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REFERENCE BOOK

WIRELESS DICTIONARY AND LIST OF AMATEUR CALL SIGNS

Edited by
BERNARD E. JONES
Editor
'AMATEUR WIRELESS'

FULLY ILLUSTRATED

CASSELL AND COMPANY, LIMITED
London, New York, Toronto, & Melbourne

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INDEX

THE

"AMATEUR WIRELESS" REFERENCE BOOK

Compiled by the Technical Staff of "Amateur Wireless."

AERIALS AND EARTHS

OUTDOOR aerials are of two main types, the inverted L-type (Fig. 1) and the T-type (Fig. 2). The question of which type of aerial to be adopted is usually decided by the position and shape of the house and by the size of the garden.

The Inverted L-Aerial.—This type has distinct directional properties. For maximum signal strength the aerial should be erected in a direct line with the direction of the broadcasting station, with the lead-in end nearer to the station than the free end. For very short wavelengths a single-wire inverted L-aerial is very efficient, while for higher wavelengths a twin-wire aerial of the same type is recommended.

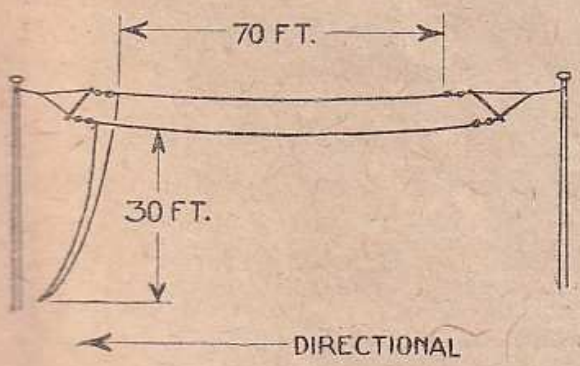


Fig. 1.—Inverted L-Type Aerial.

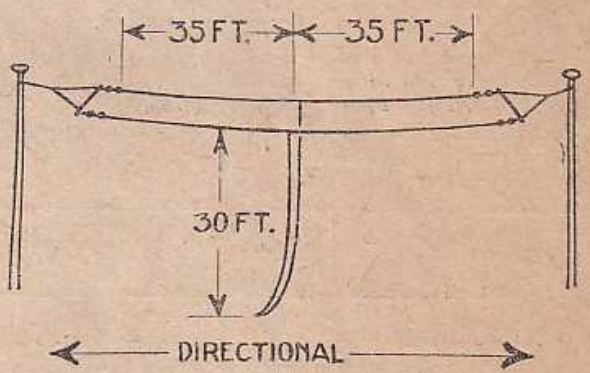


Fig. 2.—T-Type Aerial.

The T-Aerial.—With this aerial the most important consideration is that both arms should be of equal length. If they are unequal in length each arm will have its own natural wavelength, and sharp tuning will be impossible. The T-aerial has directional properties in both directions. That is, if the aerial is running north and south reception from a northern station will be equal to that from a southern station, provided, of course, that these stations are at an equal distance away.

The Cage Aerial.—Where an aerial with a large self-capacity (as for transmitting) is desired, it is usual to construct one of the "cage" or "sausage" type. This aerial is inefficient for reception of low wavelengths, and is primarily intended for transmitting purposes.

Natural Wavelength.—The natural wavelength of an aerial of the usual form may be taken as 4·5 times its electrical length (Figs. 1 and 2). Thus a standard 100-ft. aerial has a natural wavelength of 450 feet; that is, 137

metres approximately. The average aerial capacity is ·0003 microfarad.

Regulations.—The Postmaster-General's regulations concerning aerials contain the following: Length (i.e. span plus lead-in) must not exceed 100 ft.; height must not exceed 100 ft.

An aerial, however, may contain several wires, say 70 ft. long, with a lead-in of 30 ft.

Frame Aerials.—The advantage of a frame aerial lies in the marked directive properties it possesses. Powerful reactive circuits may be used in conjunction with them without fear of serious interference. Provision should be made for the frame to rotate so that any position may be taken up. Following is a table of winding data and corresponding wavelengths for a frame aerial having sides each measuring 2 ft. A variable condenser of ·0005 microfarad capacity must be connected in parallel with the aerial. The wire used for winding on the frame is 22 S.W.G. or 24 S.W.G., enamelled, and each turn spaced $\frac{5}{32}$ in. from the next.

Min. Wavelength	*Turns*	*Length of Wire*
180 Metres	6	50 feet
300 ,,	9	74 ,,
500 ,,	12	98 ,,
600 ,,	15	122 ,,
700 ,,	18	146 ,,
800 ,,	21	170 ,,

For higher wavelengths a larger frame will be required. The table in the next column is suitable for frames having each side 4 ft. in length.

COILS

Conductor Characteristics.—When any two insulated current-carrying wires are brought close together they form the plates of a condenser whose capacity depends upon (1) the size of the wires, (2) the difference of potential between them, (3) the distance for which they run side by side, (4) their proximity to one another.

Turns	*Space between turns*	*Wire*	*Wavelength with condenser in parallel*
25	$\frac{1}{8}$ inch	enamelled	1000
30	$\frac{1}{8}$,,	,,	1500
60	$\frac{1}{8}$,,	,,	2500

Single-layer Coils.—The single-layer inductance consists of turns which lie very close together. The end to which the aerial is attached is at a high potential, the earth end at low potential. There is therefore a considerable difference of potential between the first turn and the last. But between the first and second turns, which run side by side, the difference is very small indeed; hence capacity between them is at a minimum. In the single-layer coil each turn is separated by a considerable distance from those whose potential is appreciably different from its own. For this reason this type of coil is particularly efficient. Its only drawback is its bulkiness.

Slab Coils.—If having wound 100 turns on to a tubular former from left to right, a second layer containing the same number is put on, working backwards from right to left, turn No. 200 will lie immediately over turn No. 1. There is the greatest possible difference of potential between these two turns, and they lie close together for their whole length; hence the capacity between them is large. It will also be big between No. 199 and No. 2, and so on.

The object of the coil designer must be to keep turns between which there is a large potential difference as far

apart as possible and to separate adjacent turns if he can. By so doing he will keep self-capacity low.

Basket Coils.—One solution of the problem, and a fairly successful one, is seen in the basket coil, the flat narrow inductance sometimes called

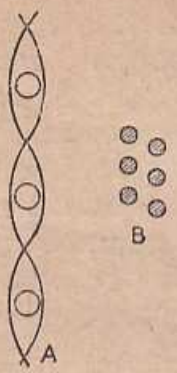


Fig. 3.—Plan and Section of Basket Winding.

the pancake or the spider's web. Here the winding takes the form of a spiral put on to a former shaped like a wheel minus the rim, the wire being woven in and out of the "spokes," just as a basket maker lays on his withes. A glance at one of these coils will show that turns between which there is a big difference of potential are as far as possible apart. The first turn is near the centre, the last at the circumference of the coil. Secondly, no two turns lie closely side by side. They are separated at one point by the width of the spokes, then they approach, cross at an angle and diverge again. Thirdly, adjacent layers are not in contact. Owing to the criss-crossing layer No. 2 separates No. 1 from No. 3 by an air space. Unfortunately the basket coil is a flimsy affair which cannot stand by itself. Manufacturers stiffen it by dipping it into paraffin-wax or shellac, thus doing away with the air space between turns and replacing this by a dielectric with two or three times the value of air. Thus they reduce self-capacity by the method of winding and increase it by dipping the coil. The best baskets are those wound on formers which are left in place; no dressing is then needed and the full benefits of the design are obtained. This point should be borne in mind.

Baskets are not suitable for wavelengths over about 3,000 metres. Above this size they become unwieldy unless they are made of very fine wire, which adds an undesirable amount of resistance. Various modifications of the basket idea have been designed to meet the difficulty. The basket has only one turn to the layer. Looked at from above its windings appear as seen in A (Fig. 3). In section they are as in B (Fig. 3).

Lattice Winding.—The lattice-wound coil A and B (Fig. 4) is broader, and therefore contains far more wire than the basket if the two are of equal diameter. It is a kind of cross between the basket and the single-layer inductance. Its first layer consists of, say, fifteen turns wound side by side. The sixteenth turn is a zigzag running right round the coil. The seventeenth is wound straight over the

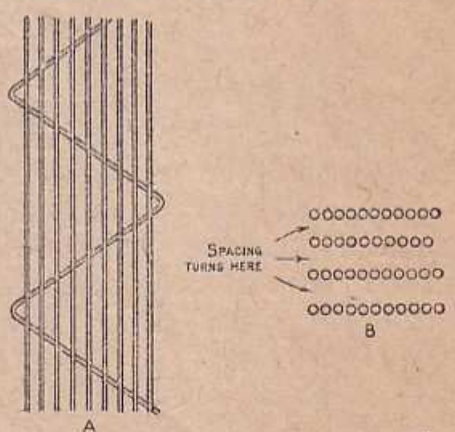


Fig. 4.—Plan and Section of Lattice Winding.

first, the eighteenth over the second, and so on until the thirty-first is reached. The thirty-second is again a zigzag turn.

In this type of coil the first fifteen turns are exactly like those of the

single-layer inductance, and have the same low capacity. The sixteenth crosses all of them, but it does so at an angle, therefore there is little capacity between it and any of them. The seventeenth turn (not the thirty-

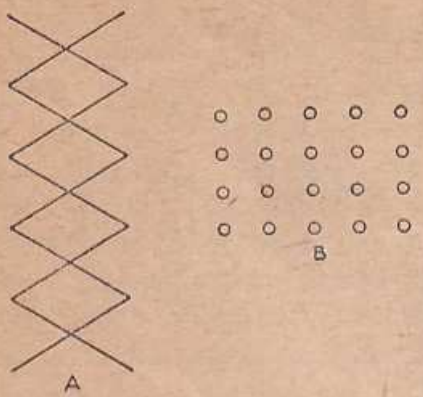


Fig. 5.—Plan and Section of Honeycomb Winding.

first, as would be the case in a plain double-layer coil) lies over the first, but it is separated from it by an air space equal to the diameter of the wire in the zigzag spacing turn as will be evident from a careful study of the diagrams Fig. 4 (A and B).

Honeycomb Coils.—The next step was to make *all* the turns zigzag, each acting as a separator for the others. This kind of winding produces the honeycomb coil shownin Fig. 5, A. Honeycomb coils can be distinguished in a moment from others if they are looked at from above. Each zigzag turn is immediately over the one that precedes it ; hence the spaces between turns look like the cells of a beehive save that they are diamond-shaped instead of hexagonal. It is possible to see right down to the core beneath. The honeycomb is a very good coil, for it gives air-spacing between both turns and layers. It has, however, the drawback that when its windings are seen in section (Fig. 5, B) the turns form vertical rows. The space between them is therefore only equal to the diameter of the wire used. It was found that self-capacity could be considerably reduced by making a small improvement.

Duolateral Coils.—This improvement, which consists in winding successive layers so that they are not immediately over those below them, produced the duolateral inductance seen in Fig. 6, A. In this drawing the heavy lines represent the turns of the outer of two layers, the dotted lines those of the one below it. When a duolateral coil is viewed from above, the cells noticeable in the honeycomb type are not to be seen. The wires appear to be interwoven like the threads in a very course piece of sacking.

The effect of winding inductances in this way is to "stagger" the turns when seen in section. Fig. 6, B will make this plain.

Tuning Coil Data.—A table of winding data for coils of the honeycomb, duolateral, lattice, and basket types is given on p. 9. The approximate wavelengths are given in the first column.

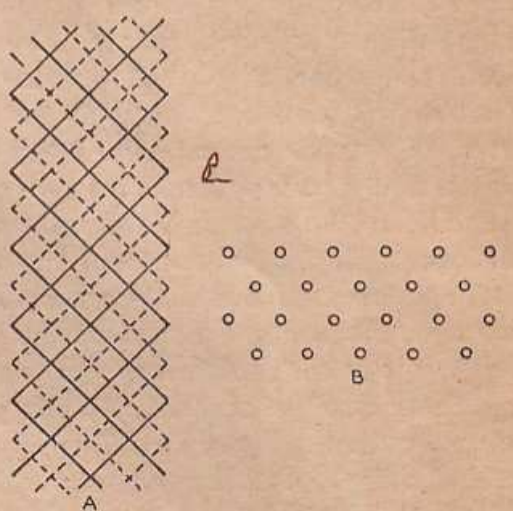


Fig. 6.—Plan and Section of Duolateral Winding.

Suitable formers for the above coils would be 2 in. diameter and 1 in. long.

Cylindrical Coils.—The table (p. 10) gives the wavelengths of "solenoid" or single-layer cylindrical coils. One

of these coils may be wound to a desired wavelength and tappings taken off at any particular intermediate wavelength required.

coil (the secondary) sliding in and out of the primary. Both coils should be tapped, and two variable condensers of ·0005 microfarad placed across

TABLE OF COIL WINDINGS

Wavelength	*Primary Coils With ·001 mfd. condenser in parallel*		*Secondary Coils With ·0005 mfd. condenser in parallel*		*Reaction Coils*	
	Turns	*S.W.G. (d.c.c.)*	*Turns*	*S.W.G. (d.c.c.)*	*Turns*	*S.W.G. (d.c.c.)*
300 — 500	35	26	50	26	75	26
500 — 800	50	26	75	26	75	26
900	75	26	150	28	150	28
1,100	100	28	150	28	200	28
1,600 — 2,200	200	28	250	28	200	28
3,000	250	28	400	30	250	28

Variometers.—Windings for broadcast wavelength ranges are given in the following table of dimensions, etc.

primary and secondary coils, one across each. The table gives particulars of useful sizes.

PARTICULARS OF LOOSE-COUPLERS

Primary Coil		*No. of Turns*	*S.W.G.*	*Turns per tap*	*Secondary Coil*		*No. of Turns*	*S.W.G.*	*Turns per tap*	*Approx. Wavelength*
Length	*Diameter*				*Length*	*Diameter*				
4	3	80	22 d.c.c.	8	4	2½	140	26 d.c.c.	14	To 500
4	4	150	28 d.c.c.	15	4	3	200	32 d.c.c.	20	To 1,000
12	7	500	28 d.c.c.	50	12	6	850	30 enam'led	85	To 6,000

The formers may be ebonite or cardboard.

Stator		*Rotor*	
Diameter in inches	*Turns of No. 24 d.c.c.*	*Diameter in inches*	*Turns of No. 24 d.c.c.*
3½	45	2½	50
4	38	3	42
4½	34	3½	38

Loose-Couplers.—A loose-coupler is a very efficient and selective tuner. The usual arrangement is to have one

Inductances in Series.—For inductances in series the total inductance is equal to the sum of the individual inductances :

$$L = L_1 + L_2 + L_3 + \text{etc.}$$

Inductances in Parallel.—For inductances in parallel the total inductance L is found thus

$$\frac{1}{L} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \text{etc.}$$

where L_1, L_2, and L_3 are the individual inductances.

Inductance of Single-layer Coils.—This may be found approximately from the formula :

$$L\ (\text{mics.}) = \frac{(5 \times D \times T)^2}{W + \frac{D}{3}} \times \frac{1}{1000}$$

of the circuit is ·0013 microfarad (·001 + ·0003 = ·0013). Similarly the inductance of the aerial must be added to the inductance of the coil. The self-capacity of the coil may be neglected.

WAVELENGTHS OF CYLINDRICAL COILS

No. of Turns of No. 24 S.W.G. enamelled copper wire	*Diameter of Coil in Inches*										
	2	2·4	2·8	3·2	3·6	4	4·4	4·8	5·2	5·6	6
10	130	135	140	140	148	153	158	162	165	170	175
20	180	195	205	220	230	241	255	266	280	295	305
30	230	250	275	295	315	335	355	275	390	420	440
40	270	300	330	355	385	410	440	370	500	525	560
50	315	350	385	415	455	490	520	535	590	625	660
60	355	400	440	495	520	560	600	650	690	730	770
70	390	435	485	535	580	630	675	725	775	825	875
80	430	480	535	590	650	700	750	805	855	910	965
90	465	520	580	640	695	750	805	865	925	985	1,050
100	490	535	620	685	745	800	870	935	1,000	1,072	1,140
110	525	590	660	730	790	860	935	1,002	1,072	1,145	1,215
120	555	630	705	775	845	920	1,000	1,075	1,150	1,225	1,300
130	580	660	730	800	875	955	1,040	1,125	1,210	1,295	1,375
140	605	685	755	825	900	990	1,080	1,175	1,270	1,360	1,450
150	630	720	800	875	965	1,045	1,140	1,235	1,335	1,430	1,525
160	655	750	835	920	1,010	1,105	1,200	1,295	1,400	1,500	1,600
170	675	790	855	955	1,045	1,137	1,240	1,345	1,450	1,560	1,670
180	700	795	890	985	1,080	1,170	1,280	1,395	1,505	1,620	1,740
190	720	830	925	1,020	1,120	1,225	1,342	1,460	1,572	1,687	1,810
200	740	850	960	1,060	1,165	1,280	1,405	1,520	1,640	1,755	1,880

where { D = diameter in inches; T = number of turns; W = length in inches of portion wound.

Wavelength.—The wavelength of a tuned oscillatory circuit may be found thus :

$$\text{Wavelength in metres} = 1885 \times \sqrt{C \times L}$$

C = capacity of circuit (microfarads)

L = inductance of circuit (microhenries).

If the aerial has a natural capacity of ·0003 microfarad and the aerial-tuning condenser (in parallel) has a capacity of ·001 microfarad, the total capacity

CONDENSERS

Fixed Condensers.—The following data will be useful to the amateur who builds his own condensers. A table on p. 12 gives the No. of copper- or tin-foil plates and their dimensions to give the required approximate capacity in the first column. Mica ·002 in. thick is used.

Capacity of Fixed Condensers.—The capacity of a fixed condenser may be found from the formula :

$$C\ (\text{mfd.}) = \frac{A \times K \times N}{50000d \times 900}$$

K = dielectric constant (*see* table on p. 12)

N = number of dielectrics

A = area of overlap of 1 plate in square inches

d = thickness of dielectric in inches.

Best *ruby* mica should be used for the dielectric. The mica should be ·002 in. thick.

Specific Inductive Capacity.—The property of a dielectric by virtue of which it is able to store electrical energy is known as its "specific-inductive capacity." This is usually denoted by the letters S.I.C. Another name for S.I.C. is "dielectric constant." (See table on p. 12.)

Variable Condensers.—The metallic surfaces in these condensers are separated by air and are so constructed that one set of plates are movable and can interlace with the fixed set of plates. Thus a variable capacity may be obtained.

The plates are usually of aluminium and of No. 22 S.W.G. Spacing washers may be obtained in thickness varying from $\frac{1}{8}$ in. to ·067 in. The former thickness is the more usually encountered. Fig. 7 shows the standard dimensions of fixed and moving plates.

TABLE OF USEFUL DATA FOR COIL WINDING

Standard wire gauge	*Diameter in inches*	*Sectional area in square inches*	*Resistance in ohms per yard at 60 deg. F.*	*Resistance in ohms per lb. at 60 deg. F.*	*Lb. per ohm.*	*Weight in lb. per 1,000 yards*	*Yards per lb.*	*Turns per inch*					*Standard wire gauge*
								Enamel covered	*Single silk covered*	*Double silk covered*	*Single cotton covered*	*Double cotton covered*	
10	·128	·012870	·001868	·0120	83·3	148·8	6·67		7·64	7·55	7·35	7·04	10
11	·116	·010570	·002275	·0200	50·0	122·2	8·16		8·41	8·30	8·06	8·69	11
12	·104	·008495	·002831	·0280	35·7	98·22	10·23		9·35	9·22	8·93	8·48	12
13	·092	·006648	·003617	·0550	18·1	76·86	13·00		10·5	10·4	10·0	9·43	13
14	·080	·005027	·004784	·0820	12·2	58·12	17·16	↓	12·1	11·8	11·4	10·6	14
15	·072	·004072	·005904	·1400	7·14	47·08	21·23		13·3	13·1	12·5	11·6	15
16	·064	·003217	·007478	·2021	4·95	37·20	26·86	15·0	14·9	14·6	14·1	13·2	16
17	·056	·002463	·009762	·3423	2·38	28·48	35·00	17·1	16·9	16·5	15·9	14·7	17
18	·048	·001810	·01328	·6351	1·56	20 92	47 66	19·8	20·0	19·4	18·5	17·2	18
19	·040	·001257	·01913	1·315	·757	14·53	68·66	23·7	23·8	23 0	21·7	20·0	19
20	·036	·001018	·02362	2·012	·497	11·77	85·00	26·1	26·3	26·3	25·3	21·7	20
21	·032	·0008042	·02990	3·221	·309	9·299	107·6	29·4	29·4	28·2	26·3	23·8	21
22	·028	·0006158	·03905	5·498	·181	7·120	140·6	33·3	33 3	31·8	29·4	26·3	22
23	·024	·0004524	·05313	10·14	·098	5·231	191·6	38·8	38·5	36·4	33·3	29·4	23
24	·022	·0003801	·06324	14.38	·069	4·395	228·3	42·1	42·1	40·0	35·7	31·3	24
25	·020	·0003142	·07653	21·08	·0471	3·632	275·3	46·0	46·0	43·5	38·5	33·3	25
26	·018	·0002545	·09448	32·21	·0309	2·942	340·0	50·6	50·6	47·6	41·7	35·7	26
27	·0164	·0002112	·01138	46·55	·0215	2·442	410·0	55·9	55·1	51·6	44·6	37·9	27
28	·0148	·0001720	·1398	70·12	·0141	1·989	503·0	61·4	60·4	56·2	48·1	40·2	28
29	·0136	·0001453	·1655	98·65	·0101	1·680	596·6	66·2	65·2	60·2	51·0	42·4	29
30	·0124	·0001208	·1991	142·75	·0069	1·396	716·6	73·3	72·0	67·1	54·4	44·7	30
31	·0116	·0001057	·2275	185·80	·0054	1·222	820·0	77·8	76·3	70·9	56·8	46·3	31
32	·0108	·0000916	·2625	243·20	·0040	1·059	943·3	73·0	81·3	75·2	63·3	50·5	32
33	·0100	·0000785	3061	337·50	·0029	·9081	1100	88·9	87·0	80·0	66·7	52·6	33
34	·0092	·0000665	·3617	471·00	·0023	·7686	1300	98·0	93·4	85·5	70·4	54·9	34
35	·0084	·0000554	·4338	676·50	·0014	·6408	1556	106	101	91·8	80·6	61 0	35
36	·0076	·0000454	·5300	1009·0	·00098	·5254	1903	116	110	102	86·2	64·1	36
37	·0068	·0000363	·6620	1574·0	·00064	·4199	2380	128	120	110	92·6	67·6	37
38	·0060	·0000283	·8503	2598·0	·000385	·3269	3056	143	133	121	100	71·4	38
39	·0052	·0000212	1·132	4645·0	·000217	·2456	4066	168	149	134	109	75·8	39
40	·0048	·0000181	1·328	6360·0	·000156	·2092	4766	180	159	142	114	78·1	40
41	·0044	·0000152	1·581	9020·0	·000112	·1758	5700	194	169	150			41
42	·0040	·0000126	1·913	13150	·000076	·1453	6866	211	191	167	↑	↑	42
43	·0036	·0000102	2·362	20120	·000050	·1177	7500	230	206	179			43
44	·0032	·0000080	2·989	32210	·000030	·0929	10766	253	225	192			44
45	·0028	·0000062	3·904	54980	·000015	·0712	14066	282	247	208			45

The table on p. 13 is a useful list of capacities, using standard size "vanes" or plates, and $\frac{1}{8}$ in. spacing washers.

Condensers in Series and in Parallel.—The resultant capacity of condensers joined up in *parallel* is the sum of the individual capacities.

If several condensers of capacities C_1, C_2, C_3, etc., are joined in *series*, the resultant capacity C is given by:

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \text{etc.}$$

Condenser Values in Wireless Circuits.—The aerial tuning condenser should be variable and have a maxi-

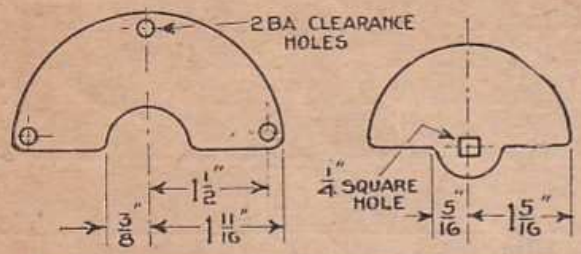


Fig. 7.—Dimensions of Standard Condenser Plates.

mum value of ·0005 microfarad to ·001 microfarad.

The secondary coil should have a ·0005 microfarad variable condenser connected in parallel.

Anode coils should be tuned with a five-plate variable condenser.

The grid condenser should have a value between ·0001 and ·0003 microfarad inclusive and need not be variable.

Other fixed condensers should have the following values: H.T. condenser, ·5 to 2 microfarads; phones condenser, ·002 microfarad; the condenser across the primary of L.F. transformers, ·002 microfarad.

Burndept Coils

Coil No.	*Wavelength, using ·00075 mfd. cond.*
S. 1	310 — 380
S. 2	350 — 470
S. 3	430 — 640
S. 4	600 — 900
75	700 — 1,100
100	950 — 1,450
150	1,300 — 2,100
200	1,900 — 3,000
300	2,600 — 4,100
400	3,700 — 5,800
500	5,500 — 9,000
750	8,500 — 13,500
1,000	12,500 — 21,000

Crystal Detectors

The following list gives the names of some of the better-known crystals. There are many others, especially those now marketed under various fancy names ending in "ite." The majority of these are purely and simply galena.

Bornite	$3Cu_2S_3Fe_2S_3$
Carborundum	SiC
Cassiterite (tinstone)	SnO_2
Copper pyrites	$Cu_2S_2FeS_2$
Galena	PbS
Graphite	C
Hessite	Ag_2Te

Dielectric Constants

Material	*S.I.C.*
Plate glass	4·5
Flint glass	4 to 6
Mica	6
Ebonite	2·75
Paper (Manilla)	1·5
Air	1
Paraffin wax	2·5
Presspahn	3
Shellac	3
Porcelain	4

Fixed Condensers

Capacity in mfds. (approx.)	*No. of Plates*	*Dimensions of Plates cms. by cms.*
·0001	2	1 × 1
·0002	2	2 × 1
·0003	2	3 × 1
·0004	2	4 × 1
·0005	2	2½ × 2
·0006	2	3 × 2
·0007	2	3½ × 2
·0008	2	4 × 2
·0009	4	3 × 1
·001	6	2 × 1
·0015	6	3 × 1
·002	6	4 × 1
·0025	6	2½ × 2
·003	6	3 × 2

Hæmatite	Fe_2O_3
Hertzite	PbS
Iron pyrites	FeS_2
Malachite	$CuCo_2CuH_2O$
Molybdenite	MoS_2
Silicon	Si
Tellurium	Te
Tungstellite	
Zincite	ZnO

The chemical formula of a pure specimen is given in most cases.

Crystal Contacts.—It is most important to use the right contact in conjunction with any particular crystal. Here is a list to guide the amateur.

Galena.—A silver, copper, or brass whisker.

Molybdenite.—A flat silver strip.

Silicon.—A gold or steel whisker.

Carborundum and Steel.—In the resistance of vibration and static disturbances and for constancy in action, this combination remains supreme. An added potential by means of a battery and potentiometer is necessary.

Crystal Combinations.—Besides the well-known zincite-bornite combination of crystals there are other combinations that are as good but less known. Four others are given: Galena - tellurium, tellurium - zincite, carborundum-silicon, copper pyrites-tellurium.

CAPACITIES OF VARIABLE CONDENSERS

No. of Fixed Plates	*No. of Moving Plates*	*Approx. Capacity in mfds.*
43	42	·0015
29	28	·001
22	21	·0075
15	14	·0005
10	9	·0003
7	6	·0001
2	1	Vernier

VALVES

A useful list of receiving valve data is given in the following table. In the column marked "Purpose," the letters signify the use for which the valves are best suited. G means a

VALVE DATA

Type of Valve	*Filament Voltage*	*Filament Amperes*	*H.T. Voltage*	*Purpose*
B.T.H. B 3	2·0	·35	20—80	G
,, B 4	6·0	·25	40—100	D L
,, B 5	2·5—3	·06	20—80	G
,, R	4·0	·63	45—60	G
Cossor P 1	3·5	·73	20—80	D L
,, P 2	3·5	·73	20—80	H
,, "Wuncell" W 1	1·6—1·8	·3	30—70	D L
,, ,, W 2	1·6—1·8	·3	30—70	H
Dextraudion	1·0	·1	20—150	G
Ediswan A R	4·0	·75	30—80	G
,, R	4·0	·75	50—100	G
,, A R D E	1·8—2·0	·3	20—50	G
,, A R 06	2·5	·06	20—50	G
,, P V 1	6·0	1·5	300—600	L
,, P V 2	6·0	1·5	200—400	L
,, P V 3	4·0	·7	70—110	L
,, P V 5 D E	5·0	·25	50—150	L
G. W. L. A 1	4·6	·45	50—200	L
,, G 1	4·0—6·0	·45	50—120	H D
Louden (Plain)	4·8—5·0	·4	40—80	D L
,, (Blue)	4·8—5·0	·4	40—80	H
Marconi-Osram D E R	1·8	·4	30—70	G
,, ,, D E Q	3·0	·2	24	L
,, ,, D E V				H
,, ,, D E 3	2·4—3	·06	30—80	G
,, ,, D E 4	3·6	·32	30—150	G L
,, ,, D E 5	5·0	·25	30—150	L
,, ,, D E 6	1·8	·4	30—150	L
,, ,, F E 1	4·5	1·5	24—100	Four-electr'de
,, ,, F E 2	4·5	1·5	24	
,, ,, L S 1	6·0	1·5	300—600	L
,, ,, L S 2				
,, ,, L S 3	4·0	·65	70—100	L
,, ,, L S 5	4·5	·8	150	L
,, ,, Q	5·0	·45	25—200	L
,, ,, Q X	5·0	·75	25—100	D
,, ,, R	4·0	·67	70	G
,, ,, R 4 B	3·8	·65	50—70	G
,, ,, R 4 C				
,, ,, R 5 V	5·0	·65	30—150	G
,, ,, V 24	5·0	·75	24—30	H
Mullard D F	2·0—3·0	·06	20—100	G
,, D F A 0	3·5	·35	30—40	L
,, D F A 1	5·5	·2	30—40	L
,, D F A 2	3·5	·25	20—25	L
,, L F Ora A	1·4	·2	20—50	G
,, L F Ora B	1·4	·3	20—50	G
,, L F Ora C	1·4	·4	20—50	G
,, 1-volt Ora	1·0	·25	30—150	G
,, Ora A	3·8	·62	20—50	G
,, Ora B				
,, P A 1	6·0	1·5	200—400	L
,, P A 2	5·5	·85	100—200	L
,, P A 3	4·0	·67	70—120	L
,, R A	3·8	·67	50—80	D L
,, S 3	6·0	·65	15—30	—
Myers	4·0	·6	20—300	G
,, D E	2·5	·25	20—300	G
Penton H E 2	—	—	—	G
,, H E 4	5·0	·15	60	G
Thorpe K 1	5·0	·42	50—100	G
,, K 4	—	—	—	Four-electrode
Wecovalve	·8—1·1	·25	17—45	D L
Xtraudion	4·0	·4	30—7[illegible]	G

general-purpose valve; D, a detector valve; H, a high-frequency amplifying valve; and L, a low-frequency amplifying valve.

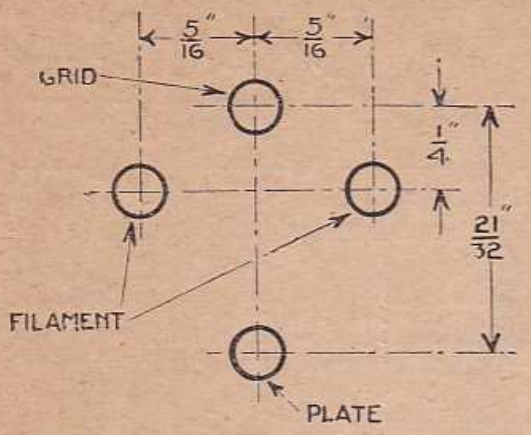


Fig. 8.—Valve Leg Spacing.

Valve Holders.—Frequently the constructor who drills his own ebonite panel experiences difficulty in drilling the holes for the valve socket in the correct positions. It is advisable to make a small brass template with the necessary holes correctly drilled, which can be used whenever necessary. Fig. 8 shows the correct setting-out of the holes.

RESISTANCES

Filament Resistances.—For bright-emitter valves the maximum resistance of the filament rheostat should be 5 ohms. Dull-emitter valves need more resistance,—from 25 to 30 ohms.

In making a wire rheostat care should be taken that the current which it will be required to pass does not exceed the safe carrying capacity of the wire used.

Potentiometer.—In multi-valve sets employing several stages of H.F. amplification the use of a potentiometer for controlling self-oscillation is almost essential. The resistance of a potentiometer lies between 200 and 800 ohms.

TRANSFORMERS

Low-frequency Transformer.—These transformers have an iron core and have a step-up ratio of from 1–1 to 1–8. The most usual ratio is 1–5. Particulars of a L.F. transformer having this latter ratio are as follow:

Primary winding—3,500 turns of No. 40 S.W.G. s.s.c. copper wire (1 oz.).

Secondary winding—17,500 turns of No. 47 S.W.G. enamelled copper wire ($1\frac{1}{2}$ oz.).

Bobbin.—$\frac{5}{8}$ in. external diameter tube, $\frac{3}{8}$ in. internal diameter, $1\frac{1}{4}$ in. long. Flanges, $1\frac{1}{2}$ in. diameter, $\frac{1}{8}$ in. thick.

The iron core should be built up of narrow strips or "laminations" of Stalloy iron. The magnetic circuit is closed by similar strips on either side of the windings parallel to the core. These two strips are yoked together by shorter strips at right-angles. Each strip should be enamelled. Fifteen strips will be required for the core, 8 strips each for the two sides, and 16 yoke strips, all $\frac{5}{16}$ in. wide.

Connections for L.F. transformers are—

O P to Plate	O S to —L.T.
I P to +H.T.	I S to Grid.

Telephone Transformer.—It is advisable to use low-resistance telephones in conjunction with a suitable transformer in the plate circuit of a valve. The telephone transformer has a step-down ratio. Suitable windings for 120 ohm phones on an iron core similar to that of the L.F. transformer are:

Primary: $4\frac{1}{2}$ oz. No. 42 S.W.G. s.s.c.
Secondary: 2 oz. No. 36 S.W.G. s.s.c.

If the low-frequency side of the set is inclined to howl, connect all the iron cores to earth. A resistance of the order of 50,000 to 100,000 ohms placed across each of the secondaries of L.F. transformers helps to produce distortionless telephony.

High-frequency Transformers.—The high-frequency transformer differs from the low-frequency transformer in that it has no iron core. There are, of course, other methods of coupling H.F. valves than by the H.F. transformer, but the latter is perhaps the most simple in operation. Below is a table giving winding and wavelength data for the plug-in type of transformer. Fig. 9 shows the pin connections.

Wavelength (·0003 mfd. condenser across primary)	*Turns Primary and Secondary*	*S.W.G.*
300 — 450	50 each	38
400 — 700	75 ,,	38
600 — 1,000	110 ,,	38
900 — 2,000	150 ,,	42
2,000 — 4,000	200 ,,	42

H.T. and L.T. Batteries

Dry Cells.—With the advent of the dull-emitter valve it is possible to use large dry cells as a source of current for filament heating. Each cell has an approximate voltage of 1½, and by joining them in series multiples of this voltage may be obtained. Two of these large capacity cells connected in series would be sufficient for the usual dull-emitter valve. Much smaller cells are used for the high tension battery. Forty of them joined in series—that is, the zinc electrode of one cell connected to the carbon electrode of the next cell and so on—would give 60 volts.

Accumulators.—Secondary batteries, or accumulators used in wireless receivers for the purpose of heating the filaments of valves, are usually of the "pasted-plate" type. These plates are made of spongy lead, or lead peroxide, and are immersed in a liquid, known as the electrolyte. The electrolyte is sulphuric acid and pure water, the specific gravity of which should be about 1·22 (sometimes written 1220). As the cell discharges the specific gravity will fall and the cell should not be discharged to less than a specific gravity of 1170. Specific gravity is conveniently measured by a hydrometer.

Mixing and Adjusting the Electrolyte.—Acid of 1·22 specific gravity contains about 1 part of concentrated pure acid to about 3 or 3½ parts of water

Table of Resistance Wires

S.W.G.	*Eureka*			*German Silver*		
	Resistance per yard	*Yards per lb.*	*Current capacity*	*Resistance per yard*	*Yards per lb.*	*Current Capacity*
18	·37	48	3·5	·177	51	3·5
20	·66	85	2·5	·315	90	2·5
22	1·10	140	1·5	·520	147	1·5
24	1·77	227	1·0	·844	238	1·0
26	2·65	340	0·5	1·26	349	0·5
28	3·91	502	0·25	1·85	527	0·25
30	5·58	714	0·2	2·65	750	0·2
32	7·35	943	0·15	3·50	984	0·15
34	10·13	1,300	0·1	4·82	1,360	0·1
36	14·84	1,905	0·5	7·06	2,000	~~0·5~~ ·05
38	23·81	3,060	—	11·33	3,295	—
40	37·18	4,761	—	17·70	4,920	—

by volume. In mixing this, add the acid slowly to the water (and not the water to the acid), and wait till the solution is cold.

Capacity of an Accumulator.—The "capacity" or holding power is rated

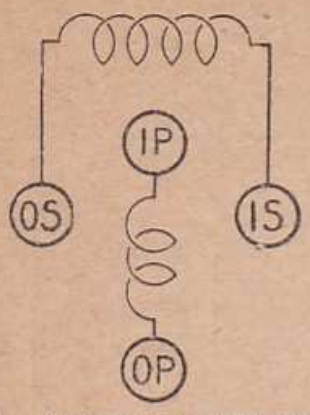


Fig. 9.—Connections of Plug-in H.F. Transformer.

in "ampere-hours." A 100 ampere-hour cell will give a continuous discharge of 5 amperes for 20 hours or 1 ampere for 100 hours.

The capacities of accumulators vary considerably with the make, size, etc., but an average value for the "pasted-plate" type is about 10 ampere-hours per square foot of positive surface (both sides).

The number of negative plates in a multi-plate cell exceeds the number of positive plates by one.

Choosing an Accumulator for Given Set.—A capacity of approximately 10 ampere-hours (actual) should be allowed for every valve of the bright-emitter type having a consumption over ·5 ampere each. For valves having a consumption of ·25 amperes, a capacity of 5 ampere-hours per valve will be suitable.

Charging Rate.—The charging amperes in practice average one-tenth to one-eighth the capacity.

Maximum Discharging Rate.—This largely depends upon the mechanical construction of the plates and should not, as a rule, exceed one-eighth the capacity.

A SHORT DICTIONARY OF WIRELESS TERMS

Aerial.—An elevated system of wires, insulated from the supports and connected in series with the receiver, used to collect the electro-magnetic waves and transform them into high-frequency oscillatory currents. These currents flow into the earth and the receiver detects them on the way.

Aerial, Frame.—The aerial in this case consists of several turns of wire wound on a frame which is able to rotate. The frame aerial usually takes the place of the aerial and the A.T.I.

Æther.—A medium, assumed to exist in space and matter, through which electro-magnetic energy may be transmitted.

Alternating Current.—An electric current which reverses its direction of flow at certain fixed periods.

ACCUMULATOR DATA

Number of Plates in Cells			*Dimensions of Plates*			*Charging Current*	*Discharging Current*	*Capacity*
Total	*Positive*	*Negative*	*Length inches*	*Width inches*	*Thickness inches*	*Amperes*	*Amperes*	*Ampere Hours*
2	1	1	$3\frac{3}{4}$	$1\frac{1}{4}$	$\frac{3}{16}$	·5	·5	3
7	3	4	7	7	$\frac{3}{16}$	8	8	30
7	3	4	15	10	$\frac{1}{4}$	10	12	130
11	5	6	15	10	$\frac{1}{4}$	15	25	220

Ampere.—The practical unit of current.

Amplifier.—An instrument consisting of a number of valves coupled together, used in conjunction with an ordinary receiver for the purpose of magnifying or amplifying the signals received. Amplifiers may be either radio (or high) frequency or audio (or low) frequency. *See* Amplifiers, High-frequency and low-frequency.

Amplifier, High-frequency.—Usually abbreviated to H.F. amplifier. One in which the incoming oscillations are magnified before being passed to the detector for rectification. Amplification may be obtained in several ways, usually by means of air-core transformers between the valves, each transformer being tuned to the wavelength it is desired to receive.

Amplifier, Low-frequency.—Abbreviated to L.F. amplifier. A device which magnifies signals received by the detector. The currents which would normally be passed through the telephones are led to the primary of a low-frequency iron-cored transformer, which has more turns in the secondary than the primary. Thus an increased voltage is delivered by the secondary winding to the grid circuit of a valve. This increased voltage liberates stronger currents in the plate circuit.

Amplitude.—The maximum or minimum value that current or voltage reaches during an alternation.

Anode.—The outer electrode of a valve. Generally a cylindrical metal plate. Also known as the "plate."

Antenna.—*See* Aerial.

A. T. I.—*See* Tuner.

Atmospherics.—Interference caused by electrical disturbances in the atmosphere.

Audio-frequency.—Frequencies which come within the range that can be detected by the human ear.

Audion.—The name given to the first three-electrode valve, which was soft.

Auto-coupling.—*See* Direct-coupling.

Autodyne.—The production of beat notes by some apparatus incorporated in the actual receiver. *See* Self-heterodyne.

Battery, High-tension.—Abbreviated to H.T. It consists of a number of small primary dry cells (or it may be of wet cells or secondary cells) connected in series to give a pressure of between 15 and 600 volts, depending on the type of valve used.

Battery, Low-tension.—Abbreviated to L.T. It is usually a secondary battery, or accumulator, and is connected to valve filaments in order to maintain them in a state of incandescence necessary for the liberation of electrons to enable the valve to function as a rectifier or amplifier.

Beat.—The result of superimposing one alternating current on another of different frequency, used in connection with autodyne and heterodyne reception.

Blocking Condenser.—A fixed condenser used to prevent the passage of D.C. in any circuit.

Buzzer.—An instrument with an automatic make-and-break which will cause damped oscillations in H.F. circuits.

Capacity.—The property which a condenser has of receiving and storing a charge of electricity. It depends upon the size of plates, the distance between them and the nature of the substance filling the spaces. Generally referred to in terms of microfarads.

Capacity-coupling.—The transference of energy from one circuit to another by a condenser connected to both circuits.

Carrier Wave.—A continuous high-frequency wave, emitted by telephony-transmitting stations which, if merely rectified, is turned into a *steady* direct

current, and if heterodyned, gives a steady note in the telephones. By means of a microphone the voice of the speaker is made to vary the amplitude of this wave.

Cathode.—Sometimes spelt kathode. The filament or source of the electron supply in a valve. (The negative electrode.)

Catwhisker.—A pointed metallic contact, usually in the form of a helical coil of wire, used in conjunction with a crystal.

Characteristic Curve.—A curve drawn on squared paper showing the relationship between the potential of the grid and the current in the anode filament circuit.

Choke, H.F.—An inductance of high value with an air core; used to prevent the passage of H.F. currents.

Choke, L.F.—An inductance of high value having an iron core; used to prevent the passage of L.F. currents.

Condenser.—*See* Capacity.

Conductor.—A substance containing electrons which are free to move under the action of an electric field. The only good conductors of electricity are metallic, the atoms of which will, under the slightest provocation, part with an electron.

Counterpoise.—A system of wires directly underneath the aerial, insulated from earth. A capacity to earth is formed through the counterpoise acting as one plate of a condenser and the earth as the other plate.

Continuous Waves.—Usually abbreviated to C.W. Waves which reach the same amplitude at each alternation or reversal.

Coupling, Direct.—If one portion of each of two circuits is common to both circuits, then the two circuits are said to be directly coupled.

Coupling, Indirect.—This is the electrostatic or magnetic connection between two circuits for the transference of energy from one circuit to the other.

Crystal Detector.—A means of detecting damped or modulated waves by which a type of crystalline mineral is used. The crystal has the property of allowing more current to pass in one direction than in the opposite direction.

Damped Waves.—*See* Waves, Damped.

Detector.—A device, usually either a valve or crystal, which has the property of allowing the passage of H.F. currents through them in one direction only.

Dielectric.—The insulating substance between the electrodes or plates of a condenser.

Direct Current.—A current which flows in the same direction continually; such as the current obtained from accumulators and dry cells.

Direction Finding.—A method by which receiving apparatus is so arranged that the operator is able to tell from which direction of its reciprocal received signals are coming. Abbreviated to D.F.

Earth.—An essential part of an aerial circuit. It usually consists of a number of wires buried in the ground under the aerial. Most amateurs make an earth connection by soldering the wire to a cold water pipe. It may be regarded as an electrical reservoir into and out of which the received oscillations may flow as they oscillate in the aerial circuit.

Electrode.—One of the elements composing a valve, such as filament, grid or anode. Also the positive and negative terminals of various other pieces of electrical apparatus.

Electro-magnetic Induction. — The transference of energy from one circuit to another when these circuits

are not connected directly with one another.

Electron.—A particle of negative electricity contained in an atom.

Electro-motive Force.—The force that produces or tends to produce current.

Ether.—*See* Æther.

Filament.—The part of the valve to which the accumulator or dry battery is connected. It is made incandescent by the passage of the current.

Frame Aerial.—*See* Aerial, Frame.

Frequency.—The number of times an oscillating current changes its direction in a given time, usually per second.

Frequency.—*See* Audio-frequency *and* Radio-frequency.

Grid.—The control electrode of a three-electrode valve, usually consisting of a mesh or helical coil of wire surrounding the filament. Potential changes of the grid cause magnified current variations in the anode circuit.

Grid-leak.—A high resistance path connected between the grid of a valve and the positive or negative of the low-tension battery. Placed in shunt across the grid condenser it provides a path or leak whereby the electrons which collect on the grid may return to the filament. Without this leak the accumulation of electrons on the grid would interfere with reception.

Ground.—An American term for earth connection.

Hard Valve.—A valve of which the containing vessel has been exhausted to the highest possible degree. Nearly all English valves are hard.

Harmonic.—Submultiples of the fundamental wavelength radiated from a station.

Heterodyne.—The production of an audible frequency by superimposing one high frequency on another of slightly greater or less frequency. As opposed to autodyne it implies that oscillations are produced by an oscillator which is not part of the receiver.

High-frequency Amplifier.—*See* Amplifier, High-frequency.

High-tension Battery.—*See* Battery.

Impedance.—The resistance offered by a coil to varying current, due to ohmic resistance and the counter E.M.F. created by the varying current.

Inductance.—Analogous to mechanical inertia. The term applied to electrical inertia of a circuit. In an oscillatory circuit the inductance alternately stores the energy in magnetic lines of force and dissipates it by charging the condenser across the coil.

Induction.—The production of varying electric currents in one coil by means of another coil possessing currents similar in form but of opposite E.M.F. in juxtaposition.

Insulator.—A term applied to all materials which form very bad conductors of electric currents. They do, however, allow high-frequency oscillations to pass when they act as the dielectric of a condenser.

Jar.—The Admiralty unit of capacity, being 1-900th or .0011 of a microfarad.

Kilowatt.—A thousand watts. A watt is the electrical unit of power just as a horse-power is the mechanical unit. 746 watts equals 1 horse-power.

Lead-in.—A conductor joined between the aerial proper and the aerial terminal of the receiver. As its name implies, it "leads in" the oscillating currents from the aerial.

Lightning Arrester.—A very small spark gap frequently connected between the aerial and earth terminals of the receiver, so that if the aerial is struck by lightning the discharge will jump across the gap and not flow through the circuit and damage the apparatus.

Loading Coil.—An additional coil, usually placed in the tuning circuit, by which the wavelength of that circuit is increased.

Loose-coupler.—An arrangement of two coils between which the coupling can be varied; frequently used in the aerial circuit of either a crystal or valve receiver. By this method slightly better selectivity is obtained than when direct coupling or only one coil is used.

Loud-speaker.—It consists, usually, of a telephone earpiece with its diaphragm placed very near the small end of a horn of conical or similar shape. The acoustic properties of the horn amplify sound emitted from the earpiece.

Low-frequency Amplifier.—*See* Amplifier, Low-frequency.

Low Tension.—A small value of electrical voltage.

Megohm.—A million ohms.

Mica.—An insulator commonly used for making fixed condensers. Ruby mica is the best to use for this purpose.

Microphone.—A mass of carbon granules loosely packed between two carbon blocks in such a manner that when these blocks are caused to vibrate by air waves striking them the granules are either compressed or released, thus producing a variation in resistance in the microphone circuit. Used in transmitters.

Oscillating Current.—An alternating current of very high frequency.

Oscillating Valve.—A valve so connected that it will produce oscillations. In a receiving circuit this is done by means of a reaction coil coupled back to the aerial or grid circuit.

Phase.—A phase difference is said to exist when one oscillating current is superimposed on another oscillating current (both of the same frequency), provided that the value and direction of one current is not, at any instant, equal to the value and direction of the other current.

Plate.—Another name for the anode of a valve.

Polarity.—The phenomenon of electricity is due to a flow of electrons in a circuit. That place in the circuit from which the electrons are considered as beginning to flow is called the negative pole; thus they flow to the positive pole. In the case of a battery it is incorrectly assumed that current flows from the positive to the negative pole, that is, in the opposite direction to the actual electron stream.

Potential.—The pressure or voltage of an electric current. The amount of current which flows through a given resistance depends upon the potential or pressure of the current applied across its ends.

Potentiometer.—A variable resistance generally used for the purpose of placing the correct potential across a crystal to enable it to rectify efficiently. Carborundum is about the only crystal that needs a potentiometer. It is also used in valve circuits to control the potential of the grids with respect to the filament.

Primary.—That coil of a loose coupler, or winding of a transformer, in which the current first flows. The coil or winding in which an induced current is produced is known as the secondary.

Radiation.—The phenomenon of an aerial throwing off electro-magnetic waves.

Radio Frequency.—Usually called high-frequency current, abbreviated to H.F. This refers to the currents as received in an aerial and earth circuit before they have been rectified or changed to an audible frequency.

Reaction Coil.—The coil used in the plate circuit of a detector valve, and usually magnetically coupled to the aerial or closed circuit of the receiver, is called the reaction coil. By its aid the stronger currents flowing in the plate circuit of the valve are made to react on the incoming oscillations in the aerial circuits. These two sets of

oscillation currents are exactly in step, and provided the coupling between the reaction coil and the aerial or closed circuit is sufficiently close, the plate currents will be superimposed on the incoming oscillations and will pass with them through the valve, producing still stronger current variations in the plate circuit. In this way a single valve may be operated as a detector and regenerative or retroactive amplifier.

Regenerative Coupling. — *See* Reaction Coil.

Resistance.—The property possessed by all substances of offering in a greater or less degree opposition to the passage of an electric current.

Resistance, Filament. — A device placed in series with a valve filament and its accumulator to limit the amount of current supplied to the valve. The brilliancy of the valve filament may thus be adjusted, and its best heat for good reception easily obtained. It consists usually of a spiral of resistance wire having a resistance value of between 5 and 30 ohms, according to the type of valve in use. The filament resistance is made variable by means of a slider which passes over the spiral.

Retroactive Coupling.—*See* Reaction Coil.

Secondary.—The coil of a loose-coupler or winding of a transformer in which a current is induced by the primary.

Self-heterodyne.—As opposed to heterodyne the superimposed oscillations are supplied by the receiver itself.

Self-induction. — Every conductor possesses the property of induction in a greater or less degree, but unless the conductor is wound in the form of a coil with adjacent turns close to one another, the self-induction of the conductor is negligible.

Solenoid.—A magnet, consisting of a cylindrical coil of wire traversed by an electric current.

Specific Inductive Capacity. — A constant applied to dielectrics which has an important bearing upon the capacity of a condenser. If a dielectric of S.I.C. 2 is substituted by a dielectric of S.I.C. 6 the capacity of the condenser is trebled.

Static.—Similar disturbances to atmospherics.

Supersonic.—Frequencies which the ear cannot detect; any frequency above 20,000 per second.

Telephones.—Instruments employed for converting electrical variations into sound waves of audible frequency. They usually consist of coils of fine wire round a magnet, in front of which is mounted a diaphragm. Electric impulses through the coils impart a movement to the diaphragm by magnetic attraction, thus setting up sound waves which affect the human ear.

Transformer.—An instrument provided with two or more windings closely coupled in such a manner that a current variation in one, known as the primary, induces an opposite current in the other, called the secondary. If the secondary is larger, that is, contains more turns of wire than the primary, the device is called a step-up transformer. If the secondary consists of less turns than the primary it is known as a step-down transformer. Transformers used for dealing with radio—or high—frequency currents have an air core, whilst those for use in connection with audio—or low—frequency currents usually have a laminated iron core which may be either open or closed.

Transformer, High-frequency.—This is the coupling device used between successive valves in a high-frequency amplifier. It consists of primary and secondary windings wound close together on a core of non-conducting

material. The primary winding is placed in the plate circuit and is shunted by a small variable condenser. H.F. currents oscillating in this winding are tuned to the wavelength of the aerial circuit by means of a condenser across the primary. These currents are transferred to the secondary winding and thence to the grid of a second valve, and these in turn liberate still stronger currents in the plate circuit of the second valve.

Transformer, Low-frequency. — It consists of primary and secondary windings of very fine wire wound on a core of iron wires or plates. It is of the step-up variety, that is, the secondary has more turns than the primary, the ratio being usually between one to three or five.

Transformer, Telephone.—An instrument consisting of primary and secondary windings of very fine wire, wound on a core of iron wires or plates. The primary usually contains more turns than the secondary. It is used with low-resistance telephones, and obviates the risk of damage to telephone windings by the direct passage of current from the high-tension battery.

Triode.—A 3-electrode valve.

Tuner.—In order to receive signals from a given transmitting station the receiver must be adjusted to the wavelength of the transmitter. This adjustment, or tuning, is effected by varying the amount of inductance and capacity in the receiver circuits. The values of inductances within the receiver will depend on the size of the inductance coil, also the number of its turns included in the circuit, and the amount of capacity (in the form of a variable condenser) in series or parallel with the coil. A fixed inductance coil, that is, one in which the number of turns is not variable, will only tune to wavelengths allowed for by variations in the capacity of the condenser. A loose-coupler is employed where two tuning circuits, aerial and closed, are used for the purposes of reducing jamming. The three-coil tuner contains mountings for three coils, one in the aerial circuit, one in the closed circuit, the third one being the reaction coil. Coupling between the circuits is effected by varying the distances between the coils.

Valve.—The valve is a vacuum tube of glass containing a filament, grid, and plate. The grid is usually a wire spiral surrounding the filament, and the plate consists of a metal cylinder surrounding both filament and grid, neither component touching the other. For detecting purposes the tuner is connected to grid and filament; and the telephone or plate circuit, which contains the telephones and high-tension battery, is joined to the plate and filament of the valve. An accumulator of two, four, or six volts is connected to the filament in order that the latter may be made hot. When the filament is glowing it throws off particles of negative electricity (electrons) which are attracted by the plate, this being at positive potential by reason of its connection to the positive pole of the high-tension battery. This flow of electrons between filament and plate constitutes a conducting path for currents from the high-tension battery, which currents pass through the telephones and impart a movement to the diaphragm when the current starts and stops. Incoming oscillations, which take the form of waves, of which the upper halves are positive and the lower negative, come on to the grid from the tuning circuits. The positive half of a wave charges the grid positively and thus assists the plate in its attraction of electrons from the filament, consequently a current flows in the plate circuit. The negative half of a wave charges the grid negatively,

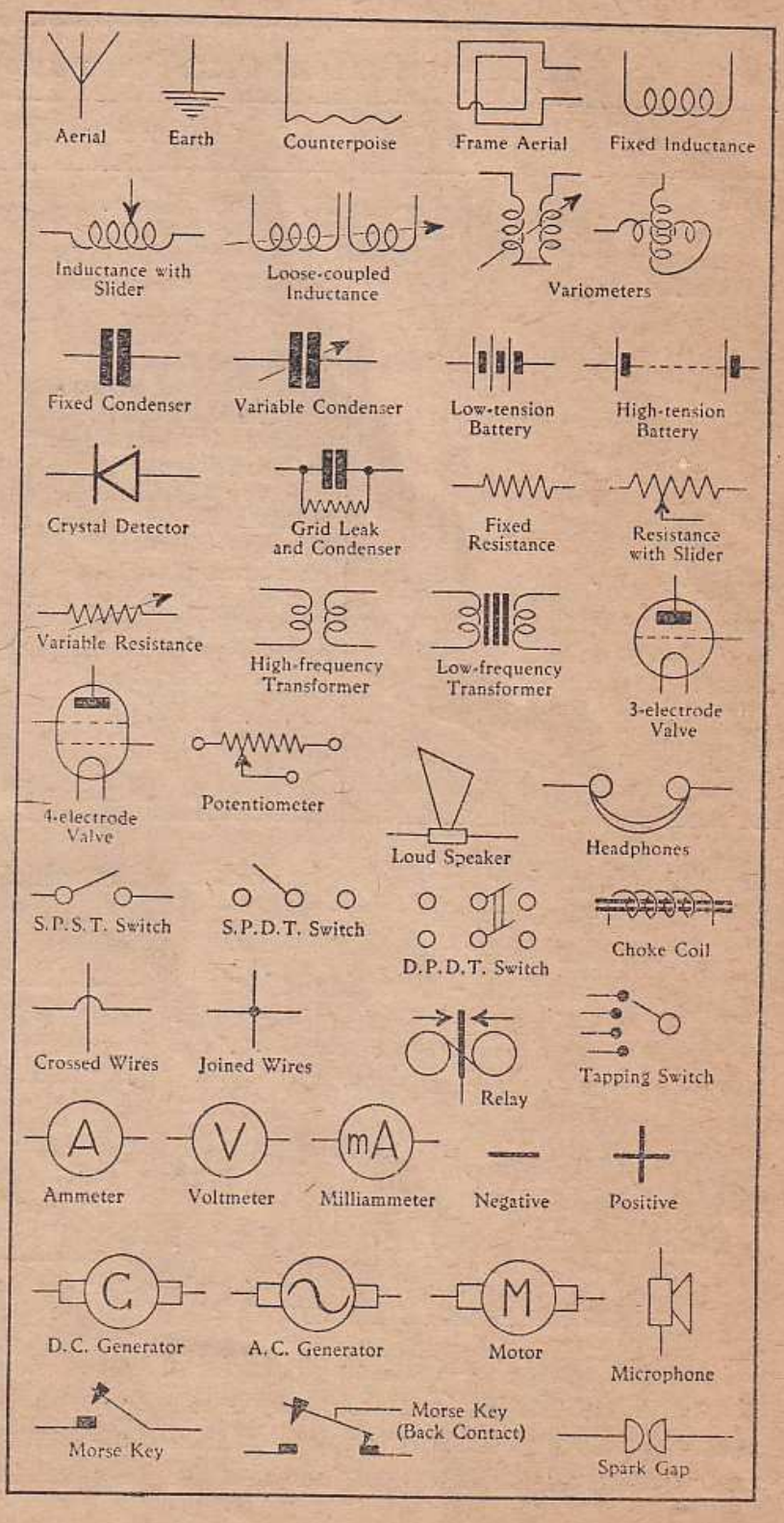
which means that the electrons, or negative particles of electricity, are repelled from the grid, on the principle that "like repels like," and thus no electrons are able to make their way to the plate. Under these conditions no current flows in the telephone circuit. Thus, at each half-wave a passage of current from the high-tension battery produces a click in the telephone, and as these occur in rapid succession, sound waves are set up.

Valve, Soft.—That type of valve in which some residual gas is left in the bulb. Usually these valves can only be used as detectors.

Vario-coupler.—A piece of apparatus employed for indirect magnetic coupling of two circuits. In construction it is usually similar to the variometer described below, except that the two windings are kept separate, each winding being part of a distinct circuit.

Variometer.—It is sometimes used as a tuner in place of the more usual inductance coil and variable condenser. It consists of two coils, an end of one being connected to one end of the other, the two free ends being connected in the same manner as an inductance coil. The two coils are wound on separate formers, one of which is made to rotate within the other through an arc of 180 degrees. Movement of the coils in relation to each other produces changes in the inductance and capacity of the circuit and thus alters the wavelength. The variometer may also be used in the plate circuit of a detector valve to tune that circuit to the wavelength of the

WIRELESS SYMBOLS



aerial oscillations, for purposes of reaction.

Volt.—The electrical unit of pressure.

Wavelength.—The distance between successive crests or troughs of an electro-magnetic wave assumed to be carried through space by the ether. The longer the wavelength of a signal the lower the frequency.

Waves, Damped.—A series of electrical oscillations of which the amplitude gradually diminishes owing to the natural characteristics of the circuit in which they flow.

Waves, Undamped.—*See* Continuous Waves.

X's.—Another term for atmospherics.

B.B.C. Station Call Signs and Addresses

Town	*Call Sign*	*Studio Address*	*Transmitting Station*
Aberdeen	2 B D	17, Belmont Street.	6, Golden Square.
Birmingham	5 I T	105, New Street.	Summer Lane Power Station.
Bournemouth	6 B M	72, Holdenhurst Road.	Bushey Road, Charminster.
Bradford	2 L S	Cabinet Chambers, Basinghall Street, Leeds.	Simes Street, Bradford.
Cardiff	5 W A	39, Park Place.	Eldon Road.
Edinburgh	2 E H	79, George Street.	Edinburgh University.
Glasgow	5 S C	21, Blythewood Square.	Port Dundas.
Hull	6 K H	26–27, Bishop Lane.	Grand Lion Mills, Wincolmlee.
Leeds	2 L S	Cabinet Chambers, Basinghall St.	Claypit Lane.
Liverpool	6 L V	85, Lord Street.	Smithdown Lane.
London	2 L O	2, Savoy Hill, Strand.	—
Manchester	2 Z Y	Ormes Buildings, Parsonage.	Same.
Newcastle	5 N O	10, Gray Street.	Blandford Street.
Plymouth	5 P Y	Athenæum Chambers, Athenæum Lane.	Mill Street.
Sheffield	6 F L	Corporation Street.	Same.
Nottingham	5 N G	4, Bridlesmith Street.	Duke Street, New Bassford.
Belfast	2 B E	31, Linenhall Street.	Corporation Generating Station, East Bridge Street.
Stoke-on-Trent	6 S T	Majestic Buildings.	London Road.
Dundee	2 D E		
Swansea	5 S X		

Miscellaneous Facts

Shellac Varnish.—Shellac should be obtained in the solid flake form. It should be chopped up into small pieces and dissolved in methylated spirits. The solution may be made as thick as possible, as it can easily be thinned down by the addition of a little more spirit.

Ebonite Weights and Sizes.—The following table will be found useful for those who construct their own sets in which ebonite panels, etc., are necessary.

Thickness (inches)	*Weight of 1 sq. ft. (oz.)*	*Area (sq.in.) of 1 lb.*	*Area (sq.in.) of 1 oz.*
$\frac{1}{8}$	13	176	11
$\frac{3}{16}$	20	$117\frac{1}{2}$	$7\frac{1}{2}$
$\frac{1}{4}$	26	88	$5\frac{1}{2}$
$\frac{3}{8}$	39	56	$3\frac{1}{2}$
$\frac{1}{2}$	52	44	$2\frac{3}{4}$

B.A. Screw Sizes.—The principal sizes of British Association standard screws are given on p. 25. Nearly all screw threads used in wireless apparatus are made to this standard.

B.A. Screw Sizes

No.	Absolute Dimensions in millimetres		Approximate No. of Threads per inch	Approximate Dimensions in inches	
	Full Diameter	Pitch		Full Diameter	Pitch
2	4·7	0·81	31·4	0·185	0·0319
4	3·6	0·66	38·5	0·142	0·0260
6	2·8	0·53	47·9	0·110	0·0209
8	2·2	0·43	59·1	0·087	0·0169

Table of Abbreviations

λ = wavelength
C = capacity
L = inductance
K = dielectric constant or S.I.C.
M = mutual inductance
Ω = ohm
MΩ = megohm (1,000,000 ohms)
F = farad
μF or mfd. = microfarad
H = henry
μH = microhenry

Capacity Constants

1,000 centimetres = 1 jar
900 jars = 1 microfarad
1,000,000 microfarads = 1 farad.

Inductance Constants

1,000 centimetres = 1 microhenry
1,000,000 microhenries = 1 henry.

Combinations of Igranic Coils

Station	Call Sign	Wavelength in Meters	Aerial Circuit with Variable Condenser in parallel		Secondary Circuit with ·0005 mfd. Variable Condenser in parallel	Tuned-anode Circuit with ·0003 mfd. Variable Condenser in parallel	Reaction on	
			·001 mfd.	·0005 mfd.			Aerial	Tuned-anode
B.B.C. Stations	—	300/400	25	35	50	50	75	75
L'Eçole Supérieure	—	400/500	35	50	75	75	75	75
Croydon and Aircraft Telephony	—	900	75	100	150	150	150	200
Paris (Radiola)	SFR	1,780	150	150	200	200	100	150
Paris (Eiffel Tower)	FL	2,600	200	250	300	300	200	200
Lyons	YN	3,100	250	300	400	400	250	250
The Hague	PCGG	1,050	100	100	150	150	150	200
Lyngby	OXE	2,400	200	250	300	300	200	200
Berlin (Königswusterhausen)	LP	2,800	250	250	300	300	200	200
Eberswalde	—	2,930	250	300	400	400	250	250
Prague	PRG	1,800	150	150	250	250	100	150
Lausanne	HB 2	1,100	100	100	150	150	150	200
Madrid	—	1,650/2,200	200	200	250	250	150	200
Rome	ICD	3,200	250	300	400	400	250	250

LIST OF CALL SIGNS

2 A A	Radio Communication Co., Ltd., Slough.
2 A B	J. O. Walker, 16, Ash Rd., North Lane, Headingley, Leeds.
2 A D	Siemens Bros. & Co., Ltd., Woolwich.
2 A F	A. R. Taylor, 49, Idmiston Rd., S.E.27.
2 A G	T. Moor, Lethbridge Rd., Southport.
2 A H	Hounslow.
2 A J	Radio Comm. Co., Ltd., Barnes, S.W.13.
2 A K	R. M. Radio, Ltd., Diglis, Worcester.
2 A L	W. Halstead, Briar Lane, Thornton-le-Fylde.
2 A M	A. Perl, 5, Sharon Rd., Chiswick, W.4.
2 A N	A. Sharman, 1, Morella Rd., Wandsworth.
2 A O	O. H. Relly, 26, Junction Rd., Eastbourne.
2 A P	F. Adams, Alexandra Hotel, Kincardineshire.
2 A Q	— Davis, Thornton Heath.
2 A R	E. Gaze, 3, Archibald St., Gloucester.
2 A S	W. H. Moon, 69, Coleridge Av., Penarth, nr. Cardiff.
2 A T	— Beresford, Birmingham.
2 A U	A. C. Bull, 25, Fairland Rd., W. Ham, E.15.
2 A V	D. H. W. Swiney, 18, Southchurch Rd., Southend-on-Sea.
2 A W	H. H. T. Burbury, Crigglestone, Wakefield.
2 A X	G. Sutton, 18, Melford Rd., S.E.22.
2 A Y	D. F. Owen, Limehurst, Sale, Cheshire.
2 A Z	William Le Queux, St. Leonards-on-Sea.
2 B B	J. Simpson, Bonnybridge.
2 B C	D. F. Owen, Limehurst, Sale. Cheshire.
2 B D	Aberdeen B.B.C. Station, 17, Belmont St.
2 B E	Belfast B.B.C. Station, 31, Linenhall St.
2 B N	——, Orchardleigh, Golders Green, N.W.11.
2 B O	Marconi Co. (Private Call), Writtle.
2 B P	Daimler Motor Co., Kelvinside, nr. Glasgow.
2 B S	Marconi Co., Chelmsford.
2 B Z	B. Davis, 23, Ferncroft Av., N.W.3.
2 C A	C. E. Palmer Jones, 20, Princes Rd., Wimbledon, S.W.
2 C B	C. E. Davies, Pastimes Ltd., 208, Walworth Rd., S.E.17.
2 C C	H. S. Nicholls, "The Whins," Stocksfield-on-Tyne.
2 C D	Burton-on-Trent W. Soc., High St., B.-on-T.
2 C H	Oundle School Sci. Soc., Oundle, Northants.
2 C I	R. Brooks King, Widcombe, Taunton.
2 C K	City & Guilds Coll., Exhibition Rd., S.W.7.
2 C M	N. D. B. Hyde, 92, Littledale Rd., Egremont, Cheshire.
2 C O, 2 C P	J. C. Elmer, 14, Gordon Sq., Birchington-on-Sea.
2 C W	B. Hippisley, Ston, Easton Park, Bath.
2 C X	A. L. Rackham, 114, Beauchamp Rd., S.E.19.
2 C Y	J. G. Lucas, 6, Spencer Av., Palmer's Green.
2 C Z	C. T. Atkinson, 17, Beaumont Rd., Leicester.
2 D B	F. L. W. Dean, 54, Pill St., Cogan, Glam.
2 D C	M. Child, 60, Ashworth Mansions, W.9.
2 D D	A. C. Davis, 105, Brynland Ave., Bristol.
2 D E	Dundee B.B.C. Station.
2 D F	R. E. Miller, 65, Malden Rd., New Malden.
2 D G, 2 D H, 2 D I	W. Burnet, 10, Coverdale Rd., Sheffield.
2 D J	A. T. Lee, Alvaston, Derby.
2 D L	Northern Polytechnic Institute, Physics Dept., Holloway Rd., N.7.
2 D N	M. N. Durnford, Kingswear, S. Devon.
2 D R	S. R. Wright, Mab Wood, Shipley.
2 D S	E. Redpath, 64, Iron Mill Lane, Crayford.
2 D T	Barrow & Dist. Amat. Wireless Assoc., Market Tower, Barrow-in-Furness.
2 D U	W. D. Norbury, 51, Chilwell Rd., Beeston.
2 D V	R. Gambier-Parry, The Old Toll House, Broxbourne, Herts.
2 D X	W. K. Alford, "Rosedene," Camberley, Surrey.
2 D Y	F. H. Haynes, 5, Regent Sq., W.C.1.
2 D Z	F. H. Haynes, 26, Avenue Rd., N.15.
2 E H	Edinburgh B.B.C. Station, 79, George St.
2 F A	F. Bennett, 16, Tivoli Rd., Crouch End.
2 F B	W. Ison, 80, Harnham Rd., Salisbury.
2 F C	D. Sinclair, 19A, Ladbroke Gdns., W.11.
2 F G	L. McMichael, 32, Quex Rd., N.W.6.
2 F H	T. Ivy Rogers, 2, Park Hill, Moseley, B'ham.
2 F J	W. J. Fry, 22, Thirsk Rd., S.W.11.
2 F K	F. C. Grover, 20, Rutland Rd., Ilford.
2 F L	L. C. Willcox, Warminster, Wilts.
2 F M	F. C. McMurray, "Burnage," Beechwood Rd., Sanderstead.
2 F N	L. Baker, Ruddington, Notts.
2 F P	F. Foulger, 118, Pepys Rd., S.E.14.
2 F Q	Burndept, Ltd., Blackheath, S.E.
2 F R	S. Rudeforth, 54, Worthing St., Hull.
2 F S	C. S. Frowd, Ranamere, Knebworth Rd., Bexhill-on-Sea.
2 F T	Edinburgh & District Radio Society.
2 F U	E. T. Manley, Arthur Rd., S.W.19.
2 F W	D. Thomas, 45, Chatsworth Rd., Bournemouth.
2 F X	H. C. Binden, 32, Oxford Rd., Bournemouth.
2 F Z	Y. W. P. Evans, 2, Parkside Rd., Alexandra Park, Manchester.
2 G A	J. A. Gibson, 18, Daniel St., Bath.
2 G D	Birmingham Ex. W. Club, Digbeth Inst.
2 G F	J. V. Newson, 130, Ormside St., S.E.15.
2 G G	A. H. Kidd, Marlborough House, Newbury.
2 G I	— Johnston, Hind House Lane, Sheffield.
2 G J, 2 G K	L. Johnson, 5, Hagg Lane, Sandygate, Sheffield.
2 G L	W. J. Henderson, 2, Hollywood Rd., S.W.10.
2 G O	L. Bland-Flagg, 61, Burlington Rd., W.2.
2 G P	W. Gartland, 14, Baalbec Rd., N.5.
2 G Q	Taunton Scouts, Wilton, Taunton.
2 G R, 2 G S	T. Forsyth, "Wenslea," Ashington, Northumberland.
2 G T	G. Irvine, 12, Treborth St., Liverpool.
2 G U	Halifax W. Club, Clare Hall, Halifax.
2 G V	W. P. Rigby, St. Lawrence Vic., Bristol.
2 G W	A. Cash, Foxley Mount, Lymm, Cheshire.
2 G Y	G. Horwood, 557, Lordship Lane, S.E.22.
2 G Z, 2 H A	A. L. Megson, Cambridge St., Manchester.
2 H B	L. H. Lomas, Summerseat, Manchester.
2 H C	F. M. J. White, Bucklebury, Reading.
2 H D	Prestwich & District Radio Soc., H. A. Wood, Spring Bank, Church Lane, Prestwich, Lancs.
2 H F	W. G. Gold, Rosedale, Belwell Lane, Four Oaks, nr. Birmingham.
2 H G, 2 H H	T. Boutland, Sr., & T. Boutland, Jr., 25, First Row, Ashington, Northumberland.
2 H K	A. A. Swinton, 66, Victoria St., S.W.1.
2 H L	A. A. Swinton, 40, Chester Sq., S.W.1.
2 H O	——, Ilford.
2 H P	H. C. Woodhall, 55, Cardington St., N.W.1.
2 H Q	A. W. Fawcett, 11, Leigh Rd., Clifton.
2 H R	Hambling, Clapp & Co., 11, Agar St., W.C.2.
2 H S	G. W. Hale, 36, Dagnall Park, S.E.25.
2 H T	R. H. Klein, 18, Crediton Hill, N.W.6.
2 H V	H. Beresford, Wylde Green, Birmingham.
2 H W	H. Beresford, 213, Bull St., Birmingham.
2 H X	F. A. Love, Guildford Pk. Rd., Guildford.
2 H Z	P. W. Northey, 12, Pelham Cres., S.W.7.
2 I A	L. F. Ostler, 19, Windsor Tce., Penarth.
2 I B	W. Bemrose, Littleover Hill, Derby.
2 I C	O. S. Stiles, "Herons Ghyll," Harrow.
2 I D	E. S. Firth, Thames Ditton.
2 I F	S. W. Bligh, 2, North Lane, Canterbury.
2 I H	Cardiff Tech. Coll., Cathays Park, Cardiff.
2 I I, 2 I J	R. W. Brown, 71, Norwood Cres., Southport.
2 I K	County High Sch. for Boys, Altrincham.
2 I L	H. R. Goodall, Bassett, Southampton.
2 I N	J. F. Fish, Station Rd., Thornton-le-Fylde.
2 I Q	W. A. Ward, 26, Marlboro' Rd., Sheffield.
2 I S	H. W. Doudney, St. Luke's Vicarage, Bath.
2 I T	E. White, 16, Cliff Tce., St. Johns, S.E.8.
2 I U	G. A. E. Roberts, Twyford, Hampshire.
2 I V	L. F. White, 10, Priory Rd., Knowle, Bristol.
2 I W	G. R. Marsh, Twyford, Winchester.
2 I X	S. G. Taylor, Littleover, Derby.
2 I Y	J. Briggs, 66½, Corporation St., Birmingham.
2 I Z	A. H. Maidment, Siddons Rd., S.E.23.
2 J A	— Atkins, Upper Norwood.
2 J B	Downside Sch., Stratton-on-Fosse, Bath.
2 J C	I. H. Storey, White Cross Mills, Lancaster.
2 J D	I. H. Storey, Escowbech, Caton, Lancaster.
2 J F	C. G. Williams, "Moranedd," 86, Rullerton Rd., Wallasey, Cheshire.
2 J G	W. A. Seed, Crigglestone, Wakefield.
2 J H	C. A. Barrand, 157, Wellington St., Slough.
2 J J	C. Wortley, 4, Riversdale Rd., Wallasey.
2 J K	P. R. Coursey, Marchmont Rd., Richmond.
2 J L	G. G. Bailey, "The Beeches," Cowley, Mdx.
2 J M	G. G. Blake, 10, Onslow Rd., Richmond.
2 J N	H. B. Burdekin, Bilton, Rugby.

2 J O — J. W. Whiteside, 30, Castle St., Clitheroe.
2 J P, 2 J Q — M. C. Ellison, Hutton's Ambo Hall, York.
2 J U — E. J. Pearcey, 610, Fulham Rd., S.W.6.
2 J V — A. J. Robbins, Station Rd., Epping, Essex.
2 J W — J. R. Barrast, Westgate Court, Canterbury.
2 J X — L. L. Vizard, 12, Seymour Gardens, Ilford.
2 J Z — R. D. Spence, Craighead House, nr. Huntly.
2 K A — Brighton and Hove Radio Soc.
2 K B — W. E. Earp, 675, Moore Rd., Mapperley, Notts.
2 K C — H. T. Longuehaye, Beckenham.
2 K D — Denison Bros., "Wainhouse Tower," Halifax.
2 K F — J. A. Partridge, 22, Park Rd., S.W.19.
2 K G — A. E. Hay, "Glendale," Abernant, Aberdare.
2 K H — Ashley Wireless Telephone Co., Ltd., Liverpool.
2 K K — F. Pinkerton, 101, Dartmouth Rd., S.E.23.
2 K L — F. Pinkerton, 50, Peakhill, S.E.26.
2 K M — C. Stainton, 155, Estcourt St., Hull.
2 K N — A. B. Day, Finchley.
2 K O — C. S. Baynton, 48, Russell Rd., Moseley.
2 K P — F. A. Bird, 13, Henrietta Rd., Bath.
2 K Q — H. Taylor, Lettenhall Wood, Wolverhampton.
2 K R — E. Edmonds, Jr., 2, Yew Tree Rd., B'ham.
2 K S — C. C. Breakell, "Mill Bank," Church St., Preston.
2 K T — J. E. Nickless, 83, Wellington Rd., E.11.
2 K U — A. J. Selby, 66, Edward St., Burton-on-Trent.
2 K V — W. J. Crampton, Weybridge.
2 K W — W. R. Burne, Thorold Grove, Sale, Ches.
2 K X — W. Stanworth, "Fern Bank," Blackburn.
2 K Y — L. Pollard, 209, Cunliffe Rd., Blackpool.
2 K Z — B. Clapp, "Meadmoor," Purley.
2 L A — N. F. Yardley, The Castle, Egremone Drive, Sheriff Hill, Gateshead, Co. Durham.
2 L B — British Wireless Supply Co., Ltd., Leeds.
2 L D — R. J. Cottis, 4, Crondace Rd., Fulham, S.W.6.
2 L F — P. V. Harris, Chilvester Lodge, Calne, Wilts.
2 L G — H. H. Whitfield, Hall Green, Birmingham.
2 L I — H. C. Wilkinson, 14, Kingswood Ave., N.W.6.
2 L J — Worc. Cadet Sig. Coy., Sansome Walk, Worcester.
2 L K, 2 L L — S. Knivcton, 22, Broadway, Kirkstall, Leeds.
2 L M, 2 L N — N. S. Wells, Platt Lane, Hindley, nr. Wigan.
2 L O — London B.B.C. Station, 2, Savoy Hill, Strand.
2 L P — A. W. Knight, 26, Stanbury Rd., S.E.15.
2 L Q — J. A. Henderson, 18, Elm Hall Drive, Mossley Hill, Liverpool.
2 L R — J. Scott-Taggart, Beattyville Gdns., Ilford.
2 L S — Leeds and Bradford B.B.C. Station, Cabinet Chas., Basinghall St., Leeds.
2 L T — A. F. Bartle, 5, Ulundi Rd., Blackheath, S.E.3.
2 L U — W. A. Appleton, 20, Spencer Pl., Wembley Pk.
2 L V — R. Tingey, 22, Leinster Gdns., Hyde Pk., W.2.
2 L W — Tingey Wireless, Ltd., 92, Queen St., W.6.
2 L X — T. S. Skeet, 36, Duncan Rd., Leicester.
2 L Y — H. H. Thompson, 59, Redlands Rd., Penarth.
2 L Z — F. A. Mayer, "Stilemans," Wickford, Essex.
2 M A — P. L. Savage, 14, Norwich Rd., Lowestoft.
2 M B — E. H. Jupus, 67, St. Paul's Rd., Gloucester.
2 M C — H. B. Dent, Fleetwood Ave., Westcliff.
2 M D — C. Chipperfield, Victoria Rd., Oulton Broad.
2 M F — Marconi Co., Ltd., 21-25, St. Anne's Court, W.1.
2 M G — C. C. Millar, "Arndene," Bearsden, Glasgow.
2 M H — T. Lawton, Brown Edge Vicarage, Stoke-on-Trent.
2 M I — L. McMichael, Ltd., Kilburn, N.W.6.
2 M K — A. W. Hambling, 80, Brondesbury Rd., N.W.6.
2 M L — R. C. Clinker, "Tryfn," Bilton, Rugby.
2 M M — C. C. A. Hines, Watley, Twyford, Winchester.
2 M O — F. O. Read, 26, Flanders Rd., Bedford Pk., W.
2 M R — R. H. Reece, 62, Addison Gdns., W.14.
2 M S — R. H. Reece, "Basketts," Birchington, Kent.
2 M T — Marconi, Ltd., Writtle.
2 M V — — Littley, Lodge Rd., West Bromwich.
2 M Y — H. M. Hodgson, Clifton House, Hartford.
2 M Z — J. Mayall, "Burfield," Gloucester.
2 N A — H. Frost, Barr Common, Walsall.
2 N B — N. G. Baguley, 37, Stodman Street, Newark-on-Trent.
2 N C — — Goodwin, Crown St., Duffield.
2 N D — E. H. Pickford, 6, Wilson Rd., Sheffield.
2 N F — J. S. Whale, Colwyn Bay, N. Wales.
2 N H — O. Shorwood, 41, Queen's Gate Gdns., S.W.7.
2 N I — R. H. Lyne, 41, Somerset Rd., Dartford.
2 N J — —— S.E.12.
2 N K — P. Priest, 174, Woodside Rd., Huddersfield.
2 N L — F. J. Hughes, 129, Wells Rd., Bath.
2 N M — G. Marcuse, Queen's Pk., Caterham.
2 N N — Brig.-Gen. H. Palmer, Hill Crest, Epping, Es.
2 N O — H. R. Adams, Sutton Rd., Walsall.
2 N P — H. G. Treadwell, Middleton Cheney, Banbury.
2 N Q — R. J. T. Morton, 14, Woodside Rd., Kingston.
2 N R — J. K. Hassall, Wooden Box, Burton-on-Trent.
2 N S — M. Burchill, 30, Leighton Rd., Southville, Bristol.
2 N V, 2 N W, 2 N Y, 2 N Z — H. Littley, Lodge Rd., West Bromwich.
2 O A — E. A. Anson, Morton Cott., Port Seton, E. Lothian, Scotland.
2 O D — E. J. Simmonds, Queensway, Gerrards Cross.
2 O F — H. C. Trent, Secondary School, Lowestoft.
2 O G — A. Cooper, 16, Wentworth Rd., York.
2 O H — C. S. Goode, "Abbotsford," Hinckley, Leicestershire.
2 O I — C. Bain, 51, Grainger St., Newcastle-on-Tyne.
2 O J — E. A. Hoghton, 52, First Ave., Hove, Sussex.
2 O L — H. D. Butler, Trebarwith, South Nutfield.
2 O M — H. S. Walker, Park Lodge, Brentford.
2 O N — H. C. Parker, 56, Shern Hall St., E.17.
2 O P — G. Courtenay-Price, 8, Lansdown Terrace, Cheltenham.
2 O Q — D. P. Baker, Cleveland Rd., Wolverhampton.
2 O T, 2 O U — F. W. Gedge, Ilford & District Radio Soc., 157, High Rd., Ilford.
2 O W — F. W. Woodward, 5, Portland Gdns., N.4.
2 O X — Dr. Ratcliffe, 22, Wake Green Rd., Moseley.
2 O Y — E. J. Hobbs, Wareham, Dorset.
2 O Z — Worcs. Cadets Sig. Co., Worcester.
2 P A — G. Z. Auckland & Son, St. John St., E.C.1.
5 P B — F. C. Hirst, Longwood, Huddersfield.
2 P C — A. G. Davies, Paul Rd., Timperley.
2 P D — W. Harvey-Marston, Willenhall, Staffs.
2 P F — R. B. Jefferies, "Lynn Dene," Mount Hill, Kingswood, Bristol.
2 P G — Messrs. B. Hesketh, Ltd., Naylor's Estate, Slough.
2 P H — L. Dore, 139, Lightwoods Rd., Bearwood, Smethwick.
2 P I, 2 P J — College Wireless Soc., Loughborough.
2 P K — Universal Radio Co., New Bridge St., Newcastle.
2 P L — Major Stephens, Haddon House, Bridport.
2 P N — C. J. Pratt, 332, Upper Richmond Rd., S.W.15.
2 P O — N. C. Hardman, Cloughfold, Manchester.
2 P P — J. S. Knight, Clark's Hill Nursery, Prestwich, Manchester.
2 P Q — G. E. Mortley, 23, Forest Rd., Tunbridge Wells.
2 P R — A. E. Whitehead, King's Ride, Camberley.
2 P S — J. H. Hill, 18, Fourth Ave., Nottingham.
2 P T — J. Jardine, Hall Rd., W., Blundellsands, nr. Liverpool.
2 P U — C. R. W. Chapman, Chaplin Rd., Wembley.
2 P V — G. Smith Clarke, Kenilworth.
2 P W — J. Matthewson, 35, Capel Rd., Forest Gate, E.7.
2 P X — H. H. Lassman, 429, Barking Rd., E.6.
2 P Y — H. C. Bowles, 51, Gunterstone Road, West Kensington.
2 P Z — A. E. Symmonds, 12, Addison Ave., W.11.
2 Q A — Dr. H. W. Taylor, Camden House, Cambridge.
2 Q D — J. Ayres, 18, Seaforth Av., New Malden.
2 Q G — J. S. Alderton, 114, College Rd., Moseley, Birmingham.
2 Q H — C. Hewins, 42, St. Augustine Ave., Grimsby.
2 Q I — Hurst & Lucas, 3, Mayford Rd., S.W.12.
2 Q J — R. Walton, 70, Moorfield Rd., Pendleton.
2 Q K — J. Bever, 85, Emm Lane, Bradford.
2 Q L — R. J. Hibberd, Grayswood Mt., Haslemere.
2 Q N — A. Hobday, Northdown Rd., Margate.
2 Q O — P. Pritchard, Broad St., Hereford.
2 Q P — L. C. Grant, 3, Langhorn St., Newcastle-on-Tyne.
2 Q Q — Burndept, Ltd., Wembley Park.
2 Q R — F. Towers, 12, Mayfield Rd., Handsworth.
2 Q S — S. Ward, 339, Brixton Rd., S.W.9.
2 Q T — C. C. Barnett, Winton Cottage, South Perrott, Mesterton, Somerset.
2 Q U — Lucas & Hurst, 198, Lansdown Rd., S.E.3.
2 Q V — W. R. Lambert, "Breeze Crest," Plane Tree Rd., Hale, Cheshire.
2 Q Y — A. Hinderlich, Central Hall, Southall, Middlesex.
2 Q Z — B. H. Colquhoun, 3, Eastbrook Rd., S.E.3.
2 R B — H. B. Grylls, Carew Rd., Eastbourne.
2 R D — G. W. Fairall, 27, Newbridge St., W'ham't'n.
2 R G — E. W. Scammell, 100, Dale End, B'ham.
2 R H — H. A. Pound, ——.
2 R J — F. S. Morgan, East Fairleigh, Kent.
2 R K — A. E. Blackall, 7, Maple Rd., Surbiton.
2 R M — S. Cross, 3, Norman Rd., Heaton Moor.
2 R N — D. D. Richards, Bontnewydd Tce., Trelewis.
2 R P — F. W. Emerson, 178, Heaton Moor Rd., Heaton Moor, Stockport.

2 RQ E. C. R. Strong, Handsworth Wood, B'ham.
2 RR W. V. Waddoup, 56, Wellington Rd., Handsworth Wood, Birmingham.
2 RS T. Hesketh, 42, Castle Hill Ave., Folkestone.
2 RT North Eastern Instrument Co., Gateshead.
2 RU North Eastern Instrument Co., "Dipwood," Rowlands Gill, Newcastle-on-Tyne.
2 RV A. L. Rawlings, 162, Burnt Ash Hill, Lee.
2 RW —"Merton Park," 6, Manor Gdns., S.W.2.
2 RY D. Hanley, Forbury, Kintbury, Berks.
2 RZ D. T. Woods, Parker Rd., Bournemouth.
2 SA Sir Hanbury Brown, Crawley Down, Sussex.
2 SB R. Heather, 102, Lyndhurst Rd., S.E.15.
2 SD J. Mayall, "Burfield," Gloucester.
2 SF C. Midworth, Ridgeway Rd., Osterley Park.
2 SH F. L. Hogg, 37, Bishop's Rd., Highgate, N.6.
2 SI S. Holton, 112, Conway Rd., Southgate.
2 SJ W. J. Bryce, 14, Walpole St., Preston, Lancs.
2 SK K. G. Styles, 52, Jerningham Rd., S.E.14.
2 SL K. G. Styles, Bower Mt. Rd., Maidstone.
2 SM R. J. Bates, 34, Abbeygate St., Bury St. Ed.
2 SO Thomas Geeson, Alder Cott., Peel St., Macclesfield
2 SP L. Mansfield, 34, Bath St., Southport, Lancs.
2 SQ A. J. Spears, 25, Rawlings Rd., Bearwood, Smethwick, Birmingham.
2 SW Marconi's Wireless Telegraph Co.
2 SX F. B. Baggs, 24, Westhorpe St., S.W.15.
2 SY H. Stevens, 25, Oaklands Rd., W'hampton.
2 SZ W. H. Brown, Mill Hill Sch., N.W.7.
2 TA H. Andrews, 8, North Grove, Highgate, N.6.
2 TB, 2 TC H. W. Sellers, 18, Edgerton Grove Rd., Huddersfield.
2 TF W. Winkler (for Edinburgh and District Radio Soc.), 9, Ettrick Rd., Edinburgh.
2 TG, 2 TH Dept. of Applied Science, The University, Sheffield.
2 TI H. B. Swift, 49, Kingsmead Rd., Tulse Hill, S.W.2.
2 TL V. Martin, 128, Dairy House Road, Derby.
2 TM T. H. Mansell, Madresfield Rd., Gt. Malvern.
2 TN C. E. Stuart, Polesworth, Tamworth.
2 TO F. T. G. Townsend, 46, Grove Lane, Ipswich.
2 TP C. W. Andrews, 26, Melody Rd., S.W.18.
2 TQ T. C. Macnamara, 31, Rollscourt Avenue, Herne Hill, S.E.24.
2 TR F. O. Sparrow, 8, North Drive, Swinton, Manchester.
2 TS A. Taylor, 122, Wellington St., Cardiff.
2 TT —, The Villa, Glenfield, Paisley.
2 TV, 2 TW E. W. Wood, 79, Colwyn Rd., Northampton.
2 TX A. R. C. Johnston, 87, Twyford Av., Acton, W.
2 TY S. Scott, Welham Rd., Norton, Malton.
2 TZ E. Jones, Offerton, Stockport.
2 UA S. B. P. Barnes, 38, Avenue Rd., Highgate.
2 UC E. J. Nock, Winstone, 53A, Gunterstone Rd., West Kensington, W.14.
2 UD E. W. Smith, 77, Grove Lane, Camberwell.
2 UF H. Bailey, 51, Manchester Rd., Denton.
2 UG W. Burton, 193, Portland Rd., Nottingham.
2 UI A. R. Ogston, 41, Broomfield Ave., N.13.
2 UJ L. R. Rowlands, 25, Cholmeley Park, N.6.
2 UK The Cotteridge Day Continuation School, Watford Rd., King's Norton, Birmingham.
2 UM H. Lloyd, 3, Ventnor Place, Sheffield.
2 UN 14th Cardiff Lord Mayor's Own Troop B.P. Scouts, Y.M.C.A., Cardiff.
2 UP G. W. Todd, Armstrong College, Newcastle.
2 UQ H. F. A. Sanderson, 23, Palace Rd., Llandaff.
2 US Radio Society of Highgate, N.6.
2 UV W. Corsham, 104, Harlesden Gdns., N.W.10.
2 UX A. T. Headley, 255, Galton Rd., Warley, B'ham.
2 UY W. Fenn, Polesworth, Tamworth.
2 UZ C. V. Stead, 29, Sholebroke View, Leeds.
2 VA R. J. Sawbridge, A.M.I.R.E., The Broadfields Radio Co., Ltd., Tenby, S. Wales.
2 VB ——, Shooters Hill.
2 VC A. S. Gosling, 63, North Rd., W. Bridgford.
2 VD E. L. Growe, Juniper Rough, Hardres.
2 VF H. A. Blackwell, Bispham, Blackpool.
2 VH S. E. Payne, 11, S. Mark's Rd., Bush Hill Pk., Enfield.
2 VI H. Curtis, 26, Upper Hall Lane, Walsall.
2 VJ B. J. Axten, 78, Ealing Rd., Wembley.
2 VK Burndept Ltd., Aerial Wks., Blackheath, S.E.3.
2 VL D. E. Pettigrew, 37, Mexborough Av., Leeds.
2 VM J. Lipowsky & Co., 614, Old Ford Rd., E.3.
2 VN H. Drury-Lavin, Old House, Sonning, Berks.
2 VO A. E. Holmes, 60, Aire View, Cononley, Keighley, Yorks.
2 VP P.G.A.H. Voigt, 121, Honor Oak Pk., S.E.23.
2 VQ H. B. Old, 10, St. Jude's Ave., Mapperley.
2 VR Burndept, Ltd., Blackheath, S.E.3.
2 VS ——, 79, Beulah Hill, London, S.E.19.
2 VT W. K. Hill, Beulah Hill, S.E.19.
2 VU J. W. Hobley, Mill Rd., Wellingborough.
2 VW E. H. Robinson, 125c, Adelaide Rd., N.W.3.
2 VX H. H. Thompson, 44, N'th'land Rd., Coventry.
2 VY R. Ely, Brighton Rd., Sutton.
2 WA J. Pigott, Manor Farm, Wolvercot, Oxford.
2 WB G. W. Jones, 8, Rosebery St., W'hampton.
2 WD C. W. Clarabout, Beverley Cres., Bedford.
2 WF A. M. Low, Woodstock Rd., W.4.
2 WG Gambrell Bros., Ltd., Southfields, S.W.18.
2 WI C. J. Munday, 37, Leat St., Tiverton.
2 WJ R. L. Royle, Alderman's Hill, N.13.
2 WK G. R. Lewis, 10, Lansdowne Rd., Ashton-on-Mersey, Manchester.
2 WL F. J. Cripwell, "Lonkhill," Thorpe, Tamworth.
2 WM J. W. Pallett, 24, Glenfield Rd., Leicester.
2 WN A. H. Wilson, 67, Broad St., Hanley, S-on-T.
2 WQ C. H. Gardner, Brierley Hill, Staffs.
2 WR L. W. Burcham, Chestnut Av., Oulton Broad.
2 WS H. E. A. Squelch, 35, Crown Lane, Bromley Common, Kent.
2 WT H. Chadwick, 9, Raimond St., Halliwell, Bolton.
2 WU C. H. Bailey, Chepstow, Monmouthshire.
2 WY H. J. Swift, 77, Upper Tulse Hill, S.W.2.
2 WZ A. Hare-Hobson, 32, Wilbury Rd., Hove.
2 XA C. H. Townson, Farm School, Warminster.
2 XB G. Z. Auckland & Son, 35, Douglas Rd., N.1.
2 XC H. Johnson, Chestnut Walk, Worcester.
2 XD H. R. Gladwell, London Rd., Abridge, Essex.
2 XF E. T. Chapman, Ringwood Rd., Newtown.
2 XG A. E. Turville, 108, Abington St., Northampton.
2 XH A. E. Turville, 108, Abington St., Northampton (Portable).
2 XI R. H. Wagner, 6, Maresfield Gdns., N.W.3.
2 XJ, 2 XK Sheffield & Dist. Wireless Soc., St. George's Square, Sheffield.
2 XL S. Davis, 222, Lavender Hill, Clapham Junction, S.W.11.
2 XM, 2 XN Downside Wireless Soc., Downside School, Stratton-on-Fosse, Bath.
2 XO A. Turner, 13, Elgin Av., Maida Vale, W.9.
2 XP J. F. Pane, 22, Shakespeare Crescent, E.12.
2 XQ C. F. Elwell, Ltd., 138, Gordon Rd., Peckham Rye, S.E.15.
2 XR J. F. Haines, 36, Zetland St., E.14.
2 XU A. H. A. Kilbourn, Bath St., Abingdon.
2 XW H. A. Woodyer, 51, Caldy Rd., W. Kirby, Cheshire.
2 XX D. F. Young, 23, Holcombe Rd., Ilford.
2 XZ L. T. Dixon, 4, Heythorp St., S.W.18.
2 YF J. R. Clay, Upper Longbottom, Luddendenfoot, Yorks.
2 YG L. G. Boomer, 51, Brook St., S.E.11.
2 YH G. E. Duveen, 40, Park Lane, Marble Arch.
2 YI W. J. Hewitt, 83, Riddings Rd., Moseley.
2 YJ Wireless Equipment, Ltd., W.C.2.
2 YK H. T. Winter, 23, Willoughby Pk. Rd., Tottenham, N.17.
2 YL W. H. Allen, 126, Newington Causeway, S.E.1.
2 YM R. W. Piper, Chiltern View Rd., Uxbridge.
2 YN A. W. Thompson, 32, St. Nicholas St., Scarborough.
2 YO, 2 YP A. I. L. Douglas, 127, Uxbridge Road, West Ealing, S.W.13.
2 YQ W. P. Wilson, Gipsy Hill, S.E.19.
2 YR A. R. Pike, 17, Avonwick Rd., Heston Hounslow, Middlesex.
2 YU G. W. Hale & R. Lyle, 36, Dagnall Park St., Norwood, S.E.25.
2 YV G. M. Whitehouse, "Allport House," Cannock.
2 YW J. H. F. Town, 4, Eversley Mount, Halifax.
2 YX F. E. B. Jones, Wylde Green, Birmingham.
2 YY O. H. Patterson, 26, Allerton Rd., N.16.
2 YZ Western Electric Co., Ltd., North Woolwich.
2 ZB C. Small, Skelvendale Rd., Clacton-on-Sea.
2 ZC General Radio Co., Ltd., Radio House, 235, Regent St., W.1.
2 ZD A. Woodcock, 1, Montague Rd., Birmingham.
2 ZG W. J. Badman, 9, Orchard St., Weston-super-Mare.
2 ZI British Thomson Houston Co., Ltd., Rugby.
2 ZK W. L. Turner, Purley, Caldy, West Kirby.
2 ZL H. W. Gee, 44, Gordon St., Gainsboro', Lincs.
2 ZM T. H. Isted, Terling, Witham, Essex.
2 ZO L. H. Soundy, 60, Bellevue Rd., Ealing, W.15.
2 ZP G. F. Forwood, West Chart, Limpsfield.
2 ZQ H. W. Nunn, 49, Leigh Rd., Highbury Pk., N.5.

2 Z R	S. G. Brown, Ltd., 19, Mortimer St., W.1.
2 Z S	T. J. Dinsdale, 14, Highfield View, Stoneycroft.
2 Z T	C. M. Benham, Westbury Rd., New Malden.
2 Z U	T. Heckles, 30, Thackeray St., Liverpool.
2 Z V	F. T. Smith, "Ruthands," Felsted, Essex.
2 Z W	S. C. Parish, Lordswood Rd., Harborne.
2 Z Y	Manchester B.B.C. Station, Ormes Bldgs., Parsonage.
2 Z Z	D. V. L. Fellows, Ltd., Park Royal N.W.10.
2 A A A	A. L. Crane, 44, Brookland Rd., Lewisham, S.E.13
2 A A X	L. Smith, 200, Church Rd., Willesden, N.W.10.
2 A A Z	C. R. N. Mills, "Barnfield," Church Rd., Urmston, nr. Manchester.
2 A B O	W. Golding, 65, Bowes St., Blyth, Northumberland.
2 A B P	R. Harris, Long Crichel Rectory, Wimborne.
2 A B T	E. M. Spielman, 359, Shaftmore Lane, Hall Green, Birmingham.
2 A B Z	E. G. Osborn, 31, Princes Pk. Av., Golders Green, N.W.11.
2 A C K	C. Prosser, E. Aberthaw, nr. Cardiff.
2 A C R	J. A. S. Wright, 90, Iona St., Leith.
2 A C S	H. Frost, 37, Marine Tce., Margate.
2 A D F	A. M. Robinson, Coombe Rd., Croydon.
2 A D J	W. Johnson, 3, Prince Alfred St., Lerwick, Shetland.
2 A D N	G. Sykes, 13, Longford St., Gorton, Manchester.
2 A D O	J. Nelson, 7, High Street, Prescot, Lancs.
2 A D T	A. Lawson, 68, Commercial St., Brighouse.
2 A D U	J. Young, 56, Hazelhurst Brow, Daisy Hill, Bradford.
2 A F B	W. N. Maddock, Elmsdale, Hawell Rd., Redditch.
2 A F F	C. D. Kidd, 33, Berkeley Rd., Bishopston
2 A F J	W. Lindow, 12, Arkwright St., Bolton, Lancs.
2 A F L	P. N. Langham, 102, Wilberforce Rd., Leicester.
2 A F R	C. J. Kearsey, 139, Fawnbrake Ave., S.E.24.
2 A G P	S. Meadowcroft, 44, Carill Drive, Fallowfield, Manchester.
2 A G Q	H. Brooks, 44, Cherry Road, Chester.
2 A G V	J. B. Joyce, Charles Rectory, Barnstaple.
2 A H C	S. M. Evans, 120, Manor Park, Lee, S.E.13.
2 A H G	S. M. Evans, 120, Manor Pk., Lee, S.E.13.
2 A H K	R. F. H. Jolley, 14, Leopold St., Derby.
2 A H M	H. B. Gardner, 129, Salisbury Rd., Barnet.
2 A H Y	H. S. Woodhouse, 42, King's Rd., Leytonstone.
2 A I N	H. White, 1, Canterbury Rd., Brixton, S.W.9.
2 A I P	H. King, 2, Henslowe Rd., East Dulwich, S.E.22.
2 A J B	N. Blackburne, Chatsworth, Carlisle Pde., Hastings.
2 A J P	P. B. Slade, 140, Newport Rd., Leytonstone, E.11.
2 A J Y	F. C. Osorio, 65, Dartmouth Rd., Cricklewood.
2 A K G	A. N. Porter, 20, Luccombe Hill, Bristol.
2 A K I	——, 4, Rathgar Ave., West Ealing, W.13.
2 A K R	Rev. R. T. Newcombe, St. Michael's Parsonage, Holderness Rd., Hull.
2 A K S	W. J. Turberville-Crewe, 111, Prince's Park Av., Golders Green, N.W.11.
2 A L G	F. N. Coni, The Cottage, Leigham Av., Streatham Hill, S.W.16.
2 A L R	B. C. Elliot, 3, Argyle Rd., Ealing, W.13.
2 A L U	C. R. Green, 9, Ladbroke Gdns., W.11.
2 A L Z	H. S. Newcombe, 31, Ackroyd Rd., Forest Hill.
2 A M G	F. Wilson, 115, Richmond Rd., Montpelier, Bristol.
2 A M P	C. Styles, 62, Bishopton Rd., Bearwood, Smethwick.
2 A M V	A. G. Priestman, 27, Pearson St., Carters Green, West Bromwich.
2 A M X	J. H. Walker, 259, Westburn Rd., Aberdeen.
2 A N B	A. J. Thornton, 38, Battersea Pk. Rd., S.W.11.
2 A N N	F. Harrison, 190, Almond St., Derby.
2 A N O	F. G. Turney, 88, Chesterton Rd., Cambridge.
2 A N X	E. Kirkby, 36, B. Rhodes St., Halifax, Yorks.
2 A O B	G. Render Harrison, 45, Howard Road, Church Hill, Walthamstow, E.17.
2 A O L	C. E. Bateman, "Monkleigh," Drove Rd., Patcham, Brighton.
2 A O O	A. Sandford, 36, Wattis Rd., Bearwood, Smethwick.
2 A O S	A. E. Oliver, 2, Salisbury St., South Shields.
2 A O V	A. E. Apps, 345, High St., Chatham.
2 A P G	——, 64, Queensland Av., Coventry.
2 A P T	W. Carter, 34, West Parade, Peterborough.
2 A Q K	G. W. Thomas, 169, Hills Rd., Cambridge.
2 A R B	W. H. Neeld, 42, Redbridge Lane, Wanstead, E.11
2 A R G	W. E. Rhodes, "Homefield," Histon, Cambs.
2 A R I	K. Gooding, 52, William St., Hurst, Ashton-under-Lyne, Lancs.
2 A R N	D. D. Richards, "Mametz House," Bontnewydd Tce., Trelewis, Glam.
2 A R U	E. J. Thomas, 9, Dock Tce, Glyn, Neath.
2 A S L	G. W. H. Tripp, Harford House, Chew Magna, nr. Bristol.
2 A S R	W. G. Pullen, 478, Hoe St., Leyton, E.10.
2 A T A	J. E. H. Smith, "Glenton," 110, Whitaker Rd., Derby.
2 A T I	H. G. Hanely, 32, Barrett Rd., Birkdale.
2 A T M	A. E. Sutton, 37, Belfield Rd., Rochdale.
2 A U G	E. W. Walford, "Gables," Stoneleigh, nr. Kenilworth.
2 A U H	J. W. Pallister, 33, Westbourne Tce., Stockton-on-Tees.
2 A U L	G. A. Ieaves, Station R.T., Great Shelford, Cambs.
2 A U V	S. J. Matthews, 27, Elgin Rd., Seven Kings, Essex.
2 A U X	E. Malkin, 76, Dewe Rd., Brighton.
5 A A	"Leicester Daily Mercury," Leicester.
5 A B	L. W. C. Martin, 4, Beer St., Yeovil.
5 A C	W. G. Kimber, 39, Bargesy Rd., Catford.
5 A F	J. A. H. Devey, 232, Gt. Brickkiln St., Wolverhampton.
5 A G	A. Gregory, 77, Khedive Rd., Forest Gate.
5 A I	A. H. Sheffield, 139, Wallwood Rd., E.11.
5 A J	W. C. Barraclough, 9, Rutland Avenue, Withington, Manchester.
5 A K	H. G. Mansell, Harvington, Evesham.
5 A N	W. J. Joughin, 21, Troughton Rd., Charlton.
5 A O	J. McLaren, Chesswood Rd., Worthing.
5 A P	A. J. Hill, 4, Buckhurst Rd., Bexhill.
5 A Q	D. Douët, 10, Ruvigny Gardens, Putney.
5 A S	F. A. Bourne, 10, Linley Rd., Tottenham.
5 A T	Dubilier Condenser Co. (1921), Ltd., W.12.
5 A U	W. H. Goodman, 94, Addison Rd., W.14.
5 A V	R. W. J. Harvey, 25, Shakespeare Avenue, Portswood, Southampton.
5 A W	F. Hough (Southport) Ltd., 60, Sussex Rd., Southport, Lancs.
5 A Y	T. F. Crowther, 29, North Drive, St. Anne's-on-Sea, Lancs.
5 A Z	F. Charnley, 43, Reads Avenue, Blackpool.
5 B A	Capt. Stevens, Chase Motors, Ltd., Newcastle.
5 B B	Vickers, Ltd., Vickers Ho., Broadway, S.W.1.
5 B C	Sir Trevor Dawson, Elstree, Herts.
5 B G	J. B. Kaye, Close Hill, Huddersfield.
5 B H	A. V. Simpson, 28, Westgate, Burnley, Lancs.
5 B J	Autoveyors, Ltd., 84, Victoria St., S.W.1.
5 B K	W. Brown, 52, Winstonian Rd., Cheltenham.
5 B L	A. E. Vick, 19, Gresham Rd., Hall Green, Birmingham.
5 B M	J. T. Quick, 164, Portland Rd., Edgbaston.
5 B P	R. A. Wells, 59, Compton Rd., Winchmore Hill, N.21.
5 B R	J. J. Smithies, Ltd., 20, Oldham Rd., Rochdale.
5 B T	L. V. Clark, 4, Compton Cres., W.4.
5 B V	H. N. Ryan, 88, Home Park Rd., S.W.19.
5 B W	A. de Villiers, 161, Westminster Bridge Rd., S.E.1.
5 C A	N. L. Yates-Fish, Mansfield Rd., Reading.
5 C B	K. E. Hartridge, 14, Westbourne Cres., W.2.
5 C C	A W. Young, Foxcombe Rd., Bath.
5 C D	——, Wisbech.
5 C F	E. G. S. Wise, 12, Crouch End Hill, N.8.
5 C G	F. L. W. Dean, 54, Pill St., Cogan, Glam.
5 C J	J. Balderton, 6, Clough Tce., Barnoldswick.
5 C K	L. H. Pearson, 54/56, Long Row, Nottingham.
5 C P	D. Fellows, 20, North Common Rd., W.5.
5 C S	G. R. Garratt, 35, Abbey Rd., N.W.8.
5 C U	J. A. Walshaw, Garnett Villa, Otley, Leeds.
5 C V	R. J. Harrison, "Seaton," Walton-on-T.
5 C W	A. H. S. Colebrooke, 82, High St., Harborne, Birmingham.
5 C X	A. Higson, 161, Cotton Tree Lane, Colne.
5 C Y	L. Gordon, 133, Old St., Ashton-under-Lyne.
5 D A	G. Gore, 24, Brucegate, Berwick-on-Tweed.
5 D B	C. H. P. Nutter, 243A, Selhurst Rd., S.E.25.
5 D C	W. T. Aked, Devonshire Rd., St. Anne's-on-Sea.
5 D D	— Barnes, Ainsdale, Southport.
5 D G	C. H. Stephenson, 32, Tettenhall Rd., Wolverhampton.
5 D I	C. J. Matthews, "Broxhill," Havering.
5 D M	A. N. J. Ley, Albert Grove, Nottingham.
5 D N	Capt. L. A. K. Halcomb, "South Dene," 106, Millhouses Lane, Sheffield.
5 D O	E. J. Watts, 6, Ashley Rd., Salisbury.
5 D P	Sea Scouts, Clacton-on-Sea.
5 D S	A. W. Fithian, 51, St. James' Rd., S.W.17.
5 D T	S. C. Tucker, Rydal Mount, Dacres Rd., Forest Hill, S.E.23.
5 D V	D. Whittaker, 56, Park Rd., St. Annes-on-Sea.
5 D Y	Chelmsford Radio-Engineering Co., Rainsford End, Chelmsford, Essex.
5 F A	F. L. Devereux, 11, Clifton Villas, W.9.

5 F F	H. Anson, 13, Nottingham Place, W.1.
5 F H	L. H. Lee, 155, Rosefield Rd., Smethwick.
5 F I	H. D. Webb, 59, Bradford St., Walsall.
5 F R	J. L. Jeffree, 191, St. James' Rd., Croydon.
5 F S	W. A. Andrews, 1, Balmoral Mns., Bristol.
5 F U	University College, Nottingham.
5 F V	N. H. G. Jones, Burford House, Malvern, Worcs.
5 F W	S. I. Holt, 21, Bromley Rd., St. Annes-on-Sea.
5 F X	Gent & Co., Ltd., Leicester.
5 F Z	Lincoln Wireless Society, Monks Rd., Lincoln.
5 G B	L. Humphries, 61, Geraint St., Liverpool.
5 G D	E. C. Burdett, 3, Stockfield Rd., Streatham, S.W.16.
5 G F	H. Stopher, 14, Johnston Tce., Cricklewood.
5 G I	R. Horrocks, 65, Leander Rd., Thornton Heath.
5 G J	T. Bevis, Linford Estate, Essex.
5 G L	N. G. Baguley, The Park, Newark.
5 G M	A. E. Greenslade, Jelf Rd., S.W.2.
5 G N	Greenslade & Brown, Lansdowne Rd., S.W.8.
5 G P	J. E. Simpson, Epsom Rd., Guildford, Surrey.
5 G Q	F. W. Nightingale, Pitsford Schools, Northampton.
5 G T	E. S. Dobson, "Lorne House," Richmond Place, Ilkley, Yorks.
5 G X	P. D. Tyers, 30, Mildred Ave., Watford.
5 G Y	G. H. Horwood, 557, Lordship Lane, S.E.22.
5 H A	R. Watson, Birkenhead.
5 H C	J. A. Beveridge, 8, Cluny Drive, Edinburgh.
5 H F	H. C. Trent, Camden House, Camden St., Lowestoft.
5 H I	L. W. Birch, 30, Linesford Rd., S.E.15.
5 H J	F. A. Sleath, 31, Archery Rd., Leamington Spa.
5 H L	G. E. Vowles, Hooley St., Nottingham.
5 H M	J. Fitton, 27B, Milnrow Rd., Rochdale, Lancs.
5 H N	D. R. Etchells, "Great Bents," Oaken, nr. Wolverhampton.
5 H P	Cunningham, Ltd., 169/171, Edgware Rd., W.2.
5 H Q	E. A. Pollard, "Spring Bank," Limefield, Blackburn.
5 H W	National Physical Laboratory, Teddington.
5 H X	At Brooklands (Elec. Disposals Syndicate), 6, Market Pl., Oxford Cir., W.1.
5 H Y	Baynham Honri, 6, Bath Lane Tce., Newcastle.
5 H Z	C. Carpenter, 10, Crossley St., Nottingham.
5 I B	L. H. Carder, 5, Deeside Parade, Birkenhead.
5 I C	F. E. Harvey, "Fairmead," Sunset Avenue, Woodford Green, Essex.
5 I D	P. D. Coates, 55, Ennismore St., Burnley.
5 I F	H. Featherstone, 3, Cumberland Gdns., Tunbridge Wells, Kent.
5 I G	J. E. Sheldrick, Third Ave., Havant.
5 I K	B. L. Stephenson, 12, Sheringham Rd., Withington, Manchester.
5 I O	Wireless Equipment Ltd., W.12.
5 I P	R. H. Knox, 24, Bridge St., Berwick-on-Tweed.
5 I S	J. S. Foord, 93, Herne Hill, S.E.24.
5 I T	Birmingham B.B.C. Station, 105, New St.
5 I Y	J. Wynn, Widney Manor, Solihull.
5 J B	D. Price-Jones, Manoravon, Llandilo, S. Wales.
5 J C	I. I. Morris, Cemaes Bay, Anglesey.
5 J D	F. D. Bulmer, 2, Carlton Terr., Scarborough.
5 J G	R. F. Longley, 81, Langdale Rd., Thornton Heath.
5 J H	E. C. Waddington, 171, Gt. Horton Rd., Bradford.
5 J J	L. D. Y. Morrison, Cults House, Cults.
5 J K	L. R. Harper, Seafield House, Aberdeen.
5 J M	W. Woods, 8, Brighton St., Barrow-in-F.
5 J N	S. Wilkinson, 6, Liverpool Rd., Burslem.
5 J R	N. C. P. Hepworth, "Moorings," Dovercourt.
5 J W	J. H. White, 81, Bromley St., E.1.
5 J X	M. G. Scroggie, 37, Cluny Gdns., Edinburgh.
5 J Y	R. L. Aspden, 6, Southport Rd., Chorley, Lancs.
5 J Z	H. J. Cheney, 263, Thimble Mill Lane, Nechells, Birmingham.
5 K A	G. C. Beddington, Westcliff Rd., Bournemouth.
5 K B	F. W. Coomber, 58, The Tything, Worcester.
5 K C	T. Dootson, 12, Gilnow Rd., Bolton.
5 K F	W. Bird, Llangrove, Cannock.
5 K L	G. M. Wood, 32, Charlestown, Glossop.
5 K N	E. J. Earnshaw, 95, Mayfield Rd., Sanderstead.
5 K O	T. W. Higgs and J. S. Hobbs, 45, Howard Rd., Bristol.
5 K P	A. T. Wallace, Brettenham, Hedge Lane, Palmers Green, N.13.
5 K W / 5 K X	W. Bingham (for R. Hodges), "Holly Mount," Westdale Lane, Mapperley, Nottingham.
5 K Y	E. E. G. Alisop, Wigginton Rd., Tamworth.
5 K Z	R. Mitchell, Springville, Earl St., Keighley.
5 L A	L. H. Soundy, 60, Bellevue Rd., Ealing, W.13.
5 L B	H. C. Foster, Hornby Castle, Lancaster.
5 L F	Secretan and Mallett, Ltd., 149, Lowther Parade, Barnes, S.W.13.
5 L G	J. F. Johnston, 48, Borough Rd., Altrincham.
5 L H	J. C. Walker, Whaddon Lache Lane, Chester.
5 L J	E. Jackson, 37, Manley Rd., Whalley Range, Manchester.
5 L K	Radio Electric Co., Penn., Wolverhampton.
5 L O	J. W. Clough, 142, Revidge Rd., Blackburn.
5 L P	L. W. Pullman, 213, Golders Gr. Rd., N.W.
5 L S	R. W. H. Bloxam, 99, Old Dover Rd., S.E.
5 L V	N. Willson, Tenbury Rd., Birmingham.
5 L W	R. K. Drury, 7, Salisbury Ave., Goole.
5 L Z	A. G. S. Gwinn, 61, Carnarvon Rd., Stratford.
5 M A	R. Munday, 17, Malden Rd., New Malden.
5 M C	W. R. Woodhams, 24, Marlborough Pl., Brighton.
5 M D	R. W. Hardisty, 5, Ethelbert Rd., Canterbury.
5 M G	Milligans Wireless Co.,Ltd., 56, Bath St., Glasgow.
5 M L	O. R. Healey, 11, Glebe Rd., Wallasey.
5 M O	W. G. Dixon, Rowland's Gill, Co. Durham.
5 M P	C. Bain, 51, Grainger St., Newcastle-on-Tyne.
5 M R	N. P. Stoate, 15, Winterstoke Gdns., Mill Hill.
5 M S	Y. W. P. Evans, 2, Parkside Rd., Manchester.
5 M T	Y. W. P. Evans, A.M.I.R.E., 2, Parkside Rd., Alexandra Pk., Manchester.
5 M U	C. W. Titherington, 33, Collington St., Dorchester.
5 M Y	W. Wyatt-Ingram, 41, Lambert Rd., S.W.2.
5 N D	J. H. Taylor & Co., Macaulay St., Huddersfield.
5 N F	R. W. Galpin, "Bank House," Herne Bay.
5 N G	Nottingham B.B.C. Station, 4, Bridlesmith Gate.
5 N H	A. C. Hulme, 39, Poplar Ave., Birmingham.
5 N L	H. C. Turner, M.I.E.E., A.M.C.T., 45, Manley Rd., Whalley Range, Manchester.
5 N N	J. H. D. Ridley, 106, Woodside Green, S. Norwood.
5 N O	Newcastle B.B.C. Station, 10, Gray St.
5 N P	E. P. Burgess, 2, Queen's Rd., Bradford.
5 N T	C. H. Friskney, 23, Tennyson St., Lincoln.
5 N U	H. L. Thomson, 100, Old Fallow Rd., Cannock.
5 N W	E. J. Allan, 8, Westfield Pl., Dundee.
5 O C	Lt.-Col. E. C. Jennings, Kidwelly, S. Wales.
5 O D	R. Bates, "Holmside," St. Catherine's, Linc.
5 O F	W. G. Gold, "Rosedale," Belwell Lane, Four Oaks, nr. Birmingham.
5 O J	J. Warburton, 47, Clayton Rd., Bradford.
5 O L	J. F. Cullen, 68, Queen's Drive, Liverpool.
5 O T	F. J. Woods, Upper Colwyn Bay, N. Wales.
5 O W	H. Green, Norman House, Manchester.
5 O X	C. H. V. Hubbard, 196, Putney Bridge Rd.
5 O Y	Belvedere Radio Society, Technical Institute, Erith, Kent.
5 P B	F. C. Hirst, Longwood, Huddersfield.
5 P D	F. A. Durrant, 366, Forest Rd., Walthamstow, E.17.
5 P J	A. Shaw, 8, Hall Rd., Trawden, nr. Colne.
5 P R	B. Ratcliffe, 68A, Dewsbury Rd., Leeds.
5 P S	J. Catt, Alexandra Rd., S. Farnborough.
5 P U	T. Allison, 33, Wilton Grove, Wimbledon, S.W.19.
5 P V	R. G. Templar, 52, Alderville Rd., Hurlingham.
5 P X	D. Shunnon, Wyvern Grange, Sutton Coldfield, Birmihgham.
5 P Y	Plymouth B.B.C. Station, Athenæum Chas., Athenæum Lane.
5 P Z	J. F. Gregory, 134, Wellesley Rd., Ilford.
5 Q B	A. G. Bainton, 8, Palace Rd., S.W.2.
5 Q C	H. C. Bateman, 2, Gideon Rd., Lavender Hill, S.W.11.
5 Q D	G. H. Wray, 198, Church Gate, Loughborough.
5 Q I	South Shields and District Radio Club, Edinburgh Bldgs., South Shields.
5 Q J	J. Pain-Prangnell, "Dalegarth," Methuen Rd., Bexley Heath, Kent.
5 Q K	F. J. Waller, Eastwood House, Rochford, Essex.
5 Q M	V. R. Mills, 122, Hughenden Rd., Hastings.
5 Q Q	H. C. Gooding, Ipswich St., Stowmarket.
5 Q R	D. G. Bird, 8, Osborne Tce., South Shields.
5 Q U	L. J. Dolphin, 23, Carless Ave., Birmingham.
5 Q V	F. L. Stollery, Vista Rd., Clacton-on-Sea.
5 Q X	J. W. Holt, 6, Raby Rd., New Malden.
5 Q Z	Newport & Dist. Radio Association, Secondary School, Newport, Mon.
5 R B	A. Garnett, Southwell Pk. Rd., Camberley.
5 R C	W. Brierley, 59, Gayner Pk., Filton, Bristol.
5 R F	L. F. Hunter, 18, Tannsfeld Rd., Sydenham.
5 R I	A. J. Stevens, Ltd., Wolverhampton.
5 R L	J. A. Sang, 22, Stanmillis Gardens, Belfast.
5 R M	Peto-Scott Co., 99, High Holborn, W.C.2.
5 R P	H. I. Hughes Hughes & Watts, Ltd., Birkenhead.
5 R Q	G. W. Tankin, 164, Coldharbour Rd., Bristol.
5 R T	—, 104, Clarendon St., Spring Bank, Hull, Yorks.
5 R W	J. W. Elliott, 69, Castleton Rd., Goodmayes, Essex.

5 R Z	A. G. Wood, 93, Upper Tulse Hill, S.W.2.
5 S A	Mercian Radio Co., Radio Works, Hinckley.
5 S C	Glasgow B.B.C. Station, 21, Blythswood Sq.
5 S D	J. D. Turner, "Barwythe," nr. Dunstable.
5 S F	J. K. Wilkie, Knowsley Rd., Liverpool.
5 S I	C. L. Naylor, 43, Hill Crescent, Longden Rd., Shrewsbury.
5 S L	J. S. Yeomans, 11, Hill View Tce., Chapel Allerton, Leeds.
5 S Q	A. P. MacGory, 58, Kirk St., Campbeltown.
5 S T	R. Morrison, Kilbarchan, Renfrewshire.
5 S U	Fraser, St. John's Lodge, N.W.1.
5 S W	C. Bedford, Turton Hall, Gildersome, Leeds.
5 S X	Swansea B.B.C. Station.
5 S Z	J. W. Riddenough, "Lawnside," Baildon, Yorks.
5 T A	V. I. N. Williams, Lees Rd., Bramhall.
5 T F	P. A. Gooding, 16, Cambridge Rd., Hammersmith, W.
5 T G	F. R. W. Stafford, 3, Lee Rd., Dovercourt, nr. Harwich, Essex.
5 T H	S. H. Suthers, 1, Stamford Brook Gdns., W.6.
5 T I	J. Bonnett, 159A, Turner's Hill, Cheshunt.
5 T L	E. D'Eresby Moss, 4, St. George's Terrace, Regent's Park, N.W.1.
5 T N	Capt. C. E. Stewart, R.E.T. "Osborne," Mount Pleasant, Weymouth.
5 T Q	H. Rayner, 32, Grange Rd., Cleckheaton.
5 T R	A. J. Cooper, 8, Cowley Rd., Ilford, Essex.
5 T S	W. Dean, Ramsgreave, Blackburn.
5 T U	I. L. Rodger, Western Tce., Falmouth.
5 T V	W. H. Lloyd, 27, Copthall Gdns., Twickenham.
5 T W 5 T X	R. Stanton Baugh, "Longfield," Wake Green Rd., Moseley, Birmingham.
5 T Z	W. G. Sherratt, 11, Bath Rd., Cowes.
5 U A	A. Barber, 15, Hartington Tce., Bradford.
5 U C	L. Gardener, Lewis Rd., Sutton, Surrey.
5 U L	J. W. Coveney, 12, Wallwood Rd., E.1.
5 U M	H. Allchin, 78, Chester Rd., Forest Gate, E.7.
5 U O	R. C. Simmonds, 61, Brightfield Rd., Lee.
5 U Q	J. C. L. Edwards, Trevor, Wrexham.
5 U S	J. Croysdale, 5, Elm Grove, Burley-in-Wharfedale, Yorks.
5 U V	L. A. Jeffrey, 90, Harringay Rd., N.15.
5 U X	H. Stephenson, Gildersome, Leeds.
5 U Y	D. B. Fry, "The Laurels," Mayfield, Sussex.
5 U Z	J. E. Llewellyn, "Elmfield," Baldock Rd., Letchworth, Herts.
5 V B	G. C. Curtis, 33, Swindon Rd., Birmingham.
5 V D	P. Wakefield, 31, Station Rd., Finchley.
5 V K	B. Caldwell, Lower Walton, Warrington.
5 V L	R. W. Leader, 93, Pinner Rd., Harrow.
5 V P	G. F. Kitchen, 10, Beech Rd. Epsom, Surrey.
5 V R	D. Kilburn, Derby House, Hendon.
5 V T	G. C. Webb, 10, Osborne Rd., Stroud Green.
5 V U	S. Butters, 51, Clarendon Rd., W. Croydon.
5 V V	S. A. Richards, 103, Isledon Rd., N.7.
5 V W	W. V. Harrington, 51, First Avenue, E.17.
5 V X	T. H. Ives, 49, Acme Rd., Watford, Herts.
5 W A	Cardiff B.B.C. Station, 39, Park Place.
5 W D	K. Ulyett, 25, Harrington Rd., Leytonstone.
5 W F	D. G. Bower, Upper Richmond Rd., S.W.15.
5 W G	G. M. Jones, 49, Baron Rd., Chadwell Heath.
5 W H	J. Goodwin, 57, Hale Lane, Mill Hill, N.W.7.
5 W I	P. Blanchard, Culliford Rd., Dorchester, Dorset.
5 W M	J. B. Renshaw, Old Chapel St., Blackburn.
5 W P	F. A. Woolridge, 83, Selsey Rd., Edgbaston, Birmingham.
5 W R	C. E. Morriss, Heron Hill, Belvedere, Kent.
5 W U	R. B. Cross, 9, Ormsby Avenue, Gorton Mount Estate, Gorton.
5 W V	J. Dow, "Woodbine," Blantyre, Lanarkshire, N.B.
5 W Z	E. W. Hettich, 1, King St., Jersey.
5 X M	F. & W. Eustance, Briardale Rd., Liverpool.
5 X S	H. W. Everett, 30, Gournock Rd., Eltham.
5 X R	F. A. Tuck, 87, Mayo Rd., Willesden, N.W.10.
5 X S	F. B. Thomas, 7, Mornington Villas, E.11.
5 X T	P. B. Thompson, 1, Chase Side Pl., Enfield.
5 X U	T. N. Lord, 6, Trafalgar Tce., Dewsbury.
5 X V	Chelmsford Broadcasting Station.
5 X W	J. C. Harrison, 10, Lake Rd., Lytham.
5 X X	A. F. C. Boyes, 48, Lavender Gdns., S.W.
5 X Y	E. Bridgewater, 28, Frederick St., Widnes.
5 Y E	A. H. Goodliffe, 17, Malvern Rd., Mapperley, Nottingham.
5 Y L	R. Hesketh, Ltd., Naylor's Estate, Slough.
5 Y M	E. H. Robinson, "Langmead," Pirbright.
5 Y O	J. E. Noble, 108, James St., Golcar, nr. Huddersfield.
5 Y Q	J. Gallacher, 4, Havelock Tce., Paisley.
5 Y R	F. H. Webber, 14, Bridge St., Tiverton, Devon.
5 Y S	C. H. Dyke, Streetebrooke Rd., Shirley, Birmingham.
5 Y W	R. S. Whitwell, 62, Spon End, Coventry.
5 Z F	K. W. F. Townend, 48, Gt. George St., Leeds.
5 Z G	H. Taylor, 30, Park Rd., Barnoldswick, Yorkshire.
5 Z H	T. Allison, Cromwell Engineering Co., 81, Oxford Av., Merton Pk., S.W.20.
5 Z K	G. E. Ward (City Accumulator Co.), 13, Queen's Rd., St. John's Wood, N.W.8.
5 Z O	W. F. Mills, 11, Stoney Hey Rd., N. Brighton.
5 Z Q	H. Jessop, 144, Halifax Rd., Brighouse, Yorkshire.
5 Z R	F. H. Austen, St. Peters, Broadstairs.
5 Z S	E. Clarke, "Churchmead," Pirbright, Surrey.
5 Z T	E. Edwards, 18, Ripon St., Moss Side, Manchester.
5 Z V	W. Herring, 221, Newark Rd., Lincoln.
5 Z X	T. L. Rawson, "Maudsley House," Preston.
5 Z Y	L. Headlam, Stakesby Rd., Whitby, Yorks.
5 Z Z	H. C. Whitby, The Ness, Winsford.
6 A A 6 A B	Durham & Northumberland Collieries Fire and Rescue Brigade, Scotswood Rd., Newcastle.
6 A D	S. Murgatroyd, "The Withens," Glenwyllin Rd., Waterloo, Liverpool.
6 A F	R. H. Rice, 70, Seaside, Eastbourne.
6 A G	W. H. Fortington, 237, Dudley Rd., Birmingham.
6 A I	H. T. Andrews, Wireless Depot, Ystradgynlais, Swansea.
6 A J	G. Ensoll, 25, Victoria Rd., Dukinfield, Ches.
6 A L	J. Parker Morter, 49, Westow Hill, Upper Norwood, S.E.19.
6 A O	A. Ruddlesden, Wakefield Rd., Dewsbury.
6 A P	J. A. Hobson, Berkswell, Coventry.
6 A Q	A. H. Bird, 35, Waverley Pk., S.E.15.
6 A V	F. A. Elliff, 10, Stumperlowe Pk. Rd., Fulwood, Sheffield.
6 A W	E. J. Jarvis, "Greensted," 24, St. James Rd., Ilkley, Yorks.
6 B B	J. Bolt, Crouchley, Lymm, Warrington.
6 B C	W. D. Clague, "White House," Gateshead.
6 B J	C. L. Solomon, 10, Cavendish Rd., Brondesbury, N.W.6.
6 B M	Bournemouth B.B.C. Station, 72, Holdenhurst Rd.
6 B N	G. E. Minvalla, 25, Weighton Rd., Anerley.
6 B O	L. C. Hagger, 35, Cunningham Pk., Harrow.
6 B P	A. E. Hayward, "Debonia," Higham Rd., Tottenham, N.15.
6 B Q	J. L. Cannon, Woodcroft Avenue, Glasgow.
6 B R	G. H. Ramsden, "Overdale," Ilkley, Yorks.
6 B T	C. A. Jamblin, 82, York Rd., Bury St. Edmunds.
6 B V	V. E. M. Oliver, Sunninghill, Berks.
6 B W	J. Mason, Westmorland Rd., New Brighton.
6 C C	B. A. Matthews, "Westgate," Frederick Rd., Wylde Green, nr. Birmingham.
6 C F	W. C. Lingard, Bridgeholme Green, Chapel-en-le-Frith, Derbyshire.
6 C G	A. W. Eagle, 42, Park Lane, Tottenham, N.17.
6 C H	R. J. Leerks, "Denmark Villa," Bromley, Kent.
6 C L	C. E. Tilley, 10, Guthlaxton St., Leicester.
6 C T	F. C. Deal, 77, Hertford Rd., Lower Edmonton.
6 C V	P. H. Dorte, "Lynwood," Oatlands Park, Weybridge.
6 C W	D. Burne-Jones, Rustic Ave., S.W.16.
6 D C	G. Young, 37, Barnard Rd., Manchester
6 D D	J. W. Barber, 205, Brockley Rd., S.E.4.
6 D F	G. W. Thinnimore, Dale Rd., Matlock.
6 D G	H. H. Burbury, Crigglestone, Wakefield.
6 D J	A. C. Copsey, 27, Sutherland Rd., N.17.
6 D K	F. A. Boyce, 111, Stoke Rd., Slough.
6 D M	C. Knight-Coutts, 16, Vine St., Evesham.
6 D P	N. Crowther, 219, Roundhay Rd., Leeds.
6 D U	E. J. Newton, 1, Jerningham Rd., New Cross.
6 D W	D. H. Johnson, 131, Clapton Com., E.5.
6 D Y	C. Keith-Murray, "Paultons," Romsey.
6 D Z	L. Halcomb, 106, Millhouses Lane, Sheff.
6 F A	G. E. Wardle, "Kingsdown," College Rd. North, Blundellsands, Liverpool.
6 F B	W. Grocott, Church Rd., Oxley.
6 F C	L. S. Taylor, 6, Bankfield Rd., Huddersfield.
6 F D	F. T. Carter, Gleneagle Mansions, Streatham.
6 F G	N. Hendry, Hertford House, Sanderson Rd., Newcastle-on-Tyne.
6 F H	G. W. Livesky, 3, Spring Bank, Market Drayton.
6 F J	G. W. Jarvis, 21, Baltic House, Tonbridge.
6 F K	Worcester Cdt. Signal Co., R.C. of Signals, Sansome Walk, Worcester.
6 F L	Sheffield B.B.C. Station, Corporation St.
6 F Q	A. B. Richardson, 9, Quarry Rd., Hastings.
6 F V	W. H. Taylor, 37, Bridge St., Warrington.

6WV	V. W. Crook, 26, Kenwyn Rd., W. Wimbledon.
6WX	A. I. Morgan, "Elysium," Ouseley Rd., Wraysbury, Bucks.
6XC	R. R. Sawell, 38, Waddon Rd., Croydon.
6XG	—, 57, Hillfield Rd., N.W.6.
6XQ	H. Field, Baggrave Hall, Leicestershire.
6XT	S. W. G. Farmery, "The Moorlands," Whinfield, Adel, nr. Leeds.
6XX	Radio Society of Great Britain (P. R. Coursey Hon. Sec., Marchemont Rd., Richmond).
6XY	F. Cropper, B.Sc., A.I.C., 42, Acres Lane, Stalybridge, Cheshire.
6XZ	M. Marshall, "Beach View," Island Rd., Newquay, Cornwall.
6ZX	H. Field, Baggrave Hall, Leicestershire.
6ZY	L. Gordon, 133, Old St., Ashton-under-Lyne.
ACA	——, ——, Aldershot.
6BBC	B.B.C. Experimental Station, Hendon.
BVG	D. F. Station, Admiralty, Berwick.
BVH	Admiralty, Harwich.
BVN	D. F. Station, Admiralty, Flamborough.
BVY	D. F. Station, Admiralty, Lizard.
BWH	Admiralty, Harwich.
BXH	D. F. Station, Admiralty, Orfordness.
BXJ	D. F. Station, Admiralty, Larne.
BXV	D. F. Station, Admiralty, Amlwch.
BYA	Admiralty, Whitehall.
BYB	Admiralty, Cleethorpes.
BYC	Admiralty, Horsea.
BYD	Admiralty, Aberdeen.
BYE	Admiralty, Ipswich.
BYF	Admiralty, Pembroke.
BYH	Admiralty, Rosyth.
BYI	Admiralty, Scarborough.
BYJ	Admiralty, Felixstowe.
BYK	Admiralty, Sheerness.
BYL	Admiralty, Dover.
BYM	Admiralty, Culver Cliff.
BYN	Admiralty, Portland Bill.
BYO	Admiralty, Rame Head.
BYP	Admiralty, Cromarty.
BYS	Post Office, Portpatrick.
BYT	Admiralty, Stockton.
BYV	Post Office (tem. closed), Grimsby.
BZA	Admiralty, Inchkeith.
BZC	Admiralty (Sig. Sch.), Portsmouth.
BZS	Admiralty, Kingsnorth.
BZT	Admiralty, Tynemouth.
BZU	Admiralty, Immingham.
BZW	Admiralty (D. F. Station), Rhyl.
GBL	Leafield Post Office.
GCC	Cullercoats Post Office.
GCS	Caister-on-Sea Post Office.
GDX	—, Isle of Man.
GEC	Civil Aviation, Castle Bromwich.
GED	Civil Aviation (D.F.). Croydon, 900 metres.
GEG	Civil Aviation, Lympne.
GEM	Civil Aviation, Didsbury.
GEP	Civil Aviation (D.F.), Pulham.
GER	Renfrew Aerodrome.
GFA	Air Ministry, London.
GFC	Air Ministry, Cranwell.
GFF	—, Felixstowe.
GFG	Air Ministry, Grain.
GFI	—, Andover.
GFL	—, Calshot.
GFM	Cattewater Air Station.
GFO	—, Shotwick.
GFW	R.A.F. Wireless Tel. Stn., Lee-on-Solent.
GFZ	—, Howden.
GKG	L.M.S.Rly. (Midland Rly.), Heysham Harbour.
GKU	—, Devizes.
GKZ	—, West Pier, Grimsby.
GLA	Stn. A (French Service), Marconi's Wireless Tel. Co., Ltd., North Weald, Essex.
GLB	Stn. B (Swiss Service), Marconi's Wireless Tel. Co., Ltd., North Weald, Essex.
GLD	Land's End Radio.
GLO	Stn. C (Spanish Service), Marconi's Wireless Tel. Co., Ltd., North Weald. Essex.
GLP	Marconi's Wireless Telegraph Co., Ltd., Ongar.
GLV	G.P.O., Seaforth, Liverpool.
GNF	H.M. Wireless, Tel. Stn., N. Foreland, Kent.
GNI	Post Office, Niton, I. of W.
GNJ	Fastnet Rock Lighthouse, Rockisland, Skibbereen, Ireland.
GNT	Niton, I.O.W.
GNV	Southern Rly. (L.B.S.C.Rly.), Newhaven.
GPQ	Great Eastern Rly., Parkeston, Harwich.
GRL	Fishguard Wireless Stn., Goodwick, P'broke.
GUR	Southern Rly. (S.E.C.Rly.), Folkestone Harbour.
GVB	East Goodwin Lightship.
GVC	Gull Lightship.
GVD	South Goodwin Lightship.
GVE	Sunk Lightship
GVF	Tongue Lightship.
KCLX	Prof. Wilson, University of Ldn. (King's Col.)
MAX	Marconi Co., Broomfield.
MFT	Marconi's Wireless Telegraph Co., Clifden.
MHH	Marconi's Wireless Telegraph Co., Poole.
MPO	—, Poldhu.
MUU	Marconi's Wireless Telegraph Co., Carn.
MUV	Marconi's Wireless Telegraph Co., Towyn.
MZX	Marconi's Wireless Telegraph Co., Chelmsford.

Chief Foreign Stations

BVZ	Admiralty, Carnsore.
BWW	Gibraltar, 4,800 metres.
BYZ	Malta, 4,200 metres.
EAA	Madrid, 3,600 metres.
FL	Eiffel Tower, 2,600 metres.
GNV	R. H. Houghton, L.B. & S.C.Rly., Newhaven.
HBB	Berne, 3,400 metres.
HS	Brussels, 1,680 metres.
ICD	Rome, 3,200 metres.
LCH	Christiania, 8,000 metres.
LCM	Stavanger, 12,000 metres.
LP	Königswusterhausen, 2,800 metres.
MSK	Moscow, 5,000 metres.
POZ	Nauen, 12,600 metres.
PRG	Prague, 4,700 metres.
SFR	Radiola, 1,780 metres.
WAR	Warsaw, 2,500 metres.
WGG	Tuckerton, 16,100 metres.
WII	New Brunswick, 13,600 metres.
WQK	Long Island, 16,465 metres.
YN	Lyons, 15,100 metres.

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W 2. (With Red top) for H.F. use.

W 3. (With Green top) for Loud Speaker.

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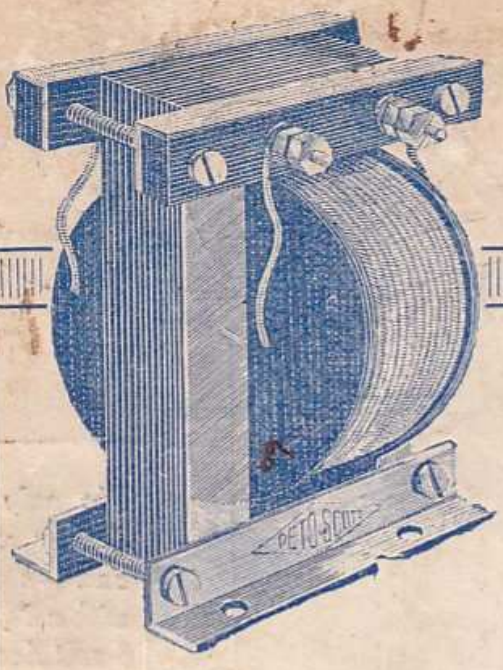

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