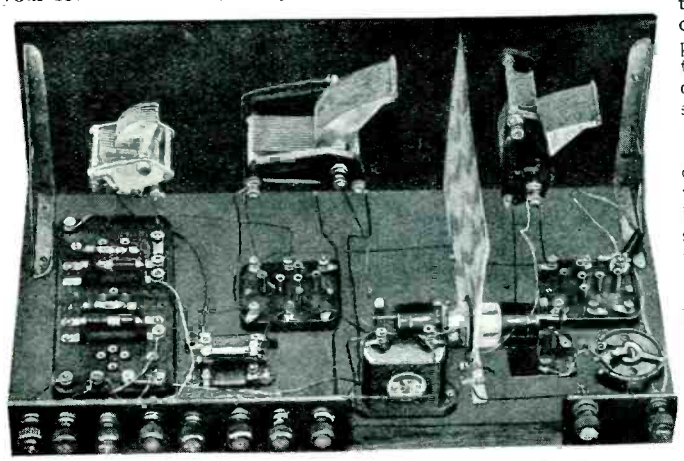
I have often been sceptical when I have read of sets that get a station at nearly every degree of the dial, and I may say I have made many a set up from "A.W." and "W.M."—two, three, and four valves—with pleasing results, but I certainly think the All-wave Screened-grid Three of last November is the limit of amazing performance.

I am situated next to a massive cold store building, with two other large buildings at the side of me. Yet I can tune in stations from anywhere just when I please, all at excellent loud-speaker strength.

Although a pentode valve was suggested, I have found that the volume from all stations is so good, that though I have bought a pentode valve, I have not used it.

The most amazing thing I have found is that with all my other sets I have never been able to get any other B.B.C. station except 2LO and 5GB, but with this one Newcastle is as powerful as a two-valve set on the local station.

I may say I found it difficult to get the right coils, having to wait six weeks, but they *were worth waiting for*, and it will have to be a marvellously good set to ever tempt me to alter the All-wave Screened-grid Three. Wishing again your publications every success.



Another view of the Screened-grid Four with which a Londonderry reader gets such good results

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FURZEHILL FOUR

MANY people are sceptical of the results to be obtained with a one-dial set, but there is no doubt that J. H. Reyner's Furzehill Four (WIRELESS MAGAZINE, *December*, 1928) *does bring in a large number of stations. Here is a report from an Islington reader :*

I would like to give you a short report on my Furzehill Four, which I recently constructed and have used for about a month. I can really say that it is the best set that I have ever made, and I receive stations at loud-speaker strength some of which I have to tone down. I have enclosed a list of them.

Simplicity is hardly the word to use as regards the one control, as there are stations all round the dial. My previous set to this was the 1927 Five, which was O.K., on which I received America on two occasions.

LOW WAVES

London	Copenhagen	Cologue
5GB	Glasgow	Oslo
Langenberg	Cork	Frankfort
Breslau	Dublin	Vienna

and others not identified.

LONG WAVES

All stations that are published in the magazine.

A READER at Blackburn has logged no fewer than fifty-two European stations at loud-speaker strength and also two U.S.A. stations

Just a few words in praise of your marvellous Furzehill Four. We have made some alterations from the original design, and thought that we might as well hand on the "good news" to its designer.

In the first place, instead of the wave-trap specified in the January, 1929,

Fifty Loud-speaker Stations on A Four-valver! (Continued)

WIRELESS MAGAZINE, we are using a 200/600 m. Met-Vick elastic aerial unit, which does wonders: cuts out Cork (491) from San Sebastian (400).

In the second place we are using the Cyldon double-gang condenser as specified for the Binowave Four; and, thirdly, we have arranged the mounting different.

The set is by far the finest we have ever made for power, tone, and long-distance reception, so much so that we are getting stations every night that we did not know existed!

We find that the set works better with C.C. output unit wander spade on point No. 2; and with 3 volts anode-bend bias.

The following is a list of stations logged in two nights, the second night as a confirmatory test. It may interest you to know that we have not locked the two condensers together, but left them separate.

The stations tune-in at practically identical readings, but the movement of the H.F. condenser a little generally brings in the station stronger—a much better idea, I think. Well! here goes:

HIGH WAVEBAND.

Kharkov	Daventry	Motala
Zeesen	Nante	Stamboul
Norddeich	Eiffel Tower	Kalundborg
	Hilversum	

LOW WAVEBAND.

Munich	Glasgow	Bournem'th
Vienna	Cork	Breslaw
Brussels	San Sebastian	Dublin
Aberdeen	Hamburg	Newcastle
Daventry (5GB)	Toulouse	Belfast
	Manchester	Königsberg
Berlin	Stuttgart	Liverpool
Lyons	Leipzig	Relays
Langenberg	London	(B.B.C.)
Oslo	Cardiff	Bordeaux
Stockholm	Prague	Relays
Madrid	Barcelona	(B.B.C.)
Frankfurt	Posen	Cologne
Katowice	Copenhagen	Toulouse
Goteburg	Gleiwitz	Nurnberg

All loud-speaker strength.

Also two U.S.A. stations at fair strength last night (really this morning at 1.15 a.m.), after Cork and Dublin had finished their tests on 400 metres.

As you see it is a truly wonderful set. I will send you the dial readings if you desire them.

FIFTY stations in one evening is also the record of a Lurgan (Ireland) reader who has built the Furzehill Four:

I have just constructed the Furzehill Four, described in the December issue of the WIRELESS MAGAZINE. The instructions and layout I followed minutely, with the result I have one of the best, and one of the simplest, sets I have ever handled; the changing from short to long waves is a pleasure.

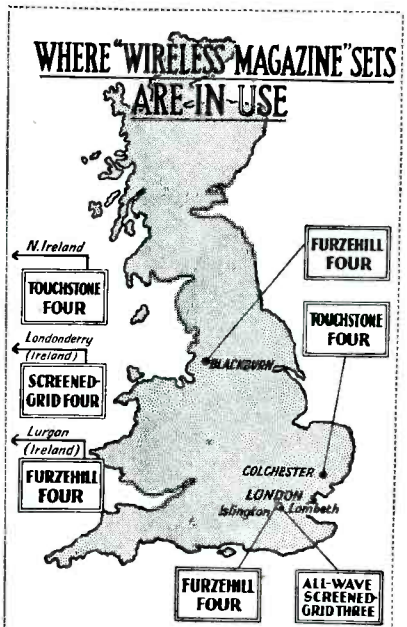
The set behaves splendidly, and does not require to be retuned on the present condensers. As for selectivity, one could not wish for better.

Living twenty miles from Belfast station, which comes in with tremendous power, I can tune it out in 5 degrees. The power and quality of foreign stations is amazing; a good few of them have to be toned down.

On Tuesday night last week I "logged" *fifty stations*, all on the loud-speaker, which is a Brown. Below is a list of a few which I recognised:

Low Waves: Nearly all the British stations, Brussels, Langenberg, Rome, Frankfurt, Dublin, Cork, Bern, Hamburg, Radio Toulouse, Stuttgart, Leipzig, Breslau, Toulouse, Königsberg, Cologne.

High Waves; Radio Paris, Königswusterhausen, 5XX, Motala, Warsaw, Hilversum; the Spanish stations coming in well also.



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.*

Remember 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 half a guinea.*

TOUCHSTONE FOUR

CONDITIONS in N. Ireland do not seem to be particularly favourable from reports we receive, but this letter about W. James' Touchstone (WIRELESS MAGAZINE, *November*, 1928) *shows it will "pull its weight".*

I am writing to you to express my appreciation of the Touchstone four-valve set. A previous correspondent stated that N. Ireland is one of the worst situated places for receiving other programmes than the local. I entirely agree with him, but the Touchstone makes light work of the added distance of the foreign stations.

I have received fifty-three stations on the Touchstone to date—thirty-one being heard on the loud-speaker at one time or another. The following are the stations received:

*Ulenborg	*Belfast	*Glasgow
*Flensburg	Agen	*Dublin
*Cork	Aberdeen	Katowice
*Biarritz	Breslau	*Frankfurt
Arebro	Cardiff	Madrid EAJ1
*Nurnberg	*Gleiwitz	Stockholm
*Newcastle	Posen	*Rome
Shaerbeck	Copenhagen	*Langenberg
Toulouse	Prague	*Lyons
PTT	Barcelona	Berlin
*Horby	*Goteberg	*Daventry
*Cologne	San	5GB
Limoges	Sebastian	Oslo
*Turin	*London	*Milan
Königsberg	*Leipzig	*Brussels
Bourne-mouth	*Stuttgart	*Vienna
	*Manchester	Riga
*Unknown	*Toulouse	*Munich
Bordeaux	*Hamburg	*Budapest

(Those denoted by an asterisk have been received on the loud-speaker.)

The receiver has been in use one mile from the local station. I am using 4-volt valves with 120 volts on H.T.+1 and 180-200 volts on H.T.+2.

The set is the same as was designed. My aerial has an effective height of 30 ft., but is badly screened on one side by tall trees. For an earth I am using an Electron earth mat. The loud-speaker is the linen-diaphragm one described in the September, 1928, issue.

Selectivity is good and the tone fine. I received most of the stations on the A2 terminal, the A1 terminal not giving enough volume, except below 300 metres. With best thanks to the WIRELESS MAGAZINE for such a fine set.

ANOTHER reader at Colchester has a record of forty identified stations besides some unknown transmissions on his Touchstone:

I have recently built the Touchstone set, and after giving it a good trial, find it one of the best. I think the good points are ease of handling, good selectivity, plenty of amplification, unusual stability and very good reproduction. I have made the cabinet to house same.

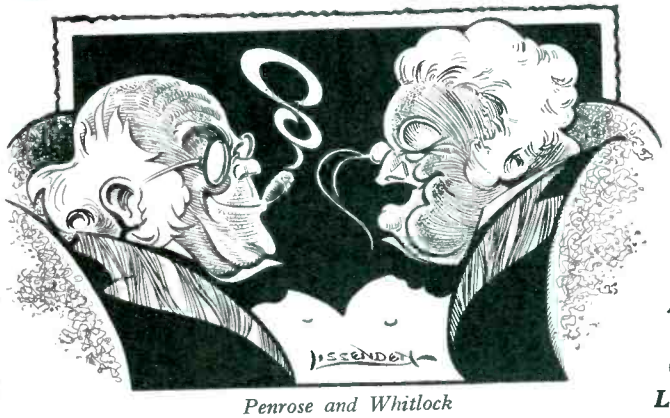
So far I have logged forty stations on the loud-speaker (all identified) as well as others (not known). I used all parts as specified, except for a Ferranti AF5 transformer.

I think Mr. W. James is to be congratulated on designing such a good set, as it seems to be well thought out in every detail, and I should certainly recommend it to anyone who wants an up-to-date set.

By the way, I can get 5GB and 2LO on the speaker in daylight without aerial or earth, which speaks well for its performance.

I find the small tapping on the aerial coil best for all-round use, and I have to use the volume control to cut down a lot of transmissions, as they would be too strong to be pleasant. Wishing your journal every success.

Glimpses of Some BROADCASTERS



Penrose and Whitlock

As seen by our Cartoonist, LISSENDEN

Randolph Sutton

Jack Grey, conductor of the Café de Paris Dance Band

Francis Toye, who has been speaking on "Music and the Theatre"

Flora Woodman, who sang in "Hiawatha"

John Ansell, conductor of th B.B.C. Wireless Orchestra

Edward O'Henry, organist at Tussaud's Cinema

Ray Stanton, conductor at the Ambassador's Club

Wireless Magazine, September 1929

Weird Wireless Echoes

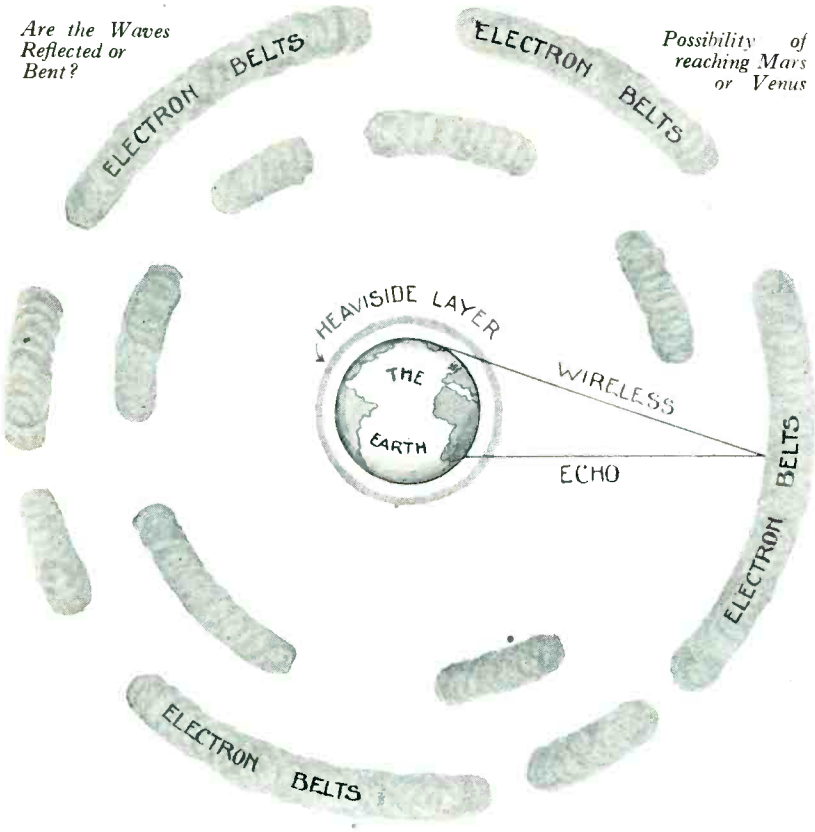


Diagram showing electron belt theory of wireless echoes. The wireless waves from the earth penetrate the Heaviside layer—strike the electron belt and are reflected back to earth

A Special Article by
GERALD H. DALY

WILL many of our present wireless theories have to be discarded owing to the discovery of wireless echoes?

It seems that our ideas of communication with life on other planets, and theories of the effect of the Heaviside layer, will require revising, at least, perhaps discarding altogether, if these strange signals do turn out to be authentic echoes from space.

When First Noticed

The phenomenon of wireless echoes was first definitely noticed by Jorgen Hals, of Oslo, and later confirmed by Professor Stormer, when both investigators heard wireless signals from 3 to 15 seconds after the original signal had been sent. Although these echoes were heard only on a wavelength of 30 metres it is unlikely that the effect is confined solely to that wave.

Indeed, two American engineers noticed a somewhat similar effect on another wavelength during experiments carried out between Washington and Rocky Point, U.S.A., although the time of the "echo" signal was only a portion of a second in this case.

Two theories have been advanced for these wireless echoes. The first put forward by the scientists who still believe in the efficacy of the Heaviside layer for preventing the wireless waves from leaving the earth, and the second theory advanced by those who think, on the strength of these echoes, that the wireless waves are not earth-bound by the Heaviside layer, and that the mysterious signals are wireless echoes from the very depth of space.

The first explanation is to the effect that wireless signals which return to the earth after an interval of 15 seconds do not actually leave the earth's atmosphere at all, but strike the Heaviside layer in the usual way, yet instead of being reflected back to earth, the waves are diverted, as it were, by the layer, so that they travel round and round the world within the confines of the Heaviside layer, but well above the earth's surface.

Until finally, all the waves, by some freak of the layer, are focused on a particular point on the earth so as to form a fairly loud signal, that is, about 5 per cent. of the original signal—which is the strength of the wireless echo signals.

Not to Be Confused

These waves which circumnavigate the world within the confines of the Heaviside layer must not be confused with the wireless waves reflected in the ordinary way by the layer from point to point such as the short-wave beam radiations. These signals are fairly well known and understood and complete their journey round the world in one-seventh of a second.

The second theory, advanced by Professor Stormer, states that wireless waves do penetrate through the Heaviside layer and (in the case of the 15 seconds signal), pass out into space for a distance up to 1,500,000 miles or perhaps more. At about this point there exist various clouds of electrons, originally shot off from the sun, which are drawn into great circular belt formations by the gravitational attraction of the earth.

Reflecting the Waves

These electron belts will naturally be reflectors of wireless waves on the same principle that a sheet of copper is a reflector of wireless radiations; thus the waves on striking any of these belts will be reflected back to earth—hence the wireless echo.

The weak point in the latter theory is that the angle at which the waves would have to be reflected back from the electron belt would require to be exceedingly small, otherwise the waves on the return journey would

miss the earth altogether; and it is difficult to imagine why this angle should be so small. In brief, there is not much to choose between either theory—they are equally possible or impossible and the evidence is as strong or as weak, one way as the other.

Curvature of Space

There is also the possibility that neither theory is correct and it seems more likely that, as Einstein has shown us, the return of the waves to earth may be due to the curvature of space. It is now generally accepted that all things are curved or travel in a curved path naturally and wireless waves must comply with this law. Consequently, if the waves describe a curve, they will, if they persist long enough, return to their approximate source.

There is also the fact that light waves are bent out of their course by the presence of matter—conclusively proved in the Sobral and Principe experiments. Thus wireless waves, fundamentally the same as light waves, may quite possibly be bent into a circular path by the presence of matter—which is the earth, in this case.

Magnetic Attraction

On the other hand, as the magnetic attraction of the earth causes these electron belts to form round the earth, this same attraction may be responsible for the wireless waves being attracted back to earth; there is also the effect of the earth's centrifugal force on wireless waves—which may account for a great deal of our present wireless mysteries.

The most important point, however, is that wireless waves can exist for 15 seconds without dying out—there is no doubt about this fact: This alone seems to indicate that the waves do pass out into space, for, travelling at 186,000 miles per second, the waves must travel over 2½ million miles and if they travelled this distance round and round the earth, they would surely be dissipated and absorbed by the earth's atmosphere.

Continuing Indefinitely

On the other hand, if they travelled through the confines of space—where there is no matter, and therefore no resistance to the passage of the waves at all, presuming space to be empty—the waves should continue indefinitely.

We know from experiments carried out at Leydon that at very low temperatures—near that of absolute zero—the resistance of anything, to electricity or electric waves, is negligible. That is to say, if a piece of wire is frozen to a temperature as near that of absolute zero as it is possible to get—the wire loses all resistance and there is no voltage drop at all. If 6 volts goes in at one end, 6 volts comes out of the other without any loss at all.

Now the temperature of space is absolute zero, and consequently there is no attenuation on any wireless waves which pass through space, whether it is for a distance of a million miles, or for only two feet. This, of course, applies to all ether radiations. Theoretically, all the heat and light waves from the sun are as strong when they reach the fringe of the earth's atmosphere as they were when they left the surface of the sun, for they would experience no resistance at all through the coldness of space.

On this hypothesis, it follows that if wireless waves do get clear of the earth's atmosphere and pass into outer space, they should travel on for ever, or until they reach some absorbing or reflecting material like Professor Stormer's belt of electrons—or another world.

Thus, basing our deductions on the wireless echo theory, it is now feasible to suppose that some of our wireless waves, at least, will penetrate between the various electron belts and pass on through space to the atmospheres of Venus and Mars—the two planets on which intelligent life might possibly exist.

Mars at its nearest is 34 million miles away and at its farthest 65 million miles away, while Venus, the evening star, is very much nearer—so it follows that if our wireless waves can persist for five or six minutes, they are likely to strike these planets.

Penetrating to Mars

It follows also that many of our earthly wireless signals must have, at some time or other, penetrated through to Mars and Venus, so that if there are intelligent beings there, equipped with sensitive receivers, they would have heard our voices and music long ago.

Vice versa, if the wireless waves which we can produce, after about thirty years of wireless investigation, can penetrate through to these

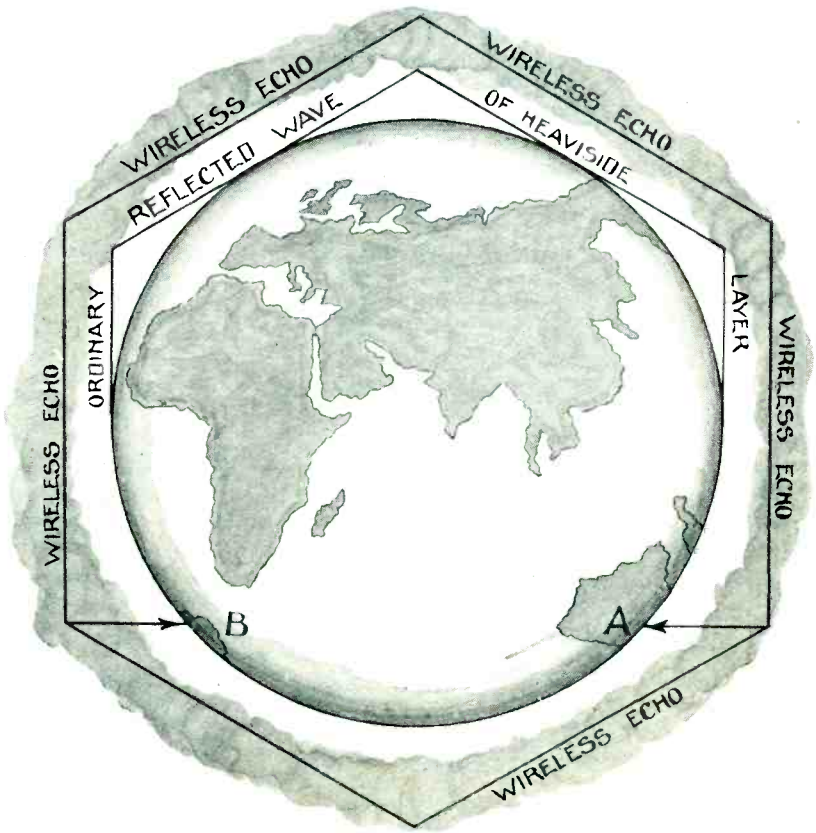


Diagram showing Heaviside layer theory of wireless echo. Wireless waves are radiated from the earth at A, travel round the world (thick line) about 100 times within the confines of the layer and, by some freak, return to the earth at B.

Weird Wireless Echoes (Continued)

planets so also can any wireless waves of their creation penetrate through to our world—yet, so far, nothing has issued from our loud-speakers or headphones which would indicate that there is intelligent life "over there."

No Visible Indicator

One of our leading astronomers, in a recent broadcast talk, stated that there was no indication of life on Mars when the latter was viewed through the latest telescope; and that the famous "canals" which look so straight as to appear man made, fail to materialise as such on the photographic plate.

In view of this and lack of wireless evidence, we are driven to the conclusion that life on Mars is either non-intelligent, extinct, or that it has never existed.

Life on Venus?

A short time ago an American scientist stated that Venus was more likely to be inhabited than Mars, but the surface of Venus is so obscured by mist and cloud as to be invisible, but it is generally thought among our own astronomers that Venus always shows the same side to the sun, so that one side would be too hot, and the other side too cold to support life.

In addition to this, we hear no wireless signals from Venus either, and, while it is absurd to jump to conclusions, the negative evidence is very strong.

Returning again to the wireless echoes: if these do penetrate the Heaviside layer, our ideas of the layer must be very considerably revised and we may yet find that this layer does not confine our wireless waves to the earth to the extent that was once thought, and further that the layer may not be the sole agent in making communication between England and Australia possible by reflection and refraction. Later we may be compelled to turn to some other phenomenon of the earth or sky to explain the persistent mystery of wireless communication around the earth's surface.

LOOK OUT FOR A SPECIAL ENLARGED EXHIBITION NUMBER NEXT MONTH.

The Expensive Wife

("The wife who is constantly demanding the latest thing in wireless sets is a drain on her husband's pocket."—From a Press article.)

Dearest wife, if I find you a trifle too dear,
With a taste that's unduly expensive,
When it comes to installing the radio here,
Can you wonder I feel apprehensive?
For we've got in the bank only just enough pelf
For our rent and hire-purchase expenses,
Little wonder I frequently say to myself:
"I must bring Marguerite to her senses!"

First you told me to go and get "out of the rut"
And to purchase a set with a crystal,
And when I discovered the dealer's was shut,
You threatened me, dear, with a pistol!
Later on you demanded "two valves" for a treat,
And the speaker put where you could view it,
And now you want "four valves," but, dear, I repeat,
Tell me, how do you think I can do it?

For I'm only a clerk, and of moderate means,
Employed in a bank in the City,
And I always abominate marital scenes,
For they only excite me to pity;
Don't hanker for stations from over the sea
For your music, orchestral or vocal,
For really, my darling, just take it from me—
There is nothing so good as the "local."

C. P. P.

Electric Music?

HAVE you listened to band music broadcasts by the silver band of the Royal Glasgow Asylum for the Blind?

This is quite a popular item in the North, and there is a somewhat unique sentiment in listening to an orchestra composed of twenty-four blind musicians. Of course, the whole repertoire has to be carried in the memory—but I'll wager no listener has any idea how the band is conducted.

As a matter of fact, each performer is attached by "reins" to the conductor's rostrum. Either his arm or leg has a long cord attached, terminating at a convenient point, in two groups, where the conductor can tap them with his baton to beat time and lead the "expression."

Feeling in a generous mood (which is supposed not to be akin to my nationality), I give the suggestion that the reins would be much better if they were electric wires giving a faint twinge or "shock" to each performer, the current impulses being controlled by a morse-key-type switch for marking time.

After an hour or so of playing, the performers might come away invigorated by the electrical treatment!

SCOT.

Fire!

A WEEK or so ago I heard an item which the B.B.C. could hardly hope ever to include in the Surprise Item feature—namely, a fire in the studio from which the broadcast was being made!

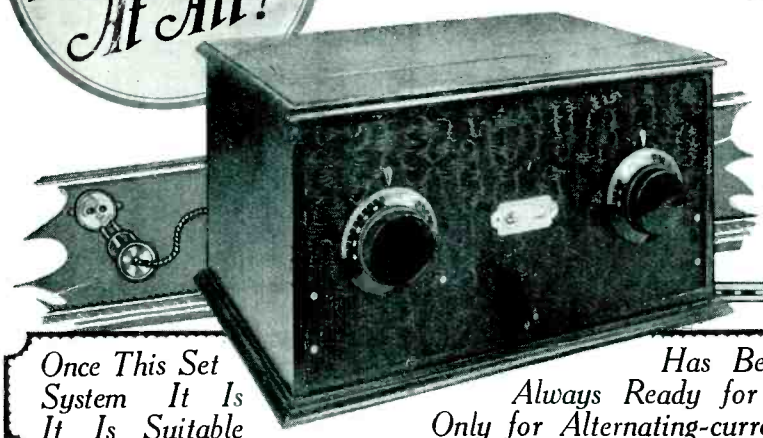
A small fire accidentally broke out in the Berlin studio, and firemen were called in to prevent the conflagration becoming serious. The announcer, either enterprising or at first too scared to think of the normally all-important "mike," did not switch off. So we heard the fire! Later he gave an account of the matter and set at rest the minds of listeners who might have been wondering if they had suddenly switched on to the radio play, Bedlam, or a new kind of Children's Hour!

But all's well that ends well, and Berlin still "emits."

RUNDFUNK.

Requires No Batteries At All!

The STAY-PUT Two



A Special "Wireless Magazine" Design Developed by J. H. REYNER, B.Sc., A.M.I.E.E., at the Furzehill Laboratories

Once This Set Has Been Connected to the Electric-light System It Is Always Ready for Use at A Turn of the Switch
It Is Suitable Only for Alternating-current (A C) Mains

ONE of the most popular sets of to-day for those who have alternating-current mains at their disposal is the two-valve all-electric receiver. A receiver of this type employing a detector and one L.F. stage, with or without a pentode as desired, is capable of giving excellent results on the local station, and in the evening one or two of the Continental stations as alternative programmes.

Freedom from Worry

Tuning is simple on such a receiver and there is, of course, a complete freedom from any worry regarding batteries.

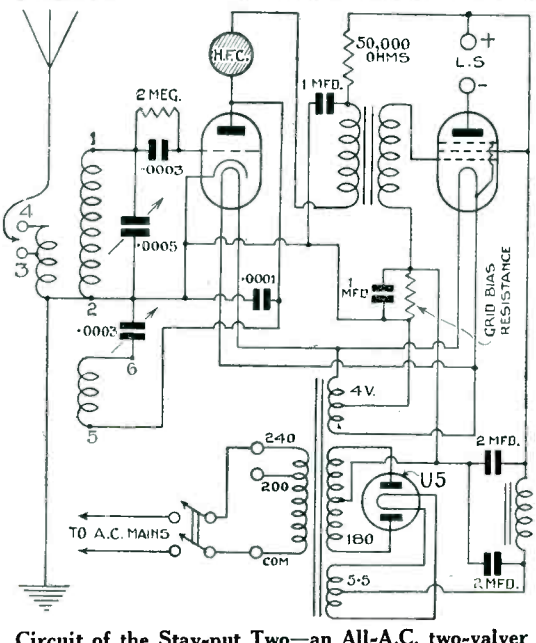
The receiver described herewith is such a set. It operates entirely from the A.C. supply, the H.T., L.T., and grid-bias voltages all being obtained from the mains. The receiver has been constructed as economically as possible without sacrificing any of the very essential factor of safety which must be provided for mains working.

Voltage Surges

Although the normal working voltages of the receiver may be relatively small—less than 200 in this particular instance—at the instant of switching on or off surges are set up in consequence of which the voltage may rise to a value two or three times the normal.

It is therefore not possible to economise in some directions if one desires to enjoy freedom from breakdown and safety has not been sacrificed to price in this model. Nevertheless the cost comes out at quite a low figure and many readers will feel disposed to discard their existing receiver and turn over to this all-electric model.

The receiver is constructed throughout to give a high factor of safety and, provided the specified components are used, it may be confidently expected to give satisfactory service for a long period. The circuit arrangements are quite simple, the circuit itself being shown below.



Circuit of the Stay-put Two—an All-A.C. two-valver with dual-range coils

Detector and L.F. Stage

It will be seen that we have a simple detector circuit followed by an L.F. stage. For the detector, one of the new Mullard indirectly-heated steep-slope detector valves—the 164V — is employed. The filament of this valve is supplied from a four-volt winding on the mains transformer, while the L.F valve is supplied directly with raw A.C. This valve, of course, has a four-volt filament also.

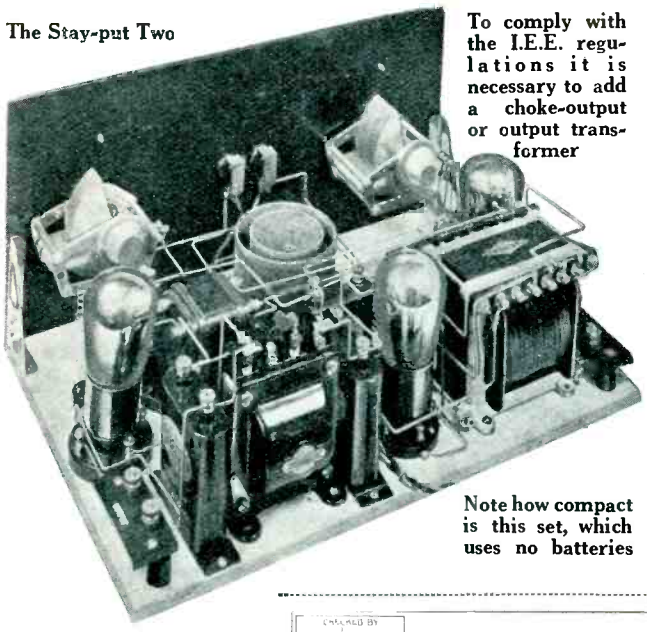
This is quite satisfactory, for experience shows that a relatively large A.C. voltage can be tolerated in the last stage without causing any appreciable hum while, in addition, the filaments of power valves are customarily of rather heavier consumption than normal.

Five-pin Holder

A five-pin valve holder is used in this position which enables the reader to utilise either a normal power valve or, if he prefers, a pentode, no alteration to the connections being necessary

The Stay-put Two (Continued)

The Stay-put Two



To comply with the I.E.E. regulations it is necessary to add a choke-output or output transformer

Note how compact is this set, which uses no batteries

In the case of a power valve, the centre pin is not used, while when the pentode is employed the centre pin provides the necessary high-tension connection to the priming grid. For this purpose, of course, one of the new five-pin pentodes must be employed.

Centre Pin

The construction of these is as usual, but the priming grid is connected to the fifth (centre) pin instead of to a terminal on the side of the cap.

The receiver is thus capable of being used in either manner, according to the preference of the reader, there being no alteration to the connections. It is necessary, however, to utilise a different grid-bias resistance in the two cases for a power valve requires a bias of 12 to 15 volts, whereas a pentode will require only 6 to 8 volts bias. This point is referred to later.

The high tension to the two valves is obtained from an eliminator of normal construction. A U5 valve is employed for rectifying the A.C. and a simple choke-condenser smoothing system is all that is required.

It will be noticed that a 2-microfarad reservoir condenser and a 2-microfarad smoothing condenser are used. These capacities are smaller than normal, but they are found to be adequate and no reduction in hum is noticed if the values are increased beyond the figures given.

In addition, the detector is provided with a resistance-capacity filter which serves the purposes of dropping the voltage on the detector valve, increasing the smoothing on this particular valve and avoiding any tendency to motor-boating. Actually, the voltage on the detector is of the order of 50 volts, with 150 volts on the last valve.

Dual-range Aerial Coils

A dual-range coil is used for tuning, one of the new Q aerial coils being employed. In this connection it may be noted that the various types of Q aerial coil which were hitherto available have now all been replaced by one type combining the advantages of all the others. This type is known as the QAT, and is now the only type of aerial coil that will be made.

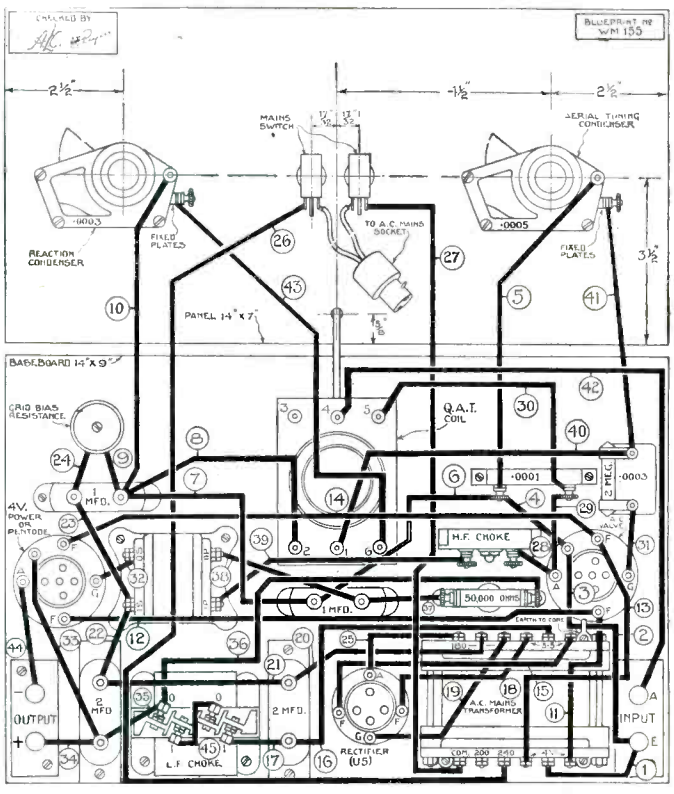
Grid bias is provided by a resistance in the negative H.T. lead. The cathodes of the valves are not connected to H.T.—, but to a point more positive than this, the extent of the voltage being determined by the drop produced by the anode current flowing through the small fixed resistance.

For power-valve working, this resistance should be 800 ohms and, as the anode current is in the neighbourhood of 18 milliamperes, this gives us a grid bias of just under 15 volts.

Lower Value

Where a pentode is required, this resistance must be reduced to 320 ohms. The anode current through the pentode is slightly more than 20, being in the neighbourhood of 22 or 23 milliamperes, and this, with the resistance quoted, gives a grid bias in the neighbourhood of 8 volts.

The pentode is essentially a valve taking a small input for a given output, rather than one giving a super output with the same input, and it is



This layout and wiring diagram of the Stay-put Two 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 September 30. Ask for No. WM155. Connect up leads in numerical order.

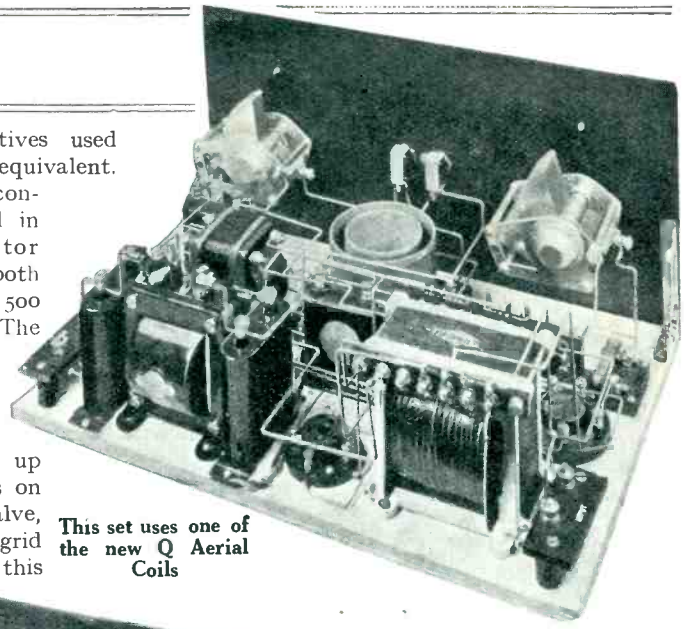
An All-A.C. Set

necessary, therefore, to reduce the grid bias and also to reduce the grid swing applied to the valve.

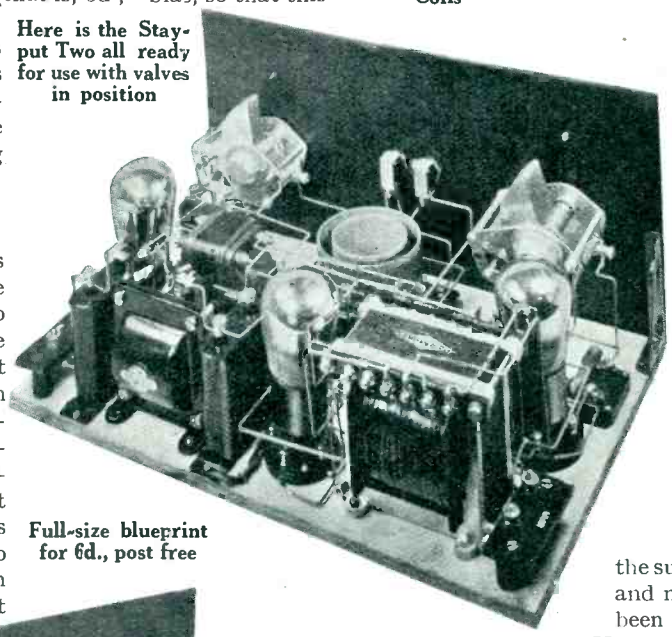
Best for Distant Stations

The advantage of the pentode in this particular set, therefore, is more marked on distant stations than on a local station, for overloading will set in if the same grid swing is applied to the pentode as is used in the case of an ordinary valve.

The construction of the receiver may be followed from the diagams and photographs provided. If desired, a full-size blueprint (WM155) may be obtained at half-price (that is, 6d , post free), if the coupon on page iii of the cover is used. Ample room has been provided everywhere and there will be no difficulty in following the layout.



This set uses one of the new Q Aerial Coils



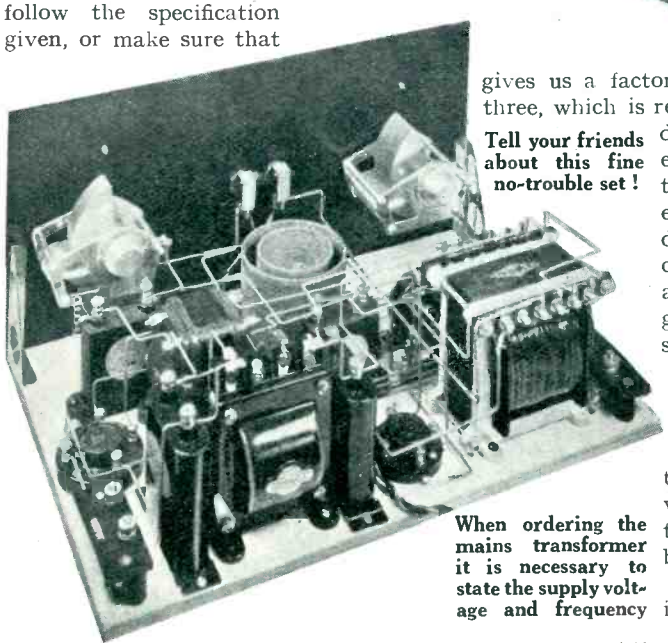
Here is the Stay-put Two all ready for use with valves in position

Full-size blueprint for 6d., post free

Arrangement

The mains apparatus is towards the back of the receiver, while the radio portion is towards the front of the baseboard. It has already been emphasised that the components have been carefully chosen to give satisfactory results without excessive loss, and it is necessary, therefore, to follow the specification given, or make sure that any alternatives used are strictly equivalent.

The two condensers used in the eliminator portion are both tested at 500 volts D.C. The maximum voltage in these itself is 165, being made up of 150 volts on the last valve, and 15 volts grid bias, so that this gives us a factor of safety of three, which is recognised today as being essential. The two condensers across the detector filter circuit, and across the grid-bias resistance, are the ordinary 300 volt test type, since the voltage developed across these will not be so heavy.



Tell your friends about this fine no-trouble set !

When ordering the mains transformer it is necessary to state the supply voltage and frequency

The smoothing choke must be capable of carrying 20 to 25 milliamperes without serious reduction of the inductance. The tuning condensers are both provided with well-insulated dials, although the circuit is so arranged that the moving plates of these condensers are both at earth potential, so that there is no danger at all.

Double-pole Switch

The switch on the panel is a double-pole switch, in accordance with the latest I.E.E. regulations, which require that both poles of the supply mains shall be broken, and not one only as has hitherto been the case.

Having laid out the components in the positions shown, the wiring up may be started. Follow the numbering given on the wiring plan as this shows the simplest order in which to work through the receiver.

Power Valve or Pentode?

With regard to the grid-bias resistance, it is necessary to make up one's mind as to whether a power valve, such as a P425, is to be employed (which will be satisfactory if average volume on purely local work is required), or whether a slightly more ambitious programme is intended, in which case a pentode, such as a PM24, should be used.

In the former case, an 800-ohm grid-bias resistance must be used, this being made up of 22 yards of

The Stay-put Two (*Continued*)

COMPONENTS REQUIRED FOR THE STAY-PUT TWO-VALVER

Panel	1—14 in. by 7 in. (Keystone, Resiston or Ready Radio
	2—Terminal strips, 2½ in. by 1 in.
Cabinet	1—Upright type with 9-in. baseboard (Camco, Caxton, Pickett).
Variable Condensers	1—.0005-microfarad, with slow-motion movement (Polar, Jackson or Ormond).
	1—.0003 - microfarad, with slow - motion movement (Polar, Jackson or Ormond).
Switch	1—Quick-break double-pole mains type (Bulgin).
Coil	1—Q coil, type QAT (Wearite, Lewcos, Lotus).
Fixed Condensers	2—1-microfarad (Lissen, T.C.C., Igranic).
	2—2-microfarad (Ferranti type C1, Mullard, T.C.C.).
	1—.0003-microfarad (T.C.C., Lissen, Edison Bell).
Condenser	1—.0001-microfarad (Lissen, T.C.C., Edison Bell).
Chokes	1—Low-frequency (Igranic type F Bulgin).
	1—High - frequency (Burndept, Igranic, or Climax).
Valve Holders	1—4-pin rigid (W.B., Igranic, Burndept).
	2—5-pin rigid (W.B., Wearite).
Transformers	1—Low-frequency ratio, 4 to 1 (B.T.H., Pye, G.E.C.).
	1—Special A.C. mains (Parmeko).
Resistances	1—50,000-ohm, with holder (Graham-Farish, Mullard or Farranti.)
	1—2-megohm (Dubilier, Lissen, Ediswan).
Sundries	Flex for mains connection (Lewcos).
	Stiff wire for connecting (Glazite).
	2—Panel brackets (Bulgin).
	2—Dial indicators (Bulgin).
	4—Terminals, marked:—Aerial, Earth, Output +, Output –, (Belling Lee).

No. 40-gauge Eureka wire. If a pentode is to be used, a 320-ohm resistance will be required, this being made up of 9 yards of the same wire. The resistances may be wound up on any convenient bobbin, since the heat dissipated is not serious.

Ready Wound and Tested

It may be pointed out, however, that the values given are only approximate, for the resistance per yard of wire of this type varies slightly, and it is preferable to purchase the resistance ready wound and tested from a manufacturer in order to ensure absolute accuracy.

If it is desired to make the apparatus really universal, then the 800-ohm resistance should be used, and two extra terminals should be mounted on the baseboard, one connected to each side of the resistance. This will be satisfactory for a power valve.

Extra Resistance

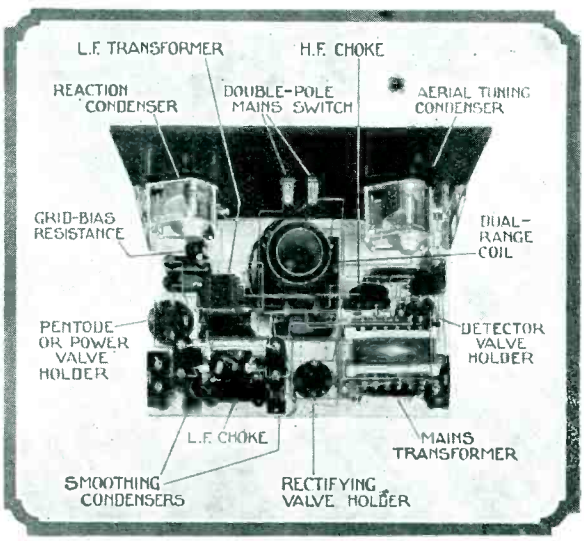
If a pentode is to be employed, an extra resistance can then be connected across these two terminals, the value of this extra resistance being such as to make the total resistance equal to 320 ohms. The value of this extra resistance should be 500 ohms, which is obtained by utilising a length of 3½ yards of No. 40-gauge Eureka wire.

Having completed the wiring and checked it over, nothing remains but to test the receiver out. To do this, insert a five-pin detector valve, such as the Mullard 164V in the detector socket, a power valve or pentode in the L.F. socket and a Marconi U5 valve in the rectifying socket.

Plug in the receiver to the electric-light supply, connect up the aerial and earth, and the loud-speaker, and switch on. It may be found at first that a peculiar howl is set up for the first few seconds until the detector valve has warmed up.

Being an indirectly-heated valve, it takes an appreciable time before the cathode starts to emit electrons, during which time there is no load on the primary of the L.F. transformer. As soon as the valve begins to do its work, however, this howl disappears and the receiver functions normally. If the howl is unpleasant, a high resistance of 0.1 to 0.25 megohm should be placed across the transformer primary.

The Q-coil switch must be placed in its correct position, which will be quite clear from the makers' instructions. The left-hand dial is used for the tuning, while the right-hand dial supplies the necessary reaction control.



This plan view of the Stay-put Two clearly shows how all the components are arranged

Foreign Stations

No difficulty will be obtained in finding the local and alternative programmes, while with a little experience, a number of foreign stations will be found to be obtainable at good loud-speaker strength—this is more particularly the case when the pentode is used.

Having got the receiver in its proper condition of working, all that is necessary is to switch on or off by means of the switch in the centre of the panel. No further attention is required and there are no batteries of any sort to be changed or replaced, so that the receiver will absolutely look after itself.

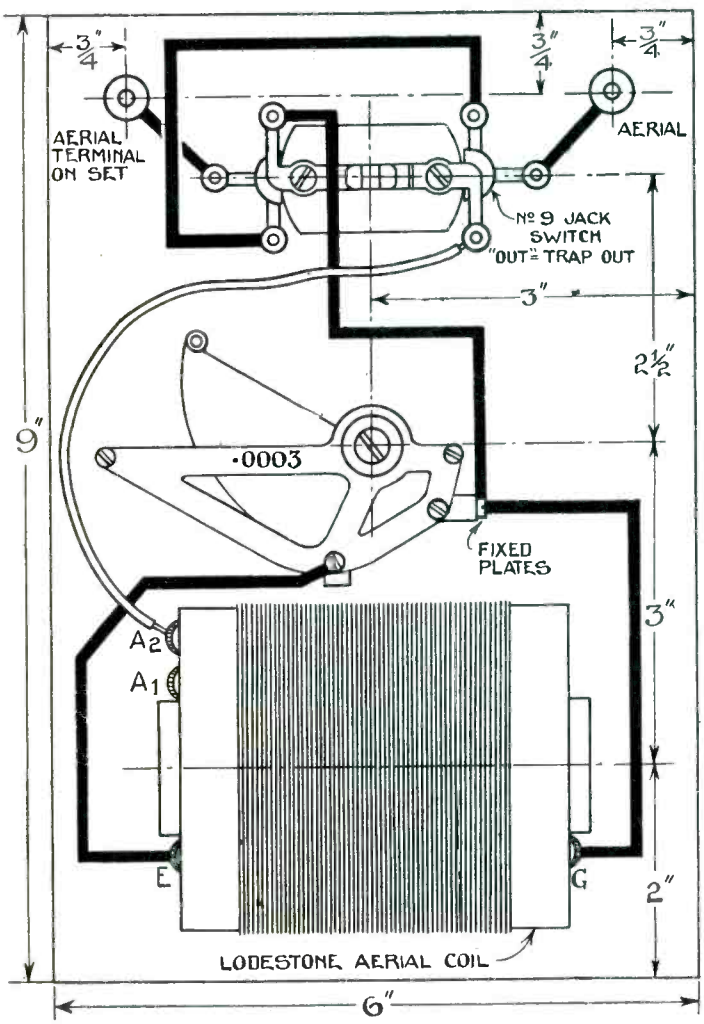
WHEN YOU HAVE BUILT THIS SET WRITE AND LET US KNOW JUST WHAT YOU THINK OF IT

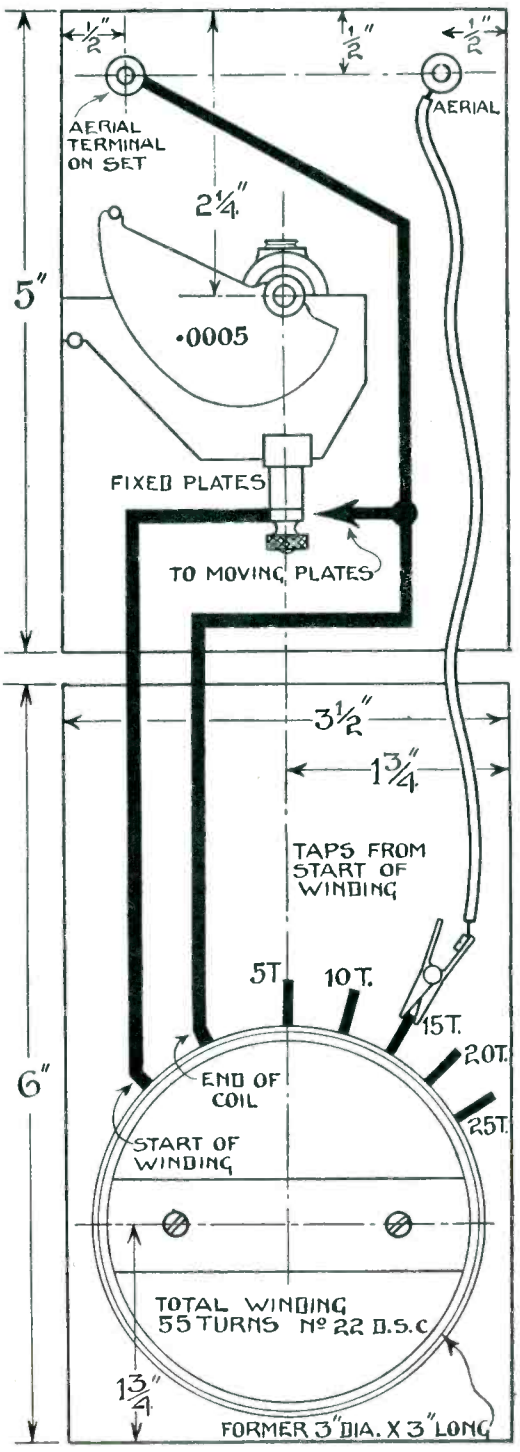
Making Your Set More Selective

Last month's article under the above title, by W. James, has created widespread interest amongst listeners who want to get better results without the trouble of rebuilding their sets.

Many requests for blueprints of the two wavetraps described have reached us, but as none are available we are reproducing the layout and wiring diagrams here on a large scale.

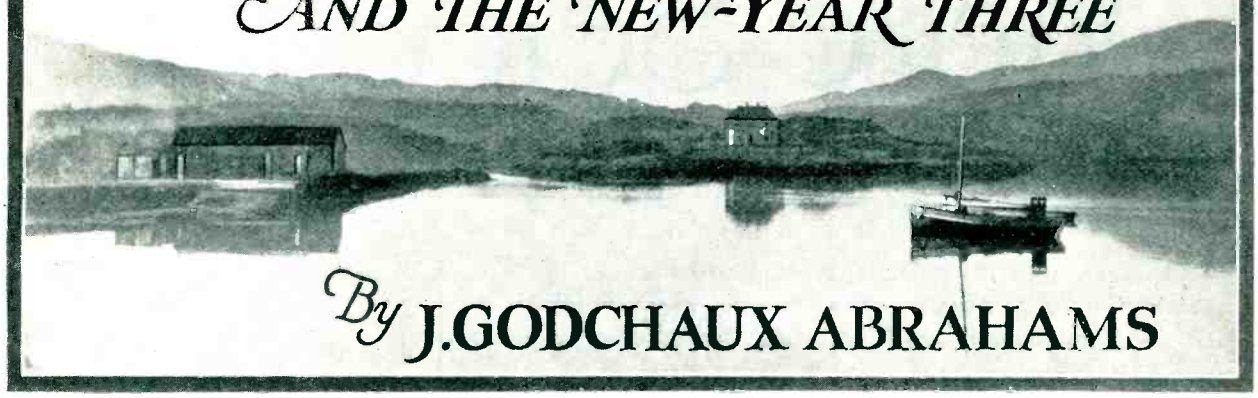
The diagram below gives all the details for constructing the wavetrap illustrated on page 17 of the previous issue, while that on the right is for the wavetrap shown on page 15.





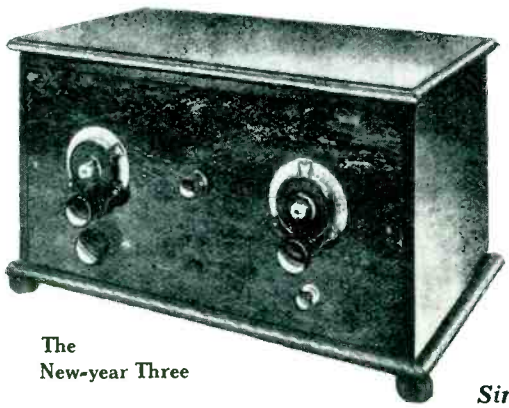
NO SOLITUDE—

AND THE NEW-YEAR THREE



By J. GODCHAUX ABRAHAMS

HAVE you ever been marooned or cast away on a desert isle? Probably not, but when a friend of mine recently appealed to me by telegram, his SOS might well have been sent out in these circumstances. From his description of the locality in which he was situated, I felt that Robinson Crusoe, even after the arrival of Man Friday, would have furnished a more cheerful story, had he been blessed with a wireless receiving set.



The New-year Three

Dreary Existences

Although it is not always realised, there still exist many spots in the British Isles which, "far, far from the madding crowd," provide but a dreary existence for their inhabitants.

Such a one is Bere Island, situated about two miles off the extreme south-west coast of County Cork, Irish Free State, in Bantry Bay. It consists mainly of a series of small mountains covering an area of some ten or eleven square miles, the low-lying portions of the land being mostly bog. At the western end of the island the cliffs are very high and rugged, containing numerous caves originally used by smugglers; in fact, the coast is very similar to that of Cornwall in the neighbourhood of Land's End.

Known to the Navy

Bere Island is seldom mentioned to-day, but during the Great War, as a destroyer base and a port of call for mystery Q ships, it loomed large at times in the annals of the Navy.

Try and visualise this rocky isle, with a civil population of some seven hundred souls, ekeing out a precarious living from an unpleasantly barren soil, and alternating this merry pastime with scallop fishing, a catch specially destined for the London markets.

Add to this inclement weather during the winter months, with the wind frequently reaching hurricane force, heavy rainfall, and high Atlantic seas breaking against the rugged coasts—realise this, and you will readily understand the reason for which I immediately responded to my friend's appeal.

It is in such wild spots of the United Kingdom that broadcast programmes are the most appreciated; radio, no longer a luxury, becomes a necessity.

It was to Bere Island I despatched the New-year Three, a receiver which I felt would get my lonely friend into close touch with most of the British and Continental cities, and in this, as you will see, we were not disappointed.

Bere Island Harbour

If I chose the New-year Three, it was for the sole reason that on a previous occasion I had thoroughly tested it; it had come up to my expectations. Moreover, it was not hampered with too many valves—an important factor where L.T. and H.T. accumulators were concerned—and with its screened-grid H.F., detector, and pentode, it possessed all the qualities of a four- or five-valver.

Simple Manipulation

Another point in its favour lay in the fact that its manipulation was of the simplest—an important item in this case, as my lonesome friend was only a beginner in radio. And then again, if tired of wireless entertainments, it was a simple matter to slip an adaptor in the detector-valve holder and, with the aid of a pick-up, reproduce gramophone records through the loud-speaker.

Without doubt the set offered many advantages, so the outfit, carefully packed with all the necessary accessories, and detailed instructions such as a novice could understand, was dispatched post haste to Rerrin, Bere Island.

Striking a Rock

Already, in anticipation, steps had been taken to erect as good an aerial as could be possibly obtained, and herein lay the difficulty. By chance, a sturdy 40-ft. mast was found, but when an attempt was made to dig a hole, solid rock was struck before a depth of one foot had been reached, for there is but a thin layer of soft

soil over entire extent of the island.

As an alternative, two signal poles were lashed—rather insecurely, it is true—to two huts some distance apart, and some stranded copper cable was slung between them. For a more permanent installation later, a big barrel was "scrounged," the base of the mast tightly packed into it, and the pole carefully stayed, it successfully withstood several wintry gales.

Real "Hot" News

Can you realise with what impatience the receiver was connected to the batteries and the pleasure derived from the capture of a transmission broadcast by 5XX? At least, the news was captured "hot," and there was no need any longer to wait until the next morning for a copy of the *Cork Examiner*, rowed over from the mainland by two sturdy fishermen, who regularly, every day, bring across the mails and newspapers.

In my friend's own words: "That night we sat up until daybreak and roamed over the entire continent, loath to retire to our beds, fearing that by so doing we might miss something. Everything was of interest, for on this lonely isle, well separated from the nearest broadcasting station, Cork, a matter of ninety miles away, we suffered no interference from any nearby transmitter, and but for bursts of morse from steamers in the St. George's Channel or on the Atlantic side of our coast, Bere Island was a minor realisation of the radio fan's paradise.

"It was with difficulty we dragged ourselves away from the receiver, and only succeeded in doing so when, after having twirled the condensers backwards and forwards, we assured ourselves that there were no more broadcasting stations on the air and that all good studio announcers had retired to a well-earned rest."

The log kept during the next few days proves interesting reading, registering, as it does, some forty-five transmissions captured on the loud-speaker, and these with but one change of plug-in coils. No doubt, with a greater selection and more experience in the handling of the New-year Three, a greater number of broadcasts could be picked up

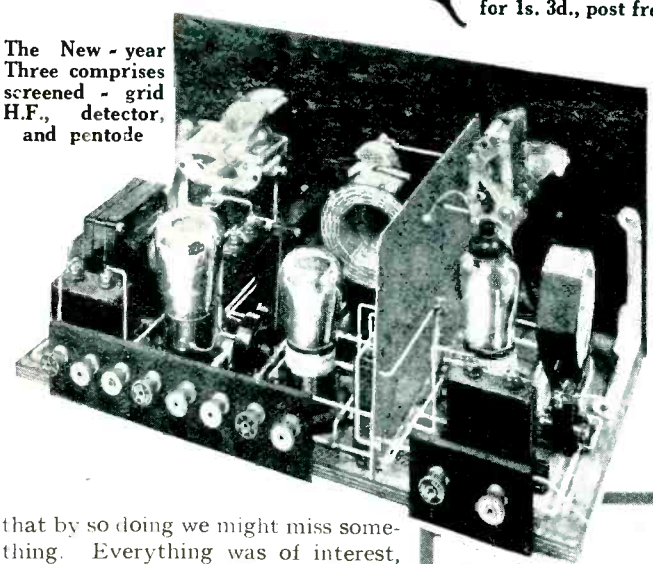
A study of the log reveals that in that corner of the British Isles some stations which provide but poor signals in south-east England are received there at full volume, and, alternatively, transmissions which are easy to pick up on this side of the Irish Channel give but little satisfaction to the listeners in the south of Ireland.

Such, for instance, is the case with 5GB, a hefty station according to its nominal power, yet heard but faintly and fitfully at Bere Island; on the other hand, Radio Toulouse, a weaker brother and situated at a much greater distance, proves a disturbing factor, inasmuch as it can be tuned-in over several degrees of the condenser dial.

Everybody will read with interest this account of the results obtained with a popular "Wireless Magazine" three-valver on a lonely island off the coast of Ireland.

Not only is the account a credit to our Technical Staff, but it is also valuable because it shows how much results depend upon purely local conditions.

The New-year Three was fully described last February, and back copies are available for 1s. 3d., post free.



The New-year Three comprises screened-grid H.F., detector, and pentode

Many German Stations

London is seldom heard, but, on the other hand, there are few transmissions from Germany which cannot be steadily held for hours on end, and such studios as those of Hamburg, Stuttgart, Frankfurt, Leipzig, Cologne, or their relays, provide alternative daily programmes to the 5XX transmissions.

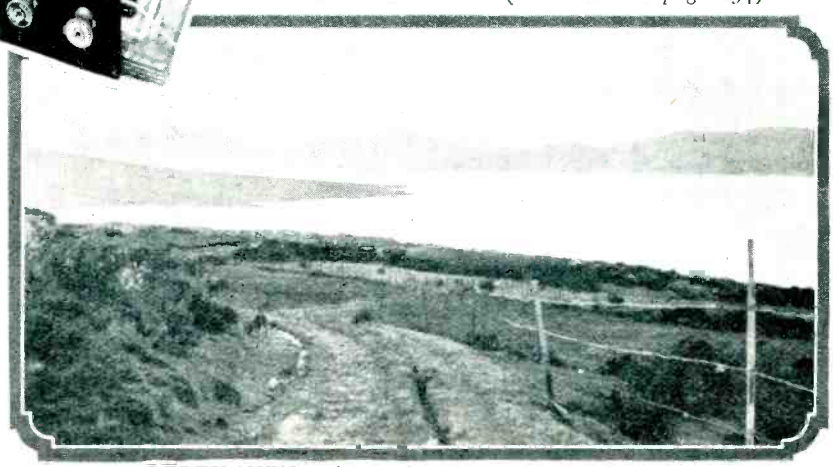
In the later hours, Madrid, San Sebastian, and the now invigorated Radio Barcelona romp in at full pressure and on some nights might be only a few miles distant.

Vienna, Turin, Buda-Pest, Brussels, Kattowitz, Rome, Milan, Prague, and more recently Genoa, have been taken at will, and on favourable nights both Radio Algiers and Rabat (Morocco) have supplied welcome entertainments.

On the long waves—again, except for morse, in view of the persistence of fog beacons—the Leningrad relays of operatic performances could be perfectly enjoyed, but Hilversum, Kalundborg, Eiffel Tower, Koenigswusterhausen, Radio Paris, Warsaw, and Motala could always be relied upon as a rule to inflate the carefully-kept nightly log of worth-while entertainments.

Then again, during the dark winter months, with the New-year Three

(*Continued on page* 154)



BEREHAVEN. A typical road is seen in the foreground

The Woman's View

By BESS MARSHALL

How the B.B.C. could make broadcasting more interesting to women

Why not a talk on motor-boat racing by the Hon. Mrs. Victor Bruce?

DO you remember the Women's Hours which were included in some of the first programmes ever put out by the B.B.C., long before it was a Corporation?

They weren't a success. They were dropped entirely for a time, re-introduced in a half-hearted attempt to do, at least, something for the millions of women listeners, modified again, re-remodified and, finally, boiled down to just a series of talks, which I personally don't think are very helpful.

At the Wrong Times

The first "hours" were not successful, partly because of the time at which they were given. If I remember rightly, they were allotted a space in the programme day which coincided almost exactly with the afternoon tea, which can be taken in comfort only by those women who have done their work early.

At this time the average woman prefers to listen to the gossip of an invited friend, rather than to turn on the "machine" and be compelled to listen. There are many more suitable times during the day than tea-time to put over talks of doubtful domestic interest.

Then, again, the subjects were wrongly chosen, and the silly attempt was made to run these periods entirely by women. It is an accepted fact that the average female voice is not well suited to broadcasting. Women do not want all their time taken up by talks on tennis results, home hygiene and recipes for tartlets (horrible word for delectable delicacies).

The following are all wrong :—

Squeaky female voices for giving talks.

Too many recipes, particularly of a fancy or French nature, which no man is likely to appreciate.

Too many health talks.

Too much highly-technical gardening information.

Too many talks giving stupid home "hints" of no value, except to food cranks or paupers.

Too many home talks of any kind.

Learning from the Dailies

I believe it has been said before in the WIRELESS MAGAZINE that the B.B.C. could learn a great deal about what is and what is not suitable for a woman's feature by reading the feminine-interest pages of most national daily papers. These features, despite the well-known women's names to be found in the headings, are run by men, by men experienced, of course, in matters of feminine appeal.

And what do we find? There is never a preponderance of domesticity. Women have interests outside the home. There are articles on fashions, on sport, on masculine enjoyments, such as motoring and —yes—even on golf. The articles have as subjects the same kind of things as those for "ordinary readers," that is, for the men-folk. But they are presented in a different way. They put the *interest* first and the *technicalities* and *difficulties* afterwards.

I am quite aware of the weaknesses of my own sex, and I know that if glamour surrounds a thing, a woman will fly to it like a moth to a light; the technicalities (but not the facts) must come afterwards.

Where the B.B.C. Goes Wrong

That is where the B.B.C. so often goes wrong. It gives subjects and talks, the "meat" of which would be very acceptable to women if put in the right way.

But the times chosen for the broadcasts, and the dry-as-dust manner in which the matter is imparted, make it the exception rather than the rule for the reception to be appreciated.

A programme official reading this will say that I have been at length to explain that women want very much the same kind of broadcasts as do the rest of the family. What, then, he will say, can be the purpose of a women's feature at all?

Well, there is a very big demand for items to interest women, given out at a time when women can listen and appreciate. Early in the morning, lunch-times and tea-times are totally unsuitable. A broadcast must be of exceptional interest for a woman to stop her work or cancel her appointments in order to listen.

You must remember that, joking apart, listening to a wireless set does not come naturally to the feminine capabilities. Listening not only necessitates concentration, it demands a mind which can quietly absorb thought, and which can reason logically, and without prejudice. It demands an interest, and a very real one, in order to maintain concentration and absorption. For the average woman this interest has to be great in order that she can listen and enjoy her listening.

Maintaining Interest

A conversation or a discussion is easier. It is not that a woman is naturally fonder of hearing her own tongue than that of anybody else, as irate husbands are fond of saying, but simply that a conversation more easily helps her to maintain interest than does a lecture, which is all one-sided.

The moral of this is simply that talks which are really lectures *must* be of vital interest; and in any case, they should be kept short. There is a further point, too, in that prolonged concentration is alien to most women's minds.

Catholic Interest Essential

That is no detriment, because variety of thought is always an advantage; but it means that Women's Hours will not be popular unless they embrace a wholly catholic series of subjects, each of very real interest.

The B.B.C. has just issued a book of Household Talks. I have read it. It is very helpful to those who want information on domestic subjects; most women do from time to time. I gather that the material from which the book has been made up has been broadcast during the time allotted to feminine-interest features. If that is so, then women who have listened to all the talks will be undoubted experts on poultry-keeping and on the gentle art of making rissoles from last Sunday's leavings!

Unsuitable Material

I maintain, with all due deference to the worthy Board responsible for picking the subjects, that knowledge of the intricacies of Rhode Islanders, and of the economic consumption of cold mutton, do not make for the perfect women!

In our Women's Hours let us, true, have a sensible proportion of helpful household hints. But let us also have Life.

Grid Bias for Nothing!

THIS does not mean that dry-cell batteries are to be given free for the asking! No, radio is not yet quite so cheap as all that! But, nevertheless, it is possible to dispense with the grid-bias battery and to obtain the necessary potential from the high-tension battery.

The method can be worked with dry high-tension batteries and accumulators, but the most satisfactory operation is obtained in conjunction with a mains eliminator, either A.C. or D.C.

Roughly, the scheme works in this way. A resistance is connected between the accumulator L.T. supply and the negative terminal of the H.T. supply. For safety's sake, and to prevent motor-boating, it should be shunted with a large-capacity fixed condenser.

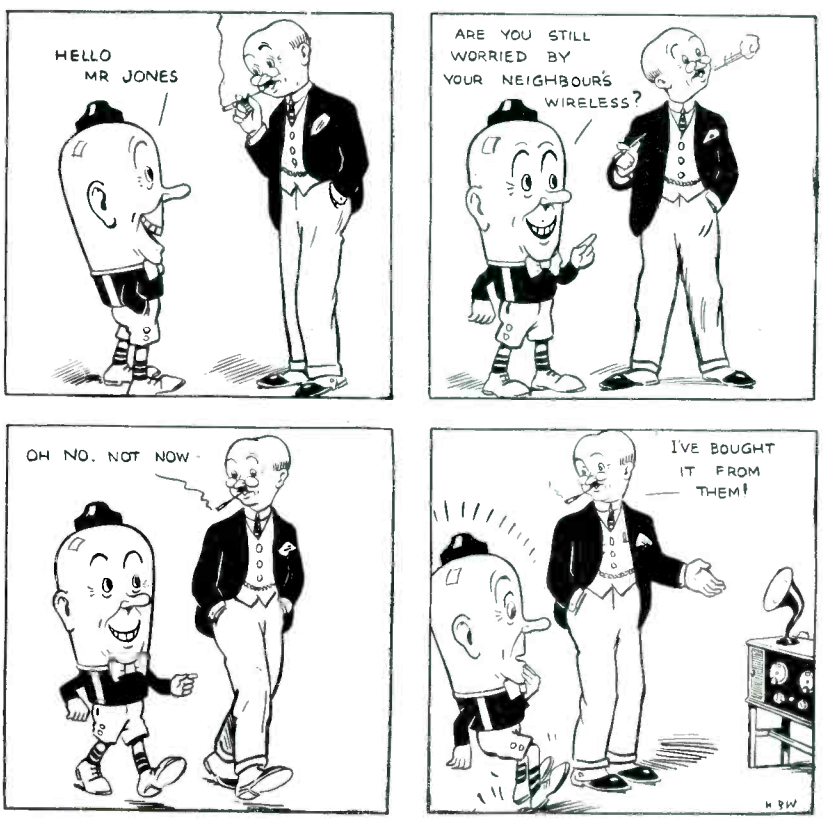
Usually the place of this resistance is taken by a direct connection, but the presence of the resistance in circuit results in a voltage drop, and this can be utilised to provide grid bias.

What you do, then, to provide grid bias for a valve, is to connect a resistance between the accumulator and the H.T. supply, and carry the bias wander plug to some point on this resistance, depending on the grid voltage required. The one snag is that the H.T. voltage is reduced by the amount of the grid voltage at its maximum, but this does not matter very much, usually, with H.T. eliminators. Two or three valves can be supplied with bias in this way, but each tapping must be shunted by an earthing condenser of 2 microfarads or so.

The value of the resistance depends on the H.T. current, and should be found accurately by simple calculation, knowing the value of grid bias required. A resistance which can be varied from 500 to 2,000 ohms is generally suitable.

STANLEY AIREY

The Adventures of Alec Trode



Wireless Magazine September: 1929

Half Hours with the Professor

How the L.F. Transformer Works

"I SAY, Professor," said Amp thoughtfully one day, "do you know you have never told me how a transformer works?"

Megohm's eyes twinkled. "Well, now," he replied, "that is a really most lamentable omission. That should obviously have come quite early in the course."

"The course?" echoed Amp. "Oh, I say," he went on hurriedly, "I didn't mean it like that, you know. It's really jolly good of you to take the trouble you do in explaining these points. I only asked the question really because Bill Higgins was laying down the law about it the other day."

Knowing It Backwards

"I suppose he knew what he was talking about and that's what made you annoyed, is that it?" asked the Professor gravely.

"No!" exclaimed Amp. "He talks as if he knew it backwards, and I am sure he doesn't really. Only, because he's made one or two WIRELESS MAGAZINE sets, he poses as an expert."

"Surely that might justifiably be considered some qualification," smiled the other. "Anyhow, what particularly criminal remarks did he make?"

"Oh, dozens! He said, for example, that the step-up ratio was all bunkum and was only put in as a selling point."

"And you couldn't answer him, I suppose?"

Amp became confidential. "'S'matter of fact, I don't know how a transformer works at all, and I'd be awfully bucked if you would tell me."

Megohm remained lost in thought for a few moments, during which time he slowly filled his pipe. "You know the general idea of a transformer, do you? Apparently not. Perhaps we had better start at the beginning If you have two coils of wire mounted on an iron core, then any magnetic field produced by passing a current round one coil will also pass through the second coil. That is straightforward, isn't it?"

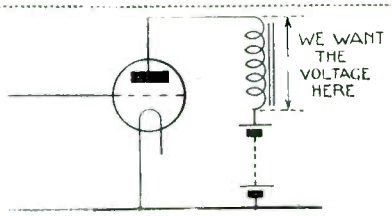


Fig. 1.—Typical intervalve transformer circuit

Amp nodded.

"Good. Now, it is a funny effect that if we vary the magnetic field passing through a coil we set up electric currents in it. Most of our methods of generating electricity depend upon this fact. Consequently, if we vary the magnetic field in this arrangement of two coils we should set up current in the coils.

"How are we going to vary the field? Why not make use of one coil to produce the variations? Suppose we pass a varying current through one coil then it will produce a varying magnetic field——"

"And that will set up currents in the other coil—is that it, Professor?" broke in Amp eagerly.

"That is exactly the idea. We have transferred our current, as it were, from one coil to the other through the medium of the magnetic field between them."

"That's really very interesting, Professor; but why should we call it a transformer?"

Effect of Altering Ratio

"I'm coming to that," was the reply. "If we make the number of turns on the two coils exactly the same, then the current in the second coil, or the secondary, as we call it, is the same as that in the first coil or primary. If we make the number of turns different, however, then the currents will be different and also the voltages developed across the circuit.

"We usually work in terms of the voltage, and it is possible to make the voltage on the secondary greater or less than that on the primary by any required amount within reason. In other words, we can transform the voltage up or down as we wish."

"Ha," exulted Amp, "that rather finishes Mr. Higgins, doesn't it?"

"Not so hasty," answered Megohm. "I think your friend Mr. Higgins would probably floor you before you got very far. He would probably start making rude remarks about self-capacity and things like that."

"The man's a marvel," said Amp wonderingly. "That's exactly the sort of drivel he did talk."

Both Feet in the Mire

Megohm's eyebrows went up. "I'm glad you think it drivel," he commented dryly, "because I was about to drivel myself, but perhaps you would rather I didn't."

The boy groaned. "Both feet firmly in the mire," he muttered. "I'm awfully sorry, Professor; only it sounded drivel coming from Bill Higgins."

Megohm seemed mollified. Really, Amp thought he was a most extraordinary chap. On some days you

could pull his leg till it nearly came off and on other days he got shirty about the most unusual things. He watched him furtively, hoping that Megohm was not really annoyed.

"The problem is fairly simple if you can maintain the voltage on the primary," resumed Megohm. "The whole art of the intervalve transformer designer, however, is concentrated on this little point. The transformer is to be used in a valve circuit the primary being connected in the anode circuit of a valve like this." Here he drew the sketch shown in Fig. 1.

Relative Impedances

"Now we apply a signal across the grid and filament of the valve, and we get, as a result, an amplified signal in the anode circuit. This voltage, however, is divided between the valve and the transformer, and unless the impedance of the transformer more or less matches that of the valve, only quite a small proportion of the total voltage will ever get to the transformer."

"What happens to it, then, Professor?" asked Amp, somewhat timidly. "Does it all get used up inside the valve?"

"Yes. The valve has a certain internal resistance, and most of the voltage is wasted in overcoming this unless we can make the transformer absorb its proper share."

"Does that mean we have to make the transformer of high resistance?"

"Not exactly high resistance, but high inductance. From the point of view of the amplification it is sufficient if we make the primary have a large number of turns. Even so, we can only effect a compromise. The voltage which the transformer will absorb in the valve circuit depends upon what we call its impedance, which is proportional to the number of turns on the primary and to the frequency of the current.

Bass Reproduction

"Consequently, for very low frequencies the impedance is only quite small, and that is why a transformer has to be very carefully designed and well constructed in order to absorb its due share of the energy in the bass frequencies."

"Oh, good heavens!" said Amp. "I begin to see. I could never understand why everybody said transformers were no good for real reproduction."

"I would not say that nowadays," rejoined the Professor, "because modern methods have enabled us to obtain good amplification down to extremely low frequencies."

"Is that done, then, by putting a very large number of turns on the primary?"

"Partly that," agreed the other, "although such a procedure brings other difficulties in its train. In the first place, the self-capacity of the winding increases so that at the high frequencies the current is short-circuited across the transformer instead of passing round the winding, as it should do. You can avoid that to some extent by winding the primary in sections."

"I know," exclaimed Amp. "I have seen pictures of the insides of transformers all wound in bits."

Megohm grunted. "Another danger," he went on, "is that of saturating the iron, because the primary winding has to carry the steady anode current of the valve, and the large magnetic effect produced by this current tends to exhaust the iron, as it were, so that it cannot do its work properly."

Amp thought this over. "I see," he said at length; "then if you increase the turns and you keep the anode current the same you increase the exhausting effect."

"Exactly. This has to be taken into account when designing the transformer in the first place, and that is why most L.F. transformers are rated to carry a certain number of milliamperes only."

"There seem to be an awful lot of things I don't know," admitted Amp soberly.

"Ah, well, my boy," smiled Megohm, his good humour completely restored, "it would be a dull world if we all knew everything. At any rate, you will appreciate the trouble we have to take to see that the voltage is maintained on the primary, despite the widely varying frequencies which we have to handle."

Amp nodded. "Then, what about the step-up?" he queried. "Can we make that as much as we like if the primary is correctly designed?"

"Only up to a point," was the reply. "We can usually obtain a step-up of 3 or 4 to 1, but beyond this point the self-capacity of the secondary winding becomes too great. We can keep the self-capacity down by sectionalising the winding, but a point is soon reached where the capacity becomes too high, and the higher frequencies are again short-circuited, and do not develop their proper voltage."

"So we do really obtain a step-up?"

"Oh, yes," was the answer. "There is no question about that. The difficulty is to maintain the step-up over the whole range, and this is where the different designs in transformers vary among themselves."

"But," objected Amp, "you sometimes see transformers of 6 or 8 to 1."

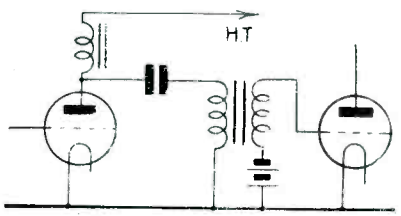


Fig. 2.—Choke feed to transformer primary

"That is so. These transformers, however, are designed to follow very low-resistance valves, in which case the primary can be made smaller than usual. This enables us to increase the ratio of secondary to primary turns, and so obtain a larger step-up. In fact, the development in the future will probably be in this direction."

"How do you mean, Professor?"

Avoiding Saturation

"There is a tendency now to avoid the difficulty caused by saturation of the iron by feeding the anode of the valve through a separate L.F. choke or through a resistance. The low-frequency currents are then passed through a large condenser on to the primary of the transformer, which thus does not carry any steady current."

Amp looked a little puzzled, so the Professor drew the sketch shown in Fig. 2 to illustrate his point.

Amp studied this for some time. At length he said: "I don't quite see how this helps us, Professor."

"In this way. If there is no steady current passing through the iron its magnetic properties are much better, and we can obtain the necessary inductance we require with a smaller number of turns. Remembering that we are more or less limited in the number of turns which we can put on the secondary, anything we can do to reduce the number of turns on the primary gives us a bigger step-up ratio."

"Oh, yes; I get the idea," cried

(*Continued on page* 154)

UNDER MY AERIAL

HALYARD'S CHAT ON THE MONTH'S TOPICS

SKETCHES BY GLOSSOP

Radio is fast becoming indispensable—even the auctioneer makes use of a microphone and amplifier to make his appeal to buyers.

Summer Favourites

NOW that we are once again nearing the end of the season of long days and holidays, I should like to know if you have made up your mind as to which is your best distant station in summertime. Is it a Continental station which is a favourite with you all the year round, or is it a station which really is a summer favourite and not necessarily a winter favourite as well?

I have been discussing this question with wireless friends and find that our old friend Hilversum has proved first favourite this summer.

Transmissions from Hilversum are always excellent, you know. The music from this station seems to have a liveliness of its own. What my friends emphasise about Hilversum, however, is that you can always depend upon it, weekday and Sunday, for the type of gay music that pleases most during a sunny afternoon or a summer's evening.

I wonder what Continental station

Summer favourites

you and your friends would put as a first summer favourite. If it were not Hilversum, I would risk a guess that its name would be found among the following :—

Radio-Paris, Kalundborg, Budapest, Brussels, Turin, Toulouse, Nurnberg.

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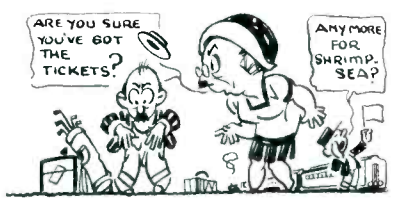
Holiday Questions

(1) How do the conditions for wireless reception in your holiday



Holiday questions

district compare with those at home?

(2) Which is the most satisfactory type of temporary aerial for a holiday?

(3) Why shouldn't you take your portable set with you in a crowded railway carriage?

(4) Ought you to take a spare valve or two and a spare accumulator?

(5) Which is the best loud-speaker for cutting out the usual cackle at a seaside boarding house?

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The Great Show, 1929

Have you realised that this is the September number of the WIRELESS MAGAZINE, and that we are only one short month off this year's wireless exhibition?

What about the exhibition, then? Of course, we shall all pay it a visit if we possibly can, but what do we expect to see? I am afraid I can tell you very little about the exhibition as yet.

Our WIRELESS MAGAZINE and *Amateur Wireless* stands are to be Nos. 19 and 20 on the ground floor, but I am not going to give away any secrets concerning the special attractions planned for those stands.

Last year there were some unusually attractive features at the exhibition, screened-grid and pentode valves for example, and many new types of receivers. What will be the great attractions this year?

Cheaper valves would be a very welcome feature at this year's exhibition, wouldn't they?

By the way, have you seen the new exhibition poster? George described the new poster as a light-

I am not going to give away

ning sketch, a pretty good description in my opinion.

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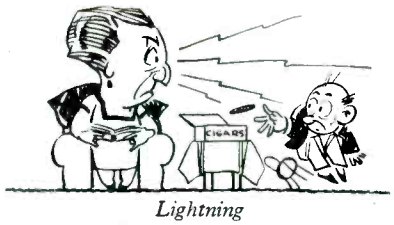
Lightning

A thunderstorm, which broke in full force over my district last Thursday, caused me to seek information on the subject of lightning from my meteorological friend. He made clear to me that lightning was the

visible flash of a discharge of electricity between two clouds or between a cloud and the earth. He then went on to explain to me that lightning was either "forked" or "sheet." Forked lightning, I learnt, was lightning in which the path of the discharge was visible. Sheet lightning, on the other hand, was the reflection of the flash proper on clouds, the actual path of the forked lightning flash not being visible to



Lightning

the observer. It was very obvious, he explained, that forked lightning was much nearer to the observer than the distant lightning which caused sheet lightning to be seen in the sky.

One of the most interesting things about lightning, so he told me, was that artists usually depicted lightning as a series of zig-zag lines, whereas photographs show a lightning flash to be a continuous wavy line.

Another interesting thing I learnt was that sheet lightning has been seen at night for distances over a hundred miles from the actual thunderstorm. Thus, it is quite possible for you to see lightning and yet not hear it on your wireless set.

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Spoiling the Ship

Have you seen an example lately in which a wireless manufacturer has spoilt his wireless ship for a ha'porth of tar, so to speak? I have had a good example of this kind of thing recently in connection with the work I have been doing on high-frequency amplification.

The component part in question was a high-frequency transformer which was good in every detail except one. I did not find out this faulty detail until I had used the transformer a few days. Then, when I was taking the transformer out of its base,

A Good Example

I heard something drop on the floor. I looked about the floor anxiously and ultimately I found a tiny threaded end of a valve-pin with the tiny nut on it. One of the valve pins had snapped off just where it entered the ebonite base-ring and when I pulled out the broken valve pin and saw how slender was its threaded end, I was not surprised at the fracture.

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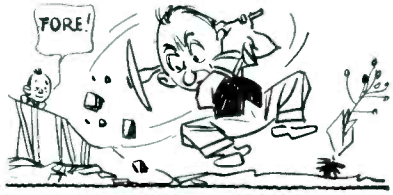
A Bad Spot

A few weeks ago *Amateur Wireless* published a letter in which the writer stated that Manchester was the worst spot he knew for reception of Europe, and he gave three reasons: (1) Manchester's situation just under the Pennines, (2) interference from ships on the Ship Canal, and (3) the proximity of 2ZY. Now I happen to have spent part of my holidays in the Pennines and, from the work I did there with my new portable set, I came to some conclusions which have a distinct bearing on reason No. 1.

From my work in the Pennines, I became quite certain that wireless



A Bad Spot

reception depends to a greater extent than is usually thought on the nature of the ground underneath, and on what is between you and the transmitting station. For example, I found that signal strength distinctly deteriorated as I passed from a gritstone area to a limestone area.

I have the idea that the amount of screening caused by a hill between you and a transmitting station depends on what the hill is made of. Hence I would suggest that Manchester's position "just under the Pennines" is bad, not so much because of the Pennines, but because the Pennines are largely limestone

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Volume Control

Don't you think it is rather amazing that we should read so much about volume control these days? Why, a few years ago, we were all straining our ears to the utmost to catch the tiniest whisper of morse on our headphones. Now we are actually using methods of volume control to

Don't you think it is rather amazing?

cut down our signal strength to agreeable proportions. Could anything illustrate better the progress that has been made in wireless in so short a time?

One of the simplest methods of exercising control over the output volume of a wireless set is one which used to be referred to in the old days as "filament tuning." This method merely requires an ordinary rheostat control of the filament current of the first valve, high-frequency amplifying valve, or detector valve as the case may be. By means of this rheostat, the filament emission of the first valve can be reduced to a suitable amount and the output volume controlled.

Another old method of volume control is the application of a positive grid bias to the first valve. Still another old method, and a very good one, is the reduction of reaction.

To those of us who are comparatively old in wireless years, modern methods of volume-control, employing variable resistances in some part of the circuit, seem a little strange.

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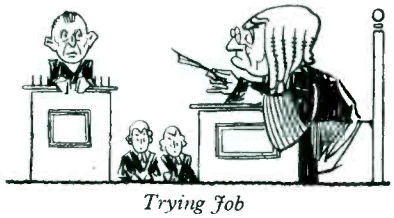
Trying Job

What is the most trying piece of work in the whole of wireless? Any idea? If you have ever tried to



Trying Job

neutralise two stages of high-frequency amplification, you won't have the least shadow of a doubt. I have been trying to carry out this most difficult piece of work for a fortnight and have not succeeded yet.

I started hopefully with a minimum amount of screening of the two stages, and with fixed resistances across the neutralised windings of the split-primary transformers. I took out the resistances and increased the screening with no better luck. I am still increasing the screening and I

Under My Aerial (Continued)

do not seem to be nearer success. My latest idea is a complete rearrangement of the component parts and a re-wiring of the set.

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A Wireless Film

Have you tried to get the manager of your local cinema to show that excellent wireless film which was described in one of our contemporaries a few weeks ago? I have had a shot at my man and I intend to

I have had a shot at my man

give him no peace until he books the film or tells me of someone else who has booked the film.

This most ingenious film, which has been made in Germany and which has already been shown in Berlin, presents the theoretical side of wireless transmission and reception in the form of a series of cleverly conceived moving pictures. What would, perhaps interest us the most in this film is that part of it which illustrates the working of the modern valve.

Another section of the film which would undoubtedly fascinate us is that dealing with reaction.

The non-technical part of the film is concerned with broadcast programmes as received in German homes and German schools. Pictures of the German broadcasting stations are also shown. There are, I believe, one or two British films dealing with wireless, but I imagine they are now somewhat out of date. This new German film is obviously the one for us to see, and I, for one, shall not rest until I have seen it somewhere.

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The Letter

"Now then, George, out with it," I said to my technical adviser when he called on me earlier in the evening, "I can see you have something of importance to tell me."

"So I have," said George, as he sat down in the armchair I usually surrender to him.

"Splendid. Is it a new circuit, a new valve, a new gadget, or what?"

"Nothing technical. I have written my letter to the B.B.C."

"Your letter to the B.B.C.—I am afraid that I——"

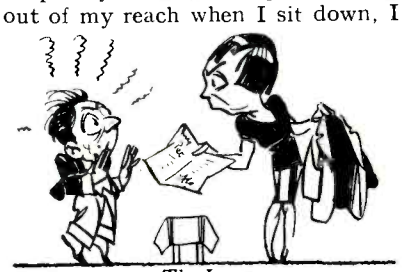
"Yes, my letter to the B.B.C. Every listener ought to write one letter to the B.B.C.—I have written my letter. Shall I read it to you?"

"Do, please, George. I am very interested and I am highly honoured with your confidence."

"How ought I to begin the letter? Dear Sirs, Gentlemen of the B.B.C., Dear Sir John, My dear Governors, Hello! Savoy, or——"

"Go on with the letter, George. We can settle the mode of introduction later."

"Very good. Stop. Start of letter. Stop. My receiver being on a shelf out of my reach when I sit down, I



The Letter

claim to be a wireless listener of many years' standing."

"Now, look here, George. I thought you were serious for once. I don't want to hear any more of your letter. You would make the Chief of the Correspondence Department of the B.B.C resign, and there have been too many resignations from the B.B.C. lately."

"But I thought they might read my letter as a surprise item."

"They would, George."

HALYARD

HUSH THAT LOUD-SPEAKER!

HAVE you heard of the S.P.P.L.S.O.P.N.? That is—if you have recovered from the blow—the Society for the Prevention of Public Loud-speakers and Other Public Nuisances.

Now, be honest and confess that you have not, because this worthy society does not exist at present, but it should do.

The Westminster City Council, some time ago, was considering making a by-law to prohibit the use of loud-speakers in the street for demonstration purposes; for all I know this by-law is probably in force by now—and a very good thing too.

In the early days of wireless much harm was done to radio in public opinion by bad reproduction blared out from wireless-shop doorways. Things are better now that these junk shops are using moving-coil loud-speakers, but surely it isn't necessary to conduct demonstrations outside a shop, and it takes a very good receiver and loud-speaker to give the same results with full volume out of doors as it does to work well indoors. Why then have blaring instruments spouting in the King's highway?

Dealers, please note! B. I. M.

TRICKS WITH SCREENING-GRID VOLTAGE

QUITE a large number of screened-grid H.F. sets have some means of making critical variations to the voltage applied to the screening grid. Sometimes a separate tapping is provided, and this is satisfactory if small voltage steps can be made on the H.T. battery or eliminator.

Another good scheme, though, is to place a variable high resistance in series with the screening-grid connection. A maximum value of 50,000 or 100,000 ohms is advisable, and the junction point of the resistance and the screen should be earthed with a condenser, 2 microfarads being a suitable value.

The great point about this little control system is that you can alter the working characteristics, and, indeed, the internal resistance, by varying the screening-grid voltage.

The effect of thus varying the "inside" of the valve is the same as with ordinary three-electrode valves. The actual amplification depends on the ratio between the impedance of the anode circuit and the valve impedance, and in practice it is a great convenience to be able to have the valve-impedance factor under control. The normal H.T. voltage used with most screened-grid sets is 100 to 150, and a 50,000-ohm resistance is sufficient to bring this down to the required value for average screened-grid valves. M. L. B.

The last "PROMS" to be run by the B.B.C.?

WITH the third of the B.B.C.'s seasons of promenade concerts running their course, one may take stock of the music situation at Savoy Hill and of the policy indicated in the formation of what is proving to be one of the best series of programmes that Queen's Hall audiences have had for many a year.

To a considerable extent, and naturally, a large proportion of the programmes owe their success to the experience of the thirty-four previous seasons which has gone to their making.

Mutual Appreciation

The real musical audience as well as those who have an innate perception of all that is beautiful in the "universal language" are consistent in their appreciation of Sir Henry Wood's monumental services to music in this country; Sir Henry Wood and the B.B.C., on their side, have signalised their recognition of the requirements of "Prom" audiences by retaining those features which have built up the reputation of these concerts.

But, as it is true that in the eyes of the critics the B.B.C. can do nothing right—if it gives the Bax Quintet it is told that listeners need a repetition, while at other times it is admonished for daring to put an item in the programmes twice within a month—so in connection with its innovations at Queen's Hall it has been criticised drastically.

Stressing British Music

The decision was reached, towards the close of last year, that if the B.B.C. were to continue its connection with the "Proms" for yet a third season, greater stress should be placed on British music.

As a tradition attached to the reservation of certain nights of the week to various foreign composers, it was felt that Queen's Hall audiences would prefer that these should remain more or less unchanged; and that a part of one particular evening each week should be set aside for British works, this arrangement not to exclude the performance of some of these works on other evenings.

Thus the comprehensive character of the ensemble would be maintained.

The inevitable snag quickly made its appearance. The scheme was pilloried as soon as it was given publicity, the allegation being that it revived "the old distinction between music and 'British music.' Is it still necessary to segregate the 'British composer' as if he were unfit?"

Such a criticism, coming from a musician whose name, singularly enough, the B.B.C. has done a good deal to make known to the mass of

In this article a B.B.C. official discusses for the benefit of "Wireless Magazine" readers the arrangements made for this year's "Proms" and symphony concerts. It may be that next season the B.B.C. will not be able to co-operate in the promenade concerts—a possibility that is of great moment to music-lovers everywhere

listeners, does not betray any vehement desire to pay even a moderate tribute to the Corporation for its efforts to popularise British music.

That fact, however, caused very little distress at Savoy Hill, where it is accepted as a foregone conclusion that whatever course is adopted will be the subject of misrepresentation amounting, probably, to recrimination.

What was distressing was that the prospectus for the 1929 season which showed that, apart from the Thursday programmes, when some forty-seven British works are being given, thirty additional British works are included on other evenings of the week, was entirely ignored by the critic in question. Further, no single Thursday is devoted entirely to British works, the latter part of the evening's programme consisting of foreign composers' works.

Of the eighteen new works being performed, only one-half figure in the Thursday programmes; but their inclusion on that evening has given the composers the opportunity of conducting their own works in person.

Future Possibilities

In these days, when British and Imperial tendencies predominate in social and political affairs, and musical associations aim to check the invasion of the foreign musician, it seems extraordinary that a British musician should want to frustrate the B.B.C.'s attempts to give even a modicum of added importance to British works by setting aside part of one evening a week to the performance of such items.

Mondays are, according to custom, Wagner nights; on Tuesdays, Mozart and Haydn practically monopolise the programmes; and Wednesdays are largely occupied by Brahms: and yet the B.B.C. hears no complaint of the "segregation" of those composers.

In course of time, Savoy Hill may feel itself justified in giving at the "Proms," or some similar outside concerts, complete Elgar nights; or Delius may figure as largely in the Queen's Hall programmes as Wagner. That, of course, would mark the beginnings of a revolution; but it would not be a bad thing for British music.

What of Next Season?

In view of its new commitments respecting the experiment in the formation of a National Orchestra, it is at present uncertain to what extent the B.B.C. may be able to continue to co-operate, after this season, in the promenade concerts. The three seasons in which such co-operation has been available have shown that the "Proms" have lost none of their old attractiveness.

The B.B.C. has in general preserved the traditions of the series and harmonious relations have existed between those concerned in the

The Last "Proms" to Be Run by the B.B.C.? (Continued)

organisation of the concerts, the "old hands" of the Queen's Hall on the one side and the newcomers from Savoy Hill on the other side. It is hardly necessary to labour the point that the musical public owes a tremendous lot to Sir Henry Wood for his work in this connection.

In the new series of symphony concerts arranged by the B.B.C. at the Queen's Hall, tradition will again play a large part, the tradition, however, of five previous seasons' broadcasts, and not of some thirty-five seasons, such as the "Proms" have.

Twenty-two Symphony Concerts

The symphony series will start on October 18 and will continue at the rate of one a week until April 11. This gives twenty-two concerts against twelve at the Queen's Hall last season.

In the presentation of these concerts, it is hoped to have the assistance of the new National Orchestra which the B.B.C. has formed in co-operation with Sir Thomas Beecham.

The plan for this orchestra was evolved in March last, when, as the result of discussions with Sir Thomas, it was decided to inaugurate a trial season this autumn with a view to the establishment, twelve months later, of a permanent symphony orchestra. The orchestra was to consist of about ninety players selected from the best talent available. Public concerts were to be given practically throughout the year, mostly in London, but also in the provinces. Musicians were to be engaged on a full-time, non-deputising basis.

What was most important was that from the outset the B.B.C. decided to give equal opportunities to women musicians in the trial season. In spite of the fact that the claims of women were thus recognised and emphasised, the critics soon got busy and the objects of the Corporation were in course of time subjected to the usual amount of misrepresentation. No places were, it was stated, to be found for women. The names of several eminent women instrumentalists were cited in the columns of a daily paper to show that women could be skilled players, but it was said the B.B.C. evidently refused to admit that fact.

Women Musicians' Contracts

As soon, therefore, as all the candidates of both sexes had been tested at the auditions which were held at Savoy Hill during the three months April to June last, the Corporation issued a notification that a number of women had been successful and had been offered contracts.

There were, indeed, more successful candidates of both sexes among the thousand who offered their services than could be given engagements; but the net result is that the orchestra, in its experimental season, will contain some ten per cent women.

No Solitude—and the New-year Three (Continued from p. 145)

reception was not limited to European transmissions, for on many occasions when the home and Continental studios had closed down, strains of music could be picked up and traced to WGY (Schenectady), WEAF (New York), WGN (Chicago), KDKA (East Pittsburg), WPG (Atlantic City), and even so far afield as Oakland, California.

American Relays

As luck would have it, interesting relays of American topical events were also tuned-in via Stuttgart, which made a point of reaching out to the United States on special occasions and, although to all intents and purposes isolated in a bleak and dreary spot, the possession of this simple receiver enabled its owner to while away pleasantly the larger portion of what would otherwise have been a peculiarly soul-killing and monotonous twenty-four hours.

To condenser-twirling and knob-twiddling there were but meagre alternatives; a little snipe shooting now and again, sailing around a reef-strewn coast when weather permitted, or a short walk over the only main road existing, the surface of which was worse than anything that could be imagined.

Bere Island offers no distraction of any kind. In these circumstances the New-year Three was thoroughly tried out and proved itself a worthy companion to the best receiving sets designed by the WIRELESS MAGAZINE staff. It achieved all it was expected to do—and more.

It was placed in the hands of a novice unfamiliar with any but the most simple two-valve circuits, and whose sole experience had been the nightly reception of the 2LO and 5GB programmes, yet from the moment it had been connected its owner found no difficulty in touring through Europe and in registering from the outset the easy capture of some fifty foreign transmissions.

It is a good receiver, indeed.

How the L.F. Transformer Works (Continued from p. 149)

Amp enthusiastically. "Then if you go on long enough at that rate you ought to be able to get quite a big step-up."

"Quite possibly we shall," agreed the Professor, "although we still have another factor—that of leakage—to consider. However, I need not say much about that now. The point is that if you have a large number of secondary turns and a small number of primary turns, then the magnetic field produced by the primary does not all affect the secondary."

"Oh," said Amp, disappointed. "Then that washes it all out, does it?"

Not Getting Proper Step-up

"It means that we do not obtain the proper step-up we should expect from the ratio of the number of turns. However, if we start going into problems like that we shall be all night over it, and I think you have probably picked up enough information to talk properly to Bill Higgins next time you see him."

Amp grinned. "You bet I will. . . . Swank-pot!" he muttered to himself.

Leaves from A Listener's Log

Compiled by JAY COOTE

HOLLAND is a curious little country—at least, so far as its broadcasting system is concerned—for, although it possesses a host of radio enthusiasts, up to the present it has not been able to establish a permanent organisation for the operation of the two transmitters at its disposal.

Pioneer Work at Hilversum

Without doubt, most of the country's pioneering work was done in the early days by a small band of wireless experimenters at Hilversum, following which, as broadcasting appealed to a larger portion of the population, many religious and political bodies stepped in to take a hand in the game. For this reason, therefore, the Hilversum station and, later, Huizen were both fed by several associations anxious to put their individual programmes over the ether.

As it is, in Holland to-day we find wireless entertainments provided by the Algemeene Vereeniging Radio Omroep — tersely calling itself the AVRO in its announcements—the Algemeene Vereeniging Radio Arbeiders (VARA), the Katholieke Radio Omroep (KRO), the Vryzinnig Protestantsche Radio Omroep (VPRO), and the Nederlandsche Christelyke Radio Vereeniging (NCRV), all of which share time at specified hours and on different days of the week.

Amalgamation Impossible

I may appear curious to British listeners that some satisfactory arrangement could not be made to amalgamate these various concerns into a united body; but I am assured by Dutch friends that in their country there exists so much divergence of opinion in political, social and religious matters that, notwithstanding all the goodwill in the world, no possible agreement could be eached.

It is obvious that in a country which possesses only 6,841,000 inhabitants and covers an area of not more than 12,800 square miles, there cannot be found room for more than two transmitters of roughly 5 kilowatts in power, and for this reason Holland at the recent conference of Prague could not obtain more than two exclusive wavelengths.

Now, the curious point lies in the fact that almost since its inception Hilversum had worked on 1,071 metres, a wavelength which the international authorities at Prague later gave to Norway for a projected station at Trondjhem, a step apparently deemed by the Dutch to be a very unjust one. The wavelength of 1 875 metres in the upper waveband and 298 metres was allotted to Holland to help her out of her difficulties.

An addition to the complication was the existence of the commercial transmitter at Scheveningen-Haven, which broadcasts throughout the larger portion of the day news bulletins and stock-exchange quotations—a service with which there could be no interference. These various factors combined to make a problem of which the solution alone could be left to the Dutch authorities.

On the one hand, Hilversum claimed its right to 1,071 metres; in its turn, Scheveningen-Haven claimed free use of 1,875 metres, and Huizen refused to limit its transmissions to the allotted position in the lower waveband. Every programme association individually asked for the most favourable wavelength.

From the Geneva Bureau, until the end of 1930, as Norway did not anticipate an early opening of the Trondjhem station, Hilversum was given the loan of the 1,071-metre wave, and thus with three exclusive wavelengths the Dutch Minister of Transport, who is responsible for radio control in that country, appears to have thought out a solution which, since it has been carried into effect, has puzzled many foreign listeners. From early morning until 5.40 p.m. B.S.T., Scheveningen-Haven broadcasts its commercial reports on 1,071 metres. During that period Hilversum works on 298 metres, passing over to the higher wavelength when the commercial broadcasts have ceased, the Huizen transmitter remaining throughout the day on 1,878 metres. In this way the authorities allotted the wavelengths to the actual transmitters, but another arrangement was made whereby the various associations responsible for the programmes alternately used the existing stations for periods of three months.

Making the Scheme Clear

To make the matter clear, let it be understood that the VARA and AVRO programmes, which have hitherto been associated with Hilversum, although actually given in a studio in that town are broadcast over the Huizen aerial on 1,875 metres, and those entertainments which until July 15 were picked up from Huizen are now to be received through Hilversum either on 298 or 1,071 metres.

The scheme is Gilbertian in its conception, inasmuch as in his endeavour to satisfy the different programme societies, the Dutch Minister has ordered that a change-over should take place every three months. In view of the fact that by the beginning of January the 1,071-metre wavelength may be withdrawn from Holland, it is difficult to see how the arrangement can continue past that date, and, bearing this in mind, we can expect another Hilversum-Huizen mix-up in the early days of January.

◆ ◆ ◆

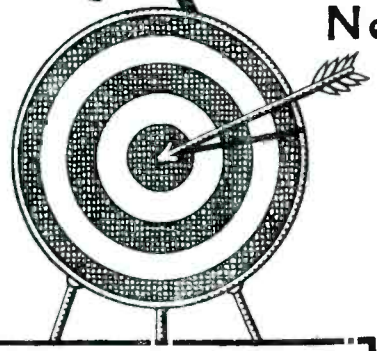
Some French Proposals

Almost regularly once a year France endeavours to bring herself level with other countries in the matter of broadcasting by an attempt to reorganise her entire radio system.

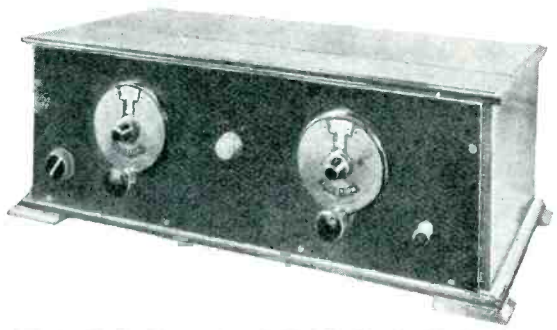
A new Bill which will be discussed in the Chamber in the early days of 1930 calls for two high-power stations working on long wavelengths and capable of covering the whole of Europe, ten smaller transmitters to give an efficient service to the country and, finally, a number of relay stations for regional purposes, the entire organisation to be under the control of the State

The ARROW FOUR

Never Beside the Mark!



A SET WITH TWO STAGES OF HIGH-FREQUENCY AMPLIFICATION WHICH IS SIMPLER TO CONTROL THAN MOST RECEIVERS OF ITS TYPE



INCORPORATES A NUMBER OF REFINEMENTS TO ENSURE COMPLETE STABILITY OF OPERATION AND ABSOLUTE PURITY

IT has been our object in designing the Arrow Four to provide an extremely powerful and selective four-valver incorporating two stages of high-frequency amplification, but with very simple tuning.

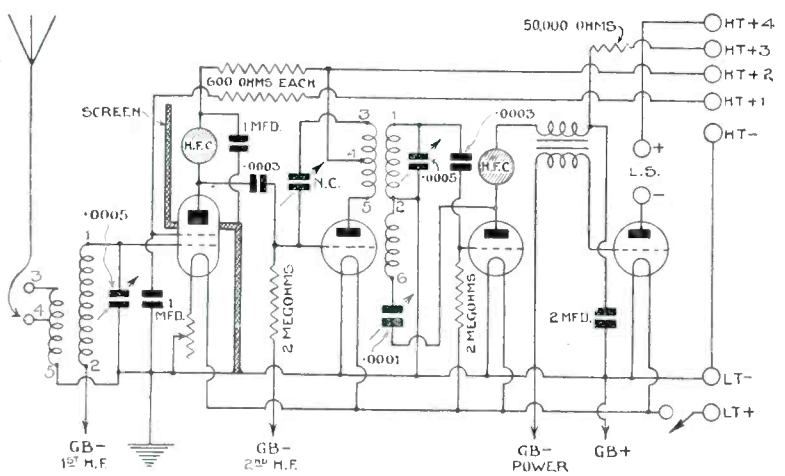
The combination employed is one stage of screened-grid high-frequency amplification which is not tuned, a stage of neutralised high-frequency amplification employing a three-electrode valve, a leaky-grid detector, and a transformer-coupled low-frequency stage.

This arrangement gives a high degree of amplification without complicating the tuning and will be especially suitable under the new conditions, when Brookman's Park starts operating, because of its great selectivity.

A feature of the receiver is its cost, which is particularly reasonable for a four-valver with two high-frequency stages. Moreover, the construction is simple and neat, as is evident from the photographs which appear in these pages.

To anybody who wants a really powerful set which is simpler than most to operate, the Arrow Four can be specially recommended. Nobody who builds it will be disappointed in its performance.

Readers with technical knowledge will be interested in the circuit, which appears on this page. The aerial tuner consists of an aperiodic coil with two tappings to vary the selectivity and a secondary tuned by a .0005-microfarad variable condenser



Circuit of the Arrow Four, which combines a screened-grid valve with a three-electrode high-frequency amplifier

Precautions for Stability

Stability is given to the operation of the screened-grid valve by decoupling resistances and by-pass condensers. It will be seen that there is a 600-ohm resistance in the screening grid and anode circuit of the first valve; these are used in conjunction with two 1-microfarad fixed condensers.

In place of a tuning coil in the anode circuit, there is a high-frequency choke which, of course, needs no tuning. Amplified impulses from the screened-grid valve are passed on to the second (three-electrode) high-frequency through a .0003-microfarad grid condenser. This valve is also provided with a 2-megohm leak in the grid circuit.

Split-primary Neutralisation

The three-electrode valve is stabilised in operation by being neutralised on the split-primary principle. That is, the primary winding of the high-frequency transformer is centre-tapped to positive high-tension, the free end of the winding being connected back to the grid of the valve through an ordinary neutralising condenser.

In this way energy which is fed back from the anode to the grid through the self-capacity of the valve

is balanced out by an equal amount of energy, but in opposite phase, fed back through the neutralising condenser.

Another .0003-microfarad condenser and 2-megohm leak are used in connection with the detector valve to give grid rectification, which in this particular set has been found to be more satisfactory than anode-bend rectification, as it is called.

How Reaction Is Arranged

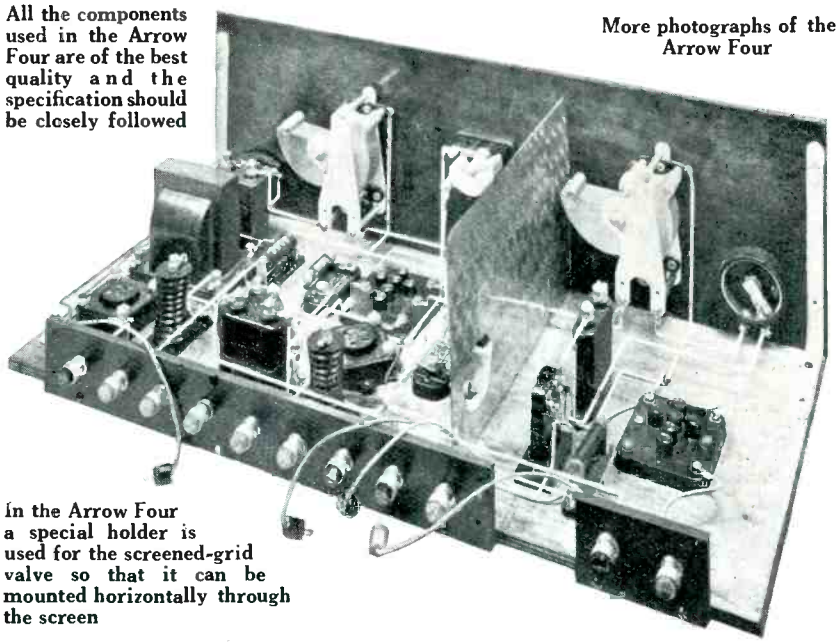
Reaction is obtained by inserting a high-frequency choke in the anode circuit of the detector and taking a connection, through a .0001-microfarad variable condenser, back to a coil coupled to the secondary of the high-frequency transformer.

The power valve is coupled to the detector by means of a low-frequency transformer. Once again, special precautions are taken to ensure complete stability of operation; in other words the transformer is used in conjunction with a "motor-boat" stopper.

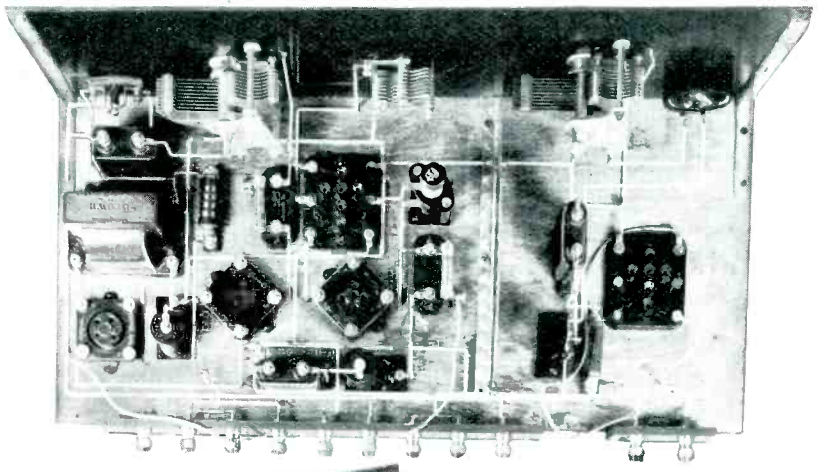
This consists of a 50,000-ohm resistance used in conjunction with a 2-microfarad fixed condenser, which effectively prevents the possibility of low-frequency oscillation occurring.

All the components used in the Arrow Four are of the best quality and the specification should be closely followed

More photographs of the Arrow Four

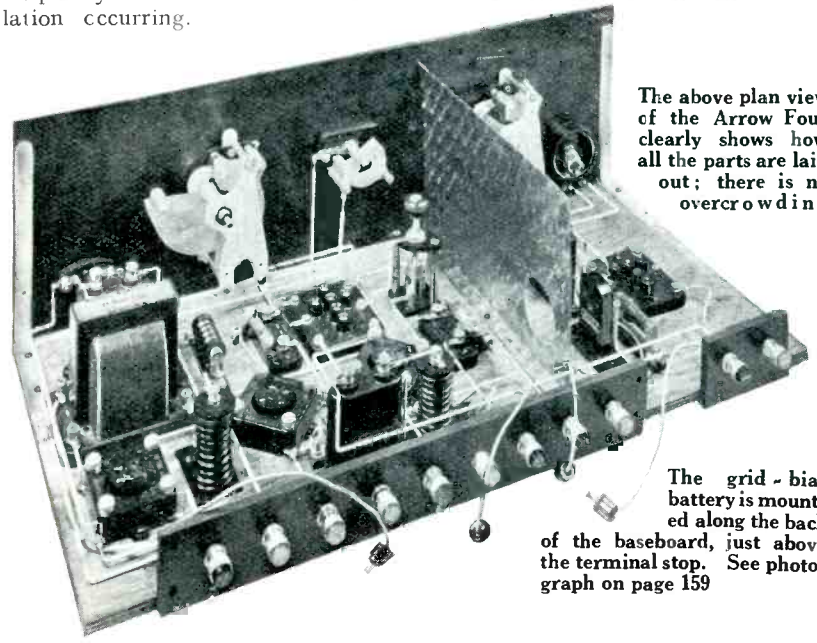


In the Arrow Four a special holder is used for the screened-grid valve so that it can be mounted horizontally through the screen



An ordinary on-off switch is provided, but in addition, the first high-frequency valve is controlled by a filament rheostat, which enables the volume to be adjusted quickly whenever it becomes overpowering. Another use of this rheostat is to increase the selectivity by increasing the impedance of the valve as the filament current is lowered.

Four high-tension terminals are provided so that the set can be operated under the most efficient conditions for the particular valves employed. For the same reason, provision is made for applying negative bias to both the high-frequency valves and the low-frequency amplifier.



The above plan view of the Arrow Four clearly shows how all the parts are laid out; there is no overcrowding

The grid-bias battery is mounted along the back of the baseboard, just above the terminal stop. See photograph on page 159

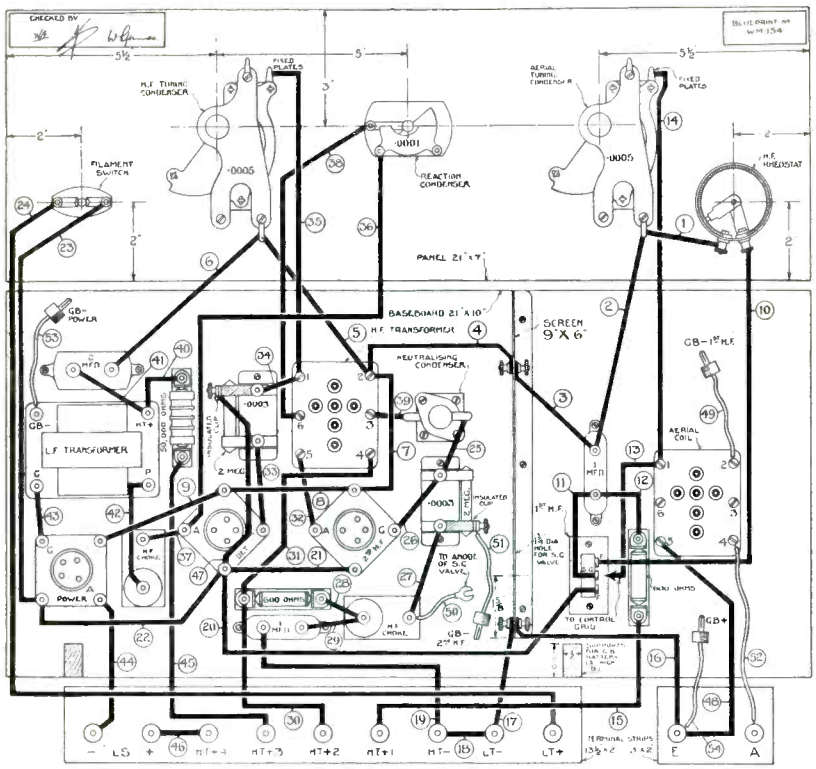
Following Specification

We wish particularly to point out that all the components used in the original WIRELESS MAGAZINE set are of good quality; if the best results are desired, the specification published on page 160 should be followed as closely as possible.

No difficulty will be experienced in the construction if use is made of the full-size blueprint which is available

The Arrow Four *(Continued)*

LAYOUT AND WIRING DIAGRAM



This layout and wiring diagram of the Arrow Four can be obtained for half-price (that is, 9d., post free) if the coupon on page iii of the cover is used by September 30. Ask for No. WM154. Connect up in numerical order

for half-price (that is, 9d., post free) if the coupon on page iii of the cover is used by September 30.

Address your enquiry to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4, and ask for No. WM154. A reduced reproduction of the blueprint is printed on this page.

There are one or two features about the construction which should be specially noted. For instance, the grid-bias battery (a new type of 24-volt block that has recently appeared on the market) is mounted on two small wooden supports at the back of the baseboard close to the terminal strip.

Utilising Battery Lid

Actually, the lid of the battery is tacked to these supports and used as a tray. The arrangement will be clear from the photographs.

One other point to be noticed is that both grid condensers are provided with an insulating clip, shown shaded on the blueprint. Failure to notice this may result in serious short-circuits.

When all the parts have been firmly fixed in position, wiring up can be started. This is very simple as all the wires are numbered in order of assembly, as the blueprint shows.

Start with connection No. 1 and carry on in numerical order. If the scheme is followed carefully there is no possibility of making an error in the wiring.

Two coils are required for each wavelength band. For the aerial tuner two binocular type aerial coils are used, while for the high-frequency position two binocular split-primary transformers are suitable.

Choice of Suitable Valves

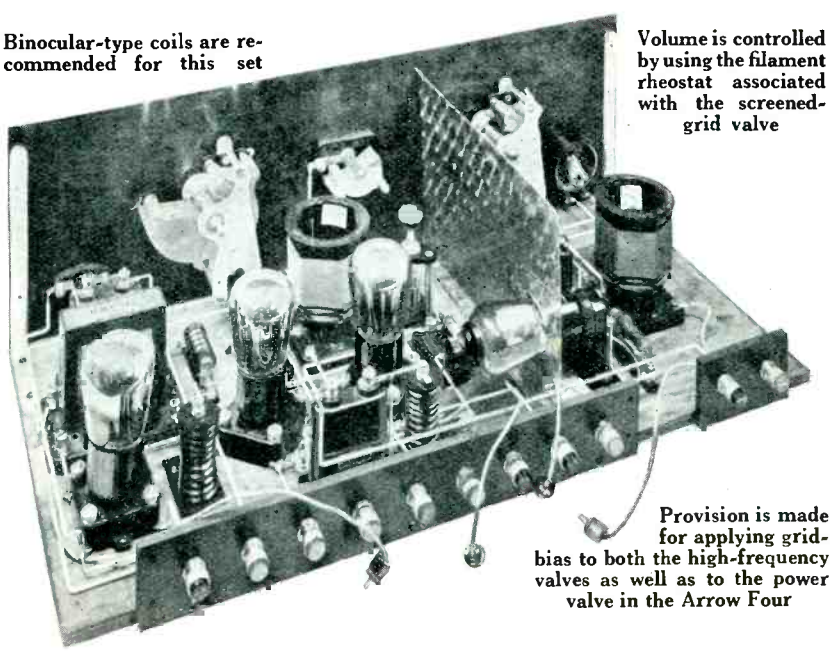
The question of suitable valves is of some importance in a set of this type, as if the proper ones are not obtained each stage will not give its maximum amplification.

For the first stage any screened-grid valve will be suitable and it can have a two-, four-, or six-volt filament, as the operator desires. Whatever voltage is chosen for this stage will, of course, have to be maintained throughout the set.

The three-electrode high-frequency amplifier should have an impedance in the neighbourhood of 20,000 to 30,000 ohms and the detector valve can also be of a similar type. Slightly better quality will result, however, if the detector-valve impedance does not exceed about 20,000 ohms.

Binocular-type coils are recommended for this set

Volume is controlled by using the filament rheostat associated with the screened-grid valve



Provision is made for applying grid-bias to both the high-frequency valves as well as to the power valve in the Arrow Four

A Particularly Efficient and Selective Set

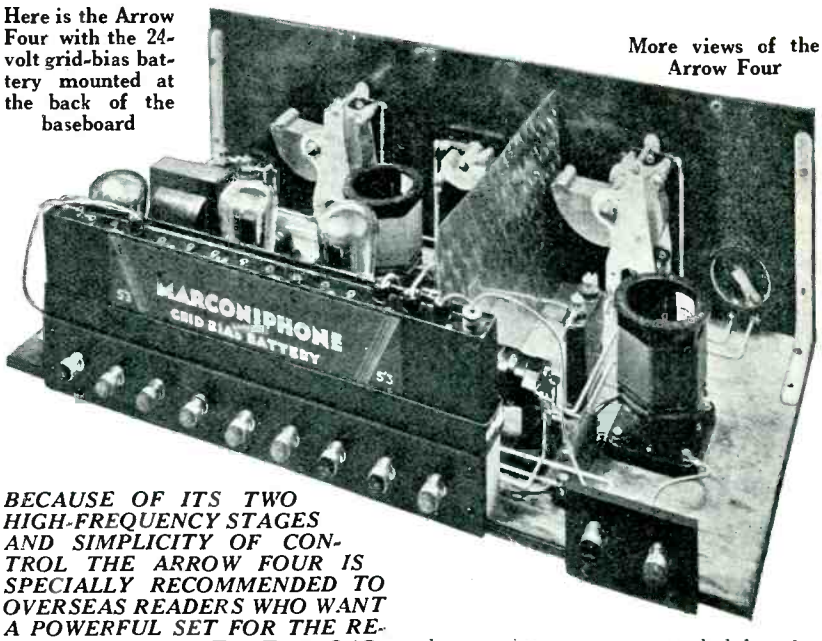
As regards the power valve, this should preferably have an impedance between 2,000 and 3,500 ohms. This valve must be chosen with due regard to the maximum high-tension voltage available and the anode-current consumption. Some power valves require so much current that no ordinary listener can afford to run them from dry-cell high-tension batteries.

Correct High-tension Voltages

When connecting up, care must be taken to apply approximately the correct voltages to the high-tension terminals, as follows: H.T.+1 supplies the screening grid of the first high-frequency valve and needs 60 to 80 volts; H.T.+2 supplies the anodes of the two high-frequency valves and needs about 120 volts; H.T.+3 feeds the detector anode and should be given a voltage between 80 and 100; while H.T.+4 supplies the anode of the power valve and should be given the maximum recommended by the manufacturers.

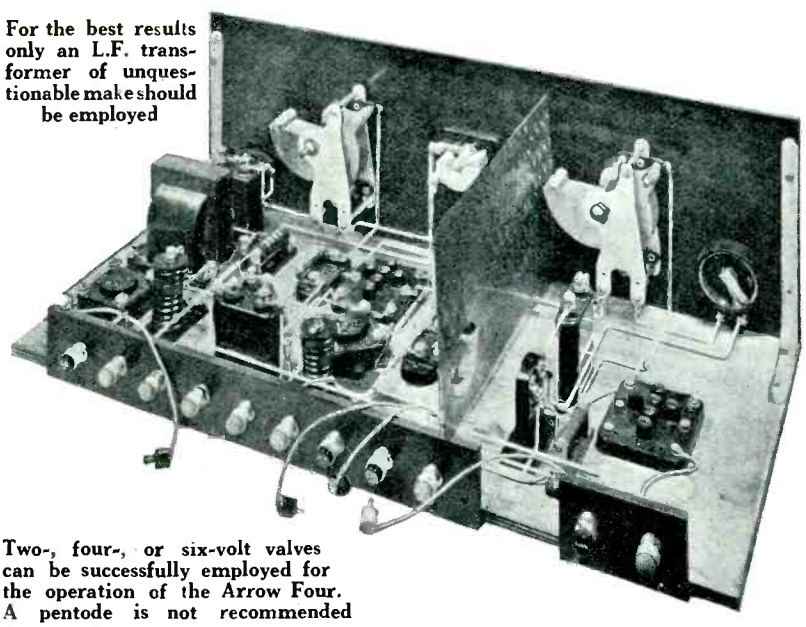
Here is the Arrow Four with the 24-volt grid-bias battery mounted at the back of the baseboard

More views of the Arrow Four



BECAUSE OF ITS TWO HIGH-FREQUENCY STAGES AND SIMPLICITY OF CONTROL THE ARROW FOUR IS SPECIALLY RECOMMENDED TO OVERSEAS READERS WHO WANT A POWERFUL SET FOR THE RECEPTION OF DISTANT BROADCASTS

For the best results only an L.F. transformer of unquestionable make should be employed



Two-, four-, or six-volt valves can be successfully employed for the operation of the Arrow Four. A pentode is not recommended

Anybody who has not previously used a set with a stage of neutralised high-frequency amplification as employed in the second stage of the Arrow Four should take care over the operation until it has been thoroughly mastered.

The setting of a neutralising or balancing condenser is extremely critical and failure to find exactly the right point when tuning will result in self-oscillation and loss of range. Indeed, the set will be almost useless unless it is correctly neutralised.

How to Operate the Set

To operate the set, plug in the appropriate coils for the local station and the four valves, connecting up the batteries, loud-speaker, aerial, and earth.

Normally, it will be desirable to apply 1½ volts negative bias to the grid of the screened-grid valve and

The Arrow Four (*Continued*)

COMPONENTS REQUIRED FOR THE ARROW FOUR

Panel	1—21 in. by 7 in (Resiston, Becol, Potter).
	2—Terminal strips, 3 in. by 2 in. and 13½ in. by 2 in.
Cabinet	1—Upright type with 10-in. baseboard (Caxton, Camco, Pickett).
Variable Condensers	2—.0005-microfarad (Igranic Lok Vane, Cyldon, Ormond)
	1—.0001-microfarad, reaction type (Peto-Scott, Bulgin, Polar)
	1—Neutralising type (Jackson or Gambrell).
Dials	2—Slow-motion (Igranic Indigraph, Ormond, Wilkins & Wright)
Rheostat	1—15-ohm, panel type (G.E.C., Lissen, Peerless)
Switch	1—Push-pull on-off (Lotus, Bulgin).
Valve Holders	3—Antimicrophonic (Benjamin, W.B., Trix).
	1—Screened-grid short type (Parex).
Coil Holders	2—6-pin coil bases (Colvern).
Coils	4—6-pin split-primary, binocular type (Colvern).
Fixed Condensers	2—.0003-microfarad, with series clip (Dubilier, T.C.C., Mullard).
	2—1-microfarad (Dubilier, T.C.C., Lissen).
	1—2-microfarad (Dubilier, T.C.C., Mullard).
Grid Leaks	2—2-megohm (Dubilier, Mullard, Ediswan).
Fixed Resistances	2—600-ohm, with holders (Ready Radio, Bulgin).
	1—50,000-ohm, with holder (Ready Radio, Varley, McMichael).
Chokes	2—High-frequency (Ready Radio, Wearite, Igranic).
Transformer	1—Low-frequency (Brown, Ferranti, Igranic.)
Screen	1—Copper, 9 in. by 6 in. (Parex, Ready Radio, Magnum).
Terminals	11—Marked:—Aerial, Earth, L T +, L.T −, H T.−, H T.+1, H T.+2, H.T +3, H T +4, L.S.+, L.S.− (Belling Lee, Eelex).
Sundries	2—Panel brackets (Bulgin).
	2 yards Lewcoflex (Lewcos).
	4—Wander plugs, marked:—G.B.+, G B.−1 G.B.−2, G.B.−3 (Lectro Linx, Igranic)
	1—Spade tag.
	1—Grid-bias battery, 24 volts (Marconiphone).

1½ or 3 volts to the grid of the second high-frequency amplifier. The bias applied to the power valve should be in accordance with the maker's instructions.

Turn on the filament rheostat associated with the screened-grid valve and pull out the knob of the main push-pull switch to put the whole set into operation.

Signals may be Weak at First

Next, adjust the two main tuning condensers until the local station is picked up. As the set has not yet been neutralised the strength may be disappointingly weak, but that does not mean that anything is amiss.

See that the reaction condenser is at its zero position. It is probable that even when this adjustment has been made the set will be in a state of self-oscillation. It is now necessary to turn the knob of the neutralising condenser very carefully until the oscillation ceases.

It will be found that the set will oscillate when the neutralising condenser is adjusted slightly either side of the balancing point and in most cases the control will be critical.

If the set is neutralised at about the middle of the main tuning-condenser scale it will normally hold good for the entire range of any particular coil. Should the receiver first be neutralised when the long-wave coils are in use, it will be necessary to re-neutralise on changing over to the low waves.

Some readers will be tempted to experiment with a pentode in the final stage, especially now that six-volt models are available. Although the use of a pentode will result in increased volume it is not recommended for the Arrow Four, as it is likely to be badly overloaded, with a consequent deterioration in the quality of reproduction.

If necessary, the selectivity of the set can be varied by changing the tapping to the aperiodic winding on the aerial coil. The two available tappings are connected to sockets Nos. 3 and 4 on the six-pin coil base. The normal connection is to No. 3, but where interference is experienced the aerial should be taken to socket No. 4.

Binocular Coils Recommended

Readers will note that, although ordinary coils are illustrated in the photographs of the set reproduced in these pages, binocular-type coils are recommended.

Extensive tests carried out since the receiver was constructed have shown conclusively that the use of binocular coils effectively prevents any tendency to instability and, therefore, neutralisation can be carried out with much greater efficiency and less trouble.

As reaction is not applied to the aerial and, as under proper working conditions the screened-grid valve will not oscillate, it is most important to take care with the aerial-earth system.

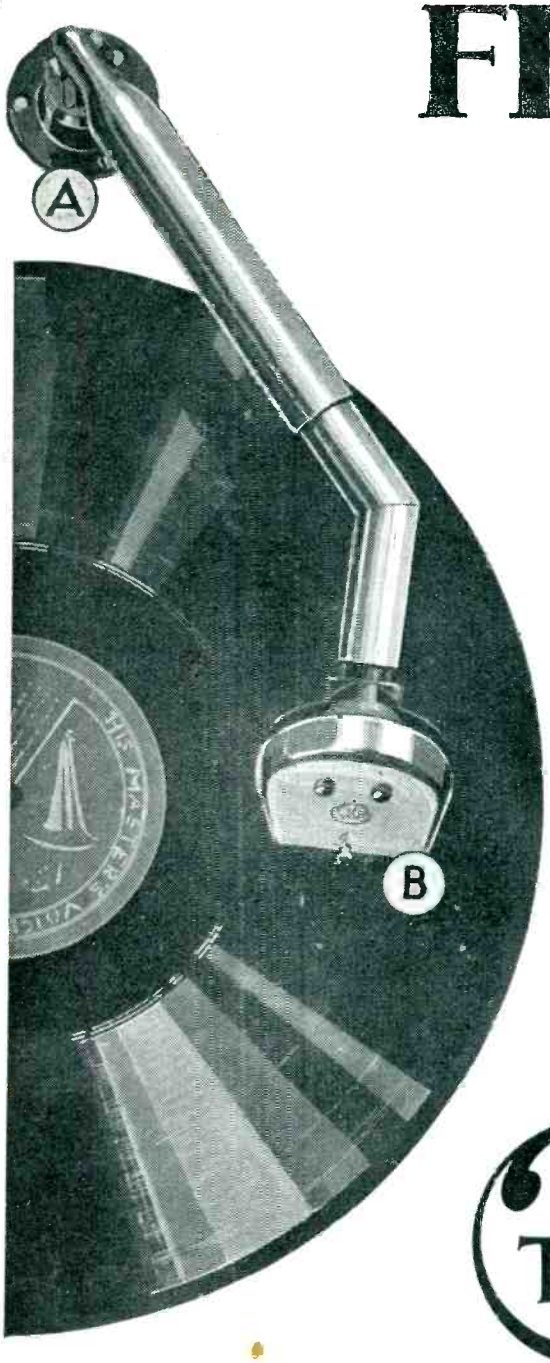
Poor Results without Reaction

An inefficient and therefore high-resistance aerial system, which will give passably good results when reaction is applied directly to it, will give a disappointingly poor performance when aerial reaction is not available.

On test we have been particularly pleased with the performance of the Arrow Four and are convinced that it will meet the needs of many readers who want a long-range receiver.

In this connection we would point out to overseas readers that the two high-frequency stages ensure the range that is essential to them without any additional complication in the control, as is usually the case when a second stage is added.

TWO NEW FEATURES



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Getting your GRID-BIAS from the MAINS

By W. JAMES

THE dry batteries so often used for providing grid-bias voltages are relatively inexpensive and trouble free. But there are occasions when something which is more permanent than a dry battery is to be preferred. An example is when a high-tension mains unit is fitted to a powerful set requiring a grid bias of 100 volts or more.

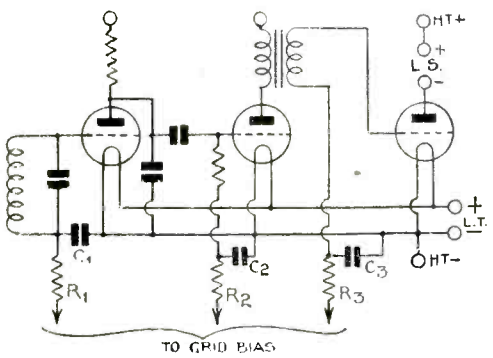

Fig. 1.—Grid-circuit filters

A dry battery, too, seems out of place in a receiver of the mains-driven type, where both filaments and high-tension circuits are supplied through suitable equipment from the mains. Granted that the grid battery will have a life of from six months to a year, the very fact of the life of the battery being uncertain is sufficient justification for the inclusion of a mains-type grid-bias supply.

Need for Reliable Apparatus

The advantages of a grid-bias mains unit are fairly well known. In the first place, given reliable apparatus, such as can be readily obtained, the grid bias is permanent.

Secondly, by connecting the unit to the switch controlling the high tension, the grid bias is always applied to the valves as and when it is required.

Thirdly, the grid bias varies approximately with the high tension as the mains input voltage changes from time to time.

It is, therefore, not surprising that arrangements for obtaining grid bias are being included in most types of receivers that take their filament and high-tension current from the mains, and a few manufacturers are issuing combined high-tension and grid-bias units or special separate grid-bias units.

Those who have a supply of alternating current may easily construct a grid-bias unit. The first point to remember is that the grids of the valves have to be given a perfectly steady bias voltage with respect to a point in the filament circuit. This is particularly important in the detector-valve circuit, for, obviously, should the bias to this valve vary at all at an audible rate, a hum or noise will be heard from the loud-speaker because of the low-frequency magnification. It is less important in the case of the last valve, because the magnification of this stage is not very great.

Any hum that may be heard when a grid-bias mains unit is being used may nearly always be traced to the detector circuit.

The second point is that the grid circuits ought not to be coupled by high resistances, and the third, that a means for regulating the voltages must be provided.

An alternating-current mains unit will, therefore, include a rectifier, a smoothing circuit, and one or more voltage dividers. The rectifier is, of course, for the purpose of converting the alternating current into a pulsating direct current. It must not be connected directly to the mains, but through a transformer of suitable construction.

A valve or other rectifier may be used. Full-wave rectification is not necessary, and half-wave rectifiers, being cheaper, are therefore used. As a rule, the current taken by the circuits connected to the rectifier is very small, with the result that an inexpensive transformer and a small rectifier are generally satisfactory.

Question of Smoothing

The smoothing circuit, too, need not be elaborate, but much depends upon the type of circuit to which it is connected.

Before discussing various arrangements, let us refer to Fig. 1, which shows how to apply decoupling resistances to the grid circuits. The first valve in this diagram is an anode-bend detector, which is resistance-coupled to the second valve. This valve is transformer-coupled to the power valve.

Avoiding Interaction

Three different values of grid bias would be used in an arrangement of this description and it is conceivable, and, indeed, within my own experience, that troubles may be introduced by connecting these three grid circuits to the output circuit of a grid-bias unit. The three circuits are sufficiently well separated, however, by the inclusion of the fixed resistances R1, R2, and R3, and the fixed condensers C1, C2, and C3.

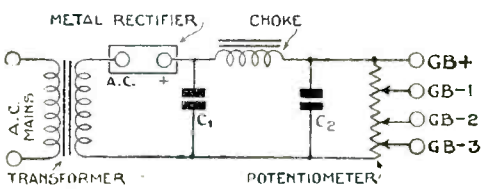

Fig. 2.—Grid-bias unit using metal rectifier

Resistances of 100,000 ohms or more (grid-leak pattern) may be used, and fixed condensers of from .1-microfarad. These grid-circuit filters are not always necessary, as so much depends upon the mains unit proper, but it is always as well to remember

(*Continued on page 164*)

FOR YOUR PROTECTION

The amazing popularity of the Blue Spot Unit has resulted in certain unscrupulous persons taking advantage of the great demand for these units by passing off certain units in plain boxes as Blue Spot units.

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Getting Your Grid Bias from the Mains (Continued)

they tend to minimise hum, noise, and oscillation.

Sometimes they must all be included; perhaps a filter circuit joined at R1, C1 to the detector valve

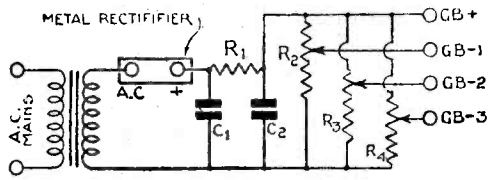

Fig. 3.—An improved grid-bias unit with metal rectifier

will alone have the desired effect, and other units may be so well constructed that separate filters are not necessary.

A Simple Method

One of the simplest methods of obtaining grid bias from A.C. mains is that indicated in Fig. 2. A transformer giving a suitable output voltage is employed with a metal rectifier of the Westinghouse type. Condensers C1 and C2, with the iron-cored choking coil, are employed for smoothing the output current, which flows through the potentiometer.

A wire-wound resistance, tapped in a number of places, would generally be used, and if it had a resistance of some thousands of ohms the current passing through it would be limited to a few milliamperes. Consequently, a small-sized choking coil, but having many turns of fine wire in order to provide an inductance of, say, 30 henries or more, is suitable. The two condensers may be of 2 or 4 microfarads each.

Satisfactory in Most Cases

With a grid-bias unit of this description, one or all of the grid-circuit filters shown in Fig. 1 will probably have to be used, for the reason that the circuits are supplied from a single potentiometer. Nevertheless, this arrangement is entirely satisfactory in most instances.

A better, though more elaborate, circuit is that of Fig. 3. Here, a resistance R1 is shown included in the filter circuit instead of a choking coil, and provided its resistance is sufficient the arrangement is satisfactory. A resistance may, of course, be used instead of the choking coil of Fig. 2. One of 10,000 ohms could be used, provided the potentiometer was of 30,000 or 40,000 ohms.

In Fig. 3 separate potentiometers are indicated, with the result there is generally no need to employ the filter circuits of Fig. 1. It is then advisable, however, to connect fixed condensers of .1-microfarad or more from the G.B. positive terminal to each negative terminal. These condensers will minimise inter-circuit couplings and so tend to promote good quality of reproduction.

A point that should be remembered when several potentiometers are used is that as each one passes current, the total current flowing through the rectifier may be considerable. This unit should, therefore, be of ample

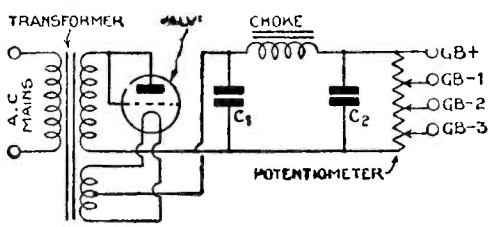

Fig. 4.—Grid-bias unit using valve rectifier

size; alternatively the potentiometers must have high resistances in order to limit the current.

Suitable values for the parts would be 2 or 4 microfarads for C1 and C2, 10,000 ohms for R1 and 100,000 ohms for potentiometers R2, R3, and R4.

A circuit similar to that of Fig. 2, but having a valve rectifier, is given in Fig. 4. As only a small output is usually required, the valve may be of the receiving type, with its grid and anode connected. There is, of course, a centre-tapped filament winding on the transformer for this valve, but otherwise the circuit is similar to that of Fig. 2. In place of the choking coil a fixed resistance may be used. It will be cheaper, but the output voltage will, of course, be reduced a little, because of the fall in voltage over the resistance.

To compensate for this, a transformer giving a little larger output may be fitted or sometimes the desired result may be obtained by increasing the size of condenser C1.

Simplified Valve Circuit

A simplified circuit is given in Fig. 5. A resistance R2 is joined across the filament of the valve and should be tapped at its centre point or be of the potentiometer pattern, and C1 may have a capacity of 4 microfarads.

This circuit will only be satisfactory when grid-circuit filters, such as described in connection with Fig. 1, are used and the receiver is of a suitable type. There would be no harm in trying the circuit of Fig. 5, for if it proved unsatisfactory, an additional condenser and a choking coil or resistance could be added, as in the Fig. 4 circuit.

These remarks also apply to the circuit of Fig. 3, which might first be tried without condenser C1 and resistance R1.

My Own Experience

I have used grid-bias units, including valve rectifiers, for three or four years with every satisfaction, but I always employ the grid-circuit filters of Fig. 1, as they effectually prevent noises or hum. Some of the units would have been satisfactory without the special filters, but one becomes accustomed to including safety devices when numbers of sets have to be carefully tested. Having used mains units for so long, I should hesitate before returning to dry batteries, excepting, of course, when they must be used,

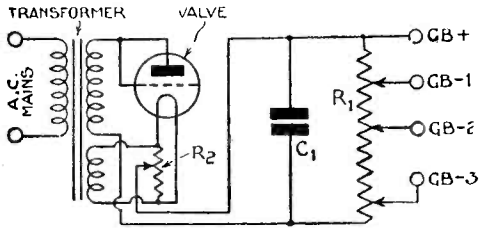

Fig. 5.—Simplified form of grid-bias unit with valve rectifier

as with normal portable receivers.

Do not attempt to measure the output voltages with an ordinary voltmeter, as false readings might be

(Continued on page 176)

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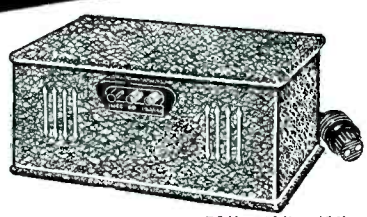

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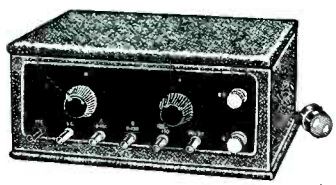

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BROADCAST MUSIC of the MONTH

Reviewed by STUDIUS

Betty Bolton

THERE is no doubt that the familiar "Proms" concerts maintain their hold on the public, and the opening programme was one of the best in choice. Both Rachel Morton and Arthur Fear, the vocalists, have won their spurs with the B.N.O.C., and Antonio Brosa, as soloist in the familiar but ever-welcome Mendelssohn E minor Concerto, is equally well known for his quartet. The concerts last well into October and will be plentifully relayed.

Relay from Ostend

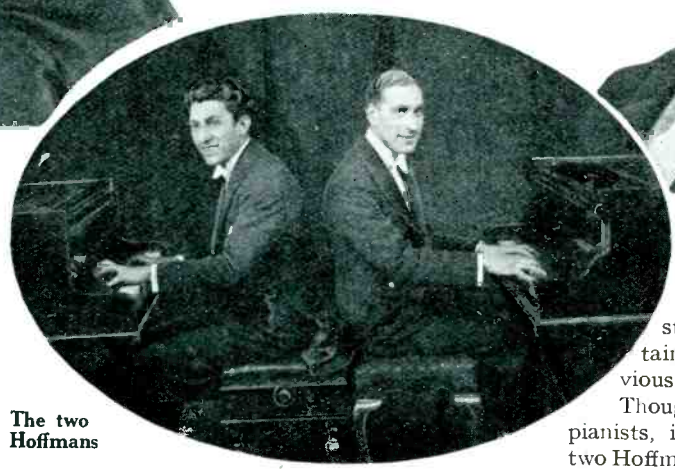
As a contrast of interest was the repetition of last year's experiment of relaying on Aug. 11 a concert from the Kursaal, Ostend. This will be repeated again this year on Aug. 25.

Famous both as conductor and composer, the announcement that Sir Alexander Mackenzie would conduct the Wireless Military Band from 5GB on Aug. 15, was particularly interesting, as the programme included some of his better-written, yet lesser-known works, such as the Courante from "Ravenswood" and ballet music from "Colomba." Generally speaking, the public insists on remembering only the sentimental "Benedictus" or his "Britannia" music.

Outstanding Provincial Concert

Amongst the provincial concerts, one of outstanding merit was by the Whitby Municipal Orchestra, conducted by Mr. Frank Gomez, a clever musician.

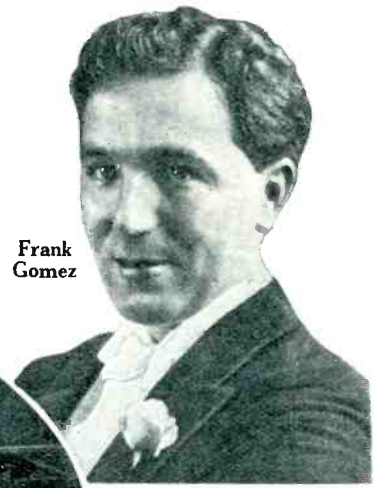
Apart from the "Proms" at Queen's Hall, at which, of course both known and unknown soloists have figured every night, many artists of note have been heard in the studios. Lafitte, who has been playing from August 12 to 17 in the Foundations of Music series, is an English pianist, though now possessed of a wide Continental reputation; but particular mention must be made of Leonard Hirsch who formed the first Radio Trio from Manchester station, Samuel Kutcher with his own quartet and in the provinces. Philip Whiteway who plays frequently from Belfast, and was heard again on Aug. 12. Miss Margaret Smart, from Glasgow, and Miss Bay Jellett, another brilliant young Belfast violinist.



The two Hoffmans

Harp with 220 Strings

An outstanding feature of a recent Belfast programme, also, was the appearance of Harry Reymos, with his "organ harp," a 220-string invention which certainly overshadows all previous recitals.



Frank Gomez

Though both capable solo pianists, it is as duettists that the two Hoffmans have scored so strongly over the wireless, and their united work is particularly good.

Another famous soloist was heard

(*Continued on page* 168)

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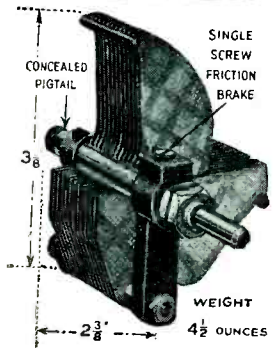

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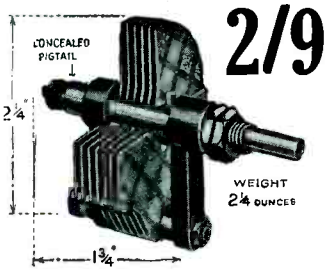

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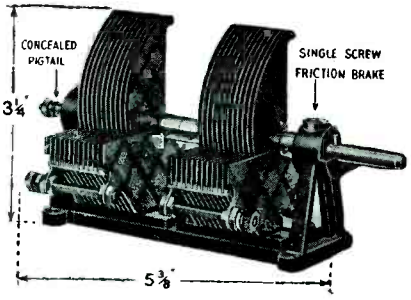

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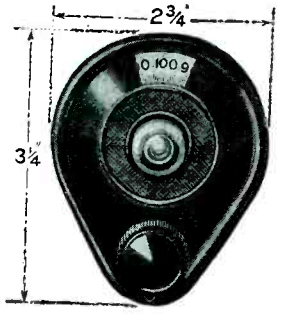

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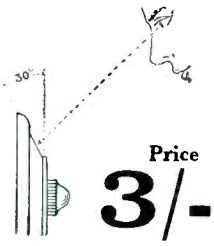

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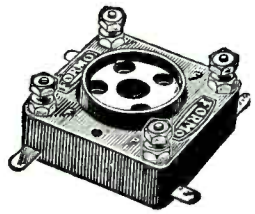

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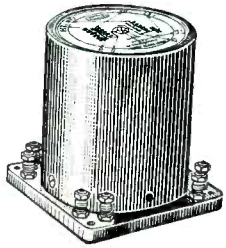

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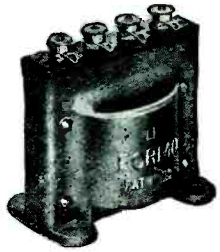

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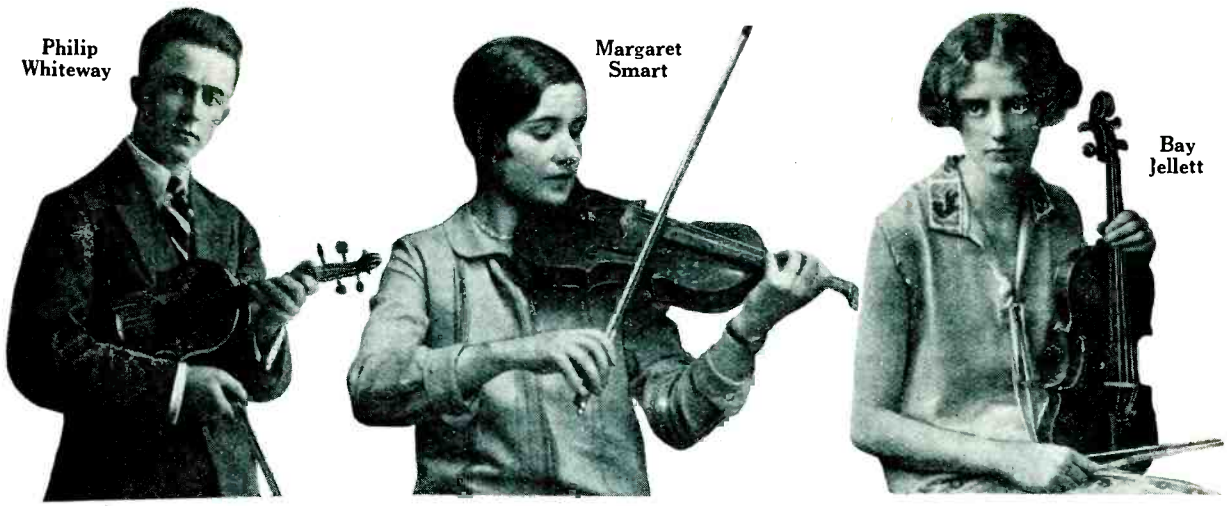
Broadcast Music of the Month (Continued)



this week in the person of Arthur Catterall. At one time leader of the Queen's Hall Orchestra, he became principal violinist of the Hallé Orchestra and of his own quartet. This week he played with the symphony concert relayed from Canterbury Cathedral during the Canterbury Festival.

Clarity of Diction

The number of singers throughout the month is legion, but one would like to hear more of those whose clarity of diction make their microphone work as clear as when on stage or platform. It is in this capacity that the operatic stars achieve such good results; a particularly good instance was the performance of *Faust* at Belfast, when the artists included such names as Parry Jones in the title role, Joseph Farrington as Mephistopheles and May Blyth as Marguerite. All are members of the B.N.O.C., and Miss Blyth in private life is the wife of Aylmer Buesst, the well-known conductor.

Gwladys Naish is another singer whose work is well-nigh perfect. One would like to hear Leonard Gowings far more frequently, Kate Winter and Walter Glynne; all are popular broadcasters and fine artists. Contraltos, too, are more rare, and therefore always to be warmly welcomed. A capable singer is Miss Brenda Yates, a soprano heard often from Manchester.

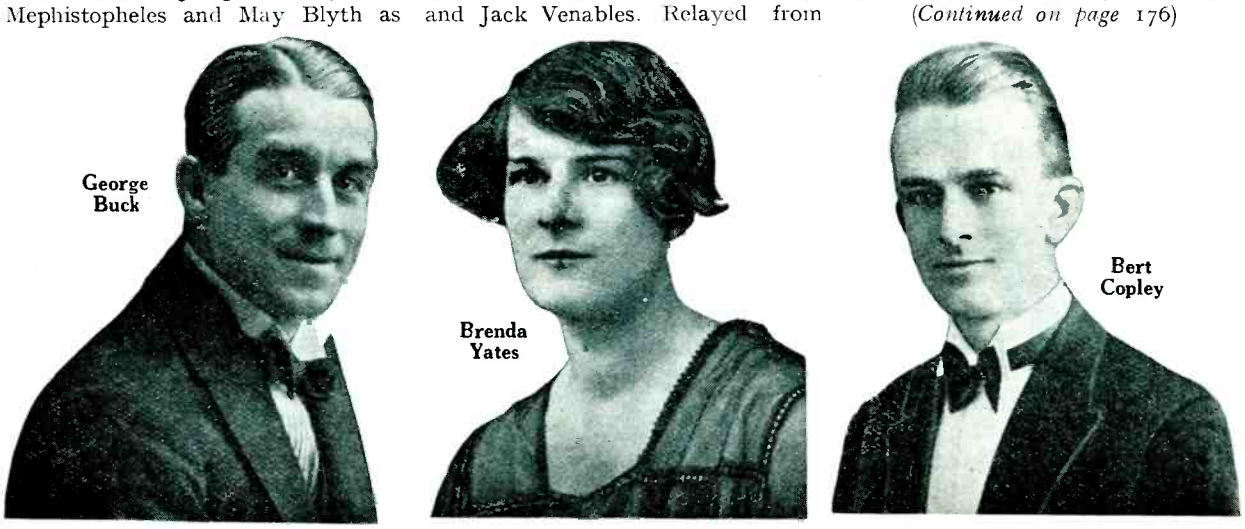
Many capital variety programmes have been heard during the month, commencing with a revue entitled *A Fallen Star*, in which many familiar broadcast names figured prominently, amongst them George Buck, John Rorke, Edith James, Alfred Butler, Colleen Clifford, and Jack Venables. Relayed from the Birmingham Studio to 5GB, it would bear repeating.

Tommy Handley, always welcome, has been many times with us this month, besides many well-known variety names, including Bransby Williams, Wee Georgie Wood, Nelson Jackson, one of the cleverest of character actors, Bert Copley and "Stainless Stephen." The last has just recorded some especially good examples of his art for Decca records.

Variety and Revue Stars

On the feminine side, we have had Gracie Fields, now at the height of her career, Wish Wynne who has been touring the stations again, and the revue stars Winnie Melville, acting with Derek Oldham in the Bank Holiday programme and Florence Bayfield. One would like, also, to hear again Betty Bolton, for

(*Continued on page* 176)



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The MUSIC LISTENER

ALL ABOUT SPEED. By C. WHITAKER-WILSON.

I HAVE just been looking at a programme paper. It seems very full of technical terms. An Adagio in C, an Andante in F, an Allegretto in something else seem to appear every few lines in the programme.

Not that I personally would have it otherwise; indeed, I cannot see any dignified alternative. Symphonies, quartets, sonatas, concertos—each and all contain movements entitled in this fashion. The terms are merely those of speed, there being very decidedly a speed limit in music.

Melville Gideon who took part in the B.B.C. Riverside Cabaret

Horror!

I have not forgotten my horror at my ignorance of the terms used in this journal in relation to wireless sets; whilst it is not necessary for me to learn how to construct a wireless set, it does seem necessary for those who are much more learned than I in these matters to have a clear idea of what is meant by terms used in the programmes, especially as such terms refer to the music about to be enjoyed through the medium of something the listeners may have themselves constructed.

I therefore propose to devote this month's article to an explanation of most of the terms of speed which are in common use as titles for the movements they govern. It might be convenient to begin with the slowest and to work up to the quickest.

Terms for Slowness

There are three terms used for a very slow speed: *Adagio, grave,* and *largo.* As to which of these is really the slowest a good deal of difference of opinion has existed. Clementi—who should have known—gave the order as *adagio, grave, largo.* Others have given the order as *largo, grave, adagio.*

I do not propose to attempt to settle the question here: neither is it really necessary that it should be settled on a question of speed alone, simply upon the grounds that each of these terms has a different significance.

I think we can afford to dismiss *grave* as being slow in pace and solemn in character; the word obviously means that and nothing else. But the other two are not so clearly defined. *Adagio* is slow, but there is a suggestion of pathos, of delicacy, of tenderness; whereas *largo* is broad, dignified—even ponderous.

So that if you hear the announcer introduce an *adagio,* you should not expect anything big and broad. Handel's well-known "Largo in G" is not at all a bad specimen of a movement controlled by such a mark: it is nothing unless it is played in a comprehensive and broad fashion.

Reita Nugent who faced the "mike" in a "Mr. Cinders" excerpt

We must now turn to the next in order of speed. There are two common terms—*larghetto* (a diminutive, of course, of *largo*) and *andantino,* the diminutive of *andante.* These two diminutives "act" (so to speak) in opposite directions. *Larghetto* is less than *largo,* that is to say, not quite so broad and ponderous; *andantino* (being the diminutive of *andante* which means "going") must mean "not going quite so much," in other words, slower.

The two terms come to about the same thing, though *larghetto* must be thought of in connection with its parent-word *largo* and with a suggestion of breadth.

Real Movement

Now we come to the real movement-term, *andante,* which must be taken by itself. If its literal meaning (going) can be its explanation, so much the better.

Once you have heard an *andante* played or sung at the correct speed, you should have no difficulty in determining that speed for the future. A slightly quicker pace, by the way, is often illustrated by the words *andante con moto,* which means nothing more than "going with movement," a self-explanatory term.

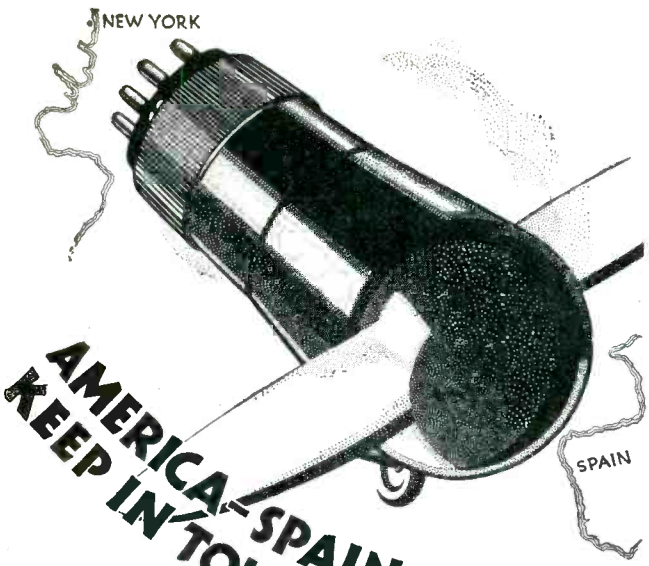
A similar speed, though perhaps a lighter atmosphere, can be recorded by the words *andante quasi allegretto.*

Cheerful Music

Allegretto is a diminutive of *allegro* (pronounced *all-ay-gro*), a word which really means nothing more than "cheerful." So that *allegretto* is a term of speed which indicates something more than *andante,* yet not so quick (or so bright) as *allegro. Quasi* means "as if," that is, an approach to.

Allegretto, applied to a movement in music, suggests refinement and delicacy. Its actual pace is often modified or augmented thus: *allegretto moderato* suggests a somewhat restraining influence; *allegretto ma non troppo* (not too much) warns the unwary against going too fast;

(*Continued on page* 172)



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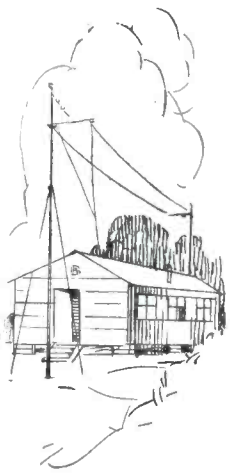
DO YOU REMEMBER?

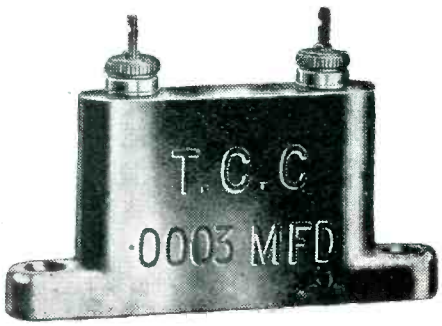
Hullo! Hullo!! this is Wrrr--ittle



If you're a real "old stager" in radio you will remember "Writtle"—"Two Emma Toc," Capt. P. P. Eckersley's station. How his "Wrrrr-ittle" used to thrill us! Those were the days! The B.B.C. first official transmission—via 2LO—was in 1922—"Writtle" days were pre-B.B.C. days—days when we knew only "R" valves—long, cumbersome sliding tuners, and hefty .001 variables. In those days transmitting and receiving gear depended largely on T.C.C. Condensers for their efficiency.

It's the same to-day—the choice of serious experimenter and amateur alike is T.C.C. Be guided by them — ask for T.C.C. always.

There is a T.C.C. Condenser for every purpose. This is the .0003 mf. Upright Type Mica Condenser, price 1s. 10d. *Other capacities from* ·0001 *mf. to* ·25 *mf. Prices* 1s.10d. *to* 18s.0d.



T.C.C. CONDENSERS

WERE USED THEN

Advt. Telegraph Condenser Co., Ltd., Wales Farm Rd., N. Acton, London. W.3
CA 9556

The Music Listener (Continued)

David Wise, a recent broadcaster

allegretto scherzando, on the other hand, suggests something a little "spicy" about the procedure, for a *scherzo* is a vivacious movement. (Pronounce *skairtso* and *skairts-ahn-do*.)

Faster Movements

And so we proceed to the first of the really quick-speed marks—*allegro*. In Bach and Beethoven it does not amount to much; in Chopin and Mendelssohn one is expected to move fairly fast.

There are several other common terms—all suggesting something subtle as well as being speed-indicators. *Agitato* is one of them. This generally follows one of the other quick-speeders, but Chopin uses it alone. I cannot translate it: *agitated* is not a happy translation. Pronounce it carefully thus: *ajeetahto*, the *j* being the same as in the French *je*.

If you listen to what you have said, I think you will know what *agitato* means. The sound will tell you.

Terms of Character

Another term is very suggestive of character—*vivace*, pronounced *vee-vah-chee*. Its meaning is clear from its sound, rather than from a translation to vivacious.

With *allegro* it has a stimulating effect, though it is not so quick an indication as *allegro assai* (*ass-sigh*) which means *very* fast. A greater speed still is indicated by the term *presto*, which scarcely needs translation. There is also a term *prestissimo*, used to indicate the fastest speed in music.

Perhaps it might be convenient to tabulate the foregoing terms for the sake of the reader:—

VERY SLOW:
Largo. *Adagio.*
Grave.
SLOWISH:
Larghetto. *Andantino.*
ON THE MOVE:
Andante. *Allegretto.*
Andante con moto.
QUICK AND BRIGHT:
Allegro.
QUICK AND BRILLIANT:
Allegro Vivace or *Allegro assai.*
Agitato.
Poco Presto (*poco*—a little).
VERY RAPID:
Presto. *Prestissimo.*

These are the terms of speed which listeners are likely to meet in the programmes daily. There are many others used in music which may, or may not, be a source of difficulty to those who play or sing themselves. Perhaps it will not be out of place to give a few of them here.

There are two which refer to a quickening of the speed of a passage —*accelerando* and *stringendo*. The first of these is pronounced *ah-chell-er-ahndo*; the other is phonetic. *Accelerando* is a gradual speeding-up which governs the music until some correcting mark appears, such as *tempo imo* (the time as at first).

Stringendo is much the same thing, but more excitement is suggested; it is a "drawing-close," and so "compelling" or "forcing."

So far as the terms for slackening the speed are concerned, there is not much difference between *rallentando* and *ritenuto*; both intend a uniform slackening, each phrase or group of notes being slightly slower in the matter of speed than its predecessor.

There are two contradictory terms to be met with very frequently in Chopin's music. One is *sostenuto* (sustained); the other is *leggiero* (lightly). Originally, neither of these terms affected the speed of a work or that of any passage they governed.

In Chopin, however, there is no doubt that they do govern the speed. *Sostenuto* originally suggested that the notes should be given their fullest value; with Chopin it is advisable to proceed at a speed very slightly slower than before, resuming the previous pace as soon as directed.

Many musicians will not agree with me that *leggiero* affects the speed at all. The word means lightly, as I have said; in Chopin—and most music of his period—the lightening of the touch upon the keys is not enough in itself; a slight increase in the pace is necessary.

Two Stronger Terms

There are two other terms which are really a little stronger than these two—*più mosso* and *meno mosso*. (*Meno—may-no*). The first means "more moved"; the other, "less moved."

When a slowing-up and a breadth of tone are wanted at the same time, it is general to use such a term as *allargando*, the opposite effect—mere dying away—being indicated by *morendo*.

I can well imagine a certain amount of impatience upon the part of any reader of this article who has not devoted all his life to music. Why must Italian terms be used?

Aptness of Italian

The answer, from my point of view, is that I am sorry they are not absolutely universal; I regret the use made of French and German—even English. There is something about these Italian terms—when you have studied the music for which they are used—which conveys the composer's thoughts to you most subtly.

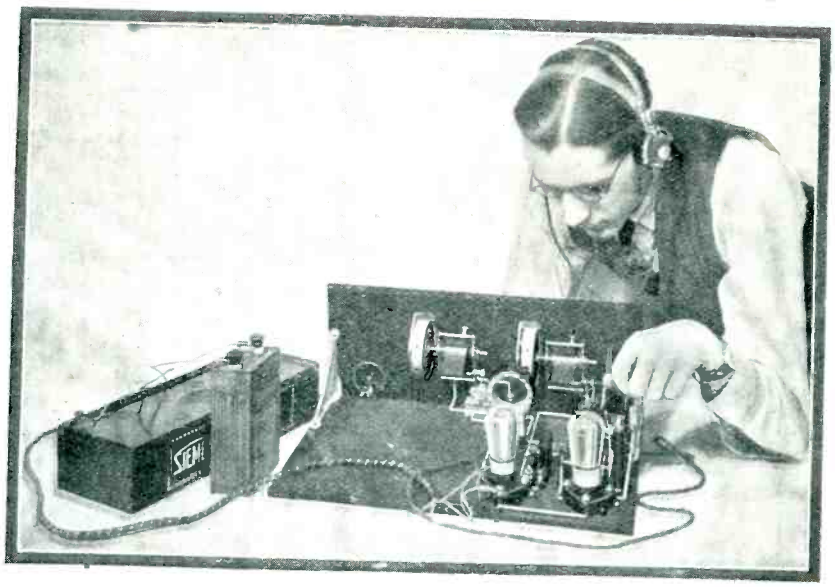
When you have noticed the effect they produce upon the passages they govern you will appreciate their excellence.

Jerry Hoey, conductor of the Piccadilly Grill Band at the Piccadilly Hotel

Test As You Build

YOU have finished the construction of your new set. The components have been mounted, the wiring completed, the aerial, earth, and batteries and loud-speaker all connected up.

After hours of toil, fascinating in itself and delightful in anticipation of the wonderful results the new receiver will give, you turn the condenser dials. You go from one end of the scale to the other, several times, and the result—not a sound.



Mortifying Conditions

Has that ever been your experience? Probably there are few enthusiastic constructors who have not, at some time or other, groaned under this mortifying condition of affairs. What could be more disappointing, or better calculated to arouse the latent evil passions of frail human nature?

All quite unnecessary and avoidable. Why not test as you build?

Below is the circuit diagram of a simple three-valve receiver, employing neutralised tuned-anode H.F. and transformer L.F. coupling. The detector circuit is drawn in ordinary lines, the additional wiring for the H.F. circuit in dotted lines and for the L.F. circuit in dashed lines.

First mount all your components, and then wire up only the detector-valve circuit. Make a temporary connection from the tuned-anode coil (at the end of the coil which will later be attached to the neutralising condenser) to L.T. — and earth; flex and clip connections are all that need be used here. Make another temporary connection of the aerial to the centre-tapping plug which goes to the anode coil.

One telephone lead is joined to the low-potential terminal of the H.F. choke, and the other to H.T.+1. These four temporary connections are shown in dot-dash lines in the diagram.

Join up the L.T. accumulator and H.T.—, and all is ready for an effective test of your detector valve. If anything is wrong here, you have quite a simple circuit to check over; and as soon as you are satisfied that it is working efficiently you can go ahead with the wiring of the next circuit.

The H.F. circuit is the best one to tackle next. After the wiring is completed, the first two valves are easily tested by re-connecting the batteries and phones, and by joining up aerial and earth, this time to their proper terminals.

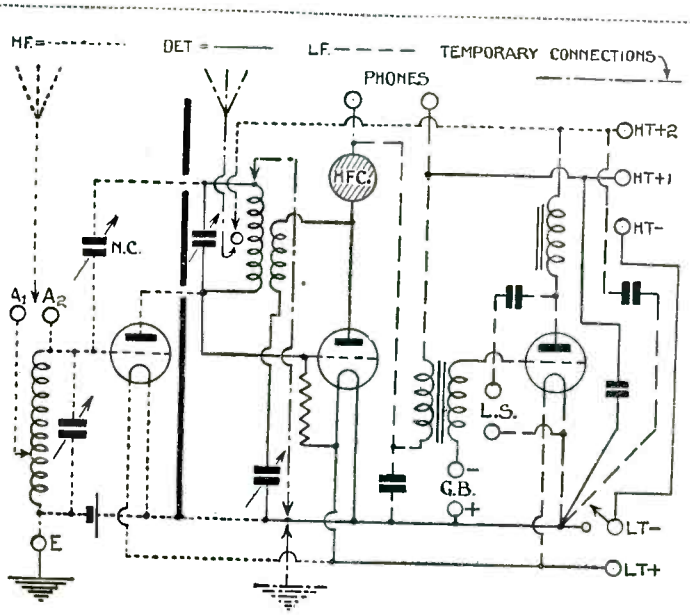


Diagram showing how circuit can be tested out step by step

Localising the Trouble

Again, if anything is wrong, you know the detector circuit is all in order, and the trouble is localised in the H.F. end. The H.F. valve may also be neutralised conveniently at this stage of the work.

Then your L.F. valve can be wired up, the phones discarded, and the whole set tested on the loud-speaker. Any failure of the set to operate properly again involves the testing of only a few simple connections or components

It should be pointed out that there is no need to adhere quite rigidly to

(*Continued on page* 176)

Test As You Build (*Continued from page 174*)

the wiring of each valve separately; for instance, it is often more convenient to complete the whole of the filament wiring in "one go." This is not inconsistent with the general idea of the scheme.

It means that after wiring the complete filament connections, the grid and plate connections of the detector valve will be finished off, and this valve tested, before tackling other grid and plate connections.

With H.F. coupling by means of tuned transformer the plan is, of course, still easier to put into effect, because one end of the transformer secondary, which has to be at earth potential, can be permanently connected, and the only temporary connection required is the aerial to the secondary winding.

The only limitation occurs when resistance-capacity coupling is used on the L.F. side (on the H.F. side it is hardly ever used). If the valve, which is R.C. coupled, has a separate H.T. tapping, phones can be connected in place of the anode resistance and the H.T. reduced to a suitable value for testing purposes; otherwise, it is advisable to omit a separate test of the R.C. coupled valve. E.W.C.

Television in the Air

SOMETHING new in the development of television, an apparatus designed to transmit aeroplane views of panoramic scenes to a ground receiving station, is under construction at Washington by Francis Jenkins, the noted American inventor.

The "aerial television eye," which Jenkins hopes to test shortly in a special plane, will record the visual scenes by means of a scanning disc, light-sensitive cell, and broadcasting apparatus, and will be received on regular television machines in the Jenkins laboratory.

It is believed that the invention would be of great value in time of war. General headquarters of an army would be put within range of actual range operations at the front. F. P.

Getting Your Grid Bias from the Mains (*Continued from page 164*)

obtained. This is because of the high internal resistance of the apparatus, which drops the voltage by a considerable amount when a low-resistance voltmeter is connected. One should also remember that as the filter and other circuits are usually designed on the assumption that no current passes through the grid circuits, it might be dangerous to connect low resistances across the terminals.

High-resistance Voltmeter

When the voltmeter is of the high-resistance type, however, the total output voltage from the unit may generally be fairly accurately measured, but the grid-circuit filter if one is used (as in Fig. 1) should not be included in this test. It is best to join the voltmeter across the output condenser of the filter of the grid-bias unit.

The correct grid bias for the valves may be obtained by trial, but it is better to adjust each potentiometer whilst watching a milliammeter connected in the anode circuit of individual valves. First, one would be fixed and then the instrument moved to the next anode circuit. The grid bias to this valve would then be adjusted.

For a uniformly wound potentiometer, the fall in voltage is evenly distributed, and the voltage tapped off it is therefore proportional to the amount of the potentiometer included between the contact arm and the positive end. When a tapped wire-wound resistance is used, the voltage may be estimated according to the position of the tapping. Thus, if one fifth of the potentiometer were included between the tap and the positive end, the voltage would be one fifth of the total.

When first connecting a grid-bias mains unit to a receiver it is advisable to set the voltages at rather more than is likely to be normally required, and then to adjust each circuit separately.

Broadcast Music of the Month

(*Continued from page 168*)

her Cockney sketches, 'Emma and 'Erb, in which she has the support of Harry Grattan, are the best heard over the wireless.

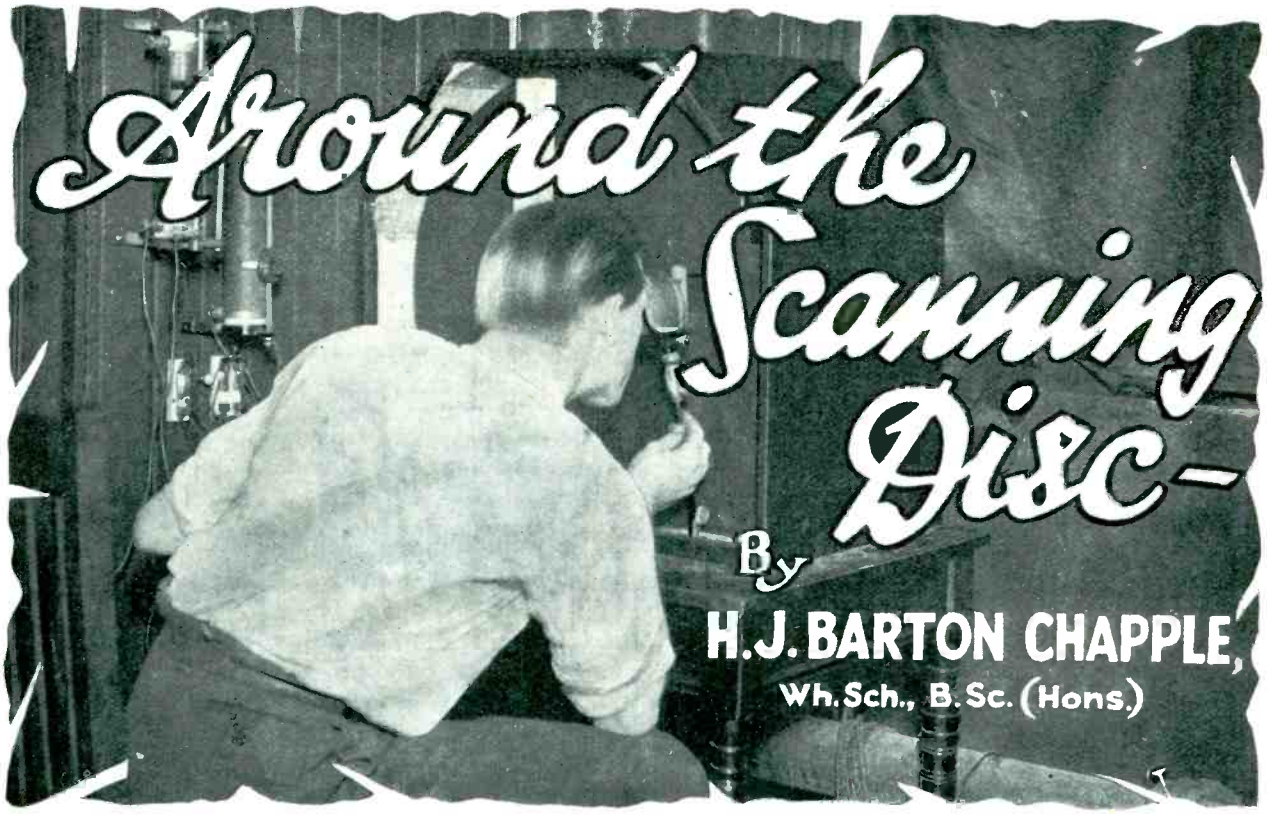
The Tramp Who Whistles

There are many more artists whose work should prove popular, a newcomer being Will Dollar, the "tramp who whistles." On the lighter side, too, may be mentioned the cabaret relayed to 2LO from the Riviera Club, and the comic opera of Alfred Reynolds, *The Fountain of Youth*, and Mr. Milne's comedy *Wurzel-Flummery* relayed from Birmingham studio on Aug. 6th, with clever incidental music by the Midland Pianoforte Trio.

The smaller bands of musicians broadcast far more clearly than large bodies of artists, though many listeners like to say that they have heard the great orchestras of the country, such as the Hallé, the Bournemouth Municipal (under Sir Dan Godfrey), and the Eastbourne Municipal (under Captain H. G. Amers), but for real artistry many of the quartets and small bands register most artistically, and the B.B.C. is evidently recognising this fact.

Well-known Orchestras

During the month one looks back on the work of the Gershom Parkington Quintet, Herbert Ware's String Orchestra, the Kutcher String Quartet, Fenwick's Orchestra at Newcastle, Jan Ralfini, Moschetto, Georges Haeck, the Squire Celeste Octet, and Leonardo Kemp and Alphonse du Clos, with their respective orchestras. They have given us much pleasant music, and although the majority of these "little concerts" have been given in the day-time, dinner-hour music as they consider if, many of them might be given the importance of a Sandler or Colombo concert at night-time in place of some of the dull talks, plays, and recitals which are still too prominent during the evening.



Around the Scanning Disc—

By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc. (Hons.)

WE left off our discourse on the spot-light system last month at a very interesting juncture. Having traced the functioning of the disc with its set of square holes arranged in spiral formation, we queried the necessity for resorting to such methods in order to obtain our scheme of transmission and suggested that the reason was bound up in the photo-electric cells.

Before delineating this important point, let me give you one other way of looking at the disc and its mode of disintegrating.

Covering the Picture

The circumferential length between individual square holes obviously will represent the length of our resulting picture; so if we take, say, an ordinary photograph of that length and cut it into the same number of vertical strips as we have holes in the disc, then each strip will represent the amount of the picture covered by each resultant light strip as each hole moves from the top to the bottom of the mask.

One revolution of our disc, therefore, is equivalent to dissecting our photograph into the strip manner suggested and placing each strip round the outer edge of a disc somewhat in the fashion indicated in the diagram (page 180).

The bottom edge of one strip will just touch the top edge of the next strip, the long inner edge of the first strip being in line (a slightly curved line in actual practice, of course) with the long outer edge of the second strip.

If these strips are pasted on a large disc as shown they will constitute the individual scans of each hole, and it is possible to make up a cardboard disc in this fashion, spin it about its centre, and, by properly observing the strips through a lens and mask, to see a complete picture.

I have gone to a little length in suggesting this way of looking at the disc functioning because it is of the utmost importance to understand clearly how and why the disc does its exploring of the televised object, and a clear mental picture obtained at this early stage will do much towards explaining other points later in this series.

Unless one grasps fundamental details initially there is a possibility that the system will be regarded as a form of wireless field-glass enabling the possessor of certain apparatus to focus it in any direction desired, irrespective of barriers.

This may seem exaggerated, but there have been many occasions when I was confronted by people who have looked at television in this light with all sincerity and breathed a sigh of relief on being convinced that so far the science has not reached such an embarrassing state of perfection.

Let us now proceed a stage farther and see how our resulting light-spot dissections can be converted into some form of intelligible electrical impulse which can be handled in a normal manner.

No doubt, some readers are familiar with the discovery, made some years ago now, that a substance called selenium possessed the property of being responsive in an electrical sense to light and shade.

Action of Selenium

If exposed to light, selenium caused a current to pass round a circuit of which it formed a part, while darkness made the current flow cease. In addition, the magnitude of the current was dependent upon the amount of light to which the selenium was exposed.

Unfortunately for television purposes, while the magnitude of the resulting current was large in a relative sense, there was an inherent sluggishness in the response, and television demands a reduction of the time element to the barest minimum.

This factor led to the development

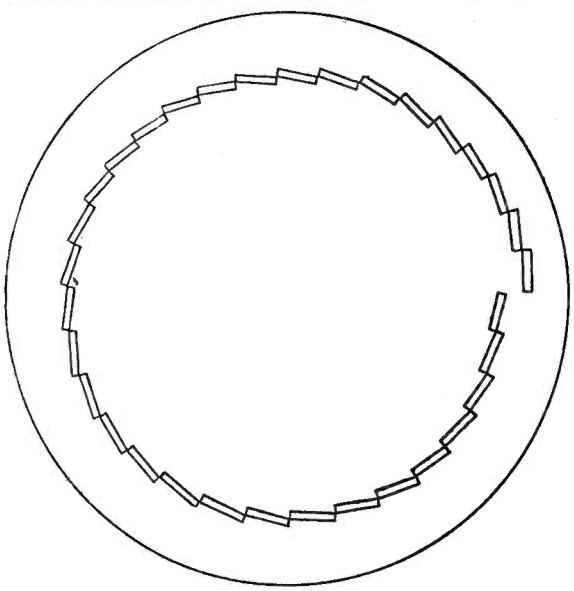
(*Continued on page* 180)

Around the Scanning Disc (*Continued from page 178*)

of the photo-electric cell, which possesses the same property as selenium in so far as it converts light to electricity; but, fortunately, the conversion is instantaneous—at least, as far as we have been able to measure.

Less Current

On the other hand, the resultant current for a given light flux is much less than that obtained with selenium, but this can be compensated for quite readily by amplification.



Arrangement of slots in scanning disc

It will be quite obvious that one or more photo-electric cells (popularly known as the "television eye") could not convert an entire image or scene into current impulses, because there are so many different light values within the area of its compass.

Now the reason for the Baird spot-light system should be clear. Providing you can analyse the subject to be televised into a number of elemental areas, each possessing a definite light value, then the photo-electric cell will respond to each light value in turn.

Obviously, the greater the number of elemental areas into which you can conveniently divide your subject, the greater will be the detail of the resulting picture; but it really is astonishing how even a coarse subdivision will produce an intelligible and recognisable picture.

Number of Disc Holes

The number of disc holes govern the picture graining, and, as I have mentioned before, some television systems use different hole standards to the Baird Co., but uniformity in this direction will undoubtedly come at some future date.

We can visualise a square perforation in the disc at one instant illuminating a certain spot of the picture and according to the amount of light reflected then the photo-electric cell, with a definite potential applied between its cathode and anode, will cause a proportional current impulse to flow in the circuit.

At the next instant when the spot has moved to its adjoining position down the light strip so a different amount of light is reflected and our cell in turn responds veritably in the twinkling of an eye, to use a colloquialism.

Spot by spot and strip by strip the picture is analysed into values of light and shade, which are handled and changed to current impulses by our cells, and with each revolution of the disc so one complete picture conversion takes place.

The current values are dependent upon the reflective properties of the televised subject, anything white reflecting more light than anything black, and so on for intermediate shades.

Fluctuating Current

It is easy now to conjure up our image as being transformed into terms of fluctuating current, and we must next impart to the observing eye any movement taking place. This is brought about quite easily by arranging to have ten or more complete explorations per second, twelve and a half pictures per second—that is, 750 revolutions per minute—being a good average.

The inherent lag of the human eye will ensure that the series of still pictures appear as a harmonious and live whole, and beyond a very slight flicker the mechanics of the process are lost to the observer.

Practice has shown that four cells mounted in two pairs, one above and one below the scene or object televised and arranged in cascade fashion, produce electrical impulses which represent faithfully the reflected light.

X's and DX's!

I SUPPOSE one of the greatest bug bears in long-distance working (usually abbreviated into the succint "DX") is static, atmospherics, X's—call it what you will.

Fading is a DX trouble which is more prone to occur on the ultra-short "wavelets," but static is with us at all times and at all frequencies; or perhaps it would be more correct to say that static has a frequency of its own, but owing to its great strength as compared with radio amplitudes, it exerts a shock effect on aerials and is heard on all wavelengths.

As yet, no effective cure has been found; and it seems rather improbable that one will be found, after all these years of experimenting. But the minimisation of static might be effected by an increased knowledge of the times and conditions at which the X's are most prolific.

A year or so ago, the National Physics Laboratory organised an "X hunt" in various parts of Europe. Observers were asked to listen to 5XX (appropriate call sign !) and report on the static disturbances.

Visual Record

Now it is learned that Fultograph receivers are to be used for the same purpose. Straight-line tests will be given out by the Fultograph transmitter in the usual way, and the receivers in various centres will record visibly each disturbance.

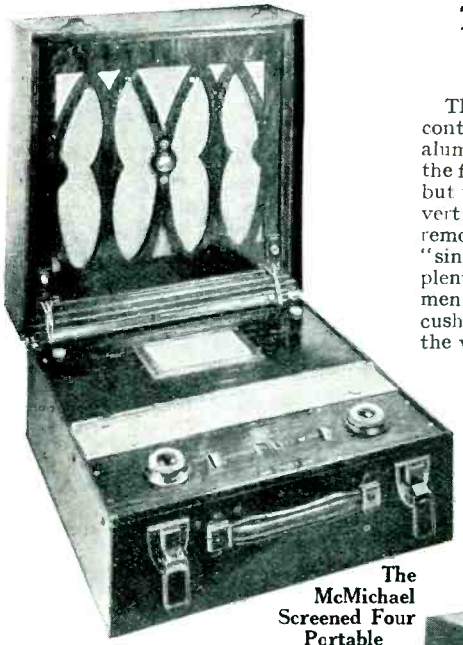
So far as amateurs are concerned, really the only way at present to get static-free reception is to use a frame aerial.

QUEUE.

Wireless Magazine, September 1929

A NEW SET TESTED

The McMichael Screened Four Portable Reviewed by J. H. REYNER, B.Sc., A.M.I.E.E.



The McMichael Screened Four Portable

BEARING in mind the limitations associated with a portable set, we seldom anticipate a performance comparable with that obtainable from a similar receiver utilising external aerial and earth. Yet, such is the progress of recent years that the performance of these sets in miniature has reached a remarkably high standard.

The sensitivity and reproduction quality of a good modern portable rank it not only as a means of entertainment, but as a truly musical instrument.

These views are upheld by a test recently made on an M.H. screened-grid four-valve portable set marketed by L. McMichael, Ltd., of Wexham Road, Slough. Contained complete in a handsome dark leather suit case measuring 15½ in. by 15½ in. by 9 in. thick, the set has an overall weight of 37 lb., and may be readily carried abont.

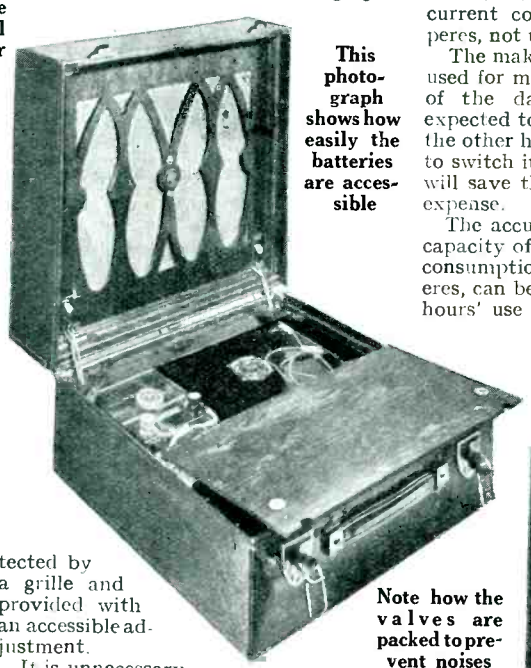
Businesslike Appearance

On opening the lid and viewing the interior, one is immediately struck by the businesslike appearance of the set as a whole. There is no glittering display of dials, such practice being naturally out of fashion at the present day: the controls, which are three in number, are arranged along the front of the set; the neat drum-drive tuning condenser, with vernier attached, is centrally placed. A combined on-off switch, long- and short-wave switch, and volume control is operated by a single dial on the left-hand side of the panel.

Note the volume control, a rather unusual fitment on a portable, but one that has to be used on the local and high-power stations to cope with the large volume available. The sole remaining control is a reaction adjustment.

The valves are arranged behind the controls and are protected by an aluminium cover. The screened-grid and the final valve are mounted horizontally, but their sockets are hinged to allow of a vertical position for insertion and removal. Forced electrode vibration or "singing" is combated by packing plenty of cotton wool in the compartment and mounting four sorbo-rubber cushions on the cover which bears on the valves.

Lifting up a hinged lid at the back of the set discloses the batteries and accumulators. The wiring to these is carried out with particular care and neatness, thus obviating possible trouble due to faulty contacts and muddled leads. The frame and loud-speaker are housed in the lid, the latter being protected by a grille and provided with an accessible adjustment.



This photograph shows how easily the batteries are accessible

It is unnecessary to expound at length on the performance of the set; suffice to say that it favourably impressed the members of our laboratory staff. For a four-valve portable set, not forgetting the screened-grid valve, the results are particularly good, the more so when it is remembered that a single tuning control only is employed.

The difficulties of tuning are further decreased by the provision of a list giving the approximate dial readings for the various British and Continental stations.

On the low wavelengths, it was possible to receive intelligibly such stations as Langenberg and Bournemouth during daytime. At night, the range of reception increased beyond compare, and high-powered Continental stations could be tuned-in one after another with ease.

Searching for the local and Daventry stations was unnecessary, one fell over them, and, when in tune, had perforce to use the volume control. Those photographs one so often sees in the Press, depicting couples dancing in the open to the music of a portable set, could almost be given credence in real life with this set.

Reasonable H.T. Consumption

It is of little use discoursing on the capabilities of a portable without saying something about the batteries and consumption figures, which, of course, are matters of importance to the purchaser. The H.T. battery used is a 120-volt standard type, and the H.T. current consumption is 10½ milliamperes, not unreasonable for such a set.

The makers point out that if the set is used for most of the broadcasting hours of the day the battery cannot be expected to give an economical life. On the other hand, if readers will remember to switch it off when not required, they will save themselves much unnecessary expense.

The accumulator fitted has an actual capacity of 24 ampere-hours, and as the consumption is approximately .5 amperes, can be expected to give nearly fifty hours' use on each charge.

From the remarks made in this report, the reader will gather that the set is the result of a successful attempt to give reliable reception.

Note how the valves are packed to prevent noises

My U.S. Radio Diary (*Cont. from p. 100*)

conceded that geographical and economic conditions were not the same.

"It all turns on the matter of censorship," he stated. "Here, in America, the public are the censors of the radio programmes. In your country the B.B.C. constitutes an autocratic censorship that we Americans would not tolerate."

At the time I could not quite see the drift of Mr. Hawkins' argument—possibly owing to the heat, which was even more pronounced than it had been in New York! Observing my vacant look, he went on to explain:

Check on Public Opinion

"Our system gives us a definite check on public opinion—yours doesn't. We radiate, say, a Lucky Strike programme. Our object is to help sell more Lucky Strike cigarettes. We find that in a sixty-day series of Lucky Strike programmes the sales increase by 47 per cent. Would they have done so if the programme had been against public taste?"

From the commercial point of view, and, believe me, that is the only point of view that interests American broadcasters, the argument of Mr. Hawkins is unanswerable. But I venture to suggest that we could call that censorship bluff very effectively.

A Low Standard

Instead of a group of artistic interests, such as we have in the B.B.C., deciding and moulding radio programmes, American radio listeners are at the mercy of the butcher, the baker, and candlestick maker, who, playing up to a fairly low standard of entertainment appreciation, consistently serve up light jazzy spasms—and get away with it.

Commercial interest cannot afford to waste money "educating" the radio public, so they stick to the shallow forms of entertainment for which education is not a first essential!

In eight days Mr. Sieger and I passed through eight cities, covering nearly 2,000 miles, so that sometimes our stay was extremely limited; so it was in Washington, D.C., which no one ought to miss seeing. We had

(*Continued on page* 185)

Frequency Records for the Experimenter

THE benefit of sound-test records is becoming increasingly appreciated. Anyone who possesses a gramophone turntable is able, by the use of these records, to supply himself with various frequencies which can be used for the testing of amplifiers, pick-ups, and all varieties of sound apparatus.

A particularly interesting set of records has just been issued by the Parlophone Co., of 85 City Road, E.C.1. These records, which are three in number (Nos. P9794, -5, and -6), are accompanied by an eight-page leaflet describing exactly how the records may be utilised to give the best results.

A Gliding Tone

The first record contains what is known as a "gliding tone," which starts with a frequency of 6,000 cycles per second and glides uniformly down to 100 cycles per second. These figures apply to a speed of 80 revolutions per minute.

If it is desired to note the pitch at any particular point, this may be observed by reference to a chart which shows the frequency in terms of needle travel or revolutions so that it is possible to determine the frequency at which any resonance or other peculiar effect is noticed.

The reverse side of this record produces what is called a "gliding howling tone." This is a particularly happy idea, designed to overcome some of the difficulties hitherto experienced in sound testing. One of the principal troubles is that of standing waves, for whenever a musical sound is produced in a confined space, reflections occur from surrounding objects.

These reflections produce nodes and anti-nodes, that is to say, points at which the reflected waves and the transmitted waves add up or balance out. A listener situated in one particular position, therefore, may appear to receive a very little sound at such frequencies, but if he moves his position he will find that the sound now appears normal, whereas certain other frequencies may now seem to be lacking.

In order to avoid the production of standing waves of this sort, the record is designed to produce, instead of a pure tone, one in which the frequency varies about 10 times a second by 50 cycles above or below the mean frequency. The gliding howling tone record, therefore, varies from 6,000 to 150 cycles per second, the note wobbling 50 cycles above or below this frequency the whole time.

The second two records, Nos. 9795 and 9796 respectively, contain four howling tones ranging from 150 to 4,800 cycles per second, the variations being plus or minus 50 cycles as already described. In addition, however, the reverse side of the third record contains two mean frequencies, which are caused to howl by very much greater variations.

The first of these is a 950-cycle note with a variation of plus or minus 650 cycles per second. The second is an 1,800-cycle note with a variation of plus or minus 1,500 cycles. It will be seen that these two notes vary practically over the whole gamut of musical frequency with a mean value of 950 and 1,800 respectively. Such records as these are of use in exceptional circumstances.

Constant Needle Velocity

The frequencies are recorded with constant needle velocity, subject to fluctuations of plus or minus 30 per cent., which variations are negligible for most acoustic purposes. This means that the voltage produced in an ideal pick-up would be constant, irrespective of the frequency; the strength of the signal is sufficient to produce a potential of about 1 volt with the average pick-up.

Our tests on the records showed them to be of distinct utility. The termination of the records at frequencies as high as 100 and 150 cycles is slightly disappointing, but we presume that the recording of lower frequencies is impossible without altering the needle velocity, owing to the usual mechanical limitations which come into force at, or around, this frequency.

This would mean that the voltage output was no longer constant.

The records are put up in a set of three, costing 2 guineas a set, including a very convenient album for preserving them from damage. J. H. REYNER.

New Transatlantic Telephone Service

A TELEPHONE conversation between London and Cleveland, Ohio, handled successfully through the Lawrenceville, N.J., short-wave transmitter of the American Telephone and Telegraph Company, recently, marked the commercial opening of the Bell system's new short-wave radio telephone transmitting centre.

In future, all Transatlantic short-wave radio messages passing over Bell system wires in America will be transmitted through the new radio plant.

Two Additional Channels

The initial unit of the new transmitting centre has been performing smoothly since the opening day. By the end of the year it is expected that the transmitters of two additional short-wave channels to Europe, and one to Buenos Aires, Argentina, will be operating from this point.

The present short-wave transmitter at Deal, New Jersey, will then be taken out of commercial operation, to be used thereafter for experimental purposes.

Equipment is being installed and tested in England and South America to take care of the proposed new channels. At the same time preparations are being pushed forward at Lawrenceville and at Netcong, New Jersey, the short-wave receiving centre in America, which began operating last summer.

Providing a third Transatlantic speech channel, the new short-wave unit supplements the long-wave and short-wave systems previously operating between the United States and Europe. With a continually expanding volume of overseas conversations, reaching its high point in the recent months, the two systems were becoming congested.

The third channel will relieve this situation and furnish ample room for additional growth until the fourth system is brought into service.

As the result of months of experiment and testing by engineers of the American Telephone and Telegraph Company and the Bell Telephone Laboratories, Inc., the transmitting equipment at Lawrenceville presents a number of improvements over that in the older short-wave system.

European Aerial

The transmitting aerials for Europe is strung on a line of nineteen 180-foot steel towers, placed 250 feet apart and at right angles to the direction voice waves travel. Each of the three Transatlantic channels has three horizontal aerials, paralleling each other perpendicularly, connected by cross wires; they resemble a huge wire net of irregular mesh.

Behind the transmitting aerial is a second similar arrangement. F.P

My U.S. Radio Diary (Cont. from p. 183)

a call to make there, hence the stop between Philadelphia and Pittsburgh.

Mr. Leroy Mark runs station WOL in Washington, and makes a success of it in spite of the competition from N.B.C. and Columbia chain stations. WOL is beloved by careful mothers and parents, who can safely allow their kiddies to listen to "the cleanest station in town" as Mr. Mark proudly proclaims it to be.

Coining Money All Day

"The world's waiting for the sunrise" announces WOL at 7.30 every morning, and proceeds to coin money until 9.30 at the rate of 3 dollars per fifty-word advertisement!

As an example of the scope the U.S.A. offers for individual effort WOL is hard to beat. The power is only 100 watts and the main programme material is selected from a wonderfully well indexed batch of 1,500 grainophone records!

Leroy Mark is a practical idealist; a young girl started to sing a somewhat equivocally worded song while I was at WOL. Mr. Mark cut out the "mike" and another song had to be started. He practises his ideals of purity—and makes money also!

Before we left on the night sleeper for Pittsburgh I had a few minutes at the dials of our portable, just to see what Washington's radio was really like. N.B.C. and Columbia, through stations WRL and WMAL respectively, were hard at it; my good friend Hawkin's "public censorship" was working out in the expected way—one station was giving the Ever-Ready hour, the other devoting its energy to an Old Gold hour.

The Real Censors!

Light musical and jazz numbers, both well worth listening to, but essentially of the same type, were offered to the public by the real censors of American radio—the manufacturers. Washington has three radio stations, but they are not altenatives in the B.B.C.'s sense of the word.

Dare Fleck is a charming personality; he is also a responsible official of KDKA, and to him we went on our arrival in the city of Pittsburgh.

(*Continued on page* 192)

Travelling Abroad with a Portable

By J. GODCHAUX ABRAHAMS

AT the request of some correspondents, since June last I have delved more deeply into the matter of adding a portable receiver to one's luggage when touring on the Continent.

Apart from the countries mentioned in my last article on the subject, I find that other European states also grant facilities to the tourist to listen on his own receiver to the broadcasts offered, and hereunder I have detailed the conditions under which such a permission is obtainable.

Conditions in Austria

Austria, in particular, affords full liberty to the radio fan to roam about to his heart's content. All you need do upon arrival at the frontier station is to declare the set as your personal property, and at your request a seal may be affixed to it by the Customs' authorities.

You are, however, required to obtain from the nearest post office a listening licence, but as it may be taken out for a minimum of one month at the low cost of two Austrian schillings or under 1s. 6d., it would hardly pay you to be a pirate !

In Poland, on the other hand, no difficulties are met, but a non-refundable duty is charged when you enter the country. It is fixed at 20.64 zloti per kilo, which at the present rate would work out to roughly 5s. per lb. of wireless set, somewhat too high a luxury for the average purse, although the licence only costs the equivalent of 1s. 5d. for one month.

Should you travel farther afield, say to Lettland (Latvia) in the hope of picking up the Riga programmes on the spot, your portable will again be weighed and a duty tax collected of 2.25 lats per kilogram. You need not puzzle your brain over figures; for your guidance, this charge works out at 10d. per lb. of "radio" including case and you will also be asked to pay roughly 3s. 6d. per month for the privilege of listening.

If you care to push on to Lithuania the excise of that country will request from you a deposit working out at about the same rate, and a further charge is made on accumulators and batteries, but, if the receiver is taken out of the country through the same customs office within six months, the deposit is re-imbursed, only a small tax is collected for the listening licence, and any foreigner may obtain this permit by application to the Central Post and Telegraph headquarters at Kovno.

In Czecho-Slovakia

Czecho-Slovakia welcomes the radio tourist and makes but few conditions for the temporary importation of his magic box. It is necessary that you should declare it on crossing the frontier and that you should get the officials to make an entry of the receiver and the date of your arrival in their records. There are to-day one hundred and sixty-four Czech kroner to the English pound, and in the Czech's option, should you not inspire confidence, they may exact a deposit of thirty kroner, or the small sum of 3s. The broadcast listener's licence you will have to pay will cost 1s. 6d. per month.

Hungary exacts somewhat more difficult conditions, inasmuch as a deposit must be made on arrival and the receiver left with the authorities. After you have obtained the necessary permit to use your apparatus—a concession freely given—from the local post and telegraph office it must be sent to the Chief Custom House at Budapest.

Deposit Returnable

Your set will be forwarded to you and handed over on production of a listener's licence, costing 2 pengos (about 1s. 6d.) per month. The original deposit is returnable when proof is given at the frontier that you are leaving the country and taking the receiver with you.

As will be seen, the regulations for the temporary importation of wireless receivers differ greatly from country to country, but, generally speaking, most authorities already consider the portable set as part of the traveller's equipment, in the same way as the folding pocket camera has been regarded during the last ten years or so.

For this reason it will be found that the custom officials are not too exacting and do not in every instance strictly adhere to the letter of the law.

Most European countries, far from discouraging the visits of tourists, do all in their power to encourage them.

Radio Stations to Serve Fourteen Cities

GENERAL James G. Harbord, President of the Radio Corporation of America, has announced plans for the immediate establishment of a radio-telegraph system serving fourteen strategic cities, to be managed and operated by the Radio Corporation of America Communications, Inc.

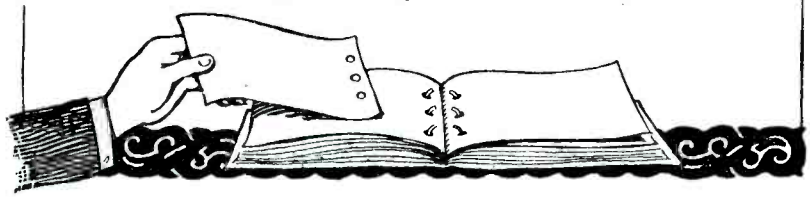
The stations will be at New York, Chicago, San Francisco, Los Angeles, Seattle, Denver, New Orleans, Kansas City, Detroit, Cincinnati, Cleveland, St. Louis, Boston, and Washington. New York and San Francisco are already operating short-wave radio communications.

The establishment of the new service, which will give the inland cities direct connection with the wireless networks radiating from New York and San Francisco to twenty-two foreign countries, was made possible by the recent grant of ten exclusive channels by the Federal Radio Commission.

It is hoped to extend the system to the full list of twenty-nine cities contemplated in the original application as soon as the additional wavelengths are made available.

The establishment of the new service will give the leading commercial and industrial centres of America a new, quick, and reliable means of communication with each other. But its greatest significance is that it brings Europe, South America, and the Orient closer to America.

"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. 141*

Transmission Units

IT is often required to compare quantities differing by considerable amounts. More particularly where curves are required, any large discrepancy between the quantities to be compared introduces difficulty. For example, the tuning properties of some circuit may be under investigation and it may be required to know where the signal strength is reduced to 1ooth of its value at resonance.

With the customary resonance curve, it is not possible to define the point with any accuracy unless the curve is plotted to a very enlarged scale.

Comparison becomes more easy, however, if the ordinance of the curves to be prepared are evaluated logarithmically. The logarithm of 10 is one, the logarithm of 100 is two, the logarithm of 1,000 is three, and so on. Thus we obtain linear increases in the ordinate for increases in strength corresponding to ten times.

It is on this basis that the transmission unit is arranged. It is necessary, first of all, to start with a standard level of strength of whatever is the quantity to be measured. Ten transmission units correspond to a strength of ten times the standard, 20 transmission units means 100 times the standard, 30 units 1,000 times, and so on.

In the same manner it is possible to express a strength which is smaller than the standard. The same nomenclature is used, but the quantities are made negative. Thus —10 units corresponds to 1/10th of the standard, —20 to 100th, and so on.

It will be clear from the above that the transmission unit is essentially a unit for expressing ratios—the ratio of one quantity to a predetermined standard. Strictly speaking, the unit is applicable only to power ratios—as, for example, the ratio of the power output to the power input in an amplifier. This may be several thousand, so that the simplicity of the T.U. as a unit is at once apparent. Clearly in a case such as this the mere current or voltage ratio is not sufficient, for the input and output impedances are nearly always different. Where any quantity is associated with a constant impedance, however, such quantities as voltages, currents, etc., may be expressed in T.U.

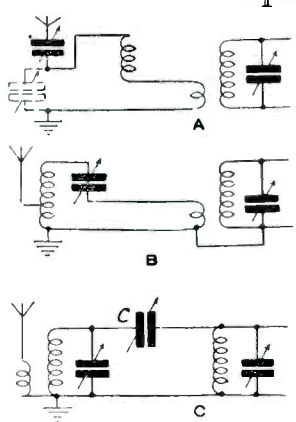
It is interesting to note that the transmission unit, as used in its true sense for power ratios, represents approximately the least difference in loudness which can be detected by the ordinary ear. To convert any power ratio to T.U., use the formula :—

$$T.U. = 10 \log_{10} P_1/P_2,$$

where P_1 and P_2 are the two powers to be compared.

WIRELESS MAGAZINE Reference Sheet — *No. 142*

Coupled Aerial Circuits



Three types of aerial circuits with magnetic and capacity couplings

IN order to obtain increased selectivity, a coupled aerial circuit may be used. This may be done by tuning the aerial circuit definitely and arranging a small magnetic or capacity coupling to a secondary circuit, which is also tuned.

Such a circuit is shown in Fig. A, a magnetic coupling being used, as this is the more convenient with this class of circuit. The aerial tuning condenser may be in series or in parallel, as shown dotted.

Another form of coupled circuit is shown in Fig. B, where the first circuit is provided with a tight-coupled aerial system, as is customarily adopted in ordinary single circuits. A small portion of the energy from this circuit is transferred to a tuned secondary circuit by means of a small magnetic coupling.

This method has an advantage over that shown in the first figure in that the tuning of the two circuits will remain substantially similar and can be made to cover a wavelength band of 250 to 550 metres without difficulty. Either the series or parallel method of tuning the aerial directly does not achieve this result.

A modified form of circuit is shown in Fig. C. Here the same arrangement is adopted but the coupling is of a capacity type instead of a magnetic type. A small condenser (C), having a maximum capacity of about .0001 microfarad, is connected between the two high potential ends of the circuits. This method has the advantage that the coupling can readily be varied in order to suit the conditions.

The advantage of the coupled-circuit system is that the tuning is distinctly sharper. (See also Sheet No. 143).

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.

Centre-tap Set	WM50
A Daventry-Local Crystal Set	AW185

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All these 1s. each, post free.

Long-range Hartley	WM54
Reflexed One for the Loud-speaker	WM66
Special One	WM116
Reinartz One	WM127
The A.1.	WM153
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
★Stay-put Two (D, Trans: All A.C.)	WM155
★Ether Ranger (D. Trans)	WM156
30/- 2 (D, Trans)	AW 31
Economical 2 (D, RC)	AW 66
Two-wave (D, Trans)	AW 83
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
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
1929 Favourite Two (D, Trans)	AW186
Loud-speaker America 2 (D, Pentode)	AW190

THREE-VALVE SETS

All these 1s. each, post free.

Five-guinea 3 (HF, D, Trans)	WM29
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
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
Binowave S.G. Three (SG, D, Trans)	WM152
★Fanfare (D, 2 Trans)	WM157
Modern Tuned-anode (HF, D, Trans)	AW 35
Economy 3 (D, 2RC)	W 48
Short-wave (D, RC, Trans)	A W 50
Standard (D, 2 Trans)	AW 56
Hartley DX (D, RC, Trans)	AW 63
Q-coil 3 (D, RC, Trans)	A 84
British Station Three (HF, D, Trans)	AW122
Optional Two-three (D, 2LF)	AW124
Simplicity Screen-grid Three (HF, D, Trans)	AW132
"Proms" Three (D, 2 RC)	AW137
Adaptable Three (D, 2 Trans)	AW139
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, RC, Trans)	AW179
Local and Continental Three (HF, D, Trans and D, RC, Trans)	AW180
Broadcast Three (SG, D, Trans)	AW192

FOUR-VALVE SETS

All these 1s. 6d. each, post free.

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 Purzehill 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)	WM141
★Arrow Four (SG, HF, D, Trans)	WM154
All-purpose 4 (HF, D, RC, Trans)	AW 43
Explorer Four (HF, D, RC, Trans)	AW120
Summertime Searcher (2HF, D, Trans)	AW128
Overseas Shortwaver (HF, D, 2 Trans)	AW133
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.

1928 Five (2HF, D, 2 Trans)	WM46
Cataract 5 (HF, D, RC, Push-pull)	WM79
Fidelity Five (HF, D, 2RC-parallel)	WM130
All-wave Loadestone Five (HF D, Push-Pull	WM146
School 5 (HF, D, 2RC)	AW85

SIX-VALVE SETS

1s. 6d. each, post free.

Nomad (2HF, D, RC, Push-Pull, Trans)	WM31
Connoisseur's Six (2HF, D, RC, Push-pull)	WM88
Eagle Six (3HF, D, RC, Trans)	WM106
Short-wave Super-6 (Super-het, Trans)	AW67
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/-
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,)	WM 145	1/6
Picnic Portable (D, RC, Trans)	WM148	1/-
Enchanter Portable (2HF, D, R.C., Trans)	WM 150	2/6
Daventry Portable (D, Trans)	AW109	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
Arcadian Portable (SG, D, 2 Trans) with Linen-diaphragm Loud-speaker (half-scale)	AW177	1/6
£5 5 0 Portable (D, Trans)	AW181	1/-
Talisman Portable (SG, D, 2 Trans)	AW184	1/6
Holiday Portable (Three) (D, RC, Trans)	AW188	1/-

AMPLIFIERS

All these 1s. each, post free

Super-power Unit (2 v.)	WM103
Signal Booster (HF Unit)	WM128
Auditrol Amplifier	WM132
Screened-grid HF Unit	AW 75
One-valve LF Unit	AW 79
Super-power Push-pull	AW 86
Hook-on Short-waver	AW104
Purity Amplifier	AW108
Add-on Distance-getter	AW117
Screened-grid HF Amplifier	AW138
"A.W." Gramophone Amplifier (3RC)	AW162
Searcher Unit (H.F.)	AW176
Gramophone Amplifier (3 V.)	AW187

MISCELLANEOUS

	Price	Post Free
A.C. Mains Eliminator	WM41	1/-
Portable Cone Loud-speaker	WM73	1/-
Universal Short-wave Adapter	WM82	1/-
Linen-diaphragm Loud-speaker	WM90	1/-
Simple Cone	WM111	1/-
Buzzer Wavemeter	WM121	-/6
James H.T. Unit for A.C. Mains	WM125	1/-
Lodestone Loud-speaker	WM126	1/-
James H.T. Unit for D.C. Mains	WM133	1/-
Short-Wave Adaptor for Dominions Five	WM140	1/-
Two Ampere Low-tension Unit	WM147	1/-
A.C. Mains Amplifier	WM149	1/-
A.C. Mains Unit for All-wave Lodestone Five	WM151	1/-
Adapter for Short-wave Super 6	AW 67A	-/6
H.T. from A.C. Mains	AW 73	1/-
H.T. Eliminator for A.C. (200 v. output)	AW 102	1/-
Knife-edge Wavetrap	AW 131	-/6
All-metal Eliminator for H.T.	AW 135	1/-
Duplex-diaphragm Loud-speaker	AW 142	1/-
Linen-diaphragm Loud-speaker with Baffle	AW152	1/-
Pedestal Cone Loud-speaker	AW164	1/-
Listener's Speaker, price 4d. with copy of "A.W."	AW170	-/1
Arcadian Linen-diaphragm Loud-speaker (full-size)	AW178a	1/-
D.C. Unit (H.T.)	AW178	1/-
Short-wave Adaptor (IV)	AW183	1/-
High-tension Battery Charger	AW101	1/-
Mains Unit for S.8 Valves	AW193	1/-
Scratch Filter	AW195	6d.

A blueprint of any one set described in the current issue of the "Wireless Magazine" can be obtained for half-price up to the date indicated on the coupon (which is always to be found on page iii of the cover) if this is sent when application is made. These blueprints are marked with an asterisk (★) in the above list and are printed in bold type. An extension of time will be made in the case of overseas readers

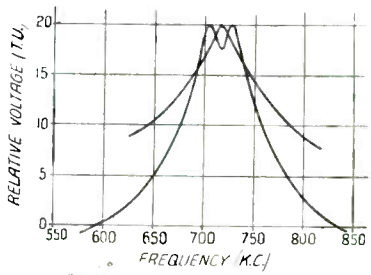
Send, preferably, a postal order (stamps over sixpence in value unacceptable) to

Wireless Magazine

Blueprint Dept., 58/61 Fetter Lane - E.C.4

WIRELESS MAGAZINE Reference Sheet **No. 143**

Coupled Circuits—Tuning of



Tuning curve for coupled circuits

THE benefit of using two or more circuits in cascade, as suggested in Sheet No. 142, is that the tuning some distance away from the resonance point is sharpened considerably, whereas around the resonance point itself the tuning becomes flatter.

From the point of view of selectivity, therefore, the circuit is excellent, since it means that a signal a little distance away from the resonance point will be reduced in intensity by a considerable amount, whereas the side bands of the transmission, which only extend for a relatively short distance on each side of the resonance point, will not be seriously reduced.

This is due to the fact that the use of the two circuits produces the two resonance points relatively close together. The combined resonance curve, therefore, tends to be flat-topped, and the tighter the coupling between the circuits, the farther apart these two humps become, until a point is reached where they introduce difficulties into the tuning of the system.

The curve herewith shows a resonance curve of a single circuit and two identical circuits coupled together. The inductance in each circuit is 200 microhenries, the tuning capacity .00025 microfarad, and the H.F. resistance 20 ohms. This represents an average circuit together with associated aerial and valve damping. The maximum strengths have been adjusted to be the same in order to obtain a fair comparison.

The mutual inductance in the case of the coupled circuits is 4.45 microhenries, at which value the double-hump effect is just perceptible, but not serious.

WIRELESS MAGAZINE Reference Sheet **No. 144**

Relative Audibility

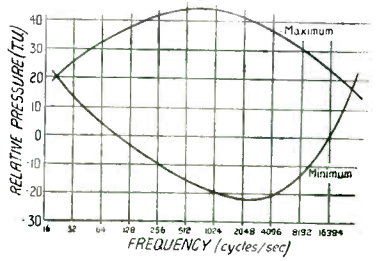
THE sound intensity necessary to produce the sensation of hearing is not by any means constant over the audible frequency range. Even with a person having normally constituted hearing, the variation is considerable, while with a deaf person the conditions are considerably more complex.

Sound pressure is measured in the customary method of so much force per unit area. The force, however, is relatively small, and is customarily measured in terms of dynes per square centimetre.

The diagram given herewith shows the manner in which the sensitivity of the ear varies at the different frequencies. The lower curve gives the minimum pressure required to produce audibility. It will be seen that the ear is most sensitive in the region of 1,000 to 4,000 cycles per second.

Below and above these points, the sensitivity falls off very rapidly and at 100 cycles the pressure required to produce the sensation of hearing is nearly 100 times as great as that required at 2,000 cycles per second.

The uppermost curve shows the maximum pressure which can be withstood comfortably without producing a sensation of pain in the ordinary ear. It will be seen that this curve is somewhat flatter than the minimum curve and, moreover, that the peak value does not appear at a position corresponding to the minimum of the lower curve.



Audibility curve of human ear

It will be noted that the two curves cross in the region of 25 cycles and 16,000 to 18,000 cycles. These are the limits of audibility for the average ear.

In the curves shown the zero level corresponds to a pressure of 0.1 dynes per square centimetre, which is the average intensity required by a normal hearing person for perfect clarity.

WIRELESS MAGAZINE Reference Sheet **No. 145**

Crystal-controlled Oscillator

IT is a matter of some difficulty in short-wave transmission to maintain the frequency of the oscillating current absolutely steady. One method by which this may be done very simply is by the use of a crystal control. For this purpose a quartz crystal is utilised, this crystal having been ground beforehand to a certain predetermined thickness.

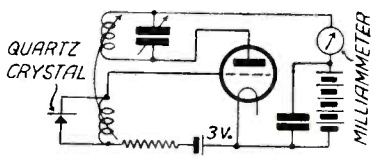
Such a crystal placed in between two metal plates exhibits certain very marked electro-mechanical resonance effects and various circuits may be devised utilising the phenomenon.

The circuit shown on this sheet illustrates a simple oscillating circuit in which the frequency, when the operation is correctly adjusted, is controlled and maintained absolutely constant by the crystal.

The circuit will be seen to consist of a simple tuned-anode oscillating circuit. Across the grid coil, however, is connected a quartz crystal, and when the tuned circuit is adjusted to the particular frequency at which the crystal resonates, the circuit will continue to oscillate at the crystal frequency irrespective of any minor deviations in the tuning capacity or in any external capacities.

As the tuning condenser in the anode circuit is rotated, the anode-feed current will be found to dip suddenly at one particular point. This is the spot at which the crystal takes control, and once the control has started, it will be found that the anode condenser can be moved several degrees on either side of the actual tuning point without making any difference to the frequency of the oscillation.

The frequency is thus maintained fixed at the predetermined value, which is controlled entirely by the mechanical dimensions of the crystal.



Oscillating circuit with crystal control

My U.S. Radio Diary (Cont. from p. 185)

We found him, on the twenty-first floor of the William Penn Hotel, just as some of the control men were getting excited about a rather fine reception they were getting from PHI, the Huizen short-waver.

We were reminded that KDKA is not only a world-wide short-wave broadcaster, but also a prominent outlet of the N.B.C., an organisation for which our respect grew as our tour progressed.

A Visit to KDKA

"There's nothing much more to see here, boys," said Dare Fleck, "so let us take an hour or two off and drive out to the KDKA short-wave gear—which you've heard so much about in England."

We seconded the proposal and were soon driving through the beautiful Shenley Park to the high ground some fifteen miles out of the town where KDKA is situated. Here we found engineers keeping a steady eye on the modulation meter indicating the signal strength of PHI, which was still coming in remarkably well. This was about 11 a.m. Pittsburgh time.

For the information of WIRELESS MAGAZINE readers we made special inquiries about the KDKA television transmissions. These take place regularly, on a wavelength of 63.5 metres, on Monday, Wednesday, and Friday. The hour is not a very convenient one for British fans, being 10 to 11 p.m. Pittsburgh time. Sixty holes are used in the disc, which rotates at 1,200 revs. per minute.

Television Pioneers

Television is a fit subject for the pioneering instincts of KDKA to grapple with, and real work is being put into it by earnest engineers. Little or no amateur participation is possible, according to these engineers, owing to the high power required to run the picture lamp.

The television receiver at KDKA is quite a simple affair; "fast" and "slow" rheostats control the speed of the scanning disc, which is run by a synchronous motor. The pictures are not absolutely stationary, due to the absence of a synchronising wave. A viewing lens about the same size as used in Baird's receivers was observed. I gathered that a television receiver with a room-size projection is available, this enlarged effect being obtained by fitting a magnifying glass to each hole of the disc.

"When in Cleveland," our friend Mr. Palmer had advised us, "you must call on the three Howlett brothers—they'll surely interest you." Thus exhorted, we made a point of looking up WHK, on the twentieth storey of the Engineers' National Bank in Cleveland, Ohio.

"Here we are," explained one of the Howlett brothers, "working on a schedule from 7.30 a.m. to 1 a.m. the next morning!" A professor friend of the brothers has a fine short-wave set, which has enabled WHK to give its listeners the chimes from Big Ben via 5SW for many weeks.

WHK is, so I am told, the fourth oldest station in the U.S.A. Its studios overlook the beautiful Lake Erie; there are no shadows in the studios, due to a most ingenious system of lighting. The walls are of Macoustic, to give them the requisite damping effect.

"We heard your station on our portable," we remarked. "It was terrific—how far away is the Hotel Cleveland from here?"

"Just over the street from here," was the reply. No wonder we found tuning a little "flat!"

A Unique Trio

The Howlett Brothers are a unique trio; Eric looks after programmes, Harry keeps the business end of the station in order and "M.A." is the station manager. Eighteen years ago the brothers emigrated from Hull to start afresh in Winnipeg.

Their varied talents, when combined, meet the basic needs of an American radio station; so to Cleveland they trekked, to run what is the most go-ahead station in Cleveland. "Not so bad for 'three dumb Englishmen' are we?" laughingly asked Harry Howlett. We agreed that they deserved congratulation.

Just before we left New York—the very day of our departure for England—we were privileged to witness a private demonstration of colour television in the Bell Telephone Laboratories, thanks to the courtesy of Paul B. Findlay.

What we saw has already been chronicled in the pages of *Amateur Wireless*.

LATEST EXHIBITION NEWS

EVERY WIRELESS MAGAZINE reader who wants the latest and most complete news of the Radio Exhibition, should make a special point of ordering our weekly contemporary, *Amateur Wireless*.

Two special and enlarged Olympia numbers will be published, the first on September 19 (four days before the opening); this will contain a complete stand-to-stand guide. The second exhibition number will appear on the following Thursday, September 26. The price of each will be 3d., as usual.

INDEX TO ADVERTISERS

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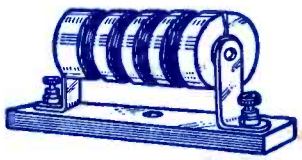

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