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TRADE
ANNUAL
1934

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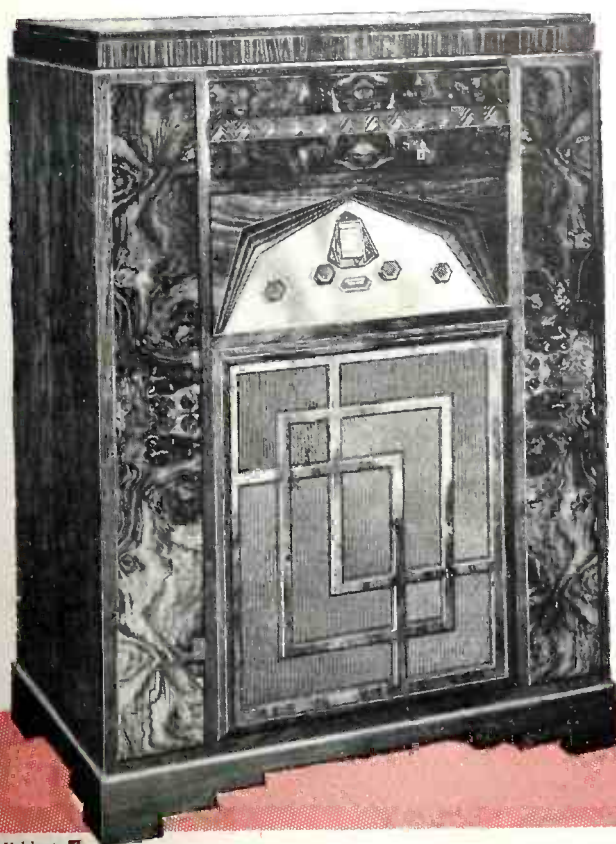
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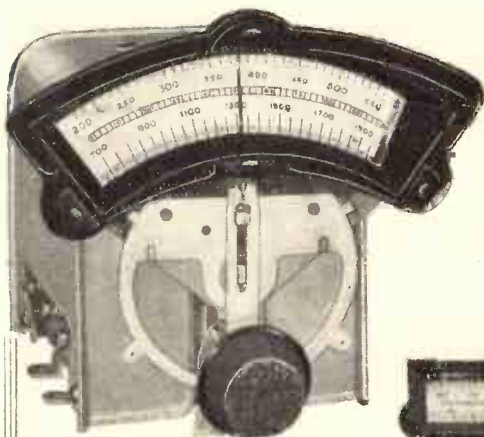
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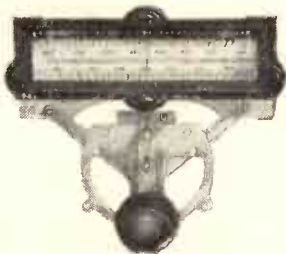


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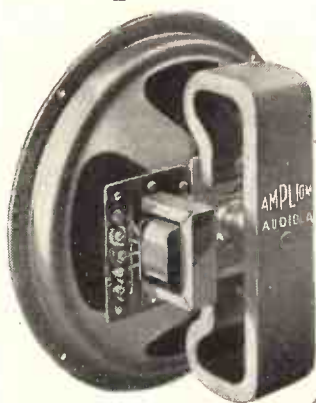
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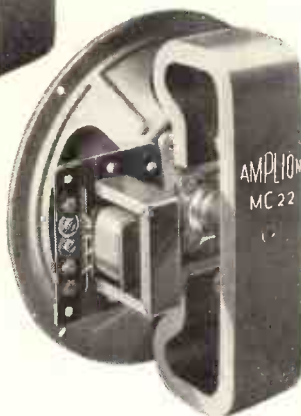
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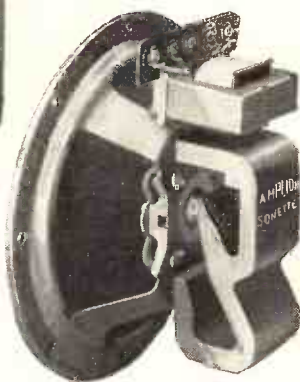


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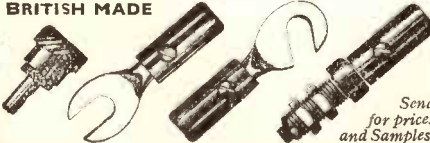
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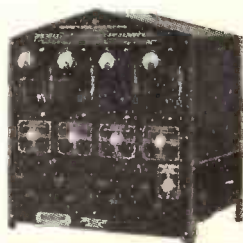
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CALENDAR for 1933

	JANUARY.	FEBRUARY.	MARCH.	APRIL.	MAY.	JUNE
Sun.	1 8 15 22 29	5 12 19 26	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25
Mon.	2 9 16 23 30	6 13 20 27	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26
Tues.	3 10 17 24 31	7 14 21 28	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27
Wed.	4 11 18 25	1 8 15 22	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28
Thurs.	5 12 19 26	2 9 16 23	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29
Fri.	6 13 20 27	3 10 17 24	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30
Sat.	7 14 21 28	4 11 18 25	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24
	JULY	AUGUST.	SEPTEMBER.	OCTOBER.	NOVEMBER.	DECEMBER.
Sun.	2 9 16 23 30	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26	3 10 17 24 31
Mon.	3 10 17 24 31	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27	4 11 18 25
Tues.	4 11 18 25	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28	5 12 19 26
Wed.	5 12 19 26	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	6 13 20 27
Thurs.	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28
Fri.	7 14 21 28	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24	1 8 15 22 29
Sat.	1 8 15 22 29	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25	2 9 16 23 30

CALENDAR for 1934

	JANUARY.	FEBRUARY.	MARCH.	APRIL.	MAY.	JUNE
Sun.	7 14 21 28	4 11 18 25	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24
Mon.	1 8 15 22 29	5 12 19 26	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25
Tues.	2 9 16 23 30	6 13 20 27	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26
Wed.	3 10 17 24 31	7 14 21 28	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27
Thurs.	4 11 18 25	1 8 15 22	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28
Fri.	5 12 19 26	2 9 16 23	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29
Sat.	6 13 20 27	3 10 17 24	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30
	JULY.	AUGUST.	SEPTEMBER.	OCTOBER.	NOVEMBER.	DECEMBER.
Sun.	1 8 15 22 29	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25	2 9 16 23 30
Mon.	2 9 16 23 30	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26	3 10 17 24 31
Tues.	3 10 17 24 31	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27	4 11 18 25
Wed.	4 11 18 25	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28	5 12 19 26
Thurs.	5 12 19 26	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	6 13 20 27
Fri.	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28
Sat.	7 14 21 28	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24	1 8 15 22 29

CALENDAR for 1935

	JANUARY.	FEBRUARY.	MARCH.	APRIL.	MAY.	JUNE.
Sun.	6 13 20 27	3 10 17 24	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30
Mon.	7 14 21 28	4 11 18 25	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24
Tues.	1 8 15 22 29	5 12 19 26	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25
Wed.	2 9 16 23 30	6 13 20 27	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26
Thurs.	3 10 17 24 31	7 14 21 28	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27
Fri.	4 11 18 25	1 8 15 22	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28
Sat.	5 12 19 26	2 9 16 23	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29
	JULY.	AUGUST.	SEPTEMBER.	OCTOBER.	NOVEMBER.	DECEMBER.
Sun.	7 14 21 28	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24	1 8 15 22 29
Mon.	1 8 15 22 29	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25	2 9 16 23 30
Tues.	2 9 16 23 30	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26	3 10 17 24 31
Wed.	3 10 17 24 31	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27	4 11 18 25
Thurs.	4 11 18 25	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28	5 12 19 26
Fri.	5 12 19 26	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	6 13 20 27
Sat.	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28

THE PAST YEAR IN THE TRADE

Considerable activity in general trade politics, in the affairs of various trade associations and organisations and important alterations in the trading policies of individual manufacturers have been the outstanding matters of interest during the period September 1, 1932, to the end of August, 1933.

Radio Manufacturers' Association

First of all the R.M.A. revised its Constitution early in the year so that a stronger hold over the use made by members of foreign components in British made sets was achieved and a number of the old regulations were clarified.

At the same time the Constitution of the R.M.A. Council was revised so that at the annual elections a two-thirds membership of set manufacturers on the Council is assured.

Radio Wholesale Trading Agreement

Very considerable activity in the R.W.T.A. has taken place. The old agreement was altered and some 25 per cent. of the wholesalers who had previously appeared as subscribers were omitted.

The original agreement between manufacturer subscribers to the R.W.T.A. and the co-operative societies whereby the co-ops. were prohibited from paying dividends on radio set sales was replaced by a new agreement under which dividends may be paid but co-operative societies are prohibited from selling to non-members and from advertising dividends in connection with radio.

This second arrangement was followed by a third (October, 1933) whereby a "No Dividend" clause governed the agreement. Most manufacturers are now supplying on these terms, or are not supplying co-ops. at all.

Set Makers Combine

As early as February came signs of increasing manufacturing interest in selling policies. Firstly Regentone instituted a scheme of distribution designed to eliminate the dabbler and the price cutter. Ekco shortly afterwards announced a comprehensive scheme designed to stabilise distribution while Telsen also published new plans.

Subsequently a number of set makers combined on points of common interest and a reduced standardised discount of 27½ per cent. with a maximum of 33½ per cent. for service agents was announced. In nearly every instance there was a reduction in the number of wholesale suppliers.

In December, 1932, a new manufacturing organisation came into being with the formation of the Radio Component Manufacturers' Federation, which was formed mainly as the result of the efforts of Lt.-Col. G. D. Ozanne and Messrs. H. W. Pettyfer, A. F. Bulgin and E. M. Lee.

Records and Copyright

Early in the period under review record manufacturing companies prohibited the use of records for the purposes of public performance. Subsequently the position was eased by clarifying statements issued by a group of record manufacturers, but certain test cases are still pending.

The Clock Conference

A new interest in radio trading was provided by the sudden growth in the popularity of synchronous electric clocks. In November, 1932, the Synchronous Clock Conference, upon which were represented most of the better-known British manufacturers, was formed.

Car Radio

Towards the end of November, 1932, appeared the first signs of interest in car radio receivers.

Patents

In April there was announced the Mullard-Philips licence, an offer which was made entirely independently of the British Patent Pool. The form of the licence closely followed the general Pool licence and an indemnity on approved circuits and apparatus against infringement was given.

As we go to press the position with regard to the British Pool Licence has altered very considerably. The Hazeltine patents have been amalgamated with the British Pool patents and a joint licence is being offered by the Pool without extra charge.

THE TREND OF DEVELOPMENT

A Twelve Months' Technical Review

The past year will be remembered for a number of important developments. Already these have resulted in considerable advances in both battery and mains sets, and it is probable that their full effect has yet to be felt.

Battery sets have been revolutionised by quiescent push-pull, or Q.P.P., and Class B. These two output systems provide quality and volume so far only associated with mains receivers and are so efficient that ordinary batteries can be used economically.

In both Q.P.P. and Class B the valves are operated from the bottom of the characteristic upwards, and the anode current is strictly proportional to the signal voltage. Obviously this is more efficient than with the ordinary output system in which the current varies above and below a comparatively high steady value.

Class B.

Naturally, with Q.P.P., which, apart from the fact that the valves carry about double the usual bias, is an ordinary push-pull arrangement, the volume obtainable is about twice that of one valve. Class B valves, which consist of two sets of electrodes in one bulb and are designed to work without bias, sometimes give as much as three watts.

As the Class B valve works with a positive grid, grid current flows, and both the intermediate transformer and the preceding valve, have to be able to supply the necessary power. These facts offered manufacturers some real problems but most firms have solved them very successfully.

Class B has gained most favour, and it does seem that if properly handled it can hold its own with other systems on the grounds of both quality and efficiency.

The characteristic feature of the season so far as mains sets are concerned has been the dominance of the four-valve plus rectifier super-heterodyne. These sets usually employ an initial detector-oscillator, an I.F. stage, a second detector and a power pentode.

Cathode coupling is used for the oscillator, and re-radiation and second channel are kept down to negligible proportions by careful design and the use of band-pass input filters. Newly introduced H.F. pentodes are generally utilised in the detector-oscillator and I.F. stages, although there are one or two sets in which a hexode or pentagrid valve is employed in the first position.

The hexode or pentagrid contain a cathode and an anode and four or five grids respectively. They actually form two valves, one

round the other. The inner three electrodes constitute the oscillator. Some of the electrons pass through the "anode" of this part of the valve and form the cathode of the second, or detector, set of electrodes.

As the supply of electrons to the detector depends on the oscillator section a purely electrical mixing is obtained. A further advantage is that practically no re-radiation whatever occurs.

The H.F. pentode was the first of several new types of valve that have been produced. It is similar to the screen-grid valve, but incorporates a third suppressor grid. The H.F. pentode has higher magnification than the screen-grid valve and is less critical as regards the screen-grid voltage.

Both ordinary and variable- μ types are produced and these can be used in the place of screen-grid valves in almost any set. The principal use of the valve, however, lies in the four-valve superhet.

Other new valves include double-diode triodes, double-diode tetrodes, double-diode pentodes and single-diode tetrodes. Most of these are used in the larger type of receiver to provide practically distortionless diode detection and automatic volume control.

A.V.C., or, more strictly speaking, automatic gain control, consists of the use of the H.F. voltage produced at the second detector to regulate the bias of the H.F. valves, and hence the gain of the set.

Automatic Volume Control.

Besides simple A.V.C., there is delayed A.V.C., in which the control does not come into operation until the incoming signal reaches a certain strength. Another development of the principle is quiet A.V.C., which suppresses all noise between stations.

Apart from these new valves—and a few similar types such as double-diode tetrodes and double-diode pentodes—a new valve construction resulting in a great increase in strength and reliability was introduced. In this construction, which so far has only been applied to mains types, the anode itself forms the envelope of the valve.

The anode is can-shape and is sealed into the foot by a rubber-mounted glass neck. The other electrodes are firmly and accurately mounted in the anode by means of mica spacers. In some types the anodes are unprotected but for a heat-resisting varnish, but in others a metal jacket, which forms an electrical screen, is fitted.

Besides giving greater strength and electrical consistency the construction saves space, while the anodes, being air-cooled,

**MULLARD—THE VALVE OF THE PAST,
THE PRESENT, THE FUTURE**

can dissipate more heat, enabling the ratings to be increased.

Valve characteristics as a whole have not improved very considerably. Most progress has been shown by mains pentodes, which now deliver 3 to 3½ watts against the 2 to 2½ watts of a year ago.

Some attention has been given to the production of valves for D.C. mains, and full ranges of types with filament voltages of from 16 to 35 are available. British makers have not, however, produced universal valves for A.C. or D.C. mains.

The "cold" valve, which has always been the subject of much speculation, made its appearance—a small metal rectifier. It can be used as a detector but it cannot, of course, amplify. It is of greatest value as a second detector in a battery superhet. In this type of receiver it is also generally used to provide A.V.C.

Probably all the applications of the device have not been seen yet. It is being used in components which adapt almost any set to A.V.C., and it can also be employed to adjust the bias of an output valve to suit the signal strength. This saves H.T. current very much as do Q.P.P. and Class B.

It seemed at one time as if the midget receiver measuring 12 in. by 9 in. by 6 in. or less would be introduced here following its success in America. However, due probably to both market considerations and the fact that universal valves were not available, most manufacturers did not interest themselves in the idea. At least one small four-valve model appeared however.

Car radio appears to be waiting for the public to become car-radio minded.

Electrical interference has received more attention than ever before. Besides participating in an inquiry, manufacturers have produced special screening tubes for aerial leads and condensers and chokes designed to "silence" machines.

One firm produced a system designed to prevent the pick-up of static at the receiver. A screened lead-in is used in conjunction with impedance matching units, and the whole receiver is fully screened and carefully designed to prevent noise entering from the mains.

There have been important developments in the direction of iron-cored coils and permeability tuning.

The way to the iron-core coil was opened up when it was found that the losses incurred when an ordinary iron-core is used can be avoided by the use of particles of iron insulated from each other. This type of core enables a given inductance to be obtained with few turns of wire. The reduction of copper losses that result means greater efficiency and sharper tuning.

Permeability tuning is a direct result of the new core material. By adjusting the

relative positions of the coil and its core, a circuit can be tuned by variation of its inductance instead of its capacity as is usual. It is still too early to say what effect permeability tuning will have on set design but its advantages, compactness, high efficiency and probably the elimination of waveband switching, are of obvious value.

An interesting development regarding components for retail sale is their growing similarity to the manufacturers' type counterparts. Chassis construction is now common in the home-made set. Kits have continued in popularity and some makers have improved on this idea by producing "paks" consisting of various H.F. components assembled on a small chassis. By buying these the constructor ensures that the trickiest part of the set will be satisfactory.

Speakers and Cabinets.

Although the general standard of reproduction has been raised, little real progress has been made with loud-speakers. Dual reproducers are almost the rule in high-class instruments, but the fall in prices has not favoured their wider adoption.

Midget speakers only 4½ in. or 5 in. in diameter have been produced in both permanent magnet and energised types for portables and midget receivers.

Cabinets have improved in design and construction. The lines are clean and modern and largely rely on woods of contrasting colours for decoration. Even inexpensive sets are veneered instead of "finished," and most expensive models have solid wood cabinets. Flat, horizontal cabinets have been very widely adopted, but makers as a whole have avoided the novelty type of case.

Full-vision scales are almost universal, and the lowest priced sets have wavelength calibration. A few de luxe instruments incorporate correct tune point indicators. These generally take the form of miniature moving-iron meters which show that the set is tuned to the centre of a transmission.

Another feature seen in a few of the more expensive sets has been automatic tone control, which compensates for the apparent loss in bass at low volumes.

The year has seen the almost complete banishment of the scanning disc in favour of the mirror drum for television. The cathode ray type of receiver has also received attention, due chiefly to the introduction of suitable inexpensive tubes. Mass produced television receivers employing both the mirror drum and cathode ray systems have been marketed.

With the present 30-line transmissions it is probable that the mirror drum is most satisfactory, but the cathode ray is likely to prove the better when the B.B.C. broadcasts 120-line images on the short waves this winter.

MULLARD THE MASTER VALVE



THE RADIO MANUFACTURERS' ASSOCIATION

Astor House, Aldwych, London, W.C.2.

Telephone: Holborn 3346 & 3347.

OFFICERS:

President:

Lt.-Col. J. T. C. Moore-Brabazon, M.C., M.P.

Vice-Presidents:

Capt. J. W. Barber, C.B.E., R. Milward Ellis, A.M.I.E.E., Capt. Ian Fraser, C.B.E., M.P., Sir Hugo Hirst, Bt., H. E. Marchese Marconi, G.C.V.O., Leslie McMichael, M.I.E.E., J. T. Mould, S.R. Mullard, M.B.E., M.I.E.E.

Chairman:

W. W. Burnham, F.Inst.R.E.

Vice-Chairman:

S. Widing Cole, O.B.E.

Hon. Treasurer:

J. Joseph, M.I.E.E.

Trustees:

J. Joseph, Leslie McMichael, J. T. Mould.

Executive Council:

Chloride Electrical Storage Co., Ltd., Climax Radio Electric, Ltd., E. K. Cole, Ltd., A. C. Cossor, Ltd., Edison Swan Electric Co., Ltd., Ferranti, Ltd., Garrard Engg. & Mfg. Co., Ltd., General Electric Co., Ltd., Igranite Electric Co., Ltd., Kolster-Brandes, Ltd., McMichael Radio, Ltd., Marconiphon Co., Ltd., Mullard Radio Valve Co., Ltd., Pye Radio, Ltd., Radio Instruments, Ltd., Telegraph Condenser Co., Ltd., Ultra Electric Ltd., Varley (Oliver Pell Control, Ltd.), Wingrove & Rogers, Ltd.

Secretary:

D. Grant Strachan.

The membership of the R.M.A. at the end of October, 1933, was 129.

The programme of Exhibitions organised by the Association during 1933 included a Private Trade Exhibition of Components (February 8 to 10); the National Radio Exhibition, Olympia, (August 15 to 24); and the Scottish Radio Exhibition, Kelvin Hall, Glasgow, (September 1 to 9).

The Private Trade Exhibition of Components, held at the Central Hall, Westminster, was the third Exhibition of this type organised by the R.M.A. Space was taken by

81 firms—as against 61 exhibitors at the corresponding 1932 Show. The interest aroused by the Exhibition among manufacturers of complete radio instruments, to whom admission to view the Exhibition was restricted, was considerably greater than on any previous occasion, and the attendance showed an increase of 50 per cent. over that at the 1932 Exhibition, which was itself an advance of 60 per cent. on that for 1931.

The National Radio Exhibition, at Olympia again occupied the Grand and National Halls, some 210 Exhibitors taking 76,350 square feet of stand space. An innovation was the erection of a broadcasting theatre in the National Hall in which, with the co-operation of the B.B.C., performances were given by favourite broadcasting artistes. The afternoon performance took the form of light music by the Gershon Parkington Quintet and vocalists, and in the evenings there were two shows—a special Radiolympia Revue, "Nine Days Wonder," and a Vaudeville Programme. Six of the performances in the broadcasting theatre were broadcast from one or other of the B.B.C. Transmitters. The broadcasting theatre proved very popular with the visiting public and "House Full" notices were displayed every night. The attendance at the Exhibition surpassed all previous records, the total paid admission reaching the figure of 209,463.

Following the conclusion of Radiolympia, the Scottish Radio Exhibition, organised by the R.M.A., opened in the Kelvin Hall, Glasgow, September 1 and ran until September 9. At this Exhibition 77 exhibitors occupied some 24,000 square feet. The attendance was 72,738.

The R.M.A. again co-operated with Provincial Exhibitions, Ltd., in the organisation of the Northern National Radio Exhibition, in the City Hall, Manchester, from September 27 to October 7.

Thus, for the first time, the R.M.A. achieved in 1933 an object which it has long aimed at, namely, the organisation of Radio Exhibitions in the three largest cities of the United

CUSTOM SAYS MULLARD

Kingdom—London, Glasgow and Manchester.

The Association's activities in connection with the development of export trade have been continued throughout the year and the "Export Markets" Survey issued in 1932 has been continuously corrected and revised as information has come to hand from the various countries of the world.

As from April 1, the R.M.A. has had under its jurisdiction the administration of the Quota for the importation of radio apparatus into France, this work being undertaken by the Association upon the decision of the French Government that after the conclusion of the first quarter of 1933 no further importations could be permitted without a certificate from some approved British organisation.

In view of the expiry of the A.3 Licence on August 28, 1933, the R.M.A. early in the year opened negotiations on behalf of the Radio Industry with the Licensing Pool, in order to clarify the patent situation existing after that date.

As the result of representations made by the R.M.A. to the Railway Clearing House, gramophones and radio-gramophones were transferred from Class 20 to Class 19 of the General Railway Classifications as from July, 1, 1933, this change securing the transport of

these goods by rail at the same rate as radio apparatus of a comparable character.

As the result of joint action between the R.M.A. and other interested parties, the Middlesbrough Corporation's attempt to obtain power to run on its own a Relay Station was defeated in the House of Commons.

The action of the R.M.A. Representatives at the Imperial Economic Conference at Ottawa in the Summer of 1932 in endeavouring to secure a modification of the Empire Labour Content figure of 25 per cent. then applicable to radio apparatus, bore fruit in the announcement made in the Import Duties (Imperial Preference) No. 3 Regulations of July 27, 1933, that radio goods, in future, would not be deemed to be manufactured in a country or territory in the British Empire unless at least 50 per cent. of their value was derived from expenditure incurred within that country or territory, in respect of materials grown or produced or work done in any such country or territory.

The Association has decided to renew its application to the Board of Trade for an order for the marking of imported radio apparatus with the country of origin, and is engaged in the preparation of a case in support of such application.

RADIO EXHIBITIONS

PROMOTED BY THE R.M.A. OR ITS PREDECESSORS.

Year	Promoter.	Venue.	Date.	No. of days.	No. of Exhibitors.	Stand area sq. ft.	Dem. Rm. area sq. ft.	Paid attendance.
1924	N.A.R.M.	Royal Albert Hall	Sept. 27 Oct. 8	10	56	11,700	—	46,000
1925	N.A.R.M. A.T.	Ditto	Sept. 12 Sept. 23	10	70	15,000	—	54,500
1926	N.A.R.M. A.T. & S.R.M.	Olympia New Hall	Sept. 4 Sept. 18	13	182	34,053	—	116,570
1927	R.M.A.	Ditto	Sept. 24 Oct. 1	7	184	34,642	—	99,315
1928	R.M.A.	Ditto	Sept. 22 Sept. 29	7	184	40,445	—	123,593
1929	R.M.A.	Ditto	Sept. 23 Oct. 3	10	185	42,177	7,006	140,627
1930	R.M.A.	Ditto and 1st floor, Empire Hall	Sept. 19 Sept. 27	8	186	54,464	8,769	161,128
1931	R.M.A.	Olympia, Nat. and Empire Halls	Sept. 18 Sept. 26	8	210	70,993	15,129	198,070
1932	R.M.A.	Olympia, Grand and Nat. Halls	Aug. 19 Aug. 27	8	241	74,154	19,368	180,750
1933	R.M.A.	Olympia, Grand and Nat. Halls	Aug. 15 Aug. 24	9	210	76,343	Offices, 7,803 Theatre, 14,000	209,463

MULLARD THE MASTER VALVE

THE BRITISH RADIO VALVE MANUFACTURERS' ASSOCIATION

59, Russell Square, London, W.C.1.

Museum 1206 and 1207—Bradval, Westcent, London.

Members—

A. C. Cossor, Ltd.
Edison Swan Electric Co., Ltd.
Ferranti Ltd.
General Electric Co., Ltd.
Marconiphone Co., Ltd.
Mullard Wireless Service Co., Ltd.
Philips Lamps, Ltd.
Six-Sixty Radio Co., Ltd.
Standard Telephones and Cables, Ltd.

Associates—

Cryselco, Ltd.
Siemens Electric Lamps and Supplies, Ltd.

Chairman :—S. R. Mullard.

Secretary :—H. Howitt.

Objects.—To promote, encourage, foster, develop and protect the interests of the public, the trade and the manufacturers of British-made thermionic valves and to impose such conditions on the conduct of the valve trade as in the opinion of the Association may be conducive to that object; to enter into agreements with and/or procure or promote agreements between members and wholesale and retail dealers in valves relating to the manufacture, supply and sale thereof, and particularly for the maintenance and protection of manufacturers' retail list prices and discounts and of the rules and bye-laws of the Association for the time being in force.

General Regulations.—These cover the strict maintenance of established list prices, and state that agreement holders may have no dealings of any kind with any make of valves unless authorised in writing by the Association. *This regulation applies to valves whether sold in sets or separately.*

These also cover allowances; consignment stocks; contracts; invoices, etc. A "Stop List" is operated by the Association.

DEFINITIONS OF PURCHASERS AND TERMS.

Users.—Any private or trading individual, firm or company purchasing valves but not reselling them as bona fide wireless dealers. The terms to users are list prices, nett with no cash discount. Wireless societies, staff associations and clubs are not entitled to any discounts.

Retailers.—Any individual, firm or company having business premises, trading on their own account as dealers in wireless apparatus and/or valves who carry a reasonable stock appertaining to such industries, and who purchase such goods on their own order forms for resale to users. The terms to retailers are 25 per cent. off English list prices or 22½ per cent. off Irish Free State list prices.

Terms to Retail Agreement-holders.—A special bonus of 10 per cent. on the nett invoice value of valves purchased is paid direct by the Association in cash at the end of each six months to retail agreement-holders subject to observance of the agreement.

Wholesale Distribution.—Certain individuals, firms or companies approved and specified by the Association, and whose business includes the distribution of valves and/or wireless apparatus to the trade and who carry and maintain on their own account for purposes of distribution a specified minimum stock of valves, who do not sell to the user, and who enter into specific obligations with the Association. The Association has a limited list of authorised Wholesale Distributors.

Set Makers.—Manufacturers of receiving sets, approved and specified by the Association, who enter into specific obligations with the Association.

Limited Licence.—All valves made by the Members are sold subject to a limited licence under the patents owned by the respective manufacturers.

THREE MILLION AERIALS CAN'T BE WRONG

THE B.B.C. YEAR

The Lucerne Conference of European Governments, appointed by the Madrid Conference of 1932 to consider the question of the allocation of waves to broadcasting stations in the European region, reached a successful conclusion in June, when the European Broadcasting Convention was signed by twenty-seven European States.

The new Lucerne Plan becomes operative on January 15, 1934. It contains 232 stations working on 130 channels, of which 55 are exclusive (not counting the common waves). The remainder of the channels are shared.

So far as Great Britain is concerned, the B.B.C. maintains its present allocation of eleven waves in the new plan. Several are shared with low-power stations in distant countries, which are not likely to cause interference. The long wavelength of Daventry remains exclusive and the slight modifications to the other British wavelengths will not materially affect the efficiency of the service.

The inauguration of the Empire broadcasting service from the new Empire short-wave station at Daventry has been one of the most important activities of the B.B.C. since the issue of the last Trade Annual. The station is equipped with two transmitters, both of which can radiate to any of five different zones. The station opened on December 19, 1932, with a regular daily service of programmes to all the Dominions and Colonies; and on Christmas Day, 1932, the King broadcast through this medium from Sandringham a special message and greeting to his people throughout the Empire.

The West Regional transmitter was completed in May, thus forming the fourth link in the chain of medium-wave high power dual-programme transmitting stations. It is situated at Washford Cross, approximately two miles from Watchet and six miles east of Minehead. The estimated average range of the transmitter, that is to say, the range to which it can provide a consistently reliable service both during daylight and after nightfall, is about 70 miles, although the range is greater in some directions.

An ultra short wave transmitter erected at Broadcasting House, with the co-operation of the Marconi Company, transmits from an aerial suspended from masts on the roof of the building. The transmitter is capable of broadcasting on any wavelength between six and eight metres and is used for experimental transmissions of sound and vision signals.

A new organ, the first to be installed by the B.B.C., was opened in the Concert Hall of Broadcasting House. The organ was nearly a year in building and was the work of the John

Compton Organ Company, Limited. For its size and capacity the instrument is estimated to occupy a smaller building space than any other organ of similar type in the world.

A further development of Sunday broadcasting was the introduction of a continuous service from 12.30 to 10.30 p.m., thus eliminating the break after 6 p.m.

Owing the increasing work and responsibilities of the B.B.C., Colonel Dawnay was appointed to the additional senior post of Controller, Programme Division, at Broadcasting House, a position which ranks next in order of importance to that of Sir John Reith, Director-General of the B.B.C. Colonel Dawnay has an "opposite number" on the administrative side in Admiral Sir Charles Cargill, now known as Controller, Administrative Division.

Mr. Dinwiddie relinquished his position as Minister at St. Machar's Cathedral, Aberdeen, to become Scottish Regional Director. Important developments in broadcasting North of the Tweed may result from his appointment.

Since October, 1932, the monthly total licence figures have shown a progressive increase. (Monthly details of licence figures from December, 1932, to July, 1933, are given for every country of the British Isles on page 131).

B.B.C. ADDRESSES.

Below is given a list of addresses of the various B.B.C. offices:—

Headquarters.

Head Office and National and London Regional Studios	Broadcasting House,
	London, W.1.
	Telegrams: Broadcasts, London. Phone: Welbeck 4468.

Regional Centres.

Midland Region	282, Broad Street, Birmingham.
West Region	39, Park Place, Cardiff.
North Region	Broadcasting House, Piccadilly, Manchester.
Scottish Region	5, Queen Street, Edinburgh.
Belfast	31, Linenhall Street, Belfast.

Other B.B.C. Offices.

Aberdeen	15, Belmont Street.
Bournemouth	72, Holdenhurst Road.
Glasgow	282, West George Street.
Leeds	Broadcasting House, Albrecht Buildings, Woodhouse Lane.
Newcastle	54, New Bridge Street.
Plymouth	Athenæum Chambers.
Swansea	Oxford Buildings.

MULLARD THE MASTER VALVE

RADIO WHOLESALERS' FEDERATION

Bloomsbury Mansions, 26, Hart Street, London, W.C.1.

Telephone: Holborn 2488.

Telegrams: Radmofac, Westcent, London,

The Officers and Council of the Federation for 1933-34 are as follows:—

President: E. W. Houghton (Ensign Ltd.)

Vice-President: B. R. Banks (Brown Bros., Ltd.)

Hon. Treasurer: A. G. Beaver (Sun Electrical Co., Ltd.)

Secretary: J. Macfarlane.

Council:

T. Beadle .. T. Beadle & Co., Ltd.
F. Brewerton .. Ecco Radio, Ltd.
E. H. Burris .. Fred Burris & Sons, Ltd.
E. J. Collier .. East London Rubber Company.

W. E. Collins .. Albion Electric Stores.
A. J. Dew .. A. J. Dew & Co., Ltd.
C. H. G. Hobday .. Hobday Brothers, Ltd.
G. Kent .. Johnson Talking Machine Co., Ltd.

E. U. Redway .. Southern Factors, Ltd.
J. W. Riddiough .. Frank Riddiough & Son.

J. Robertson .. James Robertson.

A. C. Robinson .. Robinson & Hands Electric Co., Ltd.

R. Gordon Willis .. Dulcet-Polyphon, Ltd.

North Midland Section—

Chairman and Hon. Treasurer: W. E. Collins (Albion Electric Stores).

Vice-Chairman: J. W. Riddiough (Frank Riddiough & Son).

Hon. Secretary: W. J. Smith (Sloan Electrical Co., Ltd.), 16, Jackson's Row, Manchester.

South Western (Bristol) Section—

Chairman: E. H. Burris (Fred Burris & Sons, Ltd.).

Vice-Chairman: H. R. Hurst (Southern Factors, Ltd.).

Hon. Secretary: John M. Sim (Sloan Electrical Co., Ltd.), 44, Victoria Street, Bristol.

Hon. Treasurer: H. J. Nicholl (Drake & Gorham, Ltd.).

Midlands (Birmingham) Section—

Chairman: J. Priestly (Priestly & Ford).

Vice-Chairman: E. Smith (Midland Auto Components).

Hon. Secretary and Treasurer: W. Balmford (Walter Balmford), 116, Steelhouse Lane, Birmingham, 4.

Scottish (Glasgow) Section—

Chairman: R. Adam (Ross & Adam).

Vice-Chairman: W. Harper (Wm. Harper & Co.).

Hon. Secretary & Treasurer: C. G. Tideman (Charles G. Tideman), 111, Renfrew Street, Glasgow.

Founded in 1928, the Radio Wholesalers' Federation was instituted to establish and preserve in the Radio Industry the best traditions of Wholesale trading. Primarily its objects are to secure that those engaged in this department of the business shall be "Wholesale only" and so not in conflict with the interests of their customers the Radio Retailers; the recognition by Manufacturers as Wholesalers, only of those firms or companies equipped to provide that service to Radio Retailers, which is the *raison d'être* of their usefulness; and the prevention of breaches in Manufacturers' Terms and Conditions of Sale as applied to the Wholesale trade.

Operations.

The operations of the Federation are necessarily of a private character, but it may be said that in the five years of its existence its work has resulted in the mitigation of many trade abuses, the engendering of a sound spirit of trust and good will among wholesalers themselves and many instances of assistance to manufacturers in the formulation of their policies and in the operation of these.

Questions such as members of the public dabbling in Retail selling have been substantially met by an intercommunication amongst members of the names of such endeavouring improperly to obtain trade terms on radio goods.

The Federation has steadily maintained cordial relations with other trade organisations, its policy being to co-operate with each or any Association if thereby its objects may be assisted and furthered.

The method of the Federation is to proceed by conference, and many valuable meetings of this character have been held which have produced both a practical outcome and an increased atmosphere of understanding on various aspects of the Trade.

Among the publications of the Federation is a List of Members alphabetically arranged under towns, which has proved of much value to manufacturers in arranging their schemes of wholesale distribution.

The members, with their branches, constitute a chain of wholesale establishments throughout the country numbering 250.

MULLARD—THE GREATEST NAME IN RADIO

WIRELESS RETAILERS' ASSOCIATION

OF GREAT BRITAIN AND NORTHERN IRELAND

316-318, FIRST AVENUE HOUSE, HIGH
HOLBORN, LONDON, W.C.1.

Tel.: Holborn 1391.

Vice-President :

Mr. A. E. Betambeau.

Chairman :

Mr. H. J. Galliers.

Vice-Chairman :

Mr. F. Leslie Woodbridge, A.M.I.R.E.

Hon. Treasurer :

Mr. H. C. Willard.

General Secretary :

Capt. H. A. Bain.

National Council :

Mr. R. ALCOCK.	Mr. K. MANN.
Mr. G. ATKINSON.	Mr. J. G. MARCHANT.
Mr. W. AUCLAND.	Mr. G. W. MARTIN.
Mr. S. AYRES.	Mr. A. W. MATHEWS.
Mr. C. BARTON.	Mr. E. MAYHEW.
Mr. R. BATTEN.	Mr. F. J. MELSER.
Mr. W. BETTERIDGE.	Mr. S. MIELL.
Miss G. BLADES.	Mr. L. MITCHELL.
Mr. V. W. T. BRADSHAW.	Mr. E. H. MOORE.
Mr. L. V. BRIDGES.	Mr. W. J. MORAN.
Mr. A. E. BRINLEY.	Mr. H. T. MORGAN.
Mr. J. R. CARTER.	Mr. L. B. MUNDIN.
Mr. C. W. CHATTELL.	Mr. E. A. PAGE.
Mr. W. H. CUMMING.	Mr. T. PAYNE.
Mr. S. DAGNALL.	Mr. O. H. PHILLIPS.
Mr. L. S. DAVIS.	Mr. H. PICKERING.
Mr. B. DYSON.	Mr. G. PINCOTT.
Mr. M. EDWARDS.	Mr. R. W. PROFFIT.
Mr. W. T. FENN.	Mr. J. ROADWAY.
Mr. R. W. FENNAMORE.	Mr. J. W. ROGERS.
Mr. C. FENWICK.	Mr. A. J. S. RUSSELL.
Mr. R. W. FLETCHER.	Mr. F. S. SALISBURY.
Mr. J. D. GIBSON.	Mr. F. J. SERLE.
Mr. J. GRAY.	Mr. A. E. SHINTON.
Mr. E. J. GUNN.	Mr. F. X. SMITH.
Mr. J. A. HALPIN.	Mr. W. SMITH.
Mr. W. E. HARDING.	Mr. H. STANLEY.
Mr. P. L. HARRISON.	Mr. S. STAVELEY.
Mr. R. A. HOWORTH.	Mr. R. J. STEARN.
Mr. W. H. HEATHER.	Mr. F. W. STRAW.
Mr. L. E. HENDRY.	Mr. J. SUGDEN.
Mr. J. R. HEYGATE.	Mr. W. SUTTON.
Mr. A. L. HINDER.	Mr. J. M. TAPHOUSE.
Mr. R. HOLFORD.	Mr. J. THORNTON.
Mr. L. C. HOPKIN.	Mr. J. C. TODD.
Mr. J. HOWARD.	Mr. H. F. TRUMAN.
Mr. D. HOWORTH.	Mr. F. E. WATSON.
Mr. A. JOHNSON.	Mr. E. WILLARD.
Mr. E. H. JOHNSON.	Mr. F. WILLIAMS.
Mr. E. N. JONES.	Mr. C. W. WILMOTT.
Mr. W. J. KIRK.	Mr. E. C. WINTER.
Mr. W. LAWSON.	Mr. O. WOLSEY.
Mr. D. W. LINDLEY.	Mr. S. WOODHEAD.
Mr. R. W. LOWDEN.	Mr. S. E. C. WOODS.
Mr. J. MACKINNON.	Mr. C. F. YATES.

Aims, Objects and Policy.

The Association was formed in 1923 at the special request of many retailers who felt that a live organisation was a necessity to their interests and the future good of the industry.

Since that date rapid strides have been made with the work of organisation through-

out the country, and the membership of 2,300 is increasing daily at a rapid pace.

The chief aim of the Association is to secure "Clean Trading" in industry, and towards this end a strong, sound and comprehensive policy is being pursued.

The subscription is one and a half guineas per annum.

The Association has now ninety-six branches, and others are in the process of formation.

ACCRINGTON.

Mr. R. A. Haworth, Steinway House, Whalley Road.

BARNSELEY.

Mr. J. Howard, 28, Day Street.

BATH.

Mr. S. Miell, 17, Argyle Street.

BECKENHAM.

Mr. J. Park, 5, The Broadway, Beckenham.

BEDFORD.

Mr. C. V. Ibbett, 80, Bedford Road, Kempston.

BIRMINGHAM.

Mr. H. Keeling, 83, Colmore Row.

BLACKPOOL.

Mr. F. X. Smith, 191a, Central Drive.

BOLTON.

Mr. E. H. Johnson, 9, Chancery Lane, Bolton.

BOURNEMOUTH.

Mr. A. C. Toms, 26, Granville Road, Boscombe.

BRADFORD.

Mr. F. Hyde, City Electrical Co., 100/2, Morley Street.

BRIGHTON.

Mr. A. J. S. Russell, 27, Ditchling Road.

BRISTOL.

Mr. W. Sutton, Barr Street.

BUCKS, N.

Mr. J. Bold, 30, Aylesbury Street, Bletchley.

BUCKS, S.

Mr. H. Ransley, 54, Frogmore, High Wycombe.

BURNLEY.

Mr. Wm. Smith, 67, Coalclough Lane.

BURTON-ON-TRENT.

Mr. J. L. Scattergood, 142, Waterloo Street.

BUXTON.

Mr. F. E. Watson, 16, Terrace Road.

CAMBRIDGE.

Mr. W. J. Morley, Hobson Street.

CANTERBURY.

Mr. A. Johnson, 11, Butchery Lane.

CARLISLE.

Mr. W. Auckland (E. F. Roberts, Ltd.), The Crescent.

CARDIFF.

Mr. H. Fletcher (Fletcher & Jones), 218, Whitechurch Road, Cathays.

CHATHAM.

Mr. J. Mackinnon, 22, Medway Street.

CHELTEMHAM.

Mr. R. W. Fletcher, 4, Bayshill Terrace.

CHESTER.

Mr. W. A. Guy, 75, Forgate Street.

CHESTERFIELD.

Mr. A. H. Hatfield, 20, Gluman Gate.

CHIPPENHAM.

Mr. A. L. Hinder, 55, New Road.

COLCHESTER.

Mr. S. W. Hull, 109, High Street.

CREVE.

Mr. D. W. Lindley, 29, Market Street.

CROYDON.

Mr. N. Rosen, 97, George Street.

DARLINGTON.

Mr. F. Williams (Geo. A. Williams & Son, Ltd.), 8, Tubwell Row.

MULLARD THE MASTER VALVE

W.R.A. BRANCHES

- DEARNE VALLEY.**
 Mr. A. W. Thompson, 117, High Street, Wombwell.
DUNDEE.
 Mr. J. Clifford Todd, 87, Commercial Street.
DONCASTER.
 Mr. H. Pickering, 308, Balby Road.
EASTBOURNE.
 Mr. E. Willard, 48, Grove Road.
EXETER.
 Mr. G. Pincott, 36, Bridge Road.
EXMOUTH.
 Mr. W. H. Cumming, 49, Exeter Road, Exmouth.
GLOUCESTER.
 Mr. L. Mitchell, Northgate Street.
GRIMSBY.
 Mr. L. E. Hendry, 134, Victoria Street.
HARROW.
 Mr. C. F. Yates, 136, High Street, Wealdstone.
IPSWICH.
 Mrs. Hazell, 46, Westgate Street.
LEEDS.
 Mr. R. W. Lowden, 34, Basinghall Street.
LINCOLN.
 Mr. S. Woodhead, Exchange Arcade.
LIVERPOOL.
 Mr. F. J. Melser, 8, Griffen Avenue, Moreton, LONDON, EAST.
 Mr. L. Wilde, 291, High Road, Ilford.
LONDON, N.W.
 Mr. R. Alcock, Messrs. Edmunds, Ltd., 97, Broadway, Mill Hill, N.W.7.
LONDON, SOUTH.
 Mr. E. Mayhew, 60a, Sydenham Road, S.E.26.
LUTON.
 Mr. R. J. Stearn, 7, Manchester Street.
MANCHESTER.
 Mr. Edgar Kemp, St. James' House, 44, Brazennose Street, M/2.
MIDDLESEX, WEST.
 Mr. A. E. Brixey, 9, Coldharbour Lane, Hayes.
MIDDLESBRO'.
 Mr. H. Stanley (Geo. A. Williams & Son Ltd.), 190, Linthorpe Road.
NEWCASTLE.
 Mr. G. E. Wilson, Aitken Bros., 7, Gallowgate.
NEWPORT (MON.).
 Mr. H. Williams, Skinner Street.
NORTHAMPTON.
 Mr. A. G. Huckle, Fraser, Son & Mackenzie, Abington Street.
NORTHANTS, MID.
 Mr. J. W. Rogers, Stanley Road, Wellingboro'.
NORWICH.
 Mr. C. C. Fisher, 18, Bridewell Alley.
NOTTINGHAM.
 Mr. L. Hall, 99, Derby Road.
OXFORD.
 Mr. J. M. Taphouse, 3, Magdalen Street.
PLYMOUTH.
 Mr. R. W. Fennamore, 6, Athenæum Place.
PORTSMOUTH.
 Mr. R. R. Bishop, 127, Winter Road, Southsea.
PONTYPRIDD.
 Mr. S. Bradley, 39, Glancynon Terrace, Abercynon.
PRESTON.
 Mr. S. Staveley, 15, Lune Street.
READING.
 Mr. M. Edwards, 8, Gosbrook Road, Caversham.
RETFORD.
 Mr. E. Peatfield, 52, Carolgate.
ROCHDALE.
 Mr. J. Sugden, 2, Water Street.
ROTHERHAM.
 Mr. B. Dyson, Ideal Radio, Broad Street, Parkgate, Rotherham.
SCARBOROUGH.
 Mr. H. Moore, 4-6, Nelson Street.
SHEFFIELD.
 Mr. S. Ayres, 636, Staniforth Road, Darnell.
SOUTHAMPTON.
 Mr. J. A. Halpin, 69, London Road.
SOUTHEND.
 Mr. L. V. Bridges, Bridges' Radio, Warrior Square.
SOUTHPORT.
 Mr. J. D. Gibson, 31, Liverpool Road, Birkdale.
STOKE-ON-TRENT.
 Miss G. Blades, 48, Liverpool Road.
SUNDERLAND.
 Mr. G. Atkinson, Blandford Street.
SWANSEA.
 Mr. L. S. Garley, 18A, Oxford Street.
SWINDON.
 Mr. W. J. Moran, 153, Victoria Road.
TAUNTON.
 Mr. F. J. Serle, 10, East Reach.
TORBAY.
 Mr. R. Batten, 174, Union Street, Torquay.
TUNBRIDGE WELLS.
 Mr. W. T. Fenn, 1, Camden Road.
WALLASEY.
 Mr. F. S. Salisbury, 71, King Street.
WALSALL.
 Mr. E. G. Lenton, 16, Bradford Street.
W. HERTS.
 Mr. G. Harry Gray, 57, Queens Road, Watford.
WEST BROMWICH.
 Mr. A. E. Shinton, Bull Street.
WEST HARTLEPOOL.
 Mr. Eric H. Moore, Bruce Moore & Co., York Road.
WESTON-SUPER-MARE.
 Mr. Kitchen, 2, Magdala Buildings.
WIGAN.
 Mr. W. W. T. Bradshaw, 33, Library Street.
WOLVERHAMPTON.
 Mr. C. Fenwick, Great Brickkiln Street.
WREXHAM.
 Mr. W. A. Warren, 18, Wellington Road.
YARMOUTH.
 Mr. T. E. W. Lincoln, 48, Market Place.

BRITISH "WIRELESS FOR THE BLIND" FUND

226, Great Portland Street, London, W.1. Telephone: Museum 9701.

Twenty-three thousand wireless sets of all types have now been provided to the blind in Great Britain and Northern Ireland by this Fund. During the past twelve months applications have been received for a further 3,000 sets, some of which have been supplied, and are included in the above total.

The Wireless Trade has given, and continues to give, very considerable assistance; but the Fund will still be grateful for any offers to maintain the sets which have already been supplied. It is continuing to provide

wireless sets for those blind persons whose applications are outstanding, but has not yet sufficient funds to meet the demand, as new cases of blindness are reported every month. Blind persons do not pay for a wireless licence, as these can be obtained by them free of charge.

The president of the Fund is H.R.H. The Prince of Wales, and its chairman, Capt. Sir Beachcroft Towse, V.C. The hon. treasurer is the Rt. Hon. Reginald McKenna, and the secretary Mr. W. McG. Eagar.

THREE MILLION AERIALS

LEAD DOWN TO

MULLARD MASTER VALVES

GRAMOPHONE AND RADIO DEALERS' ASSOCIATION

17, Wigmore Street, London, W.1.—Langham 1423.

President : Mr. J. H. Bainbridge (Hollinwood).

Vice-Presidents : Mr. F. T. Stokes (London), Mr. J. R. Whitfield (Huddersfield).

Council :—Messrs. A. E. Ball (Bath), R. W. Brayne (London), L. H. Clark (Buckhurst Hill), H. E. Dale (Torquay), A. V. Day (Nottingham), W. J. East (Brighton), E. B. Gough (Streatham), G. C. Forty (Birmingham), J. F. Hardy (Stockport), A. E. Hider (London), F. J. Hooke (Guildford), C. H. Hutchence (Liverpool), E. J. Marshall (London), C. J. Price (Birmingham), E. Riley (Barnsley), G. H. Russell (London), N. T. Sherwin (Hanley), E. E. Squire (Ealing), J. Trapp (Crouch End).

Secretary :—Mr. Frank Ayliffe.

Divisional Secretaries :—North Western Division : Mr. S. S. Jack, 20, St. Ann's Square, Manchester. Birmingham Branch—Mr. S. Scott Whitehouse, 71, Colmore Row, Birmingham.

The Gramophone and Radio Dealers' Association was founded in 1920 and incorporated in 1930. Its objects are—to organise the Retail Trade ; protect and promote the interests of Dealers ; to negotiate with Manufacturers, Wholesalers and others ; to stop price-cutting ; to assist in redressing wrongs or grievances ; to obtain and furnish information on all matters incidental to the Retail Trade and generally to assist its Members with advice as required.

Subscription

The financial year commences October 1, and the annual subscription is as follows :—

One establishment ..	£1 1 0
Two establishments ..	£1 11 6
Three or four establishments ..	£2 2 0
Over four and under ten establishments ..	£2 12 6
Ten or over ..	£5 5 0

The business is controlled by an Executive Committee of 16 members elected from the Council, and meets monthly. The Council itself meets quarterly.

Record Cut Outs

Some improvement in record exchange terms was secured by the substitution of monthly "cut outs" in the leading makes instead of the former annual "cut out." This is one step towards the ideal which the

Association will continue to press for, viz. : a quarterly return of any unsaleable records up to 10 per cent. of the purchases during the preceding quarter with credit for such returns without "covering order" conditions.

Sales to Schools

Conferences on supplies to educational authorities were held with the manufacturers following their repudiation of the 1924 Agreement fixing maximum discounts. The manufacturers undertook to press education authorities to make their purchases through the dealers. In cases of refusal, observance of the standard rate of discount would be stipulated.

The Association joined with the National Organisations Co-ordinated Committee in securing the taxation of Co-operative Societies.

Service Pamphlets

The Council disposed of the whole of its edition of 20,000 pamphlets emphasising the need of proper and regular servicing to radio gramophones to ensure their efficient working.

Conferences with leading manufacturers have taken place with the object of defining with precision and clarity the respective servicing responsibility of manufacturer and dealer and of making the purchaser aware of his actual position in the matter of "after sale" service.

Trading Schemes

The Council have lost no opportunity of opposing the many "trading schemes" which have so multiplied as to constitute a menace to honest trading through the recognised channels. The staffs of government departments, public authorities and large joint stock companies are the chief offenders, and strong representations have been addressed to the employers as to the pernicious effect of these schemes, the object of which is to snatch an advantage for their members, regardless of the fact that they are thereby depriving the dealer of his livelihood.

Price cutting and kindred objectionable practices are watched and action taken for preventing those engaged in them from obtaining supplies. A very wholesome respect for the Association's powers is thus engendered.

MULLARD THE MASTER VALVE

INSTITUTE OF WIRELESS TECHNOLOGY

Founded 1925. Incorporated 1932.

72, OXFORD STREET, LONDON, W.1.

Telephone :—Museum 0582.

President—

FRANCIS THOMAS FAWCETT, M.A., Ph.D., D.Sc.

Vice-Presidents—

H. J. Barton Chapple, B.Sc., A.M.I.E.E.

Y. W. P. Evans, M.Inst.R.E.

Charles C. Garrard, Ph.D., M.I.E.E.

Sir William Noble, M.I.E.E.

James Nelson, M.I.E.E.

W. B. Medlam, B.Sc., A.M.I.E.E.

F. H. Turle, M.I.E.E., A.M.I.Mech.E.

Hon. Treasurer—

W. E. Miller, B.A. (Cantab.).

Hon. Secretary—

Harrie J. King, F.C.C.S.

Council—

William A. Chambers.

Y. M. D. Cooper, B.Sc., B.es.L.

Horace W. Gambrell, M.Inst.R.E.

H. A. G. Howse, A.M.I.E.E., M.Inst.R.E.

Leslie H. Paddle.

Herbert A. Spreadborough.

SECTIONS.

LONDON AND HOME COUNTIES.

Chairman—

H. J. Barton Chapple, B.Sc., A.M.I.E.E.

Hon. Secretary—

S. Leslie Jones, 30, High Street, Tooting,
London, S.W.17.

MIDLAND.

Chairman—

Charles C. Garrard, Ph.D., M.I.E.E.

Hon. Secretary—

Albert J. Selby, 12-13, Borough Road,
Burton-on-Trent.

NORTH WESTERN.

Chairman—

Y. W. P. Evans, M.Inst.R.E.

Hon. Secretary—

Stanley Brown, 106 Nicolas Road, Chorlton-
cum-Hardy, Manchester.

YORKSHIRE.

Chairman—

George W. Bagshaw.

Hon. Secretary—

Richard H. Morgans, 42, Glover Road, Totley
Rise, Sheffield.

SOUTH-WESTERN.

Chairman—

Reginald C. Lawes.

Hon. Secretary—

Jack Bastable, "Wessex," Bishop's Hull,
Taunton.

INSTITUTE PUBLICATIONS.

Editor—

Harrie J. King, F.R.Econ.S.

Assistant Editor—

Alfred T. Fleming.

A résumé of the Institute's activities over the last twelve months indicates that progress continues to be made. Four new Sections have been inaugurated.

The Sections have already commenced operations and a number of meetings have taken place since their inception. Attractive lecture programmes are being formulated for the 1933-34 sessions and the requirements of service managers and service engineers will be given particular attention.

The membership of the Institute has increased in a remarkable manner and for the six months ending June 30 the increase equalled that for the whole of 1932.

The 1933 Examinations were very well attended. They were held at the Birkbeck College (University of London) the Sheffield University, the Heriot Watt College, Edinburgh, and in South Africa.

The proceedings have been improved and enlarged.

The Examination Syllabus has been completely revised and the revisions will come into force on January 1, 1934.

The requirements of the wireless retail trade are still being looked after on the technical side and it is felt that the Institute Examinations will be a prime factor in the life of the trade, particularly with regard to the younger members and those desirous of taking up appointments as Service Engineers. It is self evident that the trained engineer is becoming increasingly necessary in the successful conduct of a wireless retail business.

It may be recorded with considerable satisfaction that great interest is being taken in the institute Associateship and Associate Membership Examinations by a number of Local Education Committees. Certain Schools are making a special feature of their facilities for training candidates for the Institute Examinations.

The Examinations have generally attracted more interest this year than ever before and from evidence received it is obvious that there are many students at present training for future examinations. In short, it may be said that one of the great advances of 1933 has been in connection with the Examinations.

The Examinations Sub-Committee has been increased and work is going forward with a view to increasing still further the scope and utility of the Institute Examinations.

THE TILL WILL TELL YOU MULLARD

I.E.E. INTERFERENCE COMMITTEE

The Institution of Electrical Engineers has set up a Committee for the purpose of considering and making recommendations on the question of interference with broadcast reception arising from the operation of other electrical plant.

The Committee held its first meeting on Friday, June 16, under the chairmanship of Mr. Clifford C. Paterson, O.B.E., Past President of the I.E.E., with Lieut.-Col. A. G. Lee, O.B.E., M.C., Engineer-in-Chief of the Post Office, as Vice-Chairman.

The Committee set up initially four Sub-Committees dealing respectively with:—

Committee "A.":—Domestic apparatus, including electric refrigerators, fans and vacuum cleaners.

Committee "B.":—Larger electrical plant, including generators, motors, lifts and mercury rectifiers.

Committee "C.":—Traction, including trolley buses, trams.

Committee "D.":—Automobiles and aircraft.

A further Sub-Committee, dealing with suppression at consumers' premises, was formed subsequently.

The Sub-Committees are making investigations with a view to furnishing the main Committee with the data necessary for their further deliberations. The report of the Committee will be made to the Council of the Institution.

The membership of the Committee is as follows:—

Prof. E. W. Marchant, D.Sc., President, I.E.E. (ex-officio).

Lieut.-Col. A. G. Lee, O.B.E., M.C., and Messrs. C. C. Paterson, O.B.E., F. W. Purse, L. B. Turner, M.A., representing the I.E.E. Col. A. S. Angwin, D.S.O., M.C. (General Post Office).

Mr. E. A. Barker (Incorporated Municipal Electrical Association).

Mr. D. E. Batty (Society of Motor Manufacturers and Traders).

Mr. A. F. Bound (Railway Companies' Association).

Sir Charles Carpendale, C.B. (British Broadcasting Corporation).

Mr. J. M. Donaldson, M.C. (Incorporated Association of Electric Power Companies).

Mr. H. W. Ellis (Electrical Contractors' Association).

Alderman H. J. Galliers (Wireless Retailers' Association of Great Britain and Northern Ireland).

Mr. P. Good (International Electrotechnical Commission, British National Committee).

Mr. E. Harlow (London Electricity Supply Association).

Mr. H. Jones (Railway Companies' Association).

Mr. J. Joseph (Radio Manufacturers, Association).

Major G. McAlpine (Air Ministry).

Mr. J. Munro (Association of Supervising Electrical Engineers).

Mr. T. A. Pond (Provincial Electric Supply Association).

Sir Arthur Preece (Association of Consulting Engineers).

Mr. C. Rodgers, O.B.E., B.Sc., B.Eng. (British Electrical and Allied Manufacturers' Association).

Mr. C. J. Spencer, O.B.E. (Tramways, Light Railways and Transport Association).

Mr. R. A. Watson Watt (National Physical Laboratory).

Mr. E. B. Wedmore (British Electrical and Allied Industries Research Association).

Mr. T. P. Wilmshurst, M.B.E. (Electricity Commissioners).

Mr. Johnstone Wright (Central Electricity Board).

Mr. C. O. Silvers (Municipal Tramways and Transport Association).

The committee held its second meeting on Thursday, October 5.

Since the previous meeting of the main committee four sub-committees had been engaged on the consideration of methods which might be adopted and the cost of such methods to render future plant and appliances non-interfering.

Consideration had also been given to possible methods for dealing with interference apart from the suppression at the source.

The report of the sub-committees was considered in detail and accepted, the investigations having included such items as lifts, trolley omnibuses, domestic appliances and other apparatus.

The work of the sub-committees indicated that devices for the suppression of interference from many items of electrical plant, particularly domestic appliances, could be incorporated in future designs at a reasonable cost.

Further investigation was necessary on some of the larger items of plant and tests of a quantitative nature were to be carried out by the British Electrical and Allied Industries Research Association on such items.

The committee reviewed various possibilities of bringing suppression devices into general use without having recourse to legislation.

Consideration was also given to the possibilities of international action on the question of electrical equipment embodying suppression devices, and arrangements were made for a British National Committee to be set up to consider this question.

MULLARD THE MASTER VALVE

INDEPENDENT LOCAL ASSOCIATIONS

COVENTRY

The Coventry Musical and Radio Retailers' Association was formed in March, 1930, on the initiative of Mr. H. Payne, who became the first president. Its objects are to safeguard the interests of its members in the City of Coventry and (by an extension made this year) neighbouring towns within a radius of ten miles.

The Association is always open to co-operate with other kindred organisations and in both local and joint action has achieved some remarkable results.

The Association has a system for the interchange each week between members of information regarding bad or doubtful H.P. customers, this feature proving to be of great value.

Other activities include an annual dinner in March, which is attended by members of the Trade from all parts of the country as well as by distinguished guests. During the winter months a series of technical lectures are given by experts and other social functions organised.

The officers are: president, Mr. A. Salmon, F.S.M.C., F.B.O.A.; vice-president, Mr. F. W. Nicholls; hon. secretary, Mr. G. H. Parsons, 201, Broad Lane, Coventry; hon. treasurer, Mr. H. H. Spicer; committee: Mrs. Mackereth, Messrs. M. G. Dent, H. Cleaver, H. Payne, M. A. Buch, J. Fennell, H. Crane, and A. Melville Sidley.

LEICESTERSHIRE

The Leicestershire Radio Traders' Association was formed in March 1925 and since that date has been represented in its membership by the principal radio retailers in Leicestershire.

The officers of the Association are elected annually and consist at present of the following *Chairman*: Mr. E. J. Turner; *Vice-chairman*: Mr. S. May; *Hon. Treasurer*: Mr. W. E. Griffin; *Hon. Secretary*: Mr. F. J. Smith; *Secretary*: Mr. O. Holmes.

The office and general meeting place of the Association is at Corridor Chambers, Market Place, Leicester.

The Association was originally formed for the purpose of combating the price-cutting firms in the City of Leicester, and has the honour of being the first local radio retailers' association in England. It has been successful in its efforts to prevent price-cutting.

About six meetings annually are usually held, and various social functions including lectures by manufacturers representatives have taken place. At the meetings members discuss technical and other matters of interest to radio retailers generally and

obtain information from each other which is of value in the technical sides of their businesses.

Membership comprises about 20 firms. The entrance fee is 10s. 6d. and the annual subscription also 10s. 6d.

NORTH LONDON

The Radio Traders Association of North London was formed in May, 1933, by twelve ex-members of the North London Branch of the W.R.A. Mr. T. H. S. Chick formed both the present association and the North London W.R.A.

The objects of the association are to fight the price-cutter, and one of the main activities of the body is co-operative buying.

The members meet regularly every Wednesday at 8.30 p.m. at the Alpha Café, Seven Sisters Road, Finsbury Park, London, N.7. Any member who misses three consecutive meetings is liable to be dealt with by the committee.

The present officers of the association are: *Chairman*: Mr. C. M. Goodchild, 367, High Road, Wood Green. (Bowes Park 3961.)

Vice-chairman: Mr. T. W. Smith, 10, Priory Road, London, N.8. (Mountview 7870.)

Secretary: Mr. T. H. S. Chick, 553, Holloway Road, London, N.19. (Archway 3283.)

Treasurer: Mr. T. M. Petrie, 208, Seven Sisters Road, London, N.7. (Archway 3786.)

ULSTER

The Ulster Radio Traders' Association membership comprises manufacturers, wholesalers and retailers operating in Northern Ireland.

The offices of the association are at 53, Chichester Street, Belfast. (Belfast 7196.)

The officers of the association for the year 1933-34 are *Chairman*: Mr. Leonard T. Dobbin (Wm. Dobbin & Co.); *Vice-Chairman*: Mr. L. Scop (Eirco(W.)Ltd.); *Hon. Treasurer*: Mr. A. Fraser Mayne (W. Erskine Mayne); *Secretary*: Mr. Ralph S. Neilson.

The council of the association meet every month on the first Thursday and hold other meetings as may be necessary. A general meeting of the association is held on the first Thursday of every March, June, September, and December, in the Club Rooms, Donegall Chambers, Donegall Place, Belfast.

The association has recently formed a social club and taken premises in Donegall Chambers, which are open to all members of the association and their staffs.

The association council organise an annual exhibition at which members of the R.M.A. show their products and at which local traders also take stands.

JOIN THE BETTER RADIO BRIGADE

RADIO COMPONENT MANUFACTURERS' FEDERATION

Hon. Secretary: Mr. A. F. Bulgin, M.Inst.R.E., 83, Cannon Street, London, E.C.4.

Chairman: Lt.-Col. G. D. Ozanne, M.C., M.I.E.E. (Wingrove & Rogers, Ltd.).

Vice-Chairman: Mr. P. H. Pettyfer (Igran Electric Co., Ltd.).

Treasurer: Mr. E. M. Lee (Belling & Lee, Ltd.).

Executive Council: Bowyer-Lowe & A.E.D., Ltd.; Celestion, Ltd.; Colvern, Ltd.; Edison Swan Electric Co., Ltd.; Ferranti, Ltd.; Radio Instruments, Ltd.; Telegraph Condenser Co., Ltd.; Westinghouse Brake & Saxby Signal Co., Ltd.

The Radio Component Manufacturers' Federation was formed in 1932 to foster and protect the radio component and accessory industry, and to apply such conditions to the conduct of the trade as in the opinion of the federation might be conducive to that object.

Its aims are:

To endeavour to maintain a high standard of quality, design and workmanship, to give advice on and otherwise deal with manufacturing problems, to promote standardisation of radio components and accessories.

To co-operate with other organisations in promoting or advancing movements for the betterment of the conditions of the whole

radio components industry, and to join with them in negotiations with outside bodies on matters affecting the well-being of the industry.

Membership of the federation is limited to individuals and firms approved by the Council, seventy-five per cent. of whose radio sales comprise components or accessories appearing on the federation schedule, which is revised by the council from time to time, and to such other component or accessory makers whose products are made in the British and sold either singly or in kit form, as the council may approve.

The federation entrance fee is three guineas and the annual subscription is two guineas.

Standardisation groups have been formed dealing with potentiometers and variable resistances; fixed resistances (not wire wound); fixed resistances (wire wound); tuning coils; valveholders; variable condensers; loudspeakers; transformers and chokes; fixed condensers; plugs, sockets and jacks; pick-ups; fuses and fuseholders; switches, and screwed terminals.

Meetings are held frequently and valuable information circulated to members. Liaison committees have been formed to work in conjunction with the technical journals and the B.R.V.M.A.

BRITISH RADIO CABINET MANUFACTURERS' ASSOCIATION

30, Bouverie Street, London, E.C.4.

Telephone: Walthamstow 1340.

Chairman:
W. J. Salaman.

Vice-Chairman:
H. Holmes.

Hon. Secretary:
E. Ellis.

Members:

The Aerograph Co., Ltd.; Louis Bamberger & Sons; British Cellulose Lacquers, Ltd.; C.A.C. Cabinets, Ltd.; Caplan & Sons; Carrington Manufacturing Co., Ltd.; R. Cruickshank (Cellulose), Ltd.; Daventry & Co.; Edward Doherty & Sons; John J. Dunster & Sons, Ltd.; Durex Abrasives, Ltd.; A. Ercolani & Sons, Ltd.; Franchi Endura Co.; Holmes Bros. (London), Ltd.; J. B.

Manufacturing Co. (Cabinets), Ltd.; Macfarlane, Burchell & Co.; Nobel Chemical Finishes, Ltd.; C. A. Osborn; R. Segal & Co.; E. Sherry, Ltd.; Smiths Cabinets, Ltd.; T. Stanton; Trade Indemnity Co., Ltd.; Union Glue & Gelatine Co., Ltd.; Watkins Sporne & Co.; R. C. Wilkinson & Co., Ltd.; John Wright & Sons (Veneers), Ltd.

The first meeting of this new Association was held in July 1932.

Its primary object is to promote mutual understanding and good will between those connected in the making of radio cabinets, thereby improving the standard of design and service to the radio manufacturers and to the whole of the Industry.

Every cabinet manufactured by a member of the B.R.C.M.A. is to be stamped with the Association symbol.

MULLARD THE MASTER VALVE

THE WIRELESS LEAGUE

(Incorporating the Wireless Association of Great Britain)

The compilation of a Register of Approved Wireless Traders and Repairers inaugurated a few years ago by the Joint Committee of the Radio Society of Great Britain and the Wireless League has been entirely reorganised, and the work is now carried on under the sole auspices of a Sub-Committee of the Wireless League.

The object of the scheme is to give the genuine wireless trade service engineer a definite status and advertising assistance. This will be done by drawing the attention of listeners to the facilities offered by selected service engineers whose premises, service equipment and technical ability have been approved by the Committee.

By these means it is hoped that the inexperienced and unqualified shopkeeper who is causing the public to lose confidence in the Trade, will be stamped out, but to secure this end it is necessary that co-operation should be forthcoming from the genuine service engineer.

Applicants are required to satisfy the Committee as to their technical qualifications, period established in business, and adequate insurance cover in respect of customers' goods in trust. An inspection will then be made by a representative of the League who

will personally examine the applicant and his premises from a practical service standpoint.

Successful applicants will be furnished with a Certificate of Appointment, an attractive sign for external display well finished in cellulosed rustless metal, and blocks of the same design for printing purposes, while replicas carried out in the form of window transparencies will also be supplied.

The Wireless League aims at being a link between the broadcasting authorities, the wireless trade and the listener. Its membership consists of tens of thousands of ordinary broadcast listeners, and these members will be notified in regard to every Approved Service Repairer appointed to the Register, and advised to place confidence in the man exhibiting the League's sign in his district, whether for purchases, repairs, alterations or accumulator charging.

Chairman of the League: The Hon. Sir Arthur Stanley, G.B.E., C.B., M.V.O.
Traders Sub-Committee: Prof. A. M. Low (Chairman), Maurice Child, Esq., F.R.S.A., The Earl of Drogheda, C.M.G., Brig.-General Sir Capel Holden, K.C.B., F.R.S., M.I.E.E.
Secretary: Miss I. Joss. Full particulars from Head Office: 12, Grosvenor Crescent, London, S.W.1.

THE SYNCHRONOUS CLOCK CONFERENCE

Negotiations between manufacturers of synchronous electric clocks for the purpose of forming an organisation to foster the interests of this new industry resulted in the formation of the Synchronous Clock Conference, at the end of 1932.

Mr. F. G. Quance has recently been appointed chairman of the conference, which is composed of representatives of the English Clock and Watch Manufacturers, Ltd., Synlocks, Ltd. (Everett, Edgecumbe and Co., Ltd.), Ferranti, Ltd., the General Electric Co., Ltd., Smith's English Clocks, Ltd., Synchronome Co., Ltd., and the Telephone Manufacturing Co., Ltd.

The objects of the Conference are to popularise the use of synchronous electric clocks, to foster the interests of the Industry, to promote fair trading, and to protect

manufacturers, traders, and the public alike against the evils of irregular trading, and in general to see that the business is carried on through established trade channels.

Synchronous electric clocks manufactured by members of the Conference are manufactured in this country to British standards of quality and to conform with the requirements of the British Standards Institution.

The products of the different members of the Conference are standardised as far as possible in many important details.

The Conference is using its influence to ensure that alternating current electricity supplies throughout the country are time controlled.

The Conference meets at 36 and 38, Kingsway, London, W.C.2, when necessary.

WITH MULLARD AT YOUR FINGERTIPS YOU'RE CERTAIN OF YOUR SALES

THE TRADE'S LUNCHEON CLUBS

LONDON

The Radio Industry Luncheon Club exists "to promote mutual understanding and good will in the Radio Industry by the holding of periodical Luncheon Meetings."

The officers are: chairman, Mr. W. W. Burnham; vice-chairman, Mr. E. W. Houghton; honorary secretary, Mr. F. Brewerton, Ecco House, Princess Street, St. John's Wood, London, N.W.8. Telephone: Paddington 6735.

On the committee are Messrs. E. S. Brown, R. Milward Ellis, C. H. G. Hobday, W. A. Hunt, E. M. Lee, L. McMichael, and Lt.-Col. G. D. Ozanne.

Meetings are generally held on the last Wednesday of the month, and a subject for discussion relating to the general benefit and advancement of the Industry is tabled for each meeting.

The annual subscription is 10s. 6d., and there is an entrance fee for new members of 10s. 6d. Only directors or managers of bona-fide manufacturer or wholesaler firms or companies, or any person of standing in the Industry considered eligible by the committee are allowed to become members of the Club.

Members may invite as guests to the luncheons individuals of responsible standing in the Industry.

Considerable progress with many of the Industry's problems has resulted from the Club's meetings, and work of particular value has been done in the past year.

BRISTOL

In May 1932 a number of retailers met for lunch at the Crown and Dove Hotel, Bristol, under the Chairmanship of Mr. J. L. Lovell. Out of this impromptu lunch grew the Bristol Radio Trade Lunch Club as we now know it.

At first, lunches were held weekly but later it became fortnightly, and in May of this year a move to put things on a proper club footing culminated in a very successful meeting at which Mr. A. G. Lewis was elected President.

A Committee (Messrs. S. F. Down, J. W. Wharton, S. Young, F. M. Sim, and S. C. Vowles) was elected, comprising members of each section of the Industry, and Mr. W. G. W. Sutton, of 12, Barrs Street, St. James, Bristol, 1 (Telephone 24976), was made Hon. Secretary.

All male members of the trade are eligible for election and the annual subscription is five shillings.

The objects of the Club are mainly to foster social relationship between members of the

Industry and to provide opportunity for an exchange of views on matters affecting the Trade. To this end lunches are held on alternate Mondays at the Full Moon Hotel at 1 o'clock and the general practice is to invite a speaker to address members upon some subject of trade or technical interest. The address takes the form of the response to the toast of "Our Guests."

NOTTINGHAMSHIRE

Each section of the industry is equally represented among the officers and committee of the Nottinghamshire Radio Luncheon Club.

The chairman, Mr. A. H. Whiteley, is a manufacturer; the *honorary secretary*, Mr. G. A. Litchfield, of Sherwood Buildings, South Sherwood Street, Nottingham, is a wholesaler; and the *treasurer*, Mr. J. Thornton, is a retailer. The three committee members are retailer, wholesaler and manufacturer respectively.

The club meets monthly for lunch at the Milton Café, Milton Street, Nottingham. The speaker for the occasion addresses the members on a matter of general interest. The radio industry is not discussed at the luncheons.

The annual subscription of 2s. 6d. is a nominal one to cover postage and the membership is between 60 and 70. The average attendance at the monthly luncheon is 45 members. Anyone connected with the radio industry in any of its branches is eligible for membership.

It is felt that the meetings are conducive to good feeling among members of the trade, and make for good fellowship and healthier conditions.

SHEFFIELD

The inaugural meeting of the Sheffield Radio Trades Luncheon Club was held on February 15, 1933, at the Nelson Hotel. About forty members sat down to luncheon. Afterwards it was proposed that Mr. C. O. Birtles be elected president and Mr. William A. Morton, of 71, 73, Surrey Street, Sheffield 1, the hon. secretary.

Members meet for luncheon fortnightly on a Wednesday, at Tuckwoods Restaurant, Fargate.

Since the first luncheon many prominent men in the Radio Industry have been guests of the Club and have made excellent speeches on interesting subjects.

There is no doubt that the Club is serving a useful purpose in gathering together many who hitherto were unknown to each other.

MULLARD THE MASTER VALVE

RADIO INDUSTRY GOLFING SOCIETY

The Radio Industry Golfing Society was formed as the result of a suggestion put forward by Mr. J. H. Williams to Mr. F. H. Robinson, Editor of *The Broadcaster*.

A meeting called by these two gentlemen was attended by Messrs. S. Wilding Cole, R. M. Ellis, H. Howitt, E. M. Lee, S. R. Mullard, Lt.-Col. G. D. Ozanne, T. A. W. Robinson, and E. E. Rosen on January 18, 1933, and Messrs. Ernest Brown, B. Hesketh, J. G. G. Noble, E. E. Squire and A. Wragge were invited to join the Committee.

Lt.-Col. J. T. C. Moore-Brabazon, M.C., M.P., was asked to become President and agreed to do so. Mr. J. H. Williams was elected Captain, Mr. S. R. Mullard, Hon. Treasurer, and Mr. F. H. Robinson, of 29, Bedford Street, Strand, London, W.C.2 (Temple Bar 2468), Hon. Secretary.

On April 4 the Committee requested Mr. D. Grant Strachan to become Hon. Auditor, to which he agreed.

At the first Annual General Meeting on July 11, 1933, all the officers were re-elected.

Trophies for competition have been presented to the Society by the Radio Manufacturers Association, the British Radio Valve Manufacturers Association, the Radio

Industry Luncheon Club, the Radio Wholesalers Federation, the Radio Component Manufacturers Federation, the Radio Trade Press, Mr. W. W. Burnham, and the Society's President and Captain.

The Society has held five meetings. The first was on March 22, 1933, at the R.A.C. Country Club, Woodcote Park, Epsom. The second on May 10, 1933, at the West Herts Golf Club, Watford. The third competition was held at the Wentworth Club on July 11, 1933, the fourth at Stockport on September 28, and the fifth at Cuddington on October 24. A joint meeting was held with the Scottish Radio Golf Society on September 4.

The Yorkshire Section of the Society organised a meeting on July 5, 1933, at the Moortown Golf Club, and a trophy was presented by the Committee. Mr. A. P. Pearson is Northern Hon. Secretary.

The Society has at present well over 100 members. Membership is open to directorate, principals and executive of all radio manufacturers, wholesalers and retailers in Great Britain and Northern Ireland and such other persons closely associated with the Radio Industry as the Committee approves.

The annual subscription is 10s.

SCOTTISH RADIO RETAILERS ASSOCIATION

President, Mr. Robert Morrison.

Past Presidents, Mr. James Plucknett, A.M.I.E.E. (1927-1931), Mr. Alexander Steuart (1931-1932).

Secretary, Mr. W. Hood Stewart, C.A., 156, St. Vincent Street, Glasgow, C.2.

The objects of the Scottish Radio Retailers Association are to promote and protect the interest of radio retailers in Scotland.

Membership is confined to persons or firms engaged in retailing radio from business premises in Scotland and maintaining a representative stock of radio. Associate membership is open to employees of persons or firms eligible for membership. Associate members may attend meetings but may not vote. They may be co-opted as members of the Council.

The annual subscription is one guinea, but members carrying on business at more than one address in Scotland pay according to a graduated scale. Associate members pay a subscription of 5s.

The sole control of the Association is vested in a Council consisting of not less than ten members. This includes one representative from each Branch, not more than six members elected at the Annual General Meeting, and the Council has the right to co-opt not more than six additional persons who may or may not be members of the Association. The Council meets monthly.

SCOTTISH MUSIC MERCHANTS ASSOCIATION

President, Mr. George Campbell, 79, George Street, Edinburgh.

Vice-President, Mr. R. J. Larg, 24, Whitehall Street, Dundee.

Secretary and Treasurer, Mr. James Bee, 22, Rutland Square, Edinburgh.

MULLARD MEANS BUSINESS

NEWS

for the trade

Whatever happens of importance in the World of wireless and the gramophone is fully and faithfully reported in "The Broadcaster." New lines and trade developments are reviewed immediately. The technical information and test reports are sound and authoritative. New ideas are discussed for the benefit of the trade. And, in addition, "The Broadcaster" offers its subscribers a Free Service that is unique, and of immense value in the advertising and building of a prosperous retail business. At the modest annual subscription of 7/6 per annum, "The Broadcaster" represents an invaluable aid to every progressive and ambitious dealer.

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WHO'S WHO IN RADIO

ALLEN, Charles Gilbert.—Sales Manager, McMichael Radio, Ltd., Danes Inn House, 265, Strand, London, W.C.2. A.M.I.R.E. Joined Callenders Cable Co., Ltd., 1914; Marconi International Marine Communication Co., Ltd., 1917; one of first employees of McMichael, Ltd., 1923, traveller 1924, London sales manager 1927. Born August 17th, 1900. Recreations: motor-ing, tennis. Private address: Home Lea, Nightingale Lane, Bromley, Kent.

ALLIGHAN, Garry.—Journalist, 310-312, Regent Street, London, W.1. Official publicist to the Radio Manufacturers' Association, since 1929; Press manager of Radio Exhibition, 1929-30-31-32-33. Born 1895. Recreation: motoring. Private address: 59, Jermyn Street, London, S.W.1

ALLSTON, Reginald Oscar.—Distribution Sales Manager, Hellesens Ltd., S. Wimbledon, S.W.19. Six years with A. H. Hunt, Ltd. Radio trade since its incep-tion. Born June 15th, 1896. Recrea-tions: golf, motoring. Private address: "Linga Longa," West View, Letchworth, Herts.

ARBIB, Richard.—Manager of Press De-partment, The Gramophone Co., Ltd., 98-108, Clerkenwell Road, London, E.C. After sales experience in various export firms, joined The Gramophone Co., Ltd., in 1928, Electrical Reproducer Dept.; after conducting H.M.V.'s publicity for Maurice Chevalier's English visit in 1930, took up present position in 1932. Recrea-tions: motoring, swimming, golf. Private address: 35, Farm Avenue, London, N.W.2. (Gladstone 4114.)

ASHBRIDGE, Noel.—Chief Engineer, B.B.C., Broadcasting House, London, W.1. B.Sc., A.M.I.C.E., M.I.E.E.

BACHMAN, Robert Abraham.—Managing Director, Britannia Batteries, Ltd., 233, Shaftesbury Avenue, London, W.C.2. Gold medalist, World's Fair, San Francisco, for designing automatic machinery. In charge of tool room, Bethlehem Steel Co., U.S.A., for 5 years. First Vice-president and General Manager, Thomas A. Edison Works and Laboratories, 1900-1918. Since been in charge of 14 factories. Born 1876. Recreations: research and organisation,

has taken out 59 patents in connection with hobby. Private address: Oldcrest, South Street, Redditch.

BAGGS, John.—Radio Sales Manager's Chief Publicity Assistant, Ferranti, Ltd., Hollinwood, Lancs; Metropolitan-Vickers Electrical Co., Ltd., 1914-21, serving apprenticeship; Ferranti, Ltd. Meter Sales Dept., 1923; since then from commence-ment attached to Radio and Clock Sales Dept. Now in charge of Radio, Electric Clock and Electric Fire Publicity. Born November 30, 1898. Recreations: litera-ture, boating, fishing, motoring. Private address: 67, Northfield Road, New Moston, Manchester.

BAIN, Herbert Alexander, J.P.—General Secretary, W.R.A., 316, First Avenue House, High Holborn, London, W.C.1. Ministry of Labour, 1919; The Federation of British Music Industries, 1925-30; Secretary The Pianoforte Manufacturers Association, Ltd. 1926-1931; Secretary The Music Trades Benevolent Society, 1930-31; Secretary The Music Trades School Advisory Com-mittee, 1929-31. Recreations: golf, music. Private address: Deepdene, Snarresbrook, London, E.11.

BAIRD, John Logie.—Managing Director, Baird Television, Ltd., 133, Long Acre, London, W.C.2. Born August, 1888. Private address: 84, Lawn Road, Belsize Park, London, N.W.

BAKER, Arthur.—Proprietor, Bakers Sel-hurst Radio, 75-77, Sussex Road, South Croydon. Made the first electro-magnet moving coil speaker, with floating cone, January, 1925; manufactured the first cross type permanent magnet speaker with floating cone, March 1926. Born January 25th, 1895. Private address: 89, Selhurst Road, South Norwood, London, S.E.25.

BAKER-BEALL, Alfred.—Managing Dir-ector The Litanode Co., Ltd., 190, Queen's Road, Battersea, London, S.W.8; 30 years' connection with mechanical and electrical engineering, with the manufac-ture of accumulators and primary batteries. Born 1875. Recreation: motoring.

BAKER, Harold.—Wireless Correspondent and Broadcast Critic, "The Daily Mirror,"

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

- Geraldine House, Fetter Lane, London, E.C.4. Hon. Sec., Broadcasting Committee of Critics Circle. From 1918-9, O.C. Exhibitions; Photographic Section of Ministry of Information, and Imperial War Museum. 1926-7, Manager of Publicity and Trade Section of the Wireless Association of Great Britain. Joined "Daily Mirror" 1927. Club: Press. Recreations: motor-ing, golf, photography.
- BAKER, Percy William.**—Director, Climax Radio Electric, Ltd., Haverstock Works, Parkhill Road, Hampstead, London, N.W.3. Member of Council R.M.A. Was with Cambridge Instrument Co. 1908-14; Charge of Testing Dept., R. W. Paul, until end of War. Proprietor of Scientific Electrical Co. prior to amalgamating with Climax. Holds many international electrical patents. Born October, 1891. Recreations: garden-ing, fishing, badminton, swimming, walk-ing. Private address: 53, Forty Lane, Wembley Park, Middlesex.
- BAKER, Samuel.**—Director and Sales Manager, Richard Marsden & Son, Ltd., 115, Church Street, Preston. Chairman, Preston Branch W.R.A. since October, 1932. Two years' experience wholesale radio; 3½ years' war service. Born April 29, 1885. Recreations: gardening, fishing. Private address: Lambert Road, Ribbles-ton, Preston.
- BALCOMBE, Edwin Kesteven.**—Manag-ing Director, A. J. Balcombe, Ltd., 52-58, Tabernacle Street, London, E.C.2.
- BALL, Arthur Leslie.**—Accountant, The Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1. Joined present company, 1923; assistant accountant 1924; accountant 1930. Born May 24th, 1901. Recreations: music, gardening. Private address: 34, Craignish Avenue, Norbury, London, S.W.16.
- BARRETT, Ferberd Sessions.**—Adver-tisement Manager "The Broadcaster and Wireless Retailer," "Electrical Trading," Odhams Press Ltd., 93, Long Acre, London, W.C.2. Born February 27, 1896. Recreation: golf. Private address: 59A, Abbey Road, St. John's Wood, London, N.W.8.
- BARRIE, Douglas Gordon Everard.**—Partner, Henderson Electrical & Wireless Service, Electric House, Queen's Road, Brighton, and at Worthing, Tunbridge Wells and Eastbourne. 25 years in electrical trade. Born: October 5th, 1894. Recreations: deep sea fishing. Private address: "Aroca," Middleton Avenue, Hove.
- BATTEN, Ronald.**—Proprietor, 174, Union Street, Torquay. Acting Chairman and Secretary, Torquay W.R.A. Started in wireless in 1910 by fitting out the airships "Gamma" and "Eta" with wireless. Born December 7th, 1891. Recreation: motoring. Private address: 174, Union Street, Torquay.
- BAYNTON, Gordon.**—Joint General and Sales Manager, Radio Gramophone De-velopment Co., Ltd., 18-20, Frederick Street, Birmingham. Born October 1, 1895. Recreation: golf. Private address: 197, Russell Road, Moseley, Birmingham.
- BEADLE, Thomas.**—Managing Director, T. Beadle & Co., Ltd., 3, 4, 5, Castle Street, Hull, and at Grimshy, Leicester, Liverpool, Nottingham, Birkenhead, Blackburn, Derby. In wholesale electrical business 30 years, and wholesale radio since 1924. Councillor of N.A.R.M.A.T. from inau-guration until dissolution; chairman, Northern Section, 1924. R.W.F. Coun-cillor from inauguration to date; chair-man, North Midland Section, 1930. Mem-ber of wholesalers' F.T.A. Liaison Com-mittee. E.W.F. Councillor; chairman Lanes and Yorks Section, 1925. Born: November 6th, 1879. Recreations: golf, billiards, snooker, bowls. Private address: 262, Anlaby Road, Hull.
- BEARDSALL, Charles Poynter.**—Radio Sales Manager, Ferranti, Ltd., Hollinwood, Lanes; member of council, R.M.A. from January, 1929; trained for journalism, which forsook for engineering; joined Ferranti, Ltd., 1907; sales dept., 1910; sales manager, meter dept., 1926; associated with radio from commencement and appointed sales manager, radio dept., 1929. Born January 19th, 1886. Recreations: golf, gardening, motoring. Private address: Alton, Sheepfoot Lane, Heaton Park, Manchester.
- BETAMBEAU, Albert Edward.**—Pro-prietor A. E. Betambeau & Co., 101a, High Street, Penge, London, S.E.20, and 20-22, Anerley Station Road, S.E.20. Member of Council W.R.A. since August, 1923; Chairman W.R.A. 1929-31; Vice-President, 1932-33; after 17 years' practical experience, including apprentice-ship, opened present business 1920. Rotarian, Penge Rotary Club; member of Penge Chamber of Commerce. Born August 30th, 1887. Private address: Anerley Lodge, Anerley Road, London, S.E.20.
- BILANTZ, David Sidney.**—Managing Director, Itonia Ltd., 58, City Road, London, E.C.1. On General Committee A.G.M.I.M.
- BLACK, Michael.**—Managing Director, Michael Black, Ltd., 80, Blytheswood

EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER

Street, Glasgow, C.2, and 57-59, Elder Street, Edinburgh.

BOON, H.—Advertising Manager, Chloride Electric Storage Co., Ltd., 137, Victoria Street, London, S.W.1. On Advertising Committees of S.M.M.T. & A.M.A. Born January 3rd, 1898. Recreations: golf. Private address: Oakbank, Hampton Grove, Ewell, Surrey.

BOWERS, Ernest Victor.—Managing Director, Delta Radio Distributors, Ltd., 1, Soho Square, London, W.C. Telsen, Ltd., 1927; Lotus Radio, Ltd., 1930. Director of Cameron's Surgical Specialities, Ltd. Born December 17, 1904. Recreations: riding, tennis, fishing, shooting. Private address: Chapel Fields, Addlestone, Surrey.

BOWYER - LOWE, Albert Edwin, M.J.Inst.E.—Managing Director, Bowyer-Lowe & A.E.D., Ltd., Diamond Works, Brighton. Vice-chairman R.M.A., 1926; Chairman R.M.A., 1927; Vice-president R.M.A., 1928-30; Trustee R.M.A., 1927-30; designed cycles, motors, etc., 1900-22, joined present firm, 1932. Born February 27th, 1883. Recreations: motor-ing, photography, clock-making. Private address: Veloce, South View, Letchworth, Herts.

BRITAIN, Sir Harry, K.B.E., C.M.G., LL.D., M.A. (Oxon).—Director, Majestic Electric Co., Ltd.; President, W.R.A. 1929-33; Director of D. Napier & Son, Ltd.; Provincial Newspapers, Ltd.; Illustrated London News and Sketch Co., Ltd.; trained for business, after Oxford, in Sheffield; represented London at Washington International Chambers of Commerce, also represented Great Britain on Air Transport, 1930; has taken interest in wireless, from national viewpoint since he founded the first Imperial Press Conference in 1909, at which conference Marconi took part, and also the second Conference in 1920. Author of the "A.B.C. of the B.B.C." Recreations: shooting, ski-ing, golf, caravanning. Private address: 2, Cowley Street, London, S.W.1, and 13, King's Bench Walk, Temple, London, E.C.4.

BROWN, Harold Ernest.—Assistant Sales Manager, The British Blue Spot Co., Ltd., Blue Spot House, 94-96, Rosoman Street, Rosebery Avenue, London, E.C.1. Sales Dept., Pell, Cahill & Co., 1924; Assistant to Works Manager, M.P.A. Wireless, Ltd., 1926; Assistant to Sales Manager, A. J. Dew & Co., 1927; F. A. Hughes & Co., Ltd.; later developed into the British Blue Spot Co., Ltd., 1929. Born January 5, 1905. Recreation: photography. Private address: 30, Brantwood Avenue, Isleworth, Middlesex.

BROWNE, Rupert Pollard.—Assistant Secretary R.M.A. (since inception, 1926), Astor House, Aldwych, London, W.C.2, B.Sc.: assistant secretary N.A.R.M.A.T., from its inception, 1924. Born December 18th, 1897. Private address: 15, Clarence Road, Kew Gardens, Surrey.

BRUTY, Percy Edwin.—Manager Publicity Dept., Peto & Radford, 107a, Pimlico Road, London, S.W.1. Born December 31, 1892. Private address: 10, Wyndale Avenue, Kingsbury, London, N.W.9.

BRYCE, N. Dundas.—Sales Manager, Belling & Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex. Served in the R.F.C. and R.A.F., 1914-19; Lever Bros., Ltd., 1919; Advertising manager Burndep, Ltd., 1921; Advertising manager, A.J.S. Radio, 1925; Joint manager Hugh Paton & Sons, Ltd., Printers, 1928. Born 1897.

BULGIN, Arthur Frederick, M.I.R.E., F.R.S.A.—Governing Director, A. F. Bulgin & Co., Ltd., Abbey Road, Barking, Essex. Engaged in experimental spark transmission and reception 1913; R.F.C. and R.A.F., 1919; entered radio industry 1921; founded A. F. Bulgin & Co., 1924; converted to Limited Company, 1930. Has invented many radio patents. Born January 23rd, 1899. Recreations: motor-ing, tennis, cinematography. Private address: 12a, Christchurch Road, Ilford, Essex.

BURNE-JONES, David.—Managing Director, Burne-Jones & Co., Ltd., Magnum House, 296, Borough High Street, London, S.E.1. Apprenticed to Westminster Engineering Co., Ltd.; worked 9 years in India, 1905-6 engineer-in-chief of H.M. The King and Queen's fleet of cars, during their Indian Tour; worked in cinematograph industry 1913-20; since manufactured radio apparatus. Born December 18th, 1885. Recreations: motoring, fishing, tennis, shooting. Private address: Hollycroft, Brunswick Road, Sutton, Surrey.

BURNHAM, Walter Witt.—Manager, Radio Division, Edison Swan Electric Co., Ltd. (Associated Electrical Industries, Ltd.); Chairman, R.M.A.; Chairman, B.V.A.; for three years was Chairman N.A.R.M.A.T., F.I.R.E., C.I.E.E. Was Director, British Broadcasting Co., Ltd. Born April 12, 1880. Recreations: motor-ing, poultry, bees. Private address: The Plateau, Sundridge, near Sevenoaks, Kent. 'Phone: Ide Hill 241.

BUSWELL, Gordon.—Director, Whiteley Electrical Radio Co., Ltd., Radio Works, Mansfield, Notts. Born: February 27th, 1885. Private address: 3, Stella Street, Mansfield, Notts.

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

CALKIN, Alan Bernard, M.A., A.M.I.E.E.

—Technical Adviser, Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2. Company's representative on Technical and Works Committee, B.R.V.M.A. Born March 6, 1905.

CAMPBELL, Guy.—Chairman and Managing Director, Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17; Chairman, Magnavox (Great Britain), Ltd.; Majestic Electric Co., Ltd., The Majestic Electric Co. (I.F.S.), Ltd., Majestic Electric de France. Director, Hazelpat, Ltd. Private address: "Ingleborough," The Ridgeway, Enfield, Mdx.

CARRINGTON, Frederick Douglas.—Managing Director, Carrington Mfg. Co., Ltd., "Camco" Works, Sanderstead Road, S. Croydon. Engaged in production of precision woodwork since late 'nineties. Supplied Marconi's with radio casework many years before the war. Born May 26, 1883. Recreations: tennis, bowls. Private address: "The Winnatts," Fairdene Road, Coudson, Surrey.

CARTER, Harley Autton.—Diplomatist City and Guilds Technical College, Finsbury, London. Technical liaison with press, Mullard Wireless Service, Ltd., Mullard House, Charing Cross Road, London, W.C.2. Commercial Depts., various electrical manufacturers, 1910-1914; Publicity Dept., G.E.C., Ltd., 1919; Technical Editor, "British Engineers Export Journal," 1925. Joined Mullards, 1929. Born May 29th, 1889. Recreation: gardening. Private address: 6, Swakeleys Road, Ickenham, Uxbridge.

CARTER, John Reginald.—Principal, Tom Cash Radio Service Depot, 30, Regent Road, Salford, Lancs. Chairman, Manchester W.R.A.; N.W. Area Delegate to Council. Was secretary, W.R.A. Manchester Branch 1930-1932; Member of National Council W.R.A. 1930 onwards; for 12 years worked in drawing office of an electrical company, now principal of outfitting and sports stores, founded by father 70 years ago; Member of Manchester Radio Experimental Society. Born May 13th, 1893. Recreations: tennis, motoring, scouting. Is District Scoutmaster and Cubmaster and Examination Controller.

CARTER, John Reginald.—Principal, Tom Cash Radio Service Depot, 30, Regent Road, Salford, Lancs. Chairman, Manchester W.R.A.; N.W. Area Delegate to Council. Was secretary, W.R.A. Manchester Branch 1930-1932; Member of National Council W.R.A. 1930 onwards; for 12 years worked in drawing office of an electrical company, now principal of outfitting and sports stores, founded by father 70 years ago; Member of Manchester Radio Experimental Society. Born May 13th, 1893. Recreations: tennis, motoring, scouting. Is District Scoutmaster and Cubmaster and Examination Controller.

CHAMBERLAIN, Frank Joseph.—General Manager and Chief Buyer, Hellekens, Ltd., S. Wimbledon, S.W.19. 21 years with A. H. Hunt, Ltd., and Hellekens, Ltd. Born: August 15th, 1887. Private address: 61, Manor Drive, Worcester Park, Surrey.

CHAMP, Guy Henry.—Manager, Wireless Dept., Eagle Engineering Co., Ltd.; Director & Secretary, Eagle Wireless Supply Co., Ltd., Saltisford, Warwick; Secretary, Warwick & Leamington Engineering Employers' Association from 1921. Previously with Bellis & Morecam, Ltd., 1909-1912, Costs Dept., T. Chatwin, Ltd., Engineers, 1912-1914. War service, 1914-1919. Champ, Kay & Co., Electrical Engineers, 1919-1921. Born January 13, 1893. Recreations: golf, fishing. Private address: 133, Rugby Road, Leamington Spa.

CLARK, Alfred.—Chairman, Electric & Musical Industries, Ltd., the Gramophone Co., Ltd., Cie. Francaise du Gramophone; Director, Columbia Graphophone Co., Ltd., Marconiphone Co., Ltd., Skandinavisk Grammophon Aktieselskab, Gramophone Buildings, Hayes, Middlesex. Director, Covent Garden Opera Syndicate (1930), Ltd. Born: December 19th, 1873. Recreation: golf. Private address: Warren House, Iver Heath, Bucks.

CLARKE, H.—Managing Director, H. Clarke & Co. (Manchester), Ltd., Atlas Works, Patricroft, Manchester. Private address: "Gedling," Ellesmere Park, Eccles, Lancs.

CLAYTON, Charles Lawrence.—Director, Bowyer Lowe & A.E.D., Ltd., 10, Prince Albert Street, Brighton. A.R.I.B.A.; practising in architecture and surveying and interested in motor engineering. Born 1892. Recreations: motoring, gardening. Private address: Badger Wood, Henfield, Sussex.

COBB, Frederick Arthur, A.I.E.E., M.I.R.E.—Manager Radio Merchandising Dept., Standard Telephones & Cables, Ltd., 364, Gray's Inn Road, London, W.C.1. Standard Telephones' Representative to B.V.A. Senior Maintenance Engineer 2LO, 1924; Assistant Chief Engineer, Indian Broadcasting Co. from inception, 1927; Manager, Valve and Amplifier Dept., Philips, 1932. Born February 11, 1901. Private address: 28, Manor Gardens, Purley, Surrey.

COHNREICH, Alfred.—Director and General Manager Loewe Radio Co., Ltd., Fountayne Road, Tottenham, London, N.15. Born February 26th, 1893. Recreation: motoring. Private address: 22, The Meadway, Southgate, London, N.14.

COLE, Eric Kirkham.—Technical and Works Director, E. K. Cole, Ltd., Ekco Works, Southend-on-Sea. Private address: Leeways, Marine Parade, Leigh-on-Sea, Essex.

COLE, Stanton Wilding, O.B.E.—Chairman of S. Wilding Cole Ltd., 62, Moor

MULLARD—THE VALVE OF THE PAST, THE PRESENT, THE FUTURE

Street, Birmingham. Deputy-Chairman Kolster-Brandes, Ltd., Cray Works, Sidcup, Kent; Vice-chairman, R.M.A. Executive Council, N.U.M.; Managing Director, Burney and Blackburn, Ltd., 1918-1921; Chairman, S. Wilding Cole, Ltd., 1921 onwards; Director, Kolster-Brandes, Ltd., 1927 onwards. Born February 14, 1880. Recreations: golf, tennis. Private address: The Turret, Footscray Lane, Sidcup, Kent.

COLE, Thomas Noah.—Managing Director, Lissen, Ltd., Lissenium Works, Worpole Road, Isleworth, Middlesex.

COLLINSON, Richard Francis.—Managing Director, Colvern Ltd., Mawneys Road, Romford, Essex, and Collinson's Precision Screw Co., Ltd. Born July 26th, 1901. Private address: 70, The Avenue, Highams Park, Essex.

COURSEY, Philip Ray, B.Sc. (Eng.).—Technical Director, Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, N. Acton, London, W.3. Chairman of Committee on Mains Radio Apparatus of British Standards Institution. Member of Technical Committee of R.M.A.; past Member of Committee of Wireless Section of the Institution of Electrical Engineers; Secretary, Radio Society of Great Britain, 1923-4. Research Physicist, H.M. Signal School, 1918-9. Editor, "Radio Review," 1920-1. From 1922 with present company. Born May 7, 1892. Recreation: authorship. Private address: 67, Queens Road, Richmond, Surrey.

CRACROFT - AMCOTTS, Major Weston.—Managing Director, Vee-Cee Dry Cell Co. (1927) Ltd., Northwold Road, Stoke Newington, London, N.16. Born 1888. Private address: 12, Wetherby Place, London, S.W.7.

DARBY, Lawson Alfred.—London Manager, The Chloride Electrical Storage Co., Ltd., 211-229, Shaftesbury Avenue, London, W.C.2. Member of Council, R.M.A. and M.T.A.; member of Research and Standardisation Committee, Institute of Automobile Engineers. Private address: 8, Leopold Road, Ealing Common, London, W.5.

DAVIS, Leslie Waring Westacott, Captain.—Director, Automobile Accessories (Bristol), Ltd., Clifton Terrace, Sion Road, Bedminster, Bristol; Express Engineering Co., Ltd., Poole, Bristol Radio Distributors, Bristol Works Manager, Colston Works, Bristol, 1912-1915. Director of Automobile Accessories, 1921, to date. Officer, R.A.S.C., M.T., during War; afterwards Road Transport Officer, Board of Trade. Also interested in automobile engineering. Born: April 18th, 1893.

Recreations: speedboating, yachting, swimming, badminton. Private address: 143, Sefton Park Road, Bristol, N.7.

DAY, Wilfred Ernest Lytton.—Managing Director, Dayzite, Ltd., Will Day, Ltd., Musikon, Ltd., 17, 18, 19, Lisle Street, Leicester Square, London, W.C.2. Past-President, Veterans of Kinematography. F.R.P.S., F.R.S.A. President of Society of Model and Experimental Engineers. Spent most of his time since 1896, when he started showing kinematograph pictures, in the development of kinematography accompanied by sound. Has invented and patented television apparatus and loaned to the South Kensington Museum collection of kinematograph apparatus. Recreations: motoring, fishing, model steamboats. Private address: Hollydene, 15, Cholmeley Park, Highgate, London, N.6.

DIAMOND, Joseph.—Partner, Thompson, Diamond & Butcher, 34, Farringdon Road, London, E.C.1. Born March 5, 1894.

DICKINSON, Reginald Gordon.—Export Manager, Kolster-Brandes, Ltd., Cray Works, Sidcup, Kent. Recreations: tennis, badminton. Private address: "Beechwood," Oaklands Road, Bromley, Kent.

DISNEY, Henry Anthony Patrick, B.A. (Cantab).—E. K. Cole & Co., Ltd., late Director Kolster Brandes, Ltd., Standard Telephones and Cables, Ltd.; Standard Radio Relay Services, Ltd., 63, Aldwych, London, W.C.2. Born September 9, 1893. Private address: Uphanger, Shepherd's Lane, Chorley Wood, Herts.

DOBIE, Arthur John Douglas.—Area Sales Manager, South of Thames & South Wales, Wingrove & Rogers, Ltd., 188/9, Strand, London, W.C.2. Marine work with Siemens Bros. & Co., Ltd., 1915; R.F.C. and R.A.F., 1918; The Marconi International Marine Co., Ltd., 1918; The Radio Communication Co., Ltd. (Marine & Broadcasting Dept.) 1927. Born February 18th, 1897.

DOHERTY, Harold Alfred.—Director, Edward Doherty & Sons, 700/710, Seven Sisters Road, London, N.15. Member of Committee of British Radio Cabinet Manufacturers' Association. Manufacturer of leather and wood sundries to dental and surgical trades. Born February 27th, 1902. Recreations: Swimming, gardening. Private address: "Stoke Gabriel," Townsend Avenue, London, N.14.

DOIG, Thomas Watson, A.M.I.W.T.—Principal, Bossons & Doig, 27, Victoria Street, Crewe. Chairman, Crewe Branch, W.R.A. Director, Crewe Economic Building Society. Theatre, cinema and other

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

orchestral appointments, 1890-1920. Entered radio, music and electrical business 1920, and pioneer radio retail business in Crewe. Born March 10, 1881. Recreations: motor-boating, motoring. Private address: "Beechwood," 98, Gainsborough Road, Crewe.

DONISTHORPE, Horace St. John de Aulâ.—Valve Sales, General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. Member of Sales Grading Committee, B.V.A. Wireless operator, Marconi International Marine Communications, Co., Ltd., 1912-13. During the war was Captain R.E.; Director and engineer, R. M. Radio, Ltd., 1919-21; American Representative, Marconi International Marine Communication Co., Ltd., 1924; B.E.C., 1925; Broadcast work in New York, U.S.A.; B.B.C., London, Oslo, and contributions to radio press in Britain and America, 1930. Author of several radio handbooks. Born December 18th, 1896. Recreations: tennis, riding, swimming. Private address: 16, Douglas Mansions, London, S.W.7.

DUNNE, Daniel Patrick.—Managing Director, The Chloride Electrical Storage Co., Ltd., 137, Victoria Street, London, S.W.1. Born November 26th, 1875.

DYER, Carleton L.—Managing Director, Philco Radio and Television Corporation of Great Britain, Ltd., Aintree Road, Perivale, Middlesex. Born August 12, 1901. Recreation: sailing. Private address: "Four Chimneys," Hendon, London, N.W.

DYER, Henry Alfred James Shearman.—Junior partner, Shearman, Dyer & Son, 298-300, Camberwell Road, London, S.E.5. Vice-chairman W.R.A., 1929-31; Chairman W.R.A., 1931-32; Member Executive Committee National Council, W.R.A., 1931-32-33. A.M.I.R.E. Interested in house furnishing trade. Born July 5, 1895. Recreation: music. Private address: Highlands, Champion Hill, Camberwell, London, S.E.5.

DYER, Herbert John.—Editor "Wireless Trader." Press Representative, the Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1, 1929-1933. Editorial Staff "Wireless Trader" 1925-29, Born, July 19th, 1897. Private address: Rectory Cottage, Hanwell, London, W.7.

EASTICK, John Clare Newlands.—Manager J. J. Eastick & Sons, Eeclex House, 118, Bunhill Row, London, E.C.1. Private address: 137, Upper Clapton Road, London, E.5.

ECKERSLEY, Peter Pendleton.—Consulting Engineer Standard Radio Relay

Services, Ltd., Bush House, London, W.C.2; Marconi Wireless Telegraph Co., Ltd.; Rediffusion, Ltd.; and Broadcast Relay Services, Ltd. M.I.E.E., F.I.R.E. Head of Designs Section Marconi's Wireless Telegraph Co., Ltd., 1919; Chief Engineer, B.B.C., 1923; Gramophone Co., Ltd., 1929-1930; has written "All about your Wireless Set" (Hodder & Stoughton), many B.B.C. publications and technical papers in the I.E.E. and I.R.E. proceedings. Born January 6th, 1892. Private address: 82, Swan Court, Chelsea, London, S.W.3.

ELLIS, Richard Milward.—Joint Managing Director and Sales Director, Pye Radio, Ltd., Africa House, Kingsway, London, W.C.2, and Climax Radio Electric, Ltd., Haverstock Works, Parkhill Road, Hampstead, London, N.W.3. Vice-President R.M.A. 1932; Chairman, 1931; Vice-chairman, 1930; previously Member of Council R.M.A.; Member of Committee of Radio Industry Luncheon Club; has occupied executive positions on N.A.R.M.A.T.; served with Everett, Edgcombe & Co., R. W. Paul; Edison Swan; Engineering Publicity, Ltd.; Chellis, Ltd., City and Guilds College (Electrical Engineering Dept); was a Drapers' Company scholar and research student at the East London College; is a director of J. Darnell & Sons, Ltd. (Boot & Shoe Distributors), and Chairman of Consolidated Securities, Ltd. (Investment Trust). Private address: 33, Cumberland Terrace, Regent's Park, London, N.W.1.

ELLISON, Michael Chetwynd, B.A. (Cantab).—Proprietor, Coates & Co., Albert Street, Harrogate; and Chairman, Northern Hire Purchase and Finance Co., Ltd., 11, Princes Square, Harrogate. Born 1901. Recreations: shooting, fishing, tennis. Private address: 32, Queen's Road, Harrogate.

EMERY, Ernest John.—Service manager, The Columbia Graphophone Co., Ltd., The Gramophone Co., Ltd., The Marconiphone Co., Ltd., Sheraton Works, Hayes, Middlesex. Joined Marconi International Marine Communication Co., Ltd., 1915; Marconi's Wireless Telegraph Co., Ltd., 1919; The Marconiphone Co., Ltd., 1922; Electrical and Musical Industries, 1932. Born October 24, 1897. Private address: 28, Hillcroft Crescent, Ealing, London, W.5.

EVANS, Selborne.—General Manager, Ward & Goldstone, Ltd., 5, Percy Street, London, W.1. Gold medallist, City and Guilds. Born September 11, 1890. Recreations: cricket, football, tennis, swimming, gardening. Private address: Havenfield Cottage, Great Missenden, Bucks.

[Continued on page 50.]

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WHO'S WHO IN RADIO

[Continued from page 48.]

FAWCETT, Francis Thomas, M.A., Ph.D., D.Sc., M.I.W.T.—Chief Examiner Electrical Engineering Subjects, International Correspondence Schools, International Buildings, 71, Kingsway London, W.C.2. President, Institute of Wireless Technology. Member, Mathematical Association. Technical Editor, Journal and Proceedings of the Institute of Wireless Technology from their inception; article with Edison & Swan, subsequently with W. T. Henley's Telegraph Works Co., Ltd.; sometime demonstrator in Electrical Engineering in the University of London; contributor to technical journals and author of scientific textbooks. Born May 17th, 1880. Recreation: photography. Private address: 53, Snakes Lane, Woodford Green, Essex.

FELTON, Lionel Bernard.—Joint Managing Director, Lectro Linx, Ltd., 254, Vauxhall Bridge Road, London, S.W.1. B.A. (Cantab) Director, Autoveyors, Ltd., 1925-27. Recreations: tennis, motoring. Private address: 9, Kensington Hall Gardens, London, W.14.

FERRANTI, Vincent Ziani de.—Chairman, Ferranti, Ltd., Ferranti Electric, Ltd. (Canada), Ferranti Inc. (U.S.A.). Hollinwood, Lancs. Member of Council B.E.A.M.A. Born February 16th, 1893.

FÈVRE, Auguste Jean.—Managing Director, Impex Electrical, Ltd., 538, High Road, Leytonstone, London, E.11. Director, Electrical Measuring Instrument Co., Ltd. Has worked in the interest of wireless in many European and South American countries.

FIELDING, John.—Proprietor, Pilgrims (J. Fielding), 150, Portland Road, Hove, Sussex. Chairman, Brighton Branch, W.R.A., 1933. Examiner in radio for the Music Industries Council for W.R.A. Born March 30, 1895. Recreations: football, cricket, swimming, gardening. Private address: "Stella Maris," 30, Mansfield Road, Hove.

FILBY, Thomas Charles.—Managing Director, C. & E. Marquis Ltd., 9, Farringdon Avenue, E.C.4. Formerly Sales Manager, Arthur Preen & Co., Ltd., & Formo Co. Was Captain in Army since before war, and has served in most parts of the Empire. Born July 16th, 1888. Recreations: golf, tennis, motoring. Private address: "Nainital," 33, Monks Drive, West Acton, London, W.3.

FORD, Cyril Herbert.—Assistant Service Manager, The Columbia Graphophone Co.

Ltd., The Gramophone Co., Ltd., The Marconiphone Co., Ltd., Sheraton Works, Hayes, Middlesex. Joined Marconi's Wireless Telegraph Co., Ltd., 1914; The Marconiphone Co., Ltd., 1922; Electrical and Musical Industries, 1932. Born May 4, 1896. Private address: "The Chestnuts," Wood End Green Road, Hayes, Middlesex.

FOUNTAIN, Guy Rupert.—Founder and Governing Director, Tannoy Products (Proprietors: Guy R. Fountain, Ltd.), Canterbury Grove, West Norwood, London, S.E.27. Born November 26th, 1899. Recreations: yachting, motoring. Private address: 25, Lancaster Road, West Norwood, London, S.E.27.

FREEMAN, A. H. Desmond.—Sales Director, H. Clarke & Co. (Manchester), Ltd., Bush House, Aldwych, London, W.C.2. Was Sales Supervisor to Brandes Ltd., and later Kolster-Brandes, for whom he was deputy member to the R.M.A. Born January 14th, 1897. Recreations: tennis, football, bridge. Private address: "Silechester," Wembley Hill Road, Wembley, Middlesex.

FREEMAN, Horace.—Managing Director, Parris Advertising, Ltd., Craven House, Kingsway, London, W.C.2. Telephone, Holborn 2404. After active war service in France, joined Bertram Day & Co., Ltd., 1920, as representative for radio newspapers; was assistant organiser and manager of the first All-British Wireless Exhibition and Convention, Horticultural Hall, London, 1922. Was advertisement manager for John Scott-Taggart's publications. Established his own advertising agency in 1925 at above address. Recreations: swimming, motoring.

FRENCH, Cyril.—Managing Director, Celestion, Ltd., Kingston-on-Thames. Director of Eto. Constable - Celestion. High Vacuum Valve Co., Ltd., Electrical Mfg. and Plating Co., Kingston and Staines Press, Ltd. Member of Council, Radio Component Manufacturers' Federation. Responsible for designs of all types of speakers and cabinet work marketed by Celestion since 1926. Apprenticed to Scientific Instrument Co., Cambridge, 1903-10. G. Kent & Co., 1914. Walters Electrical Mfg. Co., 1918. J. E. Jaccard, 1919. Founded Celestion, 1926. Recreations: motoring, flying, golf. Private address: 64, Lingfield Avenue, Kingston-on-Thames.

FRESHWATER, George John.—Publicity and Sales Promotion Manager, The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1. Born August 2nd, 1898. Recreations: golf, cricket, tennis. Private address: Bedford, Swakeley's Road, Ickenham, Middlesex. (Ruislip 483.)

THREE MILLION AERIALS CAN'T BE WRONG

GAMBRELL, Horace William.—Radio Publicist and Exhibitions Organiser. The Edison Swan Electric Co., Ltd., 123, Queen Victoria Street, London, E.C.4. M.I.W.T., M.I.R.E., 1st Class C.G.I. Served with the British Thomson-Houston Co., Ltd., until 1929. Born November 18, 1898. Recreations: yachting, fishing. Private address: "Stanford," Lincoln Close, Pinner, Middlesex.

GIBSON, William Thomas, O.B.E., M.A.(Cantab), B.Sc. (London).—Chief Valve Engineer, Standard Telephones & Cables, Ltd., Oakleigh Road, New Southgate, N.11. Head of Valve Development Labs., I.T. & T. Labs., Paris, 1928-31. Chief Valve Engineer, Federal Telegraph Co., Newark, U.S.A., 1931-32. Born January 21, 1899. Private address: 29, Rhodes Avenue, N.22.

GILBERT, Ernest Richard.—Advertising Consultant. Gilbert Advertising Ltd., 14, Holborn, London, E.C.1.

GILBERT, Josiah William.—Managing Director, Woburn Advertising, Ltd., and "Bookletism," 30, Bouverie Street, London, E.C.4. A.I.P.A. Director, United Kingdom Industrial Trust. Born February 10, 1902. Recreations: golf, tennis. Private address: 118, Crowstone Road, Westcliff-on-Sea, Essex.

GOLDSTONE, Sampson.—Director, Ward & Goldstone, Ltd., Pendleton, Manchester. Private address: 80, Promenade, Southport.

GOODFELLOW, Magnus.—Chairman and Managing Director, The Ever-Ready Co (Gt. Britain) Ltd., Hercules Place, Holloway, London, N.7, and The Ever Ready Trust Co., Ltd. Chairman, Lissen, Ltd.

GOODMAN, William Henry.—Managing Director, Dubilier Condenser Co. (1925), Ltd., Mansbridge Condenser Co., Ltd., High Frequency Engineering Co., Ltd., Ducon Works, North Acton, London, W.3. Also Director of Isenthal & Co., Ltd.; and Société des Condensateurs de Trevoux, France. Founded Dubilier Co. in 1912. Born April 23rd, 1884. Recreations: rowing and tennis. Private address: Burcott Cottage, Aylesbury.

GOOTNICK, Samuel, F. Tv. S.—Director (in charge of purchases and production), Burgoyne Wireless (1930), Ltd., 34a, York Road, London, N.1. Has been commercially connected with radio since its inception. Recreations: motors, motor-racing and dog-breeding. Private address: 47, Highfield Gardens, Golders Green, N.W.11.

GORRINGE, Rupert Clement.—Sales Manager, Dry Battery Dept., The Edison-Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.1. Born March 30th,

1898. Private address: 32, Compton Road, Wimbledon, London, S.W.19.

GREEN, George Frederick.—Publicity Manager, The Mullard Wireless Service Co., Ltd., 111, Charing Cross Road, London, W.C.2. Life interest and work in publicity. Recreations: cinematography, motoring. Private address: 3, Alma Square, St. John's Wood, London, N.W.8.

GRUNCCELL, Randolph Albert.—Partner, Gruncell & West, 92, Shirley Road, Southampton. Chairman, Southampton Branch, W.R.A. Member Electrical Contractors' Association & Southampton Chamber of Commerce.

GRYLLS, Thomas Henry, M.J.I.E., A.M.I.R.E.—1st Class P.M.G. certificate; Proprietor, Grylls Radio, 21, Clarence Road, Grays, Essex. Vice-Chairman, Essex & East London Branch, W.R.A. After war service, joined Marconi International Marine Communication Co., Ltd., Radio Communications Co., Ltd. Started own radio business 1928. Born March 29, 1898. Recreations: swimming, boxing, motoring. Private address: 83, Clarence Road, Grays.

HAIGH, Richard.—English Manager, The Gramophone Co., Ltd., 98-108, Clerkenwell Road, E.C.1.

HAMBLING, Arthur William.—Managing Director, A. W. Hambling & Co., 26, Charing Cross Road, London, W.C.2. Sharehold, National Radio Service Co.; Member (1922) Institute Radio Engineers, New York. After serving in the war, was with F. O. Read & Co., Ltd., 1919-20; Hambling Clapp, Ltd., 1921-29. Owned and operated station G.2.M.K. since 1919. Served on R.S.G.B. Council; was Assistant Secretary, 1921. Born March 1st, 1898. Recreation: aviation. Private address: 80, Brondesbury Road, London, N.W.6.

HANCHARD GOODWIN, John Martin, M.A.(Cantab), Junior 1st Class Engineering Tripos.—General Sales Manager, Britannia Batteries, Ltd., Britannia House, Shaftesbury Avenue, W.1. Educated Highgate School and Pembroke College, Cambridge. Late Royal Engineers, Royal Military Academy. Joined Kodak, Ltd., 1923, and made Asst. Sales Manager 1927. Born April 8, 1897. Recreations: writing, rowing. Private address: Moor Park, Herts. Clubs: Oxford & Cambridge.

HARRIS, Charles Lynton.—Press Representative, Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1. 1920-24, in Merchant Service as Apprentice and Third Officer in steam; 1925-29, Showroom Salesman for Marconiphone; 1929-31, Travelling Representative; 1931-32, with Stagecraft. Press Representa-

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

- tive, Easter, 1933. Born : September 12th, 1903. Recreation : golf. Private address : 35, Hanover Road, Brondesbury Park, N.W.10.
- HARRIS, Herbert Reginald.**—Sales Organiser, Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2. With British Thomson-Houston Co., Ltd., 1922-29. Member of Council, R.C.M.F., since formation. Chairman, Commercial Committee, B.R.V.M.A., 1932-33. Born November, 1889. Recreation : motoring. Private address : 44, Woodside Park Road, North Finchley, London, W.12.
- HARRIS, Thomas.**—Sales Manager for Tungsram Valves, Tungsram Electric Lamp Works (G.B.), Ltd., 72, Oxford Street, London, W.1. 1901-6, Advertising Manager, Falk, Stadelmann & Co., Ltd.; 1906-14, Managing Director, United Chemical Works, Ltd.; 1914-23, Managing Director, Albert Lee & Co., Ltd.; 1916-18, Officer, R.A.F. on war service overseas; wounded and discharged from hospital April, 1919. Actively engaged in radio trade since 1920. First introduced Telefunken productions into this country. Freeman of the City of London. Born : August 11th, 1886. Recreations : golf, motoring. Private address : 102, Woodland Way, Winchmore Hill, N.21 (Palmer's Green 0703).
- HARRISON, Donald Frederick.**—Sales Manager, The Mullard Wireless Service Co., Ltd., 111, Charing Cross Road, London, W.C.2. Born November 27th, 1899. Private address : 40, Gyllyngdune Gardens, Seven Kings, Essex.
- HARRISON, Percy Lionel, A.M.I.R.E.**—Owner Harrisons, Radio Corner, 1-3, Melville Street, Lincoln. Chairman, Lincoln Branch, W.R.A., January, 1933. Representative on London Council 1933. Chairman, Lincoln Amateur Swimming Club last six years. Born October 4, 1891. Recreations : swimming, motoring; organist. Private address : Sunny Bungalow, Burton Road, Lincoln.
- HART-COLLINS, Cyril.**—Managing Director, Hart-Collins, Ltd., 38a, Bessborough Street, London, S.W.1. Executive Council, R.M.A., until 1930. Was Radio Sales Manager, Westinghouse Electrical Manufacturing Co., New York. Born August 10, 1896. Recreations : golf, fishing. Private address : 55, Cumberland Court, London, W.
- HART, David.**—General Sales Manager, E. K. Cole, Ltd., Southend-on-Sea. A.C.I., M.S.M.A. Nominated Deputy Member R.M.A. Executive Council. Has served with Marconiphone and linked up with
- E. K. Cole, Ltd., in 1926. Born December 6th, 1891. Recreations : motoring, golf. Private address : Vermont, Aldermans Hill, Hockley, Essex.
- HARVEY, Grinnell Strong.**—Manager, Exide Service, The Chloride Electric Storage Co., Ltd., Clifton Junction, nr. Manchester. Born July 16th, 1893. Private address : "Grosvenor Mount," Whitefield, Nr. Manchester.
- HAYNES, Frederick Henry.**—Proprietor Haynes Radio, 57, Hatton Garden, London, E.C.1. Formerly Assistant Editor to "Wireless World" and "Wireless Engineer." Born October 1st, 1893. Private address : 38, Sittingbourne Avenue, Enfield, Middlesex.
- HEALY, Henry William, A.M.I.E.E.**—Works Manager, Electric and Musical Industries, Ltd., Blyth Road, Hayes, Mdx. Born : February 16th, 1886. Private address : North Lee, Terrick, Princes Risborough, Bucks.
- HEATHORN, Frank Leslie.**—Advertising Manager, The Gramophone Co., Ltd., 98-108, Clerkenwell Road, London, E.C.1. Articled and qualified as structural engineer, 1909-15; in 1914 became interested in advertising; after war service joined the "Times," passing through Lever Bros., Ltd., to Gramophone Co., Ltd., 1931. Recreations : motoring, music, literature, carpentry and light mechanics. Private address : One Oak, Radlett Road, Boreham Wood, Herts.
- HEAVER, Ernest Frank.**—Sales Manager and Publicity Manager of The Rothermel Corporation, Ltd., and Sonochorde Reproducers, Ltd., 1, Willesden Lane, London, N.W.6. Connected with importation of American hardware and tools, 1912-1915; R.F.C. and R.A.F. wireless operator and observer, 1916-1919; hardware and tool trades, 1919-1923. Joined Rothermel Corporation, Ltd., as Sales Manager in 1923. Born July 19th, 1897. Private address : 37, Circle Gardens, Merton Park, London, S.W.19. (Liberty 1530.)
- ENDERSON, Frederick Ewart, A.M.I.E.E.**—Gold Medalist and Honours Diploma, Faraday House. Head of Osram Valve Technical Sales Dept., General Electric Co., Ltd., Magnet House, Kingsway, W.C.2. Joined G.E.C. Research Labs., 1921, and Osram Valve Sales Dept., 1924. Born August, 1898. Recreations : tennis, photography. Private address : 21, Lansdowne Road, Muswell Hill, N.10.
- HESKETH, Benjamin.**—Director McMichael Radio, Ltd., Wexham Road, Slough; B.Sc. Power Station Engineer, 1906; Power Station and Construction Engineer, 1910-14; Manufacturing Engineer, 1919-20 to present date, during which period

MULLARD—THE GREATEST NAME IN RADIO

formed B. Hesketh, Ltd., which company later amalgamated with L. McMichael, Ltd., to form the existing concern. Born February 15th, 1884. Recreations: golf, tennis, yachting, music, photography. Private address: Fernleigh, Iver Heath, Bucks.

HIGGINSON, Kingsley.—Chief Engineer, Varley, Kingsway House, 103, Kingsway, London, W.C.2. Private address: 322, Richmond Road, Kingston-on-Thames.

HILLMAN, Charles.—Partner, Hillman Bros., 123-5, Albion Street, Leeds.

HILLMAN, Edgar Martin.—Partner, Hillman Bros., 123-5, Albion Street, Leeds. A.C.G.I., Int. B.Sc. (Engineering).

HIRST, John, B.A. (Cantab), M.I.E.E.—Managing Director, Hirst, Ibbetson & Taylor, Ltd., 9, Blackfriars Street, Manchester, and at Blackpool and Burnley. Hon. Sec., North Midland Section, R.W.F., Jan., 1930—Mar., 1933. With A.E.G., 1910-1914; Williams & Robinson, Ltd., 1915-1916; Manager, Harland Engineering Co., 1916-1920. Founded Hirst, Ibbetson & Taylor, 1920. Born: January 23rd, 1884. Recreations: mountaineering, golf, amateur theatricals. Private address: "Grivola," Bowden Lane, Marple, Cheshire.

HITCHCOCK, Alan Flinders.—Managing Director, Flinders (Wholesale), Ltd., East Stockwell Street, Colchester. Born January 2, 1888.

HOBDAY, Clifford Henry George.—Managing Director, Hobday Brothers, Ltd., Great Eastern Street, London, E.C.2; also at Manchester and Wolverhampton. Council Member, R.W.F. Chairman, Phoenix Tiles, Ltd., and John Dancer, Ltd. Born: September 18th, 1899. Private address: Forest House, Chigwell, Essex.

HODSON, John Curran.—Sales Superintendent, United Radio Manufacturers, Ltd., 63, Lincoln's Inn Fields, London, W.C.2. Valve sales manager of Mullard Wireless Service Co., Ltd., 1924-1931; sales manager, Audiovisor, Ltd., 1931-1932. Born June 1st, 1900. Recreations: golf, cricket, swimming. Private address: Cooneen Cottage, Orchehill Avenue, Gerrards Cross, Bucks.

HOLMES, Herbert.—Managing Director Holmes Bros. (London), Ltd., Howard Works, Billet Road, Walthamstow, London, E.17. Vice-Chairman and Founder-Member, British Radio Cabinet Manufacturers' Association, 1932. President, Walthamstow Rotary Club, 1931-2. Born September 12, 1875. Recreations: motoring, gardening. Private address: Heath-

cote, Chelmsford Road, Woodford, London, E.18.

HOLMES, Ronald Herbert.—Director and Sales Manager, Holmes Bros. (London), Ltd., Howard Works, Billet Road, Walthamstow, London, E.17. Born: March 17th, 1903. Recreations: motoring, walking, shooting, fishing. Private address: 7, Orleans Road, Hornsey Lane, Highgate, London, N.19.

HOUGHTON, Edgar William.—Chairman and Managing Director, Ensign, Ltd., 88-89, High Holborn, London, W.C.1. President of the Radio Wholesalers' Federation, 1933-4; Chairman since its formation, 1928. Born February 6th, 1870. Private address: Denehurst, West Heath Road, Hampstead, London, N.W.

HOWITT, Harry.—Secretary of British Radio Valve Manufacturers Association, 59, Russell Square, London, W.C.1.

HUNT, Cyril Harvey.—Managing Director, Hellesens, Ltd., Hellesen Works, Morden Road, South Wimbledon, London, S.W.19; also Director, A. H. Hunt, Ltd., Born 1897. Recreations: tennis, golf, badminton, football.

HUNT, William Arthur.—Managing Director, National Radio Service Co., 15-16, Alfred Place, Tottenham Court Road, London, W.C.1. Director, S. G. Brown (Foreign and Colonial), Ltd. Was Director, L.E.S. Distributors, Ltd., 1922-32. Secretary, London Section, N.A.R.M.A.T., 1925-26; Co-opted Member, Council R.W.F., 1930-32. Recreations: golf, motoring. Private address: 11, Alexander Place, Thurloe Square, London, S.W.7.

HURFORD, George.—Managing Director, Kolster Brandes, Ltd., Cray Works, Sidcup, Kent. Late director of manufacture and telephone manager, Standard Telephones & Cables, Ltd. Member of Institution of Electrical Engineers, and of American Society of Mechanical Engineers, Chairman, British Works' Managers Association. Member of Institute of Industrial Psychology. Twenty-seven years experience of works management in England, Belgium and France. Has several times visited America to investigate manufacturing methods.

HUSTLER, Ivor William Ernest.—Managing Director, Ready Radio, Ltd. Eastnor House, Blackheath, London, S.E.3. Born June 26th, 1899. Private address: Chinnery Way, Woldingham, Surrey.

HUXLEY, George Arthur, B.A. (Eng.) Cantab.—Director and Secretary, Wright & Weaire, Ltd., and George Nissen, Ltd., 740, High Road, Tottenham, London, N.17. Carried rank of Major R.E. during

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

War, has travelled the five Continents. Prior to War, represented Henry Simon, Ltd., in South America. Since War with present firms. Born January, 1888. Recreations : golf, fishing, motoring. Private address : Whithern, Cheshunt, Herts.

LIFFE, Alfred Eldred.—Director and General Sales Manager, The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17.

JOHNSON, Albert Ernest.—Joint Managing Director, J. B. Manufacturing Co. (Cabinets), Ltd., Gainsford Road, Walthamstow, London, E.17. Secretary, British Radio Cabinet Manufacturers' Association. Member of Rotary International. Born February 23rd, 1908. Recreations : riding, shooting, motoring. Private address : Woodvale, Great Parndon, Essex.

JONES, Archibald George.—London Manager, A. Rist (1927) Ltd., and Flexible Electric Cords, Ltd., 45, Grafton Street, London, W.1. Formerly Sales Manager, London Branch, Ward & Goldstone, Ltd. Interested in electrical installation schemes for better household services. Born January 4th, 1892. Recreations : Golf, tennis, cricket, football. Private address : 28, Netheravon Road, Chiswick, W.4.

JONES, Bernard Edward.—Managing Director, Bernard Jones Publications, Ltd., 58-61, Fetter Lane, London, E.C.4. Editor, "Amateur Wireless" and "Wireless Magazine": from 1909-26, technical editor, Cassell & Co., Ltd.; founded "Amateur Wireless" and "Wireless Magazine" for Cassell's. In 1926 acquired these publications for his own company.

JOSEPH, Henry.—Representative, W. T. Lock, Ltd., Sole Representative, Grawor, and H. Vesshoff Co., 33, Percy Street, London, W.1. After serving apprenticeship in electrical engineering 1911-14 did journeyman work until 1925, when present organisation was founded. Born October 27th, 1895. Recreation : bowls. Private address : 76, Highlever Road, North Kensington, London, W.10.

JOSEPH, Joseph, M.I.E.E., M.I.R.E.—Managing Director, Radio Instruments, Ltd., Purley Way, Croydon. Trustee and member of Council R.M.A. since its inception. Honorary Treasurer R.M.A. 1933.

KAY, Barry.—Sales Promotion Manager, E. K. Cole, Ltd., Ekco Works, Southend-on-Sea. Born May 21st, 1904. Recreations : motoring, tennis, golf. Private address : 30, First Avenue, Westcliff-on-Sea.

KAY, Frederick George.—Radio correspondent "Daily Express," Fleet Street, London, E.C.4. Formerly on editorial staff "The Wireless Trader" (1929), assistant Editor "Radio Trade Review" (1932); assistant to Garry Allighan, R.M.A. Publicist (1932-3). Born May 6th, 1910. Private address : 4, Westcote Rise, Ruislip, Middlesex.

KAY, Henry Graeme Aytoun.—Director and General Sales Manager, Magnavox (Gt. Britain) Ltd., 89, Kingsway, London, W.C.2. Member of Council of N.A.R.M.A.T. and R.M.A. 1924-28 and various committees of these associations; was manager radio department, Metropolitan-Vickers Electrical Co., Ltd., 1924; Sales Manager Wireless Pictures (1928) Ltd., 1928; Secretary, the Twenty Six Trust, Ltd., 1929-1931.

KEELING, Charles Horace, A.M.I.R.E.—Sales Promotion Manager, British Radiophone Co., Ltd., Aldwych House, Aldwych, London, W.C.2. Seagoing Wireless Telegraphist Marconi Corporation, Ltd., 1917; Technical Adviser, Comparri Wireless Control Syndicate, Ltd., 1919; Technical Salesman, Leslie McMichael, Ltd., 1922-4. Born January 17th, 1900. Recreations : motoring, camping, golfing. Private address : Ulladulla, Victoria Road, Buckhurst Hill, Essex.

KENT, George Gordon.—Joint Managing Director, Johnson Talking Machine Co., Ltd., 96, Clerkenwell Road, London, E.C.1.

KING, Harrie John.—Consultant, 48, Mountview Road, North Chingford, London, E.4. Founder-Member of the Institute of Wireless Technology, Assistant Secretary 1925, Secretary 1927 to date; Editor of Institute's publications 1926 to date; F.C.C.S., F.R.Econ.S., M.I.W.T. Interested in research and investigation of sound reproduction and acoustics from 1908 to date, which has included lecturing, writing, examining and organising work furthering the interests of wireless. Spare-time interests : music, dietetics, psychology, eugenics, economics, engineering.

KIRBY-JOHNSON, Harry Linscott.—Managing Director, Martindale Electric Co., Ltd., The Hyde, Hendon, London, N.W.9. Member Arbitration Board American Chamber of Commerce in London. Councillor, Hendon Borough Council. Member of Council, Edgware Rotary Club. 1912-1921, British Westinghouse E. & M. Co., Ltd., 1921-1926, own business in Glasgow. 1922-1926, Wholesale Radio Factor. 1926-1927, Scottish Manager for Radio Communication Co., Ltd. 1927-1928, Sales Manager, Brownie Wireless Co., Ltd. 1928, Martindale Electric Co.,

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Ltd., established. Born May 16, 1884. Recreations: golf, camping. Private address: Ardlui, 23, Hillside Drive, Edgware, Middlesex.

KLEIN, Rene Henri.—Joint Managing Director, McMichael Radio, Ltd., 265, Strand, London, W.C.2; M.I.R.E., Vice-President Radio Society of Great Britain; Founded Wireless Society of Great Britain. Private address: 18, Crediton Hill, West Hampstead, London, N.W.6.

KNOX, Collie.—Radio Editor, "The Daily Mail," Northcliffe House, E.C.4. During war was A.D.C. to Lord Lloyd, the Governor-General of the Sudan and the Adjutant-General at War Office. For six years on "The Daily Express" as sub-editor, special writer, radio critic and feature editor. Born March 13, 1897. Recreations: tennis, golf, song writing. Private address: 29, Graham Street, Eaton Terrace, S.W.1.

KOHN, Louis.—Manager of Leeds Branch, Ward & Goldstone, Ltd., 49a, Briggate, Leeds.

LATHAM, Charles, F.L.A.A.—Secretary and Accountant of The Radio & Gramophone Trades Guardian Association, Ltd., 78, New Oxford Street, London, W.C.1. Alderman of The London County Council; Member of The Public Works Loan Board; Member of The London and Home Counties Joint Electricity Authority; Member London & Home Counties Traffic Advisory Committee appointed under London Passenger Transport Act, 1933. Justice of the Peace for County of London. Director and Accountant of The Automobile Trades Guardian Association, Ltd. Born 1889. Private address: 30, Sunny Gardens, Hendon, N.W.4.

LEE, Arthur.—Director and Secretary, Burgoyne Wireless (1930), Ltd., 34a, York Road, London, N.1. Has intimate knowledge of business and commerce in the Near East due to many years' residence in Persia, Egypt and the Balkan States. Recreations: motoring, gardening. Private address: Oaklands, Waterfall Road, London, N.14.

LEE, Edgar Morton., B.Sc., London.—Director and General Manager, Belling & Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex. Director, Insulators, Ltd. Hon. Treasurer Radio Component Mfrs. Federation. Radio Industry Luncheon Club Committee. Interested in Bakelite Moulding and Brass and Casein Turning; prior to jointly founding Belling & Lee, Ltd., 1922, was Physics and Physical Chemistry research worker and student demonstrator. Born March 31st, 1902. Recreations: gymnasium, swimming, tennis, golf.

LEVER, Edward Anthony, B.Sc., B. Com.—Sales & Publicity Manager, Pye Radio, Ltd., Africa House, Kingsway, London, W.C.2. Born February 25th, 1900. Recreations: films and filming. Private address: 8, Monksdene Gardens, Sutton, Surrey.

LEVER, Eric Joseph.—Director, Eric J. Lever (Trix) Ltd., 8-9, Clerkenwell Green, London, E.C.1.

LEWIS, Harold Victor.—Sales Manager, Philco Radio and Television Corporation of Great Britain, Ltd., Aintree Road, Perivale, Middlx. Born August 20th, 1897. Recreations: golf, shooting. Private address: 48, Meadway Court, London, N.W.11.

LLOYD, Sidney.—Sales Manager in Southern Counties, Ward & Goldstone, Ltd., 40, Ashton Road, Moordown, Bournemouth.

LONGMIRE, Albert.—Manager for Sales Enquiries, Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester. Born May 25th, 1894. Private address: 163, Fairfield Street, Ardwick, Manchester.

LYONS, Claude Lipman.—Joint Managing Director, Claude Lyons, Ltd., 40, Buckingham Gate, Westminster, London, S.W.1. B.Sc., M.I.R.E., Fellow Physical Society (London), R.S.G.B. Born September 21st, 1896. Recreations: reading, photography, motoring, billiards, chess.

McCREA, Frederick Harold.—Technical Director of Sales, Dubilier Condenser Co., (1925), Ltd.; Mansbridge Condenser Co., Ltd.; Ducon Works, Victoria Road, North Acton, London, W.3; Manchester Radio Co., Ltd. Member of R.M.A. Council, 1929-31; also Sales Director Isenthal & Co., Ltd. In 1922 formed Manchester Radio Co., Ltd.; joined Dubilier 1929 as sales manager. Born October 5th, 1895. Recreation: golf. Private address, 26, Sedgcombe Avenue, Kenton, Middlesex.

MACFARLANE, James.—Secretary, Radio Wholesalers Federation, 26, Hart Street, London, W.C.1. From 1898-1928 connected with motor trade press; Appointed to present position 1928. Recreations: golf, literature. Private address: Guildford Lodge, Clarendon Road, Watford, Herts.

McKENZIE, James Patrick, A.M.I.E.E., M.I.R.E.—Managing Director, Sifam Electrical Instrument Co., Ltd., York Works, Browning Street, London, S.E.17. Works Manager, C. F. Elwell, Ltd., 1921; Standard Telephone & Cables, Ltd., 1923; Founded Sifam Co., 1925. Born January 14th, 1889. Recreation: shooting. Private address: 2, Osberton Road, Lee, London, S.E.12.

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

McMICHAEL, Leslie.—Chairman and Managing Director, McMichael Radio Ltd., Slough, Bucks., A.M.I.E.E., F.I.R.E., Vice-President Radio Society of Great Britain; Vice-President R.M.A. Apprenticed to electrical engineering, 1900; held transmitting and receiving licence for 1911; call sign 2F.G.; helped form the Wireless Society of London, since extended to Radio Society of Great Britain; during the war served in the Wireless Experimental Section of the R.A.F.; for several years Secretary of the Radio Society of Great Britain; founded present firm in conjunction with Messrs. R. H. Klein and B. Hesketh in 1920; a founder member of the National Association of Radio Manufacturers, serving on the Council until R.M.A. formed, and has been on Council of R.M.A. since inception. Chairman R.M.A., 1932. Born November 17th, 1884. Private address: Everest, Prince's Park Avenue, London, N.W.11.

MACNAMARA, Arthur William.—Managing Director, Telsen Electric Co., Ltd., Aston, Birmingham. Commenced Telsens in May 1924. Prior to this in business on own account as electric contractor; held secretarial position in Ministry of Labour. Born September 10th, 1899. Recreations: hunting, tennis, golf, cricket, swimming, billiards, chess. Private address: Miradene, Hayfield Road, Moseley, Birmingham.

MACQUEEN, Montague, M.—Manager, Wireless Dept., General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. On Council and committee, R.M.A. Born February 18th, 1898.

MAHONEY, Henry Charles, M.I.S.M.A.—Sales and General Manager, Montague Radio Inventions & Development Co., Ltd., Beethoven Works, Gt. College Street, N.W.1. Joined Edison Bell, Ltd., in 1924 after varied scientific career in many parts of Europe. During War was sentenced to death as spy in Germany; in 1926 was made Wireless Sales Manager and promoted in 1928 to General Wireless Manager. Lectures and writes on wireless and allied sciences. Lecturer on Salesmanship and Systems. Chief Inspector Met. Spec. Constab. (Camberwell). Born March 17th, 1887. Recreations: motoring, photography, carving, gardening. Private address: The "Oddun," Silverleigh Road, Thornton Heath, Surrey.

MARCONI, Guglielmo, Marchese.—A Senator of Italy, Knight Grand Cross of Order of St. Maurice and La'arus of Italy, Hon.G.C.V.O., Hon.D.Sc. Oxford, Hon.Sc.D. Cambridge, Hon.

LL.D. Glasgow, etc.—Marconi House, Strand, London, W.C.2. Educated at Bologna, where he was born 1874 of Italian and Irish parents and where first experiments in wireless were conducted. In 1899 established wireless between France and England. In 1901 sent messages from Cornwall to Newfoundland, 1902 extended to America. His system practically in universal use. Amongst honours Nobel Prize, 1909; Albert Medal, Royal Society of Arts, etc. Recreations: hunting, motoring, yachting. Private address: 11, Via Condotti, Rome, Italy.

MARKS, Lord, George Croydon, C.B.E., J.P.—Chairman Columbia Graphophone Co., Ltd., Director Electrical and Musical Industries, Ltd., 58, Lincoln's Inn Fields, London, W.C.2. M.I.M.E., A.M.I.C.E. Senior partner and founder of Marks & Clerk, Patent Agents and Consulting Engineers, practising in London, Birmingham, Manchester, Glasgow, New York, Washington, Chicago, Ottawa, Toronto, San Francisco. Private address: Carrick Grange, Sevenoaks, Kent.

MARRIOTT, George Armstrong, B.A. (Cantab).—Manager Osram Valve Dept., The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. Joined G.E.C. Osram Lamp Dept., 1921; took over valves 1922 in addition to lamps, and sole charge of valves, 1927. Born 1892. Recreations: tennis, shooting, rock climbing. Private address: 5, Pitt Street, Kensington, London, W.8.

MARTIN, Anthony Wyard.—Assistant Chief Engineer, F. K. Cole, Ltd., Southend-on-Sea. Wireless manager, Bexhill Motors, Bexhill, 1926-28. Born September 26th 1907. Recreations: yachting, football, tennis. Private address: Clun, Thames Close, Leigh-on-Sea.

MAY, John.—Assistant Editor, "Broadcaster and Wireless Retailer," 29, Bedford Street, Strand, London, W.C.2. Associate member of the Institute of Radio Engineers. Joined editorial staff of "Wireless Trader," "Wireless Export Trader," and "Experimental Wireless" in February 1925. Left to go to "Industrial Daily News" and "Modern Transport" in August 1928. Joined "Broadcaster" August, 1929. Born September 27th, 1908. Recreations, writing and riding. Private address: 112, St. Leonard's Road, East Sheen, London, S.W.14.

MICHELL, Philip Claud.—Managing Director, Trelleborg Ebonite Works, Ltd., Union Place, Wells Street, London, W.1. Private address: Kingswood Court, Maidenhead.

[Continued on page 59.]

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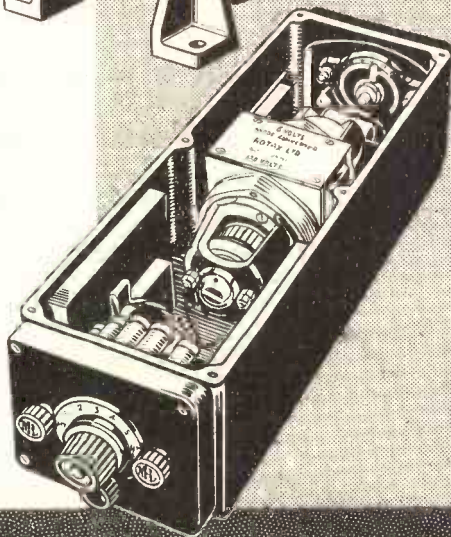
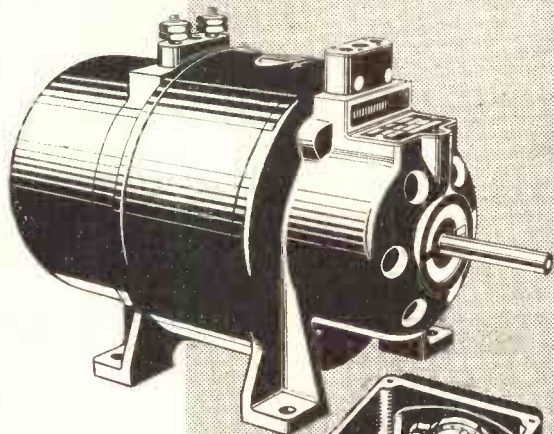
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WHO'S WHO IN RADIO

[Continued from page 56.]

MIDDLETON, Arthur.—London Manager, Ferranti, Ltd., Bush House, Aldwych, London, W.C.2. A.M.I.E.E.

MILLER, Nora Evelyn.—Manager, Publicity Dept., The Edison-Swan Electric Co., Ltd., 123-5, Queen Victoria Street, London, E.C.4. Started in Edison-Swan Drawing Office 1916. Took over present work 1927. Born March 11th, 1899. Recreation: motoring. Private address: 10, Manorway, Bush Hill Park, Enfield.

MILLER, Stanley Hugh, B.A.—Publicity and Sales Manager, National Radio Service Co., 15-16, Alfred Place, London, W.C.1. During the war held commissioned rank in Navy, afterwards 3½ years' active Flying service. 1919-1929 operated general music business in Cambridge. Born July 15th, 1898. Recreations: tennis, golf, squash, Rugby, hockey, shooting, swimming. Private address: The Rise, Elstree, Herts.

MILLER, William Edward, B.A. (Cantab). M.I.W.T.—Technical Editor, "The Wireless and Gramophone Trader," Dorset House, Stamford Street, London, S.E.1. Hon. Treasurer Institute of Wireless Technology. With the Cambridge Instrument Co., Ltd., 1924. Joined "Wireless Trader," 1925. Born June 5th, 1902. Private address: 42, Hunters Grove, Kenton, Middlesex (Wordsworth 2803).

MONTAGUE, David.—Director and Technical and Research Adviser, Montague Radio Inventions and Development Co., Ltd., Beethoven Works, Great College Street, Camden Town, London, N.W.1.

MONTAGUE, Sidney.—Director and Sales Manager, Montague Radio Inventions and Development Co., Ltd., Beethoven Works, Great College Street, Camden Town, London, N.W.1.

MOODY, Alexander Edmund. Exhibitions Organiser to the R.M.A., Astor House, Aldwych, W.C.2. Born April 12, 1886. 1906-1914 Chief Engineer, Jury's Imperial Pictures and Imperial Playhouses, Ltd. Shortly after war, Managing Director Moody's Ltd., electrical engineers. 1922-1928 joint radio sales manager, British Thomson-Houston Co., Ltd. Joined R.M.A. in 1928. War Service. Paravane Section R.N.V.R. 14th Destroyer Flotilla. Private address: 86, Augustines Avenue, Wembley, Middlesex.

MOODY, Richard Henry Cyril.—Special Products Dept., Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1. 1918-20 with R. M. Moody, Ltd.,

Manufacturers; 1920-29, Grindlay & Co. Ltd.; 1929-32, Gramophone Co., Ltd.; 1932 to date, Marconiphone Co., Ltd. Born: July 16th, 1901. Recreations: golf, Rugby, riding, shooting, cricket. Private address: 62a, Upper Mulgrave Road, Cheam, Surrey.

MOORE-BRABAZON, Lt.-Col. J. T. G., M.C., M.P.—President R.M.A., 38, Eaton Square, London, S.W.1. Educated at Harrow and Cambridge; early pioneer in motoring, aviation and radio; held a transmitting licence on the spark system before the war; Conservative M.P. for Rochester, 1918-29; Wallasey, 1931; was Parliamentary Secretary to the Ministry of Transport, 1923-7, during which time was largely responsible for passing the Electricity Act; is a director of Associated Equipment Co., Ltd., and Kodak, Ltd. Born February 8th, 1884. Recreations: yachting, golf, Swiss ice sports. Clubs: White's, Carlton, R.Y.S.

MORRIS, James R., B.A.—European Representative, National Carbon Co., Inc., 15, Kingsway, London, W.C.2. Has represented his firm and affiliated companies in Europe for 20 years. Born September 7th, 1890. Private address: 49, Eton Court, London, N.W.8.

MORRISON, L. Claude.—Director and Sales Manager, Kolster-Brandes, Ltd., Cray Works, Sidcup, Kent. Born August 10th, 1895. Recreations: tennis, football, golf. Private address: "Otterleigh," St. Albans.

MOSELEY, Sydney Alexander.—505, Cecil Chambers, Strand, London, W.C.2. Connected with journalism since 1910; written extensively on radio. Broadcast critic "Daily Herald," "People," etc. Has written some twenty books on various subjects. A pioneer of television broadcasts in this country. Chairman Broadcast Committee of Critics Circle. Born March 9th, 1888. Recreations: swimming, golf, travelling, music.

MOULD, John Thomas.—Director, Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C.4. Born: June 13th, 1861. Private address: Russell House, The Drive, Golders Green, London, N.W.11.

MULLARD, Stanley Robert, M.B.E., M.I.E.E.—Chairman The Mullard Wireless Service Co., Ltd.; Director, The Mullard Radio Valve Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2; Vice President, R.M.A. from 1928 to date; holds various directorships in manufacturing companies in electrical and sound recording industries; from 1910-15 head of Research Dept., Ediswan; during war, Lieut., R.N.V.R. and Capt. R.A.F.; after war founded Mullard Companies.

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

MULVEY, Richard G.—Advertisement Manager, "The Wireless and Gramophone Trader," Dorset House, Stamford Street, London, S.E.1.

MURPHY, Frank, B.Sc., A.M.I.E.E., A.I.Rad.E., M.B.E.—Managing Director, Murphy Radio, Ltd., Welwyn Garden City, Herts. Founded present company 1927, after service in Engineering Dept. P.O.; Wireless Officer R.A.F. during war and later O.C. Officers Wireless School R.A.F. Born June 16th, 1889. Recreations: tennis, walking. Private address: 25, Brockswood Lane, Welwyn Garden City, Herts.

NAYLOR, William Slater, M.I.E.E.—Chairman, Chloride Electric Storage Co., Ltd., Clifton Junction, near Manchester.

NECK, Leslie T.—Managing Director, Columbia Graphophone Co., Ltd., 98-108, Clerkenwell Road, London, E.C.1. Chairman of Executive Federation of British Music Industries, 1930-32. Formerly Manager, English Branch, Gramophone Co., Ltd., up to 1931.

NEUMAN, Adalbert.—Managing Director, Tungram Electric Lamp Works (G.B.), Ltd., 72, Oxford Street, London, W.1. Born: September 17th, 1900. Recreations: swimming, rowing, boxing. Private address: 59, Queensborough Terrace, London, W.2.

NOBLE, James George Gillbard.—Director, Dulcet-Polyphon, Ltd., 2-3, Newman Street, W.1. For six years Secretary, Federation of British Music Industries and Pianoforte Mfrs' Assn. President, Bush Hill Golf Club and Launceston College Old Boys' Assn. Born April 16, 1890. Recreation: golf. Private address: 18, Green Moor Link, Winchmore Hill, N.21.

NUNN, Robert Henry.—Managing Director, Regentone, Ltd., 21, Bartlett's Buildings, London, E.C.4. Born March 26th, 1901. Private address: Tetherdown, Courtlands Avenue, Hampton, Middlesex.

O'CONNELL, Henry.—Director, Climax Radio Electric Ltd., 59, Parkhill Road, London, N.W.3. With Belling Lee, Ltd., 1923; Regentone, Ltd., and Regent Radio Supply Co., 1926. Joined Climax, 1931. Born July 13th, 1891. Recreations: fishing, golf. Private address: Coverdale, Harcourt Road, Wallington, Surrey.

OLDHAM, John.—Managing Director, Oldham & Son, Ltd., Denton, Manchester. Born, 1895. Recreations: golf, riding. Private address: The Gerrards, Gee Cross, Hyde, Manchester.

OLIVER, Charles.—Chairman and Managing Director, Oliver Pell Control Ltd. (Varley), Cambridge Place, Burrage Road, Woolwich, London, S.E.18. A.I.E.E. Founded company in 1898.

OSBORNE, Gerald Robert.—Sales Manager, Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1. Wireless operator M.I.M.Co., Ltd., 1917. From 1922 with present company. Born November 4th, 1900. Recreation: golf. Private address: 42, Chalkhill Road, Wembley Park, Middlesex.

OSZANNE, Guy Durand, M.C.—Manager, Wingrove & Rogers, Ltd., 188-9, Strand, London, W.C.2. M.I.E.E. Joined Indian Army, 1909. Entered Sandhurst 1908; Member of Council, R.M.A. 1932-33; First Chairman, Radio Component Manufacturers Federation, 1932; served during the war in East Africa, mentioned in despatches; retired 1923 with major's rank; since November, 1930, Lt.-Col. Commanding 56th (First London) Divisional Signals, T.A.; joined Radio Communication, Co., Ltd., 1924; manager, Broadcasting Dept., 1925; joined Wingrove & Rogers, Ltd., 1927. Born April 2nd, 1889. Recreations: golf, riding. Private address: 18, Woodlands Road, London, S.W.13. Clubs: Junior United Service, Roehampton.

PAGE, Reginald Brougham.—Managing Director, Celestion, Ltd., Kingston-on-Thames. Born, May 27th, 1897. Private address: "Kenilworth," Woodlands Road, Surbiton, Surrey.

PARTRIDGE, Clifford Arthur Frank.—Managing Director, Partridge & Mee, Ltd., 74, New Oxford Street, London, W.C.1. Born February 21st, 1900. Private address: 50, Litchfield Way, Hampstead Garden Suburb, London, N.W.11.

PATERSON, John Russell.—Chartered Accountant. Partner, "Ulster and Scottish Radio Dealer," 29, Cadogan Street, Glasgow, C.2. Secretary, Scottish Radio Golf Society. Publisher of "The Scottish Nurse," "The Scottish Electrical Engineer." Organiser, "Glasgow Weekly Herald" Radio Exhibition, 1931-1932. Born April 20, 1894. Recreation: golf. Private address: 84, Stewarton Drive, Cambuslang.

PAYMAN, Herbert Saul, B.Sc. (London), B.Sc. Tech. (Manchester), A.Inst.P.—Dept. of Chief Engineer, Murphy Radio Ltd., Broadwater Road, Welwyn Garden City. Formerly Chief Engineer, Radio Division, Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C.4. Was with B.T.-H., Rugby, 1919-26; Marks & Clerks, 1926; War Office (Signals Experimental Establishment, Woolwich),

JOIN THE BETTER RADIO BRIGADE

- 1926-9. Joined Igranic, 1929. Born February 24th, 1898. Recreation: golf. Private address: 2, Edilom Road, Crumpsall, Manchester.
- PAYNE-GALLWEY, Reginald Frankland.**—53-54, Haymarket, London, S.W.1. B.R.V.M.A. With Mullards 1922-32, now acting as agent. Born April 15th 1889. Recreations: shooting, golf. Private address: 28, Millbank, London, S.W.
- PAYNE, Thomas.**—Managing Director, Payne & Hornby, Ltd., Gallowgate, Newcastle-on-Tyne. Chairman, Newcastle-on-Tyne Branch, W.R.A. 1910-1919. Proprietor and Manager Cinemas. 1920 onwards Proprietor Wireless Business. First B.B.C. Station Director, Newcastle-on-Tyne Broadcasting Station. Holder World's Non-Stop 24 Hours' Walking Record. Born January 8, 1882. Recreations: walking, gardening, music. Private address: The Laurels, North Gosforth, Newcastle-on-Tyne.
- PERKS, Frederick William.**—Sales Manager, The Gramophone Company, Ltd., 98-108, Clerkenwell Road, London, E.C.1. Born November 22nd, 1891. Recreation: golf. Private address: 20, Woodchurch Road, West Hampstead, London, N.W.6.
- PERRY, Percy Forrest.**—Manager and Proprietor, P. F. Perry & Co., Ltd., 11, Church Street, West Hartlepool. Chairman, W. Hartlepool Branch, W.R.A. Born December 23, 1877. Recreations: golf, motoring. Private address: 108, Grange Road, West Hartlepool.
- PETTYFER, Percy Hale.**—Commercial Manager, Igranic Electric Co., Ltd., Radio Division, 149, Queen Victoria Street, London, E.C.4. Has served with Radio Communication Co., Ltd., 1919-22; Sterling Telephone & Electric Co., Ltd., 1922; and from 1923 has been with present company. Vice-chairman, Radio Component Mfrs. Federation, 1933. Born August 29th, 1891. Recreation: golf. Private address: 73, Brighton Road, Purley, Surrey.
- PHILIPS, Dr. Anton Frederick.**—Managing Director, N. V. Philips' Radio, 29, Emmasingel, Eindhoven, Holland. Doctor L.C. Handelshoogeschool, Rotterdam. Born March 14th, 1874. Private address: Huize de Laak, Eindhoven, Holland.
- PHILLIPS, William Donald K.**—143, Sidwell Street, Exeter. Chairman, Exeter Branch, W.R.A.
- PINKHAM, Charles, M.A. (Cantab).**—Publicity Manager, The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
- POCOCK, Hugh Shellshear.**—Editor "The Wireless World," Dorset House, Stamford Street, London, S.E.1. Born 1894.
- PREEN, Arthur Harvey.**—Managing Director, Arthur Preen & Co., Ltd., Crown Works, Southmill Road, Regents Park, Shirley, Southampton. A.M.I.M.E.
- PRINCE, Herbert Stanley, A.M.I.R.E.**—Director, The National Radio Service Co., Ltd., 15-16, Alfred Place, London, W.C.1. During war attached to R.E. Signals, awarded Chevalier le Ordre de l'Couronne, Croix de Guerre and '14 Star. Entered radio 1922. Service manager Philips Lamps, Ltd., 1928-9, and Selectors (1931), Ltd., 1931. Founded N.R.S., Ltd., 1932. Born 1895. Recreations: tennis, motoring. Private address: 229, Green Lanes, London, N.4.
- QUARRINGTON, Cecil Albert George.**—Technical Service and lecturer, A. C. Cossor, Ltd., Cossor House, Highbury Grove, London, N.5.
- REES, John M. G.**—Director, Varley (proprietors Oliver Pell Control, Ltd.), 103, Kingsway, London, W.C.2. A.M.I.E.E. R.M.A. Council. Recreations: gardening, motoring. Private address: 79, Woodside, Wimbledon, S.W.
- REITH, Sir John Charles Walsham.**—Director General, B.B.C. Broadcasting House, London, W.1. LL.D., A.M.I.C.E., M.Sc. (Lafayette). Served five years' engineering apprenticeship in Glasgow; engineer, S. Pearson & Son, Ltd., London, 1913; during war, Major R.E. 1914-15, wounded; munition contracts for Great Britain in America, 1917; Admiralty 1918; Ministry of Munitions, 1919. General Manager, Wm. Beardmore & Co., Ltd., Coatbridge, 1920; General Manager, B.B. Co., Ltd., 1922; Managing Director, 1923. Clubs: Athenaeum, Royal Automobile. Born 1889.
- RICHMOND, Frank S.**—Contract Sales Manager, Hellesens, Ltd., S. Wimbledon, S.W.19. Radio trade since its inception. Born: February 28th, 1898. Recreations: swimming, motoring. Private address: 8, D'Arcy Road, North Cheam, Surrey.
- RIDDIOUGH, John William.**—Proprietor, Frank Riddiough & Son, 8-12, Simes Street, Bradford. Councillor Radio Wholesalers' Federation 1928 to date. Vice-chairman, North Midland Section R.W.F., Assoc.Inst.R.E., A.M.I.B.E. Born February 12th, 1889. Recreations: motoring, short wave transmission and reception. Private address: Greenway, Tranmere Park, Guiseley, Yorks.
- RIDGEWAY, John Whinfrey.**—Assistant Manager, Radio Division, Edison Swan Electric Co., Ltd., 155, Charing Cross

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

- Road, London, W.C.2. A.M.I.R.E. Engaged in electrical research work, 1918-24; joined Metro-Vick Supplies, Ltd., 1924; sales manager Radio Dept., 1928, since 1929 with present company. Born February 13th, 1903. Recreations: shooting, photography. Private address: Three-ways, Ockley, Surrey.
- RIDOUT, Herbert C.**—Advertising Manager, Columbia Graphophone Co., Ltd., 98-108, Clerkenwell Road, London, E.C.1. Recreation: motoring.
- ROBERTS, Edwin Schollick.**—Proprietor, Radio House, Botchergate, Carlisle. Chairman, Carlisle Branch, W.R.A. Born November 17, 1892. Recreations: golf, tennis. Private address: Beau Site, Scotby, nr. Carlisle.
- ROBERTS, Harry Charles.**—Northern Sales Superintendent, Mullard Wireless Service Co., Ltd. Marine Wireless Operator R.N.R. and Mercantile Marine for Marconi International Co., Ltd. Joined Marconiphone staff on inception of broadcasting and joined Mullard's in 1926. Born November 5th, 1899. Private address: Willow Bank, Greasby Road, Upton, Cheshire.
- ROBERTSON, Arthur Albert George.**—Manager and Buyer, Radio Dept., Dulcetto Polyphon, Ltd., 2-3, Newman Street, London, W.1. Born November 1st, 1900. Recreations: tennis, cycling, swimming. Private address: 1a, East Dulwich Road, London, S.E.22. (New Cross 3828.)
- ROBINSON, Frederick Henry,** A.M.I.R.E.—Editor, "The Broadcaster," 29, Bedford Street, Strand, London, W.C.2. Hon. Sec., Radio Industry Golfing Society. Formerly with Marconi's Wireless Telegraph Co., Ltd. Born May 6, 1900. Recreation: golf. Private address: 28, Vernon Road, Leigh-on-Sea, Essex.
- ROBINSON, Thomas Allen White.**—Joint Managing Director, Pye Radio, Ltd., Radio Works, Cambridge. Member of Council R.M.A. Born August 28th, 1886. Private address: Woodlands, Long Road, Cambridge.
- RODWAY, James.**—898, Garratt Lane, S.W.17. Chairman, South London Branch, W.R.A., 1933. Born September 25, 1897.
- ROSEN, Edward E.**—Chairman and Managing Director Ultra Electric, Ltd., Erskine Road, Chalk Farm, London, N.W.3. Member R.M.A. Council; entered Marconi's Wireless Telegraph Co., Ltd., before the war; served in Flying Corp. Radio Section, 1915-18; founded firm of Edward E. Rosen & Co. in 1919; converted to limited company 1927; has invented and patented many improvements in radio and gramophone amplifiers.
- ROTHERMEL, Royden Albert.**—Managing Director, The Rothermel Corporation, Ltd., and Sonochorde Reproducers Ltd., 1, Willesden Lane, London, N.W.6. With various American manufacturing companies as export sales manager and manager until 1913; organised exporting business to Europe 1913; opened office in London 1914; engaged in sale of motor car accessories and components until the beginning of the radio industry in Great Britain and has been part of it since, trading as R.A. Rothermel, Ltd., and latterly as The Rothermel Corporation, Ltd. Born May 13th, 1879. Recreations: golf, tennis. Private address: 23, Orchard Court, Portman Square, London, W.1. (Welbeck 7025.)
- ROWE, Bertrand Ernest.**—Northern Area Manager, Marconiphone Co., Ltd., 210, Tottenham Court Road, W.1. On B.R.V.M.A. Committee, 1929-32. Born March 29, 1892. Recreation: golf. Private address: 35, Broad Lawn, New Eltham, S.E.9.
- ROYDS, George Dawson, B.Sc., A.I.P.A.**—Managing Director, E. Walter George, Ltd., Advertising Consultants. Director Arts Publicity, Ltd., 1923; Sales Development Manager, Phillips Rubber Soles, Ltd., 1929. Present company, 1931. Born June 2nd, 1899. Recreations: farming, mink ranching. Private address: Olde Butterbox, Scaynes Hill, Sussex.
- SALAMAN, Walter John.**—Sales Manager, Carrington Manufacturing Co., Ltd., 24, Hutton Garden, London, E.C.1. Staff Capt. R.A.F. during war. Connected with radio since 1911. Chairman British Radio Cabinet Manufacturers Association. Born February 18th, 1890. Recreation: motoring. Private address: 26, Queens Court, Hyde Park, London, W.2.
- SCOP, Leo, A.M.I.E.E.**—Managing Director, Eirco (Wholesale), Ltd., 22, Waring Street, Belfast. Vice-chairman, Ulster Radio Traders' Association. Started Eirco (Wholesale), Ltd., who are also electrical factors, in 1921. Born: November 18th, 1893. Recreations: golf, bridge. Private address: 17, Downview Avenue, Belfast.
- SHEPHERD, Alfred Haddon.**—Director and Assistant Comptroller, Kolster-Brandes Ltd., Cray Works, Sidcup, Kent. Director and Secretary, Brandes, Ltd., 1924-28. General Manager, Kolster-Brandes, Ltd., 1932-33. Born: September 28th, 1892. Private address: 3, Crescent Road, Sidcup, Kent.

WITH MULLARD AT YOUR FINGERTIPS YOU'RE CERTAIN OF YOUR SALES

SHEPPARD, Arthur Henry.—Assistant Managing Director, The Ever-Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7. Director of the Ever Ready Trust Co., Ltd.

SHINTON, Albert Edward.—1 & 3, Bull Street, West Bromwich. Chairman, W. Bromwich Branch, W.R.A.

SHORE, George Charles.—Sales Manager, Reproducurs and Amplifiers Ltd., Frederick Street, Wolverhampton. A.M.I. R.E. Member of Council of N.A.R.M. and N.A.R.M.A.T., 1923-27; sales manager, Burndept, Ltd., 1921; proprietor, G. C. Shore & Co., Newman Street, London, W.1, 1928; general sales manager, Symphony Gramophone Co., Ltd., and National Electric Co., Ltd., 1929-30. Was Sales Manager of Flinders (Wholesale), Ltd., up to 1932. Born August 26th, 1899. Private address: Broad Lane, Bradmore, Wolverhampton.

SMITH, Edward Charles Scott.—Managing Director, Portadyne Radio, Ltd., 41, The Broadway, Ealing, London, W.5, and partner in Whittingham, Smith & Co. Interested in radio since 1925. Recreation: motoring. Private address: Flor-ellen, Clitherow Avenue, London, W.7.

SMITH, M.—Radio Sales Manager, Oldham & Son, Ltd., Hyde Road, Denton, Manchester. Foreman in accumulator assembly, Oldham & Son, Ltd., 1921. Designs Dept., 1924; Sales Section, 1926; charge of Radio Sales Section, 1928. Born June 16th, 1890. Private address: 28, Houghton Green Road, Denton, Manchester.

SMITH, Robert George.—Managing Director, Smith's Cabinets, Ltd., 1a, Connor Street, South Hackney, London, E.9. Member British Radio Cabinet Makers' Association. Born April 22nd, 1896. Private address: 28, Merton Road, Leyton, London, E.10.

SMITH, Sydney, F.R.S.A.—Managing Director, W. D. Houghton & Co., Ltd., Sankey Mills, Warrington. Manager, Wire Sales Dept, British Ropes, Ltd., 52, High Holborn, London, W.C.2; Director, Cleckheaton Engineering & Motor Co., Ltd.; E. & A. Smith & Co., Ltd. and the Steel Wire Co., Ltd.; Capt. 4th Battn. The Duke of Wellington's Regt. (T.A.); member of Spenborough Urban District Council; Chairman, Spen Valley Voluntary Migration Committee; Vice-President Spen Valley Junior Imperial League. Born 1900. Recreations: golf, boxing, Rugby football. Private address: Hill Top House, Gomersal, nr. Leeds.

SPINK, John Ronald.—Managing Director, Reliance Manufacturing Co. (Southwark),

Ltd., Westbury Works, Westbury Road, Walthamstow, London, E.17. Founded company in 1911. Also Director of T. A. Harris, Ltd. Born March, 1888. Recreations: tennis, gardening, fishing. Private address: Ravenswood, Gordon Avenue, Highams Park, Essex.

STANLEY, Charles Orr.—Director, Pye Radio, Ltd., Africa House, Kingsway, London, W.C.2. Recreations: yachting, hockey, golf, fishing. Private address: Mayfair Court, Stratton Street, London, W.1.

STANLEY, Edward James Walker, M.A., B.Sc.—Director, Climax Radio Electric, Ltd., Haverstock Works, Parkhill Road, Hampstead, London, N.W.3. Prior to joining Climax, was five years Managing Director, E. Walter George, Ltd., Radio Advertising Specialists. Born April 6th, 1896. Recreations: tennis, golf, yachting, swimming. Private address: Devonshire Club, St. James Street, London, S.W.1.

STEPHENSON, Edgar Bentley.—Partner, G. V. Stephenson & Sons, 31, Blackburn Road, Accrington, Lancs. Chairman, Accrington Branch, W.R.A. Born July 13, 1879. Recreations: cycling, natural history. Private address: "Mapleton," 31, Moss Hall Road, Accrington.

STEWART, Alastair Campbell.—Drydex Sales and Production Manager, Exide Batteries, Exide House, 205-31, Shaftesbury Avenue, London, W.C.2. With Exide since 1920. Two years' Service Manager; 1923-4, Sales Engineer, South-West area; 1924-31, Manager, Bristol and West of England Depot; 1931 to date, as above. Born: June 7th, 1892. Recreations: shooting, golf, fishing. Private address: "Craigard," Ridge Park, Purley, Surrey.

STRACHAN, David Grant.—Secretary Radio Manufacturers Association, Astor House, Aldwych, W.C.2. Secretary, National Association of Radio Manufacturers, 1923-1924, and of National Association Radio Manufacturers and Traders, 1924 to 1926. Born, July 26th, 1866. Recreation: gardening.

STREETON, William Laundon.—Artistes and Recording Manager, Gramophone Co., Ltd., 98, Clerkenwell Road, London, E.C.1. Recreations: music, reading, swimming, walking. Private address: 103, Fordwych Road, West Hampstead, London, N.W.

SUDLOW, Edmund William, F.C.I.S., F.C.W.A., F.S.A.A.—Managing Director, Block Batteries, Ltd., By-Pass Road, Barking, Essex. Chartered Secretary and Accountant. 1918, private secretary to Sir Thomas Lipton; 1919, Secretary, Fullers United Electrical Works, Ltd.;

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

1926, Director and Secretary, Fuller Accumulator Co. (1926), Ltd.; 1931, Managing Director, Fuller Accumulator Co. (1926), Ltd. Private address: 39, Holcombe Road, Ilford, Essex.

SUMMERS, Alfred George.—Managing Director, Summers & Sons, Ltd., Wellingborough. Chairman, Wellingborough W.R.A. Director Granville Hotel, and Wellingborough Building Society; governor of Wellingborough School; member of Technical Institute. Commenced career as engineer in 1887; started own business 1896. Born November 1st, 1873. Recreations: bowls and music. Private address: 79, Croyland Road, Wellingborough.

SWINEY, Douglas Herbert William.—Area Sales Manager, Wingrove & Rogers, Ltd., 188, Strand, London, W.C.2. During war R.F.C. and R.A.F. Wireless Section; Radio Communication Co., Ltd., 1922-27. Born April 23rd, 1898. Recreations: golf, yachting. Private address: 88, Thames Drive, Leigh-on-Sea. (Phone: Leigh-on-Sea 7358.)

TEBB, Charles William.—Southern Area Manager, The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1. During War, Lieutenant R.F.A. Born November 18th, 1892. Recreation: golf. Private address: 790, Sideup Road, New Eltham.

THOMAS, John Henry.—General Manager, A. C. Cossor, Ltd., Cossor House, Highbury Grove, London, N.5. M.C., M.I.E.E.

TURLE, Edgar Harold.—Chief Electrical Engineer, H. J. Cash & Co., Caxton House, Westminster, London, S.W.1, M.I.E.E., M.I.R.E., A.M.I.Mech.E.; Vice-Chairman I.W.T. 1926; Vice-President, 1932 onwards; pupil to G. F. Ratcliff 1903; Chief Assistant Engineer 1909; Resident Electrical Engineer new works (E.H.T.) Billingham, 1918; Chief Electrical Engineer since 1919; Lecturer in Electrical Engineering, Tottenham Polytechnic, 1924-31; Special Lecturer in Mechanical Power Equipment, Croydon Polytechnic, since 1930, now Head of Dept. in Electrical Engineering, Croydon Polytechnic; author of many articles on radio and allied subjects. Born December, 1887. Recreation: camping. Private address: Deerpark, Beckenham.

TYERS, Paul Douglas.—Consulting Radio Engineer, 28, Victoria Street, London, S.W.1. Commercial radio telegraphy and telephony with Radio Communication Co., Ltd., up to 1922; founded and edited

"The Wireless Engineer and Experimental Wireless," 1923; commenced present consulting practice 1925; owns laboratory equipped for design and measurement work extensively used by the industry. Recreations: golf, ice skating, music, scientific literature. Private address: 17, Woodland Drive, Watford, Herts.

UPTON, Walter.—Partner, E. Upton & Sons, 175-9, Linthorpe Road, Middlesbrough and Stockton, Darlington, Redcar, South Bank, and North Ormesby. Chairman Middlesbrough Branch W.R.A., secretary Tees-side Area Council; 1929-32, secretary Tees-side Wireless Retailers' Association (independent); 1928-29 secretary, Tees-side Gramophone Dealers' Association. Joined Uptons in 1921, became partner with Edward Upton in 1929; business established in 1869, and started to sell radio with commencement of broadcasting. Born May 18th, 1904. Recreations: golf, badminton, bridge and motoring. Private address: "Southlands," Walton Avenue, Linthorpe, Middlesbrough.

Van EENDENBURG, Daam Carel Frederik.—Managing Director, Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2. Born July 27th, 1885. Recreations: tennis, swimming. Private address: Hindourid, Gloucester Road, Kingston-on-Thames.

VERRELLS, Henry Victor.—Export Manager, E. K. Cole, Ltd., Ekco Works, Southend-on-Sea. Recreations: golf, motoring.

VERRELLS, William Streatfield.—Chairman and Managing Director, E. K. Cole, Ltd., Ekco Works, Southend-on-Sea.

VIGERS, Thomas Whitehair, Colonel, O.B.E., M.C., T.D.—German Diplomas in Chemistry and Physics. General Manager, British Blue Spot Co., Ltd., Rosoman Street, London, E.C.1. Deputy Chief Signal Officer (T.A.) of London District. Member Royal Engineers Board (War Office). Born: March 28th, 1887. Recreations: golf, sailing. Private address: 3, Clareville Grove, South Kensington, S.W.7. Club: Junior Army and Navy.

VOIGT, Paul Gustavus Adolphus Helmut, B.Sc., A.M.I.E.E.—Director, Voigt Patents, Ltd., The Courts, Silverdale, London, S.E.26. With Edison Bell, Ltd. from 1922 until May 1933, when he bought their stock of his patented parts (speakers and microphones). Born December 9th, 1901. Recreations: motor-ing, tennis. Private address: 53, Church Road, London, S.E.19.

MULLARD MEANS BUSINESS

WARD, Gordon Ebdon.—Managing Director, City Accumulator Co., Ltd., and C.A.C. Cabinets, Ltd., 18, Norman's Buildings, E.C.1. Founded City Accumulator Co., 1921. Active service Royal Engineers. Private address: 8, Park Road, Regent's Park, N.W.1.

WALKER, George Leonard.—Peto and Radford, 50, Grosvenor Gardens, London, S.W.1; trained at Edmundson's Electricity Corp., Ltd.; has served Siemens, Armstrong Whitworth; Chloride Electrical Storage, and Pritchett & Gold, whose portable accumulators are marketed by Peto & Radford under the name "Dagenite." Born December 4th, 1890. Recreation: tennis. Private address: Lawnswood, Grimwade Avenue, Addiscombe, Surrey.

WARRILOW, William Edward, A.M.I.E.E., M.J.I.—Odhams Press Ltd., Long Acre, W.C.2. Special Electrical Commissioner "John Bull," "Passing Show," "Ideal Home," "Picturegoer." Vice-President Electrical Commercial Travellers' Association. 1894-99, Municipal Electricity Supply at Cheltenham, Torquay, Huddersfield and Manchester; 1900-2, Electrical manufacturing with Westinghouse and Ferranti; 1903-6, Editor "The Electrical Magazine"; 1907-21, advertising manager "The Electrician"; 1922-24, Advertising Agent for "Broadcaster," and "Modern Wireless" and "Wireless Weekly" for J. Scott-Taggart; 1925-29 Special Electrical Commissioner for Odhams Press, Ltd., 1929-31 Assistant Manager, Edison Storage Battery Co.; 1931, returned to original post at Odhams Press, Ltd. Born January 15th, 1877. Recreations: golf. Private address: Amber Way, Nancy Down, Oxhey, Herts.

WATKINS, A. E.—Managing Director, Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, Middlesex.

WEESE, George Rodolph, B.Sc., M.I.R.E.—Member Veteran Wireless Operators' Association, Managing Director, Erie Resistor, Ltd., Waterloo Road, Cricklewood, London, N.W.2. Chairman, Standardisation Committee, Canadian R.M.A., about 1927-31. At present Vice-President, Erie Resistor Co., of Canada, Ltd., and Director, Erie Resistor Corporation, Erie, Penna; 1924-31, Chief Engineer, Victor Talking Machine Co., Montreal; 1922-24, Manager, Radio Sales and Special Engineering, Northern Electric Co., Canada. Prior to that, Sales Manager, John Milne & Sons, Canada's first radio factors. Born: June 27th, 1899. Recreations: golf. Private address: "Toronto House," Russell Road, Moor Park, Northwood, Middlesex.

WHEELDON, Douglas Parker.—Manager, Six-Sixty Radio Co., Ltd., 17-18, Rathbone Place, London, W.1.

WHEELER, Ralph Edmund.—Secretary and Manager, Hart Collins, Ltd., 38a, Bessborough Street, London, S.W.1. On Executive Council R.M.A. 1930; Assistant Works Manager and Organiser, British School of Motoring 1913; Machine Gun Corps 1916; since 1920 present company. Born March 18th, 1886. Recreations: billiards, motoring. Private address: Nothe Towers, Manor Road, Mitcham.

WHITAKER, Alfred, M.A., F.Inst.P.—Director of Design, Electrical and Musical Industries, Ltd., The Gramophone Co., Ltd., The Marconiophone Co., Ltd., and The Columbia Graphophone Co., Ltd., Hayes, Middlesex.

WHITE, Herbert Benjamin.—Partner, A. J. White, 21, Quarry Hill, Tonbridge, Kent. Chairman Tonbridge Branch W.R.A. Left school to go into piano manufacturing; 1923, went into retailing pianos and gramophones, with radio from 1927. Born July 10th, 1895. Private address: 5, Lawn Road, Tonbridge.

WHITE, Hugh Dunning, A.M.I.R.E., A.M.Inst.B.E.—107, Harwoods Road, Watford. Chairman, West Herts Branch, W.R.A. Born December 19, 1884.

WHITE, Walter Masden.—Partner, White Bros., 207-9, Northgate, Darlington. Chairman, Darlington Branch, W.R.A. Served with R.N.A.S. and R.A.F. during war. Born June 16, 1886. Recreations: gardening, motoring. Private address: "Glendale," Cedar Road, Darlington.

WHITELEY, Alfred Harold.—Managing Director, Whiteley Electrical Radio Co., Ltd., Radio Works, Mansfield, Notts. Born June 15th, 1893. Private address: 19, Alexandra Avenue, Mansfield, Notts.

WHITTINGHAM, Robert Buxton.—Chairman and Managing Director, Portadyne Radio, Ltd., Gorst Road, North Acton, London, N.W.10. Founder of Whittingham, Smith & Co.; pioneer of portable radio receivers, and claims to be producer of first radio portable incorporating a loudspeaker. Born 1900. Recreation: flying. Private address: Oakdene, Manor Road, Ilmchley Wood Esher, Surrey.

WILLBY, Stanley George.—In charge of editorial publicity, Murphy Radio, Ltd., Broadwater Road, Welwyn Garden City. Formerly Editor "Wireless & Gramophone Trader" and associated publications. Lifelong association with journalism. Born November 22nd, 1900. Private address: 7, High Oaks Road, Welwyn Garden City (Welwyn Garden 470).

MULLARD THE MASTER VALVE

WHO'S WHO IN RADIO

WILLIAMS, John Harold.—Managing Director Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1. Management Committee, B.R.V.M.A. Council, R.M.A. Has served with Marconiphone Co., Ltd., since 1922, as Sales Representative, Assistant Branch Manager, Assistant Sales Manager, Sales Manager. Born May 4th, 1896. Recreations: golf, motoring. Private address: 20, Blenheim Gardens, Wembley Park, Middlesex.

WILLIS, Robert.—Chairman and Joint Managing Director of Dulcetto Polyphon, Ltd., 2 & 3, Newman Street, London, W.1.

WILLIS, Robert Gordon.—Joint Managing Director, Dulcetto-Polyphon, Ltd., 2-3, Newman Street, Oxford Street, London, W.1; also Managing Director of Radio and Allied Sales, Ltd., and Park Electric Radio Productions, Ltd.

WILLMOTT, Charles William.—Proprietor, Philco East Anglian Distributors, Britannia Road, Norwich; Willmotts, 43-51, Prince of Wales Road, Norwich, and Market Place, Diss. Chairman, Eastern Counties W.R.A., and National Councillor. Apprenticed to boot trade 1893; cycle engineering 1896; secretary and sales manager 1898; manager, advertising and billposting company 1899; manager cycle depot 1903 in Bedfordshire; manager cycle depot in Lanes, 1906; bought present business 1910. Born May 24th, 1880. Recreations: tennis, badminton, motoring. Chairman, Norwich Sports Club, Ltd. Private address: 2, Britannia Road, Norwich.

WINGROVE, Major Charles William, M.C.—Managing Director, Wingrove & Rogers, Ltd., Mill Lane, Old Swan, Liverpool. Founded in 1919, with Mr. W. Rogers and Mr. G. S. Wingrove, present firm. In 1926, incorporated British Electric Vehicles, Ltd. In 1927 acquired the broadcasting business of Radio Communication Co. Born January 28th, 1889.

Private address: Broomhills, West Derby, Liverpool.

WINKLES, Wallace Frederick.—Managing Director and Chief Engineer, Lamplugh Radio Ltd., "Silver Ghost" Works, Coventry. Created the radio department of S. A. Lamplugh, Ltd., and commenced manufacturing radio products in 1923; previously interested in electrical engineering connected with kinema projection and studio work; an early aurelian radio enthusiast, gained knowledge and experience during active war and Army service, 1914-21. Born December 26th, 1894. Recreations: motoring. Private address: 151, Robin Hood Lane, Hall Green, Birmingham.

WRAGGE, Alfred.—Proprietor, Regent Investment and Sales, Ltd. Until 1933 manager, Radio Department, Selfridge & Co., Ltd., 1909-18, worked in Japan and China for Asiatic Petroleum Co. Born April 30th, 1882. Recreations: golf, fishing, bridge. Private address: 3, Campden Hill Mansions, London, W. 8. (Park, 1987).

WRIGGLESWORTH, S. J., A.I.Min.E.—General Manager, Oldham & Son, Ltd., Denton, Manchester, A.I.M.E. Joined Oldham & Son, Ltd., after the war. Successively in charge of Mining Sales, General Sales, Commercial Manager, then General Manager. Recognised as an authority upon the Lighting of Mines. Recreations: tennis, golf. Private address: Oak Drive, Denton.

WYBORN, Edward John.—Chief Engineer, E. K. Cole, Ltd., Ekco Works, South-end-on-Sea, Essex. B.Sc. (Engineering); A.C.G.I. Junior Engineer, Marconiphone Co., Ltd., 1921; Senior Designs Engineer; Marconiphone Co., Ltd., 1928; joined E. K. Cole, Ltd., as Chief Engineer 1929. Born July 9th, 1902. Private address: "Glencarse," Chalkwell Avenue, West-cliff-on-Sea, Essex.

YOULE, Frederick.—Sales Engineer, Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1. B.Sc. (Eng.) A.C.G.I., A.M.I.E.E.

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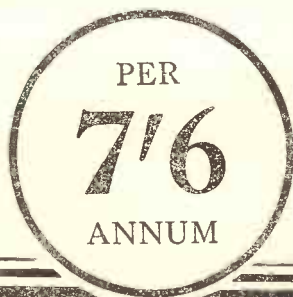
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RADIO SERVICING

Fundamental Testing Methods

As the technique of broadcast reception advances and becomes more involved, the dealer must increase his general technical knowledge. It is now almost an axiom that the dealer who can give good technical service is the dealer who is regarded as the "live" man in his district. Many dealers are, perhaps, a little apathetic in the matter of remaining abreast with technical developments. They feel that things are now so complicated that they are definitely beyond their capabilities. But this is certainly not the case.

Even the most complicated all-mains multi-valve superheterodyne receiver is simple in its mode of operation. If a dealer has a proper understanding of a few fundamental principles, he will experience no more difficulty in checking over every part of such a receiver than he does with a one-valve set.

These few fundamental ideas are briefly described in the following pages, and it is also shown how they can be applied to logical, systematic testing. This alone, however, would not be quite sufficient, and some space is given to brief descriptions of the chief components used in broadcast reception. Their good and bad points, the troubles they may cause and the identification and elimination of these troubles are dealt with. The idea is further extended in dealing with complete receivers.

Fundamental Testing Methods.

A receiver is composed entirely of a number of separate circuits. Any particular receiver can only operate correctly when the correct number of circuits exist, and *only* the correct number exist. When a receiver fails, apart from valve trouble, which will be dealt with later, it is either because one of the circuits has become incomplete, or because a new circuit has developed.

Fault testing is, therefore, almost entirely a matter of testing for continuity. It consists of looking for continuity where it is required and of finding if continuity exists where it is not required. This is the basic and fundamental idea underlying every servicing

or testing operation which a dealer will ever be called upon to perform.

All tuning coils, high-frequency chokes, low-frequency chokes, and resistances, must be electrically continuous in the circuits in which they are included. If they are not, then a fault exists. In the case of a condenser, there must be no continuity in so far as direct currents are concerned. If there is continuity then the condenser is faulty.

In the case of a resistance, choke or transformer which consists of a winding of a large number of turns, there must still be continuity but there must be what is called a high-resistance path. The value of this resistance, which can be measured extremely simply, and can be regarded as the extent or degree of continuity, is an indication of the correct condition or otherwise of a particular component.

For radio testing, then, some simple means must be devised for discovering (1) continuity or complete circuit, (2) discontinuity or open circuit, (3) extent of continuity or resistance. There are certain minor modifications which will be dealt with later, in addition, of course, to the matter of valve testing.

Testing Instruments.

Continuity or the existence of a complete circuit can be determined by either aural or visual means. Aural means include telephone receivers and buzzers. Visual means include flash lamps and meters. Both need, of course, a source of power.

Fig. 1 shows three alternative test devices with a pair of leads. When these leads are joined, the indicator operates. It may be necessary to test for continuity from a filament battery terminal to a valve holder socket. All that has to be done is to connect one lead of the test arrangement to the terminal and the other to the valve socket. If the circuit is perfect, the indicator will work. If a short circuit across a condenser is suspected only the two leads from the condenser have to be removed and the leads from the test set connected in their place. If a complete short circuit has developed, the

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RADIO SERVICING

indicator will work. If it does not, the condenser is not completely short circuited.

So far only complete circuits containing no resistances and totally incomplete circuits have been considered. Sometimes, however, a complete circuit will contain a resistance which cannot be found by the indicators seen in Fig. 1. For this reason it is preferable to use the simple arrangement shown in Fig. 2, which consists of a voltmeter and a battery.

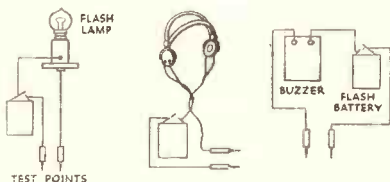


FIG. 1.—How a flash lamp, headphones and a buzzer can be used for circuit testing. Only a click is obtained in the headphones, but the lamp and buzzer give continuous indication.

If these are used, when a complete circuit exists across the leads a full voltage reading is obtained.

It frequently happens that a resistance is developed in a set, due perhaps to a "dry joint" caused by bad soldering. The indicators in Fig. 1 probably would not show the presence of a bad contact. The voltmeter arrangement will.

For example, if a six-volt battery and a low reading voltmeter is being used, a complete circuit will always give a reading of six volts. If, however, a joint has developed a high resistance a reading of less than six volts will be obtained. Obviously this method makes possible the location of somewhat obscure sources of trouble, which practically any other test method would not reveal.

Invaluable Ohm's Law.

The arrangement of Fig. 2 gives a clue to a method of measuring resistances.

If a set requires a 50,000 ohms anode resistance, and a fault develops so that the resistance becomes 10,000 ohms or, perhaps, 200,000 ohms, the set obviously will not operate properly. Accordingly, it is desirable to be able to determine approximately the value of any resistance which is used in a set.

There is a fundamental rule, known as Ohm's law, which makes this very easy to do. It holds good under all conditions. Whatever the voltage or electrical pressure that exists, the current which flows is dependent upon the resistance. The law is only a matter of arithmetic. The resistance is always given by the voltage divided by the current.

Obviously if a battery is connected in series with an unknown resistance and a

meter for measuring the current, the resistance can be found by dividing the battery voltage by the current.

This simple law is, of course, all the more valuable because all the factors are interdependent. If two are known, the third can always be calculated. If the resistance and the current flowing are known, so is the voltage. If the resistance and the voltage are obtainable what current must flow can be found.

$$I = \frac{E}{R} \quad R = \frac{E}{I} \quad E = RI$$

where I is current, R resistance and E voltage

Meters.

All circuit testing, then, can be carried out with a voltmeter and a battery. Resistance measurements require only a battery and an arrangement for measuring voltages or currents. Where valves are concerned, all that has to be measured is the amount of anode current at various anode and grid voltages. On occasions it may be necessary to check the actual filament consumption. This means that complete testing can be carried out with a very small number of meters. The suggested minimum are tabulated below.

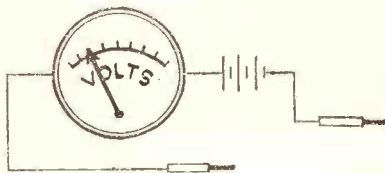


FIG. 2.—A voltmeter and battery form a circuit tester which enables resistance to be measured.

Meters for Universal Testing.

D.C. Meters.			A.C. Meters.	
Meter.	Suggested Range.		Meter.	Suggested Range.
Volts	0-8	}	Volts	0-5
Volts	0-250		Volts	0-300
Amps.	0-3		Amps.	0-8
Milliamps	0-10		Milliamps	0-100
Milliamps	0-50		NOTE. — Meters bracketed together may be combined.	
Microamps	0-10			

FIG. 3.

Dealers are advised to use first grade instruments. Meters are frequently classified by the resistance per volt reading on the scale. The lowest reading which is satis-

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factory for general work is 200 ohms per volt. For testing accurately the output of high-tension eliminators, a 1,000 ohms per volt instrument is best, because a 200 ohms per volt instrument imposes a load of 5 m.a. at full scale on a 150 volt supply.

Combined testing instruments are very attractive, and they save money. They are however, more limited in their application than a number of separate meters. There are many occasions when it is required to read simultaneous currents and voltages, and this, of course, cannot be done by a universal

The less sensitive a receiver and the more simple its nature, the greater should be the care taken with the aerial and earth system. Even the simplest form of insulator proves reasonably effective. The most elaborate form of insulated cable with a long trailing lead-in will give far worse results than a simple direct, indifferently insulated aerial. Dielectric losses due to a trailing lead-in are a serious factor, and they tend to unbalance a set.

A good earth is essential, particularly in the elimination of hum in a mains receiver

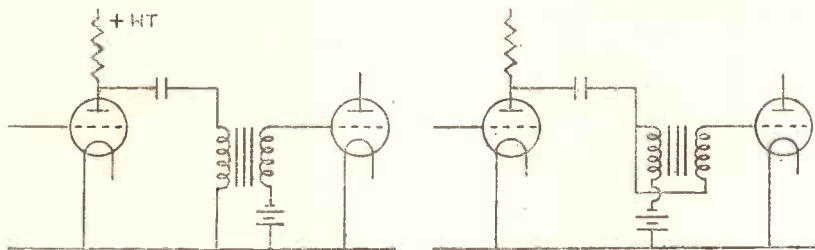


FIG. 4.—Anode feed system for a transformer giving (A) a direct connection and (B) an auto-connection, which increases the step up ratio.

meter without disconnecting or using special switching arrangements.

With the aid of the meters shown in Fig. 3, the dealer will be able to test anything from a single-valve battery set to an all-mains radio-gramophone.

It is now necessary to consider in detail the various components used in receivers and to see how the fundamental testing methods can be applied in each case. Accumulators, valves and gramophones are dealt with under separate comprehensive headings, after we have considered components and sets in general.

TESTING COMPONENTS.

Aerial and Earth Circuits.

The increased efficiency of the valve and the use of multi-valve receivers has resulted in considerable neglect of the aerial and earth circuit. While a piece of wire inadequately insulated and roughly attached to the nearest gable enables reception from Continental stations to be obtained without difficulty, it is by no means efficient or desirable.

The most important point to be considered is the use of as short a lead-in as possible. This should be kept well away from the house. When it is brought into the room it should not be taken round picture rails or tacked closely to the wall, unless absolutely unavoidable. It should be taken to the set by the shortest possible route. A set is best installed near the window. Similarly, the earth leads should be kept as short as possible.

If an earth tube is used, it should be buried as deeply as possible. An earth tube deeply buried in moist earth some feet from the wall of a house and necessitating a longer earth lead, is better than one pushed into hard dry ground by the side of a window.

Connection to a lead water pipe still forms one of the most effective earth connections. Gas companies object to the use of their pipes for earth connections and the practice should not be encouraged, even though it may prove effective. Pipes with screwed joints are obviously not as good as an electrically continuous pipe such as a lead water main.

Adequate precautions must be taken to prevent corrosion or bad contacts with lead-in tubes and earthing switches. Those in which the actual joints are protected from the weather are preferable in every respect. Where a lead-in is connected to a terminal which is exposed to the atmosphere, it is preferable to coat it heavily with vaseline or even a heavy coat of paint.

Anode Feed System.

The performance of a small transformer is always improved by removing the steady anode current from the primary winding. In the case of a special nickel alloy transformer which has a high incremental permeability, it is essential.

The transformer should be connected as shown in Fig. 4. This indicates alternative arrangements which vary the ratio by making

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an ordinary transformer an auto transformer, in which the primary and secondary windings are electrically continuous.

The value of the anode resistance depends upon the impedance of the valve with which the transformer is used. Approximately from 20,000 to 50,000 ohms is a useful range. The higher the impedance of the valve, the higher must be the value of the resistance. The feed condenser should be from 0.5 mfd. to 1 mfd. in capacity.

If a resistance-fed stage suddenly gives trouble resulting in loss of amplification and thinness of quality, it may appear at first sight to be due to shorted turns. On the other hand, it is more likely to be caused by

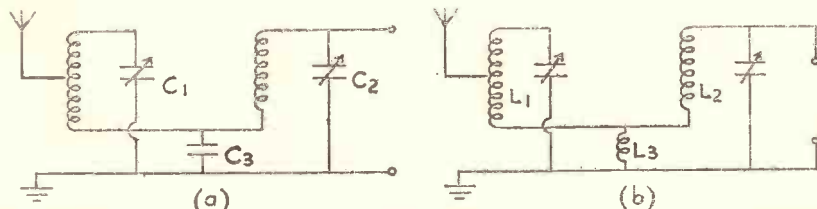


FIG. 5.—Two typical band-pass circuits. In (a) capacity coupling is used, in (b) inductive coupling.

failure of the feed condenser. Should this develop a bad leakage path a direct current load is imposed upon the primary of the transformer, the performance of which will then be completely spoilt. This fact should be determined by isolating the condenser and testing it separately.

Band Pass Units.

Band pass tuners consist of two identical inductances tuned by two identical condensers. In addition to the two main coils, if no aerial tapping is provided there is a small coil which acts as an aerial coupler. In some cases there is a coil which is used as a common portion of the two inductances for coupling purposes. In other cases, the two coils are coupled through a common condenser.

The actual windings of the coils should be tested in the normal manner, and the same remark applies, of course, to the tuning condensers. Most band pass units have a ganged control, and it is essential that the ganging is perfect, as otherwise there will be loss of signal strength, and the quality will also suffer owing to excessive side band cutting.

A band pass unit designed to work in conjunction with a screen should always be used with the screen and the use of a band pass unit of an unscreened type with a closely fitting screen will unbalance it.

Fig. 5 shows the most usual forms of band pass tuner. It will be seen that the second coil is connected to the input of the receiver, while there is no connection between the set and the first coil. The aerial coupling coil is generally fixed. No attempt should be made to modify any portion of the tuner in any way, as the correct matching of the two halves is an absolute necessity.

High-Frequency Chokes.

Desirable qualities in a high-frequency choke are a large inductance, a low self-capacity, and a small, concentrated field. A binocular arrangement helps to limit the field. Slots and fine wire limit the self-capacity and a large number of turns gives a high inductance. The resistance of a high-frequency choke varies very considerably

with various makes. This does not matter, since the other factors are the most important.

There is no easy method of testing a high frequency choke, since it is really necessary to measure its impedance when connected in the anode circuit of a valve which is amplifying at all frequencies over the broadcast range. As a rough test, however, a choke can be connected in series with the aerial lead of a fairly sensitive receiver. If it is found that fairly loud signals are obtained when the choke is connected, it is usually an indication that it is not too effective.

An essential mechanical feature of a good high-frequency choke is a positive mounting of the former at the base so that it cannot rotate and so break the fine connecting wires taken to the terminals.

Low-Frequency Chokes.

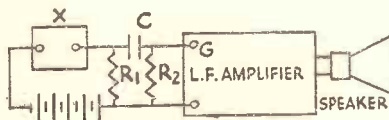
Many of the statements made with respect to low-frequency transformers apply equally to chokes. When an ordinary alloy is used for the core, a large cross section and a large number of turns are required for a high inductance. In the case of special alloys, the overall dimensions can be reduced for the same inductance.

Faults likely to develop in chokes are intermittent contacts due to a breakage, short circuited turns and leakage to frame

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A circuit tester will indicate the presence of an earth to frame, and the continuity of winding. A silence tester (Fig. 6) can be used to check up the condition of the winding and the joints. If short circuited turns are present, thinness of reproduction and loss of volume indicate this condition.

Most chokes intended to carry large steady anode currents have an air gap in the core.



$C = 0.5 \mu F$ $R_2 = 0.5 \Omega$
 $R_1 = \text{WIRE WOUND RESISTANCE}$

FIG. 6.—Circuit for a silence tester. A current from the battery is passed through a high resistance R_1 and the component under test X . Connection to the grid of the first amplifier is through a condenser C , and a leak R_2 .

This air gap is only a matter of a few thousandths of an inch, and if any repairs are carried out to the choke, great care should be taken not to disturb the gap as may be done if the clamping frame is removed. Most air gaps, however, are filled with a thin sheet of insulating material against which the core stampings are firmly pressed.

There is no easy method of measuring the inductance of an iron core choke, particularly in the case of one carrying a D.C. current. A rough idea can be obtained by connecting the choke in series with a small battery and a milliammeter of the moving-coil type, watching the rate at which the needle rises to its maximum value. If the needle comes to this point very slowly, it indicates that

detected by using a silence tester of the type shown in Fig. 6. If any "scrapiness" arises when the terminal is moved or lightly tapped, the condenser should be discarded. A complete breakdown of this type of condenser is very rare.

Larger condensers of the tin foil and wax-paper variety are far more likely to develop faults. A complete short circuit will be shown by one of the continuity testers. Partial leakage is not so easy to determine without a sensitive instrument. The following test, however, will show whether a condenser is in a good condition.

The condenser should be connected to a 200 volt high-tension battery or to D.C. mains, and allowed to stand for half a minute after being disconnected, care being taken not to touch the terminals. It should then be short circuited through a resistance of about 100 ohms when there should be a distinct spark. If there is no spark, it is a fairly certain indication that the condenser is leaking.

A leaking condenser can be regarded as a high resistance and tested accordingly, provided a sufficiently sensitive measuring instrument is available. The best arrangement is a small battery and a microammeter or galvanometer as in Fig. 7A. When connecting the microammeter and battery in circuit with the condenser, the circuit should include a safety resistance of such a value that if the condenser were completely short circuited only full scale deflection would be obtained. This will safeguard the meter. In addition, it is essential to short circuit the meter for a few seconds when the circuit is first connected, as a comparatively heavy charging current flows into the condenser.

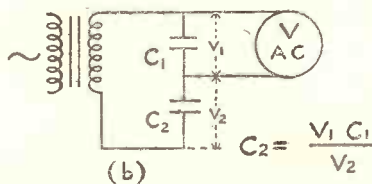
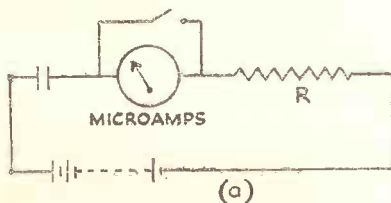


FIG. 7A.—When measuring the insulation of a condenser, a safety resistance R must be included in the circuit, the microammeter being shorted by a switch, while the condenser charges. How the capacity of a condenser can be checked is shown in (B).

the inductance is large. The quicker it reaches this value, the lower is the inductance of the choke.

Fixed Condensers.

Small fixed condensers rarely give trouble if they are of the mica type. Cheap varieties which are not too well made sometimes develop a fault at the connection of the plates to the terminal. This fault can be

The capacity of a large fixed condenser can be checked roughly by the arrangement shown in Fig. 7B. It is connected in series with a condenser of known value. A high resistance A.C. voltmeter such as a rectifier instrument is connected across both condensers. The capacity of the unknown condenser is given by the formula shown in the diagram. It is, of course, a matter of proportion.

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Variable Condensers.

Modern variable condensers are made so accurately that there is rarely occasion to question the capacity. Points to look for in a condenser are: sound bearings with an even "feel" throughout the entire movement, and absence of hard or slack spots; a good connection to the rotor, preferably by a pigtail; and firm anchoring of the stator assembly on a reasonable amount of insulating material which does not lie in the field of the condenser.

Accurate alignment of the plates is necessary. When a condenser is full-in the spacing should appear even. In particular, the spacing should appear the same when viewed from either side.

Scrapiness is the chief trouble caused by variable condensers. It is usually due to a bad friction connection to the rotor. Tightening and lubrication of bearings usually effects a cure.

If a fault persists the condenser should be returned to the makers. The slightest suspicion of scraping in a condenser used in a powerful receiver is the cause of intermittent background noise which is sometimes extremely difficult to trace.

Grid Leaks.

There is, fundamentally, no difference between a grid leak and an ordinary high resistance. The method of testing is identical except that it is preferable to measure the value at a low voltage with a microammeter. The calculation is exactly the same, and if the voltage is measured in volts, and the current in microamps, the value of the resistance is given in megohms. It is important that a grid leak be absolutely silent, particularly when it is used in a detector circuit.

Moving Coil Speakers.

Speakers can be tested in two different ways, for faults and for frequency response. The only satisfactory way of testing the frequency response of a speaker is to connect it to a good amplifier energised either from a beat oscillator or from a constant note record. This test will show two qualities of the speaker, a complete cut off or a resonance. If the input is kept constant, resonances will be apparent by a great increase in volume of certain frequencies. Cut off, of course, will be shown by the absence of any appreciable radiation.

A good moving-coil speaker should give excellent radiation at both ends of the scale, while the characteristic should be reasonably flat. The response should be fairly level in the region of 5,000 cycles and above.

Record scratch does not necessarily indicate that a moving coil speaker gives good top response, because very frequently scratch frequencies come out well, but frequencies in the neighbourhood of 4,000 to 6,000 cycles may show a distinct drop.

An excellent way of testing the bass response of a speaker is to utilise a 50 cycles mains supply. A true 50 cycle note should be used. It is easily obtained by connecting a long length of flex to the input of an amplifier and bringing it near to the mains leads. A grid leak should be connected between the grid and the bias battery.

This arrangement will pick up a large amount of 50 cycle energy which should be reproduced by the set in addition, of course, to the harmonics. A true 50 cycle note has a very deep boom, the presence of which can be almost felt. Even a 50 cycle note of low intensity produces a mild sensation of deafness. Turned up to greater volume it becomes exceedingly unpleasant. A good speaker should be capable of producing this effect. If it does not do so, it can be taken that the radiation at 50 cycles is poor.

While this test is conducted, the diaphragm should be touched with the hand. This should practically completely remove all the 50 cycle radiation, leaving only the harmonics audible. This actually occurs in a moving coil speaker if the moving coil is restricted owing to touching the gap. An excellent laboratory method of centring the coil is to supply a 50 cycle input.

A coil should not get out of adjustment in the normal way. But if it has done so, there is a possibility of the turns almost shorting owing to the insulation being scraped off due to friction in the gap. If this occurs, the output will fall and the quality will be ruined.

Faults on input transformers are rare. They should be tested like output transformers.

Moving Iron Speakers.

Moving iron speakers should be tested in the same way as moving coil speakers, with the exception that the 50 cycle test is not applicable, since practically no moving iron speaker other than an inductor has any appreciable radiation at 50 cycles.

Faults in moving iron speakers can be divided into two classes, electrical and mechanical. In the mechanical class come faults due to diaphragm fixings and mountings.

Dealing first with the electrical faults, defective windings, short circuited turns, or leakage to frame are all that are likely to happen. Short circuited turns cause loss of volume and thinness of quality. Defective windings give rise to scraping noises. They should be tested in the manner already described.

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*0-1.2 "
0-600 m.a.
*0-120 "
0-60 "
*0-12 "
0-6 "

VOLTAGE

*0-1200 volts
0-600 "
*0-120 "
0-60 "
*0-12 "
0-6 "
*0-1.2 "
0-600 millivolts
*0-120 "
0-60 "

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*0-10,000 "
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It is not advisable to attempt to remedy any defect associated with the adjusting mechanism unless the unit is of the simplest reed type. If the tongue or armature is definitely in contact with a pole piece, no attempt should be made to rectify this by bending it. It should be returned to the makers.

Loose cone clamps or the edge of a diaphragm in intermittent contact with the cabinet or supporting chassis will give rise to jingles. Close inspection usually reveals the exact source of the trouble. On occasions, the seat of the trouble is obscure. A small flake of mountant which has worked loose will produce quite an appreciable buzzing noise, and possibilities of this type should not be overlooked.

In the early types of speakers the adjustments usually caused the armatures to hit the pole pieces with a decided click. This is not the case in many modern speakers, and the absence of a loud click should not be regarded as a possible fault.

The resistance of the winding of a speaker varies greatly with various makes. Alone it is no guide to the suitability of a speaker for any particular valve. What matters is the effective impedance, this is a function of the winding and not the resistance alone. Many speakers have alternative tapings. Actual signal tests usually reveal the best connection.

Where separate models are available with different impedances, a low impedance speaker should be used with a low impedance or super power output valve. When a pentode is used, a high impedance is necessary. The use of a low impedance speaker with a high impedance valve usually results in thinness of quality, whereas a high impedance speaker connected to a low impedance valve usually causes a roundness of tone with a loss in the upper registers.

In fitting moving iron units with cones, it can be taken that as a general rule the best results are obtained with a large cone which is fairly deep. It is important that the cone is reasonably light. Every precaution must be taken to prevent the hard edge of a cone being in contact with any object such as the side of a case. A layer of resilient material such as rubber, felt, cotton wool, or a leather suspension ring should be employed.

Metal Rectifiers.

Metal rectifiers are practically free from trouble. On no account should they be dismantled, since the success of a rectifier depends largely upon its mechanical assembly.

The easiest way to test a rectifier is to connect it to an alternating current supply and provide an artificial load on the D.C. side in

the form of a resistance with a milliammeter included in the circuit. The makers rating should be referred to, and if, for example, with a 200-volt input 20 m.a. should be obtained at 160 volts, the calculated resistance which passes 20 m.a. at 160 volts should be connected to the output in series with a milliammeter. The value of this resistance is worked out, of course, from Ohm's Law, the value being given by the rated output voltage divided by the rated output current. In the example quoted, for 160 volts at 20 m.a., 8,000 ohms would be required.

The steadiness of the milliammeter needle should be carefully watched. Slight tremor may be experienced owing to the unsmoothed nature of the current, but there should be no violent needle kicks either up or down. If there are it indicates some trouble in the rectifier which should be returned to the manufacturers for their examination.

Pick-ups.

A good pick-up is usually characterised by a small light armature which is fairly freely mounted. This means that little force is required to move the armature. It results in minimum record wear and good bass reproduction, since large amplitudes are then permissible.

Two types of fault can develop in a pick-up, electrical trouble due to the winding, and displacement of the armature. If the armature gets out of centre, it will almost certainly hit one of the pole pieces. This is recognisable by loss of volume and thinness of tone. The higher frequencies will reproduce but there will be no bass response.

If, when the needle is felt with a finger, the movement seems restricted in one direction and free in the other, and if it is accompanied by a "ploppy" sound in the speaker, it is a good indication that the armature is fouling the pole pieces. Mere inspection of the pole system with the cover of the pick-up removed does not always show a displaced armature. The test described is essential.

A winding can break down completely, or it can develop short circuited turns. Short circuited turns give the same symptoms as an armature touching the poles, but the needle test described is not applicable.

Sometimes the clamping screw thread wears slack and the needle is not clamped properly. This gives rise to chatter. There is no real cure for this. Undue wear can be prevented by using less force in screwing up the needle clamp.

Continuity of winding and the possibility of one side of the winding being joined to earth or frame can be tested by one of the continuity testers.

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RADIO SERVICING

Resistances.

Resistances can be divided into two classes, wire wound and composition.

The essential features of a good wire-wound resistance are sound mechanical construction with good electrical joints at the ends. Spaghetti or link resistances should preferably be connected to their tags by electrical welding, while adequate protection in the form of reinforced high-grade sleeving is essential to prevent trouble due to absorption of moisture, and mechanical breakage through bending of the tag.

The only troubles likely to arise in resistances are bad joints and intermittent internal short circuits, giving rise to noisy operation. A noisy resistance should be tested by a silence tester.

The actual value can be quite accurately determined by measuring the current which flows through the resistance at a known voltage. The resistance, it will be remembered, is given by the voltage divided by the current.

It is essential not to overload resistances. If a resistance becomes very hot in use, it should be replaced by one of a larger current-carrying capacity.

Low-Frequency Transformers.

Low-frequency or inter-valve transformers can be divided into two classes: Those employing the normal soft iron alloy cores, and those employing special cores of some type of nickel alloy.

For an even response over the entire useful frequency scale, a transformer must be of fairly large size if it employs an ordinary type of iron core. This is due to the fact that a definite impedance is required in the anode circuit of an amplifying valve. This impedance is provided by the primary winding of the transformer, and it cannot be sufficiently great unless a large amount of iron is employed. It follows, therefore, that a very small transformer with an ordinary iron core cannot give first-class results.

A small nickel alloy core, however, is satisfactory owing to the fact that a much higher impedance is obtained with a small core. However, when a very small core is used, it is necessary to remove the steady anode current from the primary winding. This is done by means of an anode feed system as described elsewhere.

Three faults can develop in a transformer: complete breakage of a winding, partial short-circuit of turns or complete or partial connection of windings to each other or the frame. A circuit tester will show whether the windings are complete, and whether they are

in contact with themselves or the frame. The resistance measuring arrangement will give a rough indication of whether the windings are reasonably correct, but it will not show the presence of a short circuit of a few turns.

An intermittent short circuit or high resistance joint gives rise to intense scraping and crackling noises. If the fault is bad, it can be detected by connecting the windings in series with a small battery and a pair of headphones.

A noisy transformer can be tested very accurately by means of the arrangement shown in Fig. 6. It will be seen that a small current is passed through the winding in series with a resistance which is connected across the input of an amplifier. Any intermittency will produce voltages across the resistance which are tremendously magnified by the amplifier. It is essential, of course, to use very tight connections between the battery, winding and resistance, and to use only a wire-wound resistance known to be perfect.

Short-circuited turns cause a loss in amplification and, generally, raising of the tone, the reproduction sounding very thin and high pitched. A resistance measurement will not show short-circuited turns, as the change in actual resistance is almost infinitesimal.

If there is any doubt as to the existence of shorted turns when other tests have shown everything correct, substitution of a similar transformer must be tried.

Output Transformers.

Output transformers are very similar to low-frequency transformers. Taken as a whole, however, they must be of even larger dimensions, since they have to carry heavy anode currents. Some transformers have air gaps to keep the inductance reasonably constant and to prevent the core from saturating. They should be tested in a similar manner to low-frequency transformers.

The ratio of an output transformer is not always 1 to 1. Very frequently a step down is provided so that the secondary is better suited to the impedance of the speaker with which the set is used. In the case of an output transformer used to energise a moving coil, a step down ratio of the order of anything from 10 to 1 to 30 to 1 should be employed, according to the constants of the coil.

When a large step down ratio is used, it is essential that the leads between the secondary and the actual moving coil are kept as short as possible, while the resistance must be low as otherwise there is a loss of power.

Great care should be taken in testing the secondary winding of an output transformer, since the resistance is very low. If this precaution is not taken, there is a possibility

THREE MILLION AERIALS

LEAD DOWN TO

MULLARD MASTER VALVES

of a meter being burnt out. A moving coil output transformer with a large ratio has a secondary winding with a fractional resistance, very heavy gauge wire being used. Accordingly, if it is found necessary to test this, and such an occurrence would be very rare, the test must be made with an ammeter and a 2-volt accumulator.

Tuning Coils.

The technique of the design of the high-frequency portion of a receiver has advanced so tremendously in recent years that it is a little difficult to make any definite statements.

The design of a tuning coil for the anode circuit in a high-frequency amplifier is determined largely by the type of valve with which it is to be used and the general circuit arrangement as a whole. It is a fallacy to assume that a large coil wound with heavy gauge wire, or spaced turns, or even Litz wire, will be more efficient than a smaller coil which has no apparent good points.

A few general statements can be made with regard to aerial coils. The lower the aerial tapping, the greater will be the selectivity, and the smaller the voltage applied to the grid of the first valve. A coil of this type is obviously necessary for use in a simple receiver near to a Regional transmitter. At a greater distance from the transmitter a higher aerial tapping is necessary, because more voltage will be required owing to loss of signal strength with distance, while, on the other hand, the less will be the interference.

For general single circuit tuners, one incorporating a variable coupled aerial coil is an excellent component, since it is so readily adapted to meet any particular requirements.

Faults in tuning coils are likely to be due to mechanical troubles rather than electrical. Unsound construction may result in the turns slipping. No attempt should be made to remedy this defect by coating the coils with shellac or celluloid, as this will increase the high-frequency resistance considerably, giving defective tuning and loss of strength. Damp has the same effect, and if a single circuit tuner, for example, suddenly goes below standard the possibility of damp should not be excluded.

A coil which is not designed to work with a screen should never be closely screened. It can be safely used in a screened compartment, however, if the screen is large and the coil is kept at a distance from it. A coil designed to work in a screening case is usually of small dimensions, and it has fairly compact field.

If a tuning coil fails, a fault can be readily checked up by means of the circuit testers.

These should give continuous circuits with all windings, and discontinuous circuits between the various windings except in so far as they are intended to be connected. This can be determined from the maker's diagram.

If a coil gives a clear test on the circuit tester and still functions indifferently, its efficiency can be tested quite easily by the mere substitution of an equivalent coil known to be in order.

Volume Controls.

Volume controls can be divided into two types, wire wound and composition. Wire wound volume controls rarely have a value much greater than 50,000 to 80,000 ohms. A control of this type should not be used across a high impedance pick-up winding or across the secondary of a low frequency transformer.

A control in this position should have a value of the order of 500,000 ohms. This usually necessitates a composition type. A composition type in which the movable contact works directly on the element is not generally satisfactory. Efficient types usually include either a very springy dished metal washer which is pressed into contact with the element, or an arm which works over adjacent turns of wire wound over the resistance element. The wire is cut at each turn, the turns forming in effect a large number of contact studs.

The resistance of the control can be measured by the resistance measuring arrangement. If the degree of control is slow or too rapid, it is due to a change in the grading of the resistance, which sometimes occurs in the case of a composition type. This can be checked, of course, by measuring the resistance between one end of the control at equal intervals of rotation.

Silence is important, and it can be checked up by the silence tester.

TESTING RECEIVERS.

Broadcast receivers can be divided into four main classes. The first consists of a detector valve followed by one or more stages of low-frequency amplification. The second type embodies a single stage of screen grid high-frequency amplification followed by a detector, and again one or more stages of low-frequency amplification.

The third class is merely an elaboration of the second and involves more than one stage of screen grid amplification. The final class consists of a superheterodyne arrangement in which amplification is carried out at an intermediate frequency.

All other sets are really elaborations of one or other of these four basic types. There is no fundamental difference in a set operated

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from batteries or from the mains, and the principles involved are identical.

To service any receiver, it is essential that the dealer has a thorough understanding of the principle of operation, since the location and rectification of a fault is then only a matter of logical, progressive testing.

In Fig. 8 is shown a simple two-valve receiver. The first valve acts as a grid detector, and the second as an amplifier and output valve. L1C1 is the tuned input circuit and the aerial coil consists of a few turns coupled to it. The magnetic reaction coil L2 is variably coupled to L1. Rectification is obtained by means of a grid condenser C2 and a grid leak R1. Wave change is effected by short circuiting the long wave section of the coil by a switch S. The anode circuit of V1 contains the primary winding of a transformer T.

A very important part of the circuit is a condenser C3 which acts as a high-frequency by-pass, keeping any high-frequency component out of the primary winding of the transformer. The filaments of the valves are run in parallel from the battery B1 and a separate battery B2 provides the grid bias for the power valve. High-tension is supplied from a battery, and two condensers C4 and C5 are connected across the two high-tension tappings.

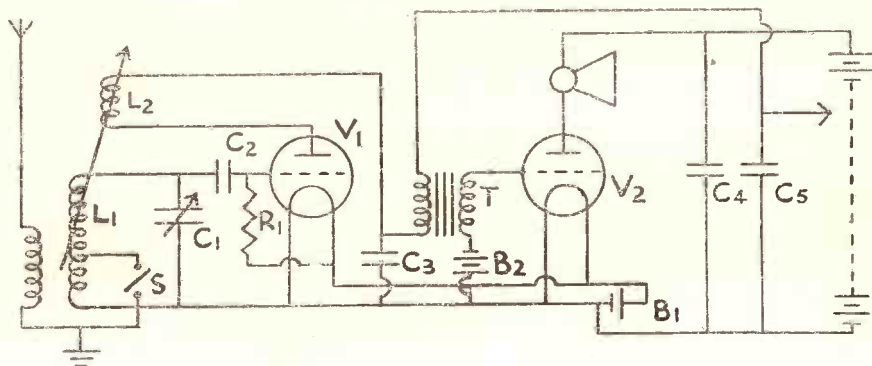


FIG. 8.—A fundamental circuit of a 2-valve receiver.

Fig. 9 shows an alternative arrangement of the input circuit using capacity reaction. A high frequency choke L3 is included in the anode circuit and reaction is controlled by a variable condenser C6 connected to a winding L4 permanently coupled to the main tuning coil L1.

Systematic Testing.

It is difficult to lay down hard and fast rules regarding the best method of testing a receiver. A fault may develop either in the

wiring or in the actual components. Readers are now familiar with the method of testing any component in a receiver, but before doing this, the set should be tested as a whole.

Having ascertained that the aerial and earth wires are connected to the set, and are not shorted, the best thing is to make sure of the presence of the high-tension and filament voltages on the actual valve holders.

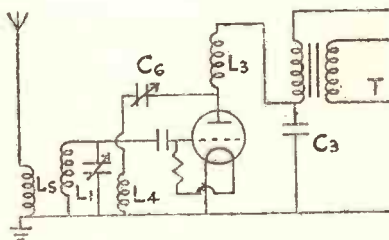


FIG. 9.—Alternative capacity reaction control to that used in Fig. 8. L1, L4 and L5 are frequently combined to form a "six-pin" coil.

If readings are obtained, it is best to commence further investigations from the speaker working towards the aerial terminal. As a preliminary test, however, slight tapping of the detector valve usually produces a distinct ringing noise in the speaker if the set is functioning. In the case of a 2-valve set, this will only happen if everything is correct

from the anode circuit of the detector valve onwards. If it is, attention can be directed to the circuit between the aerial terminal and the grid of the detector valve.

Intermittent disconnection of the speaker should give deep "ploppy" sounds if the anode circuit is correct. In any case, it should be checked up by noting the total anode current supply. If it is excessive, it may be due to a break in the secondary of the transformer, which deprives the last valve of its negative bias. If the current is very

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low it may be due to a partial fault in the speaker circuit introducing high resistance, or to the emission of the valve failing. Tests of this are described in another section.

If the last valve circuit appears correct, the anode circuit of the detector valve should be examined. If the current here appears correct and still no ringing noise is obtained in the speaker on tapping the first valve, the trouble is probably connected with the transformer T (Fig. 8) or the by-pass condenser C8. Temporary isolation of these points will indicate whether this is the trouble.

If the set has been proved correct from the

The power supply is shown obtained from an eliminator, the whole receiver working from a common positive high-tension tapping. The voltages for the various anode circuits are obtained by means of decoupling resistances consisting of a high resistance and a shunt condenser of about 1 mfd. to earth.

The speaker is not connected directly in the anode circuit of the pentode, but is operated through a feed circuit consisting of a choke and condenser. A tapped output choke is shown since this suits the impedance of a speaker better than direct connection across the choke.

This arrangement is very similar to that shown in Fig. 8, and it should be tested on similar lines.

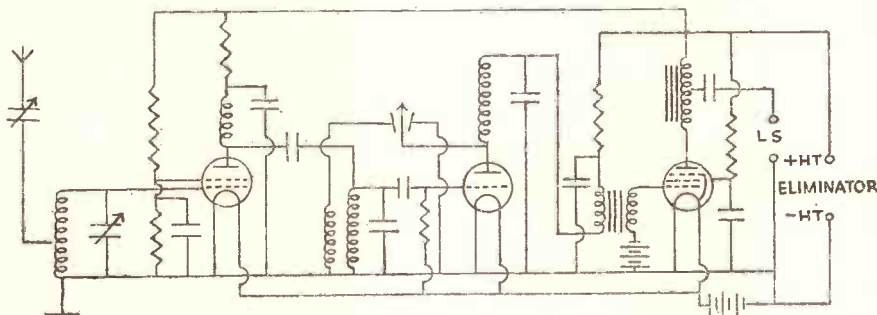


FIG. 10.—A popular 3-valve combination. A high-frequency volume control takes the form of a variable condenser in the aerial lead.

anode circuit of the detector valve onwards, everything between the aerial terminal and the grid of this valve should be examined.

A short on the tuning condenser C1 or on the coil or the grid leak will cut signals off completely. A very easy test is made by disconnecting the grid of the first valve, temporarily attaching the aerial to the grid of the valve. If the transmission is reasonably powerful, something is sure to be heard, and it is then a simple matter to find where the trouble originates, connecting in progressive order the grid leak, condenser, tuning condenser, and finally the tuning coil itself.

High-Frequency Detector and Pentode.

In Fig. 10 is shown a very popular 3-valve combination consisting of a screen grid amplifier, a grid detector, and a pentode output valve. The aerial input circuit is of a quite straightforward type, while high-frequency amplification is obtained by a tuned grid circuit. The second tuned circuit is energised by a high-frequency choke and condenser in the anode circuit of the screen grid amplifier. Reaction is obtained by a differential reaction condenser, the anode being connected to the movable element.

The condenser which feeds the speaker should be of a fairly high voltage test type, since it will be subjected to high peak voltages during operation. In some circuits the other side of the speaker is connected to the positive high-tension instead of the earth or negative filament. This is only advisable with a self-contained type of set. Should the condenser fail, little harm will result.

Failure of this condenser in a normal circuit connects the speaker across the high-tension through the choke. Attention is also drawn to the connection to the screen grid of the H.F. valve. It will be seen that a potentiometer connection is employed, a resistance being connected between the screen and earth. This type of connection should only be used with an eliminator as it imposes an additional load which is still present when the set is not in use, unless the switching disconnects the high-tension battery as well as the filament circuit.

Multi-High-Frequency Sets.

An elaboration of this circuit is shown in Fig. 11 in which an additional screen grid stage is employed. A modification in this particular arrangement is the use of a resistance coupling which replaces the trans-

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former. In addition, the speaker is shown connected through an output transformer instead of a choke feed circuit. It should be understood that resistance coupling and transformer coupling are interchangeable, as also are output transformers and choke feed circuits.

The mode of operation is identical with the receiver in Fig. 8, and the set should be tested in the same logical way, working backwards. When the low-frequency side has been tested back to the anode of the detector valve, the "tap on" method is extremely useful. This consists of connecting the aerial first to the grid of the detector valve, then to the grid of the second high-frequency amplifier, and finally to the grid of the first high-frequency amplifier.

Sudden apparent loss of volume and quality in a set of this type sometimes has an obscure cause. Receivers employing several high-frequency stages usually have the condensers ganged. Should the ganging slip, this will cause both loss of volume and quality, as the set then uses a series of non-resonant input circuits which give a very peculiar wave form.

Superheterodyne Receivers.

The ordinary method of reception of broadcast signals consists, first, of amplifying the received energy from an aerial coil at the frequency at which it is received. This process is known as high-frequency or radio

extremely inefficient. Further amplification is necessary, and this is carried out by means of low-frequency amplifiers. The successive stages of these are coupled either by transformers, resistance coupling units, or choke coupling units. In some cases, a mixed amplifier is used, one stage being resistance-coupled, and the others, perhaps, transformer types.

Supersonic or superheterodyne reception, however, is fundamentally different, in that amplification is carried out at an "intermediate" frequency different from the frequency of the received signal. Signals on the normal broadcast band are transmitted at frequencies in the region perhaps of, say, 1,000 kilocycles. This is a comparatively high frequency. Signals obtained at this frequency in supersonic reception are converted to another or intermediate frequency by the heterodyne beat principle.

This consists of combining the received oscillations with oscillations produced locally by an oscillating valve. When the two sources of oscillations are combined and the resultant output is rectified or detected, oscillations are obtained at a frequency equivalent to the numerical difference of the two frequencies. In actual practice the received oscillations are usually combined with a source of local oscillations which give a frequency difference of 100 to 180 kilocycles. This corresponds to a wavelength in the region of 2,700 metres.

The high-frequency valves in a superheterodyne receiver are, therefore, arranged

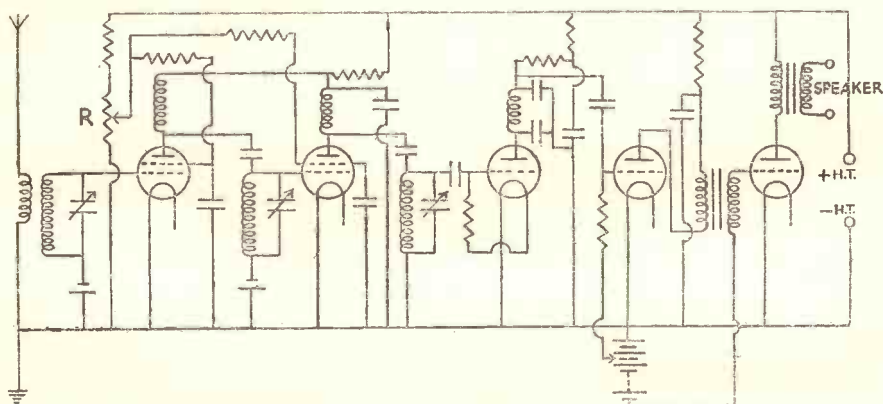


FIG. 11.—Two high-frequency stages without reaction. Volume is controlled by the potentiometer R which varies the screen voltage. All circuits are decoupled. Note the filter in the detector anode circuit to eliminate all traces of high-frequency from the low-frequency side.

frequency amplification. Energy thus amplified is then detected or rectified, a low-frequency component being obtained.

This is not sufficiently powerful to operate a speaker directly, because speakers are

to amplify not at the incoming frequency, but at a pre-determined intermediate frequency, such for example, as 2,500 metres. For this purpose incoming signals are detected by an ordinary detector valve which is

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also used to detect a source of local oscillations which is tuned to a slightly different wavelength from that at which reception is desired.

Instead of the anode circuit of this detector valve containing a low-frequency transformer, it contains an intermediate frequency transformer tuned to a wavelength in the region of 2,500 metres. The output of this detector

controls, that of the input circuit and that of the oscillator.

These two condensers are sometimes ganged, but this is a matter which should not be attempted by the dealer as it necessitates extremely complicated "laws" for the two condensers. These are frequently obtained by the use of series condensers connected to one of the variable condensers. For this

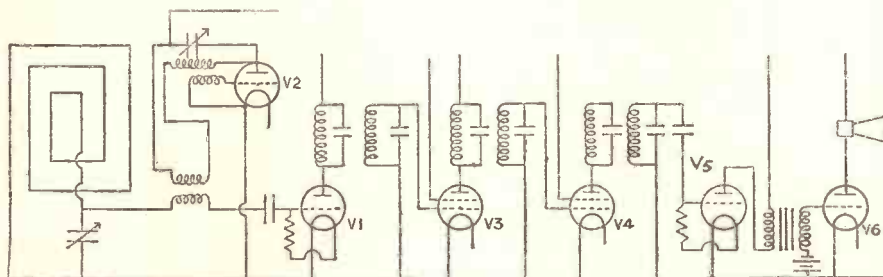


FIG. 12.—Fundamental circuit of a superheterodyne receiver; V1, first detector; V2, oscillator; V3 and V4, intermediate amplifiers; V5, second detector; V6, output valve.

valve is then amplified by one or more screen grid stages which are generally coupled by high-frequency transformers tuned to the wavelength of 2,500 metres.

Amplification having been carried out at this frequency, the output from the last valve is fairly considerable, and this is then detected so as to obtain audio frequency components. For this purpose a second detector

reason, a proprietary ganged superheterodyne receiver should never be dismantled, as ganging may be upset, in which case it will be totally unbalanced.

Fig. 12 shows a typical superheterodyne receiver working in conjunction with a frame aerial. This is a very popular arrangement in which two stages of screen grid amplification are used for the intermediate amplifier.

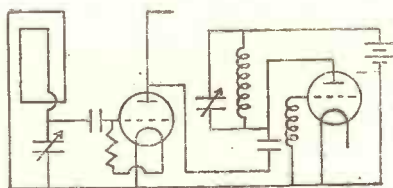
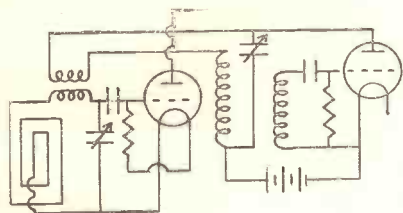


FIG. 13.—Above and on the right are shown examples of magnetic and capacity coupling of superheterodyne oscillators.

valve is used which is usually of the power grid type, that is, a fairly large valve working with a small grid condenser, and relatively low grid leak. The output of this valve is coupled to one or more low-frequency stages by means of a transformer or a resistance and capacity coupling.

It will be seen that one great advantage of this system lies in the fact that there is no need to have a large number of variable tuned circuits, since the amplifier always operates at the same frequency or wavelength. A very powerful and selective receiver is obtained which requires only two

Coupling is by means of tuned circuits consisting of coils and condensers in parallel forming circuits tuned in the region of 2,500 metres. This forms what is in effect a band pass amplifier, that is, one which amplifies over a very narrow range of frequencies, the response curve being somewhat flat topped. The actual nature of the response depends upon the sharpness of tuning and the degree of coupling.

Proprietary superheterodyne intermediate transformers, as they are generally called, consist of small coils and condensers in parallel, generally mounted in metal screens.

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The set is tested through in exactly the same way as an ordinary receiver, but the mere connection of test meters and leads or anode adaptors may introduce sufficient stray coupling to make the set oscillate.

Low-frequency oscillation at an inaudible frequency causes loss of amplification and

filament heating, high-tension voltage and grid voltage.

When the supply is direct current, high-tension is readily obtained simply by the use of a smoothing circuit. When the supply is alternating it has to be rectified and subsequently smoothed.

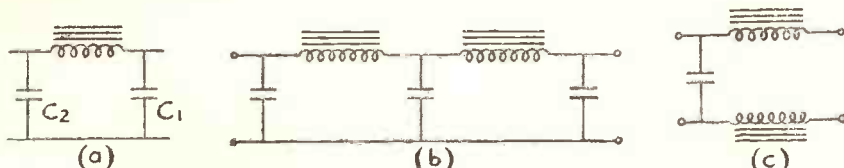


FIG. 15.—Three examples of fundamental smoothing circuits comprising iron cored chokes and large condensers.

general thinness of quality and is not easy to detect. It should never exist in a properly designed receiver. It is caused by interaction in the low-frequency stages.

Many portable sets are actually designed on compromises and certain practices are frequently adopted which are theoretically unsound, in order to stabilise a set.

One of the commonest forms of trouble is due to interaction both in high-frequency and low-frequency stages upon the high-tension battery's becoming exhausted which increases the internal resistance. For this reason, it is important that the detector valve is adequately decoupled.

It is also essential to keep the high-frequency energy out of the amplifier, and a by-pass condenser in the anode circuit of the detector valve is most necessary. The circuit actually shows an additional high-frequency choke to keep the high-frequency component out of the primary winding. A grid stopping resistance is also shown in both stages as well as a by-pass condenser in shunt with the speaker leads.

Microphonic valves are a source of very great trouble. Adequate acoustic insulation is necessary. If this does not effect a cure, the valves must be substituted by less microphonic ones.

A word must be said with regard to straight 5-valve portables in which two ordinary three electrode valves are used as high-frequency amplifiers, the anode circuits merely containing high impedances or high frequency chokes. Sets of this type are even more difficult to stabilise than a highly efficient 4-valve screen portable and, of course, they have a very much smaller amplification.

The method of test is perfectly straightforward, and no particular difficulties are likely to arise.

Mains Supplies.

Mains can be used for supplying all the power required by any set. This includes

It is common practice to construct mains units as separate components so that they can be used with existing sets in which the valves are still run from accumulators. It should be understood, however, that a mains set contains exactly the same number of components arranged in the same way as those in a separate mains unit. The only difference is that the components in a mains set are sometimes distributed throughout the set instead of being arranged in one place.

A mains unit consists of a smoothing circuit and a voltage distribution arrangement. In the case of an A.C. mains unit it includes, in addition, a rectifier.

A smoothing circuit consists of an inductance in the form of an iron core choke and two condensers. Fig. 15 shows three typical smoothing circuits. The first (a) is the most usual. It is sometimes referred as a simple *pi*. The first condenser C1 takes the feed from the supply, and the second one C2 feeds the output.

A double *pi* filter is shown in Fig. 15 (b), and it is essentially two *pi* filters with a common condenser. Provided that this filter is properly designed it gives far better smoothing than the arrangement of Fig. 15 (a).

An arrangement which is not used to a very great extent is shown in Fig. 15 (c) in which a choke is included in each leg. Sometimes these two chokes are wound on the same core, and the actual mode of operation is somewhat involved.

Faults can occur in the smoothing circuits of mains units. The chokes and condensers should be tested in the manner described for the components in question.

It is a good plan never to connect a mains unit to the supply without a load on the output since this reduces peak voltage on the condensers and tends to prolong the life.

Fig. 16 shows two basic systems of voltage distribution. It will be seen that the output of the filter is shunted by a resistance R1, the

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full positive tapping being shunted by a condenser C3. An intermediate tapping is taken across the resistance R1 which acts as a potentiometer, this in turn being shunted by a condenser C4.

Fig. 16 (b) indicates an alternative form in which the voltage is dropped for the intermediate tapping by means of series resistances R1 and R2, each shunted to earth by condensers C4 and C5. The values of the resistances R1 and R2 are sometimes made variable, taking the form of carbon compression resistances or wire-wound types. The actual values obtainable are very frequently such that they suit the normal con-

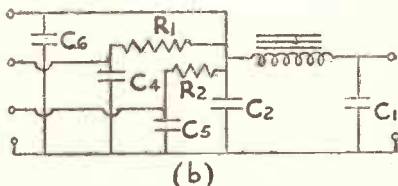
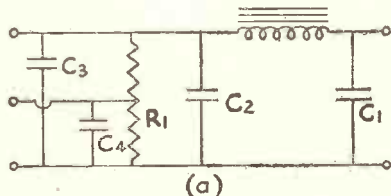


FIG. 16.—Shows two voltage distribution systems. (a) Potentiometer or constant load method. (b) Series resistance method.

nections of typical receivers, and the arrangement shown in Fig. 16 (b) is the basic principle of what is known as decoupling. When the values are fixed, however, it frequently happens that they do not suit a receiver, in which case additional decoupling resistances are necessary.

Scraping noises in an eliminator are sometimes caused by faults developing in the resistances, and these should be carefully checked.

It should be particularly noted when using a D.C. mains eliminator consisting as it does of a filter and voltage divider, that the earth connection is not made directly to the receiver, but it must be taken through a mica insulated condenser as shown in Fig. 17. This condenser is frequently incorporated in D.C. mains units. Its object is to prevent accidental short circuiting of the mains by connection to earth. It should be noted that in some cases, and particularly on a three-wire system, that the positive main is earthed.

A.C. Units.

When an A.C. supply is available, a smoothing circuit and voltage divider is energised through a transformer and rectifier, that is, either a two-electrode valve or a metal rectifier. Fig. 18 shows the basic circuits for half and full wave rectification.

The input transformer is designed to operate from the supply mains and it is provided with two secondary windings. The first suits the filament of the valve and is

frequently centre tapped. In the case of the half wave rectifier as shown in Fig. 18 (a) a single winding is used, one end going to the anode, and the other forming the main negative high-tension terminal. The positive terminal is the filament or centre tap of the filament winding.

Fig. 18 (b) shows an almost identical arrangement for a full wave rectifier, i.e., a double anode valve. In this case, the high-tension secondary winding is centre tapped, the outers going to the two anodes, and the centre tap forming the main negative terminal of the high-tension supply. When a metal rectifier is employed the input transformer has only one secondary winding, since there is no filament to heat.

Three forms of rectifier circuits are

employed. In Fig. 19, (a) shows a simple half wave rectifier in which the rectifier is connected to one of the leads from the secondary winding, the other lead forming the negative terminal. The more general arrangement, however, is shown in (b), in which the metal rectifier has four terminals. The unit actually contains four separate elements connected on what is sometimes called the Gratz system. Some form of bridge arrangement is actually employed.

The third method is shown in Fig. 19 (c) and is known as the condenser doubling method. It employs a special double metal rectifier unit, the high-tension being derived from the outer terminals of two condensers connected in series. The A.C. voltage is connected to the centre point of the rectifier unit and the centre point of the condensers. The effective output voltage is about double the input voltage.



FIG. 17.—Essential safety condenser for the earth connection of a D.C. mains unit.

The great advantage of an A.C. mains unit lies in the fact that the voltage can be stepped up to a value suitable for operating high voltage power valves. In the case of D.C.

MULLARD MEANS BUSINESS

supplies the voltage is limited to that of the supply itself, and accordingly very large sets cannot be run from D.C. mains without some form of motor generator or other supply arrangement.

the total electron emission, and, therefore, the valve operates without any appreciable hum.

The cathode, i.e., the coated tube, replaces the valve filament in so far as the grid returns

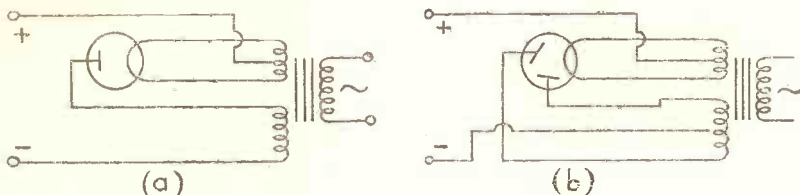


FIG. 18.—Half and full wave valve rectifier circuits.

The components of an A.C. mains unit can be tested as indicated in the appropriate sections. It is more important in the case of an A.C. unit than in the case of a D.C. unit not to connect it to the supply without a load on the output, since the first condenser in the filter circuit is subjected to much greater peak voltages than in the case of a comparatively smooth D.C. output on which there is only a commutator ripple.

Mains Driven Cathode Circuits.

There are now only two systems in general use for direct operation of valve filaments or cathodes from A.C. supplies. The valves,

and earth connections are concerned. The basic circuit is shown in Fig. 20 (a). It is the usual practice to connect the centre point of the heater winding to the earth or common cathode connection. Shown in Fig. 20 (b) is the usual conventional diagram for an equi-potential cathode mains valve.

It is essential in a sensitive receiver employing valves of this type to keep the field of the heater wires as small as possible. It is general to use the shortest possible leads between the valve holders, and the wires are usually twisted together. In some cases, an earthed screen is used for the filament leads.

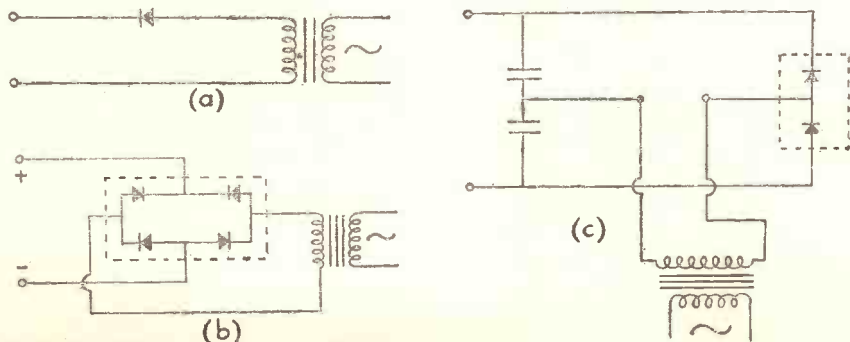


FIG. 19.—Half wave, full wave, and condenser doubling metal rectifier circuits.

for the most part, are of the equi-potential cathode type. They usually employ a flat tube coated with an electron-emitting substance. The tube is heated by means of an insulated hair pin which takes the place of the ordinary filament.

On switching on a valve a short time elapses before the cathode becomes uniformly hot. Owing to the thermal inertia of the coated tube, any changes in temperature due to the wave form of the A.C. supply do not affect

In re-wiring a set with mains valves, the heater circuit should certainly be kept as compact as possible. Large output valves having comparatively big filaments with a large thermal inertia can be run successfully by direct operation from the A.C. supply. Fig. 21 (a) and (b) shows two general arrangements in which the grid return is taken to what is substantially the middle point of a parallel resistance or the centre tapping of a filament supply.

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Grid Bias Supply.

Grid bias can be derived either from a separate metal rectifier and smoothing circuit, or from the main high-tension supply in which the high-tension voltage is robbed of a few volts for the grid bias.

Fig. 22 shows one of the most convenient methods to employ, particularly in a multi-valve receiver, since the arrangement of wiring is considerably simplified and the

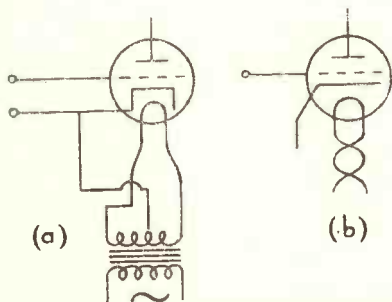


Fig. 20.—Arrangement and conventional representation of equi-potential cathode valve.

adjustment of grid bias for any particular valve is easily accomplished. The system consists in placing a resistance, shunted by a condenser, between the cathode of any particular valve and the negative high-tension terminal. The grid returns, of course, are taken to the negative high-tension terminal which is the main earth busbar, and not to the cathode.

An alternative arrangement is shown in Fig. 23 in which a main bias resistance is included in the negative high-tension lead,

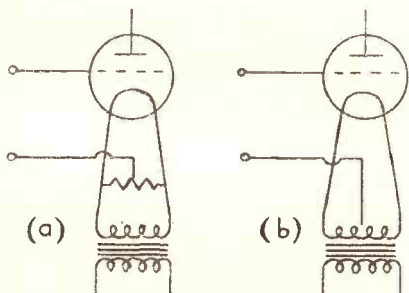


Fig. 21.—Two filament connections for directly operated A.C. valves.

and is tapped off at various points for the respective bias voltages. In some cases, it is found necessary to decouple the grid circuits in a similar manner to that used for high-tension supplies, and separate high

resistances and condensers shown at R_1 , C_1 , and R_2 , C_2 respectively are included.

When testing automatic bias voltages it is essential to use an exceptionally high resistance voltmeter, as otherwise the load imposed will totally unbalance the voltage and give a false reading. It is best to check the bias voltage by measuring the resistance

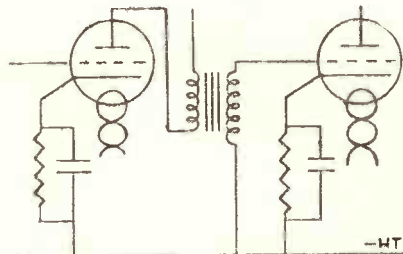


Fig. 22.—The most usual auto-bias arrangement with separate resistances and condensers in each cathode lead.

and measuring the current with a milliammeter, working out the actual voltage from the simple Ohm's Law equation.

The components used for auto-bias can readily be isolated from the circuit and tested.

Motor Boating.

Motor boating or a continuous definite frequency "plopping" sound is due to interaction of circuits, and it can invariably be

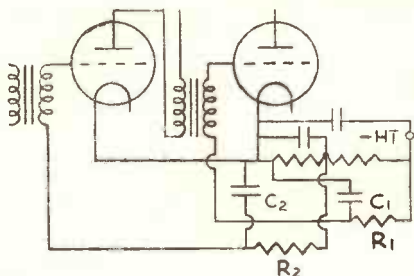


Fig. 23.—A common auto-bias resistance in series with the main negative high-tension lead tapped off for various bias voltages. Decoupling resistances and condensers are also shown.

cured by decoupling of the circuits in question.

Sometimes the reversal of the secondary winding of a low-frequency transformer will effect a cure, since it changes the phase relationship, but this is not recommended as it may affect the quality appreciably.

There is no golden rule for determining the value of a decoupling resistance, as it is largely a function of the impedance of the valve with which it is working, and also whether the valve is carrying radio-frequency or audio-frequency components, or both. A

BETTER TRADE WITH THE BETTER RADIO BRIGADE

large increase in the decoupling resistance is accompanied by a corresponding fall in the effective anode voltage with loss of power.

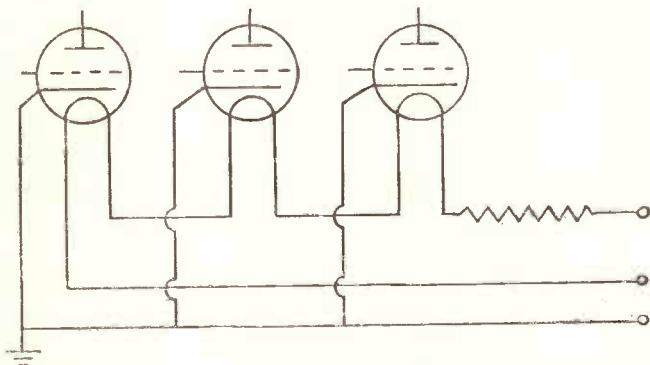
A fairly simple way of determining which anode circuit needs decoupling, if any doubt exists, is temporarily to isolate it from the power supply, and connect it to a separate external battery. The same process applies, of course, to grid returns.

When dealing with mains units or mains sets employing a really large output valve,

and the anode current at any particular high-tension voltage and grid voltage. The measurement of filament current is perfectly simple, as it involves merely the inclusion of an ammeter in the filament circuit, the valve being connected, of course, to a battery of the correct voltage.

The filament current should coincide fairly accurately with the maker's rating. This measurement immediately shows whether the filament is intact. It is better to test

FIG. 24.—Filament circuit of D.C. mains valves.



it is essential not to connect the high-tension supply before the filaments and cathodes are really hot. Exceptionally large valves really require a delay action switch, examples of which are now available. Sets run from D.C. mains are identical in operation with those worked from A.C. supplies. The only difference lies in the filament circuits.

Special D.C. mains valves are now available, and the filaments are so designed that they can be run either in series or series parallel combinations, so that the total current and voltage in each branch of the circuit is the same. The use of the valve filaments or heaters in series tends to minimise the voltage which has to be dropped to bring it down to the valve value.

A typical filament circuit for a D.C. receiver is shown in Fig. 24. The grid returns being taken to the cathodes.

Auto bias can be taken as shown in Fig. 22 if desired. It will be seen that a main resistance is used to drop the unnecessary voltage.

VALVES.

Complete valve failure is extremely rare. It can be instantly identified. Partial valve failure is a more common occurrence and precise testing methods are necessary in order to identify it. A valve can be tested either in a receiver while it is operating, or it can be more closely examined on the test bench. The latter procedure is undoubtedly the better.

There are two properties of a valve which we can measure, the filament consumption,

the filament continuity in this way rather than use one of the circuit testers, since we have known cases of intermittency arising as soon as the filament becomes hot. The filament current as indicated by the ammeter should remain perfectly constant, even if the valve is moved or tapped gently.

Occasionally the grid will come into contact with the filament, and this should be determined by one of the circuit testers when the filament is hot. This sometimes causes expansion, and the grid-filament contact will

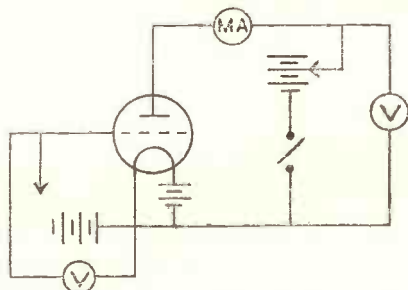


FIG. 25.—A simple circuit for obtaining a fairly accurate measurement of the amplification factor and slope, or mutual conductance, of a valve.

only show up when the filament is actually hot.

Providing the filament current is correct and no electrodes are in contact, the next test is that of the anode current. A milliammeter is included in the anode circuit of the valve, the correct high-tension and grid bias

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being applied. The value of the anode current should then be accurately observed and compared with the maker's curve. If it is found that the anode current is considerably smaller than that shown in the curve, it indicates that the filament has lost part of its emission.

This is bound to occur with a valve which has been in use for a very long time, but should it happen in the case of a comparatively new valve, further investigations should be made.

A valve must never run at too high an anode voltage or with too small a grid bias value. The position in which it has been used in a set should be investigated and the voltages measured. If these are found in order, the valve should be returned to the manufacturers for their examination. There is frequently a few milliamps difference between the actual recorded values and those of the maker's curves in the case of valves having an average anode current of 15 m.a. to 20 m.a.

If the anode current at the correct grid voltage appears correct and a valve still fails to give the presumed amplification, the slope and amplification factor can be roughly checked in the following manner.

The slope is the relationship of the change in anode current with respect to grid voltage. For example, a slope of 3 m.a./v. means a change of 3 m.a. for change of 1 grid volt. Most manufacturers rate their valves at zero grid bias, and 100 volts on the anode.

The circuit shown in Fig. 25 should be arranged, and the change in anode current noted while the grid bias is increased to, say, minus 1.5. By simple proportion the change in anode current for 1 volt can be calculated.

Measurements should not be taken at zero grid volts on power valves, since the total filament emission may be greater than the maximum for which the valve is rated. The measurements should be made at a higher anode voltage with the requisite grid bias as shown by the maker's chart.

The amplification factor is the ratio of the voltage produced in the anode circuit to the applied grid voltage. The circuit shown in Fig. 25 is again utilised, but the method of procedure is slightly different. The anode current at a given high-tension voltage is noted at a given grid bias value. The grid bias is then increased by a few volts, for example, 3 volts, when, of course, the anode current falls. Extra voltage is then added to the high-tension circuit until the former value of anode current is again reached. The extra voltage which has been added is noted and this is divided by the change in grid voltage which was applied to the valve. If 15 volts were added then the amplification factor of the valve would be 5.

From these two values we can calculate the impedance of a valve. It is only necessary to divide the amplification factor by the slope and multiply the result by 1,000. For example, a valve with an amplification factor of 14 and a slope of 2 would have an impedance of 7,000 ohms.

General Notes.

The selection of suitable valves for a receiver is a matter of vital importance. Such a problem only arises when a manufacturer's specification is not available. In the case of high-frequency amplification, screen grid valves are employed almost without exception. Where a single stage is used, a valve having the best possible amplification factor and slope should be employed, since this gives the greatest gain.

A set employing several stages of screen grid amplification, however, will be rather difficult to stabilise if high gain valves are employed, and accordingly, it is better to use a screen grid valve with a slightly lower amplification factor.

The remaining valves can be divided into four classes, three electrode valves of high, medium, and low impedance respectively, and pentode output valves.

High impedance valves should be chosen for resistance coupled amplifiers, and anode bend detectors where the applied grid swing is small. Where a large grid swing has to be dealt with, a medium impedance valve should be substituted. Grid rectification is now generally of the power type, and this calls for a medium impedance valve.

Early low-frequency stages should use medium impedance valves and output stages in small sets such as three valve combinations should use an ordinary power type which, of course, is a low impedance valve.

Super power valves are necessary in the final stages of powerful receivers, while the preceding stage generally requires a small power valve. Little need be said with regard to pentode valves, as their method of testing is identical with the ordinary type of valve.

Mention has not previously been made of rectifying valves. The method of testing, of course, consists in checking the filament consumption in the normal manner, while the total emission should be measured by including a milliammeter in circuit with a fixed resistance and using the maximum high-tension supply. This is a safety resistance to protect the valve, and the value is always contained amongst the manufacturer's data. On no account should this be omitted.

As a final word of warning, high-tension should never be applied to a large valve without the necessary grid bias. Grid bias should only be altered when the high-tension circuit has been switched off.

EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER

GRAMOPHONES.

Minor gramophone adjustments can easily be carried out by the dealer, but unless he is a qualified mechanic, we do not advise him to undertake such jobs as, for example, fitting a new spring to a gramophone motor.

Many radio-gramophones contain clockwork motors, and the dealer should be in a position to adjust these. Most troubles are usually associated with the governor mechanism starting with a little jerky action which gives rise to uneven running.

Practically all governors are controlled by a leather pad working on a friction disc.

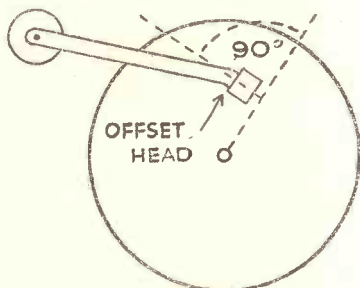


FIG. 26.—These three sketches show the correct position of a pick-up with respect to the record, and how to connect an external volume control.

If this becomes dry and hard, uneven running results. Proper lubrication almost immediately rectifies the trouble. If the leather has become very worn and hard a new piece should be fitted.

The motor should be kept well lubricated. Special oil for this purpose is available and only this should be used. Uneven running, recognisable by inconsistency of pitch, may also be due to worn or slack bearings. This can be determined by pressing on the turntable, when any lateral movement or shake will be readily apparent.

Motor Speeds.

Most records are intended to run at 78 r.p.m. The speed adjuster should, therefore, be capable of running the turntable at just below 78 to just above 80.

The easiest way to check the speed is by means of a stroboscopic disc. This is used either in conjunction with a neon lamp or an incandescent electric lamp operating on an alternating current supply. Stroboscopic discs consist of circles of dots which when viewed by interrupted light appear stationary at certain speeds, depending upon the frequency of the electrical supply, the number of dots, and the rate of revolution.

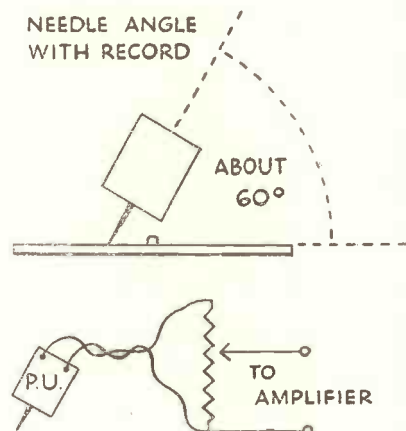
Electric Motors.

Electric motors can be divided into two classes, induction motors without brush

gear, and universal motors with brush gear. Gearless induction motors require practically no attention with the exception of occasional oiling or greasing according to the type of bearings fitted.

Motors with brush gear require occasional overhaul, which involves merely cleaning of the commutator by removal of any loose carbon dust, and perhaps the removal of the brushes from their holders, and the general clearing of particles of carbon from the actual holders themselves.

Gearing arrangements and governors with friction controls require exactly the same treatment as those of clockwork motors.



When installing an electric motor, it is usually found necessary to earth the frame, as a protective measure against shocks from the metal turntable and also in the elimination of interference with the amplifier.

Tone and Carrier Arm Fixing.

To ensure correct playing and minimum record wear, carrier arms and tone arms should be fixed so that most accurate tracking is obtained. By tracking is meant relationship of the pick-up or sound box to the record grooves. Theoretically, the movement of the needle should be in a plane at right angles to a tangent drawn at the point of contact in the groove. It is obvious that the longer the tone arm the more accurate will be the tracking. Even better tracking is obtained by means of an offset tone arm, the head of the arm carrying the pick-up pointing slightly inwards towards the centre of the record.

The needle angle is also a matter of importance, and this should neither be too flat nor, on the other hand, too steep. The accompanying diagram, Fig. 26, shows suitable positions for pick-ups and carrier arms in their relation to the record,

MULLARD THE MASTER VALVE

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Pick-ups.

Detailed information regarding pick-ups will be found in the appropriate section. One word, however, may be said here with regard to faults which can only be rectified on the carrier arm itself.

It is important to see that a pick-up is not capable of side movement with respect to the carrier arm, as chatter may be set up which causes bad reproduction on heavily recorded passages. The leads from a pick-up should preferably be screened, particularly with a pick-up which employs a single coil, or one which has a very high impedance. Omission to screen the leads of a pick-up may be the cause of instability or bad hum in the amplifier.

When the volume control is situated on the motor board itself and does not form part of the receiver, the leads to and from the control should be similarly screened.

If a new volume control has to be fitted to a motor board, great care should be taken to see that one of the correct resistance is obtained. A volume control with too low a resistance will cause a serious cutting of top, and in some cases it may reduce the output of the pick-up very considerably.

ACCUMULATORS.

Accumulator charging and service forms a very important branch of practically every dealer's business.

There are three golden rules which if properly carried out will result in the minimum of trouble, and the maximum of efficient service. Here they are: The maximum life will be obtained from an accumulator if (1) it is regularly charged at the correct rate, (2) it receives regular attention as regards acid level and strength, and (3) it is kept clean.

Accumulators should be charged at their correct rates, not only in fairness to the batteries themselves, but also to the manufacturers and the owners. Nothing does more harm to a battery, and particularly a mass type battery, than charging it at too high a rate.

Acid strength should be checked by means of a hydrometer. The necessity of using a first-class instrument cannot be too strongly urged. Dealers should buy a thoroughly reliable float type hydrometer. The battery maker's recommendation as to specific gravity must be adhered to rigidly. While most cells operate correctly at about the same S.G., certain are designed to work at higher or lower values.

Great care must be taken to remove every trace of free acid from every part of the outside of an accumulator case, and particularly the terminals. It is a good plan to wipe

the terminals over after charging, with water containing a little ammonia. Terminals should be well vaselined and, before handing a cell to a customer, the case should be given a good polish with a duster. Nothing is more revolting than an accumulator with an acid-covered top, and any charging station which sends out cells in this condition stamps itself as inefficient.

Charging Plants.

The type and size of plant which is installed must be determined entirely by the estimated amount of charging which will have to be carried out per week.

Where only direct-current mains are available, there are only two suitable systems. The first consists of charging the cells directly from the mains and the second involves the use of a motor driving a dynamo or a combined motor generator set.

Direct charging from the mains can only be economical when the total number of cells connected in series gives a voltage of about the same value as that of the supply. This means that at least 60 or 70 cells should be available for charging at the same time. It must also be remembered that the charging current must be cut down to the value required for the smallest cell. It is obvious, therefore, that charging by this method will only be economical in a few isolated cases. Those who have D.C. supplies are recommended to install a suitable motor generator set.

Where A.C. supplies are available some form of rectifying device or motor generator is immediately necessary. These can be classified under four headings: Motor generators, or motors driving dynamos, synchronous rectifiers, metal rectifiers, and valve or mercury rectifiers.

Valve, mercury, and metal rectifiers have practically no upkeep cost, since there are no moving parts. Replacements of the actual rectifying units are only necessary at long intervals. Motor generator sets, providing they are well made, run for long periods with little attention. Regular cleaning of the commutator and maintenance of the brush gear is of vital necessity for efficient operation of motor generator sets and synchronous rectifiers. Motor generators and synchronous rectifiers should not be installed without perfectly foolproof automatic cut outs.

The manufacturer's instructions regarding the correct method of installing any form of rectifying arrangement or generator set, and also the maximum outputs, should be strictly adhered to. No attempt should be made to overload any charging device.

Whatever charger is employed, external rheostats are necessary for adjusting the various charging rates. Many dealers prefer to make these themselves, and useful in-

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formation relating to wire sizes and current carrying capacities is given in Fig. 27.

Data for Calculating Charging Resistances.

Current to be carried.	Eureka Resistance Wire	Resistance per yard.
In amps.	S.W.G.	In Ohms.
0.5	30	5.57
1.0	26	2.64
2.0	22	1.09
3.0	20	0.661
5.0	17	0.273
10.0	13	0.101

Fig. 27.

Before carrying out any charging, dealers should make quite sure that their charging arrangements comply with fire insurance

invaluable. If a cell does not charge up in the correct time, there is something radically wrong, and it should be investigated as much in the dealer's as the customer's interest.

If there is no obvious cause, the dealer should communicate immediately with the manufacturers. Prompt action in this manner will save a tremendous amount of subsequent trouble between dealer, customer and manufacturer, while the dealer will do much to gain the confidence of both customer and manufacturer.

PUBLIC ADDRESS.

A successful public address demonstration is one of the best forms of advertisement which can come to a dealer. It does much to enhance his business reputation. Unfortunately the converse is true, and failure of public address does untold harm. It is absolutely essential to make quite sure that any public address demonstration will be an unqualified success from the outset.

There are only two important points which need to be watched. The first is meticulous care in the connection of the apparatus and the wiring of the amplifier. The second is the use of adequate power.

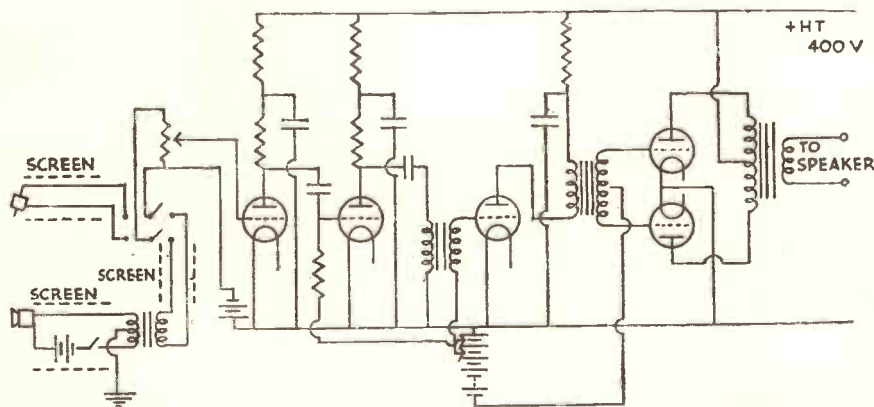


FIG. 28.—A small power public address amplifier arranged for microphone and record reproduction.

regulations. Cells should preferably be placed on glass sheets during charging. Meters should not be anywhere near the cells during charging operations because of fumes, and adequate ventilation should be provided. The ideal device, of course, is a fan extractor.

Providing the cells are carefully connected and arranged in a tidy manner there is practically no fire risk. A tangled mass of half-corroded wires lying haphazard on a heap of accumulators should never be tolerated. A proper system of time-keeping, and charging currents must be adopted, while careful inspection of all the cells during charging is

Without sufficient power, a public address system is doomed to failure.

A good powerful demonstration receiver which seems to be excellent in the showroom is utterly useless for public address. A set which is overpowering in the showroom becomes a mere whisper in a hall or an open space. It is essential, therefore, to use special apparatus for public address work.

Three Systems.

Public address arrangements can be divided into three sections, broadcast reception, gramophone reproduction, and microphone reproduction.

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RADIO SERVICING

When radio reception is contemplated, the main receiver must have an ample reserve of sensitivity on the high-frequency side. Preferably, it should be capable of working from a frame aerial or a short length of wire hung across a room, unless it is definitely known that a large aerial is available.

At a really important demonstration it is advisable to duplicate the apparatus. One faulty connection can ruin a demonstration completely.

It is necessary to build special apparatus for public address work, but an ordinary

for each stage. Adequate decoupling is necessary, and volume controls on the first and second amplifiers are desirable.

Placing of Speakers.

In arranging speakers in a hall for demonstration purposes, it is general to place them so that they all point in the same direction. One successful arrangement consists in hanging them from the roof with the horns pointing slightly downwards.

No trouble is experienced with broadcast or gramophone reproduction. Where microphones are concerned, however, great care must be taken in the placing of them. They must be so arranged that no sound waves

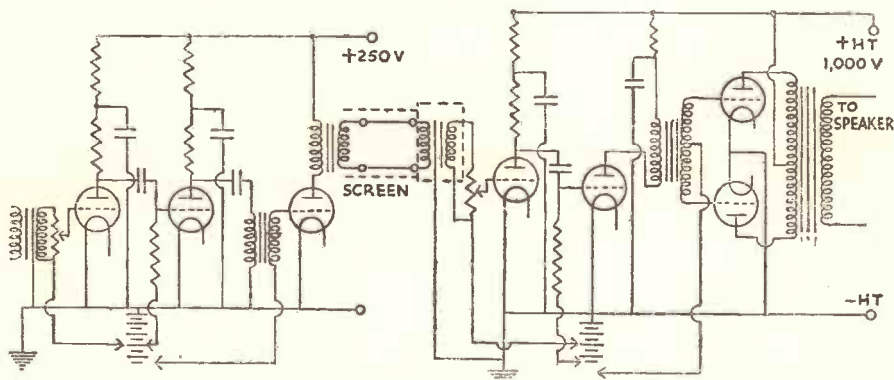


FIG. 29.—A double unit power amplifier for general work. Each stage is completely screened.

receiver can be utilised for the first part of the reception. This, of course, must be followed by a really powerful power amplifier. Each stage of the latter should be completely screened, and this again should have ample reserve power.

Unless it is definitely known that A.C. mains are available, it is best to utilise a generator, since anything from 400 volts upwards is required.

Where gramophone reproduction is concerned, a pick-up jack of an ordinary receiver may be used for the first part of the amplifier, being followed, of course, by a power bank. The leads to the pick-up must be completely screened and earthed. The output side of the amplifier must be kept well away from the input connections.

With microphones even greater care is necessary. Connecting a microphone to the pick-up jack of an ordinary set is not advised. Very considerable amplification is necessary, and unless the low-frequency side of the receiver is completely screened, and this is unlikely, trouble may be experienced. It is preferable to build a special amplifier for the initial stages.

Amplifiers are conveniently built into stout tin-plate cases with screened compartments

from the speakers can fall upon them, as otherwise continuous ringing or howling will be obtained. The less resonant the microphone, the less howling.

Only first-class microphones should be used for public address work. These are expensive and insensitive, but they should certainly be employed. The greater the number of people in the hall the less will be the tendency to howl back, owing to greater absorption.

Power Required.

From two to three times the volume of sound which fills an empty hall will be required to fill it when the seats are occupied by a large number of people. If the music is to drown the general room noise of talking or dancing, then even greater power will be necessary. A speaker which is only just audible at the bottom of an empty room will be quite useless during a demonstration.

Dealers who are bound to give a demonstration and feel that they have not the necessary power should, without hesitation, apply to firms who manufacture public address equipment for the loan of suitable gear. Suitable public address amplifier circuits are shown in Figs. 28 and 29.

CUSTOM SAYS MULLARD

Interference.

The subject of hum in a loud speaker output and interference are somewhat closely associated. Interference can be classified under three headings—pure inductive hum, ripples and surges transferred to a set through the mains supply, and radio-frequency interference.

Pure inductive hum can originate in a receiver itself and also outside the set. Hum which has its origin in a receiver is due entirely to incorrect design. The most prolific cause is inadequate smoothing, and the cure is just a matter of increasing the smoothing by using more efficient chokes of high inductance and increasing the capacity.

Hum which still persists is then invariably due to induction caused by relatively strong fields adjacent to grid wires, or even interaction amongst the low-frequency components and the mains transformer or smoothing chokes. This is easily detected by moving any components or leads which are suspected of causing trouble, and seeing if this has the effect of increasing or diminishing the hum.

Care must be taken particularly with regard to long leads connected to the input of the amplifying portion, as, for example, the pick-up connection. An earthed screen lead will usually cure the trouble. It sometimes happens on a set with which an external pick-up is used that the mains lead is brought too near to the pick-up or even to the aerial or earth lead of the set. In this manner hum is sometimes introduced, and the remedy of course is obvious.

Effects which are introduced either through the mains connection or by high-frequency radiation are best dealt with together. There is practically nothing which can be done in the set itself, and the trouble has to be cured by eliminating it at its origin.

Some of the most usual sources of interference are sparking at the brushes of motors, contactors, or similar controls, and vibrating interrupters such as tremblers on induction coils.

In the majority of cases interference can be prevented simply by the use of fixed condensers which form a low impedance path between the origin of the disturbance and earth.

The simplest case is that of sparking at motor brushes. Interference of this type can be eliminated by connecting each brush to earth through a fixed condenser of 0.1 mfd. or a 0.01 mfd. can be connected between the two brushes. High insulation types must be used.

Interference is frequently increased by radiation from the supply mains. In this case the trouble can be cured by what is known as a centre point earth system. Two condensers are connected in series and placed across the leads, the junction point of the condensers being taken to earth.

A centre point earth may be used at either end of a pair of leads.

On rare occasions H.F. chokes have to be inserted in the supply leads to a set. In this case the chokes are preferably placed in an earthed metal box, while the condensers are arranged on the set side of the chokes.

Interference from sparking plugs or distributors and magnetos on petrol engines can be reduced by using screening over the exposed portion of the electrical circuit. The high-tension leads may have a length of wire wrapped closely round them, the wire being earthed to the frame, while a metal screen can also be placed over the tops of the plugs and the distributors.

Adequate insulation, of course, is necessary and thick rubber cable should be used for the leads. Small apparatus which is the subject of tremendous electrical disturbance may require to be enclosed in an earthed screen, while centre point earth condensers and even chokes may be necessary.

Gas discharge tubes used for charging rectifiers also generate oscillations which cause interference, and these can easily be prevented by a fixed condenser from 0.001 mfd. to 0.01 mfd. connected between the anodes and earth. Each particular example of interference usually requires individual treatment, and the simplest remedy should be tried first until a complete cure is effected.

The first rule is always to disconnect the aerial from the receiver, and then the earth, to determine if the interference is being picked up on the radio-frequency side of the set. Interference which comes in strongly with the aerial connected, and is almost absent without the aerial must be eliminated at its source.

Disturbances in a set which are not affected by the aerial may be purely inductive effects in the receiver, or alternatively, they may be introduced through the supply mains.

Variable-Mu Valves.

The variable-mu valve is a screen grid amplifier in which the effective amplification factor and mutual conductance are variable over very wide limits.

When an ordinary screen grid valve is operating under correct conditions, it will only handle a small applied grid voltage. A large signal would oversweep the grid bias and cause considerable distortion introducing a rectification effect. This is a condition which is likely to obtain when a set using a screen grid amplifier is tuned in to a strong local signal.

If the effective amplification factor could be lowered, the valve would handle a very much greater grid swing without running off the straight portion of the curve. This is what happens in the case of the variable-mu

[Continued on page 98.]

MULLARD THE MASTER VALVE

The Broadcaster CIRCUIT

& WIRELESS RETAILER

WITH the data and charts given it is easy to find the component values of any circuit. This is how it is done in the case of a typical circuit such as that given on this page.

Several values can be obtained immediately from the table of Standard Average Values. C_1 must be .0005 mfd. capacity, C_2 .00015 to .0003 mfd., according to the reaction coil; C_3 .0001 mfd., and R_1 .5 megohm. C_4 , it is found, must be .0003 mfd. and C_5 2 mfd.

For the resistance of R_2 the voltage drop *abac* is used. First, however, the characteristics of the valve V_1 must be examined, and the recommended anode voltage and the anode current—in this case with no grid bias—ascertained. Values of 150 volts and 5 m.a. respectively can be assumed.

As the H.T. voltage is 250, it is obvious that 100 volts have to be dropped across the resistance R_2 .

Now, taking the *abac* and placing a straight edge so that it passes through the 100 volt and 5 m.a. marks, it will also be seen to cut the resistance line at 20,000 ohms. This is the required value of R_2 .

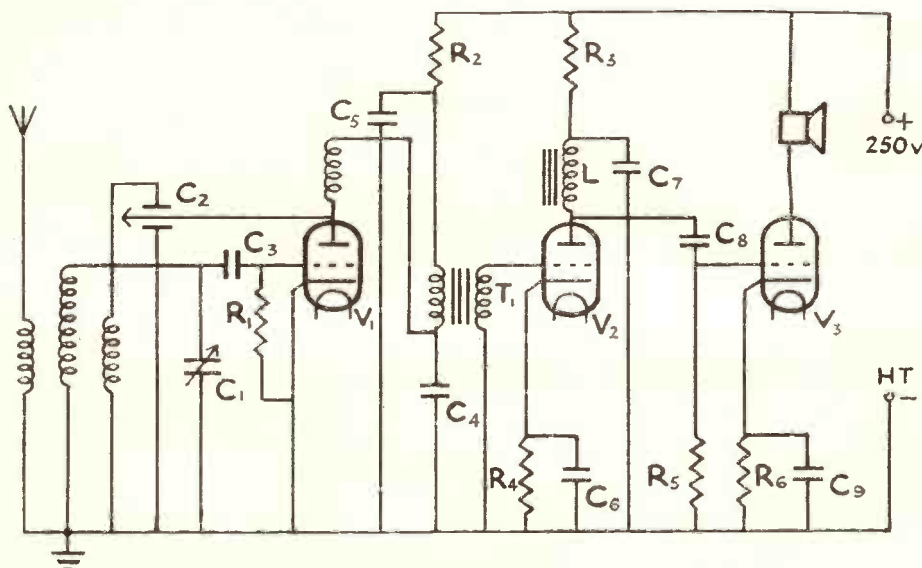
To find the required inductance of the transformer T_1 , the impedance of V_1 must be found. Supposing this to be 10,000 ohms and referring to the chart, it is seen that for 90 per cent. bass amplification T_1 should have an inductance of 67 henries.

For R_3 the same process as for R_2 is employed. Assuming that V_2 is a 5,000 ohms valve working at 200 volts and requiring 12 volts negative bias, the anode current being 10 m.a., R_3 will be found to be 5,000 ohms.

R_4 , the bias resistance, is found by placing the straight-edge on the anode current of 10 m.a., and the bias value of 12 volts. This results in a resistance value of 1,200 ohms.

For 90 per cent. bass, L_1 , the chart shows, should have an inductance of just over 30 henries, with, of course, the anode current passing. Next the table gives these values: C_6 and C_7 1 mfd., C_8 .025 mfd., and R_5 .25 megohm.

The valve V_3 , assuming 25 volts bias and 18 m.a. anode current, needs a bias resistance of 1,400 ohms. Lastly, C_9 , from the table, should be 1 mfd.



How the values of all the components of a representative circuit such as this can be determined in a few minutes by means of the charts and data given on these pages is described above.

THREE MILLION AERIALS CAN'T BE WRONG

DESIGN DATA CHARTS

STANDARD AVERAGE VALUES

CONDENSERS.

Tuning Condenser	..	..	0.0005 mfd.
Reaction Condenser	..	..	0.00015 mfd. to 0.0003 mfd.
Grid Rectification Condenser	..	..	0.0003 mfd.
Power Grid Rectification Condenser	..	..	0.0001 mfd.
H.F. By-Pass Condenser	..	..	0.0003 mfd.
H.F. Shunt Condenser	..	..	0.01 mfd.
L.F. Coupling Condenser	..	..	0.025 mfd. to 0.05 mfd.
Decoupling Condenser	..	..	1 mfd. to 2 mfd.

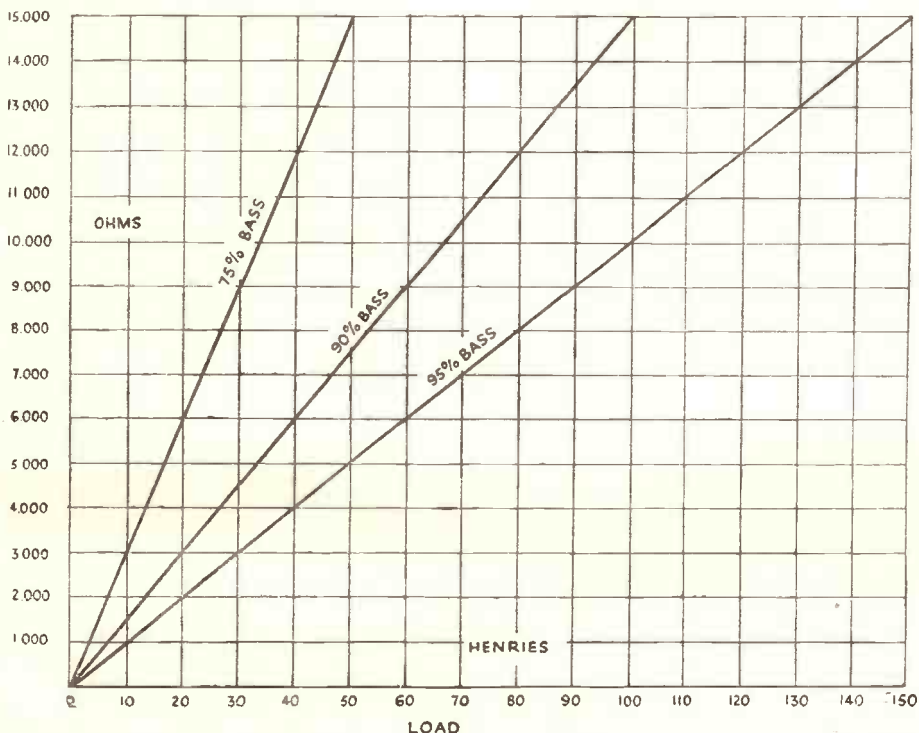
CONDENSERS—contd.

L.F. Shunt By-Pass Condenser	1 mfd.
Band-Pass Coupling Condenser	0.01 mfd. to 0.04 mfd.

RESISTANCES.

Coupling Grid Resistance	..	0.25 megohms.
Grid Rectification Leak	..	2 megohms.
Power Grid Rectification Leak	..	0.5 megohms
H.F. Stopping Resistance	..	50,000 ohms.
Volume Control Potentiometer	..	50,000 ohms.
Volume Control Potentiometer in shunt with High Impedance	..	.. 250,000 ohms.

VALVE IMPEDANCE

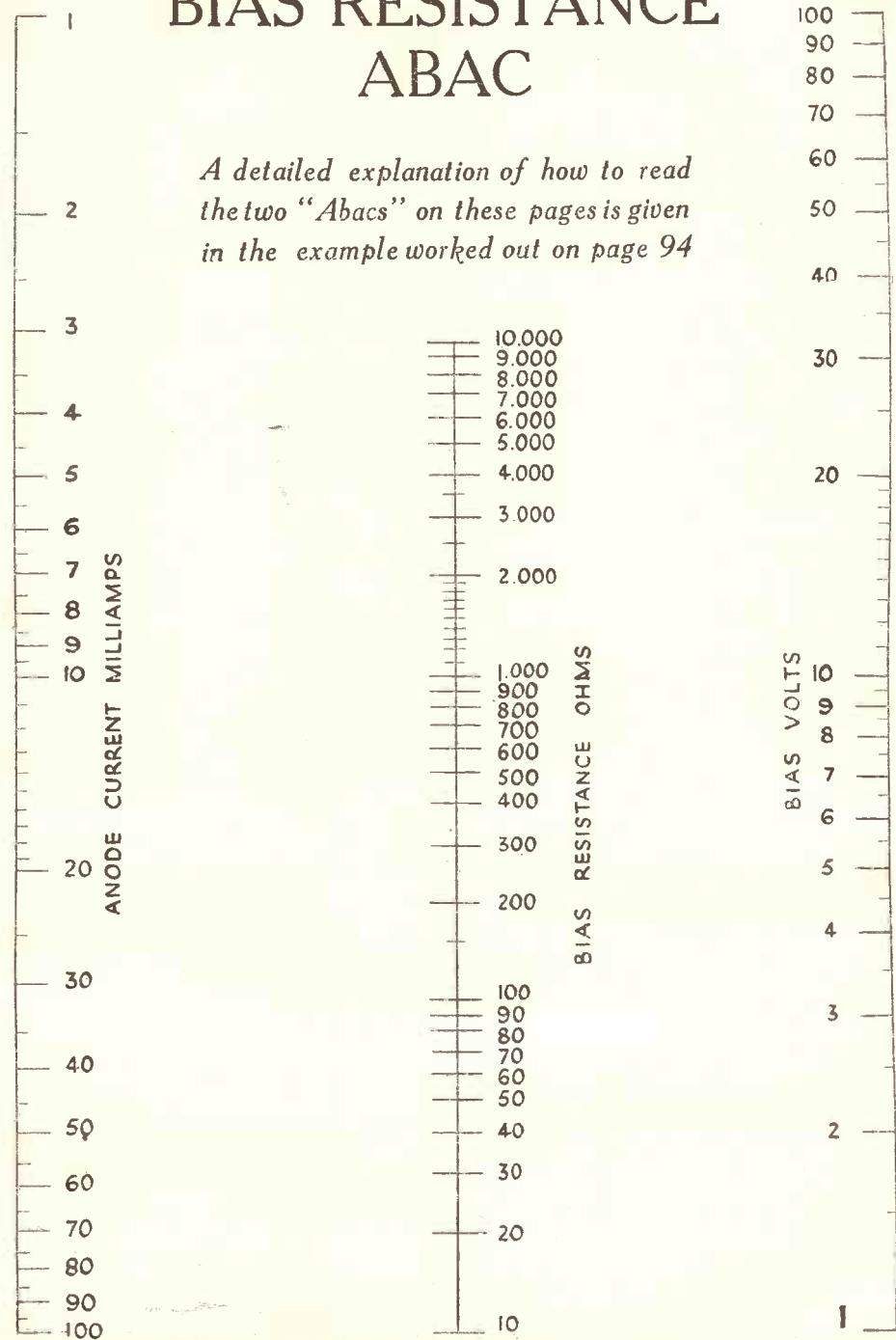


This graph shows at a glance the necessary anode load (in henries) for obtaining 75, 90, or 95 per cent. bass response with all valves up to those of 15,000 ohms impedance.

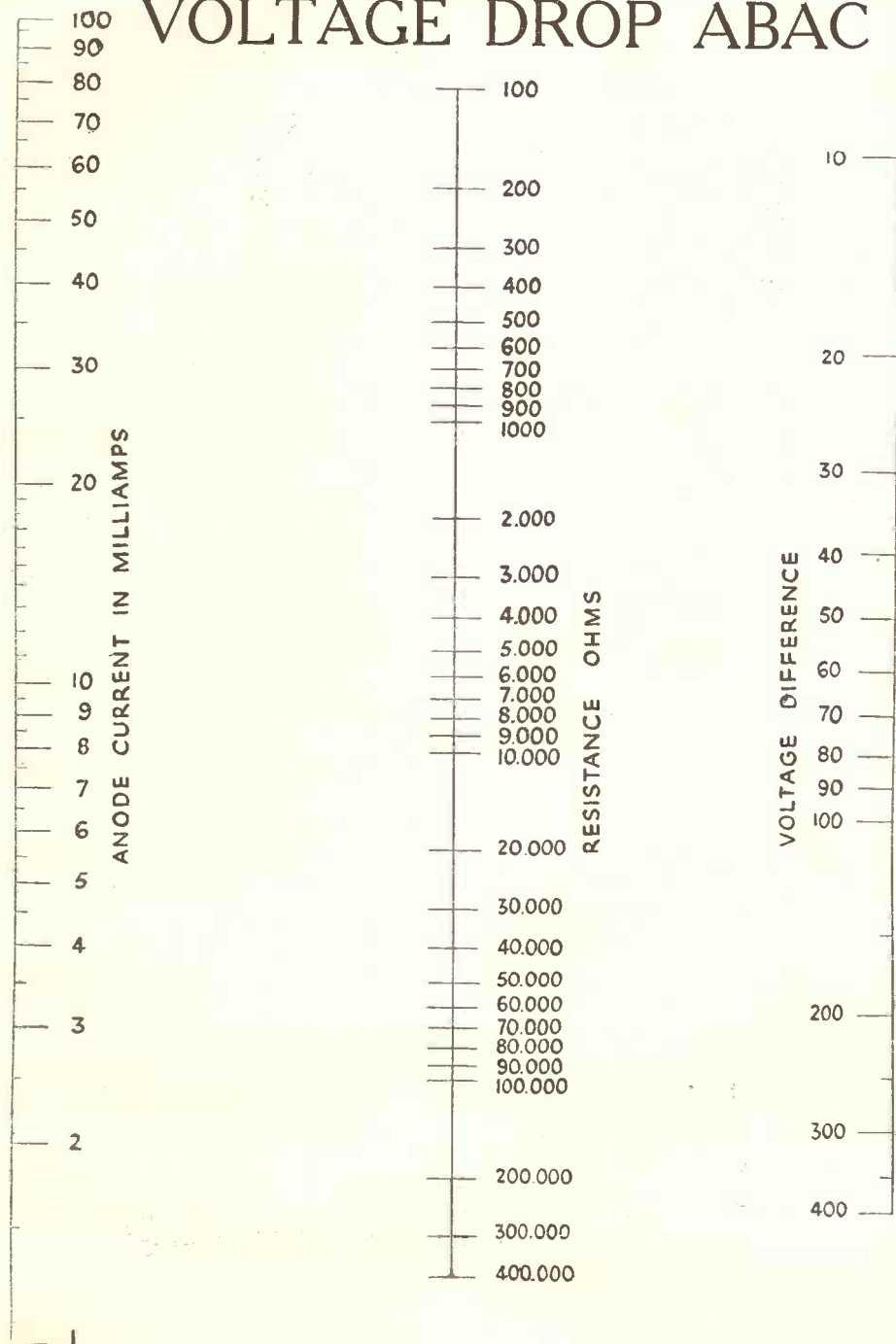
MULLARD THE MASTER VALVE

BIAS RESISTANCE ABAC

A detailed explanation of how to read the two "Abacs" on these pages is given in the example worked out on page 94



VOLTAGE DROP ABAC



MULLARD THE MASTER VALVE

RADIO SERVICING

[Continued from page 93.]

valve. The construction is different from the normal type, and the properties are usually obtained by having a gap control grid.

Constants of the valve are entirely controlled by the grid bias. In practice, the grid voltage is generally obtained on the auto bias system. This consists in passing the anode current through a fixed resistance, across which there is then a volt drop. This volt drop is applied to the grid of the valve and serves as bias. The variable-mu valve circuit is substantially identical with that of an ordinary valve, the control being obtained by means of a potentiometer which alters the grid bias.

It is essential to run the valve at the correct screen and anode voltages, and a little more care is necessary in the correct adjustment of these voltages than in the case of the ordinary screen grid valve. The bias variation is quite large, and in the maximum position the mutual conductance is reduced to a fractional value.

In the case of battery variable-mu valves, the necessary bias control is sometimes obtained from a potentiometer which can be connected across the bias battery. In this case it is best to provide a switch for disconnecting the potentiometer when the set is not in use, as this prolongs the life of the battery.

When two variable-mu valves are used, the grid potentials of the valves can be simultaneously controlled through a common potentiometer.

When converting a set from ordinary screen grid to variable-mu valves, the value of the potentiometer can be worked out very simply from the bias abacs. With a knowledge of the anode current and the maximum grid bias that will be required, it is easy to determine the value of the potentiometer. The resistance should be made too big rather than too small, so that the maximum desired bias can be obtained with a certain factor of safety.

When a common potentiometer for two valves is arranged, if it is connected so that the anode currents of both valves pass through it, it must be remembered in calculating the value that the current flowing is double that of a single valve.

Tone Control.

When a large amount of reaction or regeneration is applied to a sharply tuned circuit, the sharpness of tuning is increased still further. In a suitably designed circuit the reaction can be increased to a point at which the circuit is extremely critically tuned. In other words, the resonance curve becomes highly peaked.

A broadcast transmission consists of radiation at a given radio-frequency which is modulated at speech frequencies. This produces side bands, as they are called, which have frequencies equal to the carrier frequency plus or minus the modulated frequency.

For example, a 300 metre transmission consists of a radio-frequency oscillation having a carrier value of 1,000,000 cycles per second, and if this is modulated at 1,000 cycles, the two side bands have a value of 1,000,000 plus 1,000, and 1,000,000 minus 1,000.

In an ordinary tuned circuit the resonance curve is somewhat flat at the top, and this flatness extends over a range which would include all the side bands. Intense reaction, however, on a low loss copper circuit produces a marked peak at the resonance point with very quickly falling away sides.

This means that the upper side bands, that is those produced by the high speech frequencies, will only be received at far smaller strength. Accordingly, distortion is present, the form of distortion being known as side band cutting. It is apparent by a marked absence of the higher speech frequencies, therefore, circuits have to be used which compensate for the side band cutting.

It should be understood that what is definitely removed from the output can never be introduced, so that tone correction can only be applied so long as there is a slight amount of the frequencies which have to be corrected. The obvious method of tone correcting is to employ an L.F. amplifier which has an exactly opposite or inverse characteristic to that of the input or detector circuit.

It is only necessary, therefore, to use an L.F. amplifier in which one stage, or sometimes several, have a characteristic which is deficient in bass, so that when a falling top output is amplified by an amplifier with a falling bass characteristic, the resultant output will be substantially level.

This is frequently achieved by using an extra stage comprising a choke coupling unit in which the choke has an inductance of only a fraction of a henry, or at the most, perhaps two henries.

Correct value can be found very simply from the amplification formula if the shape of the radio-frequency response curve is known. As this is not usually the case, it is best to try the set experimentally by using different chokes, until the best results are obtained.

A rough approximation to tone correction can be obtained simply by using an ordinary transformer which has a low primary inductance. This has a falling bass characteristic, and in many cases it approximates closely to the inverse of the distorted radio-frequency response.

THREE MILLION AERIALS

LEAD DOWN TO

MULLARD MASTER VALVES

Speaker Matching.

Q.P.P. and Class B have emphasised the need for the correct matching of the speaker to the output stage. Here is a very simple formula from which the correct transformer ratio can be derived :—

$$2\sqrt{\frac{\text{Optimum Load}}{\text{Speaker impedance}}}$$

The optimum load can always be obtained from the valve makers' rating. The speaker impedance generally resolves into that of the impedance of the moving coil. This is not always known, but as a rough rule it can be taken as twice the D.C. resistance. If the optimum load of a valve is not given by the makers, this can also be taken as twice the impedance.

When two valves are used in parallel, the

same principle is adopted. In quiescent working, however, the valves are biased to the bottom of the straight portion of the characteristic.

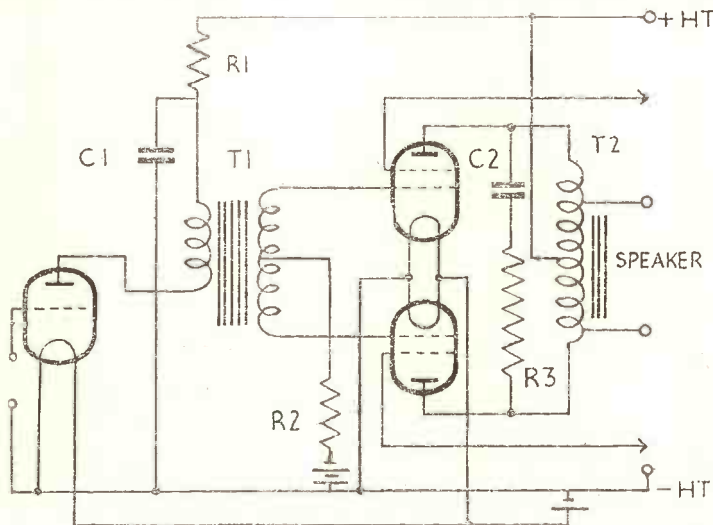
On one half cycle the operating point is swept along the entire length of one characteristic, and a similar effect takes place with the other valve during the second half-cycle.

Normally, the quiescent current is negligible and the amount of current flowing during operation is obviously proportional to the signal strength.

This system, known as Q.P.P., an abbreviation for quiescent push-pull, can be arranged with two ordinary triodes or pentodes. The fundamental circuit is shown in Fig. 30.

To obtain sufficient grid voltage to swing the operating point over the entire characteristic, it is necessary to use a high step up transformer—usually one with a ratio of

FIG. 30.—The Q.P.P. input transformer T1 is decoupled through R1 and C1. The resistance R2 in the grid bias lead prevents instability, while C2 and R3 form a tone correction to the centre tapped matching choke T2. The quiescent currents of the output pentodes are matched by individual adjustment of the priming grid voltages.



valve impedance is halved. With push-pull the effective impedance is doubled. The necessary alteration to the effective impedance must be made when applying the formula.

For example, to match two 2,000 ohms valves in parallel, using a speech coil with an impedance of 5 ohms, the correct transformer ratio is :—

$$2\sqrt{\frac{2,000}{5}} = 20$$

With a 4.2 ohms impedance coil and a pair of 8,000 ohms valves in push-pull, the ratio is :—

$$2\sqrt{\frac{32,000}{4.2}} = 87$$

Q.P.P.

In an ordinary amplifier the valve is worked about the mid point of its characteristic. When two valves are used in push-pull the

about 10-1. This is of the centre-tapped or push-pull variety.

For a useful output direct from a detector it is usually better to use two pentodes in the output stage. To prevent distortion, these should be matched (makers will supply pairs) and final adjustment should be made by means of the priming grid voltage.

So as to stabilise the circuit, a fixed resistance of 100,000 to 150,000 ohms (R2, Fig. 30) is connected in the common bias lead. A correction circuit in the form of a fixed condenser C2 and resistance R3 is also generally placed between the anodes to minimise peak voltages and correct over-emphasis of high notes.

A fixed resistance of about 50,000 ohms is frequently placed across the primary of the input transformer to prevent destructive surge voltages.

As the H.T. battery runs down, it is

MULLARD THE MASTER VALVE

RADIO SERVICING

necessary to readjust the bias to prevent distortion. Sometimes a large fixed resistance is put in shunt with the grid battery so that this runs down at the same rate as the H.T. battery.

The optimum load conditions for a Q.P.P. stage are different from those of an ordinary amplifier. Accordingly, when used with a standard speaker a step-down centre-tapped matching choke is generally used. The correct ratio can be calculated from the standard formula.

Class B.

Class B amplification is the name applied to a quiescent system utilising a special double valve. The current consumed is

similar to that used in a Q.P.P. stage, although the electrical constants are different. This type of stage cannot work direct from a detector, and there must be an intermediate driver valve.

No grid bias is used and the quiescent current of the Class B valve is only of the order of 2-3 m.a. or even less. Distortion may be introduced by the absence of decoupling on the driver stage, or the production of parasitic oscillation, generally of a transient type.

This can usually be prevented by fixed resistances, R1 in Fig. 31, across the secondaries, and it is general to use fixed condensers, C1, between the anodes and earth. Occasionally one condenser is used between the two anodes.

It is advantageous to use top cutting con-

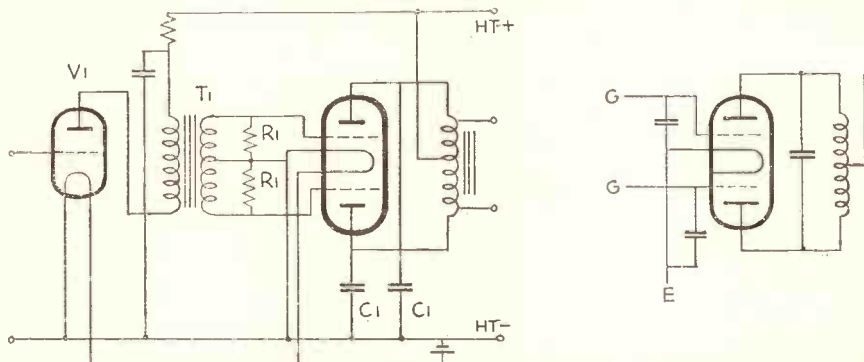


FIG. 31.—V1 is a driver valve of the small power type, and the secondary of the Class B transformer T1 is connected to the two grids and negative filament of the B valve without bias. Two condensers C1 between the anodes and earth give stability and correct tone, while fixed resistances R1 prevent parasitic oscillation. To the right is an alternative correction with condensers across the grids of the B valve, and a single condenser across the anodes.

again proportional to the signal strength, but the mode of operation is totally different from that of Q.P.P. and totally different components are necessary.

The basic feature of Class B lies in the fact that the Class B valve draws power from the preceding stage, and is not a voltage operated device, like an ordinary valve.

A Class B valve consists of two triodes of special construction in a common bulb, fitted with a seven-pin base. Each half is similar to an HL type of valve.

The valve is operated by a driver transformer, which in construction is similar to a small output transformer. It has, however, a step-down ratio of the order of 2-1 or 3-1, and a centre-tapped secondary.

The primary is connected directly in the anode of a small power valve or 10,000 ohms general purpose valve. The secondary delivers current into the grid circuit of the valve and it must, therefore, have a very low resistance.

The Class B valve is connected to a standard speaker through a matching choke

densers on the grid side as shown on the right in Fig. 31, and not on the anode side, as this prevents wastage of current due to almost inaudible heterodyne voltages applied to the grid circuit. If the condensers are placed on the grid side, they should be comparatively large, the actual value being found by trial.

A.V.C.

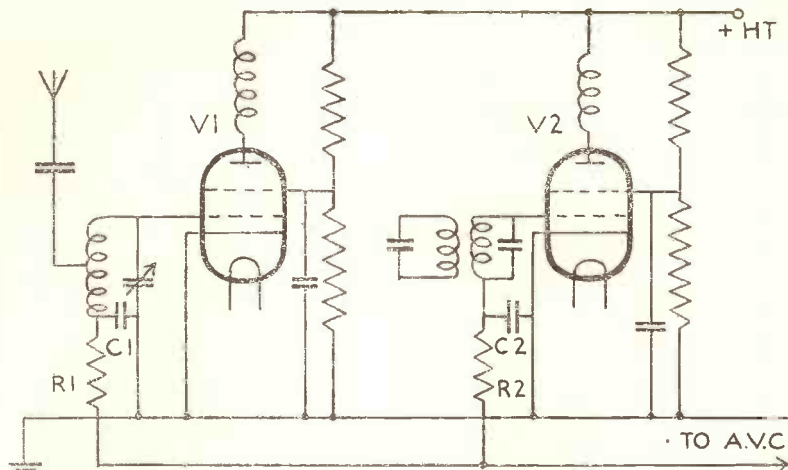
Automatic volume control has been used for many years but is now becoming general through the introduction of special valves. These are combined diode rectifiers and triodes or pentodes in the same bulb.

The circuit arrangements and combinations to produce various types of A.V.C. are extremely numerous, and accordingly it is only possible to divide them into their basic groups.

The double diode triode, which is most common in these circuits, consists of a cathode of the indirectly heated type, two anodes for rectification and a grid and anode, forming an ordinary three-electrode valve of the HL class.

THE TILL WILL TELL YOU MULLARD

FIG. 32.—V1 is a signal frequency variable-mu amplifier, and V2 is an intermediate frequency variable-mu amplifier. Note the decoupling of the grid returns through condensers R1, C1, R2, and C2.



The value of the diode rectifier lies in the fact that it will give practically distortionless rectification and at the same time deal with very powerful signals. For superheterodyne work it is almost unrivalled.

A.V.C. can be divided into the following classes: (a) Full or half wave rectification and simple A.V.C.; (b) Half wave rectification and delayed A.V.C.; (c) Quiet A.V.C.; (d) Amplified A.V.C.; (e) Amplified delayed A.V.C.

Quiet A.V.C. is generally obtained with two double diode triodes, and it is only used in very elaborate sets. Accordingly, it is not yet necessary to deal with it fully.

The principle of A.V.C. is the control of the H.F. amplification by bias variations regulated by the incoming signal. This bias is obtained from a voltage produced across a load resistance in the diode rectifier circuit. Fairly large voltages are required, and

accordingly A.V.C. of the simple type must be used with a powerful set.

Much greater control is obtained with amplified A.V.C. Fig. 32 shows the grid returns of what are intended to be the signal frequency and intermediate frequency stages of a set. The grid returns are decoupled through condensers and resistances, R1, C1 and R2, C2, and these leads are taken to the A.V.C. circuits.

The simplest arrangement of A.V.C. is shown in Fig. 33, and this is arranged for use with a pick-up and also a normal earthed ganged condenser. The two diode anodes are joined together and connected through a load resistance R1. The input circuit, which may be the last tuned grid circuit or intermediate transformer, is connected between the diode anodes and earth through an isolating condenser.

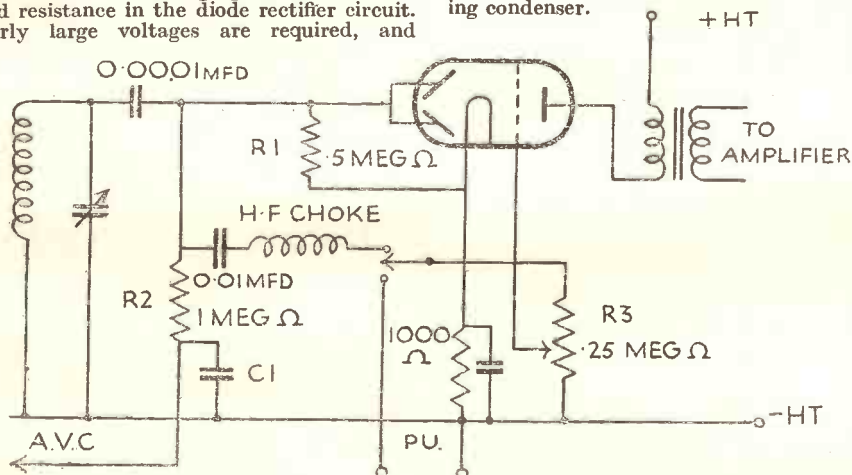


FIG. 33.—The two triode anodes are connected together to give half wave rectification. The resistance R3 serves as a manual volume control, and it is connected for pick-up switching. An ordinary L.F. transformer is in the anode circuit of the double diode triode.

MULLARD THE MASTER VALVE

also shown in the circuit how a radio-gramophone switch may be incorporated. The manual volume control again forms the potentiometer in the grid of the triode portion.

In the case of a small receiver in which the amplification is not very great, amplified volume control is generally used. The basic circuit is seen in Fig. 35.

A portion of the rectified voltage is tapped off across the load resistance and applied to the grid of the triode where it is amplified by this part of the valve. The amplified control voltage is taken from a special resistance network, through a smoothing circuit

in the form of a high resistance composition potentiometer. In so far as the valves themselves are concerned, these can be checked according to the ordinary testing methods described elsewhere. There is no likelihood of any failure on the diode section of the valve.

New Valves.

Apart from the introduction of Class B valves and the release of matched pairs of pentodes for Q.P.P. working, and, of course, the diode rectifiers, mention must be made of modern H.F. pentodes.

The H.F. pentode has now been generally introduced, although it is by no means new,

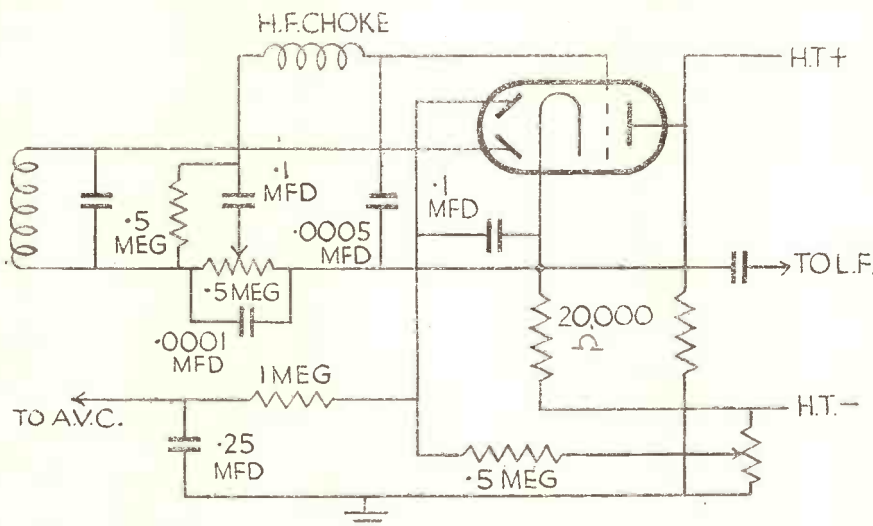


FIG. 36.—A similar arrangement to circuit Fig. 35 in which the second diode anode is biased to give delayed action.

consisting of a condenser and resistance, to the A.V.C. control point. The low-frequency output is taken from the network through a fixed condenser which, of course, goes direct to the grid of the low-frequency amplifier.

Fig. 36 shows a similar circuit in which the delayed effect is utilised. Here it will be seen that one of the diode anodes is given a steady negative bias from a tapping point on the resistance in the main high-tension circuit.

This arrangement is particularly suitable for receivers in which the overall gain is not very great, as in the case of a single intermediate stage superheterodyne. Suitable values for the various resistances are shown, but it should be understood that they depend very largely upon the constants of the valve which is used, and reference should always be made to the manufacturers' data.

Little trouble is likely to be experienced, and the most important point to check is the manual volume control which is generally

and it resembles an ordinary screen grid valve with an extra priming grid. Generally these valves are suitable for replacing existing types in any set. They are not quite so critical on screen grid voltage.

Iron Core Coils.

Use is now being made of iron dust cores for tuning coils. These cores consist of minute insulated particles of iron.

An effective permeability of the order of 3-4 can be obtained on an open core, and a permeability of the order of 10-15 on a closed core. This reduces the number of turns necessary for a given inductance, and the lowering of the copper losses thereby increases the overall efficiency.

Dust core tuning coils can be used in exactly the same way as air core coils, but it is generally best not to use them directly in anode circuits, although this method is permissible. In the case of matched assemblies, it is essential not to displace the coils or cores, as this will upset the ganging.

BRITISH STANDARD WIRE SIZES

BARE COPPER.

S.W.G.	Diam.	Section Area.	Ohms per 1,000 yds.	Length per Ohm.	Weight per 1,000 yds.	Ohms per lb.	Approx. safe current.
	ins.	sq. in.		ins.	ozs.		in amps.
50	.001	.00000079	30,570	1.18	.145	3,365,000	.003
49	.0012	.00000113	21,230	1.7	.209	1,623,000	.005
48	.0016	.00000201	11,941	3.02	.372	513,500	.008
47	.002	.00000314	7,642	4.71	.581	210,300	.012
46	.0024	.00000452	5,807	6.78	.834	101,440	.02
45	.0028	.00000616	3,899	9.24	1.14	54,750	.025
44	.0032	.00000804	2,985	10.77	1.49	32,090	.03
43	.0036	.0000102	2,359	15.26	1.88	20,040	.04
42	.004	.0000126	1,910	18.87	2.32	13,146	.05
41	.0044	.0000152	1,578	22.81	2.81	8,978	.06
40	.0048	.0000181	1,326	27.15	3.35	6,340	.07
				yards.	lbs.		
38	.006	.0000283	849	1.18	.327	2,597	.1
36	.0076	.0000454	529	1.89	.525	1,008	.15
34	.0092	.0000665	361	2.77	.769	469.8	.25
32	.0108	.0000916	262	3.82	1.06	247.4	.4
30	.0124	.000121	199	5.03	1.40	142.35	.5
28	.0148	.000172	139.5	7.18	1.99	70.14	.7
26	.018	.000254	94.3	10.6	2.94	32.08	1.0
24	.022	.000380	63.2	15.8	4.4	14.366	1.5
22	.028	.000616	39	25.6	7.12	5.475	2.5
20	.036	.00102	23.6	42.4	11.8	2.004	4
18	.048	.00181	13.27	75.4	20.9	.634	7
16	.064	.00322	7.46	134.6	37.2	.2	13
14	.08	.00503	4.78	208	58.1	.08216	19
12	.104	.0085	2.83	353	92.8	.02877	28
10	.128	.013	1.87	535	148.8	.012537	35

RESISTANCE WIRES.

Beacon Wire.				Iron Wire.		German Silver.	
Gauge.	Ohms per yd.	Yards per lb.	Current amp.	Ohms. 1,000 ft.	Current.	Ohms. 1,000 ft.	Current.
8	.067	5.5	15.7	2.4	47	6.8	30
9	.083	6.5	13.4	3.1	40	8.7	26
10	.104	8	12.4	3.8	37	11	24
11	.134	9.5	10.9	4.8	33	14	22
12	.159	12	9.5	6.1	28	17.3	19
13	.205	15.5	8.1	7.8	24	21.6	16
14	.270	20	6.7	9.8	20	27.4	13
15	.330	25	5.7	12.2	17	34.7	11
16	.422	31	4.7	15.5	14	44	9
17	.540	41	3.8	19.5	11	55.3	8
18	.750	55	2.9	28	8	77	6
19	1.04	83	2.0	39	6	112	4
20	1.33	100	1.7	48	5	138	3.5
21	1.66	125	1.4	62	4	176	3
22	2.15	164	1.05	79	3	224	2

WITH MULLARD

AT YOUR FINGERTIPS YOU'RE

CERTAIN OF YOUR SALES

STANDARD WIRE TABLES

(For enamelled wire see page 106.)

SINGLE COTTON COVERED.					DOUBLE COTTON COVERED.				
S. W. G.	Total thickness of covering in mils.	Turns per inch.	Turns per sq. inch.	Yards per lb.	S. W. G.	Total thickness of covering in mils.	Turns per inch.	Turns per sq. inch.	Yards per lb.
40	4	112.5	26,600	3,910	40	7/9	78	6,080	3,456
38	4	100	10,000	2,550	38	7/9	71.5	5,110	2,287
36	4	86.2	7,430	1,610	36	7/9	64	4,010	1,477
34	5	70.5	4,970	1,280	34	8/10	55	3,020	1,024
32	5	63.3	4,010	835	32	8/10	50.5	2,550	755
30	5	57.5	3,300	634	30	8/10	47	2,210	587
28	5	50.5	2,550	452	28	8/10	42	1,790	422
26	5	43.5	1,892	311	26	8/10	37	1,400	294
24	5	37	1,369	219	24	8/10	32.3	1,043	203
22	5/6	29.8	888	134	22	9/11	26.3	692	129
20	5/6	24.1	581	81.7	20	9/11	21.7	473	79.4
18	6/7	18.3	335	46.3	18	9/11	17.3	299	45.4
16	7	14.1	198	26.1	16	10/12	13.3	177	25.6
14	7/8	11.4	130	16.9	14	12/14	10.75	115	16.6
12	7/8	9	81	10.3	12	12/14	8.5	72	9.09
10	7/8	7.4	54	6.63	10	12/14	7.1	50.3	6.58

SINGLE SILK COVERED.					DOUBLE SILK COVERED.				
S. W. G.	Total thickness of covering in mils.	Turns per inch.	Turns per sq. inch.	Yards to weight.	S. W. G.	Total thickness of covering in mils.	Turns per inch.	Turns per sq. inch.	Yards to weight.
47	1.2	312	97,300	per oz. 1,375	47	2.2	238	56,600	per oz. 1,190
46	1.2	278	77,300	1,000	46	2.2	217	47,100	871
45	1.2	250	62,500	752	45	2.2	200	40,000	675
44	1.2	227	51,530	599	44	2.2	185	34,200	536
42	1.2	192	36,860	387	42	2.2	161	25,900	358
40	1.3	164	26,900	276	40	2.5	137	18,800	258
38	1.3	137	18,770	per lb. 2,871	38	2.5	118	13,900	per lb. 3,760
36	1.3	112	12,540	1,815	36	2.5	90.1	8,120	1,750
34	1.3	95.2	9,060	1,250	34	2.5	85.5	7,310	1,220
32	1.3	82.6	6,820	912	32	2.5	75.2	5,650	887
30	1.3	73	5,330	695	30	2.5	67.1	4,500	675
28	1.3	62.1	3,860	488	28	2.5	57.8	3,340	478
26	1.3	51.8	2,680	332	26	2.5	48.8	2,380	325
24	1.5	42.5	1,810	222	24	3	40	1,600	218
22	2	33.3	1,090	137	22	3	32.2	1,040	134
20	2	26.3	692	83.3	20	3	25.6	655	82.5
18	2	20	400	46.8	18	3	19.6	334	46.3
16	3	15	222	26.4	16	4	14.7	216	26.1

MULLARD THE MASTER VALVE

B.S.I. SPECIFICATION FOR EBONITE

The specification refers to sheet, rod and tube ebonite, not moulded. It provides for two grades, Grade I. and Grade II.

Composition.—The ebonite shall be composed of good quality raw rubber and sulphur. There shall not be more than 3 per cent. of free sulphur.

The use of "accelerators" and loading materials is no longer prohibited, but excessive proportions of such substances are prevented indirectly by the electrical tests. Consequently, although the composition of the ebonite is no longer specified, compliance with the tests ensures that the material is substantially composed of good-quality raw rubber and sulphur.

The amount of resin or other organic matter extracted by acetone after deduction of the free sulphur shall not exceed 4 per cent. for Grade I. and 8 per cent. for Grade II. The ash left after thorough incineration shall not exceed 2 per cent. for Grade I. and 3 per cent. for Grade II.

The ebonite shall be free from metallic particles.

Density.—The density at 20° C. shall not exceed 1·2 grammes per cubic centimetre for either grade.

Cross-breaking Strength.—When a sample 85 mm. long by 6 mm. square is supported in a clamp extending 20 mm. along its length from one end and it is loaded with weights held in a stirrup 5 mm. from the other end, it shall be able to withstand without fracture and without producing a permanent set exceeding ·25 ins. or 6·4 mm. at the free end, a load of 13·5 lb. (6·12 kg.) for Grade I. and 12 lb. (5·45 kg.) for Grade II. The temperature must be 15° C. to 25° C.

Surface Leakage.—An instrument of the magneto-ohmmeter type, of 1,000 volts and capable of indicating a resistance of not less than 2,000 megohms, shall give a reading greater than 2,000 megohms over the whole of the surface of ebonite sheets, and of rods and tubes where practicable, the instrument being connected to a contact comb with 25 points spaced in a straight line with $\frac{1}{4}$ -in. gaps and arranged with alternative positive and negative points. The points shall be spring mounted to secure good contact.

Electric Strength.—The ebonite shall withstand for one minute the following test voltages:—

Grade I.—2,000 volts per mil (80 k.v. per mm.).

Grade II.—1,250 volts per mil (50 k.v. per mm.).

Power Factor.—The power factor shall not exceed 0·6 per cent. for Grade I. and 0·8 per cent. for Grade II. when tested at a frequency of 800 cycles per second.

Dimensions.—Unless otherwise specified, bulk material shall be supplied in the following sizes only, and the number of pieces shall be that which most nearly gives the weight of the order:—

Sheets—36 in. by 18 in. (91·4 cm. by 45·7 cm.).

Rods and Tubes—1 metre.

STANDARD WIRE TABLES.

ENAMELLED.

S.W.G.	Total thickness of covering in mils.	Turns per inch.	Turns per sq. inch.	Yards to weight.
				per oz.
50	·2	833	694,000	6,480
49	·2	714	510,000	4,510
48	·3	526	277,000	2,540
47	·3	435	189,000	1,630
46	·4	357	127,500	1,128
45	·5	303	91,800	835
44	·5	270	72,900	642
42	·6	217	47,100	411
40	·7	182	33,100	286
				per lb.
38	1·0	143	20,450	2,810
36	1·0	116	13,450	1,840
34	1·0	98	9,600	1,202
32	1·2	83·3	6,940	915
30	1·2	73·5	5,400	694
28	1·6	60·1	3,610	488
26	1·8	50·5	2,550	330
24	2·3	41·1	1,690	221
22	2·5	32·8	1,080	137
20	2·7	25·8	666	83·3
18	2·7	19·7	388	46·9
16	3·5	14·8	219	26·4

MULLARD MEANS BUSINESS

ELECTRICAL FORMULÆ AND DATA

FOR D.C. CIRCUITS.

Ohm's Law.

$$I = \frac{E}{R} \quad E = IR \quad R = \frac{E}{I}$$

Power.

Power (watts) = E.M.F. (volts) × Current (amps.).

FOR A.C. CIRCUITS.

Current in A.C. circuit containing Inductance (L) only:—

$$I = \frac{E}{\omega L}$$

$$\omega = 2\pi f.$$

Current in circuit with Capacity (C) only:—

$$I = \omega CE.$$

Current in circuit containing Resistance, Capacity and Inductance in series:—

$$I = \frac{E}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}}$$

Impedance.

$$\text{Impedance } Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

Reactance.

$$\text{Reactance } X = \left(\omega L - \frac{1}{\omega C}\right)$$

Angle of Lag or Lead.

$$\tan \phi = \frac{\text{Reactance}}{\text{Resistance.}}$$

Admittance.

$$\text{Admittance} = \frac{1}{\text{Impedance.}}$$

Conductance.

$$\text{Conductance} = \frac{1}{\text{Resistance.}}$$

Power.

$$\text{R.M.S. value} = \frac{1}{\sqrt{2}} \times \text{peak value.}$$

In three-phase systems—

Star connection—

Line voltage = $\sqrt{3}$ × phase voltage.

Line current = phase current.

Delta connection—

Line voltage = phase voltage.

Line current = $\sqrt{3}$ × phase current.

With either connection total power is given by $\sqrt{3} E_L I_L \cos \phi$ where E_L = line voltage; I_L = line current and $\cos \phi$ = cosine of angle of phase difference between the coil voltage and the current.

$$\text{Crest Factor} = \frac{\text{Maximum value.}}{\text{R.M.S. value.}}$$

$$\text{Form Factor} = \frac{\text{R.M.S. value}}{\text{Average value.}} = 1.11 \text{ in case of sine wave.}$$

$$\text{Power Factor} = \frac{\text{True Power}}{\text{Apparent Power}} = \frac{EI \cos \phi}{EI}$$

$$\text{True Power} = EI \cos \phi = I^2 R \cos \phi$$

RESISTANCES, CAPACITIES AND INDUCTANCES IN SERIES AND PARALLEL.

Units.	Series Total.	Parallel Total.
Resistances: r_1, r_2, r_3	$R = r_1 + r_2 + r_3$	$R = \frac{1}{\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}}$
Capacities: C_1, C_2, C_3	$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}}$	$C = C_1 + C_2 + C_3$
Inductances: l_1, l_2, l_3	$L = l_1 + l_2 + l_3$	$L = \frac{1}{\frac{1}{l_1} + \frac{1}{l_2} + \frac{1}{l_3}}$

FOR COILS AND CONDENSERS.

Inductance.

In a single-layer coil close wound on a cylindrical former, the inductance is given by:

$$L = n^2 d^2 n^2 / K,$$

where d = diameter of coil in cms.; l = length of coil in cms.; n = number of turns per cm.; K = factor depending on the ratio of diameter to length of coil; L = inductance in micro-henries.

$\frac{d}{l}$.	K.	$\frac{d}{l}$.	K.
0.00	1.000	1.5	0.595
0.10	0.959	2.0	0.526
0.20	0.920	2.5	0.472
0.30	0.884	3.0	0.429
0.40	0.850	4.0	0.365
0.50	0.818	5.0	0.320
0.60	0.788	6.0	0.285
0.70	0.761	7.0	0.258
0.80	0.735	8.0	0.237
0.90	0.711	9.0	0.218
1.00	0.688	10.0	0.203

MULLARD THE MASTER VALVE

ELECTRICAL FORMULÆ.

For a single-layer close-wound coil, the coil of maximum inductance from a length of wire is given by—

$$\frac{\text{Diameter}}{\text{Length}} = 2.4.$$

Capacity.

In a parallel metal plate condenser capacity is given by—

$$C \text{ (cms.)} = \frac{nkA}{4\pi d},$$

where n =number of sheets of dielectric
 k =specific inductive capacity of dielectric with air as unit; A =area of one plate in sq. cms., and d =distance between plates.

Charge held by condenser is Q (coulombs) = C (farads) $\times V$ (volts).

WAVELENGTH AND FREQUENCY.

Radio waves travel at 300 million metres a second.

$$\text{Wavelength} \times \text{Frequency} = \text{Velocity.}$$

$$\frac{\text{Wavelength (metres)}}{\text{Frequency (cycles per sec.)}} = \frac{300 \text{ million}}{}$$

Wavelength (metres).	L.C value (microhenries \times microfarads).
6	.0000101
12	.0000407
20	.000113
30	.000253
60	.00101
100	.00281
250	.0176
300	.0253
333.33	.0313
375	.0396
428.75	.0519
500	.0704
600	.101
750	.158
1,000	.281
1,500	.633
3,000	2.53

FOR OSCILLATORY CIRCUITS.

Wavelength of a circuit LC is given by:—

$$\lambda = 1885\sqrt{LC}$$

where λ is wavelength in metres, L is inductance in microhenries and C is capacity in microfarads.

Resonant frequency of a circuit LC is given by:—

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where f is cycles per second, L is inductance in henries and C is capacity in farads.

When a voltage is applied to a circuit LC, the circulating current

$$I_R \text{ (amps)} = V \sqrt{\frac{C}{L}} \text{ (approx), and}$$

the supply current I (amps) = $V \frac{RC}{L}$

where R is resistance in ohms of the circuit, L is inductance in henries and C is capacity in farads.

The smaller the ratio $\frac{C}{L}$ the greater is the selectivity of a receiver.

The voltage across an inductance or a condenser in a circuit LC is given by:—

$$E_L = E_C = I \sqrt{\frac{L}{C}}$$

where I is current in amperes, L is inductance in henries and C is capacity in farads.

When two circuits $L_1 C_1$ and $L_2 C_2$, tuned to the same frequency, are coupled together, the co-efficient of coupling is given by:—

$$k = \frac{M}{\sqrt{L_1 L_2}}$$

where M = coefficient of mutual induction.

Both circuits coupled together radiate two frequencies given by:—

$$f_1 = f \times \frac{1}{\sqrt{1+k}} \text{ and}$$

$$f_2 = f \times \frac{1}{\sqrt{1-k}}$$

when f is the natural frequency of the two circuits.

With inductance coupling between two circuits is used, the coefficient of coupling is

$$k = \frac{L_M}{\sqrt{L_1 L_2}}$$

With capacity coupling the coefficient is

$$k = \frac{\sqrt{C_1 C_2}}{C}$$

Magnetic Equivalent of Ohm's Law.

$$\text{Magnetic Flux} = \frac{\text{Magneto-motive Force}}{\text{Reluctance}}$$

$$\text{i.e. } \phi = \frac{\text{M.M.F.}}{S}$$

M.M.F. = $0.4\pi NI$, where N = number of turns on solenoid, and I = current in amperes.

Flux Density and Permeability of Iron.

$$\text{Permeability} = \frac{\text{Flux Density}}{\text{Magnetising force}}$$

$$\text{i.e. } \mu = \frac{B}{H}$$

Energy Stored in Magnetic Field.

Stored energy = $\frac{1}{2} LI^2$ where L = induc-

tance of circuit in henries and *I* the steady current in amperes.

Building Up and Decay of Direct Current.

When an E.M.F. of *E* volts is applied to a circuit having resistance *R* ohms and inductance *L* henries, the instantaneous current is given by :—

$$i = \frac{E}{R} \left(1 - e^{-\frac{Rt}{L}} \right)$$

where *t* is time in seconds. The ratio $\frac{L}{R}$ is called the “time constant.”

Where the source of E.M.F. is removed the instantaneous current is given by :—

$$i = I e^{-\frac{Rt}{L}}$$

where *I* is the initial value of the current.

DIELECTRIC STRENGTHS.

Material.	Volts per mm.
Glass	8,000
Paraffin	12,000
Micanite	40,000
Ebonite	80,000
Porcelain	10,000
Empire Cloth	10,000
Presspahn	5,000

Two sharp points in air 10 inches apart will flash over at about 100,000 volts.

Quantities of Water and Acid to be added to produce required specific gravity.

Using 1.400 acid.

Required Specific Gravity.	Water Parts by Volume.	Acid Parts by Volume.
1.300	4.5	10
1.280	5.5	10
1.275	6.25	10
1.260	6.5	10
1.250	6.75	10

1.835 acid.

1.400	15.6	10
1.350	19.5	10
1.300	24.7	10
1.290	26.0	10
1.280	27.5	10
1.270	29.0	10
1.260	30.0	10
1.250	32.2	10
1.240	34.0	10
1.230	36.0	10
1.225	37.2	10

COMPARATIVE RESISTANCES.

Resistances of materials taking that of copper as unit.

Aluminium	1.6
Brass	4.4
Concondin	60
Constantin	30
Eureka	29
German Silver	13
Gold " "	18.
Iron	1.5
" " " "	6.2
Kruppin	7.4
Manganese Copper	52.6
Manganin	62
Mercury	26
Neusilber	59
Nichrome	23
Nickel	55
Nickel Steel	4.4
" " " "	18
Nickeline	46.5
" " " "	20
Phosphor Bronze	27
Platinoid	4.4
" " " "	20
Platinum	31
Rheostan	6.3
" " " "	30
Silicon Bronze	62
Silver	1.5
Steel ... ..	.94
" " " "	12

EQUIVALENT TEMPERATURES.

$$F = \frac{9}{5}C + 32$$

$$C = \frac{5}{9}(F - 32)$$

F = Fahrenheit scale.

C = Centigrade scale.

CALCULATION OF RESISTANCE OF WIRE.

$$R = \frac{l\rho}{\frac{\pi}{4}d^2}$$

where

R = resistance

l = length of wire

ρ = resistivity

d = diameter

Sectional area of a wire = $.7854 d^2$

where *d* = diameter

WORKSHOP HINTS

by *The Broadcaster Technical Staff*

Altering Ebonite Panels.

Modifications to early types of sets with large ebonite panels frequently necessitate moving components and fitting new ones. This leaves a number of ugly holes, and very frequently a panel is discarded because of this fact.

Holes can be filled almost invisibly with ordinary black cobblers heel ball.

To fill a hole, the panel should be placed on a flat table with the front uppermost. The wax should then be melted into the hole by holding a hot rod against the stick of wax, taking care that the rod is not too hot or the wax will be burnt. Rather more than is required should be used, as the wax tends to set with a slight dell. When it is perfectly hard, the surplus wax can be shaved away with an old safety razor blade drawn backwards across the panel so as not to risk scratching the surface. A final polish with a slightly oily rag is all that is required.

Renovating the Interior of Sets.

When any repairs have been done to the interior of a set, it always pays to make it look as clean as possible. Every trace of flux should be carefully removed from any freshly soldered joints.

It is also most important to remove all traces of dust, since this gives the set an exceptionally businesslike appearance. This can only be done satisfactorily by blowing out. A vacuum cleaner arranged for blowing with a small nozzle is the best arrangement. Satisfactory results can be obtained from a motor car foot pump with the aid of an assistant. The set should be blown out in one direction only, working from one side to the other.

Paint for the Interior of Receivers.

If many alterations have been carried out to a set, or if it has been completely re-built, the wooden base board and the interior of the cabinet can be greatly improved in appearance if the wood is given a thin coat of quick drying dead black paint.

One of the best paints to use is known as "Drop Black," ground in gold size. It dries very quickly with a dull matt surface. Another paint which gives a neat appearance is aluminium. This is more expensive and it must be remembered is a conductor.

Metal cases of transformers and similar components which may have become dirty or chipped with age can be brightened up by

using a thin coat of one of the well-known proprietary celluloid enamels. This should be applied quickly and liberally working in one direction only, no attempt being made to lay it off, as is done in ordinary painting or varnishing.

Repolishing Cabinets.

When a set is sent in for overhaul or repair, it is always a good plan to repolish the cabinet.

A qualified French polisher will quickly run over a cabinet for quite a small sum. If the work, however, is undertaken by a wireless service man, a little practice is necessary. The golden rule in French polishing is to use only polish of the finest quality, using it sparingly, and rubbing evenly and rapidly.

Drilling Glass Panels.

Dealers are frequently asked to make holes in glass panels for lead-in wires or lead-in tubes.

Many methods of drilling glass have been suggested, but that by which a special drill consisting of a short length of copper tube, is used gives the best results. The end of the copper tube is notched with a triangular file, and cutting is carried out by an abrasive compound such as carborundum powder, preferably moistened with water or turpentine.

The secret of success lies in using only a very light pressure on the drill. Any attempt to force the drill or press hard upon the glass will prevent proper cutting action taking place.

In order to prevent the drill from wandering to begin with, it is preferable to arrange some centering arrangement. This is best done by finding a short length of rod over which the tube will slide easily. The rod is held firmly in position on the glass with one hand, while the tube is rotated about the rod with the fingers of the other hand.

As soon as the tube has begun to make a sort of channel or notch in the glass, drilling can be carried out very rapidly by mounting the copper tube in an ordinary hand drill.

There should not be the slightest possibility of cracking the glass if these precautions are rigidly adhered to.

Universal Cement.

Cement which is suitable for almost any purpose can be made from a celluloid basis.

Scrap celluloid should be cut into small shreds and placed in a fairly wide neck

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bottle. The celluloid can be dissolved in amyl acetate or acetone. If acetone is used, the cement will dry very quickly, but, at the same time, it is more liable to dry up when not in use. Acetone and amyl acetate may be mixed together, when an intermediate drying time is obtained. Many people prefer a 50 per cent. mixture.

The solvents should be poured on to the scrap celluloid so that only a small layer of the liquid is left above the celluloid. The solution should be of a treacly consistency. In mixing the cement, it should be remembered that the solvent is highly inflammable, and evaporates more easily than petrol.

Mending Celluloid Accumulator Cases.

Celluloid accumulator cases can be easily mended with celluloid cement. Before carrying out any repairs, however, the accumulator should be completely emptied, so that any acid tends to drain away from the cracks. It is preferable to enlarge the crack by drawing the tip of a triangular file along the edge. It should then be filled with very thick celluloid cement and allowed to dry thoroughly, leaving it overnight if possible before refilling the cell with acid.

A very big crack should be patched with a thin sheet of celluloid. The crack should first be filled in the manner previously described, and before putting on the patch any cement which projects above the surface of the case should be scraped level. The patch should then be placed in position and cemented neatly round the edges.

The object of the patch is really to reinforce the side of the case, and a case repaired in this manner will be found to be really quite strong.

Extending the Range of a Voltmeter.

A good quality voltmeter consists of a moving coil connected in series with a resistance mounted inside the voltmeter case. A low reading voltmeter has only a small resistance, while a high reading voltmeter has a much larger resistance.

To increase the range of a voltmeter, it is only necessary to connect it in series with an additional resistance. The easiest plan is to arrange the resistance so that the voltmeter reads to double, treble, or perhaps four times its original reading. For example, if we wish to make a 100 volt voltmeter read to 200 volts, it is only necessary to connect it in series with a resistance of substantially the same value as that of the instrument itself.

To do this, the voltmeter should be connected to a high tension battery so that exactly 100 volts are recorded. The meter should then be connected in series with a resistance, the value of which is adjusted

till the meter reads 50 volts. After this, the meter and resistance can be used to read up to 200 volts, it being necessary, of course, to double the reading.

Extending the Range of an Ammeter or Milliammeter.

The moving coil of an ammeter or milliammeter is never connected directly in circuit. It is always shunted by an accurately determined resistance. The range of a meter which measures currents can easily be extended by providing it with an external shunt. This is simply a low value resistance connected in parallel with the terminals of the meter.

In order to make, for example, a doubling shunt so that a meter reads double its normal range, it should be connected with a battery and variable resistance which is altered until a full scale deflection is obtained. A short length of resistance wire capable of carrying the full current to be dealt with should be connected to one terminal and the wire tapped on to the other terminal at odd points so that the meter reads somewhere near half value.

To obtain a correct reading, it is important that a perfect contact over a large area is obtained between the shunt and the normal meter terminals. It is preferable to obtain two heavy spade terminals connected to a strip of ebonite, the resistance wire being soldered to tags.

Final adjustment of the value can be obtained by altering the exact position of soldering, when the approximate amount of wire has been determined.

Cone Mounting.

Many diaphragms are held on a circular rim of flexible material such as linen, rubberised tape, or thin leather.

A satisfactory and extremely rapid method of mounting a cone is to rest the edge against a layer of felt or cotton wool, both of which can be obtained in strip or tubular formation. It is only necessary to cut off a length of this material and stick it to a baffle board. If the cone is of doped or similar paper material, this may be attached to the cotton wool in a similar manner.

Making Cone Diaphragms.

Excellent diaphragms can be made from ordinary cartridge paper providing it is not too thick and heavy. The radial seam can be stuck with liquid glue, while the paper should be waterproofed by doping.

The dope can be made similar to celluloid cement, using a greater proportion of solvent. Too much should not be applied, a quantity sufficient to close the interstices in the surface being all that is required. The dope is best applied with a brush, working circularly from the centre outwards.

MULLARD THE MASTER VALVE

WORKSHOP HINTS

Universal Flux.

On no account should acid flux be used for soldering anywhere in a wireless set. Undoubtedly the best flux to use from an electrical point of view is ordinary resin. The resin should not be dissolved or made into a paste, but should be used as obtained.

It should be remembered that when using resin as a flux, the metal should be perfectly clean as the solder does not tend to run as well as it does with some liquid preparations.

Temporary Soldered Connections.

A satisfactory makeshift soldered joint can be carried out with medium gauge wires in the following manner. The wires should be scraped perfectly clean, and twisted together. They should then be wrapped several times with a strip of tin foil, which can be melted into the joint by holding the twisted wires over two or three matches which are held together and simultaneously lighted. No flux is used. The joint should, of course, be replaced by a proper one at the earliest possible moment.

Joining Fine Wires.

When re-winding a pick-up or speaker bobbin, great care should be taken in making connection to the fine wire. Intermediate size wire is joined to the end of the fine wire, and it is bound firmly into position, the intermediate wire being brought out to the terminals or tags.

The joint between the two wires should not be soldered, but welded.

This welded joint can very easily be made by twisting the ends of the fine wire round the end of the intermediate wire. There is no necessity to remove the enamel insulation from the fine wire. The ends of the twisted wire should then be held in a small spirit lamp or gas flame, when it will be seen that the points of the wire fuse together forming a little globule of molten metal.

This joint has the advantage of eliminating any possibility of corrosion, or of nicking the fine wire should an attempt be made to scrape off the enamel.

Stopping Valve Ring.

Some valves are very microphonic, and the only way to stop the ringing is to prevent the sound from the speaker falling on to the valve, or alternatively, to damp the valve. The best material to use is cotton wool, which should be packed round the valve.

Sometimes quite a small amount of damping is all that is required, and a piece of soft plastic wax or modelling wax simply struck on to the glass valve will completely stop the ringing.

Protecting Earth Connections.

Connections to an earth plate or tube should be provided with a hermetically sealed protection. If this is not done, corrosion will occur, particularly in the case of a connection which is permanently under the ground. When the metals employed are different, such, for example, as a copper wire connected to a galvanised tube, then the chance of corrosion is increased tremendously. Provided a joint only soldered with a non-acid flux is well covered, it will last for a long time.

Any fairly flexible form of plastic matter such as a bituminous compound is suitable. Wax and pitch should not be employed, as these will probably break and crack. If no compound is available, several coats of heavy thick paint or thick celluloid cement form a very good substitute.

Fixing Coil Covering.

Sometimes a protective layer of silk, paper, or similar material over a winding of a transformer or other type of coil becomes loose. It can readily be fixed in position again with a very small spot of Chattertons compound, or similar cement which requires heating.

When Bias Resisters Break.

Next time a fault occurs in a mains set suspect the automatic bias resisters. Often one has a vague idea that if anything was wrong in that direction the valve concerned would saturate and indicate the state of affairs by becoming extremely hot.

It is not so. When a bias resister breaks the cathode is no longer connected in the circuit, and consequently no anode current passes.

With power valves this itself is a pointer to the trouble, because the valve remains cooler than it should be. But with low consumption valves, screen-grid types for example, this doesn't apply.

The only real danger with automatic bias is that of the resistance changing in value to such a degree as to considerably underbias the valve.

Adjusting Trimmers.

Trimmers should always be adjusted at the bottom end of the condenser scale, preferably on a station which is just audible.

Usually, alteration of trimming capacity is effected by the variation of a star-shaped rotor connected on the main condenser housing. This adjustment should always be carried out by means of a long piece of insulating material such as ebonite.

When trimming, the main tuning condenser should also be varied slightly until maximum signal strength is obtained.

Having trimmed the condenser, it may be found that the trimmers are nearly fully in. This should be corrected by reducing each in

CUSTOM SAYS MULLARD

turn, again using the main condenser while so doing.

Minimum trimmer capacity should always be used, for the following reasons.

Wider Tuning Range.

The maximum trimmer capacity is generally several times the minimum of the main condenser. Thus the effective minimum with a fully inserted trimmer is high, giving a high minimum wavelength on the condenser.

Trimmers usually have a far higher dielectric loss than the main condenser, and so again it is advisable for them to be as far out as possible.

When trimming at the bottom of the scale, remember that the trimmer capacity may be higher than the tuning capacity, therefore trim very slowly. After trimming, do not change the aerial connection or the circuits will be thrown out of tune.

Reading a Distortion Meter.

When a milliammeter is connected in the anode circuit of a low-frequency valve it should be steady all the time signals are being received.

If it kicks upward or downward the valve is not properly biased and distortion is occurring.

Kicks upward indicate that the bias should be reduced. Downward jerks mean that the grid is not negative enough.

If the pointer flickers both ways the valve is simply overloaded, and both anode and grid voltages must be increased if permissible or a larger valve fitted.

Sometimes when the speaker rattles and it sounds as if the armature is hitting the pole pieces the real trouble is overloading of the output valve.

Misleading Measurements.

When conducting rapid tests with an inexpensive moving-iron meter, never forget that it consumes an appreciable amount of current. At full scale deflection this can be as much as 50 milliamps.

If an attempt to measure an anode voltage is made, the current taken by the meter will cause a large voltage drop across components in the anode circuit, and a totally misleading value will be read off.

High-Frequency Hum.

There is a special sort of hum which is often troublesome with A.C. sets.

It only becomes really noticeable when a carrier wave is tuned in.

Actually, it is due to high-frequency currents, and it can almost invariably be cured by connecting a small condenser between the negative of the set and one side of the input of the mains transformer.

How to Connect a Speaker.

There are right and wrong ways of connecting a speaker to a set which has no output circuit.

In a single-acting reed speaker, the reed is permanently attracted to the pole, which carries a winding. The anode current of the last valve passes through this winding and increases or decreases the attraction according to the direction in which it flows.

It is essential for the current to flow so that it increases the attraction.

The speaker should be temporarily connected in circuit and the adjustment moved until the armature is just beginning to hit the pole piece when signals are coming through. The leads should then be reversed. The result will be that the armature is either touching or completely clearing the pole.

If the former is the case the second connection is right, and if the latter occurs the original connection was correct.

Installing Receivers.

Customers often require their sets to be installed in some position necessitating long mains, aerial or earth leads.

It is always wisest to take these wires round the wainscoting even if carpets offer a shorter and apparently safer route. This applies particularly to mains wires.

In the latter case, if a short circuit occurs—as it well might through wear or the driving through it of, for example, a drugget pin—fire may easily result.

Sometimes aerial and earth leads can be brought into a house very neatly by passing them through an air brick or ventilation grating and up through a couple of neat holes in a floor board just inside the wall.

Frequently it will be found most convenient to take leads from one room to another via the outside walls. The windows are used for both exit and entry, of course, and shielded cable is employed outside the house.

Correct Decoupling Values.

For correct decoupling, the stopping resistance should be high compared with the reactance of the by-pass condenser at the lowest frequencies.

Here are the theoretical condenser values required by various resistances:—5,000 ohms, 7.5 mfd.; 10,000, 4 mfd.; 15,000, 2.5 mfd.; 20,000, 2 mfd.; 25,000, 1.5 mfd.; 30,000, 1.3 mfd.; 35,000, 1 mfd.; 40,000, .95 mfd.; 45,000, .85 mfd.; 50,000, .8 mfd.

It should always be made certain that decoupling resistances can carry the current and that the condensers can withstand the maximum available voltage.

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Carlin ... 250A	Cheadle ... 230A	Clayton (Yorks.) ... 230A	Coombe ... 220A	Crossgates ... 250A
Carlin How ... 250A	(Cheshire) ... 230A	Clayton-le-Dale ... 230A	Copford Green ... 230A	Crosshall ... 240A
(Barnsley) ... 230A	Cheadle Hulme ... 230A	Clayton-le-Moors ... 230A	Copgrove ... 230A	Crosshouse ... 240A
Carlton (Beds.) ... 230A	Cheam ... 200A	Clayton West ... 230A	Cople ... 230A	Crosskeys ... 230A
Carlton (Notts.) ... 230A	Chearsley ... 220A	Cleaton ... 250A	Copmanthorpe ... 230A	Croston ... 230A
Carlton (Yeadon) ... 230A	Cheesey ... 230A	Cleator Moor ... 230A	Copbridge ... 250A	Croughton ... 230A
Carlton Colville ... 230A	Cheddleton ... 230A	Cleekheaton ... 230A	Corby ... 230A	Crowborough ... 230A
Carlton-in- ... 250A	Chefeld ... 230A	Cleethorpes ... 230A	Cornelly ... 230A	Crowhurst ... 200A
Cleveland ... 250A	Chellaston ... 205A	Cleland ... 230A	Cornforth ... 250A	Crowland ... 230A
Carlton-in- ... 230A	Chellington ... 230A	Cliddesden ... 230A	Cornforth (Old) ... 250A	Crown ... 220A
Lindrick ... 230A	Chelsea ... 200C	Cliff ... 250A	Cornforth (West) ... 250A	Croxdale ... 250A
Carlton Miniott ... 230A	230A	Clifford ... 230A	Corpusty ... 220C	Croxton ... 240A
Carluke ... 230A	Cheltenham ... 220A	Clifton (Lanes.) ... 230A	230A	230C
Carlony Bay ... 230A	Chenies ... 230A	Clifton (Staffs.) ... 250A	Corsham ... 230A	Croydon ... 230A
Carmarthen ... 220C	Chepstow ... 230A	Clifton (Yorks.) ... 230A	Corton ... 200A	230A
Carmunnoek ... 230A	Cheriton ... 210C	Clifton Reynes ... 230A	Coseley ... 200A	Crumlin ... 250C
Carmyle ... 230A	210A	Climping ... 230A	Cosgrove ... 230A	Cuddington ... 200A
Carnwadic ... 230A	Cherry Hinton ... 240A	Clint ... 200A	Cotessey ... 230A	Cuddington
Carnwath ... 230A	200A	Clippesby ... 200A	220C	(Bucks) ... 220A
Carrville ... 250A	Chertsey ... 200A	Clipston ... 230A	Cotebrook ... 220A	Cuddington
Carshalton ... 220A	Chesham ... 200A	Clitheroe ... 230A	Cotherstone ... 250A	(Cheshire) ... 220A
Carstairs ... 230A	Chesham Bois ... 200A	Clive ... 220A	Coton ... 200A	Cudworth ... 230A
Carstairs ... 230A	Cheshunt ... 240A	Cliphill ... 230A	Coton-in-the- ... 230A	Cuedale ... 230A
Junction ... 230A	Chesil ... 230A	Clotton Hoofield ... 230A	Elms ... 200A	Cuffley ... 250A
Carthorpe ... 230A	Chessington ... 230A	Claughton ... 230A	Cottam ... 230A	Cuffley ... 240A
Cartmel ... 230A	240C	Clydach ... 230A	Cottenham ... 240A	Culcabocoh ... 240C
Castle Bromwich ... 230A	Chester ... 230A	Clydebank ... 230A	Cottesbrook ... 230A	Cullercoats ... 240A
Castle Gresley ... 200A	230C	Coal ... 200A	Cottingham ... 230A	Cullingworth ... 230A
Castleford ... 230A	Chester-le-Street ... 250A	Coalton of ... 250A	Cottingley ... 230A	Cullumpton ... 230A
Castleiside ... 250A	Chesterfield ... 240A	Balgionie ... 230A	Cotton Abbots ... 230A	Culmstock ... 230A
Castlethorpe ... 230A	240C	Coalton of ... 230A	Cotton Edmunds ... 230A	Culworth ... 230A
Castleton ... 230A	Chesterton ... 240A	Wemyss ... 250A	Cotton End ... 230A	Cunmor ... 230A
Castletown ... 250A	Cheswardine ... 230A	Coberley ... 210A	Coundon ... 250A	Cupar ... 250A
Castor ... 230A	Chevely Park ... 240A	Cobham ... 230A	Cowbit ... 230A	Currie ... 230A
Catcliffe ... 230A	Chevington Drift ... 250A	Cockenzie ... 230A	Cowdenheath ... 250A	Custom House ... 200A
Catfield ... 220C	Chichester ... 230A	Cockfield ... 250A	Cowes ... 240A	Cwm ... 240A
230A	Chickell ... 230A	Codcote ... 240A	Cowley (Devon) ... 230A	Cwmbran ... 230A
Catheart ... 230A	Chiddingstone ... 220A	Codsall ... 250A	Cowley (Glouc.) ... 210A	Cwmfelfinch ... 230A
Caton ... 230A	Chilcote ... 250A	Cod Talon ... 230A	Cowley (Middx.) ... 200A	Cwmllynfelf ... 220A
Catrine ... 240A	Chilton (Bucks) ... 220A	Cofon ... 200A	Cowling ... 230A	Cwmrtwrch ... 220C
Catsfield ... 200A	Chilton ... 230A	Cogenhoe ... 230A	Cowpen ... 250A	240C
Cattawade ... 230A	(Durham) ... 250A	Cogshall ... 220A	Coxheath ... 230A	
Catwicker ... 230A	Chingford ... 240A	Colburn Lodge ... 230A	Coxhoe ... 250A	
Catton ... 220C	Chinley ... 230A	Estate ... 230A	Crowld ... 230A	Dacre ... 230A
230A	Chinnor ... 230A	Colchester ... 230A	Craddock ... 230A	Daddy Shields ... 250A
Catwick ... 230A	Chippenhams ... 230A	210C	Craigendoran ... 230A	Dalbeattie ... 100C
Caughall ... 230A	Chipping ... 230A	Cold Ashby ... 230A	Cranebrook ... 240A	230C
Caverswall ... 230A	Sodbury ... 230A	Cold Heseldon ... 250A	(Kent) ... 230A	Dalilongart ... 230A
Cawsand ... 230A	Chiswell Green ... 240A	Coldfair Green ... 230A	Cranfield ... 230A	Dalkeith ... 230A
Cawston ... 220C	Chiswick ... 220C	Cole ... 230A	Cranford ... 200A	Dalmellington ... 240A
230A	220C	Cole Green ... 240A	230A	Dalmuir ... 230A
Cawthorne ... 230A	Chisworth ... 230A	Coleford ... 230A	Cranford St. ... 230A	Dairy ... 100C
Caxton ... 240A	Chittering ... 240A	Coleshill (Bucks.) ... 200A	Andrew ... 230A	100C
Cayton ... 230A	Chobham ... 200A	Coleshill ... 230A	Cranford St. John ... 230A	Dalrymple ... 240A
Cefn Coed ... 230C	Cholesbury ... 220A	(Warwick) ... 230A	Cranleigh(Surrey) ... 230A	Dalton (Lanes.) ... 230A
Cefn Cribbwr ... 230A	Chollerford ... 250A	Colinburg ... 250A	Crawbrook ... 250A	Dalton-in-Fr'ness ... 220A
Cefn Fforest ... 230A	Choppington ... 250A	Colliers Green ... 200A	Crawley ... 230A	Dalton-le-Dale ... 250A
Cefn-y-Redd ... 230A	Chorley ... 230A	Collingham ... 230A	240C	Dane End ... 240A
Cellarhead ... 230A	Chorlton ... 230A	Collingtree ... 210A	Crawleyside ... 250A	Danesbury ... 240A
Chadderton ... 230A	Chowley ... 230A	Colne ... 230A	Crayke ... 230A	Daresbury ... 250A
Chaddesden ... 205A	Christchurch ... 250C	240C	Creaton ... 210A	Darfield ... 230A
Chadwell Heath ... 230A	Christleton ... 230A	Coltishall ... 220C	Crediton ... 230A	Darlington ... 200A
230C	Chryston ... 230A	230A	Creigiau ... 250A	Darley ... 230A
Chalfont St. Giles ... 200A	Church ... 230A	Colton ... 230A	Crewe ... 230A	Darley Abbey ... 205A
Chalfont St. Peter ... 200A	Church ... 230A	Colwich ... 230A	230C	Darlington ... 230A
Chapel ... 230A	Brampton ... 210A	Colwick ... 230A	Crewkerne ... 230A	230C
Chapel Brampton ... 210A	Church Fenton ... 230A	Colwyn Bay ... 230A	Crick ... 230A	Darrington ... 230A
Chapel Charlton ... 230A	Church Gresley ... 200A	220C	Crigglestone ... 230A	Dartford ... 230A
Chapelhall ... 230A	Church Hill ... 250A	Colyford ... 250C	Cringford ... 220C	230C
Chard ... 230A	Churchdown ... 230A	Combe Down ... 230A	230A	Darton ... 230A
Chardstock ... 230A	Churchtown ... 230A	Combe St. ... 230A	Cripps Corner ... 200A	Darvel ... 240A
Charfield ... 230A	Churston ... 220C	Nicholas ... 230A	Croft ... 230A	Darwen ... 230A
Charing ... 230A	Churton ... 230A	Combe-in-Teign- ... 230A	Croftfoot ... 230A	230C
Charlcombe ... 230A	Churton-by- ... 230A	head ... 230A	(Cathcart) ... 230A	Datchet ... 230A
Charlesworth ... 230A	Farndon ... 230A	Comberbach ... 220A	Crofton ... 230A	Datchworth ... 240A
Charlton ... 230A	Cinderford ... 230A	Compton ... 230A	Cromaron ... 100C	Davenham ... 220A

MULLARD THE MASTER VALVE

Frodsham	250A	Gloucester	230A	Great Torrington	230A	Halton	230A	Hathern	230A
Lordship	230A	220C	220C	Great Usworth	250A	(Lancaster)	230A	Hatton	250A
Frome	230A	230A	230A	Great Warford	230A	Halfwhistle	250A	Haughton	230A
240C		230A	230A	Great Weldon	230A	Halvergate	200A	Haunton	250A
Fronthingham	230A	230A	230A	Great Wilbraham	240A	Ham	230A	Hauxley	250A
Frosterley	250A	240A	240A	Great	220C	Ham and Stone	230A	Havant	230A
Fulbourn	240A	230A	230A	Witchingham	230A	Hambledon	230A	Havercroft-with	
Fulbrook	110C	230A	230A	Great Witcombe	210A	Hampfallow	230A	Cold-Hiendley	230A
Fulford	230A	230A	230A	Great Wyton	230A	Hamilton	230A	Haverfordwest	230A
Fulham	200A	230A	230A	Great Wymondley	230A		240C	Haverig	230A
Fulmer	200A	230A	230A	Great Yarmouth	200A	Hammersmith	110A	Haverigland	220C
Fulneck	220A	230A	230A	Great	250A		230A		230A
Fulwell	220A	230A	230A	Green	230A	Hammerwich	250A	Haverthwaite	230A
250A		230A	230A	Hammerton	230A	Hammond's End		Haverton Hill	250A
Fulwood	230A	230A	230A	Green Street	240A	Farm	240A	Hawarden	230A
Fundenhall	230A	230A	230A	Greenfield	230A	Hampth Bridge	250A	Hawes	230A
220C		230A	230A	Greenfield	200A	Hampstead	105A	Hawkhurst	230A
Furness Vale	230A	230A	230A	Greenfair	230A		210A	Hawksworth	230A
Furneux Pelham	240A	230A	230A	Greenock	250A	Hampthwaite	200A	Hawridge	230A
		230A	230A	Greenodd	230A	Hampton	230A	Hawthorne	250A
Gaddesden Row	230A	230A	230A	Greens Norton	230A		240A	Haxby	230A
Gainsborough	230A	230A	230A	Greenside	250A	Hampton-in-		Haydock	230A
Galashiels	250A	230A	230A	Greenland	230A	Arden	230A	Haydon Bridge	250A
Galleywood	230A	230A	230A	Grendon (North-	230A	Hampton Wick	230A	Hayes	200A
Gallows Green	230A	230A	230A	ampton)	230A		240A	Hayfield	230A
Galston	240A	230A	230A	Grendon (Staffs.)	230A	Hanbury	200A	Hayle	240A
Gamston (Notts)	230A	230A	230A	Gressenhall	230A	Handforth (Ches.)	230A	Hayling Island	230A
Gardner Street	230A	230A	230A		220C	Handforth		Haynes	230A
Garfthorpe	230A	230A	230A	Grewelthorpe	230A	(Manchester)	230A	Hazlemere	210C
Gargrave	230A	230A	230A	Grimsbury	230A	Handsacre	230A	Headley	230A
Garnant	230A	230A	230A	Grimston	230A	Hanham Abbots	230A	Heald Green	230A
Garnkirk	230A	230A	230A	Grimsby	230A	Hanslope	230A	Healing	230A
Garrald	230A	230A	230A	Grindleton	230A	Hanwell	230A	Hearon	250A
Garstang	230A	230A	230A	Grindon	250A	Hanworth	200A	Heathfield	230A
Gartcosh	230A	230A	230A	Gristhorpe	230A		230A	Heaton-with-	
Garth	230A	230A	230A	Groombridge	220A	Happisburgh	220C	Oxcliffe	230A
Garw	230A	230A	230A	Grotton	230A		230A	Hebburn	250A
Gate Halmesley	230A	230A	230A	Groundsowl	230A	Hapsford	250A	Hebden Bridge	230A
Gatehouse	100C	230C	230C	Grove	230A	Hapton	230A	Hebers	230A
	240C	240C	240C	Guestwick	220C	Harden	230A	Heckingham	200A
Gateshead	250A	240A	240A		230A	Hardingham	220C	Heckmondwike	230C
	230A	230A	230A	Guide Post	250A		230A	Heddon-on-the-	
Gateley	230A	230A	230A	Guilden Sutton	230A	Hardingstone	210A	Wall	250A
Gattonside	250A	230A	230A	Guldford	230A	Hardwick	220A	Hedenham	200A
Gawcott	230A	230A	230A	Guldborough	210A	Hare Street	220A	Hednesford	230A
Gawsworth	230A	230A	230A	Gulseley	230A	Harefield	200A	Heighington	250A
Gayle	230A	230A	230A	Guist	220C	Harewood	230A	Hele	230A
Gayton	230A	230A	230A		230A	Harlaston	250A	Helensburgh	230A
Gaywood	230A	230A	230A	Gullane	230A	Harlington	230A	Hellesdon	220C
Geddington	240A	230A	230A	Gunthwaite	230A		200A		230A
Gedgrave	230A	230A	230A	Guntton (Norfolk)	230A	Harlow	240A	Hellidon	230A
Gedling	230A	230A	230A	Gurnard	240A	Harmer Green	210A	Hellingley	230A
Gedney	230A	230A	230A	Gustard Wood	240A	Harmondsworth	200A	Helmton	230A
Gedleston	200A	230A	230A	Gwauncaegurwen	220A		230A	Helmington Row	250A
Gellygaer	230A	230A	230A	Gwray	230A	Harpenden	240A	Helmshore	230A
Gerrard's Cross	200A	230A	230A		230A	Harport	230A	Helmsey	230A
Giffnock	230A	230A	230A	Habergham Eaves	230A	Harpole	210A	Helby	250A
Gifford	230A	230A	230A		220C	Harrogate	200A	Helston	240A
Gildersome	230A	230A	230A	Haberton	230A	Harrold	230A	Hemblington	220C
Gilegate Moor	250A	230A	230A	Habrough	230A	Harrow	230C		230A
Gilfach	230A	230A	230A	Hackbridge	200A	Harrow Weald	240A	Hemel	240A
Gilling	230A	230A	230A	Hackleton	230A	Harrowden Great	230A	Hempstead	240A
Gillingham	230A	230A	230A	Hackney	230A	Harsham	220C	Hemingford	230A
All Saints	200A	230A	230A		240C		230A	Abbots	240A
Gillingham	230A	230A	230A	Haddenham	220A	Harston	240A	Hemingford Grey	240A
St. Mary	200A	230A	230A	Haddington	230A	Hartfield	230A	Hemlington	250A
Gilsland	230A	230A	230A	Haddiscoe	200A	Hartford (Ches.)	220A	Hempnall	220C
Gilthead	230A	230A	230A	Hadlow	220A	Hartford (Hunts)	240A		230A
Girton	200A	230A	230A	Hadlow Down	230A	Harthill	230A	Hempstead	230A
Girvan	240A	230A	230A	Hafodryns	250C	Harthill-with-		(Kent)	230A
Gisburn	230A	230A	230A	Hailsham	230A	Woodall	230A	Hempsted	230A
Gladsmuir	230A	230A	230A	Hainford	220C	Hartlepool	240C	Hemby	200A
Glaish	230A	230A	230A	Hairmyres	230A		240C	Hemsworth	230A
Glan Conway	230A	230A	230A	Halbeath	250A	Hartley	230A	Hemycok	230A
Glanamman	230A	230A	230A	Hale (Liverpool)	230C	Harton	250A	Henbury	210A
Glanfawe	220C	240C	240C		200A	Harthead	230A	Hendon	240A
	230A	230A	230A	Hales	200A	Hartshill	230A	Hengeo	230A
Glaphay	230A	230A	230A	Halewood	230A	Hartwell	220A	Henley Down	200A
Glascote	250A	230A	230A		230C	Hartwood	230A	Henley-on-	
Glasgow	250C	230A	230A	Halfway	230A	Harwich	240A	Thames	230A
	250A	230A	230A	Halifax	220A	Harworth	230A	Hensall	230A
Glashoughton	230A	230A	230A		230C	Haselbury		Hensington	230A
Glenboig	230A	230A	230A	Halls Green	240A	Plucknett	230A	Hepscott	250A
Glencairn	250A	230A	230A	Hallside	230A	Hasland	240A	Heptonstall	230A
Glencharnock	240A	230A	230A	Halsall	230A	Haslingden	230A	Hermiston	230A
Glenluce	230A	230A	230A	Halstead	240A	Hastings	200A	Herne Bay	230A
Glenmavis	230A	230A	230A	Halton (Cheshire)	250A	Haswell	250A	Herringfleet	200A
		230A	230A			Hatching Green	240A	Hertford	240A
						Hatfield (Yorks.)	230A	Hertford Heath	240A

MULLARD THE MASTER VALVE

SUPPLY VOLTAGES

Hertingfordbury	240A	Hollingbourne	230A	Hulcote	230A	Irthlingborough	210A	Kilnhurst	230A
Hesketh	230A	Hollingworth	230A	Hulcot	220A		230A	Kilsby	230A
Hest Bank	230A	Hollybush	240A	Humberstone	230A	Irton	230A	Kilwinning	240A
Hethersett	220C	Hollym	230A	Humbledon Hill	250A	Irvine	240A	Kimberley	250A
	230A	Holmby	230A	Hummerbeck	250A	Irwell	230A	Kimberley	220C
Hett	250A	Holmby	230A	Hunshaugh	250A	Isle of Thanet	240A		230A
Hetton-le-Hole	250A	Holmby	230A	Huncoat	230A		240C	Kimpton	240A
Heworth	220A	Holmby	230A	Hunmanby	230A	Islington	100A	Kincardine	250A
	250A	Holmby	230A	Hunsdon	240A		200A	Kinderton	220A
Hexham	250A	Holmeswood	230A	Hunshel	230A	Islip	210A	Kingsborn	250A
Hexton	240A	Holmfrith	230A	Hunsworth	230A	Iver	200A	Kings Bridge	230A
Heydon	220C	Holmwood	230A	Hunters Quay	230A	Iver Heath	200A	Kings Dyke	230A
	230A	Holt	230A	Huntingdon	240A	Ivybridge	230C	King's Langley	240A
Heysham	230A	Holby	230A	Huntingdon	230A			King's Lynn	230A
Heywood	200C	Holyhead	230A	(Chester)	230A	Jarrow	250A		200C
	230A	Holytown	200C	Huntington	230A		240C	Kings Park	230A
Heywood Park	240A	Holychurch	230A	Hunwick	250A	Jaywick	230A	King's Sutton	230A
Hickling	220C	Honing	220C	Hurdfield	230A	Jedburgh	230C	Kingswinford	200A
	230A	Honiton	230A	Hurlet	230A		230A	Kingsand	230A
High Barnes	250A	Hook (Yorks.)	230A	Hurley (Berks.)	240A	Jevington	230A	Kingsat	250A
High Beech	240A	Hook Heath	200A	Hurford	240A	Jobs Hill	110A	Kingsbury	250A
High Buxton	250A	Hoolgate	230A	Hurst	230A		250A	(London)	240A
High Carntyne	230A	Hool	230A	Hurst Green	230A	John's Cross	200A	Kingsbury	250A
High Grange	250A	Hool	230A	(Lancs.)	230A	Johnstone	230A	(Staffs.)	250A
High Halden	230A	Hool	230A	Hurst Green	230A	Johnstown	230A	Kingskerswell	200A
High Hoyland	230A	Hool	230A	(Sussex)	230A	Jordanhill	230A	Kingskettle	250A
High Leigh	250A	Hool	230A	Hurworth	230A			Kingsley	250A
High Offley	230A	Hool	230A	Husborne	230A	Kearsley	230A	Kingsmarsh	230A
High Throston	250A	Hooton Pagnell	230A	Crawley	230A		220A	Kingsnorth	230A
Higham	230A	Hope	230A	Husthwaite	230A		230C	Kingstanley	230A
Higham Ferrers	210A	Hopton	200A	Hutton (Essex)	240A	Keckle	230A	Kingsteignton	230A
Higham Park	230A	Hopwas	250A	Hutton (Lancs.)	230A	Keckwick	250A	Kingston	230A
Highams Park	230A	Horby	230A	Hutton (Lancs.)	230A	Kedleston	205A	(Lothians)	230A
Highcliffe	230A	Horby	230A	Hutton Buscel	230A	Keelby	230A	Kingston-by-Sea	230A
Higher Walton	250A	Hordle	230A	Hutton	230A	Keighley	230A	Kingston(Sussex)	230A
(Cheshire)	250A	Horeham Road	230A	Cranswick	230A	(Yorks.)	230C	Kingston-upon-	230A
Highfields	230A	Hornhead	240A	Hutton Rudyby	250A	Kellington	230A	Thames	240A
Hightown	230C	Hornhead	230A	Huxley	230A	Kelmarsh	230A	Kingswood	250A
	230A	Horning	220C	Huyton	115A	Kelsall	230A	(Bristol)	210A
Hildenborough	220A	Hyde	230A	Hyde	230A	Kelso	250A	Kingswood	230A
Hill Charlton	230A	Horns Cross	200A	Hyde Heath	230A	Kelston	230A	(Surrey)	200A
Hill End	240A	Hornsea	230A	Hylton South	250A	Kelty	250A	Kinnerton	230A
Hillam	230A	Horsebridge	230A	Hythe	210A	Kelvedon	240A	KinsbourneGreen	240A
Hillend	250A	Horsell	200A			Kempshot	230A	Kinsom	230A
Hillfoot	230A	Horsend	220A	Ickenham	200A	Kempston	210A	Kinvaston	230A
Hillingdon	200A	Horsford	220C	Ickleford	240A	Kempston Box-	210A	Kippax	230A
Hilpertown	230A	Horsforth	230A	Icklesham	200A	End	230A	Kirby	250A
Hilton	230A	Horsham	230A	Ickletham	240A	Kempston	210A	Kirby Cane	200A
Hilton (Hunts.)	240A	St. Faiths	220C	Ickwell	230A	Hardwick	210A	Kirby Cross	230A
Hilton West-	250A	Horsley (East)	230A	Iddenshall	230A	Kendal	230A	Kirby-in-Furness	230A
morland)	250A	Horsley (West)	230A	Ides	230A		220C	Kirby Moorside	230A
Hindley	230A	Horsley Cross	230A	Iden	200A	Kenfig	230A	Kirk Hammerton	230A
Hindley Green	230A	Horsmonden	230A	Ifeld	230A	Kenfig Hill	230A	Kirk Langley	205A
Hindolveston	220C	Horstead with	230A	Ighenthill	230A	Kenilworth	250A	Kirk Merrington	250A
	230A	Stanninghall	220C		220C	Kennford	230A	Kirk Newton	230A
Hingham	220C	Horton (Bucks.)	230A	Ilford	230A	Kennishead	230A	Kirk O'Shots	230A
	230A	Horton (Ches.)	230A		230C	Kensington	230A	Kirk Smeaton	230A
Hinksey	230A	Horton-cum-Peel	230A	Ilfracombe	240A		200C	Kirkburton	230A
Hinton	230A	Horwich End	230A	Ilkeston	230C	Kent Street	100A	Kirkby	250A
Hinton St.	230A	Hothfield	230A	Ilkley	230A	(Sedlescombe)	200A	Kirkby	230C
George	230A	Houghall	240A	Ilmer	220A	Kentisbeare	230A	Kirkby Malzeard	230A
Hints	250A	Houghton	250A	Ilminster	230A	Kenton (Devon)	200A	Kirkby Overblow	230A
Hinxhill	230A	Houghton	230A	Immingham	230A	Kenton	200A	Kirkcaldy	230A
Hinxton	240A	(Hunts.)	240A	Impington	200A	(Northumb.)	250A		230C
Hipperrholme	230A	Houghton	230A	Ince (Cheshire)	250A	Kerridge	230A	Kirkcudbright	230A
Hipsburn	250A	Conquest	230A	Ince (Liverpool)	230A	Kessingland	230A	Kirkfieldbank	230A
Hirst	240A	Houghton-le-	230A		230C	Keswick (Cumb.)	100A	Kirkham	230A
Histon	200A	Spring	220A	Inchinnan	230A		200A	Kirkheaton	230A
Hitcham	230A	Houley	230A	Ingbirchworth	230A	Keswick (Norfolk)	220C	Kirkintilloch	230A
Hobson	250A	Houston	230A	Ingham	220C		230A	Kirkievington	230A
		Hove	220A		230A	Kettering	230A	Kirklington	230A
Hoddesdon	240A		220C	Ingrave	240A		230C	Kirkliston	230A
(Herts.)	230A	Hoveton-St.-	220C	Innellan	230A	Kettlebrook	250A	Kirkoswald	240A
Hoddesden	230A	John	230A	Innerleithen	250A	Kettlesing	230A	Kirkwall	220C
Hoe	230A	Hovingham	230A	Inshes	240C	Kew	220A	Kirn	230A
	220C	Howden-le-Wear	250A	Instow	230A		220C	Kirton	240A
Hoggeston	230A	Howdon	250A	Inveresk	230C	Keyingham	230A	Kislingbury	210A
Holbeach	230A	Howick	230A	Inverloch	240A	Keynsham	210A	Knappill	200A
	100C	Howwood	230A	Inverkeithing	250A	Keyser's Estate	240A	Knappont	230A
Holborn	200C	Hoyleake	230A	Inverness	240C	Kilbarchan	230A	Knaresborough	200A
	230A	Hoyland Nether	230A	Ipplepen	200A	Kilbirnie	240A	Knebworth	240A
Holcombe	100C	Hoyland Swaine	230A	Irchester	230A	Kildwick	230A	Knightbridge	230A
Holcutt	230A	Huby	230A	Ireshopeburn	250A	Killinghall	200A		200C
Holker	230A	Hucklecote	230A	Irmingland	220C	Kilmacoll	230A	Knightwood	230A
Holland (Essex)	230A	Hucknell	230A		230A	Kilmarnock	240A	Knodishall	230A
		Huddersfield	316A	Irstead	220C	Kilmaurs	240A	Knottingley	230A
		Hughenden	230A		230A	Kilmun	230A	Knowle	230A

THREE MILLION AERIALS

LEAD DOWN TO

MULLARD MASTER VALVES

Knowle Hill ... 240A	Lepton ... 230A	Little Wilbraham 240A	Louth ... 230A	Market
Knowles ... 115A	Lerwick... 230C	Little	Loversall ... 230A	Lavington ... 230A
Knutsford ... 220A	Lesbury ... 250A	Witchingham 220C	Low Dinsdale ... 250A	Markham Moor 230A
	Leslie ... 250A	230A	Low Fell ... 250A	Markham Village 230A
Laceby ... 230A	Lesmahagow ... 230A	LittleWymondley 240A	Low Hauxley ... 250A	Markinch ... 250A
Lacock ... 230A	Lessingham ... 220C	Littleborough ... 230A	Low Lathe ... 230A	Markington ... 230A
Lairg ... 230A	230A	Littledean(Glouc) 230A	Low Pittington 250A	Marks Tey ... 230A
250C	Letcombe Regis 230A	Littlehampton 230A	Lower Birkby ... 230A	Marlborough ... 220C
Lakeside ... 220A	Leven(Fife) ... 250A	240C	Lower	230A
Laleham ... 230A	Leven(Yorks) 230A	Littleleaver ... 205A	Boddington ... 230A	Marldon ... 200A
Lambhill ... 230A	Lewistown ... 220A	Littlethorpe ... 230A	Lower Heyford 210A	Marlow ... 230A
Lammas ... 220C	Ley Hill ... 230A	Littleton(Chester) 230A	Lower	Marlston-cum-
230A	Leyland ... 230A	Littleton(Hants) 200A	Kingswood ... 200A	Lache ... 230A
Lampeter ... 220C	Leyton ... 230A	Littletown ... 250A	Lower Kinnerton 230A	Marple ... 230A
Lanark ... 230A	1500	Littlewick Green 240A	Lower Kirby ... 230A	Marple Bridge ... 230A
Lancaster ... 230A	Leytonstone ... 230A	Liverpool ... 230A	Lower Penn ... 230A	Marsden ... 230A
Lanchester ... 250A	1500	230C	Lower Walton 250A	Marske ... 250A
Lancing ... 230A	Lidlington ... 230A	Liversedge ... 230A	Lowestoft ... 230A	Marston Green 230A
Landbeach ... 240A	Light Oaks ... 230A	Liverton Mines 250A	230C	MarstonMoretaine 230A
Landrake ... 230A	Lightwater ... 240A	Livesey ... 230A	Lowfield Heath 230A	Marston
Lane End ... 230A	Lilford-cum- 230A	Llandavenny ... 230A	Lowick ... 230A	St. Lawrence 230A
Langbanks ... 230A	Wigthorpe ... 230A	Llandilo ... 230A	Lubenham ... 230A	Martham ... 200A
Langenhoe ... 230A	Lilley ... 240A	LlandrindodWells 230C	Luddenfoot 230A	Marlock ... 230A
Langham ... 230A	Lilling ... 230A	Llandudno Junc. 230A	Luddick ... 250A	Marton ... 220A
Langley... 230A	Limekilns ... 250A	Llandyssul ... 250C	Ludgvan ... 240A	Maryhill ... 230A
Langley 220C	Limpley Stoke 230A	Llanfairfechan 230A	Ludham ... 200A	Masham ... 230A
(Norwich) 230A	Lincoln ... 230A	Llangenor ... 230A	Lugton ... 240A	Maston ... 230A
Langley Marsh 230A	220C	Llangollen ... 230C	Lumphnans ... 250A	Matfield ... 230A
Langley Moor ... 240C	Lindal-in-Furness 230A	Llangwystenin 230A	Lundin Links ... 250A	Mathern ... 230A
Langstone ... 230A	Lindale-in- 230A	Llanhilleth ... 250C	Lupset ... 200A	Matley ... 230A
Langton ... 220A	Carmel ... 230A	Llanrhos ... 230A	Lutton ... 230A	Matlock ... 250A
Lapley ... 220A	Lingdale ... 250A	Llanrwst ... 220C	Lydney ... 230A	Matson ... 230A
Lapworth ... 230A	Lingerfield ... 230A	230A	Lyme Regis 220C	Mattersey ... 230A
Large ... 250A	Lingwood ... 220C	Llantarnam ... 230A	Lyminge ... 230A	Mauchline ... 240A
Largs ... 240A	230A	Llanwern ... 230A	Lymington ... 250A	Maulden ... 230A
Larkfield ... 230A	Linthwaite ... 200A	Llanvhyther ... 220C	Lymington	Maubty ... 200A
Larkhall ... 230A	Linton (Kent) ... 230A	Llechweid ... 230A	(Hants) ... 230A	Maxwelltown ... 230A
Lasswade ... 230A	Linton (Staffs.) 200A	Llysfaen ... 230A	Lyrm ... 250A	230C
Latchford ... 240A	Linton (Yorks.) 230A	Lloanshead ... 230A	Lymstone ... 230A	Maybole ... 240A
230A	Lintz ... 250A	Loans ... 240A	Lyng ... 220C	Mayfield ... 230A
Without ... 200A	Linwood ... 230A	Lochaber ... 440A	230A	Medmenham ... 230A
Lathom ... 230A	Liskeard ... 230A	Lochans ... 230A	Lytham ... 240A	Meer Heath ... 230A
Latimer... 230A	Litherland ... 230C	Lochelly ... 250A	LythamSt.Annes 240A	Melbourn ... 240A
Lauder ... 250A	230C	Lochore ... 250A	230C	Melcombe Regis 230A
Lauceston ... 200C	Little Amwell ... 240A	Lochwinnoch ... 230A	Macclesfield ... 240C	Meldreth ... 240A
Lavant ... 230A	Little Aston ... 230A	Loddington ... 230A	230C	Melford ... 240A
Lavendon ... 230A	Little Ayton ... 250A	Loddon ... 220C	Machen ... 230A	Melksham ... 230A
Law ... 230A	Little 220C	Lofthouse ... 230A	Mackrege ... 240A	Mellor (Cheshire) 230A
Lawford ... 230A	Barningham 230A	Lofthouse-with- 230A	Mackworth ... 250A	Mellor (Lancs) ... 230A
Laycock ... 230A	Little Bookham 230A	Carlton ... 230A	Mackermey ... 230A	Melmerby ... 230A
Layer Breton ... 230A	Little Brickhill 230A	Loftus ... 230A	Madron ... 240A	Melrose ... 230A
Layer-de-la 230A	Little Brington 230A	Loggerheads ... 230A	Maesteg... 230A	Meltham ... 230A
Haye ... 230A	Little Budworth 220A	1000	Maes-y-cwmmer 230A	Melton Mowbray 240C
Lazenby ... 250A	Little Chart ... 230A	London (City) ... 200C	Magor ... 230A	Menai Bridge ... 230A
Lea ... 230A	Little Clacton ... 230A	230A	Maldenhead ... 230A	Menai Bridge
Lea (Chester) ... 230A	Little Cranley... 240A	208C	230C	U.D. ... 220A
Lea Newbold ... 230A	Little Eaton ... 205A	London Colney 240A	Maidford ... 230C	Menston ... 230A
Leamington Spa 250A	Little Eccleston 230A	Long Buckley ... 230A	Malds Moreton... 230A	Meols ... 230A
230C	Little Caddesden 230A	Long Crendon ... 220A	Maldstone ... 230C	Mere Brow ... 230A
Leanside ... 200A	Little Hampden 220A	220C	Malsmore ... 230C	Merriott ... 230A
Leatherhead ... 230A	Little Haywood 230A	Long Eaton ... 220A	Maldens ... 220A	Merrrow ... 230A
230C	Little Heath ... 240A	220C	Malpas ... 230A	Mersham ... 230A
Leathley ... 230A	Little Hoole ... 230A	Long ... 230A	Malbty ... 230A	Merthyr ... 230C
Lebberston ... 230A	Little Horkesley 230A	Long	Malton ... 230A	Merthyr Vale ... 250A
Leckhamstead 230A	Little Houghton 250A	Framlington 250A	Manchester ... 200C	Merton ... 230A
Leckhampton ... 210A	Little Houghton 230A	Long Houghton 250A	230A	Messing ... 230A
Leckbury ... 230A	(Northants) ... 230A	Long Newton ... 250A	Mancot ... 230A	Methil ... 230A
Ledston ... 230A	Little Houghton 230A	Long Sutton ... 230A	230A	Methley... 230A
Lee-on-Solent ... 230A	(Yorks.) ... 230A	Longbenton ... 250A	Mancosfield ... 210A	Mickle Trafford 230A
Leeds ... 200A	Little Hulton ... 230A	Longford ... 230A	Manley ... 250A	Micklefield ... 230A
230A	Little Kimble ... 220A	Longmiddy ... 230A	Mannington ... 220C	Mickleham ... 230A
Leek ... 230C	Little Kingshill 230A	Longridge ... 230A	230A	Mickleover ... 205A
Leeming ... 230A	Little Leigh ... 220A	Longscales ... 230A	Manningtree ... 230A	Micklethwaite 230A
Leeming Bar ... 230A	Little Lever ... 230A	Longson ... 230A	Manor Park ... 230A	Mickleton ... 250A
Lees ... 230A	Little Missenden 230A	Longton ... 230A	230C	Mid-Calder ... 230A
Lees Cross Roads 230A	Little Oakley ... 230A	Longwell Green 230A	250A	Middle Claydon 230A
Leeswood ... 230A	Little Oakley ... 230A	Loose ... 230A	Mansfield ... 240C	Middlebrough 230A
Leffwich ... 220A	(Essex) ... 240A	Lossiemouth ... 230C	220C	Middlesmoor ... 230A
220C	Little Pardon... 240A	Lostock ... 220A	Manton ... 230A	Middleton(Lancs) 230A
Leicester ... 240A	Little Paxton ... 240A	Lotherton-cum- 230A	March ... 240A	220C
Leigh ... 230A	Little Plumstead 220C	Aberford ... 230A	Marcham ... 230A	Middleton
Leigh (Kent) ... 220A	230A	Lothianburn ... 230A	Marchington ... 230A	(Sussex) ... 230A
Leigh (Lancs.) 220C	230A	Loughborough ... 230A	Margate ... 240C	Middleton
230A	230A	220C	Margrove Park 250A	(Yorks)' ... 230A
Leiston ... 230A	Little Preston ... 230A	Loughbrigg ... 200A	Mark Cross ... 230A	Middleton
Leikbrook ... 230A	Little Saughall... 230A	100A	Markaton ... 205A	Cheney ... 230A
Lensford ... 240A	Little Smeaton 230A	Loughton ... 230A	Market Drayton 240C	Middleton-in-
Lenzie ... 230A	Little Stanney 250A	Lound (Norfolk) 200A	Market	Teedale ... 230A
Leominster ... 230A	Little Sutton ... 230A	Lound (Notts) ... 230A	Harborough 240A	Middleton Junct. 230A
	Little Weldon ... 230A			

SUPPLY VOLTAGES

Middleton-one-Row ... 250A	Mulbarton ... 220C	New Milton (Hants.) ... 230A	Northumberland Heath ... 200A	Oulton (Staffs) ... 230A
Middleton St. George ... 250A	Mursley ... 230A	Newnham ... 230A	Northwood ... 240A	Oulton (Suffolk) ... 230A
Middlewich ... 230A	Murton ... 230A	Newport (Fife) ... 250A	Norton ... 450A	Oulton-with-Woodlesford ... 230A
Midford ... 230A	Musellburgh ... 230C	Newport (I.O.W.) ... 240A	Norton (Malton) ... 230A	Oundle ... 230A
Midgley ... 230A	Muston ... 230A	Newport (Mon.) ... 200A	Norton (Sheffield) ... 200A	Ouseburn ... 230A
Mildenhall ... 220C	Mutford ... 200A	Newport Pagnell ... 210A	Norton (Yorks.) ... 230A	Ouston ... 250A
Mile Oak ... 250A	Myddleton (Lancs.) ... 250A	Newsham (Blyth) ... 250A	Norton Bridge ... 230A	Overstone ... 210A
Milford ... 230A	Myddleton (Yorks.) ... 230A	New Skelton ... 250A	Norton Canes ... 250A	Overton (Hants) ... 230A
Milford Haven ... 220C	Myerscough ... 230A	New Stevenston ... 230A	Norton-in-the-Moors ... 230A	Overton (Lancs) ... 230A
Milford-on-Sea ... 230C	Mynyddislwyn ... 230A	Newton (Cambs.) ... 240A	Norton-juxta-Twycross ... 250A	Overton (Yorks) ... 230A
Mill Corner ... 200A	Mytholmroyd ... 230A	Newton (Ches.) ... 230A	Norton-sub-Mamdon ... 230A	Overtown ... 230A
Millbrook (Cheshire) ... 230A	Mytton ... 230A	Newton (Ches.) ... 239A	Norton	Oving ... 220A
Millbrook (Devon) ... 230A	Naburn ... 230A	Newton (West Lothian) ... 230A	Subcourse ... 200A	Ovingham ... 250A
Millerston ... 230A	Nafferton ... 230A	Newton (Yorks.) ... 230A	Norwood ... 230A	Ovington ... 250A
Milliken Park ... 230A	Nailsworth ... 230A	Newton Abbot ... 240A	Norwood Green ... 230A	Oxenhope ... 230A
Millom ... 230A	Nantantam ... 230A	Newton Blossomville ... 230A	Notting Hill ... 200C	Oxford ... 100A
Milngavie ... 230A	Nantaffyllor ... 230A	Newton-by-Daresbury ... 250A	Nottingham ... 230A	100A
Milnrow ... 230A	Nantymoel ... 220A	Newton-by-Frodsham ... 250A	Notton ... 230A	230A
Milton (Didcot) ... 230A	Naphill ... 230A	Newton-by-Tattenhall ... 230A	Nunecaton ... 230A	230A
Milton (Northants) ... 210A	Narberth ... 210A	Newton Flotman ... 220C	Nun Monkton ... 230A	230A
Milton Ernest ... 210A	Naseby ... 230A	Newton Grange ... 230A	Nunney ... 230A	230A
Milverton ... 230A	Nawton ... 230A	Newton-in-Makerfield ... 230A	Nunthorpe ... 230A	230A
Mimbridge ... 200A	Nazeing ... 240A	Newton Longville ... 230A	Oakdale ... 230A	230A
Minchinhampton ... 230A	Neath ... 220A	Newton Mearns ... 230A	Oaken ... 230A	230A
Minehead ... 230A	Neatishead ... 220C	Newton Poppleford ... 230A	Oakenshaw ... 230A	230A
Mirfield ... 200A	Nedderton ... 250A	Newton Regis ... 250A	Oakley (Bedford) ... 210A	230A
230A	Needham ... 240A	Newton Solney ... 200A	Oakmores ... 220A	230A
Misterton ... 230A	Neilson ... 230A	Newton Stewart ... 230A	Oakworth ... 230A	230A
Mistley ... 230A	Nelson ... 230A	Newton-under-Roseberry ... 250A	Ocherweith ... 230A	230A
Mitcheldean ... 230A	Nerston ... 230A	Newtonton ... 230A	Ockley ... 230A	230A
Mobberley (Cheshire) ... 220A	Netherfield ... 230A	New Tredegar ... 230A	Odell ... 230A	230A
240A	Netherlee ... 230A	New Windsor ... 110C	Offord ... 240A	230A
Moggerhanger ... 230A	Netherthorpe (Angus) ... 230A	220C	Ogmore Vale ... 220A	230A
Mold ... 230A	Netherton (Liverpool) ... 230A	250A	Old Bradwell ... 230A	230A
Mold Junction ... 230A	230C	200A	Old Colwyn ... 230A	230A
Mollington ... 230A	240A	240A	Old Connock ... 240A	230A
Monk Fryston ... 230A	230C	230A	Old Eldon ... 250A	230A
Monks	240A	230A	Old Hall Green ... 240A	230A
Risborough ... 220A	Netteswell Cross ... 240A	230A	Oldham (Lancs.) ... 210C	230A
Monkseaton ... 250A	Nettledon ... 230A	230A	230A	230A
Monkton ... 240A	Nevedles Cross ... 240A	230A	Old Hartley ... 250A	230A
Monkton (Ayr) ... 240A	Newark-on-Trent ... 230A	230A	Old Kilpatrick ... 230A	230A
Monkton Combe ... 230A	Newart Hill ... 230A	230A	Old Sodbury ... 230A	230A
Monktonhall ... 230A	New Biggin ... 250A	230A	Old Warden ... 230A	230A
Monmouth ... 230A	Newborough ... 250A	230A	Old Windsor ... 230A	230A
Montacute ... 230A	Newbottle ... 250A	230A	Old Ynysybwl ... 230A	230A
Moor ... 230A	New Bradwell ... 210A	230A	Oldhall ... 230A	230A
Moor Park ... 240A	Newbridge ... 230A	230A	Ollerton ... 220A	230A
Moore ... 250A	Newbursh ... 250A	230A	Olney ... 230A	230A
Moorsholm ... 250A	Newby Bridge ... 230A	230A	Olton ... 230A	230A
Morecambe ... 230A	Newcastle Emlyn ... 100A	230A	Olveston ... 210A	230A
Moreton Pinkney ... 230A	Newcastle-on-Tyne ... 240A	250A	Orbiston (Bellshill) ... 230A	230A
Morley St. Peter ... 220C	250A	240C	Orford ... 230A	230A
Morpeth ... 240A	Newcastle-under-Lyne ... 230A	230C	Orlingbury ... 230A	230A
Mortlake ... 210C	230A	230C	Ormesby	230A
Morton ... 230A	230A	230C	St. Margaret ... 200A	230A
Morton-on-Swale ... 230A	230A	230C	Ormesby	230A
Moss Side ... 240A	230A	230C	St. Michael ... 200A	230A
Mossend ... 230A	230A	230C	Orniston ... 230A	230A
Mossley ... 230A	230A	230C	Ormskirk ... 230A	230A
Moston ... 230A	230A	230C	Orrell ... 230A	230A
Motherwell ... 230C	230A	230C	Orton	230A
Mottram ... 230A	230A	230C	Longueville ... 230A	230A
Mouldsworth ... 230A	230A	230C	Orton-on-the-Hill ... 250A	230A
Moulton ... 220A	230A	230C	Orton Waterville ... 240A	230A
Moulton Chapel ... 230A	230A	230C	Osbaldeston ... 230A	230A
Mount Pleasant ... 250A	230A	230C	Osballdwick ... 230A	230A
Mount Vernon ... 230A	230A	230C	Osmington ... 230A	230A
Mountain Ash ... 230A	230A	230C	Osmington Mills ... 230A	230A
Mounthfield ... 200A	230A	230C	Osselt ... 230A	230A
Much Hadham ... 240A	230A	230C	Osswaldkirk ... 230A	230A
Much Hoole ... 230A	230A	230C	Oswaldtwistle ... 230A	230A
Muckleston ... 230A	230A	230C	Otley ... 230A	230A
Mudeford ... 230A	230A	230C	Ottery St. Mary ... 230A	230A
Muirend ... 230A	230A	230C	Ottingham ... 230A	230A
Muirhead ... 230A	230A	230C	Oulton (Norfolk) ... 220C	230A
			230A	230A

THE TILL WILL TELL YOU MULLARD

Penrhynside ... 230A	Portobello ... 250A	Ranskill ... 230A	Romney Marsh ... 230A	St. Ives ... 240A
Pensarn ... 220C	Portslade ... 230A	Ranworth-with- ... 220C	Roos ... 230A	St. James ... 230A
Penshurst ... 220A	Portsmouth ... 200A	Ranworth ... 230A	Rosell ... 250A	220C
Pentewan ... 230A	Portsmouth ... 230A	Rasau ... 240C	Roslin ... 230A	St. Johns
Pentyrch ... 250A	Portwinkle ... 230A	Ratho ... 230A	Rosliston ... 200A	(Cornwall) ... 230A
Penwith ... 240A	Portwick ... 220C	Raunds ... 210A	Rossington ... 230A	St. Johns
Penybank ... 230A	Potter End ... 230A	Ravenfield ... 230A	Rosyth ... 250A	(Surrey) ... 200A
Penybont ... 230A	Potter Heigham ... 200A	Raveningham ... 200A	Rothbury ... 250A	St. Johns Chapel ... 250A
Penydarren ... 230C	Potter Row ... 230A	Ravensden ... 230A	Rotherfield ... 230A	St. Johns-with- ... 230A
Penyflord ... 230A	Potterhill ... 230A	Ravensthorpe ... 230A	Rotherham ... 230A	Thropham ... 230A
Penzance ... 240A	Potters ... 230A	Ravenstone ... 230A	Rothsay ... 240C	St. Just ... 240A
Peover Superior ... 220A	Potters Bar ... 240A	Ravenstown ... 230A	Rothwell ... 230A	St. Lawrence ... 240A
Peppard ... 230A	Pottersbury ... 230A	Ravensworth ... 250A	Rothwell	St. Leonards ... 200A
Percy Main ... 240A	Potto ... 250A	Rawcliffe ... 230A	(Northants.) ... 240A	St. Margaret's
Perkinsville ... 250A	Potton ... 210A	Rawdon ... 230A	Rottingdean ... 230A	Bay ... 200A
Perth ... 230C	Poulton ... 230A	Rawmarsh ... 230A	Rought Close ... 230A	St. Martha ... 230A
Peterborough ... 230A	Poulton-with- ... 230A	Rawtenstall ... 230A	Rowde ... 230A	St. Martins ... 230A
Peterhead ... 230A	Pearthead ... 250A	Read ... 230A	Rowledge ... 230A	St. Marylebone ... 240A
Petersham ... 220A	Poynton ... 230A	Reading ... 200A	Rowlands Castle ... 230A	240C
Pett ... 200A	Prescott ... 115A	Redbourn ... 200C	Rowlands Gill ... 250A	St. Michaels ... 230A
Pett Level ... 200A	Prescot ... 210A	Redlynch ... 230A	Rowley Regis ... 200A	St. Neots ... 240A
Pettisfree ... 230A	Prestabryn ... 230A	Redruth ... 240A	Rowham ... 220A	St. Osyth ... 220A
Pevensey ... 230A	Prestbury ... 230A	Reed ... 240A	Rowton ... 230A	St. Stephen ... 230A
Pevensey Bay ... 230A	Prestbury (Cheshire) ... 230A	Reedham ... 200A	Roxton ... 230A	St. Stephens ... 230A
Philadelphia ... 250A	Prestbury (Glouc.) ... 210A	Reedley Hallows ... 230A	Rowdon ... 240A	St. Wools ... 230A
Philaack ... 240A	Preston (Harrow) ... 240A	Reepes-with- ... 200A	Royston (Herts.) ... 240A	Sadden ... 230A
Pickering ... 230A	Preston (Lancs.) ... 230A	Repton ... 200A	Royston (Yorks.) ... 230A	Sadberge ... 230A
Picton ... 230A	Preston Bissett ... 230A	Reynolds ... 230A	Royton ... 230A	Saffron Walden ... 220C
Pilcombe ... 230A	Preston-on-the- ... 250A	Rendlesham ... 230A	Ruarden ... 230A	Saighton ... 230A
Pilton ... 230A	Hill ... 250A	Renfrew ... 230A	Ruddington ... 230A	Salcombe ... 230A
Pinchbeck ... 230A	Prestonpans ... 230A	Renhold ... 230A	Rudge ... 230A	Sale ... 240A
Pinchinthorpe ... 250A	Prestrich ... 200A	Renton ... 230A	Rudgeway ... 230A	Salesbury ... 230A
Pinhoe ... 230A	230A	Repps-with- ... 200A	Rudheath ... 220A	Salford ... 230A
Pinner ... 240A	Prestwick ... 230A	Bastwick ... 200A	220C	Salford ... 200A
Pirbright ... 200A	Prestwick Lodge ... 250A	Repton ... 200A	Rufford ... 230A	230A
Pitchcott ... 220A	Prestwood ... 230A	Rhiwbina ... 230A	Rugby ... 230A	230C
Pitlessie ... 250A	Price Town ... 220A	Rhiwflawr ... 230A	Rugeley ... 230A	Salhouse ... 220C
Pittensor ... 230A	Princes ... 220A	Rhodes ... 230A	Runslip ... 240A	230A
Pittween ... 250A	Risborough ... 220A	Rhonda ... 230A	Rumby Hill ... 250A	Salisbury ... 230A
Pittington ... 250A	Prinknash ... 230A	Rhose ... 230A	Runcorn ... 250A	210C
Pity Me ... 250A	Pruddhoe ... 250A	Rhos-on-Sea ... 230A	Runham ... 200A	Sail ... 220C
Plaistow ... 200A	Puckeridge ... 240A	Rhydyfro ... 230A	Runham	230A
Platt Bridge ... 230A	Pudsey ... 230A	Ribchester ... 230A	Vauxhall ... 200A	Salsburgh ... 230A
Playden ... 200A	Pulford ... 230A	Richmond ... 220A	Rushall ... 230A	Saltburn ... 250A
Pleasington ... 230A	Purston ... 230A	(Surrey) ... 220C	Rushden ... 210A	Saltcoats ... 240A
Pleasley ... 250A	Putnoe ... 210A	Richmond (Yorks.) ... 230A	Rushmere ... 210C	Salford ... 210A
Pluckley ... 230A	Puttenham ... 220A	Riddlesden ... 230A	Rushon ... 200A	Saltney ... 230A
Plunley ... 220A	Pyle ... 230A	Riddrie ... 230A	Rushton ... 230A	Samblesbury ... 230A
Plymouth ... 200A	Pyrford ... 200A	Ridgmont ... 230A	Rustington ... 230A	Sampford Brett ... 230A
230C	Ptychley ... 230A	Riding Mill ... 250A	Rutherglen ... 230A	Sampford
Plympton ... 230A	Quadrang ... 230A	Rigton ... 230A	Ruthin ... 230C	Peverell ... 230A
Plympton	Quainton ... 220A	Rillington ... 230A	Rydal ... 100A	Sand Hutton ... 230A
St. Mary ... 230A	Quakers' Yard ... 250A	Rimsell ... 230A	200A	Sandal ... 200A
St. Maurice ... 230A	Quarndon ... 205A	Ringland ... 220C	Ryde ... 240A	Sandbank ... 230A
Plymstock ... 230A	Quarrington ... 230A	Ringshead ... 210A	Rye ... 200A	Sandgate ... 210A
Polegate ... 230A	Quarry Bank ... 200A	Riugwood ... 230A	Rye Park ... 240A	210C
Polesworth ... 250A	Quarryburn ... 250A	Ripley ... 250A	Rye Hill ... 230A	Sandhoe ... 250A
Pontardawe ... 220C	Quedeley ... 230A	Ripley (Surrey) ... 200A	Ryhill ... 230A	Sandhurst ... 230A
Pontblyddyn ... 230A	Queensbury ... 230A	Ripon ... 230A	Ryhope ... 250A	Sandiacre ... 250A
Ponteland ... 250A	(Yorks.) ... 230A	Risca ... 230A	Ryton ... 250A	Sandling ... 230A
Pontlanfrahth ... 230A	Queensferry ... 230A	Rise ... 230A	St. Albans ... 240A	Sandown ... 240A
Pontlotty ... 230A	Quinton ... 210A	Rishton ... 230A	240C	Sandridge ... 240A
Pontnewnydd ... 230A	Rabley Heath ... 240A	Risworth ... 230A	St. Anghow ... 250A	Sandwich ... 230A
Pontybodkin ... 230A	Rackheath ... 220C	Rising Bridge ... 230A	St. Annes ... 210A	Sandwich Bay ... 230A
Pontcymmer ... 230A	Radbourne ... 205A	Rixton-with- ... 230A	240C	Sandy ... 210A
Pontymister ... 230A	Radcliffe (Lancs.) ... 230A	Glazebrook ... 230A	St. Arvans ... 230A	Sandycroft ... 230A
Pontypool ... 230A	Radcliffe (North- ... 250A	Roade ... 210A	St. Austell ... 230A	Sandy Hills ... 230A
Pontypridd ... 230C	umberland) ... 250A	Roaderwater ... 230A	220C	Saredon ... 230A
230C	Radcliffe on ... 230A	Roberts Bridge ... 230A	110C	Sarratt ... 230A
Pontyrhyl ... 230A	Trent ... 230A	Rochdale ... 220C	St. Bees ... 230A	Saundersfoot ... 230C
Pontywan ... 230A	Radlett ... 200A	Roche ... 230A	St. Blazey ... 230A	Saunderton ... 220A
Pool (Yorks.) ... 230A	Radyr ... 240A	Rockley ... 230A	St. Blazey Gate ... 230A	Sawbridgeworth ... 240A
Poplar ... 230C	Rainford ... 230A	Rodborough ... 230A	St. Boswells ... 250A	Sawley (Yorks.) ... 230A
Poppleton ... 230A	Rainham (Kent) ... 230A	Roddy Moor ... 200A	St. Budeaux ... 230A	Sawley (Lancs.) ... 230A
Poringland ... 220C	Rainhill ... 115A	Roecliffe ... 230A	St. Clears ... 230C	Sawston ... 240A
230A	Rainon ... 230A	Rollesby ... 200A	St. Dennis ... 230A	Saxlingham ... 220C
Porlock ... 230A	Ramsbottom ... 230A	Rolleston ... 200A	St. Germans ... 230A	230A
Porlock Weir ... 230A	Ramsbury ... 230A	Rolston ... 230A	St. Helens ... 240A	Saxton-cum- ... 230A
Port Clarence ... 250A	Ramsgate ... 240C	Rolvens ... 230A	St. Helens (Durham) ... 240A	Scarthingwell ... 230A
Port Glasgow ... 250A	Ramskill ... 230A	Romaldkirik ... 250A	St. Helens (Ramsgate) ... 230A	Scagglethorpe ... 230A
250C	Ramsreave ... 230A	Romanby ... 230A	St. Ippolitts ... 230C	Scalby ... 230A
Port Seton ... 230A	Rankinston ... 240A	Romford (Essex) ... 240A	St. Ives ... 240A	Scales ... 230A
Port Talbot ... 240A	230A	Romford (Kent) ... 220A	(Cornwall) ... 240A	Scammonden ... 230A
Portchester ... 230A	230A	Romley ... 230A	240A	Scarborough ... 230A
Portland ... 230A	230A	230A	240A	Scarcroft ... 230A
230A	230A	230A	240A	Scarlsbrick ... 230A

SUPPLY VOLTAGES

Scarthoe ... 230A	Shipton ... 230A	South Heath ... 230A	Standon ... 240A	Stonyhurst ... 230A
Scholes ... 230A	Shiremoor ... 250A	South Hledley ... 230A	Stane ... 230A	Stornbridge ... 200A
Scotstoun ... 230A	Shirley ... 230A	South Hylton ... 250A	Stanhope ... 250A	Stow ... 250A
Scott ... 230A	Shocklach ... 230A	South ... 230A	Stanley ... 230A	Stowmarket ... 2000
Scriven ... 200A	Church ... 230A	Killingholme ... 230A	(Durham) ... 230A	230A
Scunthrope ... 250A	Shocklach Oviatt ... 230A	South Kilvington ... 230A	Stanley (Yorks.) ... 230A	Strand ... 200C
Seaburn ... 250A	Shoeburyness ... 230A	South Milford ... 230A	Stanley Pit ... 250A	100C
Seaham Harbour ... 230A	Shoreditch ... 240C	South Mimms ... 240A	Stannore ... 240A	Stanmaer ... 230A
Seahouses ... 250A	Shoreham-by-Sea ... 230A	South Molton ... 230A	Stanningley ... 230A	Stratford ... 200A
Sealand ... 230A	Short Heath ... 200A	South Petherton ... 230A	Stanstead ... 230A	St. Mary ... 230A
Seamer ... 250A	Shortstown ... 210A	South Ruislip ... 240A	Abbots ... 240A	Strathaven ... 230A
Seascale ... 230A	Shotesham-All-Saints ... 220C	South Shields ... 110A	Stansten ... 240A	Strathmiglo ... 250A
Seaton (Devon) ... 220C	230A	South Stainley ... 200A	Nountfitcher ... 240A	Stratton ... 220A
Seaton (Yorks.) ... 230A	230A	South Walsham ... 220C	Stanthorne ... 220A	St. Margaret ... 220A
Seaton Burn ... 250A	230A	230A	Stanway ... 230A	Stratton ... 230C
Seaton Carew ... 250A	Shotley Bridge ... 250A	South Weald ... 240A	Stanwell ... 200A	St. Mary ... 220C
Seaton Sluice ... 250A	Shotton ... 230A	South Wootton ... 230A	230A	230A
Seaview ... 240A	Shotts ... 230A	Southall ... 230A	Stanwick ... 230A	Stratton ... 220C
Seckington ... 250A	Shotwick Park ... 230A	Southam ... 210A	Staplecross ... 200A	St. Michael ... 220C
Sedgefield ... 250A	Shrewsbury ... 210C	Southborough ... 220A	Stapleford ... 240A	230A
Sedgley ... 200A	Shurdington ... 210A	Southbourne ... 250C	Staplehurst ... 230A	Streetgate ... 250A
Sedlescombe ... 200A	Shuttington ... 250A	Southend ... 230A	Starcross ... 200A	Streetly ... 230A
Seend ... 230A	Sibbertoft ... 230A	Southgate ... 240A	Starforth ... 250A	230C
Seer Green ... 200A	Sicklinghall ... 230A	Southall ... 230A	Staverton ... 240A	Strensall ... 230A
Seething ... 220C	Sidbury ... 220C	Southowram ... 230A	(Glouc.) ... 210A	Strete ... 240A
230A	Sidcup ... 200A	Southport ... 110A	Staverton ... 230A	230A
Sefton ... 230A	Sidlesham ... 230A	Southstoke ... 230A	(Northants.) ... 230A	Stretford ... 230C
230C	Sidmouth ... 230A	Southwark ... 215C	Steelworks (Mon.) ... 240C	250C
Seighford ... 230A	Sigglesthorpe ... 230A	Southwell ... 220C	Steeple Claydon ... 230A	Stretton (Lancs.) ... 250A
Seisdon ... 200A	Silkstone ... 230A	Southwell ... 250A	Steepon ... 230A	Stretton (Staffs.) ... 200A
Selby ... 230A	Silksworth ... 250A	Southwell ... 230A	Stenalees ... 230A	Stretton ... 230A
Selkirk ... 250A	Silverstone ... 230A	Southwick ... 230A	Stenton ... 230A	Chapelry ... 230A
Selsey ... 230A	Silvertown ... 230A	(Brighton) ... 230C	Stepney ... 240C	Stroud ... 230A
Send ... 200A	Silvertown ... 200A	Southwick ... 230C	Steps ... 230A	Strumpshaw ... 220C
Seven Kings ... 230A	Simonburn ... 250A	(Dumfries) ... 250A	Stevenson ... 240A	230A
230C	Simonstone ... 230A	Southwood ... 200C	Stevenage ... 240A	Stubbins Village ... 240A
Sevington ... 230A	Sinclair ... 230A	Sowerby ... 230A	Steventon ... 230A	Stuntney ... 240A
Sewardstone ... 230A	Sinfin Moor ... 205A	Sowerby Bridge ... 230A	(Berks.) ... 230A	Sturton Grange ... 230A
Road ... 240A	Sinnington ... 230A	Southworth ... 230A	Steventon (Herts.) ... 230A	Styal ... 230A
Sewardstonebury ... 240A	Sissinghurst ... 230A	with-Croft ... 250A	Stevington ... 230A	Sudborough ... 230A
Shadforth ... 250A	Siston ... 230A	Spalding ... 230A	(Herts.) ... 230A	Sudbourne ... 230A
Shadoxhurst ... 230A	Sittington ... 230A	Soatham ... 220C	Stewarby ... 210A	Sudbury (Suffolk) ... 240A
Shafton ... 230A	Six Mile Bottom ... 240A	Sparksbridge ... 230A	Stewarton ... 240A	Sulgrave ... 230A
Shalford ... 230A	Skeffing ... 230A	Speldhurst ... 220A	Stewkey ... 230A	Sully ... 230A
Shalwell ... 250A	Skelow ... 230A	Spellbrook ... 240A	Stillington ... 230A	Summerbridge ... 230A
Shamley Green ... 230A	Skelmanthorpe ... 230A	Spennymoor ... 240C	Stirling ... 230C	Sunbury ... 200A
Shanklin ... 240A	Skelmersdale ... 230A	240C	Stobhill ... 250A	230A
Sharps Hill ... 230A	Skelton ... 230A	Spettisbury ... 230A	Stockham ... 250A	Sunderland ... 220A
Sharnbrook ... 210A	Skelton-in-Cleveland ... 250A	Spofforth-with-Stockeld ... 230A	Stockport ... 230A	Sunningdale ... 220C
Sharow ... 230A	Skinningrove ... 250A	Spondon ... 205A	Stocksbridge ... 230A	Sunninghill ... 220C
Shaw Mills ... 230A	Skipton ... 230A	Springfield ... 230A	Stockfield ... 250A	Sunniside ... 250A
Sheepley ... 250A	Slaitwhaithe ... 230A	Springhead ... 230A	Stockton ... 200A	Sunnymeads ... 200A
Sheffield ... 200A	Slatts ... 230A	Springfield (Essex) ... 230A	Stockton Brook ... 230A	230A
Sheldon ... 230A	Sleaford (New) ... 230A	Springfield (Fife) ... 250A	Stockton Heath ... 250A	Surbiton ... 230A
Shelf ... 230A	Sleaford (Old) ... 220C	Springhead ... 230A	Stockton-on-Forest ... 230A	240C
Shelfield ... 250A	Sleekburn ... 250A	Springside ... 240A	Stoke ... 250A	Surfleet ... 230A
Shelley ... 230A	Slindon ... 230A	Springwell ... 250A	Stoke Albany ... 230A	Sutton ... 230A
Shenfield ... 240A	Slingsby ... 230A	Springwell ... 250A	Stoke D'Abernethy ... 230A	230A
Shenley (Bucks.) ... 230A	Slitting Mill ... 230A	Sprotborough ... 220C	Stoke Doyle ... 230A	Sutton (Bedford) ... 230A
Shenley (Herts.) ... 240A	Slough ... 230A	Sprowston ... 220C	Stoke Fleming ... 240A	Sutton (Norfolk) ... 220C
Shephall ... 240A	Slyne ... 230A	Stableford ... 230A	Stoke Goldington ... 230A	Sutton (Notts.) ... 230A
Shepherds Bush ... 110A	Smallburgh ... 220C	Stafford ... 230A	Stoke Mandeville ... 220A	Sutton (Runcorn) ... 250A
230A	230A	210C	Stoke Newington ... 240C	Sutton (Surrey) ... 200A
Shepherdswell ... 230A	Smallford ... 240A	Stagden ... 230A	Stoke-on-Trent ... 230C	Sutton Bridge ... 230A
Shepley ... 230A	Smarden ... 230A	Stainborough ... 230A	240A	Sutton Coldfield ... 230A
Shepperton ... 200A	Smelthouses ... 250A	Staines ... 200A	Stoke-under-Ham ... 230A	230C
Shepreth ... 240A	Snainton ... 230A	230A	Stoke-in-Teign-head ... 230A	Sutton Courtenay ... 230A
Shepton ... 230A	Snydale ... 230A	Stainforth ... 230A	Stokeinchurch ... 230A	Sutton-in-Ashfield ... 250A
Beauchamp ... 230A	Soham ... 240A	Stainland ... 230A	Stokesby-with-Herringby ... 200A	240A
Sherborne ... 230A	Sollihull ... 230A	Stainton ... 250A	Stokesley ... 250A	Sutton-on-Forest ... 230A
Sherburn-in-Elmet ... 230A	Somerleyton ... 200A	Staintondale ... 230A	Stoke ... 230A	Sutton Village ... 230A
230A	Somerton (East) ... 200A	Stakeford ... 250A	Stoke ... 230A	Swaffham ... 240A
230A	Somerton (West) ... 200A	Stalham ... 220C	Stoke ... 230A	Bulbeck ... 240A
Sherburns (The) ... 250A	Sompting ... 230A	Stallingborough ... 230A	Stoke ... 230A	Swaffham Prior ... 240A
Shere ... 230A	Sonning ... 230A	Stalybridge ... 230C	Stoke ... 230A	Swainby ... 250A
Sheriff Hill ... 250A	Soudley ... 230A	230C	Stoke ... 230A	Swainsthorpe ... 220C
Sheriff Hutton ... 230A	Soudrop ... 230A	Stamford Bridge (Yorks.) ... 230A	Stoke ... 230A	230A
Sheringham ... 240A	South Anston ... 230A	Stamperland ... 230A	Stoke ... 230A	Swainswick ... 230A
Sherington ... 230A	South Ascot ... 220C	Stanborough ... 240A	Stoke ... 230A	Swanbourne ... 230A
Shettleston ... 230A	South Bank ... 250A	Standish ... 230A	Stoke ... 230A	Swannington ... 220C
Shevington ... 230A	South Boldon ... 250A	230A	Stoke ... 230A	230A
Shilbottle ... 250A	South Churchland ... 200A	230C	Stoke ... 230A	Swareliffe Top ... 230A
Shildon ... 240A	South Elmsall ... 230A	230C	Stoke ... 230A	Swardeston ... 220C
Shipdham ... 230A	South Gosforth ... 250A	230C	Stoke ... 230A	230A
220C	230A	230C	Stoke ... 230A	230A
Shiplake ... 230A	230A	230C	Stoke ... 230A	230A
Shippington ... 230A	230A	230C	Stoke ... 230A	230A

JOIN THE BETTER RADIO BRIGADE

Swillington ... 230A	Thornton-le-Clay 230A	Tonbridge ... 220A	Ulley ... 230A	Wanstraw ... 230A
Swindon (Glouc.) 210A	Thornton-le-Dale 230A	Tonbridge Rural 220A	Ulverston ... 230A	Wantage ... 230A
Swindon (Wilts.) 220A	Thornton-le-Moor 230A	Tong ... 230A	Under Millbeck 100A	Warburton ... 230A
Swindon (Worc.) 200A	Thornton-le- ... 250A	Topcroft ... 200A	Up. Matherley 210A	(Cheshire) ... 250A
Swineshead ... 220A	Thornton Hall 230A	Toshpam ... 220A	Uphall ... 230C	Warden ... 250A
Swinley ... 240A	Thorp Arch ... 230A	Torban ... 200A	Upholland ... 230A	Wardle ... 230A
Swinton ... 230A	Thorpe (Staffs.) 250A	Tortworth ... 230A	Uplawmoor ... 230A	Ware ... 240A
Swinton ... 230A	Thorpe (Surrey) 200A	Torquay ... 200A	Uplyme ... 220C	Wareham ... 230A
(Berwicks.) ... 230A	Thorpe (Yorks.) 230A	Torworth ... 230A	Upper ... 230A	Warfield ... 240A
Symington (Ayr) 240A	Thorpe Achurch 230A	Totland Bay ... 240A	Boddington ... 230A	Wargrave ... 230A
Symington (Lanark) ... 230A	Thorpe Acre-cum-Dishley 230A	Toton ... 220C	Upper ... 230A	Wark ... 250A
Syresham ... 230A	Thorpe Audlin 230A	Tottenham ... 240A	Greetland ... 230A	Warkton ... 230A
Tabley ... 220A	Thorpe-le-Soken 230A	Totteridge ... 240A	Upper ... 230A	Warkworth ... 250A
Tadcaster ... 230C	Thorpe ... 230A	Tottingham ... 240A	Harlestone ... 230A	Warmfield-cum-Heath ... 230A
Tadworth ... 200A	Lubenham ... 230A	Tottington ... 230A	Upper Heyford 210A	Warminster ... 230A
Tad ... 230A	Thorpe Malsor ... 240A	Tow Law ... 250A	Upper Tean ... 230A	Warmley ... 230A
Tamerton ... 230A	Thorpe-next-Haddiscoe ... 200A	Towcester ... 230A	Upper ... 230A	Warmsworth ... 230A
Tamworth ... 250A	Thorpe St. Andrew ... 230A	Towthersey ... 220A	Winchendon ... 220A	Warrington ... 230A
Tanfield ... 440A	Thorpe Waterville ... 230A	Townhill ... 220A	Uppermill ... 230A	Warsash ... 230A
Tanfield Lea ... 250A	Thorpeness ... 230A	Towthorpe ... 230A	Ushire ... 240A	Warthill ... 230A
Tang ... 230A	Thorpeverton ... 230A	Tranent ... 230A	Upton ... 210A	Warton ... 240A
Tangmere ... 230A	Thrapston ... 210A	Trawden ... 400A	Upton (Cheshire) 230A	Warton (Staffs.) 250A
Tankersley ... 230A	Threapton ... 230A	Trebanos ... 230A	Upton (Yorks.) 230A	Washford ... 230A
Tannochside ... 230A	Threapton ... 210A	Trefriw ... 230A	Upper Noble ... 230A	Washington ... 250A
Tantobie ... 440A	Threapton ... 230A	Tregaron ... 230C	Upton Park ... 200A	Watchet ... 230A
Taplow ... 230A	Three Bridges ... 240C	Treharris ... 250A	Upton ... 230A	Water Eaton ... 230A
Tarbock ... 230A	Three Oak ... 200A	Trelewis ... 230A	St. Leonards ... 230A	Water Orton ... 230A
Tarbolton ... 240A	Thrigby ... 200A	Trentham ... 230A	Urchfont ... 230A	Waterbeach ... 240A
Tarleton ... 230A	Thrislington ... 250A	Trethomas ... 230A	Ushaw Moor ... 250A	Waterford ... 240A
Tarporley ... 230A	Thrupp ... 230A	Trevanghan ... 230A	Usworth ... 250A	Waterhouses ... 250A
Tarvin ... 230A	Thrybergh ... 230A	Trimley Martin 240A	Utkinton ... 220A	Wateringbury ... 230A
Tasburgh ... 220C	Thurcroft ... 230A	Trimley St. Mary 240A	Uttoxeter ... 230A	Waterloo ... 230A
Tatenhill ... 200A	Thurgoland ... 230A	Tring ... 220A	Uxbridge ... 200A	Waterloo-with-Seaforth ... 230A
Tattenhall ... 230A	Thurleston ... 240A	Troatbeck ... 100A	Ventnor ... 240A	Waterloo ... 230C
Tatworth ... 230A	(Devon.) ... 230A	Troedrihwfuch 230A	Victoria (Mon.) 240C	Waterlooville ... 230A
Taverham ... 220C	Thurleston (Yorks.) ... 230A	Troedyrhiw ... 250A	Viewpark ... 230A	Watford ... 200A
Tayport ... 230A	Thurton ... 200A	Troon ... 240A	Vinehall ... 200A	Wath (Ripon) ... 230A
Teams ... 250A	Thurne ... 200A	Trowbridge ... 230A	Waddesdon ... 220A	Wath (Yorks.) 230A
Teddington ... 240A	Thurning ... 220C	Trowse-with-Newton 230A	Wadebridge ... 240A	Wath-on-Dearne 230A
Teigngrace ... 230A	Thurnscoe ... 230A	Truddox Hill ... 230A	Wadenhoe ... 230A	Watling Street ... 250A
Teignmouth ... 230A	Thurstonland ... 230A	Trumpington ... 200A	Wadhurst ... 230A	Watton ... 240A
Telscombe ... 230A	Thwaite ... 200A	Truro ... 240A	Wadsborough ... 230A	Wattsville ... 230A
Temple Ewell ... 200A	Ticehurst ... 230A	Truro (Rural) 240A	Wadsworth ... 230A	Waulnwyd ... 240C
Tempford ... 230A	Tideford ... 230A	Tryddyn ... 230A	Wakefield ... 230A	Wavendon ... 230A
Tenby ... 230C	Tidkill ... 230A	Trysull ... 200A	Wakes Colne ... 230A	Waverton ... 230A
Tending ... 230A	Tidal Basin ... 200A	Tubney ... 230A	Walberton ... 230A	Waxholme ... 230A
Tenterden ... 230A	Tideham ... 230A	Tudhoe ... 240A	Walcott ... 220C	Wealdstone ... 240A
Terrington ... 230A	Tidford ... 230A	Tudhoe Wells 220A	Waldditch ... 230A	Wealdstone (Part) ... 220C
Tetson ... 230A	Tiffield ... 230A	Walker ... 200A	Waldrun ... 230A	Wealdstone (Part) ... 220C
Tetney ... 230A	Tilbury ... 230A	Walker ... 250A	Wales (S. Yorks.) 230A	Wearhead ... 250A
Tettenhall ... 230A	Tilehurst ... 200A	Walker ... 240A	Walgate ... 250A	Weaverham ... 220A
Tewin ... 240A	Tilston ... 230A	Walker ... 250A	Walcott ... 220C	Wednesbury ... 200A
Thame ... 220A	Tilstone Farnall 230A	Walker ... 250A	Wallditch ... 230A	Wednesfield ... 200A
Thames Ditton 230A	Timperley ... 100A	Walker ... 250A	Wall ... 250A	Weedon (Bucks.) 220A
Thankerton ... 230A	Tingewick ... 230A	Walker ... 250A	Wallasey ... 200A	Weedon (Northampton) 210A
The Lee ... 230A	Tinhead ... 230A	Walker ... 250A	Wallington ... 200A	Weekley ... 230A
Theale ... 200A	Tinkers Hill ... 240A	Walker ... 250A	Wallsend ... 250A	Weekley ... 230A
Themelthorpe ... 220C	Tintinull ... 230A	Walker ... 250A	Walmer ... 230A	Weeley Heath 230A
Thelwall ... 250A	Tipton ... 200A	Walker ... 250A	Walmer Bridge 230A	Weeton (Yorks.) 230A
Thetford ... 200C	Tipton St. John 230A	Walker ... 250A	Walsall ... 210C	Welford ... 230A
Thirk ... 230A	Tiptree ... 230A	Walker ... 250A	Walsall Wood ... 250A	Welham ... 230A
Thistleton ... 230A	Tir-y-Berth ... 230A	Walker ... 250A	Waltham (Lincs.) 230A	Welham (Notts.) 230A
Thorington ... 230A	Tirphill ... 230A	Walker ... 250A	Waltham Abbey 240A	Welham Green ... 240A
Thornaby ... 250A	Tisbury ... 210C	Walker ... 250A	Waltham ... 230A	Well End ... 240A
Thornbury ... 230A	Titchfield ... 230A	Walker ... 250A	Waltham ... 230A	Welling ... 200A
Thornby ... 230A	Titchmarsh ... 230A	Walker ... 250A	Waltham ... 230A	Wellingborough 230A
Thorne ... 230A	Titmores Green 240A	Walker ... 250A	Waltham St. Lawrence ... 240A	Wellington ... 230A
Thorne ... 230A	Tiverton (Ches.) 230A	Walker ... 250A	Waltham ... 230A	Wellwood ... 250A
Thorne ... 230A	Tiverton (Devon.) 230C	Walker ... 250A	Waltham ... 230A	Welwick ... 230A
Thorne ... 230A	Tobemory ... 220C	Walker ... 250A	Waltham ... 230A	Welwyn Garden City ... 240A
Thorne ... 230A	Tockholes ... 230A	Walker ... 250A	Waltham ... 230A	Wembley ... 240A
Thorne ... 230A	Todds Green 240A	Walker ... 250A	Waltham ... 230A	Wemyss ... 250A
Thorne ... 230A	Todmorden ... 230A	Walker ... 250A	Waltham ... 230A	Wendover ... 220A
Thornhambald ... 230A	Todwick ... 230A	Walker ... 250A	Waltham ... 230A	Wentworth (Surrey) ... 200A
Thornhill ... 230A	Toft ... 220A	Walker ... 250A	Waltham ... 230A	Wentworth (Yorks.) ... 230A
Thornliebank ... 230A	Toft Monks ... 200A	Walker ... 250A	Waltham ... 230A	Werrington ... 230A
Thornton ... 250A	Togston ... 250A	Walker ... 250A	Waltham ... 230A	
Thornton (Fife) 250A	Tollcross ... 230A	Walker ... 250A	Waltham ... 230A	
Thornton (Liverpool) ... 230A	Tollerton ... 230A	Walker ... 250A	Waltham ... 230A	
Thornton (Cleveland) ... 230A	Tollshunt ... 230A	Walker ... 250A	Waltham ... 230A	
Thornton-in-Craven ... 230A	Tollshunt ... 230A	Walker ... 250A	Waltham ... 230A	
	Knights ... 230A	Walker ... 250A	Waltham ... 230A	

MULLARD THE MASTER VALVE

SUPPLY VOLTAGES

Wervin ...	230A	Weston	230A	Wickwar ...	230A	Withnell ...	230A	Wormley ...	240A
Wesham ...	230A	Underwood ...	230A	Widdington ...	250A	Withyham ...	230A	Worplesdon ...	230A
West Auckland ...	250A	Westwell ...	230A	Widopen ...	250A	Witney ...	230A	Worsborough ...	230A
West Aytton ...	230A	Westwick ...	220C	Widford (Essex) ...	230A		220C	Worsley ...	230A
West Barnes ...	230A		230A	Widford (Herts.) ...	240A	Witton ...	230A	Worstead ...	220C
West Bergholt ...	230A	Wetherby ...	230A	Wigant ...	230A	Witton (Norfolk) ...	220C	Worston ...	230A
West Bolden ...	250A	Wetwood ...	230A	(Herts.) ...	220A	Wiveliscombe ...	230A	Worthing	
West Bradford ...	230A	Wexham ...	230A	(Staffs.) ...	250A	Wivenhoe ...	230A	(Sussex) ...	230A
West Bridgford ...	230A	Weybridge ...	240A	Wigginton		Wix ...	230A		230C
West Brunton ...	230A	Weymouth ...	230A	(Yorks.) ...	230A	Woburn Sands ...	230A	Worthing	
West Calder ...	250A		230C	Wigmore (Kent) ...	230A	Woking ...	200A	(Norfolk) ...	220C
West Chobham ...	240A	Whaley Bridge ...	230A	Wigton ...	230A	Wollaton ...	230A		230A
West Clandon ...	230A	Whalley ...	230A	Wigton ...	230A	Wolsingham ...	250A	Worting	230A
West Coker ...	230A	Whalton ...	250A	Wilbarston ...	230A	Wolverton ...	220C	Wortley	230A
West Cornforth ...	250A	Whaplode ...	230A	Wilby ...	230A	Wolverhampton ...	230A	Worton	230A
West Dean ...	230A	Wharlington ...	200A	Wilden ...	230A	Wolverton ...	210A	Wotton-St.	
West Drayton ...	200A	Wheatacre-all- Saints ...	200A	Widford ...	230A	Wolviston ...	250A	Mary-without	230A
West Haddon ...	230A	Wheatbottom ...	250A	Wilkins Green ...	240A	Wombledon ...	230A	Wotton-under- Edge ...	230A
West Ham ...	200A	Wheat- hampstead ...	240A	Wiland ...	230A	Wombourne ...	200A	Wotton	
West Hartlepool ...	230C	Wheatley Lane ...	230A	Willesborough ...	230A	Wombwell ...	230A	Underwood ...	220A
		Wheaton Aston ...	230A	Willesden ...	240C	Wonerah ...	230A	Wottonville ...	230A
West Hill ...	230A	Whickham ...	250A	Willetton ...	230A	Woburn ...	230A	Wrabness ...	230A
West Kilbridge ...	240A	Whimpe ...	230A	Willington		Woodburn Green ...	230A	Wraisbury ...	200
West Kirby ...	230A	Whippingham ...	240A	(Bedford) ...	210A	Woodbank ...	230A		230A
West Lavington ...	230A	Whiston ...	230A	Willington		Woodbastwick ...	220C	Wrea Green ...	230A
West Linton ...	230A	Whiston (Lancs.) ...	115A	(Chester) ...	230A	Woodbridge ...	230A	Wrekenton ...	250A
West Lynn ...	230A	Whiston		Willington Quay ...	250A	Woodbury ...	230A	Wreningham ...	220C
West Malling ...	230A	(Northampton) ...	230A	Willsbridge ...	230A	Woodchester ...	230A		230A
West Markham ...	230A	Whitacre ...	230A	Wilmington ...	230A	Wood Dalling ...	220C	Wrexham	230C
West Mersea ...	230A	Whitburn ...	250A	Wimslow ...	230A		230A		230A
West Molesey ...	230A	Whitby ...	250A	Winecote ...	250A	Wood End ...	250A	Wrightington ...	230A
West Moors ...	230A	Whitchurch		Wipshire ...	230A	Woodford Halse ...	230A	Writtle ...	230A
West Pelton ...	250A	(Cardiff) ...	230A	Wisden ...	230A	Woodford Side ...	230A	Wrottesley ...	230A
West Rainton ...	250A	Whitchurch		Wilestead ...	230A	Wood Green ...	240A	Wroxall ...	240A
West Thurston ...	250A	(Hants.) ...	240A	Wilton ...	230A		240C	Wroxham	220C
West Wycombe ...	230A	White-le-head ...	250A	Wimbledon ...	220A	Woodham ...	220A		230A
Westbury ...	230A	White Waltham ...	240A	Wimblington ...	240A	Woodhouse ...	200A	Wyberton ...	240A
Westbury (Glouc.) ...	230A	Whitecraigs ...	230A	Wimborne ...	230A	Woodlands ...	230C	Wycombe	210C
Westbury (Wilts.) ...	230A	Whitefield ...	230A	Wincham ...	220A	Woodlands			230A
Westbury Leigh ...	230A	Whitelea ...	250A	Winchelsea ...	230A	(Doncaster) ...	230A	Wye ...	230A
Westcott ...	240A	Whitfield ...	230A	Winchester ...	210C	Woodley ...	230A	Wykeham ...	230A
Weston-super- mare ...	230A	Whitley ...	230A	Winckmere ...	100A	Woodmanacote ...	210A	Wylam ...	250A
		Whitley Bay ...	240C		200A	Wood Norton ...	220C	Wyllie ...	230
			240A	Windle ...	230A		230A	Wymondham ...	220C
Westerterton ...	230A	Whitley Inferior ...	250A	Windlesham ...	220C	Woodplumpton ...	230A		230A
Westfield ...	200A	Whitley Superior ...	250A	Windlestone ...	250A	Wood Rising ...	220C	Wyton ...	240A
Westgate		Whitley Upper ...	230A	Windy Nook ...	250A		230A	Yapton ...	230A
(Durham) ...	250A	Whitlingham ...	220C	Windyngates ...	250A	Woodseaves ...	230A	Yardley Gobion	230A
Westgate (Kent) ...	240A		230A	Winestead ...	230A	Woodstock ...	230A	Yardley Hastings	230A
Westham ...	230A	Whitstable ...	230A	Wingrave ...	220A	Woodthorpe ...	230A	Yarm ...	250A
Westhampnett ...	230A	Whittlebury ...	230A	Winkfield ...	240A	Woodton ...	200A	Yarmouth ...	200A
Westhoughton ...	230A	Whittlesey ...	230A	Winkfield Row ...	240A	Wooley Pit ...	110A	Yarmouth	
Westhumble ...	230A	Whitlessford ...	240A	Winkton ...	250A	Wooley Terrace ...	250A	(I.O.W.) ...	240A
Westland Green ...	240A	Whitwell ...	230A	Winnersh ...	230A	Woolaston-with- Strixton ...	230A	Yate ...	230A
Westleigh ...	230A		230A	Winnington ...	220C	Woolley Green ...	240A	Yaxham ...	220C
Westminster ...	230A	Whitwell (Herts.) ...	240A	Winsford ...	220A	Woolmer Green ...	240A		230A
		Whitwell		Winsham ...	230A	Woolsingham		Yaxley ...	230A
				Winsley ...	230A	Bridge ...	250A	Yeadon ...	230A
Westoe ...	250A	Whitworth ...	230A	Winslow ...	230A	Woolston ...	250A	Yealmpton ...	230A
Weston (Bath) ...	230A	Whixley ...	230A	Winstanley ...	230A	Woolwich ...	210C	Yelvertoft ...	230A
Weston (Cheshire) ...	250A	Whorlton ...	250A	Winterbourne ...	210A		220A	Yeovil ...	240C
Weston (Dorset) ...	230A	Wick (Caithness) ...	230C	Winterton ...	200A	Wootton ...	230A	Yewley Without	230A
Weston (Herts.) ...	240A	Wick (Sussex) ...	230A	Winwick-with- Hulme ...	250A	Wootton (Beds.) ...	230A	Yewley	200A
Weston Coyney ...	220A		240C	Wirksworth ...	250A		230A	Ynismedwy ...	230A
Weston		Wicken ...	230A	Wirral ...	230A	Wootton		Ynysddu ...	230A
		Wickersley ...	230A	Wiseton ...	230A	(I.O.W.) ...	240A	Ynysybwl ...	230A
		Wickham		Wishaw ...	230A	Wootton		Yoker ...	230A
		Market ...	230A		240C	Courtney ...	230A	York ...	200A
		Wickhampton ...	200A	Wiswell ...	230A	Worcester Park ...	200A		230C
		Wicklewood ...	220C	Witham ...	240A	Workeston ...	240A	Youlton ...	230A
			230A	Witheridge ...	230C	Worlingham ...	200A	Ystalyfera ...	230A
		Wicklemere ...	220C	Withernsea ...	230A	Wormald Green ...	230A	Ystradgynlais	220C
			230A			Wormit ...	250A		240C

WITH MULLARD AT YOUR FINGERTIPS YOU'RE CERTAIN OF YOUR SALES

MAINS AND BATTERY SET MARKET SURVEY

During the past year there has been an increase of approximately 13 per cent. in the number of mains set prospects.

For quick reference the figures for England are grouped under County headings. London precedes the English counties, and separate general headings are given to Wales and Scotland.

Where the name of a place only is given, the supply is municipally owned. Others, as indicated, are company undertakings.

Figures are official, except where marked with an asterisk (*).

Time-controlled A.C. supply is shown thus(†).

Name of Supply Authority	Total No. of House-holders in Area.	Number of Households on A.C.	on D.O.	Without Supply.
LONDON				
Battersea	44,618	8,839†	11,153	24,623
Bermondsey	23,800	—	12,200	11,600
Bethnal Green ..	21,489	5,574	—	15,915
Brompton and Kensington E. S. Co. ..	11,000	11,000*	—	—
Chelsea E. S. Co. ..	11,919	2,915†	4,978	4,026
Chiswick E. S. Cpn. ..	10,334	282†	6,014	4,038
Fulham	40,000	32,424†	—	7,576
Hackney	40,000	30,000†	—	10,000
Hammersmith ..	28,345*	28,000†	—	345
Hampstead	23,709	19,970†	—	3,739
Islington	319,100	25,014	—	294,086
Kensington and Knightsbridge E. L. Co. ..	7,608	1,786†	5,515	307
London and Home Counties J.E.A. ..	(See Surrey and Middlesex).			
Notting Hill E. L. Co. ..	23,000	2,900†	10,250	9,850
Poplar	38,292	—	19,845	3,444
St. Marylebone ..	16,500	4,500†	8,980	3,040
St. Pancras	27,280*	312*	20,099*	6,869
Shoreditch	25,156	—	20,021	5,135
South London E. S. Cpn. Co. ..	—	15,000*	—	—
South Met. E. L. and P. Co. ..	—	20,000†	—	—
Southwark	20,064	—	4,400	13,664
Stoke Newington ..	13,800	—	10,000	3,500
Stepney	54,667	—	20,750	33,817
Woolwich	32,973	12,730	451	19,792
BEDFORDSHIRE				
Bedford	20,000	14,851†	—	5,119
Beds. Cambs and Hunts E. Co. ..	13,200	4,994	—	8,206
Luton	30,150	4,500	9,000	16,650
BERKSHIRE				
Abingdon E. S. Co. ..	5,000	1,335†	—	3,665
Ascot Dist. G. and E. Co. ..	6,850	620†	1,080	5,150
Cookham and Dist. E. Cpn. ..	4,300	1,520†	—	2,780
Maidenhead	7,383	1,975†	1,390	4,018
Reading E. S. Co. ..	27,500	3,550	1,950	22,000
Thames Valley E. S. Co. ..	8,951	1,125	—	7,826
Wantage E. S. Co. ..	1,803	338†	—	1,465
Windsor E. Inst. Co. ..	5,050	1,690†	500	2,860
Wishoech E. L. and P. Co. ..	4,900	—	509	4,091
BUCKINGHAMSHIRE				
Aylesbury	14,279	7,983†	950	5,346
Chesham E. L. and P. Co. ..	9,500	4,756	—	4,744
Cookham and Dist. E. Cpn. ..	—	—	—	—
Maidenhead	7,383	1,975†	1,390	4,018
Reading E. S. Co. ..	27,500	3,550	1,950	22,000
Thames Valley E. S. Co. ..	8,951	1,125	—	7,826
Wantage E. S. Co. ..	1,803	338†	—	1,465
Windsor E. Inst. Co. ..	5,050	1,690†	500	2,860
Wishoech E. L. and P. Co. ..	4,900	—	509	4,091
CAMBRIDGESHIRE AND ELY				
Beds. Cambs and Hunts E. Co. ..	13,200	4,994	—	8,206
Luton	30,150	4,500	9,000	16,650
CHESHIRE				
Alderley Edge and Wilmslow E. Bd. ..	4,360	1,552†	500	2,208
Altrincham, E. S. Ltd. ..	15,922	9,026	—	6,896
Birkenhead	47,880	11,260†	22,060	14,360
Bredbury and Romley ..	3,400	2,730†	—	670
Chester	17,456	8,918†	1,428	7,110

Homes.	Great Britain.	England.	Wales.	Scotland.
Total ..	11,197,620	9,338,729	648,253	1,210,638
On A.C. ..	3,835,387	3,373,142	210,721	251,524
On D.C. ..	1,046,784	883,102	61,470	102,222
Unwired ..	6,315,449	5,082,485	376,062	856,892

Name of Supply Authority.	Total No. of House-holders in Area.	Number of Households on A.C.	on D.C.	Without Supply.
CORNWALL				
Bude E. S. Co. ..	1,450*	—	1,050*	400
Callington and Dist. E. S. Co. ..	670	364†	—	306
Camborne E. S. Co. ..	3,849	638	—	3,211
East Cornwall E. S. Co. ..	4,000	1,680†	—	2,440
Launceston and Dist. E. S. Co. ..	1,370	—	764	606
Liskeard G. and E. Co. ..	1,339	—	503	836
Newquay E. L. and P. Co. ..	1,550*	—	1,654*	296
Penzance and Dist. E. S. Co. ..	3,146*	750*	—	2,396
St. Austell and Dist. E. L. and P. Co. ..	11,122	950†	402	9,770
Truro E. S. Co. ..	2,000*	400*	—	1,600
West Cornwall E. L. and P. Co. ..	30,144*	4,200*	—	25,944
CUMBERLAND				
Carlisle	22,000	7,957†	1,033	13,010
Keswick El. L. Co. ..	1,020	775	—	245
Milloom	1,981	489	—	1,492
Penrith E. S. Co. ..	2,393*	—	450*	1,943
South Cumberland Co. ..	6,129	1,470†	—	4,659
Whitehaven	5,640*	200*	8,444*	1,896
Workington	5,084	1,499	—	3,585
DERBYSHIRE				
Bolsover	1,975	1,260*	—	715
Buxton	3,685	—	2,614	1,171
Chesterfield	15,870	7,791†	5,194	2,885
Derby	45,000	29,100	200	15,640
Derbyshire and Notts. E. P. Co. ..	125,000	21,500†	1,500	102,000
Long Eaton	6,150	1,350†	3,300	1,500
New Mills	6,200*	2,000*	—	4,200
Trent Valley and High Peak E. Co. ..	11,483	2,882†	—	8,601
DEVONSHIRE				
Barnstaple	3,900	—	1,884	2,016
Bideford and Dist. E. S. Co. ..	8,181	1,300	—	6,881
Bratton E. L. and P. Co. ..	1,000	—	650	350
Brixham G. and E. Co. ..	2,350	—	653	1,697
Budleigh Salterton E. L. and P. Co. ..	—	—	680	—
Chudleigh E. L. and P. Co. ..	500*	—	200*	300
Culm Valley E. S. Co. ..	5,000	1,016†	—	3,984
Dawlish E. L. and P. Co. ..	1,600	1,050†	—	450
East Devon E. S. Co. ..	—	4,094	32	—
Exeter	20,000	14,100†	—	5,900
Exe Valley E. Co. ..	—	1,265	53	—
Holsworthy E. S. Co. ..	1,990*	—	280*	1,680

MULLARD THE MASTER VALVE

SET MARKET SURVEY

Name of Supply Authority.	Total No. of House-holders in Area.	Number of Households on A.O.	Number of Households on D.O.	Without Supply.
Ilfracombe E. L. and P. Co.	2,800*	—	800*	1,800
Ivybridge E. S. Co.	530	—	164	378
Lynton and Lymouth E. L. Co.	800*	543*	—	257
Paignton E. L. and P. Co.	5,120	3,553†	—	1,567
Plymouth	60,175	33,250†	2,900	24,025
Plympton St. Mary R.D.O.	6,400	2,665†	—	3,735
Salcombe G. and E. Co.	2,280	252	—	2,003
Seaton and Dist. E. L. Co.	1,570	—	840	730
Teignmouth E. L. Co.	4,250	2,287†	—	1,963
Tilverton	2,100	—	748	1,352
Torquay	28,000	13,000†	—	13,000
West Devon E. S. Co.	2,000*	—	750*	1,250
DORSETSHIRE				
Bridport	5,000	860†	—	4,140
Dorchester	1,520*	—	708	1,692
Lyne Regis	870	—	500	370
Portland	2,200	900	—	1,300
Swanage G. and E. Co.	1,500*	900*	—	600
Weymouth and Melcombe Regis	5,950	1,532	3,308	1,110
DURHAM				
Annfield Plain	4,000	3,000	—	1,009
Auckland	1,200*	—	708	1,692
Crook	1,720	1,454	—	268
Darlington	19,613	8,264†	973	10,478
North Eastern Supply Co. (Durham Section)	202,918	64,000	5,000	133,918
Seaham Harbour	5,492	3,430	—	1,862
South Shields	27,000	27,000	—	—
Stockton-on-Tees	16,928	7,713†	—	8,215
Sunderland	29,800	9,600	—	19,800
Tandfield	2,200	1,848	—	352
West Hartlepool	10,000	5,000	4,700	300
ESSEX				
Barking	15,183	7,954†	—	7,229
Brentwood and Dist. E. Co.	6,000	4,000†	—	2,000
Chingford and High Beech (Northmet).	15,000*	5,468†	—	9,532
Clacton	6,202	2,331†	3,285	646
Colchester	20,906	11,533†	5,000*	9,953
East Ham	32,164	8,000†	15,000	10,164
Electric Supply Cpn., Frinton and Dist. E. L. and P. Co.	9,700	4,900†	—	4,800
Grays	1,780	610	750	420
Harwich	3,712	1,371†	1,995	376
Ilford	3,411	3,090	—	321
Leyton	34,008	9,177†	18,42†	8,407
Saffron Walden	30,300	13,000†	8,000	9,300
Shoeburyness	1,600	—	550	1,050
Southend-on-Sea	1,614	780†	—	764
Tilbury	28,878	13,600	12,399	2,877
Walthamstow	8,000	2,928†	—	772
West Ham	31,000	14,013†	7,035	9,932
	60,000	28,154†	—	31,846
GLOUCESTERSHIRE				
Cheltenham	14,650	6,300†	—	8,350
Cirencester E. S. Co.	1,460	830†	—	930
Gloucester	15,500	4,600†	2,800	8,100
Stroud E. S. Co.	2,800	874†	—	1,726
Tewkesbury E. L. Co.	777*	—	145*	632
Thornbury and Dist. E. Co.	1,267*	600†	—	667
Warley R.D.O.	—	290†	—	—
West Gloucestershire P. Co.	2,089	1,308†	—	781
	37,797	5,370†	—	32,427
HAMPSHIRE				
Aldershot	4,319	763†	558	2,998
Alton and Dist. E. Co.	1,500*	365*	—	1,135
Andover E. S. Co.	3,000*	430*	—	2,570
Basingstoke	8,438*	855*	1,945*	5,638
Bournemouth and Poole E. S. Co.	55,000	29,000	1,000	25,000
Fareham	3,290	1,889†	—	1,335
Gosport and Alverstoke E. L. Co.	10,000*	—	3,500*	6,500
Lymington E. L. and P. Co.	3,349	988	—	2,361
Millford-on-Sea E. S. Co.	1,000	—	465	535
Midland and Barton E. S. Co.	2,000	800	—	1,200
Petersfield E. L. and P. Co.	1,049*	435*	—	614
Portsmouth	80,058	45,121†	—	33,937
Ringwood E. S. Co.	2,021	892†	—	1,029
Southampton	32,460	24,000†	5,000*	23,460
West Hampshire E. Co.	20,250	4,000†	—	16,250
Whitechurch G. and E. Co.	600	150	—	450
Winchester	7,925	109	3,271	4,545

Name of Supply Authority.	Total No. of House-holders in Area.	Number of Households on A.O.	Number of Households on D.O.	Without Supply.
HEREFORD				
Kington (J. H. Langston)	450*	—	170*	280
Ledbury E. S. Co.	936	330†	—	606
Leominster E. S. Co., Ltd.	1,600	390	—	1,210
HERTFORDSHIRE				
Barnet, East Barnet Valley and Potteridge (Northmet).	7,871	6,530†	29	1,312
Bishop's Stortford (Northmet).	2,408	510†	—	1,898
Cheeshunt, Cutley, Upshire and Waltham Abbey. (Northmet).	5,287	1,359†	—	3,928
First Garden City, Ltd. (Letchworth).	8,263*	2,180†	720*	5,363
Hertford, Hoddeston and Dist. (Northmet).	10,467	4,403†	—	6,064
Hitchin	3,750*	1,350†	—	2,400
Royston, Buntingford and Dist. (Northmet).	2,729	746†	—	1,983
St. Albans, Harpenden and Dist. (Northmet).	15,323	6,092†	600	8,631
Stevenage and Stevenage Rural. (Northmet).	5,032	2,306†	—	2,726
Welwyn Garden City E. S. Co.	2,684	2,414†	—	270
Watford	24,900	13,956†	—	10,944
HUNTINGDON				
Beds. Cambs and Hunts E. Co.	(See Bedfordshire).			
ISLE OF WIGHT				
(Isle of Wight E. L. and P. Co.).				
Ventnor	1,324	916†	—	408
Sandown	2,764	1,300†	—	1,464
Ryde	4,493	1,390†	—	3,103
Newport and Cowes	7,132	1,425†	—	5,709
Rural Area	7,435	356†	—	6,679
KENT				
Ashford	10,000	6,100†	—	3,900
Beckenham	13,000	11,623	—	1,377
Bexley Heath	—	10,897†	—	—
Bromley	12,000	7,200†	—	4,800
Canterbury	6,511	316	3,687	2,508
Chislehurst E. S. Co.	2,356*	800†	—	1,750
Dartford	6,400	453†	2,483	3,464
Dover	10,000	7,000	—	3,000
Erith	7,641	6,200†	—	1,441
Faversham	3,028	—	1,127	1,899
Folkestone E. S. Co.	12,000	4,000†	4,600	3,600
Foots Cray E. S. Co.	2,750	1,600†	—	1,150
Gillingham	16,761	12,000†	—	3,761
Gravesend	9,034*	5,000*	2,500*	1,534
Herne Bay and Dist. E. S. Co.	5,310	1,698	—	3,604
Isle of Thanet E. S. Co.	16,840	537	5,800	9,603
Maldstone	13,000	4,600†	2,200	6,300
Ramsgate and Dist. E. S. Co.	8,000*	—	2,759*	5,241
Sevenoaks and Dist. E. Co.	13,280*	4,802†	—	8,478
Sheerness and Dist. E. S. Co.	4,667*	1,000*	500*	3,167
South East Kent E. P. Co.	3,000*	1,930	—	1,070
Tonbridge	6,000	2,148†	311	3,541
Tonbridge Wells	14,855	9,032†	—	5,855
Weald E. S. Co.	29,895	6,189†	—	20,706
West Kent E. Co.	—	9,000*	—	—
Whitstable E. Co.	4,200	3,154†	—	1,046
LANCASHIRE				
Accrington	23,314	9,357†	—	13,957
Ashton-in-Makersfield	4,986	461†	—	4,525
Atherton	5,000	2,300†	—	2,700
Ashton-under-Lyme	15,120*	1,900*	1,200*	15,111
Bacup	6,138	2,289†	—	3,849
Barrow-in-Furness (Urban)	15,500	1,600†	4,000	9,700
Barrow-in-Furness (Rural)	—	1,200†	—	—
Blackburn	47,544	10,695†	1,500	35,449
Blackpool	28,700	22,500†	—	6,200
Bolton	45,187	17,657†	2,339	25,171
Brierfield	2,600	900†	—	1,700
British Insulated Cables Ltd. (Prescot)	6,727	2,904†	—	3,823
Burnley	27,500	7,400†	5,794	14,306
Bury	18,000	5,784†	—	12,216
Cad and Dist. E. Co.	1,200	300†	—	900
Chiltheroe	6,593	1,929†	—	3,664
Colne	8,924	1,950†	2,048	4,926
Darwen	11,209	1,224	4,467	5,518
Eccles	10,500	3,500†	—	7,300
Farnworth	7,811	3,580	1,464	2,817
Fleetham	6,308	2,163†	5,020	725
Formby	2,016*	1,331*	—	185
Grange	650	430†	—	170

MULLARD MEANS BUSINESS

Name of Supply Authority	Total No. of Householders in Area.	Number of Households on A.O.	on D.O.	Without Supply.
Hazlingden	5,000	3,050	—	1,950
Heywood	7,456	1,089†	621	5,743
Hindley	5,140	1,210†	—	3,930
Lancashire E. P. Co. ..	68,581	24,765†	—	44,126
Leicester	10,400	3,400†	—	7,000
Leigh	11,235	2,346†	1,600	7,389
Littleborough	3,600	1,200†	—	2,400
Liverpool	248,909	81,662†	9,900	157,347
Lytham St. Anne's ..	6,720	4,475†	1,375	870
Manchester	187,644	55,062†	3,816	128,765
Middleton	7,321	1,801†	1,100	4,420
Milnrow	2,500	1,250†	—	1,250
Morecambe and Heysham	8,000	6,000†	—	2,000
Nelson	10,000	7,128†	—	2,872
Newton-in-Makerfield	5,001	1,470†	—	3,531
Oldham	54,450	31,262†	3,300	19,888
Ormskirk E. S. Co. ..	2,935	843	—	1,792
Padiham	3,270	821†	—	2,449
Prescot (see British Insulated Cables, Ltd.)	—	—	—	—
Preston	38,500	19,562†	—	18,938
Radcliffe	7,000	2,250†	1,000	3,750
Ravenshall	7,000	3,550†	—	3,450
Rochdale	22,700	12,530†	—	20,170
St. Helens	27,130	5,947†	4,400	10,783
Salford	63,530	12,941†	3,230	37,359
Southport	17,000	11,000†	—	6,000
Stretford and Dist. E. Bd.	23,500	13,017	5,045	5,438
Stretford and Pendlebury	8,750*	3,417*	1,300*	4,113
Thornthorpe Cleveleys	8,200	2,590†	—	610
Tolmorden	6,752	1,932†	—	4,820
Turton	3,800	1,450†	—	1,850
Ulverston	2,500	700†	—	1,800
Warrington	28,580	11,027†	100	17,233
West Lancs. R.D.C. ..	2,950	1,151†	—	1,809
Whitworth	2,500	710†	—	1,790
Wigan	33,370	8,293†	—	25,083
LEICESTERSHIRE				
Leicester	70,900	43,000†	—	27,000
Leicestershire and Walsingham E. S. Co. ..	100,000	28,300†	—	71,700
Loughborough	7,638	2,085	4,766	787
Melton Mowbray E. L. Co.	2,756	—	1,408	1,348
LINCOLNSHIRE				
Barton-on-Humber E.S. Co.	1,613*	—	500*	1,113
Boston E. S. Co. ..	16,340	2,900*	—	12,440
Cleethorpe	7,330	3,183*	—	4,149
Grimsby	4,400	1,206†	—	3,104
Gainsborough	27,800	5,815†	9,925	12,060
Lincoln	17,586	4,927†	—	12,659
Lincolnsire E. S. Co. ..	3,159	679	—	2,480
Louth	3,200*	600*	—	2,600
Southcope and Frodingham	7,548	4,100	3,448	8
Steaforth	1,801	250†	596	955
Spalding	3,700	1,250	—	2,450
MIDDLESEX				
Brentford E. S. Co. ..	5,000*	1,725*	—	3,275
Colne Valley E. S. Co. ..	—	8,821*	—	—
Ealing	20,440	1,712	—	5,728
Edmonton. (Northmet)	18,126	9,129†	—	8,998
Egham and Staines E. Co.	29,700	9,226†	—	20,474
Enfield. (Northmet) ..	16,097	6,437†	150	9,510
Finsbury	16,300	—	11,800	8,500
Friern-Barnet. (Northmet)	4,332	3,150†	—	1,182
Harrow E. L. and P. Co. ..	9,900	—	6,500	2,395
Hendon E. S. Co. ..	20,800	27,000†	—	2,500
Hendon Rural and Kingsbury. (Northmet)	14,277	14,133†	—	124
Heston and Isleworth ..	19,338*	—	7,500*	11,938
Hillingdon	25,000	—	15,618	7,382
Northwood E. L. and P. Co.	5,200	3,526†	—	1,674
Southgate. (Northmet)	16,500	13,605†	—	2,895
South Mimms Rural. (Northmet)	2,099	1,078†	—	421
Tottenham. (Northmet)	27,091	11,318†	—	15,773
Twickenham (London and Home Counties J.E.A.) ..	27,000	18,311†	6,759	6,930
Uxbridge and Dist. E. S. Co.	33,200	20,400	—	12,800
Wembley and Wealdstone (Northmet) ..	28,227	22,355†	—	872
Willesden	37,800	21,000†	750	15,750
Wood Green. (Northmet) ..	15,301	3,477†	2,288	9,538
NORFOLK				
East Dereham	80	500†	—	350
Great Yarmouth	30,073	17,421†	—	12,652
King's Lynn	6,800	784†	3,608	2,408
Norwich (City Area) ..	32,127	22,059†	3,721	6,947
Norwich (Rural Area) ..	30,560	5,877†	—	22,223

Name of Supply Authority.	Total No. of Householders in Area.	Number of Households on A.O.	on D.C.	Without Supply.
Sheringham Dist. E. S. Co.	1,509*	427*	—	1,082
NORTHAMPTON				
Kettering	20,000	7,637†	3,979	8,384
Northampton E. L. and P. Co.	57,000	23,000†	1,800	32,200
Peterborough	15,000	6,000†	200	8,800
Rushden and Dist. E. S. Co.	11,200	8,000†	900	7,500
Wellingborough E. S. Co.	8,100	2,140†	360	5,600
NORTHUMBRIA				
Amble	1,117	902†	—	215
Hexham and Dist. E. S. Co.	2,537	1,064	—	1,573
Newcastle and Dist. E. L. Co.	67,000	6,981	373	59,646
Newcastle-upon-Tyne. North Eastern Supply Co. (Northumberland Section) ..	134,392	43,000	4,000	87,392
Tynemouth	16,544	10,689	—	5,655
NOTTINGHAMSHIRE				
Derbyshire and Notts E. P. Co.	—	(See Derbyshire)	—	—
East Retford	8,800	3,100†	—	5,500
Mansfield	16,558	2,750†	3,554	9,254
Newark	5,501	2,443†	280	2,778
Nottingham	95,000	20,000†	46,000	29,000
Worksop	6,250*	1,000*	3,000*	2,250
OXFORDSHIRE				
Banbury and Dist. E. S. Co.	3,500*	1,000*	1,000*	1,500
Burford E. L. and P. Co.	452	—	271	1,801
Chipping Norton E. S. Co.	1,067*	—	453*	584
Oxford E. Co.	6,000	2,935†	—	3,067
Oxford	14,500	6,750†	250	7,500
Witney	953	265†	540	148
Woodstock and Dist. E. D. Co.	481	308	—	173
SHERIFFS				
Market Drayton E. L. and P. Co.	1,200	—	873	328
Oswestry	3,044*	668*	755*	1,621
Shrewsbury	8,034	—	3,281	4,753
SOMERSET				
Bath	22,264	6,192†	1,548	14,523
Bridgwater and Dist. E. S. and T. Co. ..	4,400*	—	1,350*	3,050
Bristol	94,110	44,822†	—	49,288
Burnham and Dist. E.S. Co.	1,200	850†	—	350
Mid-Somerset E. S. Co.	1,000	770†	—	230
Minehead E. S. Co. ..	5,203	2,233†	—	2,970
North Somerset E.S. Co.	31,600	9,667†	—	21,933
Porlock and Dist. E.S. Co.	640	316†	—	324
South Somerset and Dist. E. S. Co. ..	12,013	1,789†	—	10,224
Wellington D. E. Co. ..	2,138*	468	—	1,667
Wells	10,920*	5,600*	—	5,320
Wester Electricity Co.	3,433	613	538	2,262
Weston-super-Mare Dist. E. S. Co.	6,500	3,600†	2,000	1,500
Yeovil E. L. and P. Co.	4,870	—	1,042	3,828
STAFFORDSHIRE				
Burton-on-Trent	23,277	14,490†	—	8,781
Cannock	10,907	3,794†	—	7,113
Chasestown and Dist. E. Co.	6,789	4,155	—	2,634
Leek	5,019	210†	2,772	2,037
Lichfield	2,203*	1,217*	—	1,082
Midland Elec. Cpn. for Power Distribution. (see Warwickshire)	6,700	700†	2,200	3,800
Newcastle-under-Lyme	30,671	2,014†	—	28,657
N. W. Midlands J.E.A.	8,000	2,500	1,000	4,500
Stafford	2,500	800†	—	1,700
Stone	59,735	8,022†	2,532	49,181
Tamworth Dist. E.S. Co.	8,300	7,300†	—	1,000
Uttoxeter	2,400	870	—	1,530
Walsall	32,890	13,624†	1,500	17,766
West Bromwich	17,748	3,717†	2,505	11,526
Weaverhampton	40,000	27,500†	—	12,500
SUFFOLK				
Aldeburgh E. S. Co. ..	770	—	472	293
Bungay G. and E. Co.	750	380†	—	370
Bury St. Edmunds ..	4,549	9,044†	401	2,054
East Anglian E. S. Co.	98,515	10,000*	2,030	85,485
East Suffolk E. D. Co.	5,130	1,567†	—	3,563
Felixstowe	3,621	2,901†	—	720
Ipswich	27,200*	9,500*	2,500*	15,200
Lowestoft	13,100	1,705	6,110	5,285
Newmarket E. L. Co. ..	2,578*	684*	—	1,894
Southwold E. S. Co. (see East Anglian E. S. Co.)	—	—	—	—
Woodbridge and Dist. E. L. Co.	1,720	633†	—	1,088

MULLARD THE MASTER VALVE

SET MARKET SURVEY

Name of Supply Authority.	Total No. of Householders in Area.	Number of Households on A.C.	on D.C.	Without Supply.
SURREY				
Barnes	11,090	—	9,680	1,320
Croydon	59,139	32,038†	5,470	21,631
Dorking (London and Home Counties J.E.A.)	7,755	826	1,724	5,205
Egham and Staines E. Co.	(see Middlesex)			
Epsum	4,490	1,083†	2,719	506
Farnham G. and E. Co. ..	6,993*	1,720†	—	5,273
Guildford G. and E. Co. ..	2,165	250†	—	1,915
Guildford	15,800	7,800†	900	6,900
Harley and Dist. E. S. Co. Leatherhead (London and Home Counties J.E.A.)	3,867*	600†	—	3,217
Kingston-upon-Thames ..	6,787	2,029†	1,043	2,210
Reigate	9,720	7,840†	—	1,880
Richmond L. and P. Co. ..	7,711	4,188	—	3,623
Burton (London and Home Counties J.E.A.)	9,659	4,800†	500	4,659
Sutton, Cheam and Dist. (London and Home Counties J.E.A.)	8,189	1,259†	6,400	530
Weybridge (London and Home Counties J.E.A.)	38,000*	27,179†	—	10,821
Wimbledon	2,000	1,636	—	364
Woking E. S. Co.	30,600	28,132†	—	2,473
Yorktown (Camberley and Dist. G. and E. Co.)	16,700	9,028†	—	7,674
7,000*	1,600*	—	5,400	
SUSSEX				
Bexhill	5,709	80	5,441	288
Bognor G. and E. Co. ..	8,500	2,819†	150	5,581
Brighton	58,000	5,900†	27,200	22,600
Burgess Hill and Dist. E. S. Co.	1,705*	—	918*	787
Central Sussex E. Ltd. ..	5,000*	1,500*	—	3,500
Chichester	8,000	3,400†	—	4,600
East Grinstead	2,820	750	1,091	679
Eastbourne	14,872	13,084	—	1,788
Hastings	22,600	20,100†	—	2,500
Horsham	3,467*	1,250*	500*	1,717
Hove	16,900	5,024	8,032	3,850
Lewes and Dist. E. S. Co. Peacehaven E. L. and P. Co.	3,200*	—	1,395*	1,805
800	500†	—	300	
Shoreham and District. E. L. and P. Co. ..	4,120	1,763†	—	2,351
Steyning E. L. Co.	2,610*	484†	—	2,126
Sussex E. S. Co. (Crawley)	1,500	350†	500	650
Sussex E. S. Co. (Littlehampton)	2,700	—	750	1,950
Worthing	18,700	4,765	8,442	5,503
Uckfield G. and E. Co. ..	5,600*	320†	—	5,280
WARWICKSHIRE				
Birmingham	263,000	70,000†	44,000	149,000
Coventry	53,986*	25,358†	—	28,598
Leamington and Warwick E. Co.	4,400*	400*	270*	3,730
Leicestershire and Warwickshire E. P. Co. (see Leicestershire).				
Midland E. Cpn. for P. Distribution	75,083	20,000†	—	55,083
Midland E. L. and P. Co. ..	—	1,814†	736	—
Nuneaton	11,600	5,500†	8,600	2,500
Rugby	5,900	4,000†	—	1,900
Sutton Coldfield	10,350	992†	5,261	4,097
WESTMORLAND				
Fendal	4,449	1,267	285	2,897
Windermere and Dist. E. S. Co.	3,811	1,599	—	2,012
WILTSHIRE				
Amesbury E. L. and Genl. S. Co.	500	—	300	200
Calne	967	—	198	771
Malmsbury E. S. Co. ..	641*	—	183*	478
Marlborough	1,190	—	470	720
Salisbury E. L. and S. Co.	7,500	2,900*	913*	4,585
Swindon	18,088	11,822†	—	6,236
Tisbury E. S. Co.	628*	—	150	478
Worminstor E. S. Co. ..	1,531*	387*	—	1,144
West Wilts. E. L. and P. Co.	19,185	7,750†	—	11,435
Wilton E. S. Co.	500	92	—	408
WORCESTERSHIRE				
Kidderminster and Dist. E. S. Co.	7,710*	2,260*	2,400*	3,110
Malvern	4,684	2,040	—	2,644
Worcester	13,375*	5,515*	—	7,815
YORKSHIRE				
Adwick-le-Street	5,000	3,500†	—	1,500
Askrgill and Beeth E. S. Co.	545	245	—	300
Barboldswick	3,245	605	—	2,640
Barnesley	17,139	8,140†	500	8,499

Name of Supply Authority.	Total No. of Householders in Area.	Number of Households on A.C.	on D.C.	Without Supply.
Batley	10,042	3,358	969	5,715
Bingley	6,000	3,495†	—	2,505
Bradford	81,500	26,644†	2,060	52,796
Bridlington	5,300*	500*	3,349*	1,451
Brighouse	6,000	2,056†	—	3,944
Buckrose L. and P. Co. ..	8,000	3,957†	—	7,004
Deane Dist. E. Bd.	9,145	2,011†	—	7,134
Dewsbury	15,000	4,600†	700	9,700
Doncaster	21,846	11,244†	666	9,936
Earby	1,602	449†	—	1,153
Elec. Distbn. of York-shire, Ltd.	213,000	59,148†	—	153,852
Elland	3,350	960	1,120	1,270
Eston	6,750	5,000	—	1,750
Guisborough	1,500*	1,000†	—	500
Hawes E. L. Co.	261	204	—	67
Halifax	32,000	6,387†	1,500	22,114
Harrogate	19,150	8,800†	—	10,850
Hedden Bridge	2,020	840†	—	1,180
Heckmondwike	2,500	—	2,027	473
Holmfirth	2,710	2,185†	—	525
Honley	1,845	1,105†	—	540
Huddersfield	41,000	25,500†	—	15,500
Ilkley	2,000	1,692†	220	731
Ingkton E. L. and P. Co. ..	667*	—	130*	637
Keighley	13,800	2,750†	2,380	8,770
Kingston-upon-Hull	95,000	21,177†	21,527	52,297
Middlesbrough	30,500	16,867†	—	13,633
Mexborough	5,028*	—	3,110*	1,918
Mirfield	8,800	2,070†	—	7,730
Leeds	134,000	85,000†	—	49,000
Newmill	955*	700†	—	255
Normanton	3,921	1,146†	—	2,775
North Eastern Supply Co. (Yorkshire Sect.)	39,233	14,000	—	25,233
Pudsey	5,143	3,192†	—	1,951
Redcar	5,560	3,759†	—	1,810
Ripon	3,400	1,136	—	2,264
Richmond	1,050	963†	—	87
Rotherham	26,000	770†	—	12,424
Scarborough	14,700	—	—	7,700
Sheffield	135,000	95,000†	—	40,000
Shipley	7,000*	2,500†	500	3,000
Skatton and Brotton	3,440	2,028	—	1,412
Skipton	4,000	1,500†	—	2,500
Slithwaite	1,304	668	—	836
S.E. Yorkshire L. and P. Co.	5,500	2,000†	—	3,500
Spenborough	4,010	1,675†	—	2,435
Tadcaster E. Co.	1,200	—	620	580
Wakefield	14,510	11,100†	—	3,410
Whitby	4,006*	45*	1,750*	2,202
Whitewood	1,680*	665*	—	1,015
York	30,089	14,292†	4,698	11,099
Yorkshire E. P. Co.	1,245*	400*	—	845
WALES AND MONMOUTH				
Aberayron and Dist. E. S. and P. Co.	400	—	190	210
Abertillery	6,764	1,000	2,000	3,764
Aberystwyth (Chiswick E. S. Cpn.)	2,400	—	1,924	576
Ammanford	1,750	—	1,275	475
Bangor	2,900	1,960†	—	940
Barry	8,470	85	—	8,405
Bedwas and Machen	2,000	1,335	—	665
Bedwery	5,079	5,000	—	1,079
Bethesda	1,500	858†	—	642
Betty-y-Coed	192	172	—	20
Blantawe E. S. Co.	2,400	—	1,320	1,080
Brecon	1,895	—	1,076	619
Bridgend	5,200*	3,894*	—	1,306
Brynamman and Dist. E. S. Co.	4,200	2,270	—	1,930
Caernarvon	2,450	1,560†	—	900
Caerphilly	9,350*	1,000*	—	8,350
Cardiff	42,000	25,000†	500	16,500
Cardiff E.D.C.	9,900	4,063	—	4,837
Cardiff E. S. Co.	2,740	430	1,934	376
Chepstow E. L. and P. Co.	1,520	794	—	726
Colwyn Bay	5,075	3,400†	780	895
Conway	3,500	2,000	—	1,500
Elbow Vale	6,095	—	5,644	451
Gelliger	11,270	6,500	—	4,770
Gorseion E. L. Co.	6,200*	2,000*	1,000*	3,200
Hawarden	6,900	3,400†	—	3,500
Holyhead (Anglesey)	2,500	350†	830	1,620
Liandilo	500*	—	400*	100
Llandudnod Dist. E. S. Co.	780	—	650	70
Llandudno	3,834*	—	3,050*	784
Llanelli and Dist. E. S. Co.	16,000*	3,000*	2,000*	11,000
Llanfairfechan	850	490†	—	360
Llangollen	918	—	870	248
Llanrwst E. S. Co.	1,082	154†	514	614
Llantrisant	1,573	1,200	—	373
Maesteg	5,500	5,439	—	61
Menai Bridge (Anglesey)	670	329†	—	341
Merthyr E. T. and L. Co.	18,000	1,373	2,577	12,050
Milford Haven	2,000	—	1,200	800

BETTER TRADE WITH THE BETTER RADIO BRIGADE

Name of Supply Authority	Total No. of Householders in Area.	Number of Households on A.O.	on D.O.	Without Supply.
Mold	1,800	1,300†	—	300
Monmouth E. Co. ..	4,100	431	—	668
Mountain Ash ..	8,125	7,950	—	245
Mynyddiwlwyn ..	5,600	2,330	—	3,170
Neath	8,160	1,960	—	6,210
Neath R.D.O. ..	7,201	3,282	705	3,214
Newport	25,560	11,702	8,179	5,688
Ogmore and Garrow ..	5,000	2,400	—	600
Ogmore Valley E. L. Co. ..	2,900	2,600†	—	300
Penarth & S. P. Co. ..	4,700	90	1,719	2,391
Penmaenmawr ..	1,392	1,228†	—	136
Penrybont	1,819	1,810	—	9
Pontardawe	6,840	2,650	50	4,140
Pontypool E. L. and P. Co. ..	7,000	1,200	4	5,798
Pontypridd	9,134	980	2,560	5,594
Portcawl E. Co. ..	1,500	830	—	870
Port Talbot	8,745	900	—	7,845
Poestalyon	1,800	1,063†	—	437
Rhondda	28,840	11,893	—	16,940
Risca	3,600	1,824	—	1,776
Ruthin E. S. Co. ..	900*	—	557*	343
South Wales E. P. Co. ..	30,000*	15,000*	—	15,000
Swansea	41,098*	16,331*	1,500*	22,967
West Cambrian P. Co. ..	—	2,778	3,191	—
Wrexham	4,737*	2,674†	900	1,163
GUERNSEY (States of)				
Guernsey Elec. Dept.)	5,500	—	2,801	2,699
JERSEY (St. Helier)	7,000*	1,521*	—	5,479
SCOTLAND.				
Aberdeen	45,957*	18,000*	—	28,037
Arbroath E. L. and P. Co., Ltd.	4,000	180	530	3,290
Ayrshire Elec. Bd. ..	71,295	22,628†	3,040	45,629
Bo'ness	3,361*	—	900*	2,461
Buckle	2,500	—	500	2,000
Clyde Valley E. P. Co. ..	157,000	62,000†	—	95,000
Coatbridge and Aldrie Gr. S. Co., Ltd. ..	17,797*	500*	2,500*	14,797
Delf E. S. Co., Ltd. ..	1,200*	—	220	880
Kenny and Dunipace ..	1,139	541	—	698
Dumbarton	5,800*	108*	648*	5,044
Dunfermline	5,752	820	1,874	3,058
Dumfriesshire C.O. ..	13,000*	300*	—	12,700
Dundee	47,470	6,000	2,796	37,674
Dunoon and Dist. E. S. Co., Ltd.	3,000	1,002	—	1,998
Edinburgh	111,851	30,677†	10,000	71,174
Elgin E. S. Co., Ltd. ..	1,000	—	350	650

Name of Supply Authority.	Total No. of Householders in Area.	Number of Households on A.O.	on D.O.	Without Supply.
Falkirk	7,100	2,591	—	4,509
Fife R. P. Co.	62,880	10,190†	—	53,700
Fort William E. L. Co. ..	960	—	400	560
Glasgow	219,150	83,757	41,254	174,139
Grantown-on-Spey E. S. Co., Ltd.	432*	—	289*	143
Greenock	23,985	5,070*†	5,415*	13,498
Hendon	8,149	230†	1,530	6,389
Helensburgh	—	—	—	—
Inverness	6,180	—	2,946	3,234
Kirkcaldy	11,138	2,000	800	8,338
Kirkcaldy C.O.	16,000	1,500†	1,100	14,750
Kirkwall	1,002	—	529	473
Lairg E. S. Co., Ltd. ..	387	46	45	178
Lerwick (Zetland) ..	1,405	—	520	885
Lochaber P. Co.	112	112	—	—
Lossiemouth	1,200	—	850	350
Lothians E. P. Co. ..	30,363	3,694†	—	26,669
Motherwell and Wishaw	14,866	—	4,755	10,101
Musselburgh and Dist. E. L. and P. Co., Ltd.	4,623	13†	1,222	3,388
North Berwick	1,150*	309†	—	841
North of Scotland E. L. & P. Co., Ltd. ..	2,230*	—	390*	1,840
Oban	1,783*	—	749*	984
Paisley	23,000	10,500†	—	11,500
Peterhead	3,220	—	3,700	5,520
Peterhead Elec. Co., Ltd.	3,000	242	—	2,758
Duke of Richmond and Gordon (Fochabers)	381*	—	325*	6
Rothsay Cpn.	4,000	—	900	3,100
Rose-shire E. S. Co., Ltd. ..	3,250*	860*	—	2,390
Scottish Central E. P. Co., Ltd.	3,954*	571*	—	3,112
Scottish Midlands E. S. Co., Ltd.	30,800*	3,000*	—	33,800
Scottish Southern E. S. Co., Ltd.	15,578	1,154	335	14,099
Skelmorlie E. S. Co., Ltd.	1,000*	150*	100*	750
Stirling Cpn.	5,470	—	2,478	2,992
Strathclyde E. S. Co., Ltd.	—	31,361	—	—
Tain Cpn.	400	190	—	240
Torbarny Cpn.	325	—	136	199
West Lothian C. O. ..	3,000	—	715	2,285
Wick Cpn.	1,850	—	1,800	550
Wigtownshire E. Co., Ltd.	—	—	900	—

P.O. LICENCE FIGURES

COUNTY.	Dec. 31, 1932.	Jan 31, 1933.	Feb. 28, 1933.	Mar. 31, 1933.	Apr. 30, 1933.	May 31, 1933.	June 30, 1933.	July 31, 1933.
SUMMARY.								
London	856,631	866,154	871,994	881,856	885,021	890,719	892,566	895,125
English Counties ..	3,815,662	3,888,700	3,939,585	3,989,778	4,016,341	4,046,027	4,064,316	4,086,394
Wales	171,453	175,293	177,820	179,918	181,097	182,908	183,928	185,014
Scotland	354,106	363,662	371,964	378,700	382,686	386,225	389,007	390,585
Northern Ireland ..	46,419	47,672	48,337	49,128	49,571	49,985	50,167	50,463
ENGLAND.								
Bedfordshire	33,756	34,254	34,470	34,701	34,857	35,013	35,136	35,245
Buckinghamshire ..	36,650	37,392	37,405	37,873	37,892	37,977	38,035	38,521
Berkshire	48,484	49,558	50,004	50,833	50,392	50,694	50,913	51,299
Cambridgeshire ..	34,807	35,303	35,530	35,796	35,975	36,145	36,269	36,449
Channel Islands ..	10,197	10,406	10,448	10,587	10,617	10,717	10,830	10,906
Cheshire	84,214	86,618	87,773	88,778	89,256	89,836	90,327	90,570
Cornwall	27,436	27,956	28,277	28,613	28,810	28,991	29,086	29,185
Cumberland	20,684	21,211	21,554	21,818	22,018	22,294	22,471	22,620
Derbyshire	59,705	61,104	61,900	62,681	63,126	63,573	63,815	64,124
Devonshire	95,516	97,601	98,762	99,898	100,535	101,240	101,579	102,011
Dorsetshire	28,756	27,879	27,274	26,867	26,469	26,700	26,841	26,958
Durham	74,350	76,005	77,270	78,310	79,016	79,534	79,985	80,482
Essex	162,452	165,110	166,499	168,232	168,951	169,375	169,863	170,785
Gloucestershire ..	101,445	103,124	103,935	104,963	105,680	106,235	106,829	107,431
Hampshire	143,855	147,703	150,183	152,583	153,848	156,088	156,889	162,962
Herefordshire	11,993	12,188	13,769	13,865	13,830	13,903	13,960	13,495
Hertfordshire	78,276	79,608	79,946	80,715	80,974	81,281	81,461	81,758
Huntingdon	6,398	6,556	6,581	6,645	6,678	6,700	6,716	6,729
Isle of Man	5,289	5,463	5,615	5,685	5,704	5,747	5,780	5,917
Kent	187,906	191,801	194,360	196,724	197,612	199,339	200,391	201,759

(Continued on page 132.)

MULLARD THE MASTER VALVE

LICENCE FIGURES—continued.

COUNTY.	Dec. 31, 1932.	Jan. 31, 1933.	Feb. 28, 1933.	Mar. 31, 1933.	Apr. 30, 1933.	May 31, 1933.	June 30, 1933.	July 31, 1933.
Lancashire	616,421	631,924	638,916	649,031	655,396	661,896	664,838	667,921
Lincolnshire	73,431	74,807	75,580	76,512	76,881	77,411	77,937	78,391
Leicestershire	68,364	69,512	69,744	70,304	70,610	71,206	71,493	72,025
Middlesex	97,658	99,453	100,795	101,726	101,988	102,577	103,055	103,710
Monmouthshire	34,462	35,650	36,107	37,045	37,377	37,729	37,932	38,238
Norfolk	56,373	57,448	57,998	58,678	59,022	59,540	59,999	60,009
Northampton	54,349	55,420	55,727	56,322	56,680	57,060	57,282	57,581
Northumberland	82,044	83,342	84,508	85,766	86,123	86,700	87,025	87,320
Notttinghamshire	95,002	97,348	98,697	100,244	101,003	101,588	102,002	102,832
Oxfordshire	33,478	33,823	34,085	34,330	34,371	34,477	34,606	34,713
Rutland	1,409	1,424	1,455	1,456	1,457	1,462	1,474	1,480
Shropshire	27,321	27,880	28,187	28,446	28,647	28,793	28,863	28,978
Somerset	50,005	51,188	51,744	52,195	52,525	52,879	53,122	53,462
Staffordshire	118,528	121,218	122,493	123,810	124,891	125,408	125,467	125,722
Suffolk	41,986	43,181	43,716	44,384	44,722	45,189	45,467	45,722
Surrey	173,208	176,569	177,855	180,017	180,881	182,053	182,934	184,008
Sussex	104,735	106,982	107,974	109,160	109,878	110,776	111,254	112,031
Warwickshire	216,344	218,823	221,190	223,039	224,464	226,089	226,927	228,214
Westmorland	4,987	5,125	5,198	5,299	5,342	5,407	5,434	5,426
Wiltshire	39,808	40,685	41,073	41,428	41,789	42,022	42,156	42,333
Worcestershire	51,040	52,685	53,331	53,826	54,206	54,530	54,749	55,073
Yorkshire	521,901	535,059	541,570	551,084	555,848	560,353	563,108	566,085

WALES.

Anglesey	1,422	1,454	1,478	1,494	1,506	1,523	1,536	1,550
Breconshire	1,652	1,695	1,699	1,697	1,693	1,697	1,701	1,701
Carmarthenshire	12,160	13,016	13,207	13,377	13,468	13,566	13,638	13,723
Carnarvonshire	16,954	17,434	17,602	17,780	18,046	18,213	18,341	18,463
Cardiganshire	2,963	3,018	3,044	3,072	3,114	3,133	3,148	3,154
Denbighshire	10,979	11,208	11,308	11,451	11,520	11,583	11,617	11,671
Flintshire	7,882	8,077	8,167	8,324	8,385	8,436	8,472	8,524
Glamorganshire	103,516	106,031	107,378	108,662	109,191	110,512	111,127	111,813
Merionethshire	2,281	2,330	2,368	2,374	2,381	2,389	2,399	2,416
Montgomeryshire	4,007	4,010	4,022	4,043	4,048	4,079	4,103	4,188
Pembrokehire	5,661	5,801	5,888	5,961	6,033	6,067	6,126	6,145
Radnorshire	1,526	1,625	1,659	1,683	1,703	1,712	1,718	1,716

SCOTLAND.

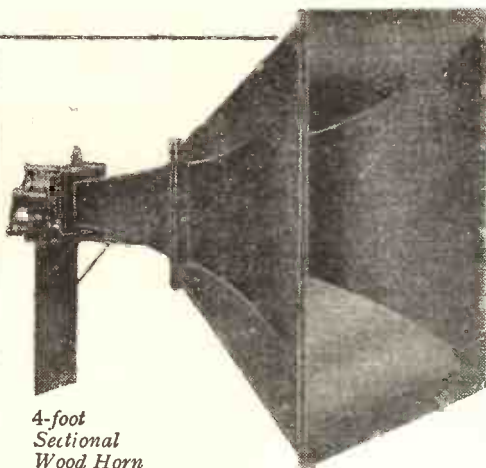
Aberdeenshire	26,171	26,682	27,093	27,605	27,733	27,872	28,007	28,075
Aberdeen	3,678	3,749	3,803	3,863	3,895	3,947	3,927	4,006
Ayrshire	19,001	20,827	21,387	21,866	22,247	22,513	22,708	22,885
Banffshire	2,246	2,325	2,380	2,451	2,478	2,501	2,509	2,514
Berwickshire	683	700	708	723	732	748	752	762
Bute	1,116	1,166	1,191	1,225	1,236	1,229	1,249	1,258
Caithness	913	954	991	1,008	1,010	1,017	1,025	1,036
Clackmannan	1,025	1,096	2,026	2,066	2,104	2,115	2,136	2,166
Dumbartonshire	4,221	4,327	4,390	4,434	4,492	4,519	4,539	4,568
Dumfriesshire	5,142	5,326	5,444	5,529	5,589	5,660	5,691	5,753
Edinburgh	55,022	57,138	58,065	58,957	59,488	60,011	60,360	60,558
Fifehire	20,282	21,328	22,084	22,717	23,152	23,394	23,636	23,808
Forfarshire	22,301	22,555	22,814	23,143	23,375	23,572	23,716	23,889
Glasgow	102,142	103,520	106,315	107,894	108,580	109,445	109,852	110,184
Haddington	3,244	3,465	3,539	3,586	3,640	3,685	3,730	3,778
Inverness-shire	3,093	3,251	3,344	3,413	3,448	3,478	3,506	3,543
Kirkcudbright	1,591	1,656	1,683	1,695	1,705	1,716	1,732	1,735
Lanarkshire	18,633	19,321	19,732	20,252	20,493	20,742	20,916	21,045
Linlithgowshire	2,822	3,024	3,132	3,214	3,287	3,330	3,370	3,393
Morayshire	2,536	2,668	2,720	2,757	2,790	2,814	2,834	2,854
Orkney	833	877	874	894	904	916	918	930
Peebles	872	898	925	953	961	975	985	992
Pertshire...	8,123	8,584	8,882	9,115	9,282	9,412	9,522	9,626
Perthshire	18,741	19,389	19,825	20,180	20,464	20,640	20,739	20,826
Ross & Cromarty	1,322	1,385	1,441	1,463	1,490	1,506	1,506	1,509
Roxburghshire	3,124	3,226	3,315	3,366	3,409	3,445	3,475	3,536
Selkirkshire	3,113	3,236	3,317	3,411	3,486	3,545	3,599	3,626
Shetland	646	674	688	713	737	756	765	765
Stirlingshire	15,948	16,636	17,057	17,373	17,628	17,862	17,981	18,054
Sutherlandshire	475	488	497	506	517	525	527	525
Wigtownshire	2,230	2,282	2,302	2,316	2,334	2,335	2,350	2,357

NORTHERN IRELAND.

Antrim	2,953	3,063	3,111	3,154	3,185	3,215	3,222	3,230
Armagh	2,445	2,531	2,548	2,579	2,597	2,637	2,647	2,662
Belfast	32,748	33,586	33,050	34,585	34,871	35,098	35,212	35,433
Down	2,564	2,654	2,703	2,762	2,783	2,808	2,817	2,829
Fermanagh	510	621	639	658	669	683	685	689
Londonderry	3,037	3,084	3,113	3,183	3,226	3,279	3,294	3,299
Tyrone	2,162	2,242	2,273	2,307	2,340	2,365	2,390	2,419

TOTAL	6,244,271	5,341,481	5,409,702	5,479,380	5,514,716	5,555,864	5,579,584	5,607,581
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EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER



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Wood Horn

CALIBRATION SERVICE

We calibrate the low frequency response curves of microphones, pick-ups, amplifiers, transformers and loudspeakers for manufacturers.

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Our "slack diaphragm" condenser microphone was originally developed for recording purposes, and should be used if lifelike transmission of speech or music is desired. It cannot blast, and does not introduce harmonics. It was fully described in the *B.B.C. Year Book* for 1933, pages 376 to 381. This microphone is ideal for loudspeaker calibrations.

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The Voigt Loudspeaker has been developed up to an ideal, not down to a price. *The Broadcaster*, Sept. 30th, 1933, page 42, says : "Reproduction very natural . . . The frequency response, which was examined with an oscillator, was for all practical purposes level between about 100 cycles and 4,000 cycles. . . We regard the speaker as an excellent production, and we recommend it as being of more than usual merit."

...

A special diaphragm which responds for an octave higher is also available for sound on film, and for specially high quality reproduction. This special diaphragm is so constructed that it does the work of a "Tweeter" speaker as well as reproduce the normal scale.

GREAT BRITAIN'S INTERNATIONAL RADIO TRADE

September, 1932, to August, 1933

The figures given in the summaries on this page are the values in sterling of radio and allied goods imported into and re-exported from Great Britain and Northern Ireland during the year from September, 1932, to August, 1933. Complete classified statistics are published monthly in "The Broadcaster."

IMPORTS

Country of Consignment.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
Australia...	...	...	10,147	9,269	7,496	3,530	1,014	2,428	1,585	2,978	3,873	3,150
Austria...	6,253	11,498	2,549	2,775	1,402	5,448	6,897	1,085	—	2,216	3,123	4,060
Belgium...	6,473	3,102	2,241	6,02	4,98	1,310	331	1,74	299	382	925	1,581
Canada...	...	...	7,335	6,891	3,877	1,620	1,522	1,74	1,684	1,406	1,639	2,792
France...	2,783	4,239	12,554	6,826	4,168	4,138	5,916	2,467	3,138	5,442	4,186	6,617
Germany...	16,838	17,218	31,918	20,954	17,405	16,991	17,058	11,721	15,595	15,420	23,430	41,260
Netherlands...	31,120	38,324	2,574	1,999	1,225	722	632	653	429	442	868	1,017
Switzerland...	1,890	2,542	4,518	1,999	1,225	722	632	653	429	442	868	1,017
United States of America...	57,952	57,343	45,518	19,403	11,852	5,252	16,208	11,625	8,768	7,066	10,536	23,792
Other Countries...	676	975	936	735	457	315	927	284	1,076	1,577	1,507	1,403
TOTAL	130,655	141,379	115,772	69,154	48,380	39,793	50,763	31,386	32,774	36,929	50,087	85,672

RE-EXPORTS

Country of Destination.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
Belgium...	...	...	...	...	...	4,849	...	...	...	...	...	...
France...	112	1,239	463	1,183	3,535	24	355	...	333	645	60	172
Germany...	398	2,028	376	80	89	84	78	161	64	27	33	175
Irish Free State...	365	332	490	302	1,748	667	425	155	764	828	468	203
Spain...	...	...	...	...	...	696	...	...	...	...	...	...
Switzerland...	...	4	...	...	...	...	...	...	...	...	...	...
United States of America...	...	4,303	34	2,985	1,212	380	3	294	74	8	30	285
Other Countries...	461	2,348	2,836	4,673	1,939	300	696	327	745	758	937	447
TOTAL	1,336	10,254	4,199	9,546	8,523	7,000	1,557	937	1,980	2,266	1,528	1,282

MULLARD

— THE VALVE OF THE PAST,
THE PRESENT, THE FUTURE

EXPORTS

The figures given in the summary on this page are the values in sterling of radio and allied goods exported from Great Britain and Northern Ireland during the year from September, 1932, to August, 1933. Complete classified statistics are published monthly in "The Broadcaster."

Country of Destination.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
Argentina Republic	10,088	4,095	1,996	1,043	871	1,997	1,786	1,361	639	2,291	758	502
Australia...	3,031	3,307	3,139	2,241	3,015	3,292	8,490	3,282	3,569	2,291	1,463	3,977
Belgium...	6,461	16,110	13,276	16,492	12,699	8,438	3,786	2,787	4,448	3,610	2,887	2,000
Brazil	2,389	9,594	2,824	5,977	2,338	3,467	3,210	27	2,753	1,610	3,333	2,603
British India	4,354	4,217	5,090	7,726	4,308	5,295	6,889	4,754	5,322	8,372	3,112	3,268
Canada	70	253	149	826	4,245	3,316	4,721	966	7,622	8,529	3,141	2,249
Channel Islands	3,889	4,791	6,331	7,097	4,951	2,353	2,331	1,594	1,454	1,272	1,910	2,445
China	1,118	1,118	3,358	2,094	3,917	1,608	2,556	908	3,594	1,523	3,128	11,082
Colombia	1,513	3,201	1,060	1,793	1,162	—	35	—	3,325	2,381	8,304	410
Cyprus	—	—	—	—	—	—	—	—	—	—	—	—
Czechoslovakia	1,007	1,522	3,201	5,208	1,841	1,811	1,116	1,940	919	1,509	42	1,765
Denmark	2,801	4,211	4,813	6,124	4,499	2,551	4,744	2,379	922	1,012	1,644	1,753
Egypt	1,199	2,777	1,229	1,239	2,970	5,351	1,119	899	4,621	1,915	649	1,259
France	5,914	7,225	11,484	17,893	16,094	9,477	5,066	6,876	3,858	2,200	1,329	1,598
Germany...	4,005	9,969	2,882	1,442	15,242	2,451	1,882	1,851	3,508	1,178	1,337	1,598
Hong Kong	247	474	287	1,401	488	333	364	756	1,333	22	484	91
Iceland	—	—	—	—	—	—	—	—	1,400	428	196	100
Iraq	658	282	110	1,373	88	738	270	1,055	444	48	124	202
Irish Free State	5,310	8,256	9,217	9,000	5,885	5,133	10,570	6,216	5,456	4,857	2,807	8,281
Italy	1,992	3,692	1,357	6,726	2,986	7,733	27,412	8,499	6,034	2,226	1,081	8,875
Japan	1,937	1,863	1,844	2,238	4,075	549	1,330	60	754	1,353	1,078	868
Kenya	438	1,332	1,119	505	524	511	375	442	816	1,458	363	199
Lithuania	—	—	—	—	—	—	—	—	—	—	—	—
Malta and Gozo	160	365	512	686	560	515	562	308	350	224	552	170
New Zealand	2,204	2,907	2,591	4,785	3,735	2,379	4,638	4,840	7,821	3,608	2,446	3,750
Norway	380	1,523	3,317	2,736	806	2,736	2,033	5,500	1,061	1,92	534	1,217
Netherlands	5,027	7,947	7,422	21,010	14,455	5,845	8,963	6,750	4,126	8,964	8,433	7,788
Palestine	—	—	—	930	930	6,640	1,429	3,362	233	1,176	45	—
Persia	—	—	—	1,619	159	90	22	52	189	171	45	—
Poland	698	2,171	1,459	1,742	1,997	223	102	644	1,001	332	198	394
Portugal	211	802	373	353	1,446	1,100	409	743	1,560	9,897	200	410
Portuguese East Africa	—	—	—	—	3,471	151	151	187	51	238	93	—
Roumania	47	1,288	321	608	56	86	11,610	3,632	712	22,191	17	—
Siam	232	3,316	542	255	110	169	67	50	294	234	64	—
Spain	561	1,009	805	932	1,507	758	1,067	949	455	1,074	401	758
Sweden	1,162	1,969	2,456	3,161	2,163	1,564	2,043	2,782	1,016	1,262	993	2,202
Switzerland	1,211	2,229	1,642	2,686	6,354	10,244	1,599	1,225	1,631	1,855	1,932	2,191
Straits Settlements	1,547	722	1,380	1,510	1,337	1,078	1,106	1,057	768	1,691	656	512
Turkey	—	—	—	2,859	15,337	8	110	184	286	745	734	16
Union of South Africa	1,510	2,360	3,853	9,702	3,382	2,311	3,569	3,080	13,252	5,154	4,506	5,293
Other Countries...	3,925	7,727	8,203	8,564	8,322	6,260	7,304	3,931	8,253	4,815	5,560	5,758
TOTAL	69,282	111,630	100,740	155,169	136,724	90,294	123,569	75,955	87,669	106,417	61,044	68,239

"THE BROADCASTER"

This is arranged in nine sections, as follows—Screen grid and HF pentode; general purpose triodes; small power triodes; power and high power triodes; pentodes; class B double triodes; multiple valves; rectifiers; double grid valves.

In each section the types are grouped by manufacturers, and then by filament voltages in the following order—2 volt; 4 volt; 6 volt; AC; DC or Universal.

The following makers are included:—Adey—Adey Portable Radio. Catkin—see Marconi and Osram. Clarion—Clarion Radio Valve Co., Ltd. Cossor—A. C. Cossor, Ltd. Eta—Electrical Trading Association, Ltd. Fotos—Concerton Radio and Electrical Co., Ltd. Hivac—High Vacuum Valve Co., Ltd. Lissen—Lissen, Ltd. Loewe—Loewe Radio Co., Ltd. Marconi—Marconiphone Co., Ltd. Mazda—Edison Swan

SCREEN GRID AND H.F. PENTODE VALVES.

Maker.	Type No.	Fil. volta.	Fil. amp.	Anode volta (max.).	Screen volta (max.).	Amp. factor.	Slope (mA/°.).	Grid bias.	Price.
Catkin ..	*MS4B ..	4.0	1.0	200	80	1,120	3.3	— 2	17/6
	*VMS4 ..	4.0	1.0	200	80	V.	2.6	2-30	17/6
Clarion ..	SG3 ..	2.0	0.15	150	80	300	1.0	—1½	12/6
	VS2 ..	2.0	0.15	150	80	V.	1.2	—	12/6
Cossor ..	*ACSG ..	4.0	1.0	200	85	500	1.4	—1½	14/-
	*ACVS ..	4.0	1.0	200	90	V.	2.0	—	14/-
	215SG ..	2.0	0.15	150	80	230	1.1	—1½	15/6
	220SG ..	2.0	0.2	150	80	320	1.4	—1½	15/6
	220VSG ..	2.0	0.2	150	80	V.	1.4	0-15	15/6
	220VS ..	2.0	0.2	150	80	V.	1.4	0-9	15/6
	410SG ..	4.0	0.1	150	80	800	1.0	—1½	20/-
	610SG ..	6.0	0.1	150	80	200	1.0	—1½	20/-
	*MSG-HA ..	4.0	1.0	200	100	1,000	2.0	—1½	17/6
	*41-MSG ..	4.0	1.0	200	80	200	1.0	—1½	17/6
	*MSG-LA ..	4.0	1.0	200	80	750	3.75	—1½	17/6
	*MVSG ..	4.0	1.0	200	100	V.	2.5	1½-35	17/6
Dario ..	*MS-PEN ..	4.0	1.0	200	100	—	3.5	—1½	17/6
	*MVS-PEN ..	4.0	1.0	200	100	V.	3.0	0-20	17/6
	*MS-PEN-A ..	4.0	1.0	200	150	V.	4.0	—3½	17/6
	FDVSG ..	16.0	0.25	200	100	V.	2.5	1½-35	17/6
	FDVS-PEN ..	16.0	0.25	200	100	V.	3.0	—1½	17/6
	Screenodiode 2v.	2.0	0.15	150	70	200	1.0	—	12/6
	V.Mu.Screendi n	2.0	0.15	150	70	V.	—	—	13/6
	*A.C.Screendi n	4.0	1.0	200	100	700	1.1	—1½	13/6
	*A.C.Super Screendi n	4.0	1.0	200	100	900	3.0	—2	13/6
	*V.Mu Super screendi n	4.0	1.0	200	100	V.	1.0	2-40	13/6
	FD.C. Super Screendi n	20.0	0.18	200	80	400	1.1	—2	15/-
	FD.C. Super Screendi n	20.0	0.18	200	80	800	1.1	—1½	12/6
ETA ..	BY6 ..	2.0	0.1	150	80	800	1.1	—1½	12/6
	*DW6 ..	4.0	1.0	200	100	1,000	1.2	—1	15/6
	*DW7 ..	4.0	1.0	200	80	600	3.0	—2	15/6
	*DW8 ..	1.0	0.0	100	100	V.	2.0	1½-30	15/6
	*24 ..	2.5	1.75	180	40	400	1.0	—2	12/6
	*35 ..	2.5	1.75	250	90	V.	1.1	1½-40	15/-
	*36 ..	6.3	0.3	250	90	870	1.0	—3	15/-
	*39 ..	6.3	0.3	250	90	V.	1.0	—3	18/-
	*57 ..	2.5	1.0	250	100	V.	1.2	—3	18/-
	*58 ..	2.5	1.0	250	100	V.	1.5	—3	18/-
	BC150 ..	2.0	0.11	150	75	250	1.0	—1½	12/6
	SG-VM ..	2.0	0.11	150	75	V.	1.0	—1½	12/6
Fotos ..	SG210 ..	2.0	0.1	150	80	250	1.0	—1½	10/6
Hivac ..	VS210 ..	2.0	0.1	150	75	V.	1.0	0-15	10/6
Lissen ..	SG215 ..	2.0	0.15	150	80	1,000	1.1	—1½	12/6
	SG2V ..	2.0	0.15	150	80	V.	1.2	0-9	12/6
	SG410 ..	4.0	0.1	150	80	1,200	1.2	—1½	12/6
	*AC-SG ..	4.0	1.0	200	80	1,000	3.2	—2	17/6
	*AC-SGV ..	4.0	1.0	200	80	V.	3.2	2-20	17/6
	*SGV16 ..	16.0	0.25	200	80	V.	3.2	2-20	17/6
	S21 ..	2.0	0.1	150	70	220	1.1	—1½	15/6
	S22 ..	2.0	0.2	150	75	350	1.75	—1½	15/6
	S23 ..	2.0	0.1	150	70	—	1.1	—1½	15/6
	S24 ..	2.0	0.15	150	70	—	1.4	—1½	15/6
	VS2 ..	2.0	0.1	150	70	V.	1.25	0-15	15/6
	VS24 ..	2.0	0.15	150	75	V.	1.5	0-9	15/6
Marconi ..	VP21 ..	2.0	0.1	150	60	V.	1.1	0-9	15/6
	S410 ..	4.0	0.1	150	70	180	0.9	—1½	20/-
	SG10 ..	4.0	0.1	150	70	210	1.1	—1½	20/-
	*MS4 ..	4.0	1.0	200	80	650	3.0	—1½	17/6
	*MS1B ..	4.0	1.0	200	80	1,120	3.2	—1½	17/6
	*VMS4 ..	4.0	1.0	200	80	V.	2.6	0-30	17/6
	*VMS4B ..	4.0	1.0	200	80	V.	2.9	0-20	17/6
	*MSP4 ..	4.0	1.0	200	100	—	4.0	—1½	17/6
	*VMP4 ..	4.0	1.0	200	100	V.	3.5	0-20	17/6
	FD8 ..	16.0	0.25	200	70	650	1.1	—	17/6
	FD8B ..	16.0	0.25	200	80	1,120	3.2	—1½	17/6
	FD8S ..	16.0	0.25	200	80	V.	2.4	0-30	17/6
	FD8SB ..	16.0	0.25	200	80	V.	3.0	0-20	17/6
Mazda ..	FD8P1 ..	16.0	0.25	200	100	—	4.0	—1½	17/6
	FD8P1 ..	16.0	0.25	200	100	V.	3.5	0-20	17/6
	SG215 ..	2.0	0.15	150	75	500	1.1	—1½	15/6
	SG215 ..	2.0	0.15	150	75	800	1.1	—1½	15/6

CUSTOM SAYS MULLARD

VALVE DATA CHART

Electric Co., Ltd. Micromesh—Standard Telephones and Cables, Ltd. Mullard—Mullard Wireless Service Co., Ltd. Oetron—Oetron, Ltd. Osram—General Electric Co., Ltd. Ostar-Ganz—Eugene Forbat. Philco—Philco Radio and Television Corpn. (G.B.), Ltd. Philips—Philips Lamps, Ltd. Pix—British Pix Co., Ltd. Six-Sixty—Six-Sixty Radio Co. Ltd. Triotron—Triotron Radio Co., Ltd. Tungram—Tungrams Electric Lamps (G.B.), Ltd. 362—The 362 Radio Valve Co., Ltd.

The following abbreviations are used:—* Indicates indirectly heated AC valve. † Indicates indirectly heated DC valve. ° Indicates indirectly heated Universal AC-DC valve. ** Indicates directly heated AC valve. VD (rectifiers) indicates voltage doubler. V indicates variable-mu.

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.).	Screen volts (max.).	Amp. factor.	Slope (mA/v.).	Grid bias.	Price.
Mazda (contd).	S215b	2.0	0.15	150	75	700	2.1	—1½	15/6
	S215VM	2.0	0.15	150	75	V.	2.0	0-9	15/6
	*AC-SG	4.0	1.0	200	100	1,700	3.0	—1½	17/8
	*AC-S2	4.0	1.0	200	100	3,000	6.0	—1½	17/8
	*AC-S1-VM	4.0	1.0	200	100	V.	1.1	0-40	17/6
	*AC-SG-VM	4.0	1.0	200	100	V.	3.0	0-30	17/6
	*AC-S2-PEN.	4.0	1.0	200	100	—	5.5	—4½	17/6
	†DC-SG	6.0	0.5	200	100	1,200	2.0	—1½	17/8
	†DC2-SG	20.0	0.1	200	100	1,000	2.0	—1½	17/8
	†DC2-SG-VM	20.0	0.1	200	100	V.	2.2	0-30	17/6
Micromesh	5B1	2.0	0.15	150	75	500	1.2	—1½	15/6
	*SGA1	4.0	1.0	200	100	1,500	3.0	—1½	17/6
	*VSGA1	4.0	1.0	200	100	V.	6.15	1½-35	17/6
	*9A1	4.0	1.0	250	100	—	4.25	1½-40	17/6
	*8A1	4.0	1.0	250	100	1,500	4.0	—1½	17/6
	PM12A	2.0	0.15	150	90	500	1.5	0	15/6
	PM12M	2.0	0.15	150	90	V.	1.4	0-7	15/6
	PM12	2.0	0.15	150	—	200	1.1	—1½	15/6
	PM14	4.0	0.1	150	—	200	0.9	—1½	20/-
	PM18	6.0	0.1	150	—	200	1.0	—1½	20/-
Mullard	*VP4	4.0	1.0	200	100	V.	2.5	0-20	17/8
	*8P4	4.0	1.0	200	100	2,700	3.0	—1½	17/6
	*34VA	4.0	1.0	200	100	1,000	2.0	—1½	17/6
	*84VB	4.0	1.0	200	100	750	2.5	—3	17/8
	*MM4V	4.0	1.0	200	100	V.	2.5	0-20	17/6
	†VP20	20.0	0.18	200	100	V.	2.9	0-20	17/6
	†8P20	20.0	0.18	200	100	—	3.5	—1½	17/8
	†MM20	20.0	0.18	200	100	V.	2.5	0-20	17/6
	†8G20	20.0	0.18	200	100	750	2.0	—3	17/8
	SG2	2.0	0.15	150	80	300	1.0	—1½	12/6
Oetron	VS2	2.0	0.15	150	80	V.	1.2	0-9	12/6
	*ACSG	4.0	1.0	200	85	500	1.4	—1½	14/-
	*ACVS	4.0	1.0	200	90	V.	2.0	0-30	14/-
	S21	2.0	0.1	150	70	250	1.1	—1½	15/6
	S22	2.0	0.2	150	75	350	1.1	—1½	15/6
	S23	2.0	0.1	150	70	—	1.1	—1½	15/6
	S24	2.0	0.15	150	70	—	1.4	—1½	15/6
	VS2	2.0	0.1	150	70	V.	1.2	0-15	15/6
	VS24	2.0	0.15	150	75	V.	1.5	0-9	15/6
	VP21	2.0	0.1	150	60	V.	1.1	0-9	15/6
Osram	8410	4.0	0.1	150	70	210	1.1	—1½	20/-
	8910	4.0	1.0	200	70	550	1.1	—3	17/6
	*MS4	4.0	1.0	200	80	1,120	3.2	—1½	17/6
	*MS4B	4.0	1.0	200	80	V.	2.6	0-30	17/6
	*VMS4	4.0	1.0	200	80	V.	2.9	0-30	17/6
	*VMS4B	4.0	1.0	200	100	—	4.0	—1½	17/6
	*MSP4	4.0	1.0	200	100	V.	3.5	0-20	17/6
	*V3LP4	16.0	0.25	200	70	530	1.1	—3	17/6
	†DS	16.0	0.25	200	80	1,120	3.2	—1½	17/6
	†VDS	16.0	0.25	200	80	V.	2.4	0-30	17/6
Ostar Ganz	†VDSB	16.0	0.25	200	80	—	4.0	—1½	17/6
	†DSPI	16.0	0.25	200	100	V.	3.5	0-20	17/6
	*SG25	250	0.02	300	100	950	3.8	—2	18/9
	*R100	250	0.02	300	100	4,000	4.0	—1	18/9
	*MS18	250	0.02	300	100	V.	8.0	0-40	18/9
	*M870	250	0.02	300	100	V.	3.0	0-40	18/9
	*PL3	250	0.02	300	100	V.	3.5	0-20	18/9
	*78	6.3	0.3	275	90	440	1.0	—3	13/-
	*24	2.5	1.75	275	90	650	1.0	—3	13/-
	*35	2.5	1.75	275	90	V.	1.1	—1½	13/6
Pix	82	2.0	0.06	180	68	610	0.6	—1½	20/6
	15	2.0	0.22	135	75	500	1.0	—1½	11/6
	25	2.0	0.15	150	70	230	1.0	—1½	11/6
	45	4.0	0.15	150	70	220	1.0	—1½	11/6
	*450-AC	4.0	1.0	200	100	600	3.0	—3	15/6
	218SG	2.0	0.15	150	90	200	1.0	—1½	15/6
	218SG	2.0	0.18	150	90	500	1.4	—1½	15/6
	218VSG	2.0	0.15	150	90	V.	0.7	—	15/6
	218VSG	2.0	0.18	150	90	V.	1.4	0-7	15/6
	*480-AC	4.0	1.0	200	100	1,000	1.0	—1½	17/6
Six-Sixty	*4X-SG-AC	4.0	1.0	200	100	1,000	3.0	—1½	17/6

MULLARD THE MASTER VALVE

VALVE DATA CHART—(Contd.)

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.).	Screen volts (max.).	Amp. factor.	Slope (mA/v.).	Grid bias.	Price.
Six-Sixty (contd.)	*4Y-SG-AC	4.0	1.0	200	100	750	3.5	—3	17/6
	*4XM-AC	4.0	1.0	200	100	V.	3.0	0-20	17/6
	*4V-MM-AC	4.0	1.0	200	100	V.	1.1	0-30	17/6
	*HP-1-AC	4.0	1.0	200	100	2,700	3.5	—1½	17/6
	*HP-2-AC	4.0	1.0	200	100	V.	3.2	0-20	17/6
Triotron	S207	2.0	0.07	200	100	180	1.0	—1½	10/6
	S215	2.0	0.15	150	90	500	1.5	—	10/6
	S208	2.0	0.08	200	100	V.	0.8	—	10/6
	*S409	4.0	0.1	200	100	350	0.9	—1½	12/6
	*S41N	4.0	1.0	200	100	V.	3.0	—	12/6
	*S415N	4.0	1.0	200	100	V.	1.2	—	12/6
	*S434N	4.0	1.0	200	100	V.	3.5	—	12/6
	*S410N	4.0	1.0	200	80	400	1.0	—2	12/6
	*S430N	4.0	1.0	200	100	900	3.0	—2	12/6
	*S435N	4.0	1.1	200	100	—	3.5	—2	12/6
	†S2010N	20.0	0.18	200	60	400	1.0	—3	14/6
	†S2030N	20.0	0.18	200	100	900	3.0	—2	14/6
	†S2012N	20.0	0.18	200	80	—	1.2	2-40	14/6
	†S2034N	20.0	0.18	200	100	—	3.5	—2	14/6
	†S2035N	20.0	0.18	200	100	—	3.0	—2	14/6
Tungarum	S220	2.0	0.3	200	100	700	2.0	—1	12/6
	S210	2.0	0.12	200	100	400	1.2	—1	12/6
	8V320	2.0	0.2	200	100	V.	1.8	0-15	12/6
	SE220	2.0	0.2	200	100	V.	1.2	0-15	12/6
	*HP4100	4.0	1.0	200	100	5,000	3.5	—2	14/6
	*HP4105	4.0	1.0	200	100	V.	3.5	2-25	14/6
	*AS4105	4.0	1.0	200	100	V.	1.2	2-30	14/6
	*AS495	4.0	1.0	200	100	1,500	3.5	0-5	14/6
	*AS494	4.0	1.0	200	100	1,000	1.5	—1	14/6
	*AS4100	4.0	1.0	200	100	250	1.5	—2	14/6
	*HP2015	20.0	0.18	200	100	5,000	3.5	—2	14/6
	*HP2118	20.0	0.18	200	100	V.	3.5	2-35	14/6
	*SS2018	20.0	0.18	200	100	1,350	3.5	—2	14/6
	*SE2118	20.0	0.18	200	100	V.	3.0	1½-24	14/6
	*S2018	20.0	0.18	200	100	400	1.2	—5	14/6
	*SE2018	20.0	0.18	200	100	V.	1.4	2-40	14/6
	*S7	2.5	1.0	250	100	1,500	1.2	—3	14/6
	*S8	2.5	1.0	250	100	V.	1.0	—3	14/6
	*S6	6.3	0.3	250	90	600	1.1	3-20	14/6
	*S9	6.3	0.3	250	90	V.	1.1	3-45	—
	*S7	6.3	0.3	250	100	1,500	1.25	—3	—
	*S8	6.3	0.3	250	125	V.	1.65	3-50	—
	*ASX2350	2.5	1.75	275	90	V.	1.0	3-20	14/6
	*ASX2240	2.5	1.75	275	90	V.	1.0	—3	14/6
882	SQ2	2.0	0.2	200	60	400	1.0	—3	7/6
	V82	2.0	0.2	125	75	V.	1.2	0-10	7/6
	SQ4	4.0	0.1	200	75	600	1.5	—1½	7/6
	V84	4.0	0.1	125	75	V.	1.2	0-10	7/6
	SQ6	6.0	0.1	200	75	600	1.5	—1½	7/6
	V86	6.0	0.1	125	75	V.	1.2	0-10	7/6
	*ACSG4	4.0	1.0	200	75	1,000	2.5	—1½	12/6
	*ACVS4	4.0	1.0	125	75	V.	2.0	0-40	12/6

GENERAL PURPOSE TRIODES.

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.).	Amp. factor.	Impedance (ohms).	Slope (mA/v.).	Grid bias (max.).	Price.
Adey ..	HLC210	2.0	0.1	150	20	11,000	1.8	—4½	—
Catkin ..	MH4	4.0	1.0	200	40	11,100	3.6	—3	13/6
Clarion ..	H2	2.0	0.1	150	20	20,000	1.0	—1½	5/6
	HL2	2.0	0.1	150	10	10,000	1.0	—4½	5/6
	*ACHF	4.0	1.0	200	35	14,000	2.5	—3	9/6
Cossor ..	*ACG	4.0	1.0	200	16	6,000	2.7	—7½	9/6
	210RO	2.0	0.1	150	40	50,000	0.8	—1½	7/6
	210HL	2.0	0.1	150	24	22,000	1.1	—3	7/6
	210HF	2.0	0.1	150	24	19,000	1.5	—3	7/6
	210Det.	2.0	0.1	150	15	13,000	1.15	—3	7/6
	210LF	2.0	0.1	150	14	10,000	1.4	—4½	7/6
	410RO	4.0	0.1	150	40	50,000	0.8	—1½	8/6
	410HF	4.0	0.1	150	22	20,000	1.1	—3	8/6
	610RO	6.0	0.1	150	17	10,000	1.7	—3	8/6
	610HF	6.0	0.1	150	40	50,000	0.8	—1½	8/6
	610LF	6.0	0.1	150	20	20,000	1.0	—3	8/6
	*41MRO	4.0	1.0	200	60	19,500	2.6	—2	14/6
	*41MH	4.0	1.0	200	72	18,000	4.0	—1½	13/6
	*41MHF	4.0	1.0	200	41	14,500	2.8	—3	14/6
	*41MHL	4.0	1.0	200	52	11,500	4.5	—3	13/6
	*41MLF	4.0	1.0	200	15	7,900	1.9	—3½	13/6
Dario ..	†DHL	16.0	0.25	200	68	13,000	4.5	—1½	5/6
	Univ.2v.	2.0	0.1	150	10	8,000	1.25	—7½	5/6
	SuperH.F.	2.0	0.1	150	32	20,000	1.6	—3	5/6
	Det.2v.	2.0	0.1	150	25	25,000	1.0	—3	5/6
	SuperDet.	2.0	0.15	150	24	7,500	2.0	—6	5/6
	*A.O.SuperDet.	4.0	1.0	200	24	7,500	3.2	—6	9/6
	†D.C.SuperDet.	20.0	0.18	200	24	11,000	3.5	—3	11/6

THREE MILLION AERIALS CAN'T BE WRONG

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.)	Amp. factor.	Impedance (ohms).	Slope (mA/v.)	Grid bias (max.).	Price.
ETA ..	BY1815 ..	2.0	.11	150	18	15,000	1.1	-3	5/8
	BY1210 ..	2.0	.11	150	12	10,000	1.2	-4½	5/8
	*DW4023 ..	4.0	1.0	200	40	23,000	1.75	-2½	11/-
	*DW4011 ..	4.0	1.0	200	40	11,000	2.8	-2½	11/-
	*DW1508 ..	4.0	1.0	200	15	7,500	2.0	-5½	11/-
	*27 ..	2.5	1.75	180	9	9,000	1.0	-13½	12/8
	*37 ..	2.5	0.3	180	9.2	10,000	0.9	-13½	12/8
	*55 ..	2.5	1.0	250	13.8	9,500	1.4	-18½	12/8
	BC18 ..	2.0	0.11	150	21	21,000	1.0	-3	5/-
	BC18D ..	2.0	0.11	150	21	21,000	1.0	-3	5/-
Fotos ..	BC9 ..	2.0	0.11	150	11	9,000	1.2	-7½	5/-
	BC9D ..	2.0	0.11	150	11	9,000	1.2	-7½	5/-
Hivac ..	H210 ..	2.0	0.1	150	25	22,000	1.1	-1½	4/8
	D210 ..	2.0	0.1	150	18	12,000	1.25	-3	4/8
	L210 ..	2.0	0.1	150	10	8,800	1.2	-4½	4/8
	H2 ..	2.0	0.1	150	50	45,000	1.1	-1½	6/8
Liesen ..	HL2 ..	2.0	0.1	150	25	22,000	1.6	-1½	6/8
	L2 ..	2.0	0.1	150	20	10,000	2.0	-3	5/8
	H410 ..	4.0	0.1	150	40	80,000	0.7	-1½	5/8
	HL210 ..	4.0	0.1	150	25	21,000	1.2	-3	5/8
	L410 ..	4.0	0.1	150	15	8,500	1.8	-4½	5/8
	H610 ..	6.0	0.1	150	40	60,000	0.7	-1½	5/8
	HL210 ..	6.0	0.1	150	25	21,000	1.2	-3	5/8
	L610 ..	6.0	0.1	150	18	8,000	2.0	-4½	5/8
	*AC-HL ..	16.0	0.25	200	35	11,700	3.0	-3	13/6
	*HL1 ..	2.0	0.1	150	35	35,000	1.0	-1½	7/-
Marconi ..	H2 ..	2.0	0.1	150	27	18,000	1.5	-3	7/-
	HL210 ..	2.0	0.1	150	24	20,000	1.2	-3	7/-
	L21 ..	2.0	0.1	150	16	8,900	1.8	-4½	7/-
	L210 ..	2.0	0.1	150	11	12,000	0.9	-6	7/-
	H410 ..	4.0	0.1	150	40	80,000	0.7	-1½	8/8
	HL410 ..	4.0	0.1	150	25	20,800	1.3	-3	8/8
	L410 ..	4.0	0.1	150	15	8,500	1.8	-4½	8/8
	H610 ..	6.0	0.1	150	40	60,000	0.7	-1½	8/8
	HL610 ..	6.0	0.1	150	30	30,000	1.0	-3	8/8
	L610 ..	6.0	0.1	150	15	7,500	2.0	-4½	8/8
Mazda ..	*MH4 ..	4.0	1.0	200	80	15,300	6.0	-1½	13/6
	*MHL4 ..	4.0	1.0	200	40	11,100	3.6	-2½	12/6
	*DH ..	16.0	0.25	200	20	8,000	2.5	-6	13/6
	H2 ..	2.0	0.1	150	50	45,000	1.1	-1½	7/-
	HL210 ..	2.0	0.1	150	26	15,500	1.4	-3	7/-
	HL2 ..	2.0	0.1	150	32	21,000	1.5	-1½	7/-
	L2 ..	2.0	0.1	150	19	10,000	1.9	-3	7/-
	H807 ..	6.0	0.07	150	40	90,000	0.45	-1½	8/8
	H610 ..	6.0	0.1	150	40	60,000	0.6	-1½	8/8
	HL610 ..	6.0	0.1	150	22	20,000	1.1	-3	8/8
Micromesh ..	*AC-HL ..	4.0	1.0	200	35	11,700	3.0	-3	13/6
	*AC2-HL ..	4.0	1.0	200	75	11,500	6.5	-1½	13/6
	*DC-HL ..	8.0	0.5	200	35	13,000	2.7	-3	13/6
	*DC2-HL ..	25.0	0.1	200	25	11,700	3.0	-3	13/6
	HLB1 ..	2.0	0.1	150	24	1,600	1.5	-3	7/-
	HLA1 ..	4.0	1.0	200	80	10,000	10.0	-1½	13/6
	HLA2 ..	4.0	1.0	200	50	9,000	5.5	-2½	13/6
Mullard ..	PM1A ..	2.0	0.1	150	50	41,600	1.2	-1½	7/-
	PM1HL ..	2.0	0.1	150	28	20,000	1.4	-3	7/-
	PM1HF ..	2.0	0.1	150	18	22,500	0.8	-3	7/-
	PM2DX ..	2.0	0.1	150	18	12,000	1.5	-3	7/-
	PM1LF ..	2.0	0.1	150	11	12,000	0.9	-3	7/-
	PM3A ..	4.0	0.07	150	38	55,000	0.7	-1½	8/8
	PM3 ..	4.0	0.07	150	14	13,000	1.05	-4½	8/8
	PM4DX ..	4.0	0.07	150	15	7,500	2.0	-4½	8/8
	PM5X ..	6.0	0.07	150	17.5	14,700	1.2	-4½	8/8
	PM6D ..	6.0	0.1	150	18	9,000	2.0	-3	8/8
Osram ..	*304V ..	4.0	1.0	200	75	12,000	2.2	-1½	13/6
	*354V ..	4.0	1.0	200	36	34,000	3.0	-3	13/6
	*244V ..	4.0	1.0	200	25	9,000	2.8	-4½	13/6
	*164V ..	4.0	1.0	200	16	4,850	3.3	-6	14/-
	*HL20 ..	20.0	0.18	200	35	14,000	2.5	-3	13/6
	H2 ..	2.0	0.1	150	20	20,000	1.0	-1½	5/-
	HL2 ..	2.0	0.1	150	10	10,000	1.0	-4½	5/-
	*ACHF ..	4.0	1.0	200	35	14,000	2.5	-3	9/6
	*ACG ..	4.0	1.0	200	16	6,000	2.7	-7½	9/6
	H2 ..	2.0	0.1	150	35	35,000	1.0	-1½	7/-
Ostar-Ganz ..	HL2 ..	2.0	0.1	150	27	18,000	1.5	-3	7/-
	HL210 ..	2.0	0.1	150	24	20,000	1.2	-3	7/-
	L21 ..	2.0	0.1	150	16	8,900	1.8	-4½	7/-
	L210 ..	2.0	0.1	150	11	12,000	0.9	-6	7/-
	H410 ..	4.0	0.1	150	40	60,000	0.7	-1½	8/8
	HL410 ..	4.0	0.1	150	25	20,800	1.3	-3	8/8
	L410 ..	4.0	0.1	150	15	8,500	1.8	-4½	8/8
	H610 ..	6.0	0.1	150	40	60,000	0.7	-1½	8/8
	HL610 ..	6.0	0.1	150	30	30,000	1.0	-3	8/8
	L610 ..	6.0	0.1	150	15	7,500	2.0	-4½	8/8
Ostar-Ganz ..	*MH41 ..	4.0	1.0	200	80	13,300	6.0	-1½	13/6
	MH4 ..	4.0	1.0	200	40	11,100	3.6	-2½	13/6
	*MHL4 ..	4.0	1.0	200	20	8,000	2.5	-6	13/6
	*DH ..	16.0	0.25	200	40	10,800	3.7	-2½	13/6
	*D120 ..	250	0.02	300	100	40,600	3.5	-1	17/8
	*A520 ..	250	0.02	300	22	8,800	2.5	-7	17/8
	*W310 ..	250	0.02	300	32	31,000	1.0	-5	17/8

MULLARD THE MASTER VALVE

VALVE DATA CHART—(Contd.)

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.).	Amp. factor.	Impedance (ohms).	Slope (mA/v.).	Grid bias (max.).	Price.
Philco ..	*37 ..	6.3	0.3	180	9.2	10,000	0.9	—13.5	13/-
	30 ..	2.0	0.06	180	9.3	11,000	0.8	—4½	9/0
Pix ..	2 ..	2.0	0.1	150	20	20,000	0.9	—3	4/6
	3 ..	2.0	0.1	150	11	12,000	0.9	—7½	4/0
	4 ..	2.0	0.1	150	33	37,000	0.9	—3	4/6
	210 ..	2.0	0.1	150	20	22,000	0.9	—3	4/6
	9 ..	4.0	0.07	150	25	21,000	1.2	—3	4/6
	10 ..	4.0	0.07	150	10	8,000	1.2	—7½	4/6
	11 ..	4.0	0.07	150	33	33,000	1.0	—3	4/6
	90-AC ..	4.0	1.0	200	30	23,000	1.7	—2	11/6
	100-AC ..	4.0	1.0	200	15	7,000	2.0	—5	11/6
Six-Sixty	210RC ..	2.0	0.1	150	50	45,000	1.1	—1½	7/-
	210HL ..	2.0	0.1	150	26	20,000	1.4	—3	7/-
	210HF ..	2.0	0.1	150	19	25,000	0.7	—3	7/-
	210D ..	2.0	0.1	150	150	10,000	1.3	—3	7/-
	210LF ..	2.0	0.1	150	10.8	12,500	0.8	—4½	7/-
	*4-DX-AC ..	4.0	1.0	200	75	36,500	2.1	—1½	13/6
	*4-GP-AC ..	4.0	1.0	200	36	12,000	3.0	—3	13/6
	*4-HL-AC ..	4.0	1.0	200	25	9,500	2.6	—4	13/6
	*4-L-AC ..	4.0	1.0	200	16	5,000	3.2	—6	14/-
Triotron	WD2 ..	2.0	0.08	200	25	25,000	1.0	—1½	5/-
	HD9 ..	2.0	0.08	200	15	15,000	1.0	—3	5/-
	SD2 ..	2.0	0.1	200	20	11,000	1.8	—3	5/-
	TD2 ..	2.0	0.08	180	9	9,000	1.0	—6	5/-
	*W420 ..	4.0	0.1	250	38	32,000	1.2	—2½	6/0
	*A430 ..	4.0	0.15	250	24	8,000	3.0	—3	6/6
	*A430N ..	4.0	1.0	200	30	1,500	3.5	—3½	6/6
	*A440N ..	4.0	1.0	200	150	30,000	4.0	—1½	8/6
	*W415N ..	4.0	1.0	200	35	23,000	1.5	—3	8/6
	1A2030N ..	20.0	0.18	200	38	12,500	3.0	—3	9/6
	1A2040N ..	20.0	0.18	200	120	30,000	4.0	—1½	10/6
Tangeram	R208 ..	2.0	0.1	900	55	20,000	0.7	—1½	5/0
	H210 ..	2.0	0.1	200	25	25,000	1.0	—3	5/6
	HR210 ..	2.0	0.1	200	50	23,000	1.3	—3	5/6
	LD210 ..	2.0	0.1	150	15	11,000	1.3	—4½	5/6
	PD210 ..	2.0	0.2	150	17	10,000	1.7	—4½	6/-
	LD210 ..	2.0	0.1	150	16	16,000	1.0	—4½	5/6
	LD210 ..	2.0	0.1	150	10	10,000	1.0	—7½	5/6
	*AR401 ..	4.0	1.0	200	40	13,300	3.0	—2	10/6
	*AR495 ..	4.0	1.0	200	85	17,000	5.0	—3	10/6
	*AR4100 ..	4.0	1.0	200	16	8,000	2.0	—6	9/6
	*AG495 ..	4.0	1.0	200	24	6,250	4.0	—6	10/6
	*R2018 ..	20.0	0.18	200	40	13,300	3.0	—2	10/6
	*G2018 ..	20.0	0.18	200	25	7,000	3.5	—5	10/6
	*50 ..	2.5	0.25	250	13.8	9,500	1.4	—13	10/-
	*37 ..	6.3	0.3	250	9.2	8,400	1.1	—10	10/-
	*ASX2270 ..	2.5	1.75	275	9.0	6,000	1.5	—14	10/-
362	H2 ..	2.0	0.1	150	32	32,000	1.0	—1½	3/6
	HL2 ..	2.0	0.1	150	16	16,000	1.0	—3	3/6
	L2 ..	2.0	0.1	150	16	12,000	1.2	—3	3/6
	H4 ..	4.0	0.1	150	32	32,000	1.0	—1½	3/6
	HL4 ..	4.0	0.1	150	16	16,000	1.0	—3	3/6
	L4 ..	4.0	0.1	150	15	12,000	1.2	—3	3/6
	H6 ..	6.0	0.1	150	32	32,000	1.0	—1½	3/6
	HL6 ..	6.0	0.1	150	16	16,000	1.0	—3	3/6
	L6 ..	6.0	0.1	150	16	12,000	1.2	—3	3/6
	*ACH4 ..	4.0	1.0	200	50	15,000	3.3	—1½	7/6
	*ACL4 ..	4.0	1.0	200	20	5,000	4.0	—5	7/6

SMALL POWER TRIODES

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.).	Amp. factor.	Impedance (ohms).	Slope (mA/v.).	Grid bias.	Price.
Clarion ..	LP2 ..	2.0	0.1	150	6.0	5,500	1.1	—9	6/9
	P2 ..	2.0	0.2	150	4.0	2,850	1.4	—18	8/6
	*ACL ..	4.0	1.0	200	9.0	3,000	3.0	—10	9/0
Cossor ..	215P ..	2.0	0.15	150	9.0	4,000	2.25	—7½	8/9
	220P ..	2.0	0.2	150	9.0	4,000	2.25	—7½	8/9
	220PA ..	2.0	0.2	150	15.0	4,000	4.0	—4½	8/9
	410P ..	4.0	0.1	150	8.0	4,000	2.0	—7½	10/6
	610P ..	6.0	0.1	150	8.0	3,500	2.3	—7½	10/6
	1DP ..	16.0	0.25	200	17.0	2,800	6.0	—7½	15/-
ETA ..	BW1304 ..	2.0	0.2	150	13.0	4,000	3.2	—6	7/6
	BX604 ..	2.0	0.2	150	6.0	4,000	1.5	—12	8/-
	*DW704 ..	4.0	1.0	200	7.0	4,500	1.5	—14	11/-
	*29 ..	1.5	1.05	180	8.0	7,500	1.1	—13	12/6
Fotos ..	POI ..	2.0	0.23	150	4.5	2,250	2.0	—12	5/6
Hivac ..	P220 ..	2.0	0.1	150	12.0	4,800	2.5	—7½	5/6
Lissen ..	LP2 ..	2.0	0.2	150	12.0	3,500	3.5	—6	8/9
	P220 ..	2.0	0.2	150	7.0	4,000	1.7	—10½	7/3
	P410 ..	4.0	0.1	150	8.0	4,000	2.0	—10½	7/3
	P610 ..	6.0	0.1	150	8.0	3,200	2.5	—10½	7/3

MULLARD—THE GREATEST NAME IN RADIO

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.).	Amp. factor.	Impedance (ohms).	Slope (mA/v.).	Grid bias.	Price.
Marconi ..	LP2	2.0	0.2	150	15	3,900	3.85	-4½	8/9
	P215	2.0	0.15	150	7	5,000	1.4	-10½	8/9
	P410	4.0	0.1	150	7.5	5,000	1.5	-10½	10/6
	P610	6.0	0.1	150	8	3,500	2.3	-9	10/6
	*ML4	4.0	1.0	200	12	2,860	4.2	-8	14/-
	†DL	16.0	0.25	200	12	2,660	4.5	-8	14/-
Mazda ..	P220	2.0	0.2	150	12.5	3,700	3.4	-7	8/9
	P215	2.0	0.15	150	—	—	1.7	-12½	8/9
Micromesh ..	PB1	2.0	0.2	150	16	4,000	4.0	-6	8/9
Mullard ..	PM2a	2.0	0.2	150	12.5	3,600	3.5	-6	8/9
	PM2	2.0	0.2	150	7.5	4,400	1.7	-12	8/9
	PM4	4.0	0.1	150	8.0	4,000	2.0	-8	10/6
	PM6	6.0	0.1	150	8.0	3,550	2.3	-9	10/6
Oetron ..	LP2	2.0	0.1	150	6.0	5,500	1.1	-9	6/9
Osram ..	LP2	2.0	0.2	150	15	3,900	3.85	-4½	8/9
	P215	2.0	0.15	150	7	5,000	1.4	-10½	8/9
	P410	4.0	0.1	150	7.5	5,000	1.5	-10½	10/6
	P610	6.0	0.1	150	8	3,500	2.3	-9	10/6
	*ML4	4.0	1.0	200	12	2,860	4.2	-8	14/-
	†DL	16.0	0.25	200	12	2,660	4.5	-8	14/-
Ostar Gans ..	*U920	250	0.02	300	11.0	8,700	3.0	-12	17/6
Pix ..	20	2.0	0.15	150	5.5	4,600	1.3	-14	6/6
	120	2.0	0.2	150	5.0	3,900	1.6	-11	8/6
	40	4.0	0.1	150	6.0	4,300	1.4	-14	6/6
	140	4.0	0.15	150	9.0	4,500	2.0	-9	8/6
Six Sixty ..	220P	2.0	0.2	150	7.2	4,800	1.5	-10	8/9
	220PA	2.0	0.3	150	13.0	3,700	3.5	-4½	8/9
Triotron ..	ZD3	2.0	0.15	150	5.0	4,200	1.2	-13	6/6
	B423	4.0	0.15	250	9.0	4,500	2.0	-13	6/6
	*E430N	4.0	1.0	200	9.0	3,000	3.0	-9	8/6
Tungsrarn ..	P215	2.0	0.2	150	5.0	3,500	1.5	-18	7/3
	LP220	2.0	0.2	150	7.8	2,600	3.0	-6	7/3
362 ..	LP2	2.0	0.2	150	15	5,000	3.0	-3	4/-
	LP4	4.0	0.1	150	15	5,000	3.0	-3	4/-
	LP6	6.0	0.1	150	15	5,000	3.0	-3	4/-

POWER AND HIGH POWER OUTPUT TRIODES

Maker.	Type.	Fil. volts.	Fil. amp.	Anode volts (max.).	Amp. factor.	Impedance (ohms).	Slope (mA/v.).	Grid bias.	Price.
Clarion ..	PN2	2.0	0.2	150	2.75	1,850	1.5	-28	8/6
	*ACF	4.0	1.0	200	6.0	2,000	3.0	-17	10/-
Cossor ..	230XP	2.0	0.3	150	4.5	1,500	3.0	-18	12/-
	415XP	4.0	0.15	150	4.5	1,500	3.0	-18	13/6
	425XP	4.0	0.25	150	7.0	2,000	3.5	-10½	13/6
	610XP	6.0	0.1	150	5.0	2,000	2.5	-15	13/6
	625P	6.0	0.25	200	7.0	2,500	2.8	-12	13/6
	*41MP	4.0	1.0	200	18.7	2,500	7.5	-7½	14/-
	*41MPX	4.0	1.0	200	11.2	1,500	7.5	-12½	16/6
	*4XP	4.0	0.8	200	4.8	1,200	4.0	-23	16/6
	*680XP	6.0	0.8	400	3.2	2,750	1.1	-67	25/-
	*620T	6.0	1.6	400	4.8	2,100	2.3	-60	30/-
	*660T	6.0	4.5	600	2.5	1,000	2.5	-100	105/-
Dario ..	Super P	2.0	0.18	150	6.0	3,000	2.0	-12	6/6
	Hyper P	2.0	0.2	150	7.0	2,400	3.0	-10	7/-
	*A.C. Hyper P	4.0	1.0	200	9.0	3,000	3.0	-12	10/-
	†D.C. Hyper P	20.0	0.18	200	6.0	2,400	2.5	-18	12/6
ETA ..	BW602	2.0	0.32	150	6.5	1,700	3.4	-12	8/-
	DX502	4.0	0.15	150	5.0	2,100	2.4	-17	8/-
	DW702	4.0	0.23	200	7.0	2,250	3.2	-20	10/6
	*BW802	4.0	0.8	250	8.0	2,000	4.0	-25	12/6
	*DW302	4.0	1.05	250	3.5	1,800	1.9	-50	11/6
	*DW1003	4.0	1.0	200	10.0	3,300	3.3	-12	11/-
	*45	2.5	1.5	250	3.5	1,750	2.0	-49	13/-
	*50	7.5	1.25	450	3.8	1,800	2.1	-80	37/-
	*10	7.5	1.25	425	7.5	3,500	2.1	-89	37/-
Fotos ..	B09	2.0	0.22	150	3.0	1,500	2.0	-25	6/6
Hivao ..	PP220	2.0	0.3	150	6.5	2,400	2.7	-12	6/8
	PX230	2.0	0.3	150	6.5	1,850	8.5	-15	7/8
Lissen ..	P220A	2.0	0.3	150	6.0	1,700	3.5	-12	12/-
	PX240	2.0	0.4	200	4.5	1,500	2.0	-24	8/-
	P425	4.0	0.25	200	4.5	1,500	3.0	-24	8/-
	P625	6.0	0.25	200	7.5	2,500	3.0	-13	8/-
	P625A	6.0	0.25	200	4.5	1,500	3.0	-24	8/-
	*AC-P	4.0	1.0	200	10	2,800	3.6	-10	14/-

MULLARD THE MASTER VALVE

VALVE DATA CHART—(Contd.)

Maker.	Type No.	Fil. volts.	Fil. amp.	Anode volts (max.).	Amp. factor.	Imped- ance (ohms).	Slope (mA/v.).	Grid bias.	Price.
Marconi ..	P2	2.0	0.2	150	7.5	2,150	3.5	-10½	12/-
	P415	4.0	0.15	150	5.0	2,080	2.4	-16½	13/6
	P425	4.0	0.25	150	4.5	2,300	1.95	-16	13/6
	P625	6.0	0.25	250	6.0	2,400	2.5	-26	13/6
	P625a	6.0	0.25	200	3.7	1,600	2.3	-39	13/6
	**PX4	4.0	1.0	250	5.0	830	6.0	-34	16/6
	**LS6a	5.5	0.8	400	2.5	2,750	0.9	-112	25/-
	**PX25	4.0	2.0	400	9.5	1,265	8.0	-30	25/-
	**LS6a	6.0	1.6	400	3.0	1,800	2.3	-98	30/-
	**DA60	6.0	4.0	500	2.5	835	3.0	-135	110/-
	**DA100	10.0	—	1,000	5.5	1,410	3.19	-146	210/-
	P220a	2.0	0.2	150	6.5	1,850	3.5	-12	12/-
	P240	2.0	0.4	150	7.0	1,900	3.7	-10½	12/-
Mazda ..	P425	4.0	0.25	150	3.5	1,250	1.8	-31	13/6
	P625A	6.0	0.25	200	4.0	1,600	2.5	-25	13/6
	P625B	6.0	0.25	200	7.0	2,500	2.8	-15	13/6
	P650	6.0	0.5	200	3.5	1,300	2.7	-40	18/-
	*ACP	4.0	1.0	200	10.0	2,650	3.75	-10	15/-
	*ACP-1	4.0	1.0	200	5.4	1,450	3.7	-19	16/-
	**PP3-250	4.0	1.0	250	6.5	1,000	6.5	-30	16/6
	**PP3-425	7.5	1.25	425	2.3	2,900	1.0	-28	30/-
	**PP3-400	4.0	2.0	400	9.0	1,500	6.0	-32	25/-
	*DC-P	8.0	0.5	200	10.0	2,222	4.5	-10	15/-
	*DC2-P	35.0	0.1	200	10.0	2,650	3.75	-10	15/-
	PA1	4.0	1.0	200	12.6	1,050	12.6	-10½	16/6
	PM202	2.0	0.2	150	7.0	2,000	3.5	-15	12/-
Mullard	PM252	2.0	0.4	150	7.0	1,900	3.7	-15	12/-
	PM254	4.0	0.2	150	6.5	2,150	3.0	-21	13/6
	PM256	6.0	0.25	250	6.0	1,850	3.2	-27	13/6
	PM256a	6.0	0.25	200	3.6	1,400	2.3	-33	13/6
	*104V	4.0	1.0	200	12.0	3,000	4.0	-12	14/-
	*ACO44	4.0	1.0	250	6.4	950	6.8	-30	16/6
	*ACO61	4.0	1.0	200	6.0	2,000	3.0	-21	16/-
	*DO24	4.0	2.0	400	9.0	1,390	6.5	-34	25/-
	*DO25	6.0	4.0	400	3.0	800	3.75	-112	30/-
	*DO28	4.0	2.0	400	3.8	600	6.2	-92	25/-
	*DO60	6.0	4.0	500	3.5	1,000	3.5	-95	110/-
	*DO75	10.0	2.0	1,000	12.0	2,000	6.0	-55	160/-
	P2	2.0	0.2	150	—	2,850	1.4	-18	8/-
Octron ..	PX2	2.0	0.2	150	—	1,850	1.5	-24	8/-
	*ACL	4.0	1.0	200	9.0	1,800	3.0	-12	9/6
	*ACP	4.0	1.0	200	6.0	2,000	3.0	-21	10/6
Osram ..	P2	2.0	0.2	150	7.5	2,150	3.5	-10½	12/-
	P415	4.0	0.15	150	5.0	2,080	2.4	-16½	13/6
	P425	4.0	0.25	150	4.5	2,300	1.95	-16	13/6
	P625	6.0	0.25	250	6.0	2,400	2.5	-26	13/6
	P625a	6.0	0.25	200	3.7	1,600	2.3	-39	13/6
	**PX4	4.0	1.0	250	5.0	830	6.0	-34	16/6
	**LS5a	5.5	0.8	400	2.5	2,750	0.9	-112	25/-
	**PX25	4.0	2.0	400	9.5	1,265	8.0	-30	25/-
	**LS6a	6.0	1.6	400	3.0	1,800	2.3	-98	30/-
	**DA60	6.0	4.0	500	2.5	835	3.0	-135	110/-
	**DA100	10.0	—	1,000	—	—	—	—	210/-
	*11525	250	0.02	300	6.5	1,850	3.0	-24	18/-
	*K3580	250	0.04	220	3.0	500	6.0	-50	25/6
Pix ..	AC-P	4.0	1.0	200	9.0	3,600	2.5	-11	11/6
	AC-P	4.0	1.0	200	9.0	3,600	2.5	-11	11/6
Six Sixty	2205P	2.0	0.2	150	7.0	2,050	3.4	-15	12/-
	2408P	2.0	0.4	150	6.6	1,900	3.5	-15	12/-
	*4P-AC	4.0	1.0	200	12.0	3,170	2.8	-12	14/-
	*4P-AC	4.0	1.0	200	5.0	1,500	4.0	-25	16/6
	**HV4/1	4.0	1.0	200	4.3	2,100	8.0	-29	16/-
	**HV4/2	4.0	0.7	200	4.1	1,200	2.4	-30	16/6
	**HV6/5	6.0	1.8	400	3.2	1,200	3.6	-98	30/-
	UD2	2.0	0.22	150	5.0	2,750	1.8	-13	6/6
	E235	2.0	0.23	200	9.0	2,570	3.5	-12	6/6
	E425	4.0	0.8	250	5.0	2,500	2.0	-17	6/6
	*K435/10	4.0	0.65	250	3.5	1,600	8.5	-40	12/6
	*K450/25	4.0	2.0	400	5.0	1,000	5.0	-50	22/6
	*K450	4.0	2.0	550	10.0	1,250	8.0	-36	22/6
	*K450/60	4.0	3.0	400	5.0	1,000	5.0	-53	45/-
Tungsram	P220	2.0	0.2	150	6.5	2,200	3.0	-12	7/3
	SP230	2.0	0.3	150	5.0	2,500	2.0	-23	8/3
	SP414	4.0	0.15	200	5.0	1,700	3.0	-23	9/-
	P430	4.0	0.3	250	5.0	2,000	2.5	-32	11/6
	*P460	4.0	0.6	220	4.0	1,100	3.5	-30	13/6
	*P4100	4.0	1.0	400	7.0	1,400	5.0	-35	14/-
	*P2018	20.0	0.18	220	7.0	2,500	2.5	-18	13/6
	**PX1120	5.0	0.25	180	8.0	4,000	2.0	-12	11/6
	**PX1710	5.0	0.25	180	3.0	1,500	2.0	-45	11/6
	**PX2450	2.5	1.5	250	3.5	1,700	2.0	-50	12/-
	**PX2100	7.5	1.25	425	7.2	3,600	2.0	-35	80/-
	**PX2500	7.5	1.25	425	3.8	1,900	2.0	-85	30/-
	P2	2.0	0.2	150	9.0	3,000	3.0	-9	4/6
	P4	4.0	0.1	150	9.0	3,000	3.0	-9	4/6

THREE MILLION AERIALS

LEAD DOWN TO

MULLARD MASTER VALVES

Maker.	Type.	Fil. volts.	Fil. amp.	Anode volts (max.)	Amp. factor.	Impedance (ohms).	Slope (mA/v.).	Grid bias.	Price.
362—(contd.)	P6	.. ..	6.0	150	8.0	3,000	3.0	— 9	4/6
	P625	.. ..	6.0	200	5.0	2,000	2.5	—20	8/-
	*ACP4	.. ..	4.0	200	8.0	2,000	4.0	—12	7/6

OUTPUT PENTODES

Maker.	Type.	Fil. volts.	Fil. amp.	Anode volts (max.).	Screen volts (max.).	Slope (mA/v.).	Grid bias.	Price.
Clarion	PN2	2.0	0.2	150	150	1.8	— 7½	13/6
Coscor	*ACPN	4.0	1.0	200	200	2.8	—12	16/-
	220PT	2.0	0.2	150	150	2.5	— 9	16/6
	220HPT	2.0	0.2	150	150	2.5	— 4½	16/6
	230PT	2.0	0.3	150	150	2.0	—15	16/6
	410PT	4.0	0.1	150	150	2.5	— 9	17/6
	415PT	4.0	0.15	150	150	2.0	—15	17/6
	615PT	6.0	0.15	150	150	2.0	—15	17/6
	*MP-PEN	4.0	1.0	250	250	3.5	—16	18/6
	**PT41	4.0	1.0	250	200	3.0	—12½	18/6
	**PT41b	4.0	1.0	400	300	2.2	—40	22/6
Dario	†DP-PEN	16.0	0.25	250	250	3.5	—10	18/6
	Polyodion	2.0	0.2	150	150	1.5	— 9	12/6
	*A.C. Polyodion	4.0	1.0	250	250	3.5	—15	18/6
	†D.C. Polyodion	20.0	0.18	200	200	2.5	—18	15/6
ETA	DY3	2.0	0.2	150	150	2.5	— 4½	14/-
	DW3	4.0	0.25	300	200	1.6	—19	15/-
	*DW9	4.0	1.0	300	250	3.0	—10½	16/-
	*43	25.0	0.3	135	135	2.3	—20	18/-
Hivao	*47	2.5	1.5	250	250	2.5	—15	18/-
	Y220	2.0	0.2	150	150	2.2	— 4½	12/6
	Z220	2.0	0.2	150	150	2.2	— 9	12/6
Liscen	PT225	2.0	0.25	150	150	1.4	— 6	12/6
	PT2A	2.0	0.2	150	150	2.5	— 4½	12/6
	PT24	2.0	0.4	200	150	2.3	— 9	16/-
	PT425	4.0	0.25	200	150	2.5	— 9	16/-
	PT625	6.0	0.25	150	150	2.5	— 9	16/-
	PT611	6.0	0.11	200	150	2.0	— 9	16/-
	*ACPT	4.0	1.0	250	200	3.2	—10½	18/6
	†PT16	16.0	0.25	250	200	3.2	—10½	18/6
Marconi	PT2	2.0	0.2	150	150	2.5	— 4½	16/6
	PT425	4.0	0.25	200	150	2.0	— 7½	17/6
	PT625	6.0	0.25	250	200	1.8	—15	17/6
	*PT4	4.0	1.0	250	250	2.8	—16	18/6
	*MPT41	4.0	1.0	250	200	5.5	— 6	13/6
	*MPT4	4.0	1.0	250	250	3.0	—13	18/6
	*PT16	4.0	1.0	300	300	5.0	—15	25/-
	*PT25	4.0	2.0	400	400	4.0	—22	45/-
	†DPT	16.0	0.25	200	200	3.0	—10½	18/6
Mazda	Pen 220	2.0	0.2	150	150	2.5	— 4½	16/6
	Pen 220a	2.0	0.2	150	150	2.5	— 9	16/6
	Pen 425	4.0	0.25	150	150	2.4	—10	17/6
	*A.O.-PEN	4.0	1.0	250	250	8.0	—13	18/6
	*A.O.2-PEN	4.0	1.75	250	250	8.0	— 5	18/6
	†D.C.-PEN	8.0	0.5	250	250	3.5	—13	18/6
	†D.C.2-PEN	35.0	0.1	250	250	2.5	—13	18/6
Micromesh	Pen B1	2.0	0.2	150	150	2.5	— 4½	16/6
	*7A2	4.0	1.0	250	250	3.2	—17	18/6
	**Pen A1	4.0	1.0	250	250	3.0	—18	18/6
Mullard	PM22A	2.0	0.2	150	150	2.5	— 4½	16/6
	PM22	2.0	0.3	150	150	1.3	—10	16/6
	PM26	6.0	0.17	150	150	2.0	—17	17/6
	*Pen 4V	4.0	1.0	250	250	3.0	—13	18/6
	*Pen 4VA	4.0	1.0	250	250	3.5	—22	18/6
	**PM24M	4.0	1.0	250	250	3.0	—18	18/6
	PM24D	4.0	2.0	500	200	4.0	—55	45/-
Octron	PN2	2.0	0.2	150	150	1.8	— 7½	13/6
	ACPN	4.0	1.0	200	200	2.8	—13	15/-
Osram	PT2	2.0	0.2	150	150	2.5	— 4½	16/6
	PT425	4.0	0.25	200	150	2.0	— 7½	17/6
	PT625	6.0	0.25	250	200	1.8	—15	17/6
	PT4	4.0	1.0	250	250	2.8	—16	18/6
	*MPT41	4.0	1.0	250	200	5.5	— 6	18/6
	*MPT4	4.0	1.0	250	250	3.0	—13	18/6
	**PT16	4.0	1.0	300	300	5.0	—15	25/-
	**PT25	4.0	2.0	400	400	4.0	—22	45/-
	†DPT	16.0	0.25	200	200	3.0	—10½	18/6
Philco	33	2.0	0.26	135	135	1.4	—13½	15/3
	42	6.3	0.65	250	250	2.2	—16½	14/-
	18	14.0	0.7	250	250	2.2	—16½	20/6
Pix	225	2.0	0.25	150	150	1.4	—	11/6
	425	4.0	0.25	180	180	2.5	—	12/6
Six-Sixty	220 Pen	2.0	0.2	150	150	2.5	— 4½	16/6
	230 P.P	2.0	0.3	150	150	1.25	—10½	16/6

MULLARD THE MASTER VALVE

VALVE DATA CHART—(Contd.)

Maker.	Type.	Fil. volts.	Fil. amp.	Anode volts (max.).	Screen volts (max.).	Skips (mA/v.).	Grid bias.	Price.
Six-Sixty (contd.).	4 Pen A.O.	4.0	1.0	250	200	3.0	—15	18/6
	4 Pen A. AO	4.0	1.0	250	250	3.5	—22	18/6
	4 Pen M.	4.0	1.0	250	250	3.0	—18	18/6
	4 Pen SP.	4.0	0.27	300	—	2.0	—	18/6
Triotron	P215	2.0	0.25	150	150	1.5	—15	11/6
	P225	2.0	0.2	150	150	2.5	—3	11/6
	P420	4.0	0.15	250	150	1.5	—16	11/6
	P425	4.0	0.25	300	200	2.0	—25	12/6
	*P440N	4.0	1.1	250	250	3.5	—15	12/6
	*P441N	4.0	1.3	250	250	—	—	12/6
	**P435	4.0	1.1	250	250	3.5	—15	14/6
	**P430	4.0	1.0	400	200	3.0	—40	16/6
	**P410	4.0	2.0	550	200	4.0	—40	30/-
	†P2020N	20.0	0.18	200	200	2.0	—18	14/6
	—	—	—	—	—	—	—	—
Tungsram	PP290	2.0	0.25	200	150	2.5	—41	14/-
	PP240	2.0	0.3	200	150	1.5	—16	14/-
	PP415	4.0	0.15	200	150	1.8	—12	14/-
	**PP430	4.0	0.3	300	200	2.5	—20	15/-
	**PP4100	4.0	1.0	400	250	2.5	—40	16/-
	*APP4100	4.0	1.0	300	250	2.5	—20	17/-
	*APP4120	4.0	1.2	250	250	3.5	—13	17/-
	*PI2018	20.0	0.18	220	200	2.5	—22	17/-
	*PP4018	40.0	0.18	95	95	3.0	—15	17/-
	*2A5	2.5	1.75	250	250	2.2	—16	—
	*38	6.3	0.3	250	250	1.2	—25	—
	*42	6.3	0.7	250	250	2.2	—16	—
	†43	25.0	0.3	135	135	2.3	—20	—
	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—
362	ME2	2.0	0.2	150	150	2.0	—5	10/-
	ME4	4.0	0.1	150	150	2.0	—5	10/-
	ME6	6.0	0.1	150	150	2.0	—5	10/-
	PN625	6.0	0.25	200	—	2.0	—	12/6
	*AC FN4	4.0	1.0	200	—	2.5	—	12/6

CLASS B DOUBLE TRIODES

Maker.	Type.	Fil. volts.	Fil. a.n.p.	Anode volts.	Grid bias.	Price.
Clarion	B22	2.0	0.22	150	0	9/-
	B24	2.0	0.44	150	0	11/-
Consor	220B	2.0	0.2	150	0	14/-
	240B	2.0	0.4	150	0	14/-
E.T.A.	*46 (1)	2.5	1.75	400	—33	18/-
Fotos	FB12	2.0	0.22	150	0	10/-
	FB20	2.0	0.44	150	0	11/-
Hivac	B220	2.0	0.2	150	0	10/6
Lassen	B2 (1)	2.0	0.1	150	0	8/-
	BB240	2.0	0.4	150	0	14/-
Marconi	B21	2.0	0.2	150	—6	14/-
Mazda	PD220	2.0	0.2	150	—	14/-
Mullard	PM2B	2.0	0.2	150	0	14/-
Octron	B22	2.0	0.22	150	0	9/-
	B24	2.0	0.44	150	0	11/-
Osram	B21	2.0	0.2	150	—6	14/-
Philco	19	2.0	0.26	135	0	20/6
	79	6.3	0.6	180	0	19/-
Six-Sixty	220B	2.0	0.2	150	0	14/-
Triotron	E220B	2.0	0.3	150	—	10/6
Tungsram	CB220	2.0	0.2	150	0	11/-
	*PX46	2.5	1.75	400	0	14/6
362	BA3	2.0	0.2	150	0	9/-
	BX2	2.0	0.4	150	0	9/-

MULTIPLE VALVES

Maker.	Type No.	Description.	Fil. volts.	Fil. amp.	Anode volts (max.).	Price.
Consor	*DD-PEN	Double diode pentode	4.0	1.0	250	20/-
	*DDT	Double diode triode	4.0	1.0	200	15/6
	†DDT-16	Double diode triode	16.0	0.25	200	15/6

THE TILL WILL TELL YOU MULLARD

Maker.	Type No.	Description.	Fil. Volts.	Fil. Amps.	Anode volts (max.)	Price.
E.T.A. ..	*65. ..	Double diode triode ..	2.5	1.0	250	15/-
Lissen ..	L2/D ..	Diode triode ..	2.0	0.1	150	10/6
	AVC2 ..	Diode pentode ..	2.0	0.15	150	17/6
	AC-AVC ..	Diode pentode ..	4.0	1.0	200	20/-
Loewe ..	3NF6 ..	2-RC. Power ..	4.0	0.125	200	23/6
	3N+W ..	2-RC. Power ..	4.0	1.0	200	27/6
	HF30 ..	2-G.F. triodes ..	4.0	0.125	200	33/6
Marconi ..	*MHD4 ..	Double diode triode ..	4.0	1.0	200	15/6
	†DHD ..	Double diode triode ..	16.0	0.25	200	15/6
Mazda ..	L2DD ..	Double diode triode ..	2.0	0.1	150	8/6
	*ACHL, DD ..	Double diode triode ..	4.0	1.0	200	15/6
	*ACDD ..	Double diode triode ..	4.0	1.0	—	13/6
Micromesh ..	11A2 ..	Double diode triode ..	4.0	1.0	200	15/6
Mullard ..	*TDD4 ..	Double diode triode ..	4.0	1.0	200	15/6
	*8D4 ..	Diode tetrode ..	4.0	1.0	200	20/-
	†TDD25 ..	Double diode triode ..	25.0	0.18	200	15/6
Osrapp ..	*MHD4 ..	Double diode triode ..	4.0	1.0	200	15/6
	†DHD ..	Double diode triode ..	16.0	0.25	200	15/6
Philco ..	*75. ..	Double diode triode ..	6.3	0.3	260	14/-
	*8A7 ..	Pentagrid ..	6.3	0.3	260	16/-
Six-Sixty ..	4DD.TAO ..	Double diode triode ..	4.0	1.0	200	15/6
Triotron ..	*H426N ..	Hexode ..	4.0	1.1	250	—
	*H426N ..	Hexode ..	4.0	1.1	250	—
	*B430N ..	Diode tetrode ..	4.0	1.0	200	15/6
	†H2026N ..	Hexode ..	20.0	0.18	250	—
	†H2026N ..	Hexode ..	20.0	0.18	250	—
	B2030N ..	Diode tetrode ..	20.0	0.18	200	15/6
Tungsram ..	*K5. ..	Double diode triode ..	2.5	1.0	250	—
	*2A7 ..	Hexode ..	2.5	0.8	250	—
	*8A7 ..	Hexode ..	6.3	0.3	260	—

DOUBLE-GRID VALVES

Maker.	Type.	Fil. volts.	Fil. a.m.p.	Anode volts (max.)	Inner grid volts (max.)	Slope (mA/v.)	Price.
Cosmor ..	210DG ..	2.0	0.1	100	20	0.19	20/-
	*41MDG ..	4.0	0.1	200	—	0.25	19/-
Marconi ..	DG2. ..	2.0	0.2	100	20	1.2	20/-
Mullard ..	PM1DG ..	2.0	0.1	80	—	0.8	20/-
Osrapp ..	DG2. ..	2.0	0.2	100	20	1.2	20/-
Six-Sixty ..	210DG ..	2.0	0.1	80	—	—	20/-
	*4DG-AC ..	4.0	1.0	260	—	0.1	17/6
Triotron ..	D210 ..	2.0	0.15	80	20	1.0	12/6
	*D410N ..	4.0	1.0	50	20	1.0	12/6
Tungsram ..	DG210 ..	2.0	0.12	100	20	1.0	15/-
	*DG4100 ..	4.0	1.0	100	20	1.0	17/-
	*DG2018 ..	20.0	0.18	100	20	1.0	17/-

RECTIFIERS

Maker.	Type.	Fil. volts.	Fil. amps.	Max. anode volts (R.M.S.).	Output mA.	Price.
Cosmor ..	506BU ..	4.0	1.0	250+250	60	12/6
	443BU ..	4.0	2.5	350+350	120	15/-
	480BU ..	4.0	2.5	500+500	120	20/-
	443U ..	4.0	0.4	200	20	15/-
	4128U ..	4.0	1.0	260	70	15/-
	6808U ..	6.0	4.0	1000	150	65/-
	408BU ..	4.0	1.0	250+250	30	12/6
	412BU ..	4.0	0.4	250+250	50	20/-
	412BU ..	4.0	1.0	250+250	70	20/-
	621BU ..	8.0	2.0	500+500	60	20/-
	825BU ..	7.5	2.0	500+500	120	22/6
Dario ..	FW1 ..	4.0	1.0	250+250	60	9/-
	FW2 ..	4.0	2.0	250+350	120	11/-
	FW3 ..	4.0	2.0	500+500	120	14/-
E.T.A. ..	D3-50B ..	4.0	0.7	300+300	50	10/-

MULLARD THE MASTER VALVE

VALVE DATA CHART—(Contd.)

Maker.	Type.	Fil. volts.	Fil. amps.	Max. anode volts (R.M.S.).	Output m.A.	Price.
E.T.A.—(contd.)	D3-80B	4.0	2.0	450+450	80	10/-
	D5-125B	4.0	2.1	500+500	125	15/-
	G7-85	7.5	1.25	700	85	25/-
	80	5.0	2.0	400+400	125	8/-
	81	7.5	1.25	700	85	30/-
	82	2.5	3.0	500+500	125	15/-
	25Z5	25	0.3	125 VD	100	15/-
Llisen	UU41	4.0	1.0	300+300	80	12/6
	U850	6.0	0.5	300	40	12/6
	†U16	18.0	0.25	300	40	12/6
Marconi	U10	4.0	1.0	250+250	60	12/6
	U12	4.0	2.5	350+350	120	18/-
	*MU12	4.0	2.5	350+350	120	15/-
	U14	4.0	2.5	500+500	120	20/-
	*MU14	4.0	2.5	500+500	120	20/-
	GU1	4.0	3.0	1000	250	25/-
	U5	5.0	1.6	400+400	45	20/-
Mazda	U8	7.5	2.5	600+500	120	22/6
	UU2	4.0	1.0	250+250	60	12/6
	UU60/250	4.0	2.0	250+250	60	12/6
Micromesh	UU120/350	4.0	2.5	350+350	120	15/-
	UU120/500	4.0	2.5	500+500	120	20/-
	U66/550	7.5	1.25	550	65	17/6
Mullard	R1	4.0	2.25	250+250	60	12/6
	R2	4.0	2.25	350+350	120	15/-
	R3	4.0	2.25	500+500	120	20/-
Mullard	DW2	4.0	1.0	250+250	60	12/6
	DW3	4.0	2.0	350+350	120	15/-
	DW4	4.0	2.0	500+500	120	20/-
	IW3	4.0	1.2	250+250	60	12/6
Osram	IW3	4.0	2.1	350+350	120	15/-
	U10	4.0	1.0	250+250	60	12/6
	U12	4.0	2.5	350+350	120	15/-
Ostar Ganz	*MU12	4.0	2.5	350+350	120	15/-
	U14	4.0	2.5	500+500	120	20/-
	*MU14	4.0	2.5	500+500	120	20/-
	GU1	4.0	3.0	1000	250	25/-
	U5	5.0	1.6	400+400	45	20/-
	U8	7.5	2.5	600+500	120	22/6
	EG50	250	0.02	250	50	12/3
Philco	EG100	250	0.02	250	125	14/9
	NG40	150	0.07	150 VD	40	22/9
	NG100	150	0.07	150 VD	100	24/-
	VG45	250	0.04	250+250	45	28/9
Philips	30	5.0	2.0	350+350	125	8/-
	1801	4.0	0.6	250+250	30	12/6
	1821	4.0	1.0	250+250	60	12/6
Pix	1807	4.0	2.0	350+350	120	15/-
	1801	4.0	2.0	500+500	120	20/-
	508K	4.0	1.0	300+300	75	20/-
	1860	5.0	2.0	300+300	125	22/6
	1817	4.0	4.0	350+350	300	50/-
	375	4.0	1.0	220	40	15/-
	505	4.0	1.0	400	60	15/-
	1862	7.5	1.25	750	110	35/-
	40/250	4.0	0.6	250+250	40	8/6
	500	4.0	1.0	300+300	60	12/6
Six-Sixty	120/500	4.0	2.0	500+500	120	15/6
	W463	4.0	1.0	250+250	60	12/6
	W120/350	4.0	2.0	350+350	120	15/-
Six-Sixty	W120/500	4.0	2.0	500+500	120	20/-
	W60/250	4.0	2.0	250+250	60	12/6
	*IH 60/250	4.0	2.0	250+250	60	12/6
	*IH 120/350	4.0	2.0	350+350	120	15/-
	*IH 120/500	4.0	2.0	500+500	120	20/-
Triotron	G429	4.0	0.3	250	30	7/6
	G431	4.0	0.6	250+250	30	8/6
	G470	4.0	1.0	300+300	70	9/6
	G4120	4.0	2.0	500+500	120	14/6
	G4100	4.0	2.0	750	100	14/6
Tungsram	G4150	4.0	3.0	750	150	48/-
	V430	4.0	0.3	200	25	10/-
	V495	4.0	1.0	400	70	10/-
Tungsram	PV495	4.0	1.0	300+300	70	10/-
	PV4200	4.0	2.0	500+500	125	15/-
	*APV4200	4.0	2.0	350+350	75	15/-
	*V2018	20.0	0.18	250	70	10/6
	*PV4018	40.0	0.18	350+350	120	10/6
	VX2810	7.5	1.25	750	110	14/6
	PVX2800	5.0	2.0	300+300	125	17/6
	83	2.5	3.0	500+500	125	8/-
	RB41	4.0	1.0	300+300	50	7/6
	RB42	4.0	2.0	600+500	100	7/6

JOIN THE BETTER RADIO BRIGADE

POSTAL REGULATIONS

INLAND

LETTERS.

Not exceeding 2 oz.	..	..	1½d.
For every additional 2 oz.	..	..	½d.
Postcards { Single	..	..	1d.
Reply paid	..	..	2d.
Maximum size, 2 ft. long, 1 ft. wide or 1 ft. deep; or in roll form 2 ft. 6 in. long and 4 in. diameter. There is no limit of weight.			

PARCELS.

Not exceeding 2 lb.	..	..	6d.
2 lb. to 5 lb.	..	..	9d.
5 lb. to 8 lb.	..	..	1s. 0d.
8 lb. to 11 lb.	..	..	1s. 3d.
Registration fee	..	..	3d.
Proof of Posting	..	..	½d.

The greatest length allowed is 3 ft. 6 in. and the greatest length and girth combined 6 ft. Parcels for the Irish Free State are accepted under the same conditions of rate and size, but a declaration of contents for customs purposes must be made.

POSTCARDS.

No card may exceed 5½ in. long and 4½ in. wide, or be less than 4 in. long and 2½ in. wide. Postcards must be of stiff material and must not be folded or enclosed in a cover of any kind.

PRINTED PAPERS.

For every 2 oz. up to 2 lb.	½d.
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To be dispatched on the day of posting, printed papers must be posted before 4.30 p.m. in London and not later than the special time announced at provincial post offices. Printed papers must be posted in wrappers which allow easy examination of contents by postal officials.

MONEY AND POSTAL ORDERS.

Inland money orders can be obtained for any sum, not comprising a fraction of a penny, up to £40. The poundage rates charged for the orders are:—

Up to £3	..	..	4d.
£3 to £10	..	..	6d.
£10 to £20	..	..	8d.
£20 to £30	..	..	10d.
£30 to £40	..	..	1s.

Money orders can be telegraphed from 1s. plus an extra fee of 2d.

Single postal orders can be purchased from amounts in sixpenny stages from 6d. to 21s. Poundage charges range from ½d. to 2d. respectively.

SAMPLES.

There is no inland rate for samples, which must be sent at either letter or parcel rate.

BUSINESS REPLY SCHEME.

Instead of stamping all reply envelopes or postcards enclosed in mailing shots dealers may make use of this scheme by which they only pay postage for the replies delivered to them. An account has to be opened with the local post office and the envelopes or cards must be of the approved pattern. The charge of all replies delivered is the normal postage plus ½d. Charges are debited against the account.

REGISTRATION.

The registration fee of 3d. for inland post only covers any postal packet, subject to certain conditions, to compensation for loss or damage not exceeding £5. Higher fees covering higher compensation are 4d. covering up to £20, and a further £20 compensation for every additional 1d. of fee up to a maximum of £400 at 1s. 11d. fee. Packets for registration must be handed in at a post office. Knots in string must be sealed. The maximum limit of compensation for unregistered parcels is £2.

EXPRESS DELIVERY.

Packets will be delivered by special messengers under five services.

All the way, on weekdays only, 6d. a mile plus a weight fee of 3d. on packets weighing more than 1 lb.

After transmission by ordinary postal service to office in district of delivery, 6d. in addition to ordinary postage. This is at sender's request.

Same service at addressee's request, 6d. a mile.

Sunday service letters and postal packets only will be expressed between certain post offices at additional fees according to distance.

Express letters may be dictated by telephone to the office nearest to the addressee where they will be written down and sent by messenger. Fees are usual telephone charge, writing fee 3d. for 30 words and 1d. for every additional 10, and 6d. a mile for delivery.

MULLARD THE MASTER VALVE

POSTAL REGULATIONS

CASH ON DELIVERY.

The cash on delivery fees which are in addition to the ordinary postage and registration fees are :—

Amount to be collected not exceeding :—	Fees.
10s.	4d.
£1	6d.
£2	8d.
£5	10d.
£10	1s. 0d.
£15	1s. 2d.
£20	1s. 4d.
£25	1s. 6d.
£30	1s. 8d.
£35	1s. 10d.
£40	2s. 0d.

The value of an article sent by registered letter or parcel post or unregistered parcel post, can on certain conditions be collected from the addressee by the Post Office and remitted to the sender. The service does not apply to the Irish Free State in either direction. Packets may be posted at any Money Order Post Office.

This service also operates on railways, when the sender must obtain from a Money Order Post Office a combined address label and receipt form for every parcel sent.

The package must be handed to the railway company and the receipt portion signed by the company official sent to the consignee. This must be handed over on delivery. Railway company's charge, 3d. in addition to the usual rail charges.

IMPERIAL AND FOREIGN

LETTERS.

To the British Empire generally, to H.M. Ships of war abroad, Egypt, U.S.A. and the British Post Office at Tangier. } 1½d. first oz. and 1d. each oz. after.

To all other places including Iraq and Transjordan. } 2½d. first oz. and 1½d. each oz. after.

Maximum size for British Dominion Colony or Possession, 2 ft. long by 18 in. wide or deep. For foreign countries limit of size is 18 in. in either direction. In either case a letter in the form of a roll must not exceed 30 in. long and 4 in. in diameter. Weight limit is 4 lb.

POSTCARDS.

Single	1½d.
Reply paid	3d.

Same size and conditions as inland.

SMALL PACKETS.

Limited to certain places. Maximum dimensions 18 in. by 8 in. by 4 in., or in roll form 18 in. long by 6 in. diameter. Weight limit 2 lb.

PRINTED PAPERS, COMMERCIAL PAPERS AND SAMPLES.

Each 2 oz. ½d., minimum for commercial papers 2½d., and samples 1d.

Conditions similar to Inland. Commercial papers may be hand produced or typewritten but must not be in the nature of correspondence.

SAMPLES.

Service restricted to bona fide samples not for sale. Size limit 2 ft. long by 1 ft. wide or deep to British Dominions, etc., and 18 in. long, 8 in. wide and 4 in. deep for foreign countries. In roll form for foreign countries size limit is 18 in. long and 6 in. diameter. Weight limit 5 lb. to British Empire generally and 1 lb. to foreign countries.

PARCELS.

Rates vary considerably. General size limit is 3½ ft. any dimension or 6 ft. combined length and girth. Weight limit 11 lb. Declaration of contents to be made on posting for customs purposes.

CASH ON DELIVERY.

Special rates available.

REGISTRATION.

Fee for letters, printed papers, etc., but not parcels, 3d.

INSURANCE.

Parcels sent to certain countries can be insured.

AIR MAIL.

Full particulars of this service for letters and parcels given on periodical leaflets available at post office.

GENERAL INFORMATION.

Full particulars of postal services together with general regulations concerning types of goods accepted in certain cases are given in the Post Office Guide available at post offices.

WITH MULLARD AT YOUR FINGERTIPS YOU'RE CERTAIN OF YOUR SALES

P.M.G. LICENCE

Most people think that the yearly charge of 10s. made by the Post Office for a listener's "licence" is merely a convenient way of collecting the cost of the programmes provided each day by the B.B.C. To a certain extent this is perfectly true, but it is not the full story.

The use of the ether for the purpose of wireless telegraphy and telephony is part of the vast monopoly of postal communications (including the ordinary telegraph and telephone systems) vested by law in the Postmaster General. No one in fact is entitled to use the ether, either for the transmission or reception of wireless signals of any kind, without the formal permission or "licence" of the P.M.G. This was the case long before the introduction of the present Broadcasting service, and the position remains the same to-day.

Of course, in practice, by far the larger part of the revenue collected by the Post Office under this head goes to maintain the B.B.C. in active operation, but whatever surplus is diverted into the Treasury coffers goes there properly and legally as a rent or profit made by the P.M.G. out of his monopoly powers over the ether.

Conditions of the Licence.

The present P.M.G. licence covers the use of one or more broadcast receivers in the same household. It does not, however, cover the use of a separate receiver by a lodger or sub-tenant in the same house. Similarly the occupier of each flat in the same block of buildings must take out his own licence.

If the possessor of a wireless set supplies low frequency current over wires to a loud speaker in an adjacent house, the owner of the loud speaker must take out a separate licence. In the case of a local relay service which supplies a large number of subscribers by means of wires from a central receiving station the owner of the service must take

out a special licence, whilst each subscriber must pay 10s. a year for the P.M.G. licence over and above the cost of the service itself.

The P.M.G. licence covers the use of one portable set, in addition to a set permanently installed in the household. Such portable set must, however, be operated only by the licensee or by a member of his family residing in the same house, who must carry the licence with him for inspection if required.

The receiving set must not be used in such a manner as to cause "interference," i.e., the valves must not be allowed to oscillate.

The licensee must not use his set to intercept messages other than those broadcast for general reception. If he does happen to overhear any private messages he must not reproduce or make any other use of them.

Every receiver is liable to inspection by a duly authorised official of the P.M.G., who must, however, produce an official card of identification if required.

The licence is not transferable. Any permanent change of address should be notified to the Postmaster of the new district. A temporary change of address need not be notified.

A notice is now inserted on each licence warning listeners who use mains-driven sets not to make any direct connection between the electric supply mains and the aerial.

It has also been agreed that a dealer may supply a set on approval for fourteen days without it being licensed, provided he keeps a record showing the name and address of the prospective purchaser, and the dates of delivery and completion of sale.

A dealer whose shop is part of his house has to take out a licence for his demonstration receiver, as well as the licence for his family receiver. The shop installation is a "separate receiving station."

Naturally, demonstration receivers in lock-up shops must be licensed just the same.

MULLARD THE MASTER VALVE

IMPORT DUTIES ACT

This Act is officially defined as "an act to provide for the imposition of a general *ad valorem* duty of customs and of additional duties on any goods chargeable with the duty aforesaid, for the imposition of duties on goods produced or manufactured in a foreign country which discriminates in the matter of importation as against goods produced or manufactured in the United Kingdom, in certain other parts of His Majesty's Dominions, in protectorates or in mandated territories, and for purposes connected with the matters aforesaid."

Main provisions of the Act are as follows :

PART I.

The Act imposes as from March 1, 1932, a customs duty of 10 *per cent.* of the value of the goods (general *ad valorem* duty) on all goods imported into the United Kingdom with the following exceptions :

(a) goods for the time being chargeable under any other Act, except the Irish Free State (Special Duties) Act, 1932, but not including (subject to the provisions of this Act) composite goods chargeable under that Act because some of their components are chargeable :

(b) goods specified for exemption under this Act.

Under the Act an Import Duties Advisory Committee is set up to advise the Treasury who, after receiving recommendations from the Committee, have the power to add to the schedule of exemptions.

The Treasury may also, after receiving a recommendation from the Advisory Committee, by order direct that additional duties shall be charged on the importation of goods into the United Kingdom by reference to value or weight or any other measure of quantity, for any period or without limit of period, at different rates for different periods or parts of periods.

In the case of countries which are Dominions within the meaning of the Statute of Westminster, 1931, and India and Southern Rhodesia, or territories which are being administered by those countries, products which have been consigned from any part of the British Empire except the Irish Free State and grown or manufactured in any of the above countries, are not subject to the duty before November 15, 1932, or any later date which may be fixed by Parliament.

At any time after that date the Treasury may, on the recommendation of the Secretary of State, direct that the general *ad valorem* duty or any additional duty or both of such duties shall not be chargeable or shall be chargeable only at some specified rate less than the full rate.

Section 5 of the Act provides that neither

the general *ad valorem* duty nor any additional duty shall be chargeable in respect of goods consigned from any part of the British Empire except the Irish Free State and grown, produced or manufactured in

(a) any part of His Majesty's Dominions outside the United Kingdom, other than a country to which the preceding paragraph dealing with preference for Dominions applies, or

(b) any territory which is under His Majesty's protection.

For the purpose of ascertaining whether goods are free from general *ad valorem* or additional duty, goods are not considered to be manufactured in the British Empire unless a certain portion of their value as prescribed by regulations is derived from materials grown or produced or from work done within the British Empire.

Goods manufactured in a bonded factory in the United Kingdom from chargeable material produced in the British Empire are free from duty to the extent to which they have been manufactured by such material.

The Commissioners of Customs and Excise have the right to require the importer to furnish proof that the goods were grown, produced, or manufactured in a part of the British Empire.

The Treasury may, on the recommendation of the Board of Trade, direct that goods of foreign origin shall not be subject to duty or only to some specified rate less than full rate.

In such cases the Board of Trade may require the importer to furnish proof of the country of origin.

Where composite goods would be chargeable under this Act or under some other Act, the general *ad valorem* duty is chargeable only up to the amount by which it exceeds the duty chargeable under that other Act, unless it is otherwise expressly provided.

Section 9 of the Act empowers the Board of Trade to demand from any manufacturer a return for information purposes with reference to goods chargeable under the Act, giving information on the following :

(a) Quantity and value of output.

(b) Quantity and cost of materials used.

(c) Quantity and cost of fuels and electricity consumed.

(d) Number of persons employed.

No information obtained in this way will, without the consent of the owner of the business, be disclosed except to members of the Committee or to a Government Department requiring the information.

Goods consigned direct to a registered shipbuilding yard for repairing or refitting

MULLARD MEANS BUSINESS

ships in that yard may, by complying with the conditions, be imported free.

PART II.

If it is found that a foreign country is discriminating between goods produced in the United Kingdom (or other territory under His Majesty's protection or in respect of which a mandate is being exercised by the British Government) and those produced by another foreign country, the Treasury may direct that additional duty shall be charged on goods imported into the United Kingdom from that foreign country.

These additional duties may be charged by reference to value or to weight or any other measure of quantity and shall not exceed 100 per cent. of the value of the goods.

The Commissioners of Customs and Excise may demand proof of the country of origin of the goods in question.

PART III.

Where it is proved that goods are imported solely with a view to re-exportation after undergoing a process in the United Kingdom which will not change the form and character of the goods, or after transit through the United Kingdom or by way of trans-shipment, the Commissioners may, under certain conditions, allow such goods to be imported free of any duty chargeable under this Act.

Section 14 of the Act states that section 6 of the Customs and Inland Revenue Act, 1879, shall not apply to goods chargeable with duty under this Act, but where chargeable goods are re-imported into the United Kingdom and it is shown that any duty chargeable was duly paid or that no drawback of any such duty was allowed on exportation, or that any drawback allowed has been repaid by the Exchequer, then the goods are exempt from duty if they have not undergone any process abroad.

If they have undergone a process abroad without changing their form or character the goods shall be chargeable as if the amount of the increase in value of the goods due to the process represented their whole value.

The value of any imported goods is the price which an importer would give for them in the open market delivered to him at the port of importation, freight, insurance, commission and all other costs incidental to the purchase, except duties, having been paid, and duty is to be paid on that value as fixed by the Commissioners.

Any disputes arising as to the value of goods have to be referred to an arbitrator appointed by the Lord Chancellor.

If at any time it is found that any duty chargeable under this Act by reference to value could be levied with greater advantage and convenience by reference to weight or other measure of quantity, the Treasury

may direct that the duty shall be charged by the latter method.

The Import Duties Advisory Committee submitted to the Treasury in April, 1923, and from time to time since that date their recommendations for additional duties, exemptions from duty and drawbacks payable on specified classes of goods, which recommendations are embodied in the Additional Import Duties (No. 1) Order, 1932, and subsequent Orders.

The following are some articles of general interest to the Radio Industry, chargeable with additional duties under the Import Duties Act, 1932 :—

	Additional duty. Per cent.	Additional plus ad- val. duty. Per cent.
Electrical goods, including :—		
Insulated wires and cables.		
Telegraph, telephone and wireless apparatus.		
Electric carbons.		
Batteries and accumulators.		
Electric meters.		
Parts of, and accessories to the above	10	20
Machinery (other than the electrical machinery specified below) or parts thereof	10	20
Electric motor and generator casings and unwound rotors and stators	5	15
Manufactures (other than sheets, piping, tubing and rods and machinery belting) wholly or partly of rubber, balata or gutta percha, including vulcanite and ebonite	10	20
Articles manufactured wholly or partly of aluminium, copper, lead, nickel, tin, zinc and alloys, including these metals (excluding sheets, and strip, rods, plates, ingots, bars, slabs and discs, angles, shapes and sections, wire and tubes; machinery, tools, scientific and medical instruments)	10	20
Iron and steel springs, screws (other than wood screws), nails (other than wire nails), tacks, studs, spikes, rivets, washers, bolts and nuts	10	20
Goods manufactured wholly or partly of asbestos	5	15
Locks, padlocks, keys, bolts, latches, hasps and hinges of metal	10	20
Tools other than agricultural tools	10	20
Articles manufactured wholly or partly of wood except plywood and veneers	10	20
Dressed leather	5	15
Paints and colours, including varnishes, lacquers, enamels, and dyestuffs	10	20
Spiegelglösen and ferro-manganese (other than refined) containing less than 5 per cent. carbon.	23½	33½

MULLARD THE MASTER VALVE

REGISTRATION OF BUSINESS NAMES ACT, 1925

By the Legal Editor

This Act is designed to ensure that the true name and nationality of any person trading under a "Business Name" shall be officially registered, and that the Register shall be open to inspection by any interested party.

All firms or individuals, whether of British or alien nationality, having a place of business in the United Kingdom must register under the Act, (a) if in the case of a firm it trades under a name which does not consist of the true surnames of all the partners; or (b) if any member has at any time changed his name (except, in the case of a woman, on marriage); or (c) if, in the case of an individual, he does not trade under his true surname.

The Act does not in general apply to a business which is incorporated as a limited company; but certain of its provisions are now applicable under the Companies Act of 1929 to any company incorporated subsequently to the 22nd November, 1916.

A firm, individual, or corporation carrying on business in this country as the nominee, trustee, or on behalf of another person or firm, or acting as general agent for any foreign firm is bound to register under the Act.

In the case of death or retirement of one of the partners, the successor or survivor can carry on the business under its original name, without registering afresh, provided he adds his own name to the original trading

name, together with the words "successor to" or "late."

Bona-fide philanthropic, charitable, religious, scientific, and similar institutions, not carried on with a view to profit, are excluded from the provisions of the Act.

Firms established abroad, but having places of business in this country, are included in the Act.

Section 18 of the Act lays down that every individual and firm required by the Act to register shall show, in legible characters, (a) the present surname and Christian names or initials, (b) and former Christian name or surname, and (c) the nationality, if not British (and also the nationality of origin if this is not the same as the present nationality) *on all trade catalogues, circulars, show cards, and business stationery*. In the case of firms, these particulars must be given for all the partners.

Registration must be made, within fourteen days of the commencement of business, at Princes House, Kingsway, London, W.C.2, when the business is situated in England or Wales, or at Exchequer Chambers, Parliament Square, Edinburgh, for businesses carried on in Scotland. The cost of registration is 5s.

Neglect to comply with the provisions of the Act renders each individual concerned liable on Summary Conviction to a fine not exceeding £5 for each offence. Proceedings under the Act can, however, only be instituted by or with the consent of the Board of Trade.

B.B.C. COPYRIGHT AND P.A.

All dealers and users of public address equipment should note the following statement issued by the British Broadcasting Corporation:—

"No unauthorised outside use may be made of a broadcast programme. In particular the copyright of all broadcast commentaries, and of all news supplied by the News Agencies, is strictly reserved.

"These broadcasts are for the private use of owners of receiving sets only and may not be communicated to the public by loud-speaker, lantern slide, printed slip or other device."

MUSIC ROYALTY AND P.A.

The Performing Right Society, Ltd., of 13, George Street, Hanover Square, London, W.1, ('phone: Mayfair 1168), collects royalties for reproduction rights.

When music is supplied in a hall or for a body which often runs events, the royalty is usually covered by an annual licence.

If in doubt, the dealer should inquire whether the organisers of an event or the owners of the venue hold a licence. One of the three parties must pay. All are equally liable.

The Society usually looks to the promoter of the event to pay any royalty. The Society will always give further information.

BETTER TRADE WITH THE BETTER RADIO BRIGADE

HANDLING EXPORT BUSINESS

If it is intended to develop seriously an export trade it will always be found a good plan to establish a separate export department at home. This department should be under the control of an export manager, who would make it his business to be thoroughly conversant not only with the firm's products but also with the theory of foreign marketing and transport problems, and if possible he should be a linguist. He should be adaptable and diplomatic and the type of man who can deal with foreign buyers when they visit his company.

When making quotations for export it should be remembered that long periods may elapse after the date of quoting before an order can materialise. It is also customary to arrange such terms of payment as will reduce to a minimum the risk of bad debts and will avoid losses due to fluctuations in exchange.

Cash Against Documents.

In cases where no previous knowledge of the customer is available, it is a common practice to handle the order on the basis of "cash against documents." In this way the exporter safeguards himself by arranging for the Bill of Lading and other documents which represent the title to the goods to be forwarded to a bank at the port of destination with instructions to collect the amount due before handing the documents over to the consignee. He also gives instructions as to the disposal of the goods in case of default by the consignee.

Procedure for Shipment.

When an order is ready for shipment the following is, generally speaking, the procedure which is adopted. The goods are despatched by road or rail to the port for shipment through a firm of forwarding agents, who arrange for insurance and take out the Bills of Lading. If the terms of sale are F.O.B. (Free on Board)—that is, the customer pays all transport expenses after the goods have been delivered to the ship—it is necessary to add insurance and freight charges to the invoice. A copy of this is sent to the customer with a letter advising shipment. The exporter draws a draft for the amount due and this, with the Bill of Lading (in triplicate), the insurance policy, and a copy of the invoice, is sent to his bankers for collection, with instructions that it shall not be presented for acceptance until the goods have arrived. In the transaction the following documents will be necessary:—

Consignment Note.—This should be in two parts, one of which is retained by the supplier as a receipt for the goods.

It is a request to the railway company (or other local transport agent) to deliver the packages to the shipping agent. It should contain the name and address of the consignee (shipping agent), a short description of the packages, their weight and special markings.

Instructions to Shipping Agents.—This takes the form of an advice note and should contain date, name of ship, destination, consignee (customer), special markings, description and dimensions of packages, their contents and net weight, value for customs declaration, value for which insurance is to be effected, and class of insurance, by whom freight is to be paid, and how forwarded to shipping agents.

Bill of Lading.—This is taken out by the shipping agent. It is a shipowner's receipt for goods which he has contracted to convey. It is also a title to the goods and by endorsing it the goods can be transferred to another owner. On the Bill of Lading are set out details of the consignment, the name of ship, destination, and full particulars of the conditions under which the consignment is carried. This document is sent in duplicate, the two copies being sent by different mails in case one may be lost.

Insurance Policy.—This is taken out by the shipping agents.

Marine insurance falls roughly under two main classes known as "with particular average" and "free of particular average." Under the former arrangement the goods are protected against individual loss or damage as distinct from the remainder of the ship's cargo. With the latter arrangement it is only possible to make a claim if the whole of the ship's cargo is lost. The former method of insurance is more expensive than the latter, and it will depend largely on the nature of the goods to be consigned as to which method is adopted. If the goods are fragile and liable to breakage during transport it is worth while to insure under the more expensive scheme. Definite instructions on this point must be given to the shipping agents.

Freight Note.—This document is sent by the shipping agent to the supplier and contains charges for the actual freight, cost of Bills of Lading, insurance and commission charges, so that if necessary these can be embodied in the invoice to the customer.

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EXPORT BUSINESS

Primage (5 per cent., 10 per cent., or 15 per cent.) on the net freight will be charged on the freight note in most cases, part or the whole to be returned under certain conditions six or twelve months later. It is a matter of arrangement who has this when collected—the exporter, shipping agent or purchaser.

Invoice.—This, the supplier's invoice to the customer, should contain the date, customer's order number, number of cases, special markings on cases, name of ship, accurate description of contents and details of charges, and gross and net weights.

Wherever possible invoices should be made out in the currency of the country to which the goods are to be sent. The customer prefers also to have weights and measurements in the local units if possible. Gross and net weights should be shown on the invoice.

The number of copies to be prepared depends on the terms of payment, on any particular wishes of the customer, and on the requirements of the customs authorities in the country for which the goods are intended. In some instances the invoices have to be certified by the consul of that country; it might also be necessary to state what would be the value of the goods if sold for home consumption. The exporter may also be called upon to state the country of origin of the goods.

Documentary Draft.—This is drawn up by the exporters for the amount due and is sent to their bankers with instructions with regard to collection.

Advice of Shipment.—An advice of shipment together with the invoice is sent to the purchaser and this should contain the name of ship, date of despatch, and accurate description of the goods forwarded.

Specification.—This document is for the use of the Customs' authorities and must contain the name of port, name of ship, destination, date of final clearance of ship, markings on packages, number and description of packages, contents, and value. This specification is prepared by the shipping agent and handed in at the Custom House at the port of shipment.

Tariffs.

The tariff list should be carefully studied, as it may be possible to avoid duty on a complete article by merely changing the method of manufacture of one of its details and utilising for that detail material which is not liable to duty in that country.

In some of the British Dominions and Colonies there is a tariff giving preference

to British goods. In that case the invoice will need to bear upon it a certificate worded in accordance with the regulations of the importing country, stating that they are of British origin.

Packing.

Too much emphasis cannot be placed on the need for extreme care in packing consignments for long journeys including sea transport. When deciding on the method of packing it should be remembered that the packages will receive rough treatment.

There is also the danger of loss by pilfering, and means should be adopted for making difficult the opening of cases during transit. It is, of course, possible to insure against loss by pilfering.

Wood as an outer protection is almost universally used for large consignments or for those that need special protection from mechanical damage. The use of exterior battens increases the overall measurements of the case and may, therefore, increase the freight charges; consequently some other method, such as metal bands, should be adopted for obtaining strength.

The cases should be lined with some kind of watertight lining, such as tarred or oiled paper, which is especially manufactured for the purpose. In many instances it is considered advisable to pack goods in cases lined with zinc or tin and hermetically sealed. Zinc lining is more costly than tin lining, but it is sometimes preferred, as it can be more readily used when the case is broken up. It is advisable to avoid the use of packing material which may be subject to duty when arriving at its destination.

In many instances the cost of freight is calculated on the cubical measurements of the packing case; the importance of compact packing will, therefore, be evident. Every available space should be filled up to prevent the goods from shifting during transit.

Marking of Packages.

The markings which are likely to be required on the packages are the special symbol of the customer, name of port, serial number of the case, gross and net weight, and measurements of the case. All markings should be heavily stencilled or painted on the cases.

Inspection.

The customer may probably arrange for the goods to be examined before despatch, but it is a good plan for the exporter himself to see that the shipments are carefully inspected before they are packed. It is also advisable to insist that, in the event of a claim being made, it should be made within a given period after delivery. A claim should be substantiated by an independent witness apart from the representative of the purchaser.

EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER

FORMING A LIMITED COMPANY

By the Legal Editor

All limited liability companies are now subject to the provisions of the Companies Act of 1929.

The first step in converting a private business into a limited company is to file the following documents at the office of the Registrar of Companies, Somerset House, Strand, W.C. :—

Memorandum of Association.

Articles of Association.

Statement of nominal capital.

Declaration that the requirements of the 1929 Act have been complied with.

The Memorandum of Association must set out :—

- (a) The name of the Company.
- (b) The address of the Registered Office.
- (c) The objects of the Company.
- (d) A statement that the liability of the members is limited.
- (e) The amount of share capital and the manner in which it is divided into different shares.

The Articles of Association are usually based on the set of rules known as Table A and contained in the first schedule of the 1929 Act. In effect they are the formal bye-laws which govern the conduct of the company, and are strictly binding both on the company and the members thereof.

Both the Memorandum and Articles of Association must be signed by at least seven members, who must each subscribe for at least one share. In the case of a private company however two signatures are sufficient. The signatures must in both cases be attested by at least one witness.

The amount payable on the incorporation of a company consists in part of an *ad valorem* duty on the amount of the nominal capital and in part of a graduated stamp fee on the Memorandum of Association. The following table shows how the total fees increase as the capital value rises.

Nominal share value.	Total fees payable.
£	£ s. d.
100	5 0 0
250	7 0 0
500	9 0 0
1,000	14 0 0
2,000	24 0 0
5,000	57 0 0
10,000	108 5 0
50,000	518 5 0

Difference between Public and Private Companies.

The main distinction between a Public and Private Company is that the latter :—

- (a) restricts the right to transfer its shares,
- (b) limits the number of its members (exclusive of persons in the employment of the company) to fifty, and
- (c) makes no appeal to the public to subscribe for any shares.

In the case of a small business, conversion into a Private limited liability company is the more usual course. It offers the same safeguards against personal liability for business losses as a Public Company. Although it has fewer restrictions as compared with the latter, it enjoys certain definite advantages. For instance: no "Statement in lieu of Prospectus" need be filed; no Statutory meeting need be held; an annual balance sheet is not required to be filed with the Registrar; whilst any member requiring a balance sheet must pay for it.

On the other hand, as previously stated, there must be no question of inviting the public to subscribe for shares, or even debentures in a Private Company.

If at any future time it should be desired either to increase the shareholders to more than fifty, or to invite the public to subscribe for shares or debentures, a Private Company can convert itself into a Public Company by passing a Special Resolution to that effect, amending the Articles of Association accordingly, and filing with the Registrar of Companies a Prospectus (or Statement in Lieu of Prospectus) in the proper form.

Some Advantages of a Private Company.

The principal advantage is, of course, that the liability of each member or shareholder is limited to the shares he holds. Another is that on the death of one member the survivors are not prejudiced financially, i.e., no capital is withdrawn, as would probably be the case with a partnership.

In general, the appointment or removal of directors can be effected in a simple manner; facilities are afforded for obtaining additional capital, or for borrowing money on joint security, and for negotiating with other companies; and finally the disposal of whole or part of the business is simplified.

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FACTORY AND WORKSHOPS ACTS

1901—1920

By the Legal Editor

The main structure of the law relating to Factories and Workshops in this country is contained in the Act of 1901, which is too lengthy to be reproduced in full. The main provisions are summarised below, attention being directed to points of particular interest. A copy of the Act should be in the possession of every manager of a workshop or factory, since those responsible are expected to make themselves conversant with their duties and obligations to employees. It should be remembered that in matters of law ignorance is no excuse.

It is difficult to draw any clear distinction between "Factory" and "Workshop." They are both places where any manufacturing process is carried on, with or without the use of mechanical power.

Broadly speaking the legislature only protects the adult male worker in those matters which directly affect his safety and health. For the rest he is expected to be able to fend for himself. It is very different as regards (a) women of 18 and upwards, (b) "young persons" (male and female), between the years of 14 and 18, and (c) children of both sexes under 14 years of age.

Health (Sections 1-9).

The factory or workshop must be kept clean and properly ventilated. Wet floors must be drained and a reasonable temperature maintained. There must be no overcrowding, (i.e. a minimum of 250 cubic feet of space must be allowed per person, and during periods of overtime, at least 400 cubic feet per person). Proper sanitary conveniences must be provided.

All the inside walls and ceilings of each room, whether plastered or not, if they have not been painted with oil or varnished once at least within seven years, must be lime-washed at least every fourteen months; and if they have been painted or varnished, must be washed with hot water and soap every fourteen months.

Safety (Sections 10-18).

Certain kinds of machinery must be fenced; steam boilers maintained in proper condition and periodically overhauled; adequate means of escape provided in case of fire; the doors must be made to open

from inside; the moving carriage of any automatic machine must not run out beyond the fixed frame of the machine to within a distance of eighteen inches from any fixed structure in any passage or space through which any person is liable to pass.

A child is not allowed to clean any part of any machinery, or any place under any machinery other than overhead mill gearing. A young person is not allowed to clean any dangerous part of any machinery while in motion. A woman or young person is not allowed to clean mill gearing while in motion.

The Courts are given power to make an Order prohibiting the use of any dangerous machinery or plant, or to close down a factory or workshop as unhealthy or dangerous.

Accidents (Sections 19-22).

These Sections are now supplemented by the Notice of Accidents Act, 1906, and the "Dangerous Occurrences Notification Order of 1928," dealt with below.

Any accident in a factory or workshop

(a) causing loss of life to a worker, or

(b) due to any power-driven machinery, or to molten lead or hot liquid, or to an explosion or escape of gas or steam, or to electricity, inflicting such injuries to a worker as to cause him to be absent from employment for at least one day, or

(c) any accident disabling a worker from employment for more than seven days,

must be notified in writing to the Factory Inspector and also to the certifying Surgeon for the district.

Hours of Employment, etc. (Sections 23-35).

These sections relate to hours of employment and provision for meal-times and holidays, particularly as affecting women, young persons, and children.

The manager must fix a notice in a prominent position in the factory or workshop setting out (a) the daily hours of employment, (b) the time allowed for meals. A copy must be sent to the Factory Inspector, who must also be notified of any subsequent changes.

The period of employment of women and young children in a non-textile factory or workshop shall, except on Saturday, and

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with certain other exceptions, begin between 6 a.m. and 8 a.m., and end between 6 p.m. and 8 p.m., with meal intervals of not less than one hour and a half, of which at least one hour must be before 3 p.m. No woman or young person shall be employed continuously for more than five hours without an interval of at least half an hour for a meal.

All women and young persons must have their meals at the same times of day; they must not be employed or allowed to remain in any room in which work is in progress during these times.

The recognised Bank Holidays must be observed—or a full day, or its equivalent, allowed as a holiday in lieu.

If an employer of the Jewish faith keeps his factory or workshop closed on Saturday until sunset, he may employ women and young persons from after sunset on Saturday until 9 o'clock in the evening. If he closes down all day on Saturday, he may extend the permitted hours of work by one hour each day during the rest of the week, except on Sunday.

Miscellaneous Provisions.

The remaining sections of the Act may be briefly summarised as follows:—

Sections 36-48 set out special exceptions which may be made to the general rules previously laid down regarding hours and holidays.

Sections 49-60 regulate overtime and night-work, and deal with intermittent and special employment.

In non-textile factories and workshops the "hours of employment" for women on any day except Saturday may be extended for two hours overtime, provided that at least two hours are allowed during the day for meals, of which half an hour must be after 5 p.m., and also provided that a woman must not be so employed on overtime for more than three days in any one week, or for more than thirty days in twelve months.

Sections 61-67 forbid the employment of children under 12, and of women within four weeks of childbirth. Employers must have medical certificates of fitness in the case of young persons and children residing more than three miles from the factory.

Sections 68-72 relate to education, and make the employer share with the parent the obligation of seeing that each employed child shall attend a recognised school.

A child employed during the morning or afternoons must attend a recognised efficient school on each work-day for at least one attendance; or, when employed on the alternate day system, must on each other day make at least two attendances at the school, these attendances being between the hours of 8 a.m. and 6 p.m. ("Child" is defined to be a person under the age of

14 years and who has not—at the age of 13—obtained a certificate of proficiency or attendance at school.)

Sections 73-86 are concerned with certain industries specified as "Dangerous and Unhealthy."

Sections 87-106 set out certain modifications and extensions which are allowable in respect of the provisions made in the preceding sections.

Sections 107-115 are concerned chiefly with the conditions of employees who work at their own homes, particularly as regards the use of unwholesome premises or where there is infectious disease.

Sections 116-117 are designed to ensure that piece-workers in certain trades are fairly paid for the work they do.

In every factory, for the purpose of enabling each piece-time worker to calculate the amount of wages due to him, there must be a clear list of the rate of wages applicable to the work done, and also particulars of the work to which the rate is applicable. These must be given to the worker when the work is handed to him, or posted up in a conspicuous place in the workroom.

Sections 118-134 contain provisions regarding the general administration of the Act; the appointment, power, and duties of Factory Inspectors and Surgeons; and regulations as to special notices, registers, and returns, and how and when they are to be made.

Sections 135-148 relate to the various penalties incurred by any breach of the Act, and the legal procedure for enforcing them.

The last part of the Act (*Sections 149-163*) are of a supplementary nature, and do not call for further description.

Since the passing of the 1901 Act various supplementary measures have been passed.

"Notice of Accidents Act 1906."

This tightens up the provisions of the 1901 Act relating to accidents, and lays down that certain kinds of "dangerous occurrences" must be notified even though no bodily injury is caused.

Dangerous Occurrences Notification Order, 1928.

This is a further development of the preceding Act making notification to the Inspector compulsory in the following cases, whether personal disablement or injury is involved or not—

(a) bursting of a revolving vessel or wheel driven by mechanical power;

(b) breaking of a rope or chain or other appliance used for raising or lowering persons or goods by mechanical power;

(c) any explosion or fire due to (i) ignition of dust, vapour, or gas; (ii) ignition of celluloid or substances composed wholly or

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FACTORY ACTS

partly of celluloid; (iii) electrical short-circuit or failure of electrical apparatus, if the occurrence causes damage to the structure of any building in which persons are employed or to any machinery or plant therein, and results in the complete suspension of ordinary work, or stoppage of plant for not less than five hours;

(d) explosion or fire due to causes other than those set out under (c) above, and causing total suspension of ordinary work for not less than 24 hours.

Police, Factories, etc. (Miscellaneous Provisions) Act, 1916.

This act empowers the Secretary of State to make "Welfare Orders" compelling special precautions to be taken for the health and comfort of workers in certain industries.

Employment of Women, Young Persons, and Children Act, 1920.

This was passed to give effect to recommendations made by the International Labour Organisation of the League of Nations. It forbids the employment of children under fourteen years of age in any industrial undertaking, except domestic factories and workshops. It also restricts the employment of young persons of both sexes between the years of 14 and 18.

In this connection it may be pointed out that the Education Act of 1921 forbids the employment of children between 12 and 14 in any manner which prevents their attendance at school.

Regulations for Accumulator Manufacture and Repair.

Among the numerous Statutory Rules and Orders issued under the Factory and Workshops Acts, No. 28 of 1925, which repeals a previous Order of 1923, No. 1004, is of particular interest since it applies to the repair, as well as the manufacture, of any accumulator containing lead or any compound thereof. The principal provisions are:—

No person under 18 years of age shall be employed in any lead process, *i.e.*, in melting lead or any material containing lead, or in casting, pasting, lead-burning, or any operation involving trimming, abrading or cutting of pasted plates containing lead oxide.

No woman or young person under 18 shall be employed in any room in which the manipulation of raw oxide of lead, or pasting, is carried on.

In every room in which a lead process is carried on there must be a minimum of 500 cubic feet of air per person, any height over 12 feet not being taken into account.

Every person employed in a lead process

shall be medically examined within seven days of his first employment, and monthly thereafter.

Other sections of the Order regulate the working conditions under which various processes are to be carried out, prescribe the protective clothing to be worn by the workers, and specify the sanitary and washing accommodation to be provided in each workshop or factory.

Regulations for the Use of Electrical Energy (Order No. 1312 of 1908).

The principal provisions are as follows:—

All apparatus and conductors shall be sufficient in size and power for the work they are called upon to do, and so constructed, installed, protected, worked and maintained as to prevent danger so far as is reasonably practicable.

All conductors shall either be covered with insulating material, and further efficiently protected where necessary to prevent danger, or they shall be so placed and safeguarded as to prevent danger so far as is reasonably practicable.

Every switch, switch fuse, circuit-breaker, and isolating link shall be: (a) so constructed, placed, or protected as to prevent danger; (b) so constructed and adjusted as accurately to make and to maintain good contact; (c) provided with an efficient handle or other means of working, insulated from the system, and so arranged that the hand cannot inadvertently touch live metal; (d) so constructed or arranged that it cannot accidentally fall or move into contact when left out of contact.

Every switch intended to be used for breaking a circuit and every circuit-breaker shall be so constructed that it cannot with proper care be left in partial contact, or so that an arc cannot accidentally be maintained.

Every fuse and every automatic circuit-breaker used instead thereof shall be so constructed and arranged as effectively to interrupt the current before it so exceeds the working rate as to involve danger.

Every electrical joint and connection shall be of proper construction as regards conductivity, insulation, mechanical strength and protection.

Efficient means, suitably located, shall be provided for cutting off all pressure from every part of a system, as may be necessary to prevent danger.

Every motor, convertor and transformer shall be protected by efficient means suitably placed and so connected that all pressure may thereby be cut off from the motor, convertor or transformer as the case may be, and from all apparatus in connection therewith; provided, however, that where one point of the system is connected to earth, there shall be no obligation to disconnect on that side of the system which is connected to earth.

CUSTOM SAYS MULLARD

Every flexible wire for portable apparatus, for alternating currents or for pressures above 150 volts direct current, shall be connected to the system either by efficient permanent joints or connections, or by a properly constructed connector.

In all cases where the person handling portable apparatus or pendant lamps with switches, for alternating current or pressures above 150 volts direct current, would be liable to get a shock through a conducting floor or conducting work or otherwise, if the metal work of the portable apparatus became charged, the metal work must be efficiently earthed.

The Truck Act, 1896.

The Truck Acts prohibit, in general, the payment of workers' wages in any form other than cash.

Fines and Deductions.

The 1896 Act, which amends former Acts, lays down that an employer shall not make any contract with a workman for any deduction from the stipulated rate of wages, or for any payment by way of fine, unless

(a) the terms of the contract are conspicuously displayed in the workshop, or are set out in writing and signed by the worker, and

(b) the contract sets out specifically the acts or omissions in respect of which fines may be levied, and

(c) the fine imposed by the contract is in respect of some act which causes or is likely

to cause damage or loss to the employer, and

(d) the amount of the fine is fair and reasonable having regard to all the circumstances of the case.

These provisions apply equally to shop assistants as to other workers.

Payments for Damaged Goods.

Deductions or fines in respect of damage done by workmen to goods or materials supplied are also subject to the foregoing provisions. In addition :—

(a) Not only must the fine be "fair and reasonable," but it must not, in any circumstances, exceed the actual amount or loss suffered by the employer.

(b) The contract need not set out all particulars of deductions, since it is impossible to foresee these completely, though it must set out definitely that deductions are to be made in respect of damage done to materials by the workman.

Recovery of Fines.

Any sum taken by or paid to the employer by way of fine, contrary to this Act, can be recovered by the employee provided he applies to the Court within six months of the date of deduction or fine; but if he has signed a contract agreeing to such fines or deductions, he can only recover whatever amount has been paid in excess of that which the Court may hold to be fair and reasonable.

G.P.O. RELAY REGULATIONS

All relays have to be licensed by the P.M.G. This licence costs £1 a year, and imposes upon the licensee certain obligations. Subscribers to relay services must hold an ordinary P.O. receiving licence. The relay firm must disconnect any subscriber who ceases to hold a listening licence.

In addition the G.P.O. has to be advised monthly of new subscribers' names and addresses, of the expiry dates of their listening licences, and of the date when they became subscribers. The names and addresses of people who have ceased to be subscribers and the date when they ceased to be subscribers have also to be returned monthly.

The licensee may not originate at the station or collect by wire any programme, message or item, nor must the licensee use or allow the station to be used for the receipt of messages other than programmes.

The relay may not distribute any programme or message containing political,

social or religious propaganda received in the English language from any station outside Gt. Britain and Northern Ireland.

A daily record of the programmes supplied to subscribers must be kept, with the origin of these programmes, and the time of reception. This log must be open to G.P.O. inspection at any time without notice.

The relay company must, if asked by the P.M.G., instal and maintain free a relay service at the residence of any Post Office official in the district covered by the relay. All apparatus used in relays has to be of British make, and the station and wires have to be open to Post Office inspection at any time.

The licensee must not without the P.M.G.'s consent (a) sublet the powers given by the licence, or (b) acquire shares in any other licensed relay concern.

The P.M.G., on the determination of the agreement (for which six months' notice is necessary) may, after giving three months' notice, purchase the whole station.

MULLARD THE MASTER VALVE

SHOP REGULATION ACTS

1919—1928

By the Legal Editor

The term "shop" as here used applies to any "premises where a retail trade or business is carried on," a definition which distinguishes the scope of the Shops Acts from that of the "Factory and Workshops Acts" dealt with separately on pages

The origin of the law relating to the employment of shop assistants may be traced back to the early Truck Acts, which first compelled employers to pay all wages entirely in cash or coin, and prohibited any part being paid "in kind," *i.e.*, in food clothing, or other commodities.

In his own interest the owner or manager of any shop, large or small, should study the main provisions of the Shops Acts. He is responsible for the proper observance of specified obligations towards his employees, and cannot evade the consequences of any infraction of the law under the plea of ignorance.

This Act consolidates the Shops Regulation Acts 1892-1911.

Conditions of Employment.

(a) On at least one weekday in each week a shop assistant shall not be employed after half-past one o'clock in the afternoon.

This does not apply to the week preceding a Bank Holiday if the shop assistant is not employed on the Bank Holiday, and if on one weekday in the following week, in addition to the Bank Holiday, the employment of the shop assistant ceases not later than half-past one o'clock in the afternoon.

(b) The occupier of a shop shall set out in a notice displayed in the shop the day of the week on which his shop assistants are not employed after half-past one o'clock, and may fix different days for different shop assistants.

Meal Times.

Intervals for meals shall be allowed to each shop assistant and shall be arranged so as to secure that no person shall be employed for more than six hours without

an interval of at least twenty minutes being allowed, provided that:—

(1) where the hours of employment include the hours from 11.30 a.m. to 2.30 p.m., an interval of not less than three quarters of an hour shall be allowed between those hours for dinner, which shall be increased to one hour in cases where that meal is not taken in the shop, or in a building of which the shop forms a part or to which the shop is attached:

(2) where the hours of employment include the hours from 4 p.m. to 7 p.m., an interval of not less than half an hour shall be allowed between those hours for tea.

This provision does not apply to a shop if the only persons employed as shop assistants are members of the family of the occupier of the shop, maintained by him and dwelling in his house.

The penalty for any breach of the foregoing regulations is, for the first offence, a fine not exceeding £1; for a second offence £5; and for a third or subsequent offence £10; but an exception is made in the case where an assistant stays on after 1.30 for the purpose of serving customers who were in the shop at that time.

Employment of "Young Persons."

(a) No "Young person" (*i.e.*, one under the age of eighteen years) shall be employed in or about a shop for a longer period than seventy-four hours, including meal times, in any one week.

(b) In every shop in which a young person is employed a notice shall be kept exhibited by the occupier of the shop in a conspicuous place stating the number of hours in the week during which a young person may lawfully be employed in or about the shop.

For any offence against the first regulation the occupier of the shop shall be liable to a fine not exceeding one pound, or, where more than one young person is so employed, one pound for each young person,

THREE MILLION AERIALS CAN'T BE WRONG

If the occupier of a shop fails to comply with the provisions regarding "notices," he is liable to a fine not exceeding forty shillings.

Seats for Female Assistants.

In all rooms of a shop where female shop-assistants are employed in the serving of customers, the occupier of the shop shall provide seats behind the counter, or in such other position as may be suitable for the purpose, and such seats shall be in the proportion of not less than one seat to every three female shop-assistants employed in each room.

Failure to comply with this provision entails a fine not exceeding three pounds for the first offence, and for a second or subsequent offence a fine not less than one pound and not exceeding five pounds.

Early Closing.

Every shop shall, save as otherwise provided, be closed for the serving of customers not later than one o'clock in the afternoon on one weekday in every week.

The local authority may, by order, fix the day on which a shop is to be so closed for "the weekly half-holiday," and any such order may either fix the same day for all shops, or may fix :—

(a) different days for different classes of shops ; or

(b) different days for different parts of the district ; or

(c) different days for different periods of the year.

Failing such an order, the weekly half-holiday shall be such day as the occupier may specify in a notice affixed in the shop, but it shall not be lawful for the occupier of the shop to change the day oftener than once in any period of three months.

Where the local authorities have reason to believe that a majority of the shopkeepers of any particular class in any area are in favour of being exempted from the provisions of this section either wholly or by fixing as the closing hour instead of one o'clock some other hour not later than two o'clock, the local authorities shall make an order exempting the shops of that class within the area from the provisions of this section of the Act, either wholly or to such extent as specified.

Failure to comply with any of the provisions of this section, entails a fine not exceeding :—

(a) in the case of a first offence, one pound ;

(b) in the case of a second offence, five pounds ; and

(c) in the case of a third or subsequent offence, ten pounds.

Special Exceptions.

In places frequented as " holiday resorts " during certain seasons of the year, the local authority may by order suspend, for such period or periods as may be specified in the order (not exceeding in the aggregate four months in any year), the obligation imposed by this Act to close shops on the weekly half-holiday.

Where the occupier of any shop in any place in which any such order of suspension is in force satisfies the local authority that it is the practice to allow all his shop assistants a holiday on full pay of not less than two weeks in every year, and keeps affixed in his shop a notice to that effect, the requirement that on one day in each week a shop assistant shall not be employed after half-past one o'clock shall not apply to the shop during such period or periods as aforesaid.

Definitions.

The expression "shop" includes any premises where any retail trade or business is carried on ;

The expression "shop assistant" means any person wholly or mainly employed in a shop in connection with the serving of customers or the receipt of orders or the despatch of goods ;

The expression "Bank Holiday" includes any public holiday or day of public rejoicing or mourning ;

The expression "week" means the period between midnight on Saturday night and midnight on the succeeding Saturday night.

The Shops (Hours of Closing) Act, 1928.

This enacts that every shop (with certain exceptions which do not include wireless retailers) shall be closed not later than nine o'clock in the evening on one day in the week (known as the late day) and not later than eight o'clock in the evening of all other weekdays. Generally speaking the "late" day is Saturday, but the local authorities have powers to fix an alternative day.

PATENTS, DESIGNS AND TRADE MARKS

By "The Broadcaster" Patent Expert

The last Patents and Designs Act, which came into force on November 1st, 1932, introduced certain important changes in existing practice. For the information of those familiar with the former procedure, it may be convenient to give a short summary of the more outstanding alterations.

In order to give more time to an inventor to develop his plans, the time limit for filing a Complete after a Provisional Specification has been increased from nine to twelve months (or to thirteen months by paying an extension fee). A corresponding extension has been made in the statutory periods for Acceptance and Sealing.

An applicant who has filed a Complete Specification may convert it into a Provisional, in order to be able to include later developments; or he may post-date his Specification, on paying a fee, for a period not exceeding six months.

The official search into the novelty of the invention may now include Foreign as well as British patent Specifications, together with technical and scientific periodicals, text-books, and other relevant publications.

To cover the extended search, the fee paid on filing a Complete Specification has been increased from £3 to £4. Otherwise the official Stamp fees—with a few unimportant exceptions—remain as before.

A patent may now be granted direct to an assignee, in cases where the inventor has agreed to assign. The Comptroller is also given powers to adjudicate as to the grant of licences when joint owners disagree.

The grounds on which a patent may be revoked have been specified and enlarged. They include—an objection that the invention is not useful; that it is not fairly described in the specification; that the scope of the patent is not fairly ascertained; that the inventor has not described the "best" method of carrying out the invention known to him when he filed his application; that the invention has been "secretly" worked on a commercial scale before patent protection was applied for; and various other objections.

The provisions intended to protect the public against unjustifiable threats of infringement have been strengthened. Relief against such threats may now be obtained whether the threatener has an interest in the patent in question or not. Also it is now no defence against an "action for threatening" to institute proceedings for infringement. This used to be a convenient way out for the threatener—if brought to book—as the infringement suit could always

be dropped if the threats were merely "bluff."

The Patent Office is now given power to refuse patents for inventions of an obviously frivolous or fantastic nature.

A new Tribunal has been set up to hear Appeals on the part of inventors from decisions of the Comptroller. Such appeals were formerly heard by the Law Officer, who has now been replaced by a Judge of the High Court (Mr. Justice Luxmoore).

The procedure as regards Designs is but little affected. Perhaps the most important change is one allowing the proprietor of a Registered Design to secure protection for a minor improvement on his design in much the same way as an inventor is allowed to take out a "patent of addition."

What May be Patented.

In the first place the invention must be for a "manner of manufacture." That is to say, it must have some commercial application and be beneficial to trade.

The discovery of a new scientific principle, such as Einstein's theory of relativity, is not patentable unless it is embodied in some practical application. The same objection applies to any abstract notion or bare philosophic idea.

Inventions for which a patent can be obtained usually fall into one or other of the following classes:—

- (1) New articles of commerce made by mechanical or chemical operations.
- (2) New machinery and apparatus.
- (3) New processes of manufacture in which a series of operations are performed in sequence.

Essentials of a Patent.

Obviously the invention must be new and original. The degree of novelty may be slight, but it must be present. In other words, the inventive step must be something more than an improvement such as would naturally be carried out by an intelligent artisan or skilled workman engaged in the trade to which the invention relates.

The invention must also be useful. There is no advantage either to the State or the inventor in granting a patent for something which is obviously futile.

To secure a patent, the inventor must file a written specification setting out clearly and fairly (a) the nature of his invention, and (b) the way in which it is to be carried into effect. An inventor is sometimes tempted to give as little information as possible. This is dangerous because it may have the effect of rendering the patent

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invalid. The criterion is that the description must be sufficient to enable a skilled workman to carry out the invention and to secure the correct results from the information given in the Patent specification. Anything less than this, or any deliberate misstatement of facts, will be sufficient to invalidate the patent should it be brought to Court.

Procedure on Application.

Generally speaking, it is advisable to employ professional assistance in applying for a patent.

To assist inventors who may desire to proceed in person, a useful official pamphlet entitled "Instructions to Applicants for Patents" may be obtained free on application to the Comptroller-General of Patents, 25, Southampton Buildings, London, W.C.2. This sets out in detail the formalities to be observed in preparing the written specification and accompanying drawings.

Provisional Application.

The application for a patent may be made either in two stages or in one. In the former case the first step is to file a Provisional specification, and then at any time within twelve months to follow this up by filing a Complete specification.

In the Provisional specification the inventor is only called upon to give a brief description of the nature of his invention. He then has a further year (or 18 months, by paying an extension fee) in which to work out the idea fully before filing the Complete specification.

Should he decide to abandon the application, he can do so without further expense.

It should, however, be clearly understood that the filing of a Provisional application gives the inventor no patent rights whatever. These do not come into existence until a Complete specification has been filed, accepted, and sealed.

Complete Specification.

The Complete specification should contain a full and detailed description of the invention and the way in which it is to be carried into effect. Usually it must be illustrated.

The specification may be deposited at the Patent Office in the first instance. Or it may be submitted nine months after the preliminary filing of a Provisional application for the same invention, as previously explained.

The Cost of a Patent.

(Official Stamp Fees only)

Provisional specification only..	£1	0	0
On filing Complete specification thereafter	4	0	0
	£5	0	0

Or Complete specification filed in the first instance	£5	0	0
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In both cases there is a Sealing fee of £1, making the total £6.

There are no further charges for the first four years, but £5 must be paid before the end of the fourth year to keep the patent alive during its fifth year, £6 for the sixth year, £7 for the seventh year, and so on, up to the sixteenth and last year of the monopoly period. There are various other fees and "fines" which may be incurred by not filing documents within the proper times. These are set out in the Patent Acts and Rules.

Trade Marks.

The register of trade marks is divided into Part A and Part B. As the fullest protection in law is obtained by marks entered in Part A, it is desirable, if possible, to qualify for entry in this part of the register.

Part A Registration.

For registration in Part A, a trade mark must contain or consist of at least one of the following essential particulars:—

Group 1:—The name of a company, individual, or firm represented in a special and distinctive manner, such as by particular lettering, which must, however, be really distinctive and not ordinary typographical printing. Fictitious names should not be used under this heading, nor names in the possessive sense.

Group 2:—The signature of the applicant for registration, or some predecessor in his business.

Group 3:—An invented word or words, such as "Kodak," "Mazawattee," "Magnavox," "Gecophone."

Group 4:—A word or words having no direct reference to the quality or character of the goods and not being, according to its ordinary significance, a geographical name or a surname. Obviously such words as "best," or "loudest," could not in fairness be monopolised by any one maker of, say, loud-speakers.

Group 5:—This includes such marks as pictorial, ornamental and geometrical devices, letters, numerals, and monograms, which fulfil the sole condition of being distinctive.

Formerly the rules excluding references to quality were rigidly enforced, but nowadays skilful and covert allusions to quality, so long as they are not evident or obvious, are frequently accepted.

Part B Registration.

Part B of the register is mainly intended to take trade marks that have been in use for over two years without having previously been registered; but marks which do not possess any of the essential particulars requisite for Part A may, in certain cases, qualify for Part B, so long as such marks are capable of distinguishing the trader's goods.

What Cannot be Registered.

A mark which is not new as applied to the

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particular goods for which it is proposed to use it, cannot be registered.

Representations of the Royal Arms or Crests, or of the Red Cross or Geneva Cross, are not allowed; nor are such words or phrases as "Patent," "Registered," or "Entered at Stationers Hall."

How to Register.

Application for registration should be made direct or in writing to the Registrar, Trade Marks Branch, Patent Office, Southampton Buildings, Chancery Lane, London, W.C.2, who will forward full particulars.

Designs.

A registrable design is defined by Act of Parliament to be "the features of shape, configuration, pattern or ornament applied to any article by any industrial process or means, whether manual, mechanical, or chemical, separate or combined, which in the finished article appeal to and are judged solely by the eye; but does not include any mode or principle of construction or the operation of a mechanical device."

This definition brings out the true distinction between a design and a patent, a point which is frequently confused. Contrivances or devices which essentially involve

processes or methods of manufacture or some mechanical principle, can only be protected by means of Letters Patent and not by registration under the Designs Act.

Registration.

The necessary forms can be obtained through the Post or on personal application at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

The Register is divided into a number of different classes, and it is necessary to specify the particular class in which registration is required. If the applicant is uncertain on this point, he can apply by letter to the Patent Office.

Rights Given by Registration.

Registration of a design gives the proprietor the exclusive right to use the design. By Act of Parliament, any manufacturer who infringes or imitates a registered design, whether or not he does so knowingly, may be proceeded against in the Courts.

Marking Articles.

Before delivery on sale of any article to which a Registered Design has been applied, the proprietor of the design must mark the article "Registered" or "Regd." even if such articles are only intended for export. Failure to do this may cause the proprietor to lose his right to get damages for infringement.

ELECTRICITY SUPPLY CHANGEOVER AND REPLACED APPARATUS

When an authorised electricity undertaking wishes to change the system of the supply, it has to obtain the consent of the Electricity Commissioners or in certain cases of the local authority (as for instance the L.C.C. in the London area). The consent is usually given subject to the undertaking replacing any of the consumer's apparatus (which includes wireless equipment) affected by the change.

If the undertaking refuses to make good the change-over of the wireless equipment, or disputes the cost of it, the listener can take the matter to arbitration in accordance with the conditions of the consent. It is within the power of the arbitrator to award that the cost of the arbitration shall be borne

by the party against whom the award is given. Under the form of consent now issued by the Electricity Commissioners the undertaking is relieved of the responsibility for replacing consumer's apparatus installed after notice (six months) of the change over has been given.

All this applies to authorised electric supply undertakings only—that is to say, those which have undertaken to supply electric current under the provisions of the Electricity Supply Acts, 1882 to 1926. There are a few comparatively unimportant undertakings which have been set up independently of those Acts, and over whom the Electricity Commissioners have no control.

**MULLARD—THE VALVE OF THE PAST,
THE PRESENT, THE FUTURE**

THE A.4 LICENCE

The A.4 agreement, which is the latest form of licence to manufacture issued to set makers in this country, is offered by the British Thomson-Houston Co., Ltd., Electric and Musical Industries, Ltd., Marconi's Wireless Telegraph Co., Ltd., Standard Telephones and Cables, Western Electric Co., Ltd., and the Hazeltine Corporation.

The agreement covers radiograms as well as receivers and is designed to supersede both the A.3 licence and the R.G.2.

It is a five-year agreement to continue until August 28th, 1938, and covers the manufacture and sale of broadcast receiving apparatus in Great Britain, Northern Ireland, the I.F.S., Channel Islands and the Isle of Man for private and domestic use only with the exception that the use of radio sets and radiograms is permitted in public-houses, hotels, cafes and small dance halls not being attached to a theatre or cinema.

Except as stated above the use of broadcast apparatus for revenue earning purposes is prohibited.

Export is not permitted without the consent of the licensors.

The licence covers kits as well as complete receivers and a clause concerning British radio licence conditions in this country stipulates that all companies or firms directly or indirectly owned or controlled by the licensee shall, if engaged in any field of business to which the licence is applicable, accept licences from the grantors.

No permission is included in the licence to manufacture or sell valves, loudspeakers or television apparatus, and manufacturers are bound to use British-made apparatus.

The royalty on receivers is 2s. 6d. per valve holder, the expression valve meaning in the case of multiple-valves that every cathode-anode stream shall be deemed to be one valve. The royalty on kits is 1s. 6d. per valve with the same proviso applying in the case of multiple-valves.

In the case of radio gramophones, in addition to the above royalty, there is a further single payment of 2s. 6d. over and above the per valve royalty, while in the case of kits of parts intended for assembly into radiograms, there is also a further additional final sum of 2s. 6d. over and above the 1s. 6d. per valve royalty.

No royalty is payable in respect of a battery eliminator incorporated in a broadcast receiver or radiogram.

A minimum royalty of £150 per annum is payable and licensees may not manufacture sets for sale except under their own trade-mark or trade name.

The royalty on eliminators sold separately is 2s. 6d. per valve or equivalent of a valve.

To the scale of royalty as set out above a form of rebate is applied, to come into operation when the licensee pays a sum of £1,800 to the Pool.

This sliding scale rebate does not apply to the single payment of 2s. 6d. due in the case of radio gramophones.

The rebate is of such a nature that the scale ends at a point where the actual amount of royalty due, after deducting the percentage rebate, drops to 1s. in the case of sets or 6d. in the case of kits.

In actual practice, while the per valve royalty of a manufacturer whose actual payment to the Pool is £1,800 per annum remains, therefore,

at the standard rate per valve of 2s. 6d., a manufacturer whose total payment to the Pool on this standard scale would amount to £9,000 would receive such a rebate as would reduce his per valve payment to approximately 1s. 5d. and the actual net sum from £9,000 to £5,000.

No schedule of patents is incorporated in the licence, but the following is a list of the principal patents, including those of the Hazeltine Corporation, which are held at the moment by the Pool.

Patent No. 275 of 1915 covering the push-pull amplifier (recently extended by order of the High Court until January, 1935) is still on the list, as well as No. 15448/15 relating to the use of a centre-tapped filament for raw A.C. valves, which was similarly given a fresh lease of life up to November, 1935.

One or two of the scheduled patents are due to expire within the next year, including one of the earliest superhet patents, No. 135177, but the rest have still a long term to run.

The well-known "Craft" patent, covering the basic principle of the radiogram, the Rice-Kellog patents for moving-coil speakers, and the Willans tone-compensating circuits are, of course, carried over from the old RG2 to the new A4 agreement. In addition, there are circuits covering forms of automatic grid bias, the use of the loudspeaker field coil to assist the eliminator "smoothing," and a D.C. supply unit with means for applying out-of-phase voltages to compensate for hum.

The following is a short analysis of the patents now included for the first time, and not previously scheduled, either in the RG2 or A3 agreements.

No. 259664 (Western Electric Co.), July 14, 1925.—Part of the output from the second detector of a superhet is diverted through a tuned circuit and fed to an auxiliary amplifying valve, which passes the amplified current to a rectifier. The direct-current voltage developed across a resistance in the plate circuit of the latter is used to control the grid bias of one or more of the high frequency valves in accordance with the strength of the incoming carrier.

No. 283120 (British Thomson-Houston), January 3, 1927.—In a "straight" circuit the output from the second H.F. valve is fed to a detector. The plate circuit of the detector includes the primary of a low-frequency transformer and, in series with it, a high resistance. The latter is in the input circuit of an auxiliary valve amplifier, the D.C. output voltage from which is applied directly to bias the grids of the H.F. stages. The auxiliary valve may be dispensed with, and the D.C. voltage may be used to bias the grids either of the preceding H.F. stages or of the following L.F. stages.

No. 372155 (Marconi's Wireless Telegraph Co.), July 7, 1930.—"Quiet" automatic volume control. The loudspeaker is cut out of circuit so long as the desired programme falls below a certain strength. This eliminates undesirable background "noise" during the operation of tuning. The anode circuit of one of the intermediate-frequency valves includes a time relay so adjusted that a short-circuiting resistance is connected across the loudspeaker input until the signal being tuned in reaches a certain level of strength. The short-circuit is then removed and the loudspeaker automatically comes into operation.

No. 377307 (Marconi's Wireless Telegraph Co.; G. Mathieu; and G. A. Isted), March 28, 1931.—The rectified voltage from the second detector valve of a superhet is applied in the first instance

MULLARD THE MASTER VALVE

A.4 LICENCE

to regulate the bias on the first detector valve only; next, if necessary, to control the output of the intermediate frequency valve; and then in succession, the frequency-changing valve and the H.F. amplifier. The A.V.C. rectifier may be a diode valve arranged in parallel with the second detector.

No. 381847 (Marconi's Wireless Telegraph Co.), March 21, 1931.—The A.V.C. voltage is derived either from a double-diode-triode valve, or from an ordinary triode valve in which the cathode and grid are used to rectify the signal voltages, while the cathode and anode act as a second pair of electrodes to rectify the carrier-wave. The rectified carrier voltage is fed back to the grid of the preceding valve for A.V.C., whilst the audio-frequencies are applied to a resistance in the grid-cathode circuit, and, after passing through the valve in this form, are fed forward to another stage of L.F. amplification. The arrangement can be used to give "quiet" or "delayed" A.V.C. by preventing the development of any D.C. carrier voltage until the signal reaches a definite level of strength.

No. 393318 (Marconi's Wireless Telegraph Co. and R. M. Armstrong), December 2, 1931.—Part of the rectified carrier-wave is used to vary the voltage applied to the screening-grid of a S.G. valve in such a way as to increase its effective amplification-factor as signal strength falls off and vice versa. Part of the resistance across which the A.V.C. voltage is developed may consist of the anode-cathode path of an auxiliary valve.

OTHER PATENTS.

Ganged Tuning Control.—No. 221868 (Western Electric Co. and G. H. Nash), June 19, 1923.—Covers the use in a receiving set of a number of variable tuning condensers which are mounted coaxially, but not on the same shaft, and so locked together that the rotation of one from a single control knob simultaneously effects the rotation of the others.

Anti-Reaction Circuit.—No. 260036 (H. J. Round), July 20, 1925.—In order to eliminate reaction due to interelectrode capacity, the usual anode "balancing" inductances consist of various coils, some wound in the ordinary way, whilst others are astatically wound, i.e., so that there is no external magnetic field.

Screening.—No. 285020 (British Thomson-Houston), February 8, 1927.—Covers the use of "partition" screening in the case of screen-grid amplifiers. The input and output circuits are preferably arranged on opposite sides of the same partition, the bulb of the valve extending part way through.

Automatic Grid-bias.—No. 348540 (S. J. Anderson), February 12, 1930.—"Free" grid bias is obtained by using the voltage drop across one of the usual anode impedances. For instance, the D.C. voltage developed across the primary of an ordinary L.F. coupling-transformer is used to bias the grids both of the detector and the following L.F. stage.

Remote Tuning Control.—No. 355706 (Marconi's Wireless Telegraph Co. and A. T. Wits),—The tuning condensers of a receiving set are controlled from a distance through a potentiometer knob, which varies the resistance in a circuit, comprising a solenoid, and so alters the position of an armature moving in and out of the solenoid. The armature is coupled to the moving plates of the condenser through a spring-controlled plunger, which prevents any movement of the condenser plates when the solenoid is de-energised.

Straight-line Amplifier.—No. 358932 (Marconi's Wireless Telegraph Co.; H. J. Round, and P. K. Turner), June 12, 1930.—The grid and cathode of a valve of high mutual conductance are tapped across a small portion of the inductance of a tuned circuit, which is also lightly coupled to the plate circuit, the degree of reaction being such as to reduce the damping practically

to zero. The response of such a circuit to impressed signals is substantially linear.

Frequency-correcting Circuits.—No. 370030 (N. M. Rust), December 24, 1930.—Covers the use of inductance, resistance, and capacity networks for correcting variations in current frequency or phase, and compensating for attenuation.

Band-pass Circuits.—No. 393983 (N. P. Hinton).—A variably-tuned band-pass input or coupling-circuit which has two resonant frequencies at each setting (double-humped curve), and a constant difference between these two frequencies at all points within the tuning range. The two circuits forming the band-pass are cross-connected, so that there is always a tuned "series" circuit, together with a second tuned "figure-of-eight" circuit. The arrangement is suitable for ganged control, and more particularly for coupling the signal and local oscillator circuits in a superhet receiver.

The Hazeltine Corporation's list includes one patent originally issued to Mr. Scott Taggart for an early neutrodyne development, and certain others issued to Messrs. Loftin and White for couplings designed to ensure a constant amplification over the entire tuning range of a set.

Broadly speaking, the inventions fall into three main groups, the first relating to constant amplification, the second to methods of ganging for single-knob tuning control, and the third to neutrodyne. The remainder are chiefly concerned with constructional details.

As they were originally intended for the American rather than the British market the circuits are not, as a rule, designed to cover both medium and long-wave ranges. There is, however, evidence of a far-sighted appreciation of the problems of ganged tuning and automatic volume control.

The first-mentioned group is probably the most important at the present time. It covers various methods of ensuring constant coupling, and therefore constant amplification at different frequencies, together with other advantages, such as increased stability and simplified control.

The patents concerned are:—

256644, issued to S. Y. White.
256967, issued to S. Y. White.
259613, issued to Hazeltine Corporation.
263804, issued to E. H. Loftin.
273639, issued to Hazeltine Corporation.
297723, issued to Hazeltine Corporation.
315399, issued to Hazeltine Corporation.

The constant-coupling circuit usually identified with the names of Loftin and White consists of a magnetic coupling combined in additive phase with a capacity coupling. That is to say, the two separate couplings are so proportioned as to give a constant total transfer of energy throughout the whole tuning range.

The first patent 256644, describes this coupling as applied between the aerial and the input to a valve amplifier. The other two patents, 256967 and 263804, cover the same principle as applied to intervalve couplings. In addition to maintaining a constant energy transfer, the coupling counteracts any tendency to instability caused by the inter-electrode capacity of the valve.

With this type of coupling, the plate circuit is not purely inductive, but contains a capacity element, and also the resistance of the tuned circuit at resonance.

In general, resistance or inductance in the plate circuit creates a positive feed-back, while a capacitive plate circuit produces the opposite effect, the change from an inductive to a capacitive load reversing the phase of the oscillatory voltages. With an inductive load, the resultant feed-back to the grid is in phase, while with a capacitive load it is out of phase with the input.

By combining the two effects, the feed-back can be adjusted either to zero or to any desired amount necessary to obtain increased amplification, while, at the same time, maintaining stability. In actual practice one of the magnetic couplings is usually adjusted by the manufacturer before sale, so that the receiver cannot be made to oscillate at any point on the tuning scale.

THE TILL WILL TELL YOU MULLARD

Patents 273639 and 315399 cover an alternative system of constant coupling, more suited to mass production. By analysing the response curves of an ordinary amplifier it is shown that the required effect can be secured by means of a mixed inductive, and capacity coupling in combination with a choke-fed valve, the whole output circuit, including the choke, being tuned to a wave-length slightly longer than the longest to be received.

The tuned circuit, as a whole, has a capacitive reactance, and the transformer primary an inductance reactance to the valve output, causing the currents in the two windings to be in opposite phase. The amplification is, in fact, maintained constant throughout the tuning range entirely by the design of the primary circuit. The moving vanes of the condenser in the secondary circuit can therefore be earthed, to facilitate "ganging" and to eliminate hand capacity effects.

Patent No. 259613 covers the use of differently designed transformers in a multi-stage amplifier. The first-stage transformer is, say, most efficient at one wave-length, while the transformer in the next stage is made more efficient at another wave-length, the result being that the overall efficiency is kept substantially constant for all wave-lengths.

Patent No. 297723 discloses a constant amplification receiver, in which the valves are neutrodyne by split primary transformers, the primary, neutralising and the secondary inductances all being variable, while the coupling to the secondary is controlled by means of movable screens. All the variable components are ganged to specially designed tuning-condensers in such a way as to maintain constant amplification at all points on the tuning scale.

To avoid the difficulty of ganging the aerial circuit, the input to the first valve is made aperiodic.

The next group relates to methods of ganging for tuning control, and comprises the following patents:

- 250162, issued to S. Y. White.
- 250969, issued to Hazeltine Corporation.
- 252691, issued to Hazeltine Corporation.
- 312354, issued to Hazeltine Corporation.
- 314070, issued to Hazeltine Corporation.

Patent No. 250162 describes a self-contained speaker set with some interesting ganging features. Trimming condensers are used to secure resonance at the lowest wave-length to be received, whilst at the highest wave-length special plates are provided on the tuning condensers to allow the rate of change of capacity to be varied in order to secure uniformity. The ordinary aerial is replaced by a metal plate inserted at the bottom of the speaker compartment, the screens and batteries serving as a counterpoise earth. If an external aerial is used, any variation in capacity is compensated by a series condenser.

Circuits of the reflex type where the same valve is used to amplify at both high and low frequency are concerned in patents 250969 and 252691. By using an untuned aerial two advantages are gained. First, re-radiation is prevented, and, secondly, the difficulty of ganging is overcome.

In No. 312354 the aerial tuning-coil is made sufficiently large to tune to a wavelength slightly longer than the longest wave to be received, and is only loosely coupled to the secondary. The aerial is thus kept inductively reactive over the whole tuning-range, and does not reflect capacity into the coupled secondary circuit. This secures the following advantages: (1) The aerial constants are less critical than with the usual aperiodic aerial; (2) the aerial tuning favours the longer waves, which ordinarily are the least amplified; and (3) the only component affected by "ganging" is the aerial tuning-coil and not the tuning condenser, which means less cost.

PROBLEMS OF GANGING.

The problem of ganging when using a frame aerial and without employing large trimming or padding condensers, which restrict the tuning

range, is touched on by patent 314070. The required object is achieved by making the inductance of the frame equal that of the tuning coils, the larger distributed capacity of the loop being reduced to that of the other tuned circuits by connecting a part only of the frame across the input to the first valve.

The third group of patents covers various methods of neutrodyneing, or balancing-out the effect of inter-electrode capacity inside the valve.

Since the introduction of the screened-grid amplifier the value of the neutrodyne has fallen off as far as the modern receiving set is concerned, but the principle still has important applications in other directions.

The neutrodyne patents are contained in the following list:—

- 217971, issued to J. Scott-Taggart.
- 222894, issued to Jackson-Mellersh (Independent Radio Manufacturing, Inc.).
- 222895, issued to Jackson-Mellersh (Independent Radio Manufacturing, Inc.).
- 223181, issued to Jackson-Mellersh (Independent Radio Manufacturing, Inc.).
- 240114, issued to Hazeltine Corporation.
- 248389, issued to Hazeltine Corporation.
- 248311, issued to Hazeltine Corporation.
- 256649, issued to Hazeltine Corporation.
- 264304, issued to A. E. White (Thermodyne Research Lab., Inc.).

The earliest of the series is 217971, which was originally issued to Mr. John Scott-Taggart. It covers the use of a supplementary condenser inserted in parallel with the grid-anode capacity of the valve, as well as a neutralising condenser.

The others are of American origin and include No. 222895, which is the first to describe "split primary" neutralising with maximum coupling between the primary and neutralising windings. It also refers particularly to the use of screening and the employment of sheathed leads as a refinement in stabilising.

It depends upon the use of a "balanced" bridge, the arms of which are made up of the anode-grid capacity C1, the neutrodyne condenser NC, and the inductances L1 and L2. The input is applied across the diagonal AB, whilst the output is taken from the opposite diagonal CD, so that fluctuations in one cannot affect the other so long as the bridge is balanced.

Patent 222894 applies the neutrodyne idea to an input coupling between an aerial and secondary circuit. In No. 223181 the turns ratio of the neutralising and the primary windings is made equal to the ratio of the grid-anode capacity to the neutralising capacity, and Nos. 240114 and 248389 relate to neutrodyneing by capacitive elements only, with the object of maintaining a more exact balance at all frequencies.

The last three patents in this series disclose features of more modern interest. For instance, 248311 describes the decoupling of the H.T., L.T. and G.B. supplies in a neutralised receiver. Resistance-capacity decoupling combinations are used, and the necessity for the separate screening of each stage is recognised.

No. 256649 covers a method of arranging the components and wiring of a receiver in such a way that the mutual capacitive couplings automatically give a neutrodyne effect.

The plate circuit of a valve is arranged in 264304, to give a capacitive step-up by applying the anode voltage across one of a pair of series condensers used to tune the output inductance. The arrangement also reduces the oscillating voltage between the anode and filament, and so diminishes feedback to the grid.

The remaining patents mostly relate to various detail improvements in components and circuit design.

Patent 229625 covers a neutrodyne condenser formed of a wire and insulating sleeving, with a sliding tubular electrode for adjustment.

No. 231820 aims to reduce the magnetic coupling between adjacent coils by setting them with their axes parallel and inclined at an angle of 55 degrees to the line joining the centres of the coils.

No. 238256 is for a method of mounting a

MULLARD THE MASTER VALVE

A.4 LICENCE

coil on a tuning condenser by means of short brackets, and 252315 is for a valve-mounting in which the connecting leads form the sole support for the valve. The leads consist of spring strips flexible in both the horizontal and vertical planes.

The improvement of selectivity is the aim of 253146. The idea is to make the primary winding of the coupling-transformers smaller than the calculated optimum value, so that the impedance of each tuned circuit, as presented to the valve, is less than the anode impedance.

There remain two patents which fall outside the groups already mentioned.

Patent 293462 covers various improvements in automatic volume control, including the use of a meter to give a visual indication of resonance. The use of a two-electrode valve as a detector and for obtaining a biasing voltage for the high-frequency valves, is described, as well as the use of the ordinary type of detector valve for the same purpose. Both systems are designed to prevent

fluctuations in the mains supply voltages from affecting the output. Volume control may also be applied by varying in the filament current in a mains-driven set using series-connected valve filaments.

The elimination of hum is the object of the next patent. No. 304309 covers the use of a Wheatstone bridge filter for suppressing disturbances in the supply circuits of a valve amplifier. A "balanced bridge" is formed of the anode-cathode path of the valve, a choke or resistance and two condensers. The output is taken from the diagonal A, B joining the plate of the valve to the mid-point of the two condensers, while the H.T. supply is inserted across the opposite diagonal.

As long as the bridge is balanced, voltage fluctuations in the H.T. supply cannot affect the speaker, which is across the opposite diagonal of the bridge. Similarly, any mains hum, or any current from other valves passing through the common H.T. supply, cannot affect the output. The arrangement therefore eliminates any form of low-frequency distortion, such as "motor-boating," or "hum," due to incomplete smoothing.

PHILIPS—MULLARD LICENCE

The terms of the Philips-Mullard agreement offered to manufacturers of radio sets was announced in May, 1933.

The text of the agreement follows broadly the general lines of the old A.3 and R.G.2 licences issued by the British Pool.

The initial period of the agreement is two years from June 1, 1933. If not previously terminated by six months' notice before June 1, 1935, it is to continue on a yearly basis.

Fifty-seven selected patents are scheduled and the amount of the royalty payable is fixed at 1/6 per valve holder with a proviso that in the case of multi-valves the rate is 1/6 for the first function of the valve and 1/- for every additional function.

The royalty is subject to a sliding scale of rebate. This rebate varies from a minimum of $\frac{1}{2}$ per cent. on a payment of £1,500 to a maximum of 62 per cent. on a payment of £30,000.

The patents listed vary from the earliest which dates back to July, 1926, and is due to expire on July, 1942, to a patent which normally would remain in force until June, 1947.

The well-known pentode patent is of course included.

Actually 50 of the patents are scheduled on the part of Philips Lamps and seven by the Mullard Radio Valve Co.

A clause of special interest in the licence states that it is the intention of the licensors to maintain the scheduled patents free from infringement by third parties, to indemnify licensees from all actions for infringement by third parties and to furnish technical information and assistance to enable licensees to manufacture and use their sets to the best advantage. A selection of the patents scheduled includes:

287958, Mullard.—Pentode valve patent. Covers any three-grid amplifier in which the grid nearest the anode is directly connected to the cathode so as to be maintained continuously at cathode potential. Also claims various arrangements designed to prevent a rise in screen-grid current when the anode potential falls below that of the screening grid.

361450, Mullard.—Indirectly heated diode rectifier combined with a triode amplifier in which means are provided to prevent the amplifier from working on an unfavourable part of the curve. A condenser connected between the grid and cathode of the amplifier is shunted by a resistance, and the capacity of the condenser is made such that no H.F. potential occurs between the rectifier cathode and either the grid or cathode of the amplifier.

347018, Philips.—A full-wave grid-leak rectifier valve, having two grids (at least one being provided with a grid condenser), in which both grids are connected to the common input circuit at points sufficiently out-of-phase to counteract any tendency to anode rectification.

323823, Philips.—Back-coupled amplifier for A.C. voltages at high or low frequency, or for D.C. Distortion is prevented by feeding back to the grid an out-of-phase component tapped off from a shunt resistance in the output circuit.

341403, Philips.—Pentode circuit designed to limit the high-note response and to prevent excessive voltage on the anode. The primary or secondary of the coupling transformer is shunted by a high resistance; or the resistance may be inserted in parallel with the loudspeaker.

358881, Philips.—Automatic volume control by utilising the bias derived from a grid-leak detector through a resistance connected between the grid of the detector and a point situated on the cathode side of the grid circuit of a preceding H.F. amplifier.

381907, Philips.—Superhet set in which the coupling between the I.F. stages consists of a tuned series circuit, connected between a step-down output transformer and a step-up input transformer.

384583, Philips.—Superhet in which the local oscillator is inductively back-coupled between its grid and plate, but is capacitatively coupled to the H.F. input valve and to the first detector, so that the energy transferred to the grid of the first detector is kept constant over the whole tuning range.

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RECOMMENDED RADIO TEXT BOOKS

These Books may be obtained from Odhams Press, Ltd.,
Technical Book Dept., 85, Long Acre, London, W.C.2.

Prices quoted do not include postage. Five per cent. should be added to the price of the book in all cases to cover this item.

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THE INDUSTRY AT LAW

Summary of the Year's Actions

Patents; Trade Marks; and Price Cutting.

Mullard Trade Mark: Forged Cartons.—At Old Street Police Court, Barnett Weinberg, printer, of Stepney, was charged on remand with forging certain trade-marks, the property of the Mullard Radio Valve Co., Ltd. Ernest Rogers, 28, builder, of Clapton, was also charged on remand with causing Weinberg to forge them. Prisoners were further charged with conspiring with four men and other persons unknown to contravene the provisions of Section 2 of the Merchandise Marks Act, and there were three other charges against them of causing certain trade-marks, the property of the Mullard Radio Valve Co., to be forged on December 30, 1932, and February 13 and 23, 1933.

The four men, *vs.* Jacob Lithauer, of 18, Ganton Street, W.; Charles Edward William Manning, of 5, Great Chapel Street; William Bennison, of 180, New Bond Street, and Thomas Rogers, of 30, Powell Road, Clapton, were summoned for conspiring with Weinberg, Ernest Rogers, and others.

Lithauer was also summoned for having in his possession, for the purpose of trade, certain valve cartons, to which forged trade-marks were applied, and for selling radio valves to which forged trade-marks were applied. Manning was further summoned for having in his possession, for the purpose of trade, cartons to which forged trade-marks were applied. There were two summonses each against Bennison and Tom Rogers for selling the radio valves.

In opening the case, Mr. G. D. Roberts had stated that it was alleged that the valves from set makers' cartons had been placed in retail sale cartons, and thereby that a fraudulent profit was made.

The charges of conspiracy had been withdrawn and defendants had elected to be dealt with summarily.

Mr. G. D. Roberts now stated that since the matter was last before the court the prosecuting company had had an opportunity of considering the position with regard to certain of the defendants.

He knew the story that Ernest Rogers, according to his statement, caused those cartons to be produced. He went to Weinberg, who, as a printer, caused Mr. Child to print them. The other four men, Tom Rogers, Lithauer, Bennison, and Manning, came later into the story and the case against them had always been that they had acquired in very large numbers those cartons which were apparently new.

In those circumstances, the prosecutors, always taking up the position that they acted in good faith in that matter, were prepared to acknowledge that the explanation made by those four men was true that they did not know the cartons were forged, and in those circumstances they were prepared, if his worship considered it a proper course, to offer no more evidence against them.

The prosecution was brought very largely to break up that system, which was doing much harm to the prosecuting company.

Mr. J. D. Caswell, for Lithauer, said he did not suggest for a moment that that prosecution was brought in bad faith, but in the course of the proceedings it had been pointed out that there was a very large traffic in those cartons. His clients had purchased cartons for a long time and in large quantities and there was no suggestion they were forged until the beginning of this year. What he understood was that the printers had overstocked themselves. Mr. Harrison, the sales manager of Mullard's, said: "Oh, yes, I have

changed our pattern quite lately," and that was what was told Mr. Lithauer. Mr. Lithauer was under no contractual relationship with Mullard's.

Mr. Fearnley Whittingstall, for Manning, stated that his client had always borne the highest reputation in the trade and he had not been accused, neither was there any suggestion, that he had transferred cartons from one box to another. From the first he admitted having the cartons in a showroom. He had bought them not for himself but for Mr. Lithauer, and in order that Mr. Lithauer might not lose what everyone understood was a perfectly legitimate bargain.

Mr. J. Maude, for Bennison, said so far as any criminal charge was concerned his client had an answer. He did not know anything about the cartons having been forged.

The summonses against Lithauer, Manning, Bennison, and Tom Rogers were accordingly withdrawn.

Mr. T. F. Davis, who defended Weinberg, contended that his client had no intention to defraud.

Weinberg entered the witness box and said in the whole matter he had no intention to defraud in any way.

Weinberg was discharged under the Probation of Offenders Act, and Ernest Rogers was placed on probation for twelve months.

Price Cutting: Mullard Secures Injunction.—In the Chancery Division, Mr. Justice Eve, on the motion of the Mullard Radio Valve Co., Ltd., by consent granted a perpetual injunction restraining Mr. Mark Wiseman, trading as the Gas Light and Radio Co., of High Street North, East Ham, from selling valves of their manufacture below the price at which they were licensed for sale.

Mr. Graham, for the plaintiff company, said defendant had agreed to the order asked for and had also agreed to pay £15 by way of damages and £35 towards the plaintiff company's costs.

On the same day, in the Chancery Division, a similar action by the Mullard Radio Valve Co., Ltd. against the Gas Light Fittings Co., Ltd., was mentioned to Mr. Justice Farwell.

Mr. L. Heald, for the Mullard company, explained that the defendants had not entered an appearance, and he had a signed consent from them to an order in the form of a notice of motion.

They consented to a perpetual injunction restraining them from selling valves below the list price and from selling to the public valves licensed to be sold only to set makers.

Mr. Justice Farwell said he would make an order for a perpetual injunction in the form which had been signed, subject to the defendants producing a consent brief to the Registrar.

At a later date, Mr. Justice Farwell, in the chancery Division, granted an injunction restraining C.P. Wireless, Ltd., the Pax Manufacturing Co., John Henry Duke, and G. D. Duke, from selling or offering for sale or disposing of otherwise than as part of a wireless set any valve manufactured under any of the Mullard Radio Valve Co., Ltd.'s, patents and licensed for resale as part of a wireless set only.

Mr. Moritz, K.C., for the Mullard Co., explained that the valves were sold under six or seven British patents, the property of his clients. Each valve sold to a set manufacturer was sold in a plain carton bearing a notice that there was a restrictive licence. It was an extremely lucrative trade for small manufacturers to obtain valves for retail trade and sell them to the public at cut

WITH MULLARD AT YOUR FINGERTIPS YOU'RE CERTAIN OF YOUR SALES

prices. It was a source of considerable trouble to valve manufacturers.

The Mullard Co., had for some time past been receiving complaints from legitimate traders about cut prices.

In the present case complaint was made of the selling of valves at cut price at a shop in Coventry Street, London, W. In an affidavit it was stated that there was a notice in the window that all valves were sold at trade prices.

Mr. Phillips, for C.P. Wireless, Ltd., said that his clients ceased to carry on business about October 12, 1932, and no business had been carried on by them since that date. There was no evidence that C.P. Wireless, Ltd., was in control or management of the Pax Manufacturing Co., and he submitted that there was no ground for the granting of an injunction against them.

Mr. Justice Farwell said that the defendants, other than C.P. Wireless, Ltd., had not thought it necessary to appear. The evidence was perfectly plain, and there must be an injunction against them.

With regard to C.P. Wireless, Ltd., they had put in a defence that they were no longer in existence, but he was not satisfied about that. If they had ceased to carry on business it would not do them any harm if an injunction was granted against them.

Regentone's Injunction.—Mr. Justice McCardie, in the King's Bench Division, granted an injunction restraining Super Radio (Lancashire), Ltd., of Withy Grove, Manchester, from selling or advertising for sale products of Regentone, Ltd., and Regent Radio Supply Co., at less than their fixed price.

The matter came before the court as a motion for judgment in default of appearance, Super Radio having failed to answer the writ. It was stated that Super Radio had advertised Regentone eliminators at 30 per cent. below the fixed price.

Mr. Justice McCardie directed that damages should be assessed by a Master.

P.R.S. Licence for Public Performances.—According to a decision of Mr. Justice Maughan, the reproduction in public of broadcasts of copyright music is subject to the payment of a licence fee to the P.R.S. The decision affects the use of receivers by hotels, cafés, restaurants and public-houses.

The matter came up in an action brought by the Performing Right Society, Ltd., against Hammond's Bradford Brewery Co., Ltd., as proprietors or licensees of the George Hotel, Brighouse. The action was for an injunction to restrain alleged infringement of copyright.

The defendants denied infringement and pleaded that there had been no performance entitling the Performing Right Society to fees in addition to those paid by the B.B.C.

Mr. Justice Maughan, giving judgment, said it was important to remember, first, that the Copyright Act of 1911 was passed with the object of benefiting authors of all classes, whether the works were literary, dramatic or musical, and, secondly, that the subject matter with which it was dealing was of a very practical and human kind. It was really nothing more than the advantages which the works of authors derived from the senses of sight or hearing possessed by the public as a whole.

The first question to be decided was, were the defendants or their servants giving a performance when they tuned in their receiver? It was admitted that if that were a performance, it was a performance to the public.

"The fact that there is no power of selection is, I think, irrelevant to the question of whether the sound produced amounts to a performance.

"The reproduction is, in my opinion, as much a performance as the reproduction of a musical piece by gramophone.

"The copyright in these musical works has been infringed by the hotel proprietors if, without the consent of the P.R.S., the defendants have performed the works in public.

"They can't justify their act by saying the B.B.C. broadcast the musical works. That, no doubt, entitled them to listen to the works by

phones or speakers. Anyone who is not a member of the public, and was living in their house, or happened to be there, I am not speaking of the guests at a hotel, but the members of a household and people of that sort, are entitled to have the advantage of the broadcast. That is not perhaps because it is directly authorised by the owners of the copyright, but because it is not an infringement of copyright for the sounds to be transmitted to them. But the public, and, according to the authorities that includes the residents in a hotel, are in a different position.

"In my opinion, the use of the tuning apparatus and the loudspeaker for the purpose of reproducing the musical works for the benefit of these guests is an act which was not justified or authorised by the licence given to the B.B.C. and is an infringement of copyright.

"I shall make a declaration to that effect as understand there is no desire for an injunction the case being in the nature of a test case.

The Court of Appeal, consisting of the Master of the Rolls (Lord Hanworth) and Lords Justices Lawrence and Romer, later dismissed with costs an appeal arising over this action.

The Reaction Patent: Marconi Wireless Telegraph Co., Ltd., v. Philips Lamps, Ltd.—Infringement by Philips Lamps of the famous "Reaction" patent No. 13636 of 1913 issued to Mr. C. S. Franklin and controlled by the Marconi Co. was alleged in an action which commenced on June 13 last and continued until the following July 3. Mr. Justice Maughan pronounced judgment on July 28.

The patent actually expired on June 11, 1929, but damages were claimed for the unauthorised use of reaction prior to that date. The defendants maintained that the patent was invalid on several grounds, including anticipation, lack of subject matter, and ambiguity. Alternatively they pleaded that, even if the patent was valid, the circuits used by them did not fall within its scope.

Mr. Hubert Alexander Gill for the plaintiffs said that the basis of Franklin's invention was the discovery that if you had a valve circuit which was coupled back from anode to grid circuit so that it tended to generate oscillations, you could use such a circuit in a receiving apparatus to give greatly increased selectivity without oscillation.

He agreed that it was well known in 1913 that you had to use elements of low resistance if you wanted to get a sharp response, and that if you reduced the resistance to as nearly zero as possible and reduced the loss of energy, you would get the maximum of selectivity. He also agreed that the phenomena of reaction to give oscillation was known before 1913 as a scientific fact, but how far it was common knowledge he was unable to say.

Mr. Trevor Watson submitted that the discovery by Franklin of the intermediate condition between oscillation and no oscillation and his realisation of the use to which it could be put in reception to obtain greater selectivity was a "stroke of genius." He claimed that the position had never been appreciated by any earlier radio engineer, and that in reproducing the Franklin results the Philips set was an infringement of the plaintiffs' patent.

Mr. Whitehead, K.C., in his closing address for the Marconi Co., said it had been urged that this was an old patent and that the plaintiffs had not ventured to bring any action upon it until some considerable time after it had lapsed. The answer was that there had never been any occasion to do so. The patent had lived the whole of its life without anybody challenging its validity.

On the question of construction it was true that the anode circuit was described by Franklin as a tuned circuit, but he submitted this did not affect the specification as a whole. Taking the broad idea of the Franklin invention, he contended that it was incontestable that it had been used in the Philips alleged infringing set.

Mr. Moritz, opening the defence, dealt with the subject matter with which the patent was concerned, the state of the art when the patent was applied for, and the problem, if any, which arose at that date.

MULLARD THE MASTER VALVE

THE INDUSTRY AT LAW

It was important to remember that it was not until long after the expiration of the sixteen years' life of this patent that an action was based upon it. Further it had to be remembered that the triode valve upon which this invention was based came into this country practically contemporaneously with the invention.

On the question of construction of the Franklin specification, the defendants' case was that the claim was limited to a receiving set containing a triode valve and two circuits—a tuned grid circuit and a tuned anode circuit—coupled together. Mr. L. W. Meyer, chartered Patent Agent, said that he had considered the specification of the plaintiffs' patent many times and he was firmly of opinion that it had not been infringed by the manufacture of the Philips three-valve all electric set.

Sir Stafford Cripps, summing up the case for the defendants, dealt at length with the construction of the Franklin specification, which, he said, was the most critical point in the case. It was said by the plaintiffs that at the date of Franklin it was obvious that either a tuned or an untuned anode circuit could be used, but not a single book, illustration, or document had been produced to show any circuit before 1913 without a tuned anode. He denied that it was common knowledge at the date of the alleged invention that an untuned anode could be used.

This was the fundamental difference between Franklin and Philips. Franklin had limited himself to a tuned anode and the fact that Philips did not use a tuned anode to get their results was sufficient to take them out of infringement.

In delivering Judgment Mr. Justice Maugham said that the length of time which had elapsed before the bringing of the action had great disadvantages, as it was no longer easy for witnesses to speak with confidence as to what was common general knowledge and what was clear to wireless engineers in 1913, when the art was scarcely beyond its infancy.

He found as a fact with regard to the issue of common general knowledge that it was perfectly well known in 1913 that in order to get selectivity or sharp tuning it was necessary to reduce the resistance as low as possible. The matter of coupling circuits or feeding back energy for the purposes of transmission was also well known, but such knowledge had not been applied to receiving sets before Franklin's invention. The question whether the invention was confined to an apparatus in which the anode circuit was tuned was a doubtful one.

With respect to subject matter, he said there was ample invention to support the invention. Considerable thought and ingenuity were required, and it could not be maintained that it was merely the application of an old idea to a new purpose.

On these grounds he held that the patent was valid.

As to the alleged infringement, his lordship said that the valve used by the defendants possessed very different qualities to the sort valve used in 1913. The anode also differed from that of the plaintiffs' in that it was untuned. He therefore came to the conclusion that the defendants' set was not an infringement of the patent, and that the claim for infringement must be dismissed.

Costs which are estimated to exceed £30,000 were awarded as follows: One fifth to the Marconi Co., who had maintained the validity of their patent, and four-fifths to Philips Lamps, who had defeated the claim for infringement.

Hire Purchase and Sale of Goods

Set Returned after Seven Months.—George Henry Martin, trading as the Zenith Radio Co., Park Street, Gullford, claimed for goods sold and delivered to a local customer. Mr. Chas. A. Measor was for the plaintiff.

Mr. Saville Peck, for the defendants, said the defence was that the goods were on approval.

Plaintiff said that in December, 1931, he supplied a wireless set on defendant's order, and the price was £21. He installed it at defendant's premises, and had to supply certain fittings amounting to £2 5s. 5d. An account was rendered to defendant on February 2, and statements were sent in March, April and July, 1932, but payment was not made.

Replying to Mr. Peck, plaintiff said no mention was made as to payment at the time of the delivery. Hire-purchase was mentioned, but defendant did not say he would purchase that way. No H.-P. agreement was signed, although he sent one to defendant.

The only time he had the set back was for about a week in April, when adjustments were made, and it was not refused when sent back. He (plaintiff) refused to take the set back about July 15, after it had been in use by defendant for seven months.

Defendant said the set was left for him to try out over the Christmas holidays, 1931, but it went wrong some time in January, and a man was sent by plaintiff to put it right, but it frequently went wrong afterwards. On April 4 the set was removed because it was unsatisfactory. He first received an account in July.

Defendant's wife said she asked for the set to be taken away on several occasions, but each time adjustments were made and they said it would be all right.

The Judge: What steps did you take to send it back?—I never actually tried to send it back. I thought they would take the necessary steps. She added that the set was fetched away on April 4, and when it was taken back the engineer said it was a new set as the old one was wrong, and she said she would not pay the full value of an Amplion Six as the firm had gone into liquidation. She learned of the liquidation through an advertisement by Selfridge's in the "Daily Mail."

Giving judgment, his Honour said the defence set up in the affidavit was that the goods were not satisfactory, but no defence of that character had been set up in evidence. He was satisfied it was an out and out sale, but supposing the view of the defendant's was right, and it was a sale on approval, the business of a firm could not be conducted unless the disapproval was shown within a reasonable time. He could not accept the fact that the goods were returned to be retained, but that they were returned for adjustments. Judgment would be given for plaintiff for £22 5s. 5d., and costs.

H.-P. Agreements Should Be Read.—"Far too much business is done by getting ignorant people to sign documents without any attempt to point out to them their obligation," said Judge Sir T. Artemus Jones at Wrexham County Court, when a Liverpool firm sued Allen Morris, of 10, Llay Hall Avenue, Llay, for £6, representing 12 months hire of a radio set.

For the plaintiff, it was explained that when the defendant agreed to purchase the set the salesman pointed out the special 12 months' hire clause, and told the defendant that he would have to pay 12 months' hire in any case. In addition to signing the agreement, defendant also initialled the 12 months' clause. He paid the first instalment and three subsequent instalments, and then stopped payment, his reason being that the set was out of order.

The Judge remarked to the witness, that getting people to put their signatures to a hire-purchase agreement did not "carry you home" in a court of law. A signature was worthless unless it was written under such circumstances that the person knew what he was signing. Plaintiff's salesman said that he did not give the defendant a copy of the agreement at the time the order was given. The time to give the copy was before the agreement was signed, so that the person could know what he had signed.

Defendant said that when he gave the order he did not know what the clauses were. He had never heard the 12 months' clause read, and denied having initialled the clause.

MULLARD MEANS BUSINESS

Some business people, said the judge, seemed to think they had only to get the signature of the other party and the terms were binding. The sooner that illusion was dispelled amongst business people the better. It would be the height of iniquity on his part, if he allowed a more or less uneducated man to be bound when he, the judge, was satisfied that the terms were not read out to him at all. Judgment was given for the defendant with costs.

H.-P.—or Sale on Credit?—The decision that a certain agreement was not an H.-P. agreement, but was a sale on credit, was made by the magistrate at North London Police Court, when Charles Ernest Clark, boot repairer, of Holloway, was charged with stealing, as bailee, a 14 guinea set entrusted to him by the Phillips Music Stores, of Marc Street, Hackney.

Clark, who had pleaded guilty, was advised to plead not guilty after the magistrate had read the agreement. Clark was later discharged.

The evidence was that Clark obtained the set in December, 1931, paying a deposit of 26s., and sold it the following March for £5. Following this he made a further payment of £1.

Mr. James Penny, managing director of the firm, said the H.-P. price was £16. Interest amounted to 26s., and the cost price was £10 5s., giving £3 13s. profit. Under Clause 5 of the H.-P. agreement the hirer had to pay £3 10s. in any event, whether he returned the set within three months or not.

In giving his decision, Mr. Claude Mullins said the case was of considerable importance to trade and public alike. Dealing with the Clause 5, he added it meant that if the customer returned the set within three months he had to pay £3 10s. "by way of compensation for depreciation of the said article." He had to decide whether this clause transformed the agreement into a sale on credit.

The cost value to the firm was £10 5s., and the effect of the agreement was that they were guaranteed, either by getting the set back with payments, or by getting their full payments, their minimum sum. If it was returned within three months they had 26s. down, possibly two monthly instalments of £1, a further sum which brought the total up to £8 10s., and a second-hand set which must be worth over £2.

He must hold that the agreement was not an H.-P. agreement, but a sale on credit, and that therefore Clark had committed no crime in transferring the set to someone else. It was a dishonest thing to do, and Clark was still liable in a Civil Court for the balance of the sum under the agreement.

"I quite agree that the point is difficult," he added. "So far as I can see the effect of this clause on the Criminal Law has never been taken to the High Courts. Frankly, the matter is in doubt, but the only safe rule for a magistrate is to give the benefit of the doubt to the accused."

An appeal in this case was heard in the King's Bench Divisional Court before Lord Hewart and Justices Roche and Talbot.

It was explained by Mr. A. A. Periera (for the appellants) that Clark signed a hire-purchase agreement for a Pye set and made an initial payment of £1 6s. Later he paid another £1. It was then discovered that he had sold the set for £5.

He was prosecuted for larceny as a bailee and pleaded "guilty," but, upon the suggestion of the magistrate, he withdrew that plea. Then the magistrate considered the agreement, and held that the ownership of the set passed to the person purchasing it and no crime had been committed.

Their lordships held that there was nothing in the agreement which passed the ownership of the set away from Phillips Music Stores, Ltd., and they ordered that the magistrate should hear and determine the case having regard to the terms and intentions of the parties as expressed in the contract.

The defendant was accordingly brought before the North London Police Court, and admitted that he had stolen the set. In recording a conviction the magistrate said that in the peculiar circum-

stances he would bind the offender over to come up for judgment if called upon in 12 months.

Miscellaneous Actions

Ex-Employee as Competitor.—An appeal by Mr. R. G. Lawes, wireless engineer, against a verdict by the Exeter County Court Judge in favour of Mr. J. B. Braid, chemist and wireless dealer, of The Parade, Exmouth, was heard before Justices Acton and Talbot in the King's Bench Division.

Mr. Braid had successfully applied for an injunction restraining Mr. Lawes from carrying on a wireless business within six miles of Mr. Braid's premises, and had been awarded £100 liquidated damages.

The principal questions in the appeal were whether a covenant in a service agreement between appellant and Mr. Braid was in restraint of trade, and whether the £100 was not really in the nature of a penalty.

Mr. Wright, counsel for the appellant, said by a covenant in a service agreement, Mr. Lawes agreed that he would not "at any time hereafter carry on the business of wireless engineer at Exmouth or within six miles thereof." There was a further covenant to pay £100 as "liquidated damages and not as a penalty" for any breach without prejudice to any right to proceed for an injunction.

Later he set up in business in Exmouth, close to Mr. Braid's premises, and the proceedings resulting in the injunction followed.

In giving judgment, Judge Lindley had pointed out that Mr. Lawes's present reputation was in a great measure due to the prominence given to him in advertisements issued by Mr. Braid.

But, submitted Mr. Wright, the clause in the covenant was too wide in point of time—it was lifelong—and the injunction ought not to stand. He also contended that the only purpose of the clause was to safeguard Mr. Braid against competition by the appellant when his employment ended, and for that reason the appeal must succeed.

The Court dismissed the appeal with costs.

D.C. To A.C. Test Case.—In the King's Bench Division, Mr. Justice Goddard had before him a dispute between Mr. Bertram Lakeman, electrical engineer and contractor, of Chester, and the Chester Corporation, arising out of Mr. Lakeman's claim to be indemnified in respect of his battery charging apparatus, which, he said, had been rendered useless by the corporation's change-over in the electricity supply from direct to alternating current.

Judgment was given in favour of Mr. Lakeman. The matter came before the court on a special case stated by an arbitrator, who found that the apparatus constituted "existing apparatus" within the meaning of the consent order given by the Electricity Commissioners, to whom the corporation had to apply for permission to effect the change-over.

The arbitrator also found that the alteration in the supply system had rendered the apparatus useless for battery charging and that a converting apparatus would be necessary to enable Mr. Lakeman to carry on battery charging with the altered system.

The consent order of the Electricity Commissioners was subject to the condition that "unless otherwise agreed, the undertakers shall, at their own expense, carry out the necessary alterations to consumers' existing apparatus to suit the altered system . . . or pay to the consumer injuriously affected by the alteration of the system such a sum as may be agreed upon or in default of agreement as may be determined by an arbitrator."

Mr. J. H. Thorpe, for the corporation, said the question before the court was whether the corporation were liable to pay Mr. Lakeman £2 as the scrap value of his obsolete apparatus, or, as Mr. Lakeman contended, £41 17s. 4d., for new plant suited to the altered system. His lordship upheld the arbitrator's award of £41 17s. 4d. in Mr. Lakeman's favour.

MULLARD THE MASTER VALVE

NEW COMPANIES REGISTERED

The new companies listed here are those connected with the Radio Industry registered with a capital of £2,000 or over during the past year.

Anderson, Angell & Co., Ltd.—Private co. Capital, £6,000. To adopt an agreement with H. A. Angell, and to carry on the business of radio engineers, etc. Directors: Henry B. Angell and Charles C. Vacher. Solicitors: Gilbert, Clarke & Gilbert, 14, Queen Victoria Street, E.C. Registered office: 12, Paul Street, E.C.2.

Athco, Ltd.—Private co. Capital £3,000. To acquire the business of tool and radio products manufacturers, carried on by J. H. Payne, A. T. Harrison and G. H. Valentine at Kintore Works, Bermondsey, London, S.E.1, as A. T. Harrison & Co. Directors: J. H. Payne, Albert T. Harrison and George H. Valentine. Registered office: Kintore Works, Grange Road, Bermondsey, London, S.E.1.

Athlone Radio Publicity, Ltd.—Private co. Registered in Dublin. Capital £3,000. Suppliers of news and publicity and advertising services to the proprietors of newspapers, magazines, news distributing organisations and broadcasting stations all over the world. Subscribers: W. J. Herman, E. W. MacAlpine and F. L. McIlraith.

Bargoed, Ltd., R. C. E.—Private co. Capital: £7,500. To establish relay services and to adopt an agreement with W. T. Davies. Subscribers: W. T. Davies and T. Thomas. Registered office: 53, Cardiff Road, Bargoed, Glam.

Bathes, Ltd.—Private co. Capital, £4,000. To acquire the business now carried on at 24, Fleet Street, Torquay, and elsewhere by Wilfred H. Bathe, and to carry on the business of makers of and dealers in wireless apparatus, etc. Directors: William H. Bathe and Mrs. Lattie Bathe. Solicitors: Almy and Thomas, Bank Chambers, Torquay. Registered office: 23-4, Fleet Street, Torquay.

Batterylife, Ltd.—Private co. Capital, £5,000. To acquire the business of dealers in "accu-light", heretofore carried on by Harry Goodman, Simon B. Goorney and Max Waldenberg, at Sheffield, and to carry on the business of manufacturers of and dealers in "accu-light," acids and containers, electrical accumulators, etc. Directors: H. Goodman, S. B. Goorney and M. Waldenberg.

Bauer, Ltd.—Private co. Capital, £5,000. Manufacturers of and dealers in gramophones and other sound-reproducing instruments. Subscribers: Edna M. Stacey and F. C. Winter. Solicitors: Buckeridge & Braune, 3-4, Clement's Inn, W.C.2.

Bedford Battery Co., Ltd.—Private co. Capital, £2,000. Manufacturers and repairers of and dealers in electrical accumulators and batteries. Directors: G. Ayres and V. E. Ayres. Registered office: National Provincial Bank Chambers 17, St. Paul's Square, Bedford.

Birmingham Sound Reproducers, Ltd.—Private co. Capital £2,500. To acquire the business of electrical reproducers carried on by Birmingham Sound Reproducers at Claremont Works Old Hill, Staffs, to adopt an agreement with D. McDonald, and to carry on the business of manufacturers of gramophones, electrical reproductions and wireless apparatus, etc. Directors: D. McDonald and W. H. Lovell. Solicitors: Thomas Cooksey & Co., Old Hill. Registered office: Claremont Street, Old Hill, Staffs.

Birtles, Ltd., C. C.—Private co. Capital £3,500. To acquire the business carried on by C. O. Birtles at West Street and elsewhere in Sheffield. Directors: C. O. Birtles and F. Bramhall. Solicitor: R. B. Grayson, Sheffield.

Black, Ltd., Alexander.—Private co. Capital £3,000. To acquire the business of a wireless consultant and designer, manufacturer, seller, repairer and hirer to the public of electrical

apparatus and sound amplifiers now carried on by Keith A. B. Gilfillan, at 55, Ebury Street, London, S.W., as "Alexander Black." Directors: Keith A. B. Gilfillan and Mrs. Ann M. Gilfillan. Registered office: 55, Ebury Street, London, S.W.1.

Bridgman & Co., Ltd., H. C.—Private co. Capital: £2,000. To acquire the business of an electrical radio and general engineer heretofore carried on by Howard C. Bridgman at 55, Queen's Road, Clifton, Bristol. Directors: Howard C. Bridgman, Reginald A. Bridgman.

Britton, Ltd., C. E. & J. P.—Private co. Capital £5,000. Manufacturers and patentees of magnets for radio, electric meters, etc. Directors: C. E. Britton and J. P. Britton. Solicitor: G. F. Pearson, 57, Colmore Row, Birmingham. Registered office: Britannia Works, Westwood Road, Witton, Birmingham.

Brockley Radio, Ltd.—Private co. Capital £3,000. Manufacturers of and dealers in gramophones, sound reproducing machines, accumulators and wireless components, etc. Directors: W. E. Band and L. A. Mitchell. Registered office: 286, High Road, Lee, S.E.13.

Cambswell Relay Service, Ltd.—Private co. Capital £5,000. To construct and maintain broadcasting and other stations, exchanges and lines for the reception or distribution of wireless or radio signals or waves, etc. Permanent directors: S. F. Youles, W. J. Jennings, W. H. Graham and A. R. Hunt.

Charles Radio Relay Co., Ltd.—Private co. Capital £3,000. To acquire, construct, maintain or deal with wireless apparatus, and to carry on the business of wireless engineers, etc. Directors: J. C. Charles and C. D. Watkins. Registered office: 15, Castle Street, Tredgar, Mon.

City Accumulator Co., Ltd.—Private co. Capital £5,000. To adopt an agreement with G. E. Ward, and to carry on the business of manufacturers of and dealers in electrical accumulators and batteries, radio apparatus, gramophones, etc. Directors: G. E. Ward and W. H. Dunn. Registered office: 7, Angel Court, Strand, W.C.2.

Construments, Ltd.—Private co. Capital £12,000. To acquire and turn to account certain patents, the property of C. W. Hansel and to carry on the business of wireless engineers, etc. Directors: C. W. Hansel, L. Smith, and H. S. Murkett. Solicitors: Beaumont, Son & Riden, 18, Fleet Street, E.C.4. Registered office: 18, Fleet Street, E.C.4.

Cranage Radio, Ltd.—Private co. Capital £2,000. To acquire the business of a radio engineer carried on by Gordon Cranage, at Uckfield, Rotherfield, and surrounding districts, etc. Directors: Gordon Cranage, and John F. Mitchell. Registered office: 114, High Street, Uckfield, Sussex.

Dale & Co. (Chester), Ltd.—Private co. Capital £2,500. To acquire the business of a music dealer, carried on by Charlotte W. Dale, at 51, Bridge Street, Row, Chester, and to carry on the business of manufacturers of and dealers in musical instruments, gramophones, wireless, etc. Directors: Christopher R. Jackman, Mrs. Iris R. Jackman, Charlotte W. Dale and Lynda Eyes. Solicitors: Rivers and Milne, 30, Theobalds Road, W.C.1. Registered office: 51, Bridge Street Row, Chester.

Dawson & Co., Ltd., Fred.—Private co. Capital £5,000. To acquire the business carried on by Fred Dawson at 9, Mill Hill, Leeds, and to carry on the business of radio distributors and dealers, etc. Directors: F. Dawson and H. Hicks.

Devonia Finance Corporation, Ltd.—Private co. Capital £3,000. Manufacturers of and dealers

BETTER TRADE WITH THE BETTER RADIO BRIGADE

in radio, electrical and hardware goods; to finance dealers in radio or electrical and hardware goods under hire-purchase agreements; to lend money and negotiate loans, etc. First directors: F. D. Newcombe, C. Newcombe, and W. Drake. Registered office: 5, Bampfylde Street, Exeter.

Eldeco Radio, Ltd.—Private co. Capital £4,000. To acquire the business carried on by D. E. Barnett, at 62, Conduit Street, W., to manufacture and deal in gramophones, radio sets, etc. Directors: D. E. Barnett and J. R. Coats. Solicitors: Yarde & Loader, 1, Raymond Buildings, Gray's Inn, W.C. Registered office: 62, Conduit Street, W.

Electric Service Station, (Halifax) Ltd.—Private co. Capital £2,500. To acquire the business of the relay service now belonging to and carried on by Harry Wilkinson and Ronald C. Neaves at Wheatley Lane, Lee Mount, 4, Oak Lane, and 46, King Cross Street, Halifax, as the "Electric Service Station." Directors: Harry Wilkinson, Arthur Wilkinson and Ronald C. Neaves. Solicitors: Rice, Jones & Smiths, Halifax. Registered office: Barum House, Harrison Road, Halifax, Yorks.

Electrical and Radio Research, Ltd.—Private co. Capital £15,000. Manufacturers of and dealers in radio apparatus, machinery, plant, etc. Subscribers: A. Paterson and J. E. Booth. Solicitors: Cave, Darch, Crickmay & Rundle, 20, Eastcheap, E.C. Registered office: Finsbury House, Blomfield Street, E.C.

Electrical Screw, Ltd.—Private co. Capital £2,000. Screw, bolt and nut manufacturers, wireless and gramophone manufacturers, etc. Directors: Ernest Flury, Louis Fillmore. Registered office: 29a, Woodside Gardens, Bruce Grove, N.17.

Electrical Units, Ltd.—Private co. Capital £2,000. Electricians, mechanical engineers, and manufacturers of and dealers in, apparatus used in connection with the generation, distribution, supply, accumulation and employment of electricity and wireless waves, etc. Subscribers: R. A. Bullock.

Enfield Zinc Products, Ltd.—Private co. Capital £6,000. Manufacturers of and dealers in electrical batteries, storage cells, accumulators and parts thereof. Subscribers: Elizabeth Watt and David L. Pollock.

Ewing & McIntosh, Ltd.—Private co. Capital £5,000. Manufacturers, importers and exporters of and dealers in wireless and radio appliances, etc. Directors: J. Buxton and J. A. McIntosh. Registered office: 431, Sauchiehall Street, Glasgow.

Express Radio Factors, Ltd.—Private co. Capital £2,500. Manufacturers of and wholesale dealers in gramophones and sound-reproducing machines, accumulators and batteries, wireless receiving sets, etc. Directors: Rosa F. Hobday, C. H. G. Hobday and J. W. S. Hobday. Solicitor: E. Oliver, 23, Budge Row, E.C.4. Registered Office: 25, Great Eastern Street, E.C.2.

Fay Radio and Recorders (1933), Ltd.—Private co. Capital £4,000. Manufacturers of home recording machines, electrical amplifiers, pick-ups and recording heads for home recording and talking pictures, etc. Directors: Delia Fay and Percy D. Foley. Solicitors: Ashfield Rose and Co., 12, Henrietta Street, Strand, W.C.2.

S. Fell & Sons, Ltd.—Private co. Capital £2,000. To acquire the business of dealers in wireless and gramophones, now carried on by Sidney J. P. Fell, at Bridge Buildings, Wisbech, St. Peter, Cambs., as "S. Fell and Sons." Subscribers: Sidney J. P. Fell and Arthur W. Milton. Solicitors: John W. A. Ollard, Wisbech St. Peter, Cambs.

Fletcher, Geoffrey, Ltd.—Private co. Capital £2,000. Manufacturers of and dealers in gramophones, wireless sets, etc. Directors: Reginald J. C. Shipley and Herbert G. Henman. Solicitors: Bower, Cotton & Bower, Bream's Buildings, E.C.4. Registered office: 25, Denmark Street, Charing Cross Road, W.C.2.

Foulkes, Gornall & Co., Ltd.—Private co. Capital £3,000. To acquire the business of

radio dealer carried on by W. J. Jones at Welsh Bridge and Castleforegate, Shrewsbury, as Foulkes Radio, and the business of electrical engineers carried on by H. J. Gornall and J. W. Hodgkinson at 4, Chester Street, Shrewsbury, as Gornall and Co., and to acquire and undertake all or part of the assets of the vendors in connection with such businesses. First directors: W. J. Jones, J. W. Hodgkinson, H. J. Gornall and J. H. Medicott. Solicitors: Pinsent & Co., 6, Bennetts Hill, Birmingham.

France's Electric, Ltd.—Private co. Capital £2,000 in £1 shares. Electrical engineers and contractors, manufacturers of and dealers in electrical, mechanical and wireless goods, etc. Subscribers: Wm. G. France, Mrs. Jane M. France.

H. Früs (London), Ltd.—Private co. Capital £2,500. Wireless apparatus manufacturers, etc. Subscribers: Ethel Johnson, C. J. Winterson and A. F. White. Solicitors: Ernest Simmonds & Co., 163, Regent Street, W. Registered office: 9, Southampton Street, Bloomsbury Square, W.C.

G.B. Equipments, Ltd.—Private co. Capital £5,000. Manufacturers of and dealers in phonographs, gramophones, television and wireless apparatus, etc. Subscribers: H. J. White, Chas. H. Brown.

General Mouldings Co., Ltd.—Private co. Capital £10,100. Moulders in plastic and synthetic resin and any other substance or material, etc. Directors: James W. Barber (chairman), Arthur Cunningham, David Blairman and Rene Henri Klein. Solicitors: Blundell Baker & Co., 16, Serjeant's Inn, London, E.C.4.

Goodman & Kelway, Ltd.—Private co. Capital £2,300. Wireless and electrical engineers, manufacturers and suppliers of electricity. Directors: W. I. S. Kelway and K. I. Goodman. Solicitors: Dunn & Baker, Castle House, Exeter.

Great Yarmouth Radio Relays, Ltd.—Private co. Capital £6,000. Distributors of wireless broadcast programmes and to let out on hire radio relay equipment and appliances, etc. Permanent directors: F. C. Bowers, Charles Carr, John F. Egerton, Thos. F. W. Lincoln, Cecil E. Thrower and Noel E. Wolsey. Secretary: C. E. Thrower, 7, Trafalgar Road, Great Yarmouth.

Greson Boreham, Ltd.—Private co. Capital £2,500. Wireless accessory and instrument manufacturers, etc. Directors: A. Bland-Greson and Madeline G. Boreham. Solicitors: Loxdales, 93, Gloucester Road, South Kensington, S.W.7. Registered office: 9-11, Marban Place, Marban Road, W.9.

H. & K. Radio Services, Ltd.—Private co. Capital £2,000. Radio engineers and general wireless specialists, etc. Subscribers: V. H. Holding and W. W. Fay. Registered office: 4, The Parade, Kilburn, N.W.6.

A. Hamer & Son, Ltd.—Private co. Capital £2,000. To acquire the business carried on by R. A. J. Hamer at 57, St. Paul's Churchyard, London, E.C., as A. Hamer & Son, and to carry on the business of manufacturers of and dealers in radio accessories and apparatus, etc. Directors: J. A. Hamer and J. Clancy.

Hancock & Lant, Ltd.—Private co. Capital £2,000. Manufacturers and repairers of and dealers in wireless, etc. Directors: Stanley Hancock and Alfred Lant. Solicitors: Arnold Brittain, 12, Norfolk Row, Sheffield.

Hants Relay, Ltd.—Private co. Capital £9,000. To adopt an agreement with E. Wyatt to establish wireless stations, to relay wireless or radio signals and broadcast programmes, etc. Directors: E. A. Wyatt and L. F. Glanville. Registered office: 10, Queen's Road, Buckland, Portsmouth.

Harris, Herbert, Ltd.—Private co. Capital £4,000. Manufacturers of and dealers in wireless sets and accessories, etc. Directors: H. Harris, Mrs. S. Harris, and H. Black. Solicitor: M. Borg, 9, Cecil Square, Margate.

Hart, Lionel, Ltd.—Private co. Capital £3,000. Manufacturers of and dealers in accumulators, and batteries, wireless sets, aeriads and cabinets, etc. Directors: H. L. Hart and A. Finburgh.

MULLARD THE MASTER VALVE

NEW COMPANIES

Registered office: 47, Sparkenhoe Street, Leicester.

Harvey-Thompson Accumulator Service, Ltd.—Private co. Capital £2,000. To acquire the business carried on by C. H. J. Harvey and A. A. Thompson, at 246, Coldharbour Lane, Brixton, S. W. 9. Directors: C. H. J. Harvey, A. A. Thompson, W. A. Harding and W. G. Wakefield. Solicitors: James and Charles Dodd, 77, High Street, Lewisham, S.E. Registered office: 246, Coldharbour Lane, Brixton, S.W.9.

Hawley Products, Ltd.—Private co. Capital £10,000. Manufacturers of and dealers in materials, apparatus and appliances for use in connection with the transmission or reproduction of sounds, signals, etc. Subscribers: J. F. Warre-Rathstone and S. F. A. Clarke. First directors: A. H. J. Bull, H. J. Madge and G. J. Corrigan. Registered office: 85, Gracechurch Street, London, E.C.3.

Hazelpat, Ltd.—Private co. Capital £3,000. Manufacturers of and wholesale and retail dealers in wireless transmitting and receiving sets, accessories and installations, gramophones, etc. Directors: H. W. McAteer (director of Philco Radio and Television Corporation of Great Britain, Ltd.), G. Campbell (chairman of Majestic Electric Co., Ltd.), and J. R. Binns, of New York, U.S.A., (director of Hazeltine Corporation of America). Solicitors: Faithfull, Owen & Fraser, St. Michael's Alley, Cornhill, E.C. Registered office: Jamaica Buildings, St. Michael's Alley, Cornhill, E.C.

Heywood, Hill & Co., Ltd.—Private co. Capital £5,000. Manufacturers of and dealers in radio fittings, etc. Directors: Cyril E. Hill and Charles Heywood. Solicitors: Springthorpe, Holcroft & Bishop, 75 and 77, Colmore Row, Birmingham.

Holmes & Cooper (Horsham), Ltd.—Private co. Capital £2,000. To acquire the business of electrical engineers carried on by Wm. R. Holmes and Robert B. Swain at Horsham, Sussex, and to carry on the business of wireless engineers, etc. Directors: William R. Holmes and Robert B. Swain. Solicitors: Eager & Sons, 2, North Street, Horsham. Registered office: 50, East Street, Horsham.

Home Wireless Service (Brighouse), Ltd.—Private co. Capital £2,000. To acquire the radio relay service business carried on by G. A. Stillingfleet and H. Harper at 29, Church Lane, Brighouse. Directors: George A. Stillingfleet and Harold Harper. Solicitors: Barber & Jessop, 23, Church Lane, Brighouse.

International Broadcasting Co. (Ireland), Ltd.—Capital £10,000. Wireless telegraph, telephonic engineers, etc. Subscribers: P. B. Tierney and Eileen Perry.

International Resistance Co., Ltd.—Private co. Capital £2,500. Manufacturers and repairers of and dealers in resistors and resistance material. Subscribers: H. Pender and E. Gearing. Solicitors: Simons, 34, Great St. Helens, E.C.

Irish Electrical Co., Ltd.—Private co. Capital £10,000. Manufacturers of and wholesale and retail dealers in wireless transmitting and receiving sets, etc. Subscribers: Miss Catherine McKenna and Edward A. Harrison. Directors: William J. Dwyer, John W. Tate and Ursula H. Stanley.

Jackson Bros. (London), Ltd.—Private co. Capital £10,000. Manufacturers of wireless apparatus, etc. Directors: L. E. Fillmore, L. W. C. Fillmore, and W. L. Fillmore. Registered office: 72, St. Thomas's Street, S.E.1.

Jewel Battery Co., Ltd.—Private co. Capital £5,000. Electrical engineers, manufacturers of and dealers in accumulators and batteries and their parts and elements, etc. Directors: C. Dunkley, T. L. Bullock, and A. Eyre. Registered office: Room 5, 7, Lincoln's Inn Fields, W.C.2.

R. J. Jones & Sons, Ltd.—Private co. Capital £2,000. Wireless engineers, etc. Permanent directors: Robert J. Jones, senr., R. J. Jones, junr., John H. Jones, and Clifford H. Jones.

Registered office: East End Garage, Pontardawe Road, Clydach, Swansea, Glam.

K.L.M. Radio Relays, Ltd.—Private co. Capital £24,000. To adopt an agreement with K.L.M. Radio Relays, Ltd. (incorporated in 1931), and Wm. Smith, the liquidator thereof, to establish, maintain and develop a service for the relaying of wireless radio and television entertainment programmes and news, etc. Subscribers: Frank Medlicott and John J. Medlicott. Solicitors: J. D. Langton & Passmore, 16, Tokenhouse Yard, E.C.

Lindley Thompson Transformer & Service Co., Ltd.—Private co. Capital £6,000. To specialise in the designing and manufacture of static and other transformers, to deal in electric generators, dynamo and magnetic machines, etc. Directors: John L. Thompson and Mrs. Frances A. Thompson.

Loyds (Northern Counties), Ltd.—Private co. Capital £10,000. To acquire the businesses carried on by L. Moss at 10, Albion Place, Leeds, and elsewhere, as "Loyds," at 340, Hesse Road, Hull; and elsewhere as "L. Moss"; and at Groat Market, Newcastle-on-Tyne, as "Randolph"; and to carry on the business of manufacturers of and dealers in radio and wireless telegraphy instruments, gramophones, records, etc. Directors: Louis Moss and Mrs. Lillian Moss. Solicitor: J. B. Clarke, 7, East Parade, Leeds. Registered office: Lloyds Bank Chambers, Vicar Lane, Leeds.

Luxram Lamp Works, Ltd.—Private co. Capital £5,000. Manufacturers of accessories and sundries for wireless, etc. Subscribers: J. Waimann and F. Gay. Registered office: No. 1 Building, Angel Road Factory Colony, Angel Road, Upper Edmonton, N.18.

Mackett & Kelk, Ltd.—Private co. Capital £2,000. Manufacturers, wholesalers and retailers of all-mains radio accumulator parts and accessories, wireless apparatus, etc. Directors: Charles K. Kelk, Harold F. A. Kinder, and William H. Mackett. Registered office: 44, Upper Richmond Road, East Sheen, S.W.14.

Mantelcraft, Ltd.—Private co. Capital £4,000. To acquire the business of wood mantel manufacturers heretofore carried on by O. Ruhl (1922), Ltd., at 70, Leather Lane, London, E.C., and elsewhere, and to carry on the business of cabinet makers, manufacturers of and dealers in gramophones and records, wireless and radio instruments, etc. Directors: J. Dight and E. O. Summerfield. Registered office: 70, Leather Lane, London, E.C.

Marlborough Radio Co., Ltd.—Private co. Capital £2,500. Manufacturers of and dealers in wireless receiving, transmitting and television apparatus, etc. Subscribers: E. Pickup and J. C. Radcliffe.

Mavox Radio, Ltd.—Private co. Capital £2,000. Manufacturers of and dealers in wireless and television apparatus, electrical fittings, appliances and accessories, etc. Directors: Harold C. Pitt, James E. Underhay.

E. H. Maxwell & Sons, Ltd.—Private co. Capital £2,000. To adopt an agreement with E. H. Maxwell, and to carry on the business of dealers in gramophones, wireless and other reproductive instruments, etc. Directors: E. H. Maxwell, G. E. Maxwell and A. S. Maxwell. Solicitors: Henry Boustred & Sons, 70, Basinghall Street, E.C.2. Registered office: Mendelssohn House, Station Road, Woking.

Mead Electric Co., Ltd.—Private co. Capital £2,000. Dealers in electrical and radio engineering supplies, etc. Directors: Albert G. Mead, William Fletcher and George F. Perry. Registered office: 10, The Broadway, Ealing, London, W.5.

Merthyr Radio Central Exchange, Ltd.—Private co. Capital £10,000. To establish, maintain, develop and control services for the relaying of wireless and radio programmes, and to adopt an agreement with W. B. Morgan relating to the obtaining of necessary licences in connection therewith. Subscribers: W. R. Morgan and D. A. Davies. Solicitors: Routh, Stacey & Castle, 14, Southampton Street, Bloomsbury, W.C.1. Registered office: 91, High Street, Merthyr Tydfil.

EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER

Midland Electric Radio, Ltd.—Private co. Capital £2,000. To acquire the business of wireless and general electrical engineers, suppliers of and dealers in wireless sets, radio-gramophones, gramophones, records, etc., now carried on at 84, High Street, Stourbridge, and to adopt an agreement with S. C. Whitehouse and J. Whitehouse. Directors: J. Whitehouse and S. C. Whitehouse. Solicitor: Alfred E. Thomas, 198, Wolverhampton Street, Dudley.

Millns & Co., Ltd.—Private co. Capital £7,000. To acquire the business of wireless and gramophone dealers, etc., carried on by James and John W. Millns at Doncaster. Directors: James Millns, Mrs. Florence Millns, John W. Millns, Mrs. Florence May Millns, John S. Millns, and John W. Millns, junr.

Mishon & Co., Ltd.—Private co. Capital £2,000. Manufacturers of and dealers in gramophones, records, wireless sets, electrical appliances, etc. Directors: Emanuel P. Mishon (permanent managing director), Mrs. Annie D. Mishon, Maurice Solomon, and Harold Peres. Registered office: 285, Deansgate, Manchester.

F. D. Newcombe & Co., Ltd.—Private co. Capital £25,000. To acquire the business carried on by F. D. Newcombe & Co., at 25, Catherine Street, and 5 & 6, Bamfylde Street, Exeter, and to carry on the business of dealers in radio, television, wireless and telegraphy apparatus, appliances and accessories, etc. First directors: F. D. Newcombe, C. Newcombe and W. Drake. Registered office: 25, Catherine Street, Exeter.

Newmode Electric Appliances, Ltd.—Private co. Capital £5,000. Manufacturers of and dealers in wireless apparatus, etc. Subscribers: Charles Collins and Robert Churchman. Solicitor: A. R. Monks, Crown House, Aldwych, W.C.

Notts. & Derby Radio Relays, Ltd.—Private co. Capital £5,000. To construct and maintain wireless signal and receiving stations, to receive and relay signals and broadcast programmes, etc. Directors: F. Moss and L. R. Moss. Registered office: Halford Chambers, Market Place, Mansfield.

Pantheon Radio, Ltd.—Private co. Capital £2,000. To adopt an agreement with H. Panagakis for the purchase of his business and trade marks, and to carry on the business of wireless distributors, manufacturers of all kinds of wireless and electrical equipment, including television. Directors: H. Panagakis and R. G. Kitchen. Solicitor: F. H. Henri, 2, Bixteth Street, Liverpool. Registered office: 91, Dale Street, Liverpool.

Philco Southern Distributors.—Private co. Capital £2,000. Wholesale dealers in wireless goods, apparatus, sets and accessories. Directors: J. J. Baker and E. S. Baker. Solicitors: Smith, Rundell, Dods & Bockett, 9, John Street, Adelphi, W.C.2. Registered office: Eldon Street House, Eldon Street, E.C.2.

Preston Radio & Electrical Supply Co., Ltd.—Private co. Capital £5,000. To acquire the business of a radio and electrical appliance dealer carried on by Wm. Sugden at 29, Church Street, Accrington. Permanent directors: Wm. Sugden, Geo. A. Mitchell, and Walter Wilson. Registered office: 19, Winckley Square, Preston.

R. B. Pullin & Co., Ltd.—Private co. Capital £5,000. Manufacturers of wireless instruments, etc. Subscribers: R. B. Pullin and Hilda V. Hillary. Solicitors: Bevan & Rodwell, 329, High Holborn, W.C.1.

Rex Radio Corporation, Ltd.—Private co. Capital £2,200. Manufacturers of and dealers in all kinds of apparatus for the recording and reproduction of sound or light, radio and wireless sets, gramophones, etc. Directors: D. M. Gilbert and C. Fonteyn. Solicitors: Warren, Murton, Miller & Foster, 45, Bloomsbury Square, W.C.1. Registered office: 34, London Wall, E.C.

Rhondada Radio Central Exchange, Ltd.—Private co. Capital £10,000. To acquire the business of relaying wireless and radio programmes to subscribers in and about Rhondada carried on by Christmas E. Hughes. Subscribers: C. E. Hughes and D. G. Bell. Registered office: Aubrey Road, Penygraig, Rhondada, Glam.

Graeme E. Robson, Ltd.—Private co. Capital £2,000. To acquire the business of radio consultants, wireless service engineers, manufacturers of precision test meters, etc., carried on by G. E. Robson, A. F. Knight, and R. F. Knight, at 44, Norwood Road, S.E., as "Graeme E. Robson." Life directors: G. E. Robson, R. F. Knight, and A. F. Knight. Registered office: 44, Norwood Road, S.E.24.

B. Rose & Co., Ltd.—Private co. Capital £5,000. Manufacturers of and dealers in wireless and radio sets and accessories, gramophones, etc. Subscribers: A. D. Lumsden and M. S. Brough. First directors: B. Rose (managing director and chairman) and A. Mackenzie. Registered office: 12, Purdon Street, Glasgow, W.1.

Rotax, Ltd.—Private co. Capital £10,000. Manufacturers of and dealers in electrical and other equipment and accessories for motor vehicles, stationary engines, omnibuses and road and railway motor coaches, wireless apparatus, etc. Subscribers: P. F. B. Bennett and A. Harris. Solicitors: Evershed & Tomkinson, 25, Temple Row, Birmingham. Registered office: Well Street, Birmingham.

Scarborough Relay Services, Ltd.—Private co. Capital £6,000. Electrical, radio and general engineers, relayers of wireless entertainments and programmes, etc. Permanent directors: H. A. Close and S. Flowitt. Registered office: 28, Falsgrave Road, Scarborough.

Scientific Supply Stores (Wireless), Ltd.—Private co. Capital £2,000. To acquire the business of designer, manufacturer, repairer of and dealer (wholesale and retail) in wireless and acoustic apparatus, gramophones, radio gramophones, etc., carried on by W. H. Allen, at 126, Newington Causeway, S.E. Directors: W. H. Allen and J. R. Seabrook. Solicitors: Hicklin, Washington, and Pasmore, 1, Trinity Square, Southwark, S.E.1. Registered office: 126, Newington Causeway, S.E.

Segmental Wire Corporation, Ltd.—Private co. Capital £2,000. To acquire from Alec Avis, the benefit of an invention for improvements in the construction of metal ropes and conductors for electricity, and to carry on the business of manufacturers of and dealers in metal ropes, wire and cables, insulating materials, etc. Directors: A. D. Pennant, Alec Avis and Jesse Brown. Solicitors: Taylor & Taylor, 70, Old Broad Street, E.C.2. Registered office: Africa House, Kingsway, W.C.2.

Sellers of Leeds, Ltd.—Private co. Capital £12,000. To acquire the business of a wireless dealer, radio engineer and electrician carried on by H. W. Sellers at Standard Buildings, City Square, Leeds. Directors: H. W. Sellers, and Mrs. E. M. Sellers. Solicitors: Stephenson & Moxon, 39, Albion Street, Leeds.

A. H. Silcocks & Son, Ltd.—Private co. Capital £3,000. To acquire the business now carried on as "A. H. Silcocks & Son," and to carry on the business of wholesale and retail dealers in wireless, gramophones, gramophone records, etc. Directors: Alfred H. Silcocks, Eric H. Silcocks and Frank H. Hardingham. Solicitors: Ball & Redfern, 10, Gray's Inn Place, W.C.1. Registered office: 56, High Street, Romford, Essex.

Sloane Investments, Ltd.—Private co. Capital £10,000. Capitalists, financiers, manufacturers and importers of, agents for and dealers in gramophones, phonographs, records, electrical wireless and television apparatus and accessories, etc. Subscribers: G. Schedwin and Mary A. Bond. Registered office: Maxwell House, Arundel Street, Strand, London, W.C.2.

Smarts (Middlesbrough), Ltd.—Private co. Capital £2,000. To acquire the business of a wireless and gramophone dealer, now carried on by Jacob Bharier at 100 and 102, Newport Road, Middlesbrough, and 28, Dovecot Street, Stockton-on-Tees, as "The Smart Cycle Co." Directors: Louis Bharier and Jacob Bharier and Marks Bharier.

F. W. Smurthwaite, Ltd.—Private co. Capital £2,000. To acquire the business carried on by F. W. F. Smurthwaite at Harmony Works, Ross Parade, Wallington, Surrey. Directors: F. W. F.

MULLARD THE MASTER VALVE

NEW COMPANIES

Smurthwaite and Alice M. Smurthwaite. Solicitors: Henry Gover and Son, Grosvenor Chambers, Wallington, Surrey. Registered office: Harmony Works, Ross Parade, Wallington, Surrey.

Sound and Cinema Equipment, Ltd.—Private co. Capital £12,000. To acquire the business and all or any of the assets and liabilities of Sound Equipment, Ltd., and to carry on the business of manufacturers of and dealers in gramophones, phonographs, phonographic records, wireless apparatus, etc. Directors: Oscar Deutsch, Chas. Collins, Jas. Metcalfe, Walter J. Boddy and Gordon M. Campbell. Solicitors: A. R. Monks, Crown House, Aldwych, W.C.2.

Stains, Ltd., Gerald.—Private co. Capital £5,000. Wholesalers, retailers and importers, exporters and manufacturers of and dealers in wireless accessories, etc. Directors: Gerald C. Stains and Mrs. Myrel E. Stains. Solicitors: G. B. Howard and Macarthur, 12, Gray's Inn Square, W.C.1. Registered office: 12 and 14, Underwood Street, Shoreditch, E.

F. W. Straw (Radio), Ltd.—Private co. Capital £4,000. To acquire the business of a radio merchant and repairer, now carried on by Fdk. W. Straw at Radio Corner, St. John's Street, Colchester, as "F. W. Straw." Directors: Fdk. W. Straw and Leonard V. G. Barrow. Solicitors: Page and Ward, Colchester.

Switchit Service, Ltd.—Private co. Capital £3,000. To carry on the business of relaying and general redistribution of wireless broadcast programmes of all kinds, etc. Directors: W. J. Garrett, D. G. Jones and R. M. Ponder. Registered office: 75/7, Church Road, Hove, Sussex.

B. and B. Tate, Ltd.—Private co. Capital £2,000. Electrical mechanical, domestic and radio engineers and contractors, and sellers of all articles pertaining thereto, etc. Directors: C. L. Bunt, Mary J. Bunt, S. M. Benn and Elinor Benn. Registered office: 31, Bond Street, Ealing, London, W.

Telegraph Condenser Co., Ltd.—Public co. Nominal capital £280,000. To acquire the business now carried on by the Telegraph Condenser Co., Ltd., to adopt an agreement with the said old company and its liquidator, and to carry on the business of manufacturers of and dealers in all apparatus for use in connection with the generation, distribution supply, accumulation or employment of electricity, electricians and mechanical engineers, etc. Directors: Rt. Hon. Lord Ebbisham, Edwin H. F. Reeves, Sidney G. Brown, Mrs. Alice S. G. Brown and Wm. J. Cole. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, London, E.C.

Tungwire, Ltd.—Private co. Capital £6,000. Manufacturers of and dealers in tungsten, molybdenum, tantalum, wireless apparatus, rough and fine wire drawers, etc. Directors: J. Ismay and W. L. T. Arkwright.

Universal Wireless Relay, Ltd.—Private co. Capital £12,000. Manufacturers, erectors, installers, maintainers and repairers of wireless apparatus, valves, instruments, equipment and accessories, etc. Directors: S. Martineau, Lt.-Col. E. H. R. Thackwell, R. N. Martineau, and Lt.-Col. A. F. H. S. Simpson, C.M.G. Registered office: 3, Polebrook House, Golden Square, W.1.

Vernon Gash (1932), Ltd.—Private co. Capital £2,000. Manufacturers of and dealers in wireless apparatus, etc. Directors: G. E. Wedge, J. D. Longley, A. W. Cooper and H. V. Gash. Solicitor: A. E. Messer, 7, Park Square, Leeds.

Wackett Bros. (Radio and Cycles), Ltd.—Private co. Capital £2,500. To acquire the business of a radio dealer carried on by Geo. W. Betts as Wackett Brothers at Chatham and Sheerness, and to carry on the business of manufacturers of and dealers in gramophones and sound-reproducing machines, etc. Directors: Geo. W. Betts (life director and chairman), Grace Betts and Robert Wackett. Registered office: Vulcan House, 56, Ludgate Hill, London, E.C.4.

Wakefield Relay Services, Ltd.—Private co. Capital £5,000. Radio engineers, etc. Directors: H. A. Close and S. Flowitt. Solicitors: Green and Williamson, Wakefield. Registered office: The Saw Yard, Wakefield.

Wm. G. Walter (Bath), Ltd.—Private co. Capital £8,000. To acquire the business of wireless dealer carried on by W. G. Walter at 39/40, James Street West, Bath. Directors: W. G. Walter, F. C. Barnard and C. F. Blake. Registered office: 39/40, James Street West, Bath.

Warner's Electrical Trust, Ltd.—Private co. Capital £20,000. To acquire any British, Colonial and foreign patents or inventions which can be utilised or in any way adapted for use in connection with cables and wiring and wireless telephony and radio, etc. Subscribers: N. Shine and B. Gevaerts. Registered office: 20/21, Broad Street Avenue, E.C.

Warners Pianos (1933), Ltd.—Private co. Capital £2,500. To acquire the business of pianoforte, wireless, gramophone and general music dealers lately carried on by Warners Pianos, Ltd., at 6, Narborough Road, Leicester, and contracted to be sold to Fdk. W. Gardner. Directors: Fdk. W. Gardner and Ernest J. F. Tyler.

Wates Radio, Ltd.—Private co. Capital £5,000. Manufacturers of and dealers in wireless telegraphy and television apparatus and to acquire, the business carried on by Standard Battery Co. Subscribers: A. Kinge and A. T. Winfield. Solicitors: Philip Conway, Thomas and Co., 80, Rochester Row, S.W.1. Registered office: 184, Shaftesbury Avenue, W.1.

Welsh Finance Co. (1932), Ltd.—Private co. Capital £3,000. To acquire the business of hire purchase traders and financiers now carried on by E. Morgans, Elizabeth Williams, P. W. Harries and D. G. W. Griffiths at 9, Walters Road, Llanelly, as "Welsh Finance Co., 1932," and to carry on the business of sellers on the hire purchase or easy payment systems of and dealers in wireless and electrical appliances, musical instruments, etc. Directors: E. Morgans (managing director), Mrs. Elizabeth Williams, P. W. Harries, D. G. W. Griffiths and D. J. Johns.

Western Broadcast Service, Ltd.—Private co. Capital £2,000. Constructors, erectors and maintainers of wireless signal stations, etc. Director: A. G. Tonkin and J. F. Powell. Registered office: 3, Bond Street, Redruth, Cornwall.

Western Distributors, Ltd.—Private co. Capital £3,100. To adopt an agreement with Standard Telephones and Cables, Ltd., and to carry on the business of wireless distributors, etc. Directors: R. A. Wright, W. G. Frogley, and R. C. Byng. Solicitors: Hurd, Rowley & Co., 9, King Street, E.C.2. Registered office: 123, Victoria Street, Bristol.

Western Garage and Engineering Works, Ltd.—Private co. Capital £15,000. To acquire the business carried on by W. A. Trigg, E. G. Randall and C. R. Walker, at 48-56, Wolborough Street, Newton Abbot, and to carry on the business of wireless engineers, etc. Directors: W. A. Trigg, E. G. Randall and C. R. Walker.

Westradio, Ltd.—Private co. Capital £4,000. Dealers in wireless sets and apparatus, gramophones and other sound-producing and musical instruments, etc. First directors: E. M. Crease, and George E. A. Crook.

White Metals, Ltd.—Private co. Capital £30,000. To acquire that portion of the business carried on at Watford of Grosvenor Electric Batteries, Ltd., pertaining to the manufacture of zinc containers, etc. Directors: W. G. Adie, A. Kirkeback, H. C. Dunell and L. S. M. Wells. Solicitors: H. H. Wells and Sons, 17, Paternoster Row, E.C.4. Registered office: 304b, High Street, Watford.

Wildbore's (Radio), Ltd.—Private co. Capital, £3,500. To acquire the business of a wireless, gramophone and television engineer and dealer carried on by J. E. Wildbore at 68, Yorkshire Street, Oldham, as "Wildbore's." Directors: John E. Wildbore, Mrs. Nellie Wildbore, Mabel Wildbore, and Clara M. Wildbore.

MULLARD—THE VALVE OF THE PAST,
THE PRESENT, THE FUTURE

DIRECTORY SECTION.

This directory of "The Broadcaster Radio and Gramophone Trade Annual" is divided into four sections.

Most of the information contained in each of these sections has been obtained direct from the manufacturers and wholesalers concerned, but no responsibility can be assumed in respect of any possible errors, although every precaution has been taken to prevent the presentation of inaccurate information. Inaccuracies or omissions should be communicated to the Editor.

For the purpose of identification coloured paper has been used to distinguish the various sections. The four sections of the directory are :—

1. **MANUFACTURERS AND SOLE CONCESSIONNAIRES.** The names are arranged alphabetically with addresses, telephone numbers and telegraphic addresses. Yellow.—Pages 179-198
2. **WHOLESALE OF RADIO AND GRAMOPHONE APPARATUS ALPHABETICALLY ARRANGED.** All names and addresses, with telephone numbers and telegraphic addresses of radio and gramophone wholesalers are given. Pink.—Pages 199-206
3. **TRADE NAMES.** All trade names used as brands by radio and gramophone manufacturers are alphabetically arranged. No addresses are given, this information being obtained by cross reference to section (1). Details of the type of goods to which each trade name applies are given in this section. Green.—Pages 207-222
4. **PRODUCTS SUPPLIED.** This is in two sections, radio and gramophone. In each section, alphabetically arranged, are all types of radio and gramophone instruments, components and accessories. Under each heading is an alphabetical list of makers or sole concessionnaires of each particular appliance. Buff.—Radio pages, 223-257
Gramophone pages, 257-262

MANUFACTURERS' DIRECTORY

ALPHABETICAL

Makers of radio and gramophone instruments, parts and accessories with addresses and telephone numbers are listed in this section.

A

- Abbey Engineering Works, Watton, Norfolk.
Watton 2.
- Abbey Radio, 47, Victoria Street, Westminster, S.W.1. Victoria 3914. Abbicab, Sowest, London.
- Abingdon Wireless Supplies, 45, Stert Street, Abingdon, Berks. Abingdon 149.
- Academy Gramophone Co., Academy House, 96, Clerkenwell Road, E.C.1. Clerkenwell 3501-5.
- Accles and Pollock, Ltd., Oldbury, Birmingham. Broadwell 1611. Accles, Oldbury. Fairfax House, Fulwood Place, High Holborn, W.C.1. 26, Cannon Street, Manchester.
- Accumulator Makers' Association, 66, Victoria Street, S.W.1. Victoria 3286. Acmakas, Sowest, London.
- Acme Album Service (Lunn, Wright and Co.), 47-51, Featherstone Street, City Road, London E.C.1. Clerkenwell 3196.
- Acton Battery Co., Ltd., Dorland House, Regent Street, London, W.1. Whitehall 5885. Floeril Piccy London. 57, Bridgman Road, London, W.4. 229, Acton Lane, London, W.4.
- Adey Portable Radio, 99, Mortimer Street, Regent Street, London, W.1. Langham 3258.
- Adie and Co., Ltd., 2, Aldermanbury Avenue, E.C.2. Metropolitan 2474-5.
- Adolph, F., 28, Percy Street, W.1.
- Aerialite, Ltd., Aerialite House, Amber Street, Manchester, 4. Blackfriars 9104. Aerialite Manchester.
- Aerodyne Radio (Hustler, Simpson and Webb, Ltd.) Aerodyne Works, Walthamstow, London, E.17. Walthamstow 2535. Aerodyne Phone, London.
- Airelapse, Ltd., 182, Vauxhall Bridge Road, London, S.W.1. Victoria 5022.
- Aladdin Gramophone and Accessories Co., 93, Tabernacle Street, E.C.2. Clerkenwell 3852.
- Alklum Storage Batteries, Ltd., Waterside Works, Halifax. Halifax 3020.
- Allen and Co., Ltd., E., Imperial Steel Works, Sheffield 9. Attercliffe 41055. Allen, Sheffield. Artillery House, Westminster, London, S.W.1. Victoria 4528.
- Allwood, Blackband and Co., Alexander Works, Alcester.
- Alpha Coil and Component Co., Hawksley Avenue, Hillsborough, Sheffield. Sheffield 43335.
- Alpha Products, 86, Manningham Lane, Bradford. Bradford 8388.
- Altham Radio Co., 25, Mosley Street, Manchester. City 0231. Slaportco, Manchester.
- Amalgamated Manufacturers, 431, Coventry Road, Birmingham. Victoria 1662.
- American Hard Rubber Co. (Britain), Ltd., 95, Hatton Garden, E.C.1. Holb. 6037. Eboniseth, Smith, London. Hardrubber, London.
- Amplifiers Ltd., Billet Works, Billet Road, Walthamstow, E.17. Walthamstow 0618.
- Amplion (1932), Ltd., 82-4, Rosoman Street, Rosebery Avenue, London, E.C.1. Clerkenwell 5440. Nuamplion, Isling, London.
- Andrews and Co., A. E., 31, Tollington Park, Finsbury Park, N. 4. Archway 1948.
- Anglo Swiss Screw Co., Ltd., Trout Road, West Drayton, Middlesex. West Drayton 66. Accuracy, Yiewsley.
- Anglo-Swiss Electrical Co., Ltd., 15, Victoria Street, S.W.1. Victoria 2002.
- Appletons (Leeds) Ltd., Hanover Place, Leeds. Leeds 21694-5-6. 96, New Bridge Street, Newcastle-on-Tyne. Newcastle 27651. Gramophones, Newcastle.
- Arden Vulcanizer Syn., Ltd., 318, King Street, Hammersmith, W.6. Riverside 0365.
- Artic Fuse and Electrical Mfg. Co., Ltd., Birtley, Co. Durham. Birtley 61. Artic, Birtley.
- Ashford, Dunn and Co., Ltd., Ryde Avenue, Hull. Central 7577. Mantel, Hull.
- Ashley Wireless Telephone Co. (1925), Ltd., Finch Place, Falkland Street, London Road, Liverpool. North 238. Rotary, Liverpool.
- Ashton and Co. (Est. 1787), Ltd., 45, Chorlton Street, Manchester. Central 0365. Klaretun, Manchester.
- Ashton's Wireless Depot, 8-10, Bull's Head Yard, Market Place, Manchester. Blackfriars 2854.
- Atlanta Products, Ltd., Callard House, 74, Regent Street, London, W.1. Regent 2934. Heatinstal, London.
- Atlas Carbon and Battery Co., Ltd., 56, Southwark Bridge Road, S.E.1. Hop 0795. Atlas-battery, Sedist, London.
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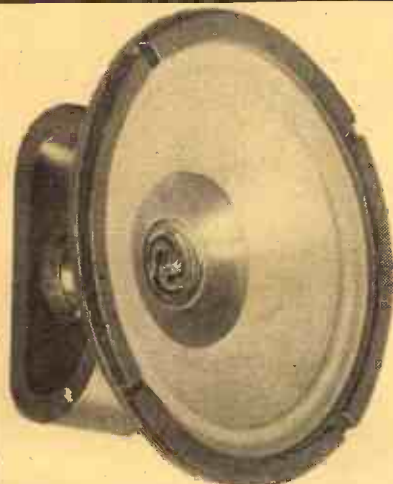
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 Markham and Co., W., East Street, Leicester. Leicester 21658.
 Marlowe and Co., C. H., Hertford Place, Queen's Road, Coventry. Coventry 2082.
 Mason and Collins, Ltd., 19, Percy Circus, King's Cross Road, London, W.C.1. Terminus 4438.
 Mattia, H. B., Down Road, Merrow, Guildford, Surrey. Guildford 387.
 Metal Agencies Co., Ltd., Queen Square, Bristol Bristol 21061. Themac, Bristol. "Russells," Colston Street, Bristol. Bristol 10040. Alma, Bristol.
 Michelson Brothers, Mark Lane Station Buildings, London, E.C.3. Royal 9056-7. Inland grams: Michemada, Fcn., London. Foreign: Michemada, London.
 Midland Auto Components, 58, Cambridge Street, Birmingham. Midland 6524 (5 lines). Replace, Birmingham. 169-171, High Road, Willesden, N.W.10. Willesden 3371/3. 1, King Street, Gloucester. Gloucester 3589.
 Midland Electrical Co., 113, Colehill Street, Birmingham. Central 1096.
 Midland Motor Factors, Ltd., 17, Higheross Street, Leicester. Leicester 5101.
 Midland Wireless Co., 32, The Broadway, Bedford. Bedford 2590.
 Moores and Co., J., Ravald Street Works, Blackfriars Road, Salford, Manchester. Blackfriars 7618.
 Morton, W. A., 71-73, Surrey Street, Sheffield. Central 25131 (2 lines). Morton, Sheffield 25131. 16, Tudor Street, Sheffield.
 Motors and Cycles (Factors), Ltd., 60-62, Regent Street, Cambridge. Cambridge 1348. Factor.
 Murdoch Trading Co., 59/61, Clerkenwell Road, London, E.C.1. Clerkenwell 6144. Putiel-Smith, London. 64, Edgbaston Street, Birmingham. 38, Charles Street, Cardiff. 79, Dunlop Street, Glasgow. 7, Bigg Market, Newcastle-on-Tyne. Woodcock Street, Castle Cary, Somerset.

N

Needham and Brother, Ltd., C. E., Change Alley and Milk Street, Sheffield. Sheffield 21011 (5 lines). Pumps, Sheffield.
 New Era Wireless and Electrical Co., Ltd., 3, Hobmoor Road, Small Heath, Birmingham. Victoria 0744.
 Newcastle General Supply Co., Ltd., 10, Leages Park Road, Newcastle-on-Tyne. Newcastle-on-Tyne 23177.
 Newcombe and Co., Ltd., F. D., 25, Catherine Street, Exeter. Exeter 4116.
 North British Engineering Equipment Co., Milburn House, Newcastle-on-Tyne. Newcastle 25252. Equipment, Newcastle-on-Tyne.
 Northern Factors, Ltd., 89, Corporation Road, Middlesbrough. Middlesbrough 4090.
 Northern Steel and Hardware Co., Ltd., 1/3, Southgate, Deansgate, Manchester. Blackfriars 3871. Assiduous, Manchester. Stores, 23, Larkhill, Blackburn. Blackburn 5833.
 Nottingham Radio Supplies, Ltd., Sherwood Buildings, Sherwood Street, Nottingham. Nottingham 44351-2.

O

O'Brien and Hulma, 78, George Street, Manchester. Central 6486/7/8. Robanco, Manchester.
 Olympia Radio, Ltd., 49A, Shudehill, Manchester. Blackfriars 9128. Olympiaphone.
 Ormrod and Co., Ltd., A., Wigan. Wigan 80.

P

Payne and Hornsby, Ltd., 7, St. Andrews Buildings, Gallowate, Newcastle-on-Tyne. Newcastle 24604. O'Connell Bridge, Dublin. Dublin 44227. 66, Camden Street, North Shields. N. Shields 743. 46, Crowtree Road, Sunderland. Sunderland 2768.
 Perseus Manufacturing Co., Perseus Street, Branton Road, Burton-on-Trent. Staffs. Burton 168. Perseus Co.
 Priestley and Ford, 3-11, Carrs Lane, Birmingham. Midland 5941. Peanef, Birmingham. 59, Friar Lane, Nottingham. Nottingham 40326. Peanef, Nottingham. 21, Bridge Street and 18, King Street West, Manchester. Blackfriars 9157. Peanef, Manchester.
 Provincial Incandescent Fittings Co., Ltd. (Pifco, Ltd.), Pifco House, 71, High Street, Manchester. City 0381 and 4044. Provencal, Manchester. 150, Charing Cross Road, London, W.C.1. Temple Bar 3720. Pifco, Westcent, London.
 Pulford Bros., Ltd., 102-104, Whitechapel, Liverpool. Royal 4940. Personal, Liverpool.

Q

Queen's Radio Supply Co., 632, Wandsworth Road, S.W.8. Macanlay 2466/7.

R

Radio Supply Co., Wood Street, Northampton. Northampton 1494. 32, Queen Street, Peterborough. Peterborough 846. 42, Waterloo Street, Swansea. Swansea 4871.
 Radio Trading Co., Service House, 309, Old Street, London, E.C.1. Clerkenwell 0255 and 3940. Tradonli, Finsquare, London.
 Radio Wholesalers' Federation, Bloomsbury Mansions, 26, Hart Street, W.C.1. Holborn 2488. Radmofax, Westcent, London.
 Rawson (Sheffield and London), Ltd., H. C., 100, London Road, Sheffield. Sheffield 26006. Hardware, Sheffield. 37-9, Clyde Place, Glasgow. C.5. South 1289. 22, St. Mary's Parsonage, Manchester. Blackfriars 4229. 177, Westgate Road, Newcastle. 1. Newcastle 23868.
 Regent Fittings Co., 120, Old Street, London, E.C.1. Clerkenwell 2923.
 Renshaw Radio Manufacturing Co., 55, Renshaw Street, Liverpool. Royal 1880.
 Richardson (R.M.L.), Ltd., 24, Park Lane, Liverpool. Bank 5443/4. Trutone, Liverpool. 24, St. John Street, Deansgate, Manchester. Blackfriars 6477-8. Trutone, Manchester.
 Riche, H. A., 20A, Queen's Arcade, Leeds. Leeds 24928.
 Riddiough and Son, F., Simes Street, Westgate, Bradford, Yorks. Bradford 8777-8. Challenger, Bradford. 31, Eastfield Road, Peterborough. Peterborough 971. 23, Park Avenue, Shelton, Stoke-on-Trent. Hanley 48131.
 Riley and Son, W., 51, Farringdon Road, E.C.1. Holborn 8180.
 Roberts, J., 1-3, Bridgwater Viaduct, Knott Mill, Manchester. Blackfriars 1837-8. 14, Wellington Road South, Stockport. Stockport 3761.
 Robertshaw and Co., Ltd., 20, Canal Road, Bradford. Bradford 4502.
 Robertson, J., 95, West Nile Street, Glasgow. Douglas 4040. Exhaust, Glasgow.
 Robinson and Son, Ltd., George, River Plate House, South Place, London, E.C.2. Metropolitan 5886-8. Ancomac, Ave, London.
 Robinson and Hands Electric Co., Ltd., 54-6, Barwick Street, Birmingham. Branches: Lincoln, Stoke and Taunton. Central 8131/3. Rewind, Birmingham.
 Rose, Morris and Co., Ltd., 57, City Road, London, E.C.1. Clerkenwell 5377.
 Ross and Adam, 68, Gordon Street, Glasgow. Central 543. Hedros, Glasgow.

EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER

Runwell Cycle Co. (Birmingham), Ltd., Lawson Street, Birmingham, 4. Aston Cross 0752.
Runwell, 16, Great Eastern Street, London, E.C.2. Bishopsgate 1320. Cyconunel, London.
Camp Street, Deansgate, Manchester. Blackfriars 8352-3. Runwell, Manchester. 48, Duke Street, Liverpool. Royal 4725. Runwell, Liverpool. 101, Temple Street, Bristol.
Bristol 21695. Runwell, Bristol. 5, Carver Street, Sheffield. Sheffield 23995. Runwell, Sheffield. Rose Lane Works, Norwich. Norwich 2042. Runwell, Norwich. 68, Bridge Street, Cardiff. Cardiff 4732. Runwell, Cardiff.
Ryley, J. A., 3/5, Newmarket Street, Birmingham. Central 4354/5. Plugs, Birmingham.
R.C. Radio Electric, Ltd., 51, Whitcomb Street, London, W.C.1. Whitehall 8877. Loudsigs. Lesquare, London.

S

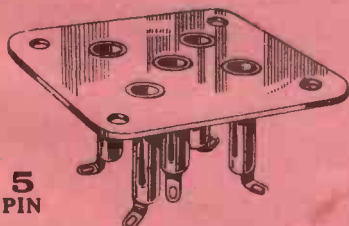
St. Mary's Motor Co., St. Mary's Road, Market Harborough. Market Harborough 6. "St. Mary's Garage," Market Harborough.
Sanger and Son, M., 31-31A, King Street, Plymouth. Plymouth 3470. 6, Whitehall, Taunton. Taunton 981.
Santon, Ltd., Newport, Mon. Newport 4840. Santon, Newport, Mon.
Seacats, Ltd., C., 128, Barton Street, Gloucester. Scott and Co., Ltd., A. C., 39, City Road, Manchester. City 9235. Cromaloy, Manchester.
Selecta Gramophones, Ltd., 81, Southwark Street, S.E.1. Hop 6671. Floradon, Boroh, London.
Sellers of Leeds, Ltd., Standard Bldgs., City Square, Leeds. Leeds 25319 and 24246. Orion. 25, Glovers Court, Preston. Preston 4433. Selradio.
Sheffield Radio and Electric Co., 39, Eyre Street, Sheffield 1. Sheffield 26121.
Shemelds, Ltd., 51-53, Berry Street, Belfast, N. Ireland. Belfast 2336.
Siemens-Schuckert (Great Britain), Ltd., 30-34, New Bridge Street, London, E.C.4. Central 8461-3. Elefos, Ltd, London.
Silcocks Bros., 50, Victoria Street, Bristol 1. Bristol 25263. Silcocks Bristol 25263.
Simpson Baker and Co., Ltd., 2/5, Nelson Street, Bristol.
Sinclair J. Corston and Co. (Newcastle), Ltd., 2, St. Nicholas Buildings, Newcastle-on-Tyne 1. Newcastle 22515-6. Rubelpac, Newcastle-on-Tyne.
Sloan Electrical Co., Ltd., 8-12, Golden Lane, E.C.1. National 2040. Slonetric, Barb. 41, Kingsway, London, W.C.2. Temple Bar 897. 16, Jackson's Row, Deansgate, Manchester. Slonetric. 79, Hanover Street, Edinburgh. Central 30041. Slonetric, 143, St. Vincent Street, Glasgow. Central 7874. 44, Victoria Street, Bristol. Bristol 23426. Gandy Street, Exeter. Exeter 4106. Slonetric.

Smethurst, Lincoln, 17, Hanover Bldgs., Southampton. Southampton 6091-2.
Smith and Cookson, 22, Paradise Street, Liverpool. Bank 3525.
Solomon and Peres, 79, Donegal Street, Belfast. Belfast 8050-1. Apparatus, Belfast.
Solway Factoring Co., 128, Queensberry Street, Dumfries. Dumfries 102. Solway.
South Wales Wireless Installation Co., Ltd., 21-22, Edward Terrace, Cardiff. Cardiff 2636-7. Electron.
Southern Factors, Ltd., Cornfield Road, Eastbourne. Eastbourne 2222. Factors, Eastbourne. 48, Victoria Street, Bristol. Bristol 22118. Factormac, Bristol. Avenue Lane, The Square, Bournemouth. Bournemouth 4737. Factors, Bournemouth.
Sterno Manufacturing Co., Ltd., 19, City Road, E.C.1. National 5886. Sternoec, Finsquare, London. Sternoec, London.
Stockall, Marples and Co., Ltd., 6-10, Clerkenwell Road, London, E.C.1. Clerkenwell 2781 (4 lines). 64, Bridge Street, Deansgate, Manchester.
Storey, F. M., 357, Hylton Road, Sunderland. Stubbs, C. P., 69a, Mansfield Road, Nottingham. Nottingham 2903. Stubbs 2903. Nottingham.
Sun Electrical Co., Ltd., 118-20, Charing Cross Road, W.C.2. Temple Bar 3500. Secabilis, Westcott, London. 45-50, Park Place, Leeds 1. Leeds 28511-2. Secabilis, Leeds. Sunco House, Carloli Square, Newcastle-on-Tyne 1. Newcastle-on-Tyne 20525. Secabilis, Newcastle-on-Tyne. 137, Victoria Street, Bristol 1. Bristol 22667. Secabilis, Bristol. Kings Road, Guernsey, C.I. Guernsey 1664.
Superlamp, Ltd., 92-94, Paul Street, London, E.C.2. Bishopsgate 4868. 24a, High Street, Charing Cross Road, W.C.2. Temple Bar 2504. 223, Hammersmith Road, London, W.6. Riverside 2254. 6, Bond Street, Ealing. Ealing 0938. 143, New Cross Road, London, S.E.14. New Cross 3677. 5, Shrubbery Road, Streatham, London, S.W. Streatham 3073. 805, High Road, Leyton, London, E. Leytonstone 2202. 62, Turnpike Lane, Hornsey, London, N. Mountview 1317. 38, Gloucester Road, Brighton. Brighton 4904. 11-3, Union Street, Maidstone. Maidstone 3033. 47, Marine Place, Worthing. Worthing 735.

T

Taylor, F., 9, Grove Road, Balham, S.W.12. Balham 1632.
Taylor, H. S., Roper Street, Whitehaven. Whitehaven 360. Taylor, Factor, Whitehaven.
Taylor and Co., J. H., Macaulay Street, Huddersfield. Huddersfield 341. Thorough, Huddersfield.
Taylor, Paul, Radio House, 24, Rockingham Road, Kettering. Kettering 476.
Taylor, Dunford and Co., Ltd., J., 12-14, Dean Street, Newcastle-on-Tyne. Newcastle 25324.

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5
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"METCRAFT" patent valve sockets, which ensure positive contact. The sockets, which are incorporated in these valve holders, have several great advantages, one being that the end of the socket is closed, making it impossible for solder to run down. Another is that the tag on end of socket is finished with a special dipping process, which makes soldering easy and permanent. Sockets can be supplied separately at 15/- per 1,000. Leading manufacturers in the Trade appreciate the advantages of the "Metcraft" valve holders and are using them as a standard component.

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WHOLESALESAERS' SECTION

Taylor. 37, Wicker, Sheffield. Sheffield 24787.
 Taytask. 6-8, Oswald Street, Glasgow, C.1.
 Central 3814. Taylorite.
 Thompson, Diamond and Butcher, 34, Farring-
 don Road, E.C.1. Clerkenwell 5492 (6 lines).
 Thomdibu, London. Factory at 78, St.
 John Street, London, E.C.1. 102, Bath Street,
 Glasgow, C.2. Douglas 1223. Thomdibu,
 Glasgow.
 Thomson and Brown Brothers, Ltd. See Brown
 Bros., Ltd.
 Tideman, C. G., 111, Renfrew Street, Glasgow,
 C.3. Douglas 3782.
 Tower Radio Supplies, 5, High Street, Shore-
 ditch, London, E.C.1. Bishopsgate 3684-5.
 Trentstreet Factors, Ltd. Trent Street, Notting-
 ham. Nottingham 43521. Springbuck.

U

Unity Lamp and Accessories, Ltd., 41, Call Lane,
 Leeds. Leeds 21375. Unilamp, Leeds. 13,
 Gothic Arcade, Snow Hill, Birmingham.
 Universal Electric Supply Co., Ltd., 4-8, Brown
 Street, Manchester. City 3409. Uniselco,
 Manchester.

W

Wall and Attwooll, 47-49, Craswell Street,
 Portsmouth. Portsmouth 2031. Wanda,
 Portsmouth.
 Watson Bros., 40, Dock Street, Newport, Mon.
 Newport 2741.
 Watson's, 10, High Bridge, Newcastle-on-Tyne.
 Newcastle-on-Tyne 25225.
 White, F. G., 36, Woodhouse Grove, Manor Park,
 London, E.12.
 Whiteford and Co., J., 5, Oswald Street, Glasgow,
 C.1.
 Whiteley, S. E., Ltd., Gartside Street, Deansgate,
 Manchester. Blackfriars 7773. Retreads, Man-
 chester. Cold Pella Road, Colwyn Bay. Colwyn
 Bay 2802.
 Whitworth Elec. Lamp Co., Ltd., 6/10, Gorleston
 Street, West Ken., London, W.14. Fulham
 4221. 1, Back of the Walls, Bernard Street,
 Southampton, Hants. Southampton 6564.
 Wholesale Radio Supplies Co., 126, High Road,
 Leyton, London, E.15. Leytonstone 1396.
 Leytonex, Leyton.
 Wilday and Sons, J., Stanley Works, Bond Street,
 Birmingham. Central 1004.
 Wildbores, 68, Yorkshire Street, Oldham, Lancs.
 Oldham Main 4939.
 Wilkes and Co., S. J. H., Station Road, Stechford,
 Birmingham. Stechford 2105.
 Wilkinson, L., 8, City Road, Finsbury Square,
 London, E.C.1. Metropolitan 7359.

Wilrose Co. (Birmingham), Ltd., Atmos House,
 47, Cornwall Street, Birmingham. Central
 3813.
 Wireless-Electric (Wholesale), Ltd., 23-24,
 North Street, Bristol 1. Bristol 24505. 79B,
 Holdenhurst Road, Bournemouth, Bourn-
 mouth 2882.
 Wolsey (Radio and Allied Trades) Wholesale,
 Ltd., 54, Lamb's Conduit Street, London, W.C.1.
 Holborn 6455.
 Wood, E. A., 100, Aston Road, Birmingham.
 Aston Cross 2595-6. 105-7, John Bright
 Street, Birmingham. Midland 4334-5. Crutches,
 Birmingham. 80, Belgrave Gate, Leicester.
 Leicester 21511. Wood, Leicester 21511. 77,
 Gallowgate, near Glasgow Cross. Glasgow
 Bell 2304.
 Wood, L. R., Bridge Street, Cork, I.F.S. Cork
 1581. 116a; St. Stephen's Green, Dublin.
 Dublin 51397.
 Wood, R. C., Pertrix House, 18-19, Hills Terrace,
 Cardiff. Cardiff 641. Wood, 641, Cardiff.
 Pertrix House, 22, Park Street, Swansea.
 Swansea 3385. Wood 3385, Swansea.
 Wood and Cairns, Ltd., Argyll House, 11,
 Queen Street, Edinburgh. Edinburgh 25237-
 8-9. Hillwood. 41, Albert Square, Dundee.
 30-32, Cadogan Street, Glasgow, C.2.
 Woodhall and Partners (1929), Ltd., Swansea.
 Swansea 2901. Equipment.
 Woolfsen, Ltd., P., 165, Trongate, Glasgow, C.1.
 Bell 3460. Clocks, Glasgow.

Y

Yerrah Electric Co. (Y.E.C.), 37, Union Street,
 London, S.E.1. Hop 6708-9.
 Young and Sons, Ltd., T. D., 127-9, Wollaton
 Street, Nottingham. Nottingham 3155.
 Young and Wildsmith, Ltd., 35, Little Russell
 Street, W.C.1. Museum 7057 (4 lines). 17,
 The Oracle, Minster Street, Reading. Read-
 ing 2072.

Z

Zelco, Ltd., 53, Farringdon Road, London,
 E.C.1. Holborn 2053.
 Z. Electric Lamp and Supplies Co., Ltd., 21,
 Newman Street, London, W.1. Museum,
 4650-1-2. Zedellam, Phone, London. 126,
 Edmund Street, Birmingham. Central 7977-8.
 62, Dingwall Road, Croydon. Fairfield 6378.
 50, Wellington Street, Glasgow. Central 3858.
 Orme Bldgs., Parsonage, Manchester. Black-
 friars 0915-6. 15, Lisle Street, Northumberland
 Street, Newcastle-on-Tyne. Newcastle 26789.
 48, Friar Lane, Nottingham. Nottingham
 42413. 47, Queen Street, Derby. Derby 1985.

TRADE NAMES DIRECTORY

Inclusion of a trade name in this section of the directory does not necessarily mean the name is registered.

A

Abbey.—Abbey Engineering Works. Steel tubular masts and aerial accessories.
Absorbos.—Stratton and Co., Ltd. Rubber cushions.
Ace.—American Hard Rubber Co. (Britain), Ltd. Insulating material.
Ace.—John E. Dallas and Sons, Ltd. Gramophone.
Ace.—Telsen Electric Co., Ltd. L.F. transformer.
Achl.—E. M. Francis, Ltd., Acid pump for accumulators.
Acme.—Acme Album Service. Record album and carrying case.
Acme.—McLeod and McLeod. Instrument wire, insulating cloth and paper.
Aconometer.—Leslie Dixon Switchgear Co. Voltmeter.
Acoustabaff.—Weedon Power Link Radio Co. Box Baffle.
Acton.—C. A. Vandervell, Ltd. Accumulator.
Adaptagram.—Peto Scott Co., Ltd. Radiogram cabinet complete to take kit sets.
Adeleo.—Nuvolion Electrics, Ltd. Transformer laminations.
Adey.—Adey Portable Radio. General trade mark.
Adleo.—Adle and Co., Ltd. Batteries, components, accessories and brass work.
Aerialite.—Aerialite, Ltd. General trade mark.
Aerialite Levenstrand.—Aerialite, Ltd. Eleven strand insulated aerial wire.
Aermonic.—Jas. Christie and Sons, Ltd. Components.
Aerodyne.—Aerodyne Radio. General trade mark.
Aeroficient.—Graham Parish, Ltd. Aerial kit.
Aga.—Aladdin Gramophone and Accessories Co. Mainsprings.
Alrmax.—J. Dyson and Co. (Wks.), Ltd. Plug-in and 6-pin coils.
Airweight.—J. H. Taylor and Co. Headphones.
Ajusta.—Danco Manufacturing Co., Ltd. Coil holder.
Akostex.—Ashton and Co. (Est. 1787), Ltd., Silk gauze.
Akrite.—Ward and Goldstone, Ltd. Aerial wire.
Akross.—Ward and Goldstone, Ltd. Circular flex and black adhesive tape.
Aladdin.—Aladdin Gramophone and Accessories Co. Sound boxes, automatic brakes, valves, portable gramophone, turntables and cabinets.
Aladdinite.—Electrocolor Products, Ltd. Record lubricant.
Alba.—A. J. Balcombe, Ltd. General trade mark.
Albany.—Carrington Mfg. Co., Ltd. Cabinet.
Albemarle.—H. B. Hicking. General trade mark.
Aldergate.—P. H. Lawrence. Receivers.
Alembic.—J. Millet. Crystal, meter, switch, headphones and speaker.
Alert.—K. E. Beswick, Ltd. Fuses.
Alhambra.—Shalless and Evans. Set.
Alkum.—Alkum Storage Batteries, Ltd., Batteries and accumulators.
Alligator.—Guillaume and Sons, Ltd. Gramophone needles.
Allscott.—James Scott and Co. Receivers and radio-gramophones.
Allwave-Beatal.—S. W. Scott and Co. Tuner.
Alpha.—Alpha Products. General trade mark.
Alpha.—Reproducers and Amplifiers, Ltd. P.M. M.C. speaker.

Altham.—Altham Radio Co. General trade mark.
Altham Copperite.—Altham Radio Co. Wire.
Always.—Abingdon Wireless Supplies. Grid leaks, anode resistances, spaghetti resistances, potential dividers.
Amaphone.—Amalgamated Manufacturers. Components and sets.
Ambassador.—Carrington Manufacturing Co., Ltd. Cabinet.
Amplion.—Amplion (1932), Ltd. General trade mark.
Amscote.—Siemens Elec. Lamps and Supplies, Ltd. Composite insulating material.
Ancalite.—Callender's Cable and Construction Co., Ltd. Electric cable.
Ankaflex.—Callender's Cable and Construction Co., Ltd. Unkinkable flexible cord.
Anodex.—S. Smith and Sons (M.A.), Ltd. Dry batteries.
Ansil.—Gresley Radio, Ltd. Components.
Antifroth.—Cowlishaw Bros. Accumulator anti-frothing solution.
Antinodal.—Radio Instruments, Ltd. Short wave adaptor.
Antistat.—Lamplugh Radio, Ltd. Aerial unit.
Antoria.—J. T. Coppock. Gramophones.
Apex.—J. Bennett Heyde and Co. Turntable discs (cork).
Apollo.—Acles and Pollock, Ltd. Steel telescopic aerial masts and tubular box spanners.
Apollo.—Baxter, Stavridi and Craies, Ltd. Playing-desks, pick-ups, and gramophones.
Ardenne.—W. Edwards and Co. Cathode ray oscillographs.
Arldwick.—Runbaken Magneto Co., Ltd. Battery chargers.
Arega Radio.—Precision Electric, Ltd. Receivers.
Aresco.—Radio Service Co. Receivers, eliminators, radio-gramophones and loudspeakers.
Argyll.—Carrington Mfg. Co., Ltd. Cabinet.
Aristocrat.—Claude Lyons, Ltd. Electric Gramophone motor (induction pattern).
Arrow.—Claude Lyons, Ltd. QMB mains switches.
Ario.—Ario Fuse and Electrical Manufacturing Co., Ltd. Valve holder and fuses.
Artiste.—Pohlmann and Son, Ltd. Gramophone record cabinets, etc.
Ashley-Ledward.—Ashley Wireless Telephone Co. (1925), Ltd. Resistance.
Ashley Radio.—Ashley Wireless Telephone Co. (1925), Ltd. Sets, amplifiers and components.
Ashton.—Ashton's Wireless Depot. General trade mark.
Aston.—Carrington Mfg. Co., Ltd. Cabinet.
Astoria.—E. P. Whetton and L. Gold. General trade mark.
Astoria.—Aladdin Gramophone and Accessories Co. Tone arms and fittings.
Astra.—Emkabe Radio Co., Ltd. Dials and condensers.
Atalanta.—Atalanta, Ltd. Tools.
Athco.—A. T. Harrison and Co. Resistors and grid leaks.
Atlas.—Atlas Carbon and Battery Co. Batteries.
Atlas.—H. Clarke and Co. (Manchester), Ltd. General trade mark.
Atlas.—O. Ruhl (1922), Ltd.—Gramophones and accessories.
Audak.—Claude Lyons, Ltd. Electromagnetic pick-ups.
Audioformer.—Telsen Elec. Co., Ltd. Intervalve transformers.
Audiola.—Amplion (1932), Ltd. Moving coil speaker.

MULLARD THE MASTER VALVE

TRADE NAMES

Audion.—Graham-Farish, Ltd. Resistance capacity unit.
Audirad.—Radio Instruments, Ltd., L.F. output choke.
Austin.—Austin, Mills and Co. General trade mark.
Auto-Bat.—Climax Radio Electric, Ltd. Mains supply units.
Auto Parafed.—Radio Instruments, Ltd. L.F. transformer.
Autocel.—Primus Manufacturing Co., Ltd. H.T. batteries.
Autoceptor.—A. W. Hambling and Co. Programme selector.
Autocrat.—Itonia, Ltd. Portable receiver.
Autokoll.—A. W. Hambling and Co. Tuner.
Automatic Tension.—J. G. Beddoes, Ltd. Automatic safety lock.
Aveco.—Willmott, Son and Phillips, Ltd. Insulating tape and fibre.
Avecolite.—Willmott, Son and Phillips, Ltd. Bakelite sheets, rods and tubes.
Avometer.—Automatic Coil Winder and Electrical Equipment Co., Ltd. Combination measuring instrument.
Avon.—Avon India Rubber Co., Ltd. Battery accessories and insulating material, acid, resisting rubber washers, etc., gasket tubing for sound boxes and sponge rubber.
Axiom.—Goodmans (Clerkenwell), Ltd. Speakers.
A.A.—Linolite, Ltd. Earth clip.
A.B.C.—Allwood Blackband and Co. Gramophone needles.
A.C.C.O.—Alpha Coil and Component Co. Components.
A.C. Co.—Alpha Coil and Component Co. Components.
A.E.F.—A.E.F. Manufacturing Co. Accumulators.
A.E.G.—A.E.G. Electric Co., Ltd. General trade mark.
A.J.D.—A. J. Dew and Co., Ltd. Products.
A.J.H.—A. J. Hewitt, Ltd. General trade mark.
A.W. 1934 Box Baffle.—Weedon Power Link Radio Co. Box baffle.

B

Bairn.—Kenwell Radio, Ltd. Receiver.
Bakelite.—Bakelite, Ltd. Insulating materials.
Bakelite Dilecto.—Diamond Fibre Co., Ltd. Panel and components.
Bakelized.—R. O. Bridger and Co. Paper cones.
Baklin.—Baker and Finemore, Ltd. Products.
Ballsoak.—Lionel Robinson and Co., Ltd. Insulators.
Bantam.—Union Radio Co., Ltd. Receivers.
Bantam.—Reproducers and Amplifiers, Ltd. Speaker.
Barrier.—Junction Engineering Co., Ltd. Aerial insulator.
Barrynola.—E. Robertshaw and Co., Ltd. Gramophones.
Barto.—J. G. Coates, Ltd. Products.
Baty.—E. J. Baty. Receivers, speakers, and mains units.
Bayliss.—W. Bayliss, Ltd. General trade mark.
Beanco.—Baxendale and Co., Ltd. Gramophones.
Bear Brand.—G. Bowerman, Ltd. H.T. batteries.
Beasal.—Beardsall and Co., Ltd. Speakers, batteries and sets.
Bentall.—S. W. Scott and Co. Tuners.
Bebe.—Sydney S. Bird and Sons, Ltd. Variable condensers.
Bebelog.—Sydney S. Bird and Sons, Ltd. Baby logarithmic condensers.
Becker.—G. Becker, Ltd. Switches.
Becon.—British Ebonite Co., Ltd. Ebonite.
Beconlate.—British Ebonite Co., Ltd. Composite material.

Beethoven.—Montague Radio Inventions and Development Co., Ltd. General trade mark.
Belco.—Nobel Chemical Finishes, Ltd. Wood finishes for cabinets.
Belgrave.—Electrical and Radio Products (1931), Ltd. Radiogram.
Bell.—J. and J. Laker Co., Ltd. Aerial insulators.
Belling Lee.—Belling and Lee, Ltd. General trade mark.
Beltona.—Murdoch Trading Co. General trade mark.
Benchrack.—B. Thomas. Storage trays for small parts.
Benhyco.—J. Bennett, Heyde and Co. Colloidal graphite grease.
Benjamin.—Benjamin Electric Ltd. Components.
Benwood Linze.—The Rothermel Corporation, Ltd. Dry rectifiers.
Berclif.—Berclif, Ltd. Sets and components.
Berco.—British Electric Resistance Co., Ltd. Fixed and variable resistances, rheostats and resistance wire.
Berkeley.—Halford Radio, Ltd. Receivers, radiograms and S.W. converters.
Bettaflex.—Saxonia Elec. Wire Co., Ltd. Flexible wires and cables.
Bi-Duplex.—Varley. Resistances.
Bisfecca.—Aladdin Gramophone and Accessories Co. Amplifier.
Big Ben.—Stockall, Marples and Co., Ltd. Radiograms, gramophones and sound boxes.
Binode.—Mullard Wireless Service Co., Ltd. Valves.
Birmite.—E. Elliott. Synthetic resin mouldings.
Biscar.—Cleveys Engineering Co. Cone aerial.
Bisolac.—Bakelite, Ltd. Lacquer.
Bivolt.—Beaver Electrical Supply Co. Accumulators.
Blackfriars.—Spicers, Ltd. Black adhesive tape and sleeving.
Blackley.—Connollys (Blackley), Ltd. Insulating tape.
Bligh.—S. W. Bligh. Set and accessories.
Blue Comet.—Blue Comet, Ltd. General trade mark.
Blue Flyer.—The Rothermel Corporation, Ltd. Gramophone motors.
Blue Spot.—British Blue Spot Co., Ltd. General trade mark.
Boley.—S. Wolf and Co., Ltd. Precision machine tools.
Bowerman's.—George Bowerman, Ltd. Headphones, speakers and cone units.
Brassoline.—Fredk. Crane Chemical Co., Ltd. Cold cellulose lacquer.
Brexton.—Brexton, Ltd. Portable set cases.
Bridge Megger.—Evershed and Vignoles, Ltd. Testing instruments.
Brilliant Label.—Columbia Graphophone Co., Ltd. Needles.
Britannia.—Britannia Lathe and Oil Engine Co., Ltd. Lathe and tools.
Britannia.—Britannia Rubber and Kamptulicon Co., Ltd. Ebonite.
Britannic.—Ever Ready Co. (Great Britain), Ltd. Dry cell.
Briticent.—British Central Electrical Co., Ltd. Crystals and switches.
Britinol.—Bi-Metals. Soldering outfits, cored wire, paste solders and flux.
British.—British Battery Co., Ltd.—H.T. dry batteries.
British General.—British General Manufacturing Co., Ltd. General trade mark.
British Radiogram.—British Radio Gramophone Co., Ltd. Portable.
Britkam.—Britannia Rubber and Kamptulicon Co., Ltd. Ebonite and all rubber goods made by the company.
Broadcast.—Crystalate Gramophone Record Manufacturing Co., Ltd. Gramophone records.
Broadcaster.—J. and A. Margolin. Gramophones.
Broadcasting House.—Weedon Power Link Radio Co. Speaker baffle.

CUSTOM SAYS MULLARD

Broadway.—Rose, Morris and Co. General trade mark.
 Browne and Sharpe.—Buck and Hickman, Ltd. Fine tools.
 Brownie.—R.C. and Wilson Elec., Ltd. Crystal sets and permerectors.
 Brunswick.—Brunswick, Ltd. General trade mark.
 Buckman.—Buck and Hickman, Ltd. Precision gauges.
 Bulgin.—A. F. Bulgin and Co., Ltd. General trade mark.
 Bull.—British Ropes, Ltd. Wire.
 Bull-Dog.—Pomona Rubber Co. Insulating tapes.
 Bull-Dog.—Ward and Goldstone, Ltd. Spring connectors.
 Bulle.—Bulle Co., Ltd. Electric clocks.
 Bulwark.—Redfern's Rubber Works, Ltd. Ebonite, panels, sheets and coil formers.
 Bur-Bri.—Fred Burris and Sons, Ltd. General trade mark.
 Bureaugram.—Lawson and Raphael. Radiogram unit.
 Burgoyne.—Burgoyne Wireless (1930), Ltd. Sets.
 Burndept.—Burndept, Ltd. General trade mark.
 Burrell.—Burrell Radio, Ltd. Receivers.
 Bur-Ton.—C. F. and H. Burton. General trade mark.
 Busco.—Busby and Co., Ltd. Lightning arrester, terminal tags and push-pull switches.
 Bush.—Bush Radio, Ltd. General trade mark.
 Bush Ranger.—Bush Radio, Ltd. Sets.
 Byldurone.—J. J. Eastick and Sons. Cabinets.
 B.A.A.—F. W. Berk and Co., Ltd. Accumulator acid.
 B.A.T.—Claude Lyons, Ltd. Components, amplifiers and receivers.
 B.B.—George Bowerman, Ltd. Duralumin headbands.
 B.B.Co.—British Battery Co., Ltd. G.B. battery.
 B.E.M.—British Electric Meters, Ltd. General trade mark.
 B.I.—British Insulated Cables, Ltd. General trade mark.
 B.N.B.—B.N.B. Wireless, Ltd. Sets and components.
 B. and O.—F. W. Lechner and Co., Ltd.
 B.S.R.—Bakers Selhurst Radio. Speaker.
 B.S.R.—Birmingham Sound Reproducers. General trade mark.
 B.T.-H.—British Thomson-Houston Co., Ltd. Set components, accessories, amplifiers, valves, speakers and headphones.
 B.W.—L. R. Wood. Aerial wire.

C

Cabinet Cone.—Goodmans (Clerkenwell), Ltd. Cone speaker.
 Caddie.—Acme Album Service. Record cases.
 Cadet.—Columbia Graphophone Co., Ltd. Portable gramophone.
 Cadison.—R. Cadisch and Sons. Accumulators, Accumulator carriers, batteries, battery switches, earth tubes, valve holders, etc.
 Callender.—Callender's Cable and Construction Co., Ltd. General trade mark.
 Cambridge.—Cambridge Instrument Co., Ltd. Instruments.
 Cambridge.—G. J. Pooley. General trade mark.
 Camco.—Carrington Manufacturing Co., Ltd. Cabinets, panels and brackets.
 Capehart.—Giffens (London), Ltd. Automatic record changer.
 Capehart.—Sun Electrical Co., Ltd. Automatic record changer.
 Capitol.—Hobday Bros., Ltd. Components and accessories.
 Carl Lindstrom.—Parlophone Co., Ltd. Gramophones, motors, etc.
 Carlton.—Fred Bulmer. General trade mark.
 Carlton.—Vincos Dry Batteries, Ltd. H.T. and grid bias batteries.

Castaphone.—G. Castagnoli. Public address outfits, valve sets, amplifiers and components.
 Castle.—Dundas Fox, Ltd. Batteries.
 Castle.—Watson, Saville and Co., Ltd. High-speed steels.
 Castlewood.—Majestic Electric Co., Ltd. Receivers.
 Cathode.—Lithanode Co., Ltd. Battery.
 Cecil.—Mansell and Ogan, Ltd. Components and accessories.
 Celastine.—British Celanese, Ltd. Sheets, rods and moulding powder.
 Celastoid.—British Celanese, Ltd. Non-flam. celluloid sheets.
 Celec.—Curtis Manufacturing Co., Ltd. Resistances.
 Celestion.—Celestion, Ltd. General trade mark.
 Celestrol.—Celestion, Ltd. Loud speakers.
 Cellbest.—Cellgrave Co. Engraved dials, labels and scales.
 Cellotone.—Runwell Cycle Co. (Birmingham), Ltd. Gramophones, sound boxes and needles.
 Centralab.—Rothermel Corporation, Ltd. Volume controls and resistances.
 Centrex.—Goodmans (Clerkenwell), Ltd. Moving coil speaker.
 Centurian.—Saxon Radio Co. Insulated aerial wire.
 Ceolian.—L. R. Wood. Receivers, radiograms, amplifiers, gramophones and gramophone accessories.
 Chakophone.—Eagle Engineering Co., Ltd. Sets and components.
 Chakotrope.—Eagle Engineering Co., Ltd. Amplifiers.
 Chalkgrove and Chalkley.—C. G. Chalkley. Sets, components, speakers and accessories.
 Challenger.—Reproducers and Amplifiers, Ltd. P.M.-M.C. speaker.
 Champion.—Hobday Bros., Ltd. Portable receiver.
 Chaslyn.—J. H. Collie and Co. Hydrometer.
 Chassiset.—Six-Sixty Radio Co., Ltd. Receiver.
 Chauvin and Arnoux.—M. Benoit. Electrical measuring instruments.
 Chippendale.—Halford Radio, Ltd. Receivers and radiograms.
 Choice of Critics.—A. F. Bulgin and Co., Ltd. General trade mark.
 Chorister.—H. J. Fletcher and Co., Ltd. Sets, radiograms, needles, soundboxes, pick-ups and arms.
 Chromel.—M. Coquantin. Resistance wire.
 Chromic.—Edison-Bell (1933), Ltd. Needles.
 Chromostat.—Radio Mfg. Co. Receivers.
 Cifel.—Cifel Products, Ltd. General trade mark.
 Circsale.—Record Electrical Co., Ltd. Electrical measuring instruments.
 Claremont.—Electrical and Radio Products (1931), Ltd. Receiver.
 Clarion.—British Clarion Co., Ltd. Sets.
 Clarion.—Octron, Ltd. Radio valves.
 Clarion.—Clarion Radio Valve Co. Valves.
 Claristal.—Ward and Goldstone, Ltd. Aerial set.
 Claritone.—Ashley Wireless Telephone Co. (1925), Ltd. Headphones, components and speakers.
 Clearostat.—Claude Lyons, Ltd. Controls, grid-leaks.
 Clarowax.—Bakelite, Ltd. Insulating materials.
 Classic.—Goodmans (Clerkenwell), Ltd. Moving coil speaker.
 Classic.—Goodmans. Moving coil speaker.
 Classic.—A. E. Shearing, Ltd. Components.
 Clayton.—Clayton (Rubber Sales), Ltd. Ebonite.
 Clearer-Tone.—Benjamin Electric, Ltd. Valve holder.
 Clearertone.—Benjamin Electric, Ltd. Antimicrophonic valveholders.
 Clearstone.—Anderson Clark and Moir, Ltd. General trade mark.
 Clifton.—Hobday Bros., Ltd. Switches.
 Climax.—Climax Radio Electric, Ltd. General trade mark.
 Clix.—Lectro Linx, Ltd. Terminals.
 Clutch Brand.—Hellekens, Ltd. Insulating tape.
 Coaguline.—Kay Bros., Ltd. Transparent cement.

MULLARD THE MASTER VALVE

TRADE NAMES

Colassion.—W. L. Colassi. Speakers and pick-ups.
 Coliseum.—Shalles and Evans, Ltd. Receiver.
 Collaro.—Collaro, Ltd. General trade mark.
 Collett.—S. H. Collett Manufacturing Co. Aerial pulley and components.
 Collings.—N. R. Collings and Co. Bookcase pedestals and playing desks.
 Colossus.—Lissen, Ltd. Receivers.
 Coltags.—S. H. Collett Manufacturing Co. Battery cord tags.
 Columbia Graphophone.—Columbia Graphophone Co., Ltd. Radio-gramophones and electric reproducing gramophones.
 Columbia Radio.—Columbia Graphophone Co., Ltd. Radio receivers, gramophones and power units. Speakers.
 Colverdynes.—Colvern, Ltd. Band-pass intermediates for super het. receivers.
 Colvern.—Colvern, Ltd. Coils.
 Colverstats.—Colvern, Ltd.—Fixed and variable resistances.
 Combenola.—E. J. Lever (Trix), Ltd. Radio gramophones.
 Comet.—London Commercial Electrical Stores, Ltd. Switch.
 Compax.—Wingrove and Rogers, Ltd. Variable condensers.
 Competa.—A. F. Bulgin and Co., Ltd. Components.
 Concord.—Concordia Electric Wire Co., Ltd. Extension flexibles and cables.
 Concordin.—Concordia Electric Wire Co., Ltd. Resistance wire.
 Condensite.—Bakelite, Ltd. Insulating materials.
 Connect-a-Gram.—Garnersound, Ltd. Playing desks.
 Connectite.—Concordia Electric Wire Co., Ltd. Connecting wire.
 Connexit.—Saxon Radio Co. Insulated wire.
 Connode.—C. E. Needham and Bro., Ltd. Condensers and coil holders.
 Connoisseur.—A. F. Bulgin and Co., Ltd. Transformer.
 Constantan.—Concordia Electric Wire Co., Ltd. Resistance wire.
 Contra Resonant.—R.O. Bridger and Co. Dual cones.
 Copex.—Peto Scott and Co., Ltd. Coils and coil screens.
 Copparite.—Altham Radio Co. Insulated copper aerial wire.
 Cordesia.—Cordesia Batteries Ltd. General trade mark.
 Corner Cabinet.—Jonathan Fallowfield Ltd. Cabinet-set.
 Corona.—Beaver Electrical Supply Co. Speakers.
 Coronet.—Faudels, Ltd. Receivers.
 Cortabs.—Money Hicks, Ltd. Tags for marking connecting wires.
 Cossor.—A. C. Cossor, Ltd. General trade mark.
 Crabtree.—J. A. Crabtree and Co., Ltd. General trade mark.
 Craigwell.—British Radio-Gramophone Co., Ltd. Receivers and radio-gramophones.
 Cranco.—Fredk. Crane Chemical Co., Ltd. Cold cellulose lacquer.
 Crawford.—Romac Motor Accessories, Ltd. Jacks.
 Cressall.—Cressall Manufacturing Co. Asbestos resistance nets and rheostats.
 Cristophone.—R. O. Bridger and Co. Super-paper cones.
 Critic.—Franklin and Freeman, Ltd. Components.
 Cromaloy.—A. C. Scott and Co., Ltd. Wires and resistances.
 Cromwell.—Cromwell (Southampton), Ltd. Receivers.
 Crown.—J. Leibovici. Gramophones.
 Cruiser.—British Lumophon, Ltd. Kits.

Crypto.—Lancashire Dynamo and Crypto, Ltd. Rotary and valve rectifiers for L.T. and H.T. charging.
 Cryptoverter.—Lancashire Dynamo and Crypto, Ltd. Rotary converter for radiograms.
 Crystacel.—Siemens Electric Lamps and Supplies, Ltd. L.T. accumulators.
 Crystalate.—Crystalate Gramophone Record Manufacturing Co., Ltd. Mouldings.
 Cub.—Ward and Goldstone, Ltd. Wave trap.
 Curry.—Curry's Ltd. Receivers and L.F. transformer.
 Cydon.—Sydney S. Bird and Sons, Ltd. Variable condensers.
 Cynthex.—Acton Battery Co., Ltd. H.T. and G.B. batteries.
 C.A.C.—City Accumulator Co. General trade mark.
 C.A.V.—C. A. Vandervell, Ltd. H.T., L.T. accumulators and dry batteries.
 C.R.—Clayton Rubber Sales, Ltd. Ebonite.
 C.R.L.—Rothermel Corporation, Ltd. Rheostat, potentiometer and modulator.
 C.T.S.—St. Helen's Cable and Rubber Co., Ltd. Electric cable.
 C.W.—Jeb Trading Co. Battery links.

D

D'accord.—Burwood's Wireless. General trade-mark.
 Dagenite.—Peto and Radford. Accumulator.
 Dagenite Tell Tale.—Peto and Radford. Accumulator.
 Daly.—H. C. Daly. General trade mark.
 Damarda.—Bakelite, Ltd. Lacquer.
 Danco.—Danco Manufacturing Co., Ltd.
 Dania.—Atlas Carbon and Battery Co., Ltd. Battery.
 Daptacon.—British Ideal Patents, Ltd. General trade mark.
 Dario.—Impex Electrical Ltd. General trade mark.
 Davenset.—Partridge, Wilson and Co. General trade mark.
 Davent.—Midland Electrical Co. H.T. and grid bias batteries.
 Davenport.—Carrington Mfg. Co., Ltd. Cabinet.
 Davey Radio.—E.M.G. Hand Made Gramophones, Ltd. General trade mark.
 Dayzite.—Dayzite, Ltd. General trade mark.
 Decee-Acee.—A. Wade and Co. (Burnley), Ltd. Receiver.
 Decko.—A. F. Bulgin and Co., Ltd. Accessories.
 Deckorem.—A. F. Bulgin and Co., Ltd. General trade mark.
 Dekkor.—Adam Hilger, Ltd. Optical devices for engineers.
 De Luxe Label.—Columbia Graphophone Co., Ltd. Needles.
 Deucalion.—Yorkshire Radio Co. Coil and valve set.
 Dexim.—Lissen, Ltd. Batteries.
 Dexolin.—Danco Manufacturing Co., Ltd. Bake-lised tubing.
 Dial.—Plowden and Thompson, Ltd. Glass tubing, laboratory apparatus, etc.
 Dialite.—A. F. Bulgin and Co., Ltd. Panel mounting light.
 Diamine.—T. Webster and Co., Ltd. General trade mark.
 Diamond-F.—Diamond Fibre Co., Ltd. Fibre sheets, rods and tubes and components.
 Dido.—Kay Bros., Ltd. Cement for celluloid ebonite, etc.
 Difeed.—Radio Instruments, Ltd. L.F. transformer.
 Dimic.—McMichael Radio, Ltd. Coil.
 Discol.—Gent and Co., Ltd. High-frequency transformer.
 Discomax.—Wingrove and Rogers, Ltd. Variable condensers.
 Disque.—Disque Cabinet Co., Ltd. Cabinets.
 Distavox.—Distavox, Ltd. General trade mark.
 Dix Charger.—Leslie Dixon Switchgear Co. Battery chargers.

THREE MILLION AERIALS CAN'T BE WRONG

Dix-Ohmmeter.—Leslie Dixon Switchgear Co. Resistance meter.
 Dix-Onemeter.—Leslie Dixon Switchgear Co. Universal tester.
 Dix-Wattmeter.—Leslie Dixon Switchgear Co. Power meter.
 Doelcam.—McLeod and McLeod. Sleeving (Varnished insulating).
 Dominion.—Carrington Mfr. Co., Ltd. Cabinet.
 Domino.—Thos. R. Ellin (Footprint Works). Ltd. Tools.
 Donaphone.—Abingdon Wireless Supplies. Five Valve Portable Receivers. Three Valve Table Model Receivers.
 Donophone.—Donophone Public Address Co., Ltd. General trade mark.
 Doric.—T. O'Brien, Ltd. Cabinets.
 Dot.—T. M. Tod. General trade mark.
 Double Pentagon.—Woodhams, Dade and Co. Shellacs.
 Douglas.—Automatic Coil Winder and Electrical Equipment Co., Ltd. Automatic coil winders, both hand and power.
 Dr. Nesper.—Dr. Nesper, Ltd. General trade mark.
 Draco.—Drury Radio Co., Ltd. H.T. batteries.
 Dragon.—Amplion (1932) Ltd. Speaker.
 Dreadnaut.—R. O. Bridger and Co. Paper cones.
 Dreadnought.—Goodman's (Clerkenwell), Ltd. Moving coil speakers, chassis and cabinet models.
 Drivemu.—Radio Instruments, Ltd. Class B. transformer.
 Drummer.—Edge Radio, Ltd. General trade mark.
 Dtdex.—Chloride Electrical Storage Co., Ltd. Dry Battery.
 Drymac.—Metal Agencies Co., Ltd. H.T. batteries.
 Dual.—Dual Motors, Ltd. Electric motors.
 Dual Astatic.—Radio Instruments, Ltd. H.F. chokes.
 Dualcone.—Goodmans (Clerkenwell), Ltd. Double cone chassis.
 Dual-Finish.—Ripaults, Ltd. Ebonite.
 Dubilier.—Dubilier Condenser Co. (1925), Ltd. General trade mark.
 Duco.—Brown Brothers, Ltd. Components.
 Ducon.—Dubilier Condenser Co. (1925), Ltd. Plug to use lighting circuit as aerial.
 Dulcetto.—Dulcetto Polyphon, Ltd. General trade mark.
 Dumolite.—Dew and Co., Ltd., A. J. Accumulators and battery tester.
 Duplex.—McMichael Radio, Ltd. Receivers.
 Duracold.—Columbia Graphophone Co., Ltd. Needles.
 Duratex.—Ioco Rubber and Waterproofing Co., Ltd. Leather cloth.
 Duray.—Duray, H.T. eliminators, tone purifiers, H.T. economisers and aerials.
 Dux.—Radio Instruments Ltd. L.F. transformer.
 Dwarf.—Everett, Edgcombe and Co., Ltd. Ammeters and voltmeters.
 Dynamotone.—Murdoch Trading Co. Talkie needles.
 Dynatone.—Scientific Supply Stores (Wireless), Ltd. Air cored auto S.W. inductance.
 Dynatron.—H. Hacker and Sons. Radiograms and receivers.
 D.C.—Buck and Hickman, Ltd. Screw placers.
 D.E.U.—McLeod and McLeod. Bobbins, boxes, etc., for batteries, etc., in papier mache.
 D.R.C.—Danco Manufacturing Co., Ltd. Ebonite.

E

Eagle.—Eagle Engineering Co., Ltd. H.T. dry batteries.
 Eagle.—Eagle Transfer, Ltd.—Transfers.
 Eagle.—John Riley and Sons, Ltd. Accumulator acid.
 Eagle.—Static Condenser Co. Condensers.
 Eagranco.—Eagle Transfer, Ltd. Transfers.
 Earlwood.—Majestic Electric Co., Ltd. Receiver.

Easifil.—S. Guiterman and Co. Distilled water carrier.
 Easifix.—Ward and Goldstone, Ltd. Combined H.T. and L.T. battery cords.
 Eastrip.—Ward and Goldstone, Ltd. Connecting wire.
 Ebonart.—Redfern's Rubber Works, Ltd. Ebonite panels, sheets and coil formers.
 Ebonests.—Ebonests Insulators, Ltd. Moulded plastic, bakelite and other synthetic materials.
 Ebonex.—Money Hicks, Ltd. Engraved labels.
 Ebonoid.—Clayton Rubber Sales, Ltd. Mouldings.
 Ecco.—Ecco Battery Co., Ltd. Wireless batteries.
 Eccoradio.—Ecco Radio, Ltd. Receivers.
 Eclipse.—Frys (London), Ltd. Lathes, grinding and drilling machines.
 Eclipse.—James Neil and Co. (Sheffield), Ltd. Permanent magnets.
 Eddystone.—Stratton and Co., Ltd. Short wave sets and components, and transmitting coils.
 Edina.—Bruntons. Resistance wire.
 Edison Bell.—Edison Bell (1933), Ltd. General trade mark.
 Ediswan.—Edison Swan Electric Co., Ltd. General trade mark.
 Editor.—Peto Scott Co., Ltd. Kits.
 Edna.—J. W. Bramley. Receiver and water motors.
 Edwards.—Rowland Edwards and Co., Ltd. Non-spillable accumulators.
 Eedee.—Edward Doherty and Sons. Radio cabinets in wood and leather.
 Eelex.—J. J. Eastick and Sons. Components and accessories.
 Ekeco.—E. K. Cole, Ltd. General trade mark.
 Ekeozene.—E. K. Cole, Ltd. Mouldings.
 Eldeco.—Eldeco Radio, Ltd. General trade mark.
 Electone.—F. J. Gordon and Co., Ltd. Automatic programme selector.
 Electra.—Vee Cee Dry Cell Co. (1927), Ltd.
 Electrad.—Rothermel Corp., Ltd. Resistances and potentiometers.
 Electravox.—Amplion (1932) Ltd. Gramophone pick-up.
 Electroceet.—Electroceet Radio Co. General trade mark.
 Electrocolor.—Electrocolor Products, Ltd. Non-metallic needles and repointers.
 Electro Dynamic.—Electro-Dynamic Construction Co., Ltd. General trade mark.
 Electro-Graphophone.—Columbia Graphophone Co., Ltd. Electric reproducing gramophone.
 Electron.—New London Electron Works, Ltd. Aerial wire, earth and insulator pins.
 Electronic.—Varley Resistances.
 Electrostone.—Edison Bell (1933), Ltd. Sound-boxes.
 Elite.—Beaver Electrical Supply Co. Coils.
 Elite.—Vines Dry Batteries, Ltd. H.T. and grid bias batteries.
 Ella.—Lionel Robinson and Co., Ltd. Converter, voltmeter and ammeter.
 Ella Flex.—Lionel Robinson and Co., Ltd. Insulating sleeving.
 Ellance.—Ellance Radio, Ltd. Valve receiving sets and tuners.
 Ella-Varie.—Lionel Robinson and Co., Ltd. Components.
 Elliott.—Elliott Radio Mfg. Co., Ltd. General trade mark.
 Ellis.—The Rothermel Corporation, Ltd. Microphones.
 Elo.—Birkbys, Ltd. Mouldings, powders, varnishes, cements.
 Elrad.—Elliott Radio Mfg. Co., Ltd. Aerial wire.
 Eltax.—Acton Battery Co., Ltd. H.T. and G.B. batteries.
 Elic.—E. A. Wood. Batteries and components.
 Embassy.—British Needle Co., Ltd. Gramophone needles.
 Embassy.—Carrington Manufacturing Co., Ltd. Cabinet.
 Embassy.—Shalles and Evans. Receiver.
 Emita.—Shalles and Evans. Receiver.
 Emkabe.—Emkabe Radio Co., Ltd. General trade mark.

MULLARD THE MASTER VALVE

TRADE NAMES

Emo.—George Emmott (Pawsons), Ltd. Main-springs for gramophone motors.
 Empire.—Carrington Manufacturing Co., Ltd. Cabinet.
 Empire.—Micanite and Insulators Co., Ltd. Insulating material.
 Empire.—Manufacturers' Accessories Co. (1928), Ltd. Battery.
 Empire Sixty.—Efandem Co., Ltd. H.T. battery
 Empyream.—Halford Radio, Ltd. Receivers and radiogram.
 Enameloid.—Fredk. Crane Chemical Co., Ltd. Cold cellulose lacquer.
 Endy.—Michelson Bros. Dry batteries.
 Energex.—Saxon Radio Co. H.T. batteries, L.T. accumulators, mains transformers and L.F. chokes.
 Enfield.—Enfield Cable Works, Ltd. Wires and cables.
 Enhansa.—Ward and Goldstone, Ltd. Indoor aerial.
 Enox.—Frys (London), Ltd. Metal and ebonite cutting saws.
 Ento.—J. Hyatt and Co., Ltd. Cabinet and battery box.
 Eon.—Eon Vacuum Wireless Co. General trade mark.
 Epoch.—Epoch Radio Mfg. Co., Ltd. General trade mark.
 Equator Super.—G. Scott Sessions and Co. S.W. sets.
 Erie.—Erie Resistor, Ltd.—General trade mark.
 Erinoid.—Erinoid, Ltd. Insulating material.
 Erl.—Ecco Radio, Ltd. Coils.
 Erlite.—Ecco Radio, Ltd. Condensers.
 Eros.—Vee Cec Dry Cell Co. (1927), Ltd.
 Erzophon.—E. Oppenheim and Co., Ltd. Speakers.
 Essell.—Spicers, Ltd. Fibre and leatheroid.
 Essex.—Essex Accumulator Co., Ltd. Accumulators.
 Eta.—Eta Tool Co. Tools and coil winding machine.
 Ether Master.—A. E. Andrews and Co. Coils.
 Ethern.—St. Helens Cable and Rubber Co., Ltd. Ebonite panel.
 Ethophone.—Burndept, Ltd. Receivers.
 Eureka.—London Electric Wire Co. and Smiths, Ltd. Resistance wire.
 Eureka.—L. Person and Son. General trade mark.
 Everdamp Earth.—Weedon Power Link Radio Co. Earthing device.
 Everlast.—Midland Wireless Co. Batteries.
 Everlock.—McLeod and McLeod. Washers.
 Ever Ready.—Ever Ready Co. (Gt. Britain), Ltd. Primary and secondary batteries, H.T., L.T. and G.B.
 Ewebec.—Evington Electrical Mfg. Co. Coil former.
 Exact.—Exact Manufacturing Co. Aerial and anode tuners.
 Excel.—S. H. Collett Manufacturing Co. Terminal tags and fuses.
 Excelsior.—Carrington Mfg. Co., Ltd. Cabinet.
 Excelsior.—Ward and Goldstone, Ltd. Resistance wire.
 Exide.—Chloride Electrical Storage Co., Ltd. Accumulator.
 Expressvolt.—Express Radio Factors, Ltd. H.T. batteries.
 Extralife.—Edison Swan Electric Co., Ltd. L.T. accumulators.
 Eze-tite.—S. H. Collett Manufacturing Co. Phone adaptors.
 Eze-Way.—S. H. Collett Manufacturing Co. Pulleys.
 E.A.W.—E. A. Wood. Components and accessories.
 E.D.L.—Electric Depot, Ltd. Accumulator charging equipment.
 E.R.P.—Electrical and Radio Products (1931), Ltd. General trade mark.
 E.S.—Edison Swan Electric Co., Ltd. Dry batteries, accumulators and valves.

E.S.C.—English Steel Corporation. Permanent magnets.
 E.T.A.—Electrical Trading Association, Ltd. The. Valves.

F

Facile.—Ross Courtney and Co., Ltd. Terminals.
 Faeritone.—Mechanical Utilities Co., Ltd. Crystal and S.W. accessories.
 Falco.—George Bowerman, Ltd.
 Faneeka.—Michael Black, Ltd. H.T. batteries.
 Feet o' Felt.—McLeod and McLeod. Felt feet for cabinets.
 Ferno.—Bruntons. Resistance wire.
 Ferranti.—Ferranti, Ltd. General trade mark.
 Ferrocart.—Colvern, Ltd. Iron core tuning coils and intermediates.
 Fitzall.—Peto Scott Co., Ltd. Cabinets.
 Filt.—Graham Farish, Ltd. Percolative earth.
 Filtron.—Amplion (1932), Ltd. Trickle charger and earthing device.
 Flag.—Ever Ready Co. (Great Britain), Ltd. Dry cell.
 Flatta.—Barrow, Hepburn and Gale, Ltd. Patent handles for portable cases.
 Flex.—Daws, Clarke and Co. Sound box diaphragms.
 Fluxite.—Fluxite, Ltd. Soldering paste and soldering set.
 Fonatex.—Ashton and Co. (Est. 1787), Ltd. Gauze for speakers and gramophones.
 Footprint.—Thos. R. Ellin (Footprint Works), Ltd. Tools.
 Formsapex.—Ioco Rubber and Waterproofing Co., Ltd. Bakelite type miocarta and varnish.
 Formica.—Willmott, Son and Phillips, Ltd. Laminated bakelite sheets, rods and tubes.
 Formite.—Bakelite, Ltd. Insulating materials.
 Formo.—Formo Co. Components.
 Formo Densor.—Formo Co. Pre-set condenser.
 Fotos.—Concerton Radio and Electrical Co., Ltd. General trade mark.
 Four in One.—British Homophone Co., Ltd. Records.
 Foursquare.—Goodmans (Clerkenwell), Ltd. Speakers.
 Franklin.—Franklin Electric Co., Ltd. General trade mark.
 Fulgor.—J. Toubkin. Batteries.
 Fuller.—Fuller Accumulator Co. (1926), Ltd. Dry batteries and radio accumulators.
 Full O' Power.—Siemens Electric Lamps and Supplies, Ltd. Dry batteries.
 Fur.—E. Enderlein. Coil winding machines.
 Fybro.—Willmott, Son and Phillips, Ltd. Homogeneous vulcanised fibre rods.
 F.A.V.—F. Brown, Ltd. Valve holder.
 F.M.C.—Fairfield Mfg. Co. Receiver.
 F.N.C.—Bruntons. Resistance wire.

G

Gaede.—W. Edwards and Co. All-steel diffusion and rotary oil vacuum pumps.
 Gainsborough.—Electrical and Radio Products (1931), Ltd. Set and radiogram.
 Galakerite.—S. R. F. Freed. Casein products.
 Galloy.—Climax Radio Electric, Ltd. Earth tubes.
 Galvanic.—Grosley Radio, Ltd. Earth tube.
 Gambrell.—Halford Radio, Ltd. Receivers and radiograms.
 Gard.—Graham Farish, Ltd. Lightning arrester.
 Garner.—Garnersound, Ltd. Tone arm.
 Garnersound.—Garnersound, Ltd. General trade mark.
 Garrard.—Garrard Engineering and Mfg. Co., Ltd. Gramophone motors.
 Garrard.—J. Moores and Co. Gramophone motors.
 Garrick.—Shalles and Evans. Receiver.

MULLARD—THE GREATEST NAME IN RADIO

Gas-ohm.—Rotor Electric, Ltd. Grid leaks and resistances.
 G. Burri.—McLeod and McLeod. Instrument wire.
 Geisha.—C. Gilbert and Co., Ltd. Pedestal and portable gramophones, sound boxes and needles.
 Gel-Cel.—Chloride Electrical Storage Co., Ltd. Jelly acid accumulator.
 Gilbert.—C. Gilbert and Co., Ltd. General trade mark.
 Givrite.—Le Carbone, Ltd. Carbon resistances.
 Gladiator.—Murdoch Trading Co. Batteries.
 Gladitz.—W. Edwards and Co. Lamp and valve-making machinery.
 Glaswood.—Eagle Transfer, Ltd. Transfers.
 Glazite.—London Electric Wire Co. and Smith's, Ltd. Insulated instrument wire.
 Globe.—Shalless and Evans. Receiver.
 Globex.—British G.W.Z. Battery Co., Ltd. H.T. batteries.
 Gloria.—British G.W.Z. Battery Co., Ltd. Dry batteries.
 Gloster.—T. R. Francis. General trade mark.
 Godwinex.—J. Dyson and Co. (Wks.), Ltd. Eliminators and components.
 Glyda.—Danco Manufacturing Co., Ltd. Coil-holder.
 Gold Seal.—Acton Battery Co., Ltd. H.T. and G.B. batteries.
 Golden Series.—S. Lilley and Son, Ltd. Switches, terminals and wander plugs.
 Golden Arrow.—J. Toubkin. Loudspeaker and mains units.
 Golden Disc.—Edison Swan Electric Co., Ltd. Electric gramophone motor.
 Golden Domes.—J. and A. Margolin. Gramophones.
 Golden Pyramid.—British Needle Co., Ltd. Gramophone needles.
 Golden Pyramid Radiogram.—British Needle Co., Ltd. Needles for electric pick-ups.
 Goldring.—British Goldring Products, Ltd. General trade mark.
 Goldtone.—Ward and Goldstone, Ltd. General trade mark.
 Goodwin.—Goodwin Radio, Ltd. Valve receivers, cabinet speakers, portables and trans-portables.
 Gordometer.—F. J. Gordon and Co., Ltd. Hydrometer.
 Gordon.—F. J. Gordon and Co., Ltd. General trade mark.
 Grafonola.—Columbia Graphophone Co., Ltd. Gramophones.
 Graham Farish.—Graham Farish, Ltd. Components.
 Gramplan.—Gramplan Reproducers, Ltd. Speaker units.
 Grantona.—R. O. Bridger and Co. Speakers, cones, etc.
 Grawor.—H. Joseph. Speakers.
 Grayson.—Grayson and Co. Drills for bakelite and glass.
 Greatrex.—R. G. Greatrex and Co. Receivers.
 Greatrex, R.G.—R. G. Greatrex and Co. Speaker.
 Green Flyer.—The Rothermel Corporation, Ltd. Gramophone motors.
 Greleo.—Grafton Elec. Co. Multi plug adaptors.
 Gresley.—Gresley Radio, Ltd. General trade mark.
 Gripall.—Gripall Elec. Products, Ltd. General trade mark.
 Grippleshell.—Partridge, Wilson and Co. Aerial insulator.
 Gripso.—Gripso Co. General trade mark.
 Grosvenor.—Carrington Mfg. Co., Ltd. Cabinet.
 Grosvenor.—Grosvenor Electric Batteries, Ltd. Dry batteries.
 Guardian.—Peto Scott Co., Ltd. Panel meter.
 Guidor.—J. H. Collie and Co. Hydrometers.
 G.—Pye Radio, Ltd. Set.
 G.E.C.—General Electric Co., Ltd. General trade mark.
 G.F. Radio.—Graham Farish, Ltd. General trade mark.

G. & H.—Halford Radio, Ltd. Superhet chassis.
 G.H.—Gould, Harper and Co. Lightning arrester.
 G.R.—Claude Lyons, Ltd. Laboratory apparatus.
 G.W.Z.—British G.W.Z. Battery Co., Ltd. Dry batteries.

H

Hall.—Daws Clarke & Co. Round shank fibre needles.
 Hammarlund.—The Rothermel Corporation, Ltd. Short wave coils and condensers.
 Hammond.—The Rothermel Corporation, Ltd. Electric clocks.
 Handy.—Lehmann, Archer and Co., Ltd. Carded tools.
 Harbros.—Hart Bros. Electrical Mfg. Co., Ltd. General trade mark.
 Harlie.—Harlie Ltd. Components and accessories.
 Harp.—N. R. Collings and Co. Speakers.
 Hartley-Turner.—Hartley Turner Radio, Ltd. General trade mark.
 Havenwood.—Majestic Electric Co., Ltd. Receiver.
 Haynes.—Haynes Radio. General trade mark.
 Heayberd.—F. C. Heayberd and Co. General trade mark.
 Hegra.—J. Millet. Cone unit, speakers, lighting arresters and grid-leak clips.
 Heliogen.—E. Enderlein. Aerial accessories.
 Hellesen.—Hellesen, Ltd. General Trade Mark.
 Herculaaker.—Concordia Elec. Wire Co., Ltd. Lacquered wires and cables.
 Hercules.—Boynton and Co., Ltd. General trade mark.
 Hercules.—Ever Ready Co. (Gt. Britain), Ltd. Low tension battery.
 Heron.—Henry Righton and Co., Ltd. Non-ferrous metals.
 Hesco.—Octron Ltd. Valves.
 Het.—Univolt Electric, Ltd. Indoor aerial.
 Heussen.—Blitz Bros. Valves.
 Hexa.—F. C. Hill and Co. General trade mark.
 His Master's Voice.—Gramophone Co., Ltd. General trade mark.
 Hivac.—High Vacuum Valve Co., Ltd. Valves.
 Hobart.—F. J. Gordon and Co., Ltd. Battery charger.
 Hobut.—Howard Butler, Ltd. General trade mark.
 Hosiamic.—L.P.S. Electrical Co., Ltd. Resistance wire.
 Holbro.—Holmes Bros. (London), Ltd. Cabinets.
 Holdite.—S. H. Collett Mfg. Co. Battery clips.
 Hoyt.—F. J. Gordon and Co., Ltd. Testing instruments.
 Huber.—McLeod and McLeod. Wire (silk-covered).
 Hum-dinger.—Claude Lyons, Ltd. Variable resistances for mains apparatus.
 Hymax.—E. Allen and Co., Ltd. Magnet.
 Hymeg.—Edison Swan Electric Co., Ltd. H.T. accumulator.
 Hypercore.—Radio Instruments, Ltd. L.F. smoothing and filter output choke.
 Hypermite.—Radio Instruments, Ltd. L.F. transformer.
 Hypermu.—Radio Instruments, Ltd. L.F. transformer.
 Hypernik.—Lissen, Ltd. Transformers.
 Hyvac.—W. Edwards and Co. Rotary vacuum pumps.
 H.B.—Cookson and Co. Syphon hydrometers.
 H.B.—Hobday Bros., Ltd. Components and accessories.
 H.C.H.—H.C.H. Co., The. General trade mark.
 H.E.K.—H. E. Kettle, Ltd. Valve set.
 H. and H.—Hildick and Hildick. Telescopic masts.
 H.L.C.—Havenhand, Lewis and Co. Accumulator.
 H.M.S.—Graham Farish, Ltd. Single screened choke.
 H.M.V.—Gramophone Co. Ltd. General trade mark.

MULLARD THE MASTER VALVE

TRADE NAMES

H.S.—Adam Hilger, Ltd. Trade mark for spectroscopically standardised substances.
H.S.P.—H.S.P. Wireless Co. General trade mark.

I

Icall.—I. Calvete, Ltd. Small fractional horse power electric motors.
Ideal.—Columbia Graphophone Co., Ltd. Needles.
Ideal.—Danco Manufacturing Co., Ltd. Coll-holder.
Ideal.—J. S. Millar and Son. Mast and tower.
Ideal.—Wingrove and Rogers, Ltd. Variable condensers.
Igranio.—Igranio Electric Co., Ltd. General trade mark and super-het kit.
Igranico.—Igranio Elec. Co., Ltd. Metal core tuning coils.
Igranipak.—Igranio Elec. Co., Ltd. Tuning unit.
Igranite.—Igranio Electric Co., Ltd. Insulating varnish.
Igranovox.—Igranio Electric Co., Ltd. Pick-up.
Imp.—Ultra Electric, Ltd. Speakers.
Imp.—Imp Radio Co. General trade mark.
Impedance Matching.—Varley. Output transformers.
Imperi.—Hobday Bros., Ltd. Components and accessories.
Imperial.—E. Allen and Co., Ltd. Magnet.
Imperial.—Imp Radio Co. General trade mark.
Imperial.—Crystalate Gramophone Record Mfg. Co., Ltd. Gramophone records.
Imperial.—Ward and Goldstone, Ltd. Dry battery.
Imperial.—Watmel Wireless Co., Ltd. Components.
Indigraph.—Igranio Electric Co., Ltd. Recording tuning dial.
Indispenso.—Ward and Goldstone, Ltd. Charging set.
Industria.—E. Oppenheim and Co., Ltd. Horns.
Inkwell.—Everett, Edgumbe and Co., Ltd. Recording ammeters, voltmeters and wattmeters.
Insulex.—F. L. Lesingham. Screened and Insulated wires and sleeving.
Invincible.—Goodmans (Clerkenwell), Ltd. Moving coil speaker.
Ionic.—Ionic Alkaline Batteries, Ltd. Battery.
Itonaphone.—H. J. Goulden, Ltd. Valve sets.
Itonia.—Itonia Ltd. Gramophone products.
Ivalek.—Ivory Electric. General trade mark.
Ivorex.—Money Hicks, Ltd. Engraved labels.

J

Jacelite.—J. A. Crabtree and Co., Ltd. Moulded B.S. gauge, plugs and sockets, tumblers switches.
Jacid.—Rowland Edwards & Co., Ltd. (Jelly acid) accumulators.
Jacobean.—Halford Radio, Ltd. Receivers and radiograms.
Janette.—The Rothermel Corporation, Ltd. Rotary converters.
Jedson.—John E. Dallas and Sons, Ltd. Gramophones.
Jetei.—J. Thibouville-Lamy and Co. Gramophones.
Jimlinx.—Ready Radio Ltd. Connection wire.
Jockey.—Connollys (Blackley), Ltd. Adhesive tape.
Joyster.—F. M. Storey. H. T. batteries.
Junoeco.—Junction Engineering Co., Ltd. General trade mark.
Jussrite.—Murdoch Trading Co. Record filing cabinets.
Justone.—Bakers Selhurst Radio. Speakers.
J. and A.—Claude Lyons, Ltd. Laboratory apparatus.
J.B.—Jackson Brothers (London), Ltd. Variable condensers.
J.L.—Walter Balmford. Wiring clips.
J.M.—J. Millet. Condensers.

K

Kabi.—F. W. Lechner and Co. General trade mark.
Kabilok.—W. and T. Lock, Ltd. Wireless cabinets.
Kadette.—Kadette, Ltd. Receiver.
Kalanite.—Callender's Cable and Construction Co. Ltd. Insulating material.
Kaleeco.—Callender's Cable and Construction Co., Ltd. Electric cable.
Kalibond.—Callender's Cable and Construction Co., Ltd. Electric cable.
Karna.—Appletons (Leeds) Ltd. Gramophones and speakers.
Karadio.—Lancashire Dynamo and Crypto, Ltd. Battery charger.
Kayvee.—Kemps Vulcanizing Co., Ltd. Accumulators.
Kelsey.—Peto Scott Co., Ltd. Shortwave adaptor.
Kelswood.—Majestic Electric Co., Ltd. Receivers.
Ken.—E. Kerridge and Co. Indoor aerial.
Kenwell.—Kenwell Radio Ltd. Speaker and power pack.
Keramo.—Siemens Elec. Lamps and Supplies, Ltd. Insulating material.
Kestra.—G. Castagnoli. Radio-gramophone outfits, valve sets, amplifiers and components.
Keystone.—Peto Scott Co., Ltd. Condensers and H.F. chokes.
Kidkord.—British Homophone Co., Ltd. Records.
Kingswood.—Majestic Electric Co., Ltd. Receiver.
Kinva.—Postlethwaite Bros. General trade mark.
Kitten.—Kolster Brandes, Ltd. Receiver.
Klinx.—Kay Bros., Ltd. Heat-proof cement.
Klock.—Baker's Selhurst Radio. Moving-coil speaker incorporating synchronous clock.
Kniffy.—Kniveton Cable Works, Ltd. General trade mark.
Knightswood.—Majestic Electric Co., Ltd. Receiver.
Kobra.—Kolster Brandes, Ltd. Receiver.
Kohinor.—British Central Electrical Co., Ltd. Insulating tapes.
Koh-i-Noor.—Primus Manufacturing Co. H.T. batteries.
Kolstar.—Kolster Brandes, Ltd. Super-Het receiver.
Konekap.—Graham-Farish, Ltd. Grid leak.
Konductite.—City Accumulator Co. Metallic screening paper.
Koorak.—Lissen, Ltd. Batteries.
K.—Pye Radio Ltd. Receiver.
K.B.—Kolster-Brandes, Ltd. Receivers and speakers.
K.C.—Dubilier Condenser Co. (1925). Ltd. Variable air condenser, kilocycle tuning.
K.V.—Kemps Vulcanizing Co., Ltd. Accumulators, ebonite, etc.

L

Lacoline.—Ward and Goldstone, Ltd. Coloured connecting wire.
Laker.—J. and J. Laker Co., Ltd. Masts and aerial equipment.
Laminic.—Magnetic and Electrical Alloys, Ltd. Nickel iron cores.
Laminol.—Ellison Insulations, Ltd. Sheet insulating material.
Langmore.—Miscellaneous Trading Co., Ltd. Cabinets.
Lassophone.—East Ham Wireless Supplies. Sets, components and accessories.
Leatheroid.—Willmott, Son and Phillips, Ltd. Fibre.
Lebakite.—Spicers, Ltd. Bakelite sheets, panels, tubes, formers and rods.
Lecodyne.—London Electrical Co. (Sherborne Lane), Ltd. H.T. eliminators and radiograms.
Leogloss.—London Elec. Co. (Sherborne Lane), Ltd. Wires and cables.

THREE MILLION AERIALS

LEAD DOWN TO

MULLARD MASTER VALVES

Leconite.—London Electrical Co. (Sherborne Lane), Ltd. Panels.
 Leosona.—Universal Winding Co. Coil winding machinery.
 Lektrik.—A. P. Lundberg and Sons, Ltd. Switches and plug and sockets.
 Lektrite.—Ward and Goldstone, Ltd. Waterproof insulated aerial wire.
 Leweos.—London Electric Wire Co. and Smiths, Ltd. Radio products.
 Lighthouse.—Dundas Fox, Ltd. Batteries.
 Limit.—Limit Engineering Co., Ltd., General trade mark for gramophone components.
 Limit.—Limit Radio, Ltd. Pick-ups and arms.
 Limpet.—Connollys (Blackley), Ltd. Adhesive tape.
 Linapex.—Ioco Rubber and Waterproofing Co., Ltd. Insulating cloth, silk and tapes.
 Linco.—F. Line and Co. Tools.
 Lindex.—Parlophone Co., Ltd. Sound boxes.
 Linwood.—Dent and Co. and Johnson, Ltd. Speaker.
 Lion.—Amplion (1932), Ltd. Cone speaker.
 Lisenin.—Lisenin Wireless Co. General trade mark.
 Lissen.—Lissen, Ltd. Components.
 Lissenagon.—Lissen, Ltd. Coil.
 Lissenceptor.—Lissen, Ltd. Wavetrap.
 Lissium.—Lissen, Ltd. Coils.
 Lissenola.—Lissen, Ltd. Radio-gramophones, receiving sets, gramophones, speakers, etc.
 Lissenstat.—Lissen, Ltd. Components.
 Lithanode.—Lithanode Co., Ltd. Batteries.
 Litholite.—Litholite Insulators, Ltd. Battery accessories, coil plugs and sockets, insulating mouldings.
 Litlos.—Graham-Farish, Ltd. Variable condensers.
 Little Wonder.—S. W. Scott and Co. Dual range coil.
 Lively "O"—Oldham and Son, Ltd. Accumulators, L.T. and H.T.
 Lockwood.—Lockwood Casework Mfg. Co. General trade mark.
 Loewe Radio.—Loewe Radio Co., Ltd. General trade mark.
 Lohys.—J. Sankey and Sons, Ltd. Transformer laminations.
 Lokvane.—Igranic Electric Co., Ltd. Variable condenser.
 London.—Empire Trading Co. Electric Clock.
 Longlife.—Runwell Cycle Co. (Birmingham), Ltd. Batteries, accumulators and gramophone needles.
 Londona.—Londona, Ltd., P.M. M.C. speakers.
 Lorival.—Lorival Manufacturing Co. (1921), Ltd. Mouldings.
 Loten.—Edison Swan Electric Co., Ltd. L.T. Accumulators.
 Lothian.—S. W. Scott and Co. Screened grid dual range coils.
 Lowrah.—Harwol Specialities Co. Slow motion dials and H.T. batteries.
 Lumophon.—British Lumophon Co. General trade mark.
 Lunmet.—London Metal Warehouses, Ltd. Insulated terminals.
 Lustrolux.—Lustrolux, Ltd. Valves.
 Luxus.—British Goldring Products, Ltd. Goldring sound boxes.
 Lynx.—Ultra Elec., Ltd. Receivers.
 L.E.M.—McLeod and McLeod. Wound bobbins.
 L.E.S.—L.E.S. Distributors, Ltd. Earth tubes.
 L.E.W.—London Electric Wire Co., and Smiths, Ltd. General trade mark.
 L.M.S.—Graham-Farish, Ltd. Twin screened choke.
 L.P.S.—L.P.S. Electrical Co., Ltd. Wire.

M

Macadie.—Automatic Coil Winder and Electrical Equipment Co., Ltd. Coil winder.
 Maco.—Manufacturers Accessories Co. (1928), Ltd. Cabinets and accumulators.

Maconite.—Macintosh Cable Co., Ltd. Insulated cables.
 Macovox.—Manufacturers Accessories Co. (1928), Ltd. Sets.
 Madrigal.—Radio Instruments, Ltd. All mains and battery receivers.
 Magna-flux.—Watson, Saville and Co., Ltd. Magnet steel, cobalt and tungsten magnets.
 Magnafilter.—Burne-Jones and Co., Ltd. Wave trap.
 Magnagram.—Burne-Jones and Co., Ltd. Radio-gramophones.
 Magnavox.—Magnavox (Gt. Britain), Ltd. Moving-coil loudspeakers, mains energised and permanent magnet.
 Magnet.—General Electric Co., Ltd. Accumulators.
 Magnetic.—J. and J. Laker Co., Ltd. Earth tube.
 Magnex.—Higgs (Gt. Britain), Ltd. Receivers and radiograms.
 Magnum.—Burne-Jones and Co., Ltd. Receivers, components and accessories.
 Mahogonite.—American Hard Rubber Co. (Britain), Ltd. Insulating material.
 Majestic.—Majestic Electric Co., Ltd. All-electric receivers and radio-gramophones.
 Maklodon.—McLeod and McLeod. Bakelite mouldings and knobs.
 Mall.—Mall Radio and Electric, Ltd. General trade mark.
 Mandek.—McLeod and McLeod. Choke, head-phone, loudspeaker, and transformer bobbins.
 Mandem.—McLeod and McLeod. General trade mark.
 Mandemite.—McLeod and McLeod. Connecting wire.
 Marathon.—Vince's Dry Batteries, Ltd. H.T. and grid bias batteries.
 Marbalite.—Clayton (Rubber Sales), Ltd. Ebonite sheets and panels.
 Marconi.—Marconiphone Co., Ltd. Valves.
 Marconiphone.—Marconiphone Co., Ltd. Sets, speakers.
 Margo.—Margo Products. Aerial eliminator.
 Marlborough.—Electrical and Radio Products (1931), Ltd. Receiver and radiogram.
 Massicores.—W. B. Savage. Mains components.
 Mastertone.—John E. Dallas and Sons, Ltd. Gramophone.
 Mastiff.—Ward and Goldstone, Ltd. Spring connectors.
 Matched Tone.—Kolster-Brandes, Ltd. Head-phones.
 Matchless.—T. D. Young and Son. Rheostats, coil holders, etc.
 Maxitone.—Lugton and Co., Ltd. General trade mark.
 Mavox.—Mavox All Electric Radio. Mains receivers.
 Max.—Lawrie and Co. Portables.
 Mayfair.—Electrical and Radio Products (1931), Ltd. Radiogram.
 Mazda.—Edison Swan Electric Co., Ltd. Valves.
 Mazelite.—M. Feldman. Crystals.
 McQuality.—Kenwell Radio, Ltd. Receiver.
 Medium Resistance.—J. Sankey and Sons, Ltd. Transformer laminations.
 Megavac.—W. Edwards and Co. Rotary Vacuum pumps.
 Megger.—Evershed and Vignoles, Ltd. Testing instruments.
 Megite.—Graham-Farish, Ltd. General trade mark.
 Megohmax.—J. Moores and Co. Insulation.
 Megohmior.—J. Moores and Co. Ebonite panels.
 Megostat.—Igranic Electric Co., Ltd. Volume control.
 Mellow Tone.—The Mellow Tone Co., Ltd. Needles.
 Melo.—Gould, Harper and Co. Sets.
 Melodee.—Carrington Manufacturing Co., Ltd. Cabinet.
 Melody Maker.—A. C. Cossor, Ltd. Melody Maker kits, battery and all-electric.
 Mercure.—Ward and Goldstone, Ltd. Charging plant.

MULLARD THE MASTER VALVE

TRADE NAMES

- Mercury.—Grosvenor Electric Batteries, Ltd. H.T. battery.
- Meritone.—Thompson, Diamond and Butcher. Gramophones.
- Meritus.—Willis and Co. (Meritus), Ltd. General trade mark.
- Merrybright.—J. and A. Margolin. Gramophones.
- Merrymaker.—Burndept, Ltd. Receivers.
- Mershon.—Magnavox (Gt. Britain), Ltd. Electrolytic condensers.
- Mervyn.—Mervyn Sound and Vision Co., Ltd. General trade mark.
- Messenger.—Lionel Hart, Ltd. H.T. and G.B. batteries.
- Metaplex.—Peto Scott Co., Ltd. Metallised baseboard.
- Metcraft.—Marks and Son, S. General trade mark.
- Metocell.—Ward and Goldstone, Ltd. Air spaced metal screened down lead.
- Metrohm.—Everett, Edgumbe and Co., Ltd. Insulation and resistance testing sets.
- Mettallamax.—Dux Chemical Solutions Co., Ltd. Cone paper.
- Met-Vick.—Edison Swan Electric Co., Ltd. General trade mark.
- Meyer.—E. Oppenheim and Co., Ltd. Turntables.
- Micaylor.—Taylor and Petters, Ltd. Diaphragms for sound-boxes.
- Micron.—Radio Instruments, Ltd. Adjustable inductance coil.
- Microdenser.—Stratton and Co., Ltd. S.W. condenser.
- Microflu.—Microfuses, Ltd. Fuses.
- Microloide.—Whiteley Elec. Radio Co., Ltd. Speakers.
- Micromesh.—Standard Telephones and Cables, Ltd. Valves.
- Microtone.—J. Dyson and Co., Ltd. Radio instruments.
- Midget.—Danipad Rubber Co., Ltd. Micro-gear coil-holders.
- Mika-Densor.—Formo Co. Mica fixed condensers.
- Millgate.—Chorlton Metal Co., Ltd. General trade mark.
- Milnes.—Milnes Radio Co., Ltd. H.T. supply unit from L.T. accumulator.
- Minivo.—Formo Co. Battery eliminators.
- Minor.—Shalless and Evans. Receiver.
- Minster.—Appletons (Leeds), Ltd. Gramophones and speakers.
- Moda.—Michelson Bros. Dry batteries.
- Modula.—British Pix Co., Ltd. Volume control.
- Monarch.—Carrington Mfg. Co., Ltd. Cabinet.
- Monix.—Money Hicks, Ltd. Components.
- Monolt.—Tudor Accumulator Co., Ltd. L.T. accumulator.
- Mononob.—Formo Co. Ganged condenser.
- Monosonic.—Primus Manufacturing Co. Sets.
- Motor.—Motor Radio and Elec. Products. General trade mark.
- Mouldensite.—Bakelite, Ltd. Insulating materials.
- Mozart.—Bradnam and Co. Radio-gramophones.
- Mullard.—Mullard Wireless Service Co., Ltd. General trade mark.
- Multi-Cellular.—Varley. H.F. chokes.
- Multi-Coil.—A. F. Bulgin and Co., Ltd. Patent dual range tuner.
- Multistat.—Six-Sixty Radio, Ltd. Combined on/off switch and radio and gramophone volume control.
- Multitest.—Gambrell Bros. and Co., Ltd. Combined voltmeter, milliammeter and ammeter.
- Multitone.—Multitone Electric Co., Ltd. General trade mark.
- Multivo.—Formo Co. Battery eliminators.
- Multi-Volt.—Varley. Power transformers.
- Mumax.—Climax Radio Electric Ltd. L.F. transformer.
- Musola.—Tyrela Gramophones, Ltd. Gramophones.
- M.A.C.—Manufacturers' Accessories Co. (1928), Ltd. General trade mark.
- M.H.—McMichael Radio, Ltd. Set, amplifier and components.
- M.L.—M.L. Rotax, Ltd. General trade mark.
- M.M.—Pye Radio, Ltd. Set.
- M. and M.—McLeod and McLeod. General trade mark.
- M.R.—Mains Radio Mfg. Co. General trade mark.
- M.U.C.L.—Mechanical Utilities Co., Ltd. H.T. batteries.

N

- Nakvo.—R. O. Bridger and Co. Waterproof compo. cones.
- Nassak.—Nassak Mfg. Co., Ltd. General trade mark.
- National.—Rothermel Corporation, Ltd. Vernier dials.
- National Band.—Thompson, Diamond and Butcher. General trade mark.
- Neawid.—Imp Radio Co. Tapped potential dividers and heavy duty resistances.
- Neawid-Superflex.—Imp Radio Co. Spaghetti type resistances.
- Necol.—Nobel Chemical Finishes, Ltd. Enamels for metal parts, speakers, etc.
- Negrolac.—Ward and Goldstone, Ltd. Indoor and outdoor aerials.
- Neptune.—Danco Manufacturing Co., Ltd. Receiver.
- Neta.—E. A. Wood. Receivers and components.
- Netaglass.—E. A. Wood. Valve-holders.
- Netavox.—E. A. Wood. Receivers and cone assemblies.
- Netax.—E. A. Wood. Valve and coil-holders.
- Neutron.—Ectron, Ltd. Valves.
- Neutron.—Neutron (1927), Ltd. Crystals, components and valves.
- Neutrosonic.—Igranic Electric Co., Ltd. Portable receiver.
- Neutrovernia.—Gambrell Bros. and Co., Ltd. Neutrodyne and balancing condenser.
- Neverbreak.—S. Guiterman and Co., Ltd. Hydrometer.
- New Empire.—Victor Battery Co. Dry batteries.
- New Mascot.—Churchmans, Ltd. General trade mark.
- Newton.—Newtons of Taunton, Ltd. Battery chargers and valve rectifiers.
- Nichoke.—Varley. L.F. choke.
- Niclet.—Varley. L.F. intervalve transformer.
- Nicore.—Varley. H.F. chokes, tuning coils and A.V.C. unit.
- Nicore I. and II.—Varley. L.F. intervalve transformers.
- Ni-fe.—Batteries, Ltd. Battery.
- Nigen.—Formo Co. Nickel alloy transformer.
- Nine Lives.—Boynton and Co., Ltd. Batteries.
- Nivex.—Runbaken Magneto Co., Ltd. Meters.
- Nobeline.—Sicaloid, Ltd. Phenol synthetic resin.
- Nomad.—General Electric Co., Ltd. Set.
- No-Mast.—"No-Mast" Patent Aerial Co. Special mastless outdoor (or indoor) aerial.
- Non-Jam.—J. and J. Laker Co., Ltd. Aerial pulley.
- Non-Resonant.—Weedon Power Link Radio Co., Baffle rings.
- Noroco.—Wilrose Co. (Birmingham) Ltd. Non-rotary D.C.-A.C. converter.
- Nosco.—Northern Steel and Hardware Co., Ltd. Batteries and accumulators.
- Noshok.—E. W. Bonson. Sockets and couplers.
- Novodyne.—R. Waldo Emerson. Testing and P.A. equipment.
- Novotone.—Gambrell Bros. and Co., Ltd. Tone compensator for electrical reproduction of records.
- Nutone.—Carrington Mfg. Co., Ltd. Cabinet.
- Nuvolon.—Nuvolon Electric, Ltd. Speaker.
- N.C.—Bruntons. Resistance wire.
- N.P.—Nash Products, Ltd. General trade mark.

THE TILL WILL TELL YOU MULLARD

O

Obo.—A. E. Andrews and Co. General trade mark.
 Octopus.—Edmonds, Ltd., G. Grip terminals.
 Oclron.—Oclron, Ltd. Valves.
 Odeon.—Parlophone Co., Ltd. Records.
 Ohmic.—B. Kimber Allen and Co. Transformers.
 Ohmite.—Graham Farish, Ltd. Anode and Spaghetti resistances.
 Oldham.—Oldham and Son, Ltd. Batteries.
 Olympic.—Stadium, Ltd. Hydrometers.
 Omega.—H. Joseph. Soldering irons.
 Orchestrion.—Thompson, Diamond and Butcher. General trade mark.
 Organola.—Gresley Radio, Ltd. Radio-gramophone.
 Orgola.—Mullard Wireless Service Co., Ltd. General trade mark.
 Original.—Lehmann, Archer and Co., Ltd. Tools, taps and dies.
 Orizone.—Harrison and Norris. Sets, coil and lightning arrester.
 Ormond.—Ormond Engineering Co., Ltd. Components.
 Orr.—Orr Radio, Ltd. General trade mark.
 Orthotone.—Watmel Wireless Co., Ltd. Components.
 Osborn.—C. A. Osborn. General trade mark.
 Osram.—General Electric Co., Ltd. Valves.
 Osram Music Magnet.—General Electric Co., Ltd. Home constructor's set.
 Ostar-Ganz.—Eugen Forbat. General trade mark.
 Overnight.—F. C. Heayherd and Co. Battery charger.
 Oxford.—Carrington Mfg. Co., Ltd. Cabinet.
 O.K.—J. Toubkin. Chokes, batteries, speakers, etc.
 O.K. Presspahn.—Willmott, Son and Phillips, Ltd.

P

Pakawa.—Barrow, Hepburn and Gale, Ltd. Patent handles for portable cases.
 Pam.—Claude Lyons, Ltd. D.C. and A.C. operated amplifiers.
 Pan.—Master Radio Co. General trade mark.
 Panachord.—Brunswick, Ltd. Records.
 Panadyne.—E. V. Mackintosh and Co. Loud-speakers.
 Panalite.—Clayton Rubber Sales, Ltd., Ebonite panels and sheets.
 Panatrop.—Brunswick, Ltd. Radio-gramophone.
 Panswitch.—Gent and Co., Ltd. Switches.
 Panther.—Ultra Electric, Ltd. Receiver.
 Pantophone.—Parlophone Co., Ltd. Records, needles and pick-ups.
 Parafeed.—Radio Instruments, Ltd. L.F. transformer.
 Paragon.—Clarkes (Redditch) Ltd. Terminals.
 Paragon.—H. J. Fletcher and Co., Ltd. Needles and record-filing cabinets.
 Paramount.—Paramount Gramophone Co. Receivers and gramophones.
 Parex.—E. Paroussi. Components, accessories and metal cabinets.
 Parfait.—H. B. Potter and Co., Ltd. Ebonite.
 Parlophone.—Parlophone Co., Ltd. Records and needles.
 Parmeko.—Partridge and Mee, Ltd. General trade mark.
 Parvo.—Igranic Electric Co., Ltd. Parallel feed transformer.
 Passport.—Hart Collins, Ltd. Receivers and radiogram.
 Pattonite.—David J. Patton, Ltd. Insulating material.
 Paulette.—Paul's Wireless Stores. General trade mark.
 Paxolin.—Micanite and Insulators Co., Ltd. General trade mark.
 Peace.—J. E. Stott. Earth switch and lead in tube.
 Peace Products.—Henry Peace, Ltd. General trade mark.
 Peerlex.—Clarke Bros. (Leicester), Ltd. H.T. batteries.

Pentamu.—Radio Instruments, Ltd. Pentode output transformer.
 Pentomite.—Radio Instruments, Ltd. L.F. smoothing and filter output choke.
 Pentode Two.—Mains Power Radio, Ltd. Receiver.
 Pentone.—Mullard Wireless Service, Co., Ltd. Valves.
 Petrovol.—Igranic Electric Co., Ltd. Microphone.
 Perco.—Gre-Solvent Co. Iron cement.
 Percolite.—Aerialite, Ltd. Chemical percolative earth tubes.
 Perfect.—Oclron, Ltd. Valves.
 Perfecta.—E. W. Bonson. Plugs.
 Perma.—F. W. Lechner and Co., Ltd.
 Permadyne.—Goodmans (Clerkenwell), Ltd. Moving-coil speaker.
 Permalloy.—Standard Telephones and Cables, Ltd. High magnetic alloy for cores.
 Permol.—British Hard Rubber Co., Ltd. Non-discolouring ebonite.
 Perpetuum.—Aladdin Gramophone and Accessories Co. Gramophone motors.
 Pertinax.—G. L. Scott and Co., Ltd. Insulation and wire.
 Pertrix.—Britannia Batteries, Ltd. Dry batteries and accumulators.
 Petmecky.—Murdoch Trading Co. Gramophone needles.
 Phantom.—Lampex Radio and Elec. Co. General trade mark.
 Philco.—Philco Radio and Television Corp. (of G.B.), Ltd. General trade mark.
 Philco Transitone.—Philco Radio and Television Co. of Great Britain, Ltd. Car radio.
 Philips.—Philips Industrial Ltd. General trade mark.
 Philips.—Philips Lamps, Ltd. Sets, rectifying valves, components and accessories.
 Philite.—Philips Industrial Ltd. Synthetic resin moulding.
 Philomel.—Philomel and Radio Equipment. General trade mark.
 Phoenix.—Phoenix Telephone and Elec. Works., Ltd. Tinsel.
 Pifco.—Provincial Incandescent Fittings Co., Ltd. General trade mark.
 Pilot.—Peto-Scott Co., Ltd. Kits, sets.
 Pilot Author.—Peto Scott Co., Ltd. Kits.
 Pioneer.—Pioneer Manufacturing Co. General trade mark.
 Pip.—Graham Farish, Ltd. Transformers.
 Piouette.—A. W. Chapman, Ltd. Turntables, loud speakers, frame aerials, etc.
 Pix.—British Pix Co., Ltd. General trade mark.
 Pix-Crossley.—British Pix Co., Ltd. Receivers.
 Pixie.—L. R. Wood. General trade mark.
 Plastape.—Amplion (1932), Ltd. Aerial, earth and twin extension wire.
 Plastine.—Sicaloid Ltd. Acetate moulding powder.
 Plaza.—British Homophone Co., Ltd. Records.
 Plaza.—E. H. Maisner and Co., Ltd. H.T. batteries.
 Plus Four.—Paul Taylor. H.T. dry battery.
 Pluton.—A. Wade and Co. (Burnley), Ltd. Receivers.
 Polar.—Wingrove and Rogers, Ltd. Components and accessories.
 Polar Star.—Wingrove and Rogers, Ltd. Variable condensers.
 Popular.—Baker's Selhurst Radio. Speakers.
 Popular.—Carrington Manufacturing Co., Ltd. Cabinet.
 Popular.—Danco Manufacturing Co., Ltd. Coil-holder and receiver.
 Popular.—Ever-Ready Co. (Great Britain), Ltd. H.T. batteries.
 Portadyne.—Portadyne Radio (Whittingham Smith and Co., Ltd.). Sets.
 Portland.—Curry's Ltd. Sets.
 Positive Grip.—Lisenin Wireless Co. Plugs, sockets, spade ends, pin ends, wander plugs, mains sockets.
 Powa-Pac.—Brown Brothers, Ltd. H.T. and grid bias batteries.

MULLARD THE MASTER VALVE

TRADE NAMES

Power Unit.—Watson and Henderson, Ltd. Batteries.
Powertone.—Powertone Products. General trade mark.
Precision Radio.—Precision Radio and Mfg. Co., Ltd. General trade mark.
Precision Unit Cell.—Watson and Henderson, Ltd. H.T. batteries and replacement cells.
Premier.—Vinces Dry Batteries, Ltd. H.T. and grid bias batteries.
Premierphone.—Lisenin Wireless Co. Sets.
Prima Donna.—Aladdin Gramophone and Accessories Co. Sound boxes.
Primus.—Primus Manufacturing Co. Cone units and speakers.
Primus-Autocel.—Primus Manufacturing Co. H.T. batteries.
Primustatic.—Primus Manufacturing Co. Loud-speaker.
Princewood.—Majestic Electric Co. Receiver.
Prisma.—Mica Mfg. Co., Ltd. Mouldings.
Progress.—British G.W.Z. Battery Co., Ltd. H.T. batteries.
Protexo.—H. S. Cooke and Co. Safety aerial earth switch.
Protograph.—Siemens Schukert (Gt. Britain), Ltd. Record cutting apparatus.
Pup.—Kolster-Brandes, Ltd. Receiver.
Puretone.—J. and H. Walter, Ltd. Loudspeaker units.
Pushback.—Ward and Goldstone, Ltd. Connecting wire.
Pyaneer.—Brown Brothers, Ltd. Pocket Lamp batteries.
Pylon.—Time Recorder and Equipment Co. Electric clocks.
Pyrex.—J. A. Jobling and Co., Ltd. Insulators.
Pye.—Pye Radio, Ltd. General trade mark.
P.B.—McLeod and McLeod. Tapes (varnished).
P.D.—Automobile Accessories (Bristol), Ltd. Valve set and components.
P.D.—Gould, Harper and Co. Sets.
P.M.—Mullard Wireless Service Co., Ltd. General trade mark.
P.P.M.—Celestion Ltd. Speakers.

Q

Quad-Astatic.—Radio Instruments, Ltd. H.F. choke.
Quaker.—McLeod and McLeod. Processing oils.
Queen Anne.—Halford Radio, Ltd. Receivers and radiograms.
Quickfix.—Aerialite, Ltd. Aerial erecting brackets.
Quick-fix.—Eagle Transfer, Ltd. Transfers.
Quick-Grip.—Ward and Goldstone, Ltd. Connector.
Quickwyre.—A. F. Bulgin and Co., Ltd. Slip covered connecting wire.
Quixo.—Runbaken Magneto Co., Ltd. Battery testers.
Q.—Pye Radio Ltd. Portable.
Q.C.C.—Quartz Crystal Co. Crystals and transmitting apparatus.
Q.J.—Wingrove and Rogers, Ltd. Variable condenser.

R

Radeo.—Radio Mfg. Co. Receivers.
Radenite.—Van Raden and Co., Ltd.
Radiamp.—Radiamp Co. Components.
Radiant.—Dawkins Trading Co., Ltd. Accumulators.
Radiette.—Kadette, Ltd. Midget sets.
Radio for the Million.—United Radio Mfrs., Ltd. Kit set.
Radiocraft.—Radiocraft Supplies, Ltd. Components and accessories.
Radiogrand.—Telsen Electric Co., Ltd. L.F. transformer.
Radio-Graphophone.—Columbia Graphophone Co., Ltd. Radio-gramophones.

Radiola.—Richardsons (R.M.L.), Ltd. Gramophones.
Radiolab.—Radiolab Mfg. Co. Laboratory testing apparatus.
Radiomatic.—Gent and Co., Ltd. Valve set.
Radio-Micro.—Impex Electrical, Ltd. Valves.
Radiomonic.—Radiomonic Ltd. General trade mark.
Radion.—American Hard Rubber Co. (Britain), Ltd. Insulating material.
Radion.—Green's Wireless Stores. Cradle frames.
Radionite.—British Radio Mfg. Co. (Liverpool) Ltd. Synthetic crystal rectifiers.
Radiopak.—British Radiophone, Ltd. Band pass and super het units.
Radiopath.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Radiostenode.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Radiostenostat.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Radiotrope.—Thompson Diamond and Butcher. Gramophone to radio conversion unit.
Radiowire.—David Green and Son, Aerial wire.
Radio XXX.—M. Feldman. Accumulators and crystals.
Radvaco.—Blitz Bros. Valves.
Rapid-Flow.—S. Gulterman and Co., Ltd. Acid pump.
Ravalid.—J. Moores and Co. Cabinets and components.
Ray.—Ray Eng. Co., Ltd. General trade mark.
Reactol.—Gent and Co., Ltd. Reaction coils.
Reactone.—Sylvex, Ltd. Coils.
Ready Radio.—Ready Radio, Ltd. Screens, coils and variable condensers.
Reception.—Concordia Electric Wire Co., Ltd. Insulated aerial wire.
Receptra.—British Radiophone, Ltd. Anti-static down lead.
Record.—Danco Manufacturing Co., Ltd. Geared coil-holder.
Record.—Record Electrical Co., Ltd. Tester.
Record.—Ward and Goldstone, Ltd. Dry Battery.
Recitane.—Varley. Compensating transformer.
Red-ditch.—Clarkes (Redditch) Ltd. Gramophone needles.
Red Kap.—London and Provincial Factors, Ltd. Transformers and speaker units.
Red Lion.—R. Cadisch and Sons. General trade mark.
Redmanol.—Bakelite, Ltd. Insulating materials.
Red Triangle.—Peto Scott Co., Ltd. Ebonite panels.
Refty.—Davis and Timmins, Ltd. Terminals.
Regal.—Spicers, Ltd. Ebonite.
Regal-Zonophone.—Columbia Graphophone Co., Ltd. Records.
Regentone.—Regentone, Ltd. Mains units, mains receivers and mains components.
Regis.—E. W. Bonson. Plugs.
Rejestostat.—Kolster Brandes, Ltd. Static eliminator.
Reliability.—J. H. Taylor and Co. Batteries, variable and fixed condensers, and ebonite.
Reliance.—A. Diggle and Co. Charging plant.
Reliance.—Emaree, Ltd. General trade mark.
Reliomac.—Manufacturers' Accessories Co. (1928), Ltd. H.T. battery, dual range coil and P.W. coil.
Renown.—Goodmans (Clerkenwell), Ltd. P.M. M.C. speaker.
Renown.—Mile End Radio Co. Components and accessories.
Resiston.—American Hard Rubber Co. (Britain), Ltd. Insulating material.
Revlec.—A. W. Green. Home talks.
Rex.—Rex Gramophone Co., Ltd. Portable gramophones.
Rheoswitch.—A. F. Bulgin and Co., Ltd. Combined H.T. and L.T. switch.
Rich and Bundy.—Rich and Bundy, Ltd. General trade mark.
Richtone.—London Radio Co. (Leeds), Ltd. Valves, speakers, accumulators and H.T. batteries.

JOIN THE BETTER RADIO BRIGADE

Richtone.—H. A. Riche. General trade mark.
Rifanco.—Regent Fittings Co. Gramophones and accessories.
Riley Radio.—W. Riley and Son. Sets and radio-grams.
Ring.—George Bowerman, Ltd. H.T. battery.
Ripaults.—Ripaults, Ltd. Components and accessories.
Rival.—Hobday Bros., Ltd. Components and accessories.
Riverside.—Carrington Mfg. Co., Ltd. Cabinet.
Roebuck.—Buck and Hickman, Ltd. Belting, pulleys and tools.
Rola.—British Rola Co., Ltd. Moving coil speakers.
Ross, Courtney.—Ross, Courtney and Co., Ltd. Terminals.
Rotor-Ohms.—Rotor Electric, Ltd. Variable resistances.
"Rover 2."—Goodwin Radio, Ltd. Set.
"Rover 3."—Goodwin Radio, Ltd. Set.
Royal Cullinan.—Commercial Engineering Co. Sets built in plate glass.
Royal Prince.—Commercial Engineering Co. Mains transformers, chokes and speakers.
Royalty.—Rothermel Corporation, Ltd. Wire-wound grid-leak, resistance and modulator.
Rozinal.—Gre-Solvent Co. Soldering paste.
Rubiphone.—F. Cholerton. Receiver.
R. and A.—Reproducers and Amplifiers, Ltd. General trade mark.
R.A.P.—Radio Acoustic Productions. General trade mark.
R.C.—R. C. and Wilson Elec., Ltd. General trade mark.
R.G.D.—Radio-gramophone Development Co. Radio-gramophones, speaker, pick-ups and arms.
R.K.—British Thomson-Houston Co., Ltd. Coil-driven speaker and amplifiers.
R.L.—R. Cadisch and Sons. Switches, terminals and plugs.
R.M.R.—R.M. Radio, Ltd. Complete receivers.

S

Sampson.—Ward and Goldstone, Ltd. Accumulators and accumulator carriers.
Samson.—Claude Lyons, Ltd. Laboratory apparatus.
Sandringham.—Goodmans (Clerkenwell), Ltd. Cone speaker.
Saturn-Electric.—British Goldring Products, Ltd. Sound boxes.
Savage.—W. B. Savage. Fixed condensers.
Savana.—Rose, Morris and Co., Ltd. General trade mark.
Saveit.—Hellesens Ltd. Safety fuse wander plug.
Saville.—Shalless and Evans. Receiver.
Savoy.—Shalless and Evans. Receiver.
Saxbestos.—Saxonia Elec. Wire Co., Ltd. Asbestos cord wires.
Saxon.—Saxon Radio Co. Components and aerial wire.
Saxonia.—Saxonia Electrical Wire Co., Ltd. General trade mark.
Shik.—Willmott, Son and Phillips, Ltd. Lightning arresters.
Scientific.—Scientific Supply Stores (Wireless), Ltd. General trade mark.
Scientific.—Stratton and Co., Ltd. Short wave apparatus and receivers.
Scott Sessions.—G. Scott—Sessions and Co. General trade mark.
Seoville.—The Rothermel Corporation, Ltd. Tung tuning condensers.
Serufuse.—Belling and Lee, Ltd. Long path wire fuse.
Seamark.—C. E. Needham and Brother, Ltd. Coil.
Secos.—Lissen, Ltd. Batteries.
Segie.—S. Guiterman and Co., Ltd. Battery charging clips.
Selectanet.—Spong and Co., Ltd. Indoor and outdoor aeriels and earth mat.

Selectatune.—C. G. Chalkley. Tuning unit.
Self Regenerative.—Ripaults, Ltd. H.T. dry batteries.
Senator.—A. F. Bulgin and Co., Ltd. Trans-formers.
Seradex.—T. Pepper. General trade mark.
Sesame.—A. Boumphey. Record cabinet.
Setaw.—London and Provincial Factors, Ltd. Meters.
Shalless.—Shalless and Evans. General trade mark.
Shearex.—A. E. Shearing, Ltd. Components.
Sicalite.—Sicaloid, Ltd. Casein products.
Sicaloid.—Sicaloid, Ltd. General trade mark.
Sickles.—Rothermel Corp., Ltd. Coils.
Sicoid.—Sicaloid, Ltd. Non-flam. celluloid.
Siemens.—Siemens Electric Lamps and Supplies Ltd. Batteries.
Siemens and Halske.—Siemens Schuckert (Gt. Britain), Ltd. General trade mark.
Sieverts.—J. McMillan and Co. Enamelled copper wire.
Sifam.—Sifam Elec. Instrument Co., Ltd. General trade mark.
Siftron.—Amplion (1932), Ltd. Aerial wire.
Silent Sentry.—Lamplugh Radio, Ltd. Lightning arrester.
Silcor.—Magnetic and Electrical Alloys, Ltd. Silicon iron cores.
Silverdome.—Octron Ltd. Valves.
Silver Ghost.—Lamplugh Radio, Ltd. General trade mark.
Simple.—Gould, Harper and Co. Tuners.
Simple-strip.—New London Electron Works, Ltd. Perforated instrument wire.
Simplicity.—S. Guiterman and Co., Ltd. Acid pump.
Simplicon.—Williams and Moffat, Ltd. Components.
Simpson's Electric Turntable.—Simpsons Electricals, Ltd. Electric gramophone motor.
Sinew.—Clarks (Redditch), Ltd. Steel springs.
Single Dial.—S. W. Scott and Co. Dual coils.
Sinus.—E. A. Wood. Speakers.
Sistoflex.—Spicers, Ltd. Insulating sleeving and materials.
Six-Sixty.—Six-Sixty Radio Co., Ltd. General trade mark.
Skyscraper.—Lissen, Ltd. Kits.
Slektun.—Slektun Products, Ltd. Sets and components.
Slipquik.—Concordia Elec. Wire Co., Ltd. Insulated connecting wire.
Snap.—Graham Farish, Ltd. H.F. chokes.
Solar.—Cadmam, Williams and Co., Ltd. Speakers.
Solex.—British Homophone Co., Ltd. Records.
Solex.—Wilhose Co. (Birmingham), Ltd. Sets, speakers and batteries.
Soldura.—F. L. Lesingham. Insulating sleeving and connecting wires.
Sonette.—Amplion (1932), Ltd. Moving coil speaker.
Songster.—J. Stead and Co., Ltd. Gramophone needles and sound-box.
Sonochoorde.—Sonochoorde Reproducers, Ltd. General trade mark.
Sopranoist.—London and Provincial Factors, Ltd. Accumulators, batteries, components and hydrometers.
Sorbo.—Sorbo Rubber Sponge Products, Ltd. General trade mark.
Sound Service.—Hillman Bros. Accumulators and earth tubes.
Sovereign.—Atlas Carbon and Battery Co., Ltd. Batteries.
Sovereign.—Sovereign Products, Ltd. Components.
Sparta.—Fuller Accumulator Co. (1926), Ltd. Dry batteries.
Spedding-Super.—A. Spedding. Valve sets.
Spekker.—Adam Hilger, Ltd. Trade mark for specialised spectroscope, spectro photometer, etc.
Spirohm.—Dubillier Condenser Co. (1925), Ltd. Wire-wound resistors.
Spot.—Danco Manufacturing Co., Ltd. Coil-holder.

MULLARD THE MASTER VALVE

TRADE NAMES

Spotter.—Yorkshire Radio Co. Valve and crystal sets.
Sprague.—The Rothermel Corporation, Ltd. Electrolytic condensers.
Springflat.—J. G. Beddoes, Ltd. Collapsible spring handle.
Springmore.—Igranic Electric Co., Ltd. Wander plug.
Square Peak.—Varley. Mains receivers and tuning coils.
Squiregram.—Frederick Squire, Ltd. Portable gramophone attachment with pick-up.
Stabyl.—C.I.V.A.R.E., Ltd. Products.
Stadium.—Stadium, Ltd. Hydrometers, voltmeters and ammeters.
Stal.—Electric Lamp Service Co., Ltd. Transformers.
Stalloy.—Joseph Sankey and Sons, Ltd. Transformer lamination and diaphragms.
Standard.—Graham Farish, Ltd. Grid leak.
Standard.—Shalles and Evans. Receiver.
Standard-de-Luxe.—Commercial Engineering Co. All mains short wave sets.
Standard Radio.—Standard Telephones and Cables, Ltd. General trade mark.
Standard Red.—Edison Swan Electric Co., Ltd. Universal electric gramophone motor.
Standynis.—Geo. L. Scott and Co., Ltd. Dynamo and transformer sheets and stampings.
Stantranis.—Geo. L. Scott and Co., Ltd. Dynamo and transformer sheets and stampings.
Staric.—George Bowerman, Ltd. Condensers, transformers, switches and flex.
Starmac.—Metal Agencies Co., Ltd. Accumulators.
Steed.—Amalgamated Manufacturers. Coil winder.
Stenode.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Stenodyne.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Stenolith.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Stenophone.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Stenostat.—British Radiostat Corporation, Ltd. Radio-gramophone and receiver.
Sterling.—Sterling Varnish Co. Insulating varnishes and compounds.
Sterno.—British Homophone Co., Ltd. Records.
St. Ivel.—British General Radio Co., Ltd. General trade mark.
Stockmar.—Stockall Marples and Co., Ltd. Synchronous clocks.
Storan.—Storey Bros. and Co. General trade mark.
Storch.—F. L. Lesingham. Two-pin plugs and sockets.
Sternovox.—Goodmans (Clerkenwell), Ltd. Chassis.
Stremlin.—Aladdin Gramophone and Accessories Co. Tone arm.
Stronkor.—Johnson & Phillips, Ltd. Flexible cable.
Struckakit.—Peto Scott Co., Ltd. Kits.
Sunbeam.—Sunbeam Electric Ltd. General trade mark.
Sunco.—Sun Electrical Co., Ltd. General trade mark.
Super 1.—Ever-Ready Co. (Gt. Britain), Ltd. H.T. battery.
Super Artiste.—Pohlman and Son, Ltd. Radiogram.
Super A.—Higgs (Gt. Britain), Ltd. Receiver and radiogram.
Super B.—Higgs (Gt. Britain), Ltd. Receiver and radiogram.
Super C.—Higgs (Gt. Britain), Ltd. Receiver and radiogram.
Super D.—Higgs (Gt. Britain), Ltd. Receiver and radiogram.
Superb.—Commercial Engineering Co. Mains eliminators, A.C. and D.C.
Superbe Label.—Columbia Graphophone Co., Ltd. Needles.

Supercell.—Runwell Cycle Co. (Birmingham), Ltd. Accumulators.
Supercision.—F. C. Heayberd and Co. Measuring instruments.
Superdyne.—British Radio Manufacturing Co. (Liverpool), Ltd. Super-heterodyne apparatus and accessories.
Superial.—New London Electron Works, Ltd. Insulated aerial wire.
Superscale.—Everett, Edgcombe and Co., Ltd. Moving iron and moving coil ammeters and voltmeters.
Supertone.—Supertone Pianos, Ltd. Radio piano.
Supreme.—Vee Cee Dry Cell Co. (1927), Ltd.
Supremus.—Supremus Specialities, Ltd. General trade mark.
Supronic.—L.P.S. Electrical Co., Ltd. Resistance alloys.
Susaphon.—Imp Radio Co. M.C. speakers, cone speakers and units.
Sutra.—George Bowerman, Ltd. Transformers, voltmeters, valve holders, coil holders, mains supply units, etc.
Sutra.—C.I.V.A.R.E., Ltd. Components.
Swan-Neck.—Amplion (1932), Ltd. Speaker.
Sylphone.—Frederick Squire, Ltd. Moving coil speaker.
Sylvania.—Claude Lyons, Ltd. Valves.
Sylverex.—Sylvex, Ltd. Cone material, cone washers and tinsel fabric for speakers.
Sylver Fox.—Dundas Fox, Ltd. Batteries.
Symphonion.—Dulcetto Polyphon, Ltd. Gramophones.
Symphony.—J. Toubkin. Headphones and transformers.
Synchratrane.—Sydney S. Bird and Sons, Ltd. Ganged variable condensers with individual adjustment.
Synchrone-Blue.—Edison Swan Electric Co., Ltd. A.C. electric gramophone motor.
Synchromains.—Synchronome Co., Ltd. Synchronous clocks.
Synchroneome.—Synchronome Co., Ltd. Electric clocks.
Synolock.—Everett Edgcombe and Co., Ltd. Synchronous clocks and time switches.
S.—Pye Radio Ltd. Superhet.
S.D.L.—S. Dagnall, Ltd. Receiver.
S. G. Brown.—National Radio Service Co. Headphones.
S.I.W.—Scott Insulated Wire Co., Ltd. Wire.
S.L.—Spiers, Ltd. Ebonite.
S.R.S.—Stonehouse Radio Supplies. Ultra short wave unit, receivers, coils and screen grid converters.
S. and S.—J. E. Stott. Lead-in tubes.

T

Tablegram.—Carrington Mfg. Co., Ltd. Cabinet.
Tachy.—Acme Album Service. Record carrying case.
Talkatome.—British Talkatome, Ltd. Home talkies.
Talkie Label.—Columbia Graphophone Co., Ltd. Needles for cinema use.
Tangent.—Gont and Co., Ltd. Components and accessories, mains transformers and chokes.
Tannoy.—Tannoy Products. General trade mark.
Tarry.—Tarry's. General trade mark.
Taylex.—F. Taylor. Wet H.T. batteries.
Tefag.—Dr. Nesper, Ltd. Tongue-type four-pole unit.
Telecontrol.—Halford Radio, Ltd. Receivers and radiograms.
Telenduron.—Thos. De-la-Rue and Co., Ltd. Bakelite, insulating compounds and mouldings.
Televisor.—Baird Television, Ltd. Television receiving apparatus.
Telsen.—Telsen Electric Co., Ltd. General trade mark.
Temo.—Telephone Mfg. Co., Ltd. A.C. electric clocks.
Tenastine.—Kay Bros., Ltd. Adhesive cement.
Termytabs.—Money Hicks, Ltd. Terminal labels.
Terralto.—R. Custerson. Speakers, cones and receiving sets.

WITH MULLARD AT YOUR FINGERTIPS YOU'RE CERTAIN OF YOUR SALES

Terravivor.—Eric J. Lever (Trix), Ltd. Earthing chemical.
The New M.P..—McWhirr, Paterson and Co. General trade mark.
Theorem.—McWhirr, Paterson and Co. Variable condensers.
"The Perfect.".—Aladdin Gramophone and Accessories Co. Sound boxes.
Thermo-Breaknot.—S. Guiterman and Co., Ltd. Hydrometer.
Thordarson.—The Rothermel Corporation, Ltd. L.F. transformers and chokes.
Three Star.—Sunlight Mfg. Co., Ltd. Dry batteries.
Three Star.—Three Star Accumulators, Ltd. Accumulators.
Thunderbolt.—Buck and Hickman, Ltd. High speed steel, insulated pliers (non-chip).
Tiger.—Ultra Elec., Ltd. Receiver.
Tiltrack.—B. Thomas. Storage trays for small parts.
Timpani-Tone.—Lamplugh Radio, Ltd. Baffle.
Tinol.—Tutills, Ltd. Set, components and accessories.
Titian.—H. J. Fletcher and Co., Ltd. Spring motors.
Toga.—Buck and Hickman, Ltd. Small tools and bar iron.
Tone Selector.—Harlie, Ltd. Components and accessories.
Torex.—Lissen, Ltd. Transformers.
Touchstone.—Gent and Co., Ltd. Speaker.
Tourist.—Hart Collins, Ltd. Portable and transportable sets.
Tournaphone.—Murdoch Trading Co. Gramophones.
Tower.—Tower Radio Supplies. General trade mark.
Traficand.—Junction Engineering Co., Ltd. Speaker toner.
Transadyne.—Neutron (1927), Ltd. Receiver.
Transchoke.—Varley, Q.P.P. Output components.
Transfeeda.—Benjamin Electric, Ltd. Parallel feed transformer.
Trefoil.—Bakelite, Ltd. Laminated sheet.
Trelleborgs.—Trelleborgs Ebonite Works, Ltd. Ebonite and bakelite.
Trentradio.—Cowlshaw Bros. Set and tuner.
Triad Grand.—Union Radio Co., Ltd. Receivers.
Trier.—Buck and Hickman, Ltd. Grindstone dressers and safety rests.
Triotron.—Elec. Lamp Service Co., Ltd. Valves.
Triotron.—Triotron Radio Co., Ltd. General trade mark.
Triparte.—Ward and Goldstone, Ltd. Terminals.
Trix.—Eric J. Lever (Trix), Ltd. Sets, components, accessories, mains transformers and power amplifiers.
Truescrews.—True Screws, Ltd. General trade mark.
Truevibro.—R. O. Bridger and Co. Cones.
Trump.—Ardea Vulcanizer Syn., Ltd. Electric soldering irons.
Trutest.—S. Guiterman and Co. Hydrometers.
Trutone.—Richardsons (R.M.L.), Ltd. Gramophones and components.
Truvolt.—The Rothermel Corporation, Ltd. Resistance.
Truvox.—Universal Gramophone and Radio Co., Ltd. General trade mark.
Tube Wire.—J. Moores and Co. Connecting wire.
Tudor.—Tudor Accumulator Co., Ltd. Accumulator.
Tufnol.—Ellison Insulations, Ltd. Insulating material, tube sheet and panel.
Tuftest.—Willmott, Son and Phillips, Ltd. Fibre.
Tuftex.—Williamson and Phillips, Ltd. Leatheroid substitute.
Tunewell.—Tuncwell Radio Co., Ltd. General trade mark.
Tungar.—British Thomson-Houston Co., Ltd. Battery charger.
Tungstelite.—Tungstelite, Ltd. Crystal and crystal detector.
Tungstyle.—Gramophone Co., Ltd. Semi-permanent needles.

Tungsum.—Tungsum Electric Lamp Work (Great Britain), Ltd. Valves.
Tungstone.—Tungstone Accumulator Co., Ltd. Accumulators.
Turbo-Stalloy.—J. Sankey and Sons, Ltd. Speaker pole pieces and reeds.
Twin-cone.—Green and Faulconbridge, Ltd. Speakers.
Twin-Fuse.—Gambrell Bros. and Co., Ltd. Safety fuses.
Twingrip.—J. G. Beddoes, Ltd. Automatic safety lock.
Twin-Mag.—Goodmans (Clerkenwell), Ltd. Loud-speaker unit.
Twintriple.—Pye Radio, Ltd. Portables.
Twoside.—Redferns Rubber Works, Ltd. Ebonite panels.
Tylophonic.—Tyrela Gramophones, Ltd. Gramophones and radiograms.
Tyrela.—Tyrela Elec., Ltd. General trade mark.
Tyrela.—Tyrela Gramophones, Ltd. Gramophones and radiograms.
T.C.C..—Telegraph Condenser Co., Ltd. Fixed condenser.
T.E.C..—Elandem Co., Ltd. Dry cell and accumulator.
T.M.C. Hydra.—Telephone Mfg. Co., Ltd. Condensers.
T.S.L..—Tone Screws, Ltd.

U

Ultra.—Ultra Electric, Ltd. General trade mark.
Umello.—Umello, Ltd. General trade mark.
Unic.—Richardsons (R.M.L.), Ltd. Components and gramophones.
Uniflex.—Liverpool Radio Supplies. Sets.
Unigrad.—Radio Instruments, Ltd. Volume controls.
Unigram.—Cosmocord, Ltd. Playing desk.
Uni-Knob.—Wingrove and Rogers, Ltd. Variable condensers.
Unipivot.—Cambridge Instrument Co., Ltd. Galvanometers.
Unique Radio.—W. Riley and Sons. Batteries.
Unirad.—Union Radio Co., Ltd. General trade mark.
Unisphere.—Mervyn Sound and Vision Co., Ltd. Mirror drum scanners.
Unit.—Belling and Lee, Ltd. Pick-up.
United Press.—Rothermel Corp., Ltd. Moulded cones.
Unitron.—Service Equipment Co., Ltd. Battery chargers.
Universal.—E. J. Francois. Terminals, winder-plugs and switches.
Universe.—Cosmocord, Ltd. Pick-ups, potentiometers and volume controls.
Univolt.—Univolt Elec. Ltd. Radiogram units.
Utility.—Wilkins and Wright Ltd. General trade mark.
Utix.—Ripaults, Ltd. H.T. dry batteries and loudspeakers.

V

Van Raden.—Van Raden and Co., Ltd. H.T. and L.T. accumulators.
Vari-a-fixed.—Franklin and Freeman, Ltd. Compression type fixed condensers.
Varial.—New London Electron Works, Ltd. Variable aerial.
Varicap.—Radio Instruments, Ltd. Preset condenser.
Varitone.—Radio Instruments, Ltd. L.F. Transformer.
Varoto.—W. Bird and Sons. Set and amplifier.
Varsity.—Guillaume and Sons, Ltd. Gramophone needles.
Vatea.—Abbey Radio. Valves.
Vee Cee.—Vee Cee Dry Cell Co. (1927), Ltd. H.T. dry cell batteries.
Vee Cee Baa.—V. C. Bond and Sons, Ltd. Cabinets.
Venauto.—Venner Time Switches, Ltd. Automatic programme selector.

MULLARD THE MASTER VALVE

TRADE NAMES

Verona.—Jabez, Bate and Co., Ltd. General trade mark.
 Veso.—H. Joseph. Electric clocks.
 Verto.—Baxendale and Co., Ltd. Accumulators.
 Vibro.—Burne Jones and Co., Ltd. Valve-holder.
 Vibroider.—Benjamin Electric, Ltd. Anti-microphonic valve holders.
 Victor.—Victor Battery Co. H.T. battery.
 Victor.—R. and A., Ltd. P.M.-M.C. speakers.
 Violina.—Leslie Dixon Switchgear Co. Cabinet speaker.
 Violute.—E. A. Wood. Speakers.
 Viophone.—E. A. Wood. Speakers.
 Visitron.—Claude Lyons, Ltd. Photo cells.
 Vitres.—E. R. Morton, Ltd. Wire wound resistance.
 Viva-Radio.—Columbia Graphophone Co., Ltd. Dry batteries.
 Viva-Tonal.—Columbia Graphophone Co., Ltd. Portable gramophone.
 Vivavox.—Amplion (1932), Ltd. Gramophone pick-up.
 Volamp.—Lithanode Co., Ltd. Batteries.
 Volax.—Ward and Goldstone, Ltd. Batteries.
 Volplus.—Hobday Bros., Ltd. Batteries.
 Voltex.—Formo Co. Battery eliminators.
 Volustat.—Harlie, Ltd. Components and accessories.
 Voluvernina.—Gambrell Bros. and Co., Ltd. Volume control.
 Vono.—Buck and Hickman, Ltd. Vices.
 Vulcan.—J. Stead and Co., Ltd. Gramophone main springs.
 Vulco.—Vulco Dry Battery Co., Ltd. Dry batteries.

W

Wallnut.—J. Chnrlly Cann, Ltd. Lead-in s tech.
 Wanderfuse.—Belling and Lee, Ltd. Wander-plug with fuse.
 Wandering Minstrel.—Burndept, Ltd. Receivers.
 Watmel.—Watmel Wireless Co., Ltd. Components and valve receivers.
 Wavemaster.—Webb Condenser Co., Ltd. Variable condenser.
 Waveola.—Aladdin Gramophone and Accessories Co. Amplifiers.
 Waverley.—Carrington Mfg. Co., Ltd. Cabinet.
 Waverley.—M. Sanger and Son. Battery and accumulators.
 Wearite.—Wright and Weaire, Ltd. Components and accessories.
 Webber.—R. A. Webber, Ltd. Moving coil loud-speakers and P.A. equipment.
 Webster.—The Rothermel Corporation, Ltd. Power amplifiers.
 Wego.—Wego Condenser Co., Ltd. Condensers.
 Weilo.—S. W. Lewis and Co., Ltd. Components.
 Wellington.—L. E. Jaccard. Gramophone and wireless apparatus and components.
 Westbury-Ware.—Rellance Mfg. Co. (Southwark), Ltd. Mouldings.
 Westector.—Westinghouse Brake and Saxby Signal Co., Ltd. H.F. Metal rectifier.
 Westinghouse.—The Rothermel Corporation, Ltd. Receivers.
 Westinghouse.—Westinghouse Brake and Saxby Signal Co., Ltd. General trade mark.
 Westminster.—Curry's, Ltd. Sets.
 Weston.—Weston Electrical Instrument Co., Ltd. Measuring instruments.
 Wharfedale.—Wharfedale Wireless Works. General trade mark.
 Wick.—Baxendale and Co., Ltd. Dry battery.
 Wilco.—L. Wilkinson. General trade mark.
 Wilson.—R.C. and Wilson Elec. Ltd. Microphone bar amplifier.
 Wilson.—E. Wilson. Aerial pulley.

Windsor.—Carrington Mfg. Co., Ltd. Cabinet.
 Wing-Nut.—Thos. R. Ellin (Footprint Works). Ltd. Tools.
 Winner.—Edison Bell (1933), Ltd. Gramophone records and needles.
 Winner.—Ever-Ready Co. (Gt. Britain), Ltd. H.T. and G.B. dry batteries.
 Wirelect.—Wireless Electric (Wholesale), Ltd. H.T. batteries and aerial wire.
 Wolf.—S. Wolf and Co., Ltd. Electrical soldering iron and portable electric tools.
 Woodland.—Brown, Brew and Co., Ltd. Sets and components.
 Wo-Tan.—Frys (London), Ltd. Reamers and end mills.
 Wufu.—M. Lichtenberg. Loud speakers.
 Wyephone.—W. Butcher and Sons (Ross), Ltd. Receiver.
 W.B.—Walter Balmford. General trade mark.
 W.B.—Whiteley Electrical Radio Co., Ltd. General trade mark.
 W. and W., Ltd.—Wright and Weaire, Ltd. Components.

X

Xaltona.—G. F. Baker and Co., Ltd. Gramophones and portable radio.
 X.L.N.T.—W. G. West. Cabinets and accumulator crates.

Y

Yaxley.—The Rothermel Corporation, Ltd. Rheostats and switches.
 Yeldon.—Yeldon (Radio), Ltd. Receivers and mains units.
 Yeoman.—Hillman Bros. H.T. and G.B. batteries.
 Young.—Young Accumulator Co. (1929), Ltd. General trade mark.

Z

Zalma.—Lissen, Ltd. Kits.
 Zapon.—Fredk. Crane Chemical Co., Ltd. Cold cellulose lacquer.
 Zapon.—Ioco Rubber and Waterproofing Co., Ltd. Leather cloth.
 Zaza.—Metropolitan Lighting Co., Ltd. Dry battery.
 Zelos.—Graham Farish, Ltd. Air dielectric condensers.
 Zenite.—Zenith Electric Co., Ltd. Vitreous wire-wound resistance unit.
 Zenith.—Zenith Electric Co., Ltd. General trade mark.
 Zenohm.—Zenith Elec. Co., Ltd. Heavy duty strip resistance units.
 Zetavox.—Zetavox Radio and Television Co., Ltd. General trade mark.
 Zeval.—Automatic Coil Winder and Electrical Equipment Co., Ltd. Electric soldering iron.
 Zip.—Victor Battery Co. H.T. batteries.
 Zodac.—Dawkins Trading Co., Ltd. Accumulators.
 Zonophone.—British Zonophone Co., Ltd. Gramophone pick-ups, accumulators, batteries and needles.
 Zwietsusch.—Siemens Schuckert (Gt. Britain), Ltd. Condensers and factory conveyors.

MISCELLANEOUS.

3 E.—Claude Lyons, Ltd. Rheostat.
 99.—J. and J. Laker Co., Ltd. Enamelled aerial wire.
 60.—Reproducers and Amplifiers, Ltd. M.I. speakers.
 362.—362 Valve Co., Ltd. Valves.

MULLARD MEANS BUSINESS

RADIO PRODUCTS SUPPLIED

(For Gramophone Products see page 257.)

ACCUMULATORS L.T.

Alkum Storage Batteries, Ltd.
A.E.F. Manufacturing Co.
Barnard Accumulator Co.
Block Batteries, Ltd.
Blue Comet, Ltd.
Boynton & Co., Ltd.
Britannia Batteries, Ltd.
British Zonophone Co., Ltd.
Chorlton Metal Co., Ltd.
Chloride Electrical Storage Co., Ltd.
Cossor, Ltd.
Dawkins Trading Co.
Edison Storage Battery Distributors, Ltd.
Edison Swan Electric Co., Ltd.
Edwards & Co., Ltd., R.
Essex Accumulator Co., Ltd.
Evac, Ltd.
Ever Ready Co. (Great Britain), Ltd.
Feldman, M.
Fuller Accumulator Co. (1926), Ltd.
General Electric Co., Ltd.
Havenand, Lewis & Co.
Hewitt, Ltd., A. J.
Hillman Bros.
Lissen, Ltd.
Lithanode Co., Ltd.
London Radio Co. (Leeds), Ltd.
Lucas, Ltd., J.
Lugton & Co., Ltd.
Manufacturers' Accessories Co. (1928), Ltd.
Metal Agencies Co., Ltd.
Oldham & Son, Ltd.
Peto & Radford.
Sanger & Son, M.
Saxon Radio Co.
Smith & Son (M.A.), Ltd.
Three Star Accumulators, Ltd.
Toubkin, J.
Tower Radio Supplies.
Tudor Accumulator Co., Ltd.
Tungstone, Ltd.
Van Raden & Co., Ltd.
Vandervell, Ltd., C. A.
Young Accumulator Co. (1929), Ltd.

ACCUMULATORS H.T.

Alkum Storage Batteries, Ltd.
Barnard Accumulator Co.
Block Batteries, Ltd.
Blue Comet, Ltd.
Chloride Electrical Storage Co., Ltd.
Evac, Ltd.
Fuller Accumulator Co. (1926), Ltd.
General Electric Co., Ltd.
Lissen, Ltd.
London Radio Co. (Leeds), Ltd.
Lucas, Ltd., J.
Milnes Radio, Ltd.
Oldham & Son, Ltd.
Peto & Radford.
Smith & Sons (M. A.), Ltd.
Three Star Accumulators, Ltd.
Tudor Accumulator Co., Ltd.
Van Raden & Co., Ltd.
Vandervell, Ltd., C. A.
Young Accumulator Co. (1929), Ltd.

ACCUMULATOR BOXES.

Automobile Accessories (Bristol), Ltd.
A.E.F. Manufacturing Co.
Barnard Accumulator Co.
Blue Comet, Ltd.
Brit Radio Mfg. Co. (Liverpool), Ltd.
Caxton Wood Turnery Co.
Chloride Electrical Storage Co., Ltd.
Collings & Co., N. R.
Cookson & Co.

Evac, Ltd.
Holmes Bros. (London), Ltd.
Lithanode Co., Ltd.
Lock, Ltd., W. & T.
Peto & Radford.
Redfern's Rubber Works, Ltd.
Tungstone, Ltd.

ACCUMULATOR CARRIERS.

Bate & Co., Ltd., Jabez.
Blue Comet, Ltd.
Boynton & Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Caxton Wood Turnery Co.
Chloride Electrical Storage Co., Ltd.
Evac, Ltd.
Ivory Electric.
Line & Co., Ltd., F.
Lockwood Casework Mfg. Co.
McWhirr, Paterson & Co.
Radiamp Co.
Smith & Sons (M.A.), Ltd.
Tungstone, Ltd.
Ward & Goldstone, Ltd.

ACCUMULATOR PARTS AND ACCESSORIES.

Anglo Swiss Screw Co., Ltd.
Avon India Rubber Co., Ltd.
Barnard Accumulator Co.
Block Batteries, Ltd.
Blue Comet, Ltd.
British Hard Rubber Co., Ltd.
Chloride Electrical Storage Co., Ltd.
Collie & Co., J. H.
Cookson & Co.
Cowlshaw Bros.
Crystallato Gramophone Record Mfg. Co., Ltd.
Evac, Ltd.
Francis, Ltd., E. M.
Fuller Accumulator Co., Ltd.
Lithanode Co., Ltd.
Merrington Bros., Ltd.
Oldham & Son, Ltd.
Partridge, Wilson & Co.
Plowden & Thompson, Ltd.
Redfern's Rubber Works, Ltd.
Remax Cables.
Smith & Sons (M.A.), Ltd., S.
Three Star Accumulators, Ltd.
Tudor Accumulator Co., Ltd.
Tungstone, Ltd.
Van Raden & Co., Ltd.
Webster & Co., Ltd., T.
Young Accumulator Co. (1929), Ltd.

ACCUMULATOR ACID.

Berk & Co., Ltd., F. W.
Blue Comet, Ltd.
Cruckshank, Ltd., R.
Evac, Ltd.
Riley & Sons, Ltd., J.

ACCUMULATOR CHARGERS A.C.

Alpha Coil & Component Co.
British Radio Mfg. Co. (Liverpool), Ltd.
Chorlton Metal Co., Ltd.
Custerson, R.
Evac, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Gordon & Co., F. J.
Gresley Radio, Ltd.
Heayberd & Co., F. C.
Higgs Motors.
Hill & Co., Ltd., F. C.
H.C.H. Co.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Junction Engineering Co., Ltd.
 Lancashire Dynamo & Crypto, Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod.
 Nash Products, Ltd.
 Newtons of Taunton, Ltd.
 Northampton Plating Co.
 Partridge, Wilson & Co.
 Pepper, T.
 Philips, Industrial.
 Pye Radio, Ltd.
 Ray Engineering Co., Ltd.
 Rectifiers, Ltd.
 Regentone, Ltd.
 Robinson & Co., Lionel.
 Smurthwaite, Ltd., F. W.
 Sound Sales, Ltd.
 Supremus Specialties, Ltd.
 Tannoy Products, Ltd.
 Westinghouse Brake & Saxby Signal Co., Ltd.
 Willis & Co. (Meritus), Ltd.

ACCUMULATOR CHARGERS D.C.

British Radio Mfg. Co. (Liverpool), Ltd.
 Custerson, R.
 Electric Depot, Ltd.
 Evac, Ltd.
 General Electric Co., Ltd.
 Gent & Co., Ltd.
 Gordon & Co., F. J.
 Gresley Radio, Ltd.
 Higgs Motors.
 Lancashire Dynamo & Crypto, Ltd.
 Lever (Trix), Ltd., Eric J.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod.
 Nash Products, Ltd.
 Newtons of Taunton, Ltd.
 Partridge, Wilson & Co.
 Pepper, T.
 Philips Industrial.
 Ray Engineering Co., Ltd.
 Robinson & Co., Lionel.
 Rotax, Ltd.
 Tannoy Products.
 Ward & Goldstone, Ltd.
 Willis & Co. (Meritus), Ltd.

ACCUMULATOR CHARGING PLANT.

Evac, Ltd.
 Gordon & Co., F. J.
 Hayberd & Co., F. C.
 Higgs Motors.
 Lancashire Dynamo & Crypto, Ltd.
 Lever (Trix), Ltd., Eric J.
 London Electrical Co. (Sherborne Lane), Ltd.
 Nash Products, Ltd.
 Newtons of Taunton, Ltd.
 Oldham & Son, Ltd.
 Partridge, Wilson & Co.
 Pepper, T.
 Philips Industrial.
 Ray Engineering Co., Ltd.
 Rich & Bundy, Ltd.
 Roberts, J.
 Small Power Dynamo & Motor Co., Ltd.
 Tannoy Products.
 Westinghouse Brake & Saxby Signal Co., Ltd.
 Willis & Co. (Meritus), Ltd.

AERIAL AND EARTH ACCESSORIES

(Excluding frame and portable aerials, earth tubes and clips, insulators, lightning arresters, masts and wire).

Abbey Engineering Works.
 Aerialite, Ltd.
 Altham Radio Co.
 Amplion (1932), Ltd.
 Anderson, Clark & Moir, Ltd.

Ashley Wireless Telephone Co. (1925), Ltd.
 Bate & Co., Ltd., Jabez.
 Bird & Sons, W.
 Blue Comet, Ltd.
 British Insulated Cables, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Cann, Ltd., J. Churly.
 Chorlton Metal Co., Ltd.
 Christie & Sons, Ltd., Jas.
 Clifford Pressland (Sales), Ltd.
 Colvern, Ltd.
 Danco Manufacturing Co., Ltd.
 Eastick & Sons, J. J.
 Elvy, C. L.
 Enderlein, E.
 Eon Vacuum Wireless Co.
 Graham Farish, Ltd.
 Gresley Radio, Ltd.
 Gripso Co.
 Hildick & Hildick.
 Ivory Electric.
 Kniveton Cable Works, Ltd.
 Kolster-Brandes, Ltd.
 Laker Co., Ltd., J. & J.
 Lamplugh Radio, Ltd.
 Lever (Trix), Ltd., Eric J.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod.
 Millar & Son, J. S.
 Millet, J.
 New London Electron Works, Ltd.
 Olympia Radio Co., Ltd.
 Partridge, Wilson & Co.
 Pioneer Mfg. Co.
 Purdy, B. N.
 Radiamp Co.
 Spong & Co., Ltd.
 Toubkin, J.
 Trent Elec. Wire Works, Ltd.
 Univolt Elec., Ltd.
 Ward & Goldstone, Ltd.
 Wilson, E.
 Wright & Weaire, Ltd.

AERIALS (frame, indoor and portable).

Aerialite, Ltd.
 Altham Radio Co.
 Amplion (1932), Ltd.
 Ashton's Wireless Depot.
 Blue Comet, Ltd.
 British Insulated Cables, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Cleveleys Engineering Co.
 Colvern, Ltd.
 Custerson, R.
 Daly, H. C.
 Duray.
 Eastick & Sons, J. J.
 Elvy, C. L.
 Enderlein, E.
 Eon Vacuum Wireless Co.
 General Electric Co., Ltd.
 Gresley Radio, Ltd.
 Holmes Bros. (London), Ltd.
 Ivory Electric.
 Lever (Trix), Ltd., Eric J.
 London Electric Wire Co. & Smiths, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod.
 McWhirr, Paterson & Co.
 Merrington Bros., Ltd.
 O.V. Aerial Co. (1931).
 Plessey Co., Ltd.
 Reliance Electric Wire Co.
 R.C. & Wilson Electric, Ltd.
 Shearing, Ltd., A. E.
 Spong & Co., Ltd.
 Toubkin, J.
 Trent Electric Wire Works, Ltd.
 Ward & Goldstone, Ltd.
 Wright & Weaire, Ltd.

ALUMINIUM (sheet and panel)

Andrews & Co., A. E.
 Bate & Co., Ltd., Jabez.
 Braby & Co., Ltd., F.
 British Aluminium Co., Ltd.
 British Insulated Cables, Ltd.

BETTER TRADE WITH THE BETTER RADIO BRIGADE

City Accumulator Co.
Daly, H. C.
Francis, T. R.
Gresley Radio, Ltd.
Hewitt, Ltd., A. J.
Hounslow & Co., C.
Jackson Bros. (London), Ltd.
Lever (Trix), Ltd., Eric J.
London Electrical Co. (Sherborne Lane), Ltd.
Marks & Son, S.
Morton, Ltd., E. R.
Paroussi, E.
Peto Scott Co., Ltd.
Righton & Co., Ltd., H.
Sankey & Sons, Ltd., J.
White Bros. & Jacob, Ltd.
Wright & Weaire, Ltd.

ANODE RESISTANCES.

Abingdon Wireless Supplies.
Alpha Coil & Component Co.
Ashley Wireless Telephone Co. (1925), Ltd.
Bulgin & Co., Ltd., A. F.
Burne, Jones & Co., Ltd.
Castagnoli, G.
Colvern, Ltd.
Concordia Electric Wire Co., Ltd.
Dubilier Condenser Co. (1925), Ltd.
Edison Swan Electric Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Harrison & Co., A. T.
Igranic Electric Co., Ltd.
Imp Radio Co.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Lyons, Ltd., Claude.
Orion Lamps, Ltd.
Peace, Ltd., Henry.
Pepper, T.
Precision Radio & Mfg. Co., Ltd.
Pye Radio, Ltd.
Radiamp Co.
Radio Resistor Co.
Siemens Schuckert (Gt. Britain), Ltd.
Sovereign Products, Ltd.
Tunewell Radio, Ltd.
Varley
Zenith Electric Co., Ltd.

BAKELITE AND SYNTHETIC RESIN (sheet and raw).

Attwater & Sons.
A.E.G. Electric Co., Ltd.
Bakelite, Ltd.
Bromley-Langton Electric-Wire & Insulator Co., Ltd.
Bullphone Radio.
Clarke & Co. (Manchester), Ltd., H.
Diamond Fibre Co., Ltd.
Ellison Insulations, Ltd.
General Electric Co., Ltd.
Ioco Rubber & Waterproofing Co., Ltd.
Lissen, Ltd.
MacEchern & Co., Ltd.
McLeod & McLeod.
Maul & Murphy, Ltd.
Merrington Bros., Ltd.
Micanite & Insulators Co., Ltd.
Phillips Industrial.
St. Helens Cable & Rubber Co., Ltd.
Scott & Co., Ltd., G. L.
Shearing, Ltd., A. E.
Spicers, Ltd.
Willmott, Son & Phillips, Ltd.

BAKELITE AND SYNTHETIC RESIN (mouldings).

Ashley Wireless Telephone Co. (1925), Ltd.
Attwater & Sons.
Birkbys, Ltd.
Charlsworth, W. J.
Chorlton Metal Co., Ltd.
Clarke & Co. (Manchester), Ltd., H.
Cole, Ltd., E. K.
Daly, H. C.

De La Rue & Co., Ltd., T.
Elliott, E.
Ellison Insulations, Ltd.
Enderlein, E.
Ernest Turner Electrical Instruments, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Gresley Radio, Ltd.
Harlie, Ltd.
Harrison & Co., A. T.
Lamplugh Radio, Ltd.
Lissen, Ltd.
Litholite Insulators, Ltd.
Lorival Mfg. Co. (1921), Ltd.
Lucas, Ltd., J.
McLeod & McLeod.
Merrington Bros., Ltd.
Ormond Engineering Co., Ltd.
Paroussi, E.
Phillips Industrial.
Precision Radio & Mfg. Co., Ltd.
Radiamp Co.
Redfern's Rubber Works, Ltd.
Reliance Mfg. Co. (Southwark), Ltd.
Rist (1927), Ltd., A.
St. Helens Cable & Rubber Co., Ltd.
Shearing, Ltd., A. E.
Smith & Sons (M.A.), Ltd., S.
Stadium, Ltd.
Ward & Goldstone, Ltd.
Webster & Co., Ltd., T.
Westinghouse Brake & Saxby Signal Co., Ltd.
Whiteley Elec. Radio Co., Ltd.
Wilkins & Wright, Ltd.
W.R.C., Ltd.

BATTERIES, H.T. (dry).

Acton Battery Co., Ltd.
Adie & Co., Ltd.
Altham Radio Co.
Anderson, Clark & Moir, Ltd.
Atlas Carbon & Battery Co., Ltd.
Batteries, Ltd.
Baxendale & Co., Ltd.
Beardsall & Co., Ltd.
Blue Comet, Ltd.
Bowerman, Ltd., G.
Britannia Batteries, Ltd.
British Battery Co., Ltd.
British G.W.Z. Battery Co., Ltd.
Chloride Electrical Storage Co., Ltd.
Chorlton Metal Co., Ltd.
Clarke Bros. (Leicester), Ltd.
Cordesia Batteries, Ltd.
Cossor, Ltd.
Dr. Nesper, Ltd.
Drury Radio Co.
Dundas Fox, Ltd.
Eagle Engineering Co., Ltd.
Ecco Battery Co., Ltd.
Edison Swan Electric Co., Ltd.
Efandum Co.
Emareo, Ltd.
Ever Ready Co. (Gt. Britain), Ltd.
Fuller Accumulator Co. (1926), Ltd.
General Electric Co., Ltd.
Grosvenor Electric Batteries, Ltd.
Hart, Ltd., L.
Harwol Specialties Co.
Hellesens, Ltd.
Hewitt, Ltd., A. J.
Higgs (Gt. Britain), Ltd.
Hillman Bros.
Itonia, Ltd.
Le Carbone Co., Ltd.
Lissen, Ltd.
London Radio Co. (Leeds), Ltd.
Lugton & Co.
McLeod & McLeod.
Mainsier & Co., Ltd., E. H.
Manufacturers Accessories Co. (1928), Ltd.
Marconiphone Co., Ltd.
Merrington Bros., Ltd.
Metal Agencies Co., Ltd.
Metropolitan Lighting Co., Ltd.
Michelson Bros.
Midland Electrical Co.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Millet, J.
 Oldham & Son, Ltd.
 Pye Radio, Ltd.
 Riley & Son, W.
 Ripaults, Ltd.
 R.A.M.S. Metal Wks., Ltd.
 Sanger & Son, M.
 Saxon Radio Co.
 Siemens Electric Lamps & Supplies, Ltd.
 Smith & Sons (Motor Accessories), Ltd., S.
 Storey, F. M.
 Three Star Accumulators, Ltd.
 Toubkin, J.
 Vandervell, Ltd., C. A.
 Vee Cee Dry Cell (1927), Ltd.
 Victor Battery Co.
 Vince's Dry Batteries, Ltd.
 Vulco Dry Battery Co., Ltd.
 Watson & Henderson, Ltd.
 Wireless Elec. (Wholesale), Ltd.

BATTERIES (grid bias)

Acton Battery Co., Ltd.
 Adie & Co., Ltd.
 Anderson, Clark & Moir, Ltd.
 Atlas Carbon & Battery Co., Ltd.
 Batteries, Ltd.
 Baxendale & Co., Ltd.
 Beardsall & Co., Ltd.
 Blue Comet, Ltd.
 Britannia Batteries, Ltd.
 British Battery Co., Ltd.
 British G.W.Z. Battery Co., Ltd.
 Chloride Electrical Storage Co., Ltd.
 Chorlton Metal Co., Ltd.
 Cordesia Batteries, Ltd.
 Cossor, Ltd.
 Dr. Nesper, Ltd.
 Dundas Fox, Ltd.
 Ecco Battery Co., Ltd.
 Edison Swan Electric Co., Ltd.
 Ever Ready Co. (Gt. Britain), Ltd.
 Fuller Accumulator Co. (1926), Ltd.
 General Electric Co., Ltd.
 Grosvenor Electric Batteries, Ltd.
 Hart, Ltd., L.
 Hellesens, Ltd.
 Hewitt, Ltd., A. J.
 Hillman Bros.
 Le Carbone Co., Ltd.
 Lissen, Ltd.
 London Radio Co. (Leeds), Ltd.
 McLeod & McLeod.
 Manufacturers Accessories Co. (1928), Ltd.
 Marconiphone Co., Ltd.
 Metal Agencies Co., Ltd.
 Michelson Bros.
 Midland Electrical Co.
 Millet, J.
 Oldham & Son, Ltd.
 Pye Radio, Ltd.
 Riley & Son, W.
 Ripaults, Ltd.
 R.A.M.S. Metal Works, Ltd.
 Saxon Radio Co.
 Siemens Electric Lamps & Supplies, Ltd.
 Smith & Sons (Motor Accessories), Ltd., S.
 Storey, F. M.
 Vandervell, Ltd., C. A.
 Vee Cee Dry Cell (1927), Ltd.
 Victor Battery Co.
 Vince's Dry Batteries, Ltd.
 Vulco Dry Battery Co., Ltd.
 Ward & Goldstone, Ltd.
 Watson & Henderson, Ltd.

BOBBINS (headphones, speakers or transformer).

Amplion (1932), Ltd.
 Bromley-Langton Electric Wire & Insulator Co., Ltd.
 Clarke & Co. (M'chester), Ltd.
 Crystallate Gramophone Record Mfg. Co., Ltd.
 Custerson, R.
 Eagle Engineering Co., Ltd.

Elvy, C. L.
 General Elec. Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Gresley Radio, Ltd.
 Harrison & Co., A. T.
 Lever (Trix), Ltd., Eric J.
 McLeod & McLeod.
 Merrington Bros., Ltd.
 Micanite & Insulators Co., Ltd.
 Millet, J.
 National Radio Service Co.
 Ormond Engineering Co., Ltd.
 Patton, Ltd., D. J.
 Radio Gramophone Development Co., Ltd.
 Reproducers & Amplifiers, Ltd.
 Shearing, Ltd., A. E.
 Trent Elec. Wire Wks., Ltd.
 Webster & Co., T.
 W.R.C., Ltd.

BOXES (cardboard, display cartons, etc.)

Avis (Rugby), Ltd., A.
 Boxfoldia, Ltd.
 British Ideal Patents, Ltd.
 Hyatt & Co., Ltd., J.
 McLeod & McLeod.
 Marlborough Radio Co., Ltd.
 Philips Lamps, Ltd.

BRACKETS (panel and baseboard).

Andrews & Co., A. E.
 Bate & Co., Ltd., Jabez.
 Bulgin & Co., Ltd., A. F.
 Burne Jones & Co., Ltd.
 Carrington Mfg. Co., Ltd.
 Chorlton Metal Co., Ltd.
 Collet Mfg. Co., S. II.
 Francois, E. J.
 Gee (Birmingham), Ltd.
 General Electric Co., Ltd.
 Gresley Radio, Ltd.
 Hewitt, Ltd., A. J.
 Ivory Electric.
 Jackson Bros. (London), Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Lockwood Casework Mfg. Co.
 Manufacturers Accessories Co. (1928), Ltd.
 Marks & Son, S.
 Millet, J.
 Morton, Ltd., E. R.
 Paroussi, E.
 Toubkin, J.
 Williams & Moffat, Ltd.
 Wright & Weaire, Ltd.
 W.R.C., Ltd.

BRASSWORK.

Amplifiers, Ltd.
 Andrews & Co., A. E.
 Anglo-Swiss Screw Co., Ltd.
 Baker & Finnemore, Ltd.
 Beddoes, Ltd., J. G.
 Belling & Lee, Ltd.
 Bi-Metals.
 British Ideal Patents, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Buck & Hickman, Ltd.
 Burne Jones & Co., Ltd.
 Busby & Co., Ltd.
 Calvete, Ltd., I.
 Cann, Ltd., J. Churley.
 Castagnoli, G.
 Christie & Sons, Ltd., J.
 Custerson, R.
 Eagle Engineering Co., Ltd.
 Edmonds, Ltd., G.
 Fenriss (1932), Ltd.
 Francois, E. J.
 Gee (Birmingham), Ltd.
 General Electric Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Gresley Radio.
 Grippall Electrical Products, Ltd.
 Harris, G. & R.
 Harrison & Co., A. T.
 Henderson & Co., Ltd., D. M.
 Jackson Bros. (London), Ltd.

EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER

Lever (Trix), Ltd., Eric J.
 Lilley & Son, Ltd., S.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod.
 McWhirr, Paterson & Co.
 Marks & Son, S.
 Mervyn Sound & Vision Co., Ltd.
 Morton, Ltd., E. R.
 Muller & Co. (England), Ltd.
 M.C.L. & Repetition, Ltd.
 Ormond Engineering Co., Ltd.
 Peace, Ltd., Henry.
 Person & Son, L.
 Prideaux, Junr., R.
 Radiamp Co.
 Reliance Mfg. Co. (Southwark), Ltd.
 Righton & Co., H.
 Ross, Courtney & Co., Ltd.
 R.A.M.S. Metal Works, Ltd.
 Toubkin, J.
 True Screws, Ltd.
 Walter, Ltd., J. & H.
 Whiteley Electrical Radio Co., Ltd.
 Wilkins & Wright, Ltd.
 Williams & Gray, Ltd.
 Williams & Moffat, Ltd.
 Wright & Weaire, Ltd.
 Yorkshire Radio, Co.

CABINETS (wood).

Aladdin Gramophone & Accessories Co.
 Appletons (Leeds), Ltd.
 Automobile Accessories (Bristol), Ltd.
 Bligh, S. W.
 Bond & Sons, Ltd., V. C.
 Bounphrey, Arundel.
 Bradnam & Co.
 Calders, Ltd.
 Carrington Mfg. Co., Ltd.
 Castagnoli, G.
 Caxton Wood Turnery Co.
 Clarion Radio Furniture.
 Collings & Co., N. R.
 Cossor, Ltd.
 Custerson, R.
 Digby, F.
 Doherty & Sons, Edward.
 Eagle Engineering Co., Ltd.
 Eastham, Thos.
 Eastick, J. J., & Sons.
 Electrical & Radio Products (1931), Ltd.
 Elvy, C. L.
 Eon Vacuum Wireless Co.
 Ericsson Telephones, Ltd.
 E.M.G. Hand-Made Gramophones, Ltd.
 Fairfield Mfg. Co.
 Ferranti, Ltd.
 General Electric Co., Ltd.
 Goodwin Radio, Ltd.
 Gould, Harper & Co., Ltd.
 Gresley Radio.
 Haynes Radio.
 Holmes Bros. (London), Ltd.
 Joseph, H.
 J. B. Mfg. Co. (Cabinets), Ltd.
 Lathwood, J.
 Lissen, Ltd.
 Lock, Ltd., W. & T.
 Lockwood Casework Mfg. Co.
 London Electrical Co. (Sherborne Lane), Ltd.
 Manufacturers' Accessories Co. (1928), Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Miscellaneous Trading Co.
 Morton & Co., R.
 Northampton Plating Co.
 O'Brien, Ltd., T.
 Ormond Engineering Co., Ltd.
 Osborn, C. A.
 Peto Scott, Ltd.
 Philomel Radio Equipment Co.
 Picketts Cabinets.
 Radiocabinets (Walsall), Ltd.
 Ramsey, F. W.
 Ready Radio, Ltd.
 Segal & Co., R.
 Shalless & Evans.

Six-Sixty Radio Co., Ltd.
 Stanton, T.
 Storey, F. M.
 Storrar & Balls.
 Supertone Pianos, Ltd.
 Tarry, F. L.
 Tower Radio Supplies.
 Tyrela Electric, Ltd.
 Watson & Henderson, Ltd.
 Wood, L. R.
 Woodware Supplies, Ltd.
 Yeldon (Radio), Ltd.

CABINETS (leather and fabric, for portables).

Appletons (Leeds), Ltd.
 Automobile Accessories (Bristol), Ltd.
 Barrow, Hepburn & Gale, Ltd.
 Carrington Mfg. Co., Ltd.
 Custerson, R.
 Doherty & Sons, Edward.
 Eon Vacuum Wireless Co.
 Goodwin Radio, Ltd.
 Holmes Bros. (London), Ltd.
 Hyatt & Co., Ltd., J.
 J. B. Mfg. Co. (Cabinets), Ltd.
 Lissen, Ltd.
 Lockwood Casework Mfg. Co.
 Merrington Bros., Ltd.
 Millards.
 Ormond Engineering Co., Ltd.
 O'Brien, Ltd., T.
 Storrar & Balls.

CABINETS (metal).

Burne Jones & Co., Ltd.
 Custerson, R.
 General Electric Co., Ltd.
 Lissen, Ltd.
 Lockwood Casework Mfg. Co.
 Marks & Son, S.
 Paroussi, E.
 Peto Scott Co., Ltd.
 Sankey & Sons, Ltd., Joseph.

CABINETS (moulded composition).

Birkbys, Ltd.
 De La Rue & Co., Ltd., T.
 Ebonestos Insulators, Ltd.
 Elliott, E.
 General Electric Co., Ltd.
 Lissen, Ltd.
 Merrington Bros., Ltd.
 Paroussi, E.
 Phillips Industrial.

CAR RADIO.

A. J. Balcombe, Ltd.
 Blue Comet, Ltd.
 British Radiophone, Ltd.
 Castagnoli, G.
 Cole, Ltd., E. K.
 Custerson, R.
 Edge Radio, Ltd.
 Electrical & Radio Products (1931), Ltd.
 Elliott Radio Mfg. Co., Ltd.
 Eon Vacuum Wireless Co.
 Fel-Electric Radio.
 General Electric Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Haynes Radio.
 Lissen, Ltd.
 Mains Radio Mfg. Co.
 Majestic Electric Co., Ltd.
 Midland Radio & Television Co.
 Page Car Radio, Ltd.
 Phileo, Ltd.
 Philips Lamps, Ltd.
 Precision Electric, Ltd.
 Rotax, Ltd.
 Sunbeam Electric, Ltd.
 Wilkins & Wright, Ltd.

CASTINGS.

Allen & Co., Ltd., E.
 Bullers, Ltd.
 Crabtree & Co., Ltd., J. A.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Ferranti, Ltd.
General Electric Co., Ltd.
Lissen, Ltd.
McLeod & McLeod.
Peace, Ltd., Henry.
Westinghouse Brake & Saxby Signal Co., Ltd.
Yorkshire Radio Co.

CHATTERTON'S COMPOUND.

British Insulated Cables, Ltd.
Bromley Langton Elec. Wire & Insulator Co., Ltd.
General Electric Co., Ltd.
Kemp Vulcanizing Co., Ltd.
Micanite & Insulators, Co., Ltd.
Pomona Rubber Co.

CHOKES H.F.

Aerodyne Radio.
Alpha Coil & Component Co.
Altham Radio Co.
Amplion (1932), Ltd.
Andrews & Co., A. E.
Ashley Wireless Telephone Co. (1925), Ltd.
Automobile Accessories (Bristol), Ltd.
Bayliss William, Ltd.
Berclif, Ltd.
British Ebonite Co., Ltd.
British General Manufacturing Co., Ltd.
British Radio Gramophone Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Brown, Brew & Co., Ltd.
Bulgin & Co., Ltd., A. F.
Bullphone Radio.
Burndept, Ltd.
Burne Jones & Co., Ltd.
Castagnoli, G.
Chorlton Metal Co., Ltd.
Clarke & Co. (Manchester), Ltd., H.
Clifford Pressland (Sales), Ltd.
Custerson, R.
Daly, H. C.
Dyson & Co. (Wks.), Ltd., J.
Eagle Engineering Co., Ltd.
East Ham Wireless Supplies.
Electric Lamp Service Co., Ltd.
Elektra Supplies.
Elliott Radio Mfg. Co., Ltd.
Faraday Allwave Wireless, Ltd.
Fel-Electric Radio.
Ferranti, Ltd.
Formo Co.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Goodwin Radio, Ltd.
Graham Farish, Ltd.
Gresley Radio.
Grippall Electric Products, Ltd.
Harken Electric Co., Ltd.
Harrison & Co., A. T.
Hartley Turner Radio, Ltd.
Hewitt, Ltd., A. J.
Igranie Electric Co., Ltd.
Ivory Electric.
Johnson & Phillips, Ltd.
Junction Engineering Co., Ltd.
Kimber Allen & Co., B.
Lanchester Laboratories, Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electric Wire Co. & Smiths, Ltd.
McMichael Radio, Ltd.
McWhirr, Paterson & Co.
Mains Radio Gramophones, Ltd.
Merrington Bros., Ltd.
Mile End Radio Co.
Ormond Engineering Co., Ltd.
Patton, Ltd., D. J.
Pepper, T.
Plessey Co., Ltd.
Pooley, G. J.
Posthewait Bros.
Powertone Products.
Precision Radio & Mfg. Co., Ltd.
Pye Radio, Ltd.
Radiamp Co.
Radio Instruments, Ltd.
Ready Radio, Ltd.

Saxon Radio Co.
Scott & Co., S. W.
Shearing, Ltd., A. E.
Slektun Products, Ltd.
Sound Sales, Ltd.
Sovereign Products, Ltd.
Stratton & Co., Ltd.
Supertone Pianos, Ltd.
Telsen Electric Co., Ltd.
Truphonic Radio Co.
Tunewell Radio, Ltd.
Varley.
Walter, Ltd., J. & H.
Ward & Goldstone, Ltd.
Whiteley Electrical Radio Co., Ltd.
Wilson, W. H.
Wood, L. R.
Wright & Weaire, Ltd.
W.R.C., Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.

CHOKES L.F.

Aerodyne Radio.
Alpha Coil & Component Co.
Amplion (1932) Ltd.
Automobile Accessories (Bristol), Ltd.
Bayliss, William, Ltd.
Birmingham Sound Reproducers.
British Ebonite Co., Ltd.
British Radio Gramophone Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Brown, Brew & Co., Ltd.
Bulgin & Co., Ltd., A. F.
Bullphone Radio.
Castagnoli, G.
Chorlton Metal Co., Ltd.
City Accumulator Co.
Clarke & Co. (Manchester), Ltd., H.
Clifford Pressland (Sales) Ltd.
Climax Radio Electric, Ltd.
Coates, Ltd., J. G.
Custerson, R.
Daly, H. C.
Danipad Rubber Co., Ltd.
Dyson & Co. (Wks.), Ltd., J.
Eagle Engineering Co., Ltd.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Fel-Electric Radio.
Ferranti, Ltd.
Formo Co.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Graham Farish, Ltd.
Gresley Radio.
Harken Electric Co., Ltd.
Hartley Turner Radio, Ltd.
Heayberd & Co., F. C.
Hill & Co., F. C.
Igranie Electric Co., Ltd.
Ivory Electric.
Johnson & Phillips, Ltd.
Junction Engineering Co., Ltd.
Kimber, Allen & Co., B.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electric Wire Co. & Smiths, Ltd.
Mains Radio Gramophones, Ltd.
Mains Radio Mfg. Co.
Merrington Bros., Ltd.
Metal Agencies Co., Ltd.
Midland Radio & Television Co.
Mile End Radio Co.
Multitone Electric Co., Ltd.
Ormond Engineering Co., Ltd.
Partridge & Mee, Ltd.
Pepper, T.
Person & Son, L.
Patton, Ltd., D. J.
Plessey Co., Ltd.
Radio Gramophone Development Co., Ltd.
Radio Instruments, Ltd.
Reproducers & Amplifiers, Ltd.
Rich and Bundy, Ltd.
Savage, W. B.
Scott & Co., S. W.
Shearing, Ltd., A. E.

MULLARD—THE VALVE OF THE PAST,
THE PRESENT, THE FUTURE

Slektun Products, Ltd.
Sound Sales, Ltd.
Sovereign Products, Ltd.
Standard Tels. & Cables, Ltd.
Tarry, F. L.
Telsen Electric Co., Ltd.
Tod, T. M.
Tunewell Radio, Ltd.
Varley.
Voight Patents, Ltd.
Whiteley Electrical Radio Co., Ltd.
Willis & Co. (Meritus) Ltd.
Wilson, W. H.
Wright & Weaire, Ltd.
W.R.C., Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.
362 Radio Valve Co., Ltd.

CHOKE COUPLING UNITS.

British General Mfg. Co., Ltd.
British Radio Gramophone Co., Ltd.
Bulgin & Co., Ltd., A. F.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Custerson, R.
Elliott Radio Mfg. Co., Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Gresley Radio, Ltd.
Igranic Electric Co., Ltd.
Lamplugh Radio, Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Mile End Radio Co.
Plessey Co., Ltd.
Radio Instruments, Ltd.
Slektun Products, Ltd.
Tunewell Radio, Ltd.
Varley
Ward & Goldstone, Ltd.
Whiteley Electrical Radio Co., Ltd.
Wright & Weaire, Ltd.

CHOKES (mains unit).

Aerodyne Radio.
Austin Mills & Co.
Bayliss, Ltd., W.
Birmingham Sound Reproducers.
British Radio Mfg. Co. (Liverpool), Ltd.
Brown, Brew & Co., Ltd.
Bulgin & Co., Ltd., A. F.
Bullphone Radio, Ltd.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Clarke & Co. (Manchester), Ltd., H.
Custerson, R.
Daly, H. C.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Gresley Radio.
Harken Electric Co., Ltd.
Hartley Turner Radio, Ltd.
Heayberd & Co., F. C.
Igranic Electric Co., Ltd.
Ivory Electric.
Johnson & Phillips, Ltd.
Junction Engineering Co., Ltd.
Kimber Allen & Co., B.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Lyons, Ltd., Claude.
Mains Radio Mfg. Co.
Metal Agencies Co., Ltd.
Midland Radio & Television Co.
Mile End Radio Co.
Nassak Mfg. Co., Ltd.
Partridge, Wilson & Co.
Patton, Ltd., D. J.
Pepper, T.
Plessey Co., Ltd.
Postlethwaite Bros.
Radio Gramophone Development Co., Ltd.
Radio Instruments, Ltd.
Rectifiers, Ltd.
Regentone, Ltd.

Rich & Bundy, Ltd.
Savage, W. B.
Shearing, Ltd., A. E.
Slektun Products, Ltd.
Sound Sales, Ltd.
Sovereign Products, Ltd.
Standard Tels. & Cables, Ltd.
Supertone Pianos, Ltd.
Tarry, F. L.
Tod, T. M.
Tunewell Radio, Ltd.
Varley.
Voigt Patents, Ltd.
Ward & Goldstone, Ltd.
Whiteley Electrical Radio Co., Ltd.
Willis & Co. (Meritus), Ltd.
Wilson, W. H.
Wright & Weaire, Ltd.
Zimba Radio Co.

CLASS B. CONVERTORS.

Automobile Accessories (Bristol), Ltd.
Bulgin & Co., Ltd., A. F.
Burne-Jones & Co., Ltd.
City Accumulator Co.
Custerson, R.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Eon Vacuum Wireless Co.
Epoch Radio Mfg. Co., Ltd.
Fel Electric Radio.
Ferranti, Ltd.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gresley Radio, Ltd.
Imp Radio Co.
Lamplugh Radio, Ltd.
Lanchester Laboratories, Ltd.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Lt l.
Midland Radio & Television, Ltd.
Multitone Electric Co., Ltd.
Peto Scott Co., Ltd.
Radiolab Mfg. Co.
Reproducers and Amplifiers, Ltd.
Rothermel Corporation, Ltd.
Sound Sales, Ltd.
Sovereign Products, Ltd.
Whiteley Electric Radio Co., Ltd.
Wood, L. R.
362, Radio Valve Co., Ltd.

COIL FORMERS.

Altham Radio Co.
Andrews & Co., A. E.
Automobile Accessories (Bristol), Ltd.
British Ebonite Co., Ltd.
British Radio Gramophone Co., Ltd.
Bromley-Langton Electric Wire & Insulator Co., Ltd.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Clarke & Co. (Manchester), Ltd., H.
Colvern, Ltd.
Crystalate Gramophone Record Mfg. Co., Ltd.
Daly, H. C.
Evington Electric Mfg. Co.
General Electric Co., Ltd.
Gresley Radio.
Harrison & Co., A. T.
Ivory Electric.
Lever (Trix), Ltd., E. J.
Lissen, Ltd.
McLeod & McLeod.
Merrington Bros., Ltd.
Micanite & Insulators Co., Ltd.
Patton, Ltd., D. J.
Plessey Co., Ltd.
Precision Radio & Mfg. Co., Ltd.
Radiamp Co.
Redfern's Rubber Wks., Ltd.
Scott & Co., S. W.
Slektun Products, Ltd.
Stratton & Co., Ltd.
Tunewell Radio, Ltd.
Ward & Goldstone, Ltd.
Webster & Co., Ltd., T.
Whiteley Electrical Radio Co., Ltd.
Wright & Weaire, Ltd.
W.R.C., Ltd.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

COILS (plug in, all types).

British General Mfg. Co., Ltd.
Chalkley, C. G.
Clarke & Co. (M'chester), Ltd., H.
Colvern, Ltd.
Custerson, R.
Daly, H. C.
Dyson & Co. (Wks.) Ltd., J.
Evington Electrical Mfg. Co., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Igranie Electric Co., Ltd.
Ivory Electric.
Johnson & Phillips, Ltd.
Kimber, Allen & Co., B.
Lissen, Ltd.
London Elec. Wire Co. & Smiths, Ltd.
McWhirr, Paterson & Co.
Northampton Plating Co.
Shearing, Ltd., A. E.
Sovereign Products, Ltd.
Stratton & Co., Ltd.
Wilson, W. H.
Wright & Weaire, Ltd.
Zimba Radio Co.

COILS (dual range).

Alpha Coil & Component Co.
Altham Radio Co.
Amplion (1932), Ltd.
Andrews & Co., A. E.
Automobile Accessories (Bristol), Ltd.
Bercliff, Ltd.
British General Manufacturing Co., Ltd.
British Radiophone, Ltd.
Brown, Brew & Co., Ltd.
Bulgin & Co., Ltd., A. F.
Bullphone Radio, Ltd.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Chalkley, C. G.
Chorlton Metal Co., Ltd.
Cifel Products, Ltd.
Clifford Pressland (Sales), Ltd.
Colvern, Ltd.
Custerson, R.
Daly, H. C.
Danco Manufacturing Co., Ltd.
Dyson & Co. (Wks.), Ltd.
Eagle Engineering Co., Ltd.
Eastick & Sons, J. J.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Evington Electrical Mfg. Co.
Exact Mfg. Co.
Faraday Allwave Wireless, Ltd.
Formo Co.
Francis, T. R.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Goodwin Radio, Ltd.
Gould, Harper & Co., Ltd.
Grippall Electrical Products, Ltd.
Hambling, A. W.
Harrison & Co., A. T.
Hewitt, Ltd., A. J.
Igranie Electric Co., Ltd.
Imp Radio Co.
Johnson & Phillips, Ltd.
Kimber, Allen & Co., B.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electric Wire Co. & Smiths, Ltd.
McWhirr, Paterson & Co.
Merrington Bros., Ltd.
Northampton Plating Co.
Paul's Wireless Stores.
Pooley, G. J.
Postlethwaite Bros.
Radiamp Co.
Radio Instruments, Ltd.
Radiolab Mfg. Co.
Ready Radio, Ltd.
Scott & Co., S. W.

Shearing, Ltd., A. E.
Slektun Products, Ltd.
Sovereign Products, Ltd.
Storey Bros. & Co.
Stratton & Co., Ltd.
Telsen Electric Co., Ltd.
Tower Radio Supplies.
Tunewell Radio, Ltd.
Varley.
Ward & Goldstone, Ltd.
Whiteley Electric Radio Co., Ltd.
Wright & Weaire, Ltd.
Zimba Radio Co.

COILS (iron-cored).

Bercliff, Ltd.
Burne-Jones & Co., Ltd.
Colvern, Ltd.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Harrison & Co., A. T.
Igranie Electric Co., Ltd.
Ivory Electric.
Kimber, Allen & Co., B.
Lissen, Ltd.
London Electric Wire Co. & Smiths, Ltd.
Radiamp Co.
Radio Instruments, Ltd.
Scott & Co., S. W.
Standard Tels. and Cables, Ltd.
Telsen Electric Co., Ltd.
Varley.
Ward & Goldstone, Ltd.
Wright & Weaire, Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.

COIL WINDING MACHINES.

Amalgamated Manufacturers.
Automatic Coil Winder and Electrical Equipment Co., Ltd.
Britannia Lathe and Oil Engine Co., Ltd.
Elvy, C. L.
Enderlein, E.
Eta Tool Co.
McLeod & McLeod.
Trent Electric Wire Wks., Ltd.
Universal Winding Co.
Whitelegg, F.

CONDENSERS (fixed, Mansbridge).

Alpha Products.
British Insulated Cables, Ltd.
British Radio Gramophone Co., Ltd.
British Radiophone, Ltd.
Chorlton Metal Co., Ltd.
Cifel Products, Ltd.
Cossor, Ltd.
Daly, H. C.
Elliott Radio Mfg. Co., Ltd.
Ferranti, Ltd.
Formo Co.
Franklin Electric Co., Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Hearberr & Co., F. C.
Hill & Co., Ltd., F. C.
Igranie Electric Co., Ltd.
Ivory Electric.
Lever (Trix), Ltd., E. J.
Lissen, Ltd.
McLeod & McLeod.
Millet, J.
Muirhead & Co., Ltd.
Orion Lamps, Ltd.
Pepper, T.
Sarago, W. B.
Siemens Shuckert (Gt. Britain), Ltd.
Sovereign Products, Ltd.
Standard Telephones & Cables, Ltd.
Static Condenser Co.
Supremus Specialities, Ltd.
Telegraph Condenser Co., Ltd.
Telephone Mfg. Co., Ltd.
Telsen Electric Co., Ltd.
Toubkin, J.
Wego Condenser Co., Ltd.
Wilburn & Co.
W.R.C., Ltd.

CUSTOM SAYS MULLARD

CONDENSERS (fixed, mica).

Aerodyne Radio.
 Altham Radio Co.
 Ashley Wireless Telephone Co. (1925), Ltd.
 British Radio Gramophone Co., Ltd.
 British Radio Mfg. Co. (L'pool), Ltd.
 Castagnoli, G.
 Daly, H. C.
 Dubilier Condenser Co. (1925), Ltd.
 Emkabe Radio Co., Ltd.
 Ferranti, Ltd.
 Formo Co.
 Franklin Electric Co., Ltd.
 General Electric Co., Ltd.
 Graham Farish, Ltd.
 Hellesens, Ltd.
 Igranice Electric Co., Ltd.
 Ivory Electric.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Millet, J.
 Muirhead & Co., Ltd.
 Ormond Engineering Co., Ltd.
 Siemens Shuckert (Gt. Britain), Ltd.
 Sovereign Products, Ltd.
 Standard Telephones & Cables, Ltd.
 Sullivan, Ltd., H. W.
 Telegraph Condenser Co., Ltd.
 Telsen Electric Co., Ltd.
 Ward & Goldstone, Ltd.
 Wilson, W. H.
 W.R.C., Ltd.

CONDENSERS (electrolytic).

Alpha Products.
 British Insulated Cables, Ltd.
 British N.S.F. Co., Ltd.
 Cifel Products, Ltd.
 Dubilier Condenser Co. (1925) Ltd.
 Electric Lamp Service Co., Ltd.
 Ferranti, Ltd.
 Franklin Electric Co., Ltd.
 Hellesens, Ltd.
 Lyons, Ltd., Claude.
 Magnavox (Gt. Britain), Ltd.
 Millet, J.
 Morton, Ltd., E. R.
 Mullard Wireless Service Co., Ltd.
 Rothermel Corporation, Ltd.
 Telegraph Condenser Co., Ltd.
 Telephone Mfg. Co., Ltd.
 Telsen Electric Co., Ltd.
 Triotron Radio Co., Ltd.
 Wego Condenser Co., Ltd.

CONDENSERS (variable).

Altham Radio Co.
 Andrews & Co., A. E.
 Bird & Sons, Sidney S.
 British N. S. F. Co., Ltd.
 British Radio Gramophone Co., Ltd.
 British Radiophone, Ltd.
 Bulgin & Co., Ltd., A. F.
 Burne-Jones & Co., Ltd.
 Castagnoli, G.
 Chorlton Metal Co., Ltd.
 Cossor, Ltd.
 Danco Manufacturing Co., Ltd.
 Emkabe Radio Co., Ltd.
 Ferranti, Ltd.
 Formo Co.
 Francis, T. R.
 Franklin Electric Co., Ltd.
 General Electric Co., Ltd.
 Godfrey Radio, F. E., Ltd.
 Graham Farish, Ltd.
 Hewitt, Ltd., A. J.
 Igranice Electric Co., Ltd.
 Ivory Electric.
 Jackson Bros. (London), Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Lyons, Ltd., Claude.
 McWhirr, Paterson & Co.
 Melbourne Radio Supply.
 Millet, J.
 Nassak Mfg. Co., Ltd.
 Ormond Engineering Co., Ltd.

Plessey Co., Ltd.
 Pooley, G. J.
 Radiamp Co.
 Ready Radio, Ltd.
 Standard Telephones and Cables, Ltd.
 Stratton & Co., Ltd.
 Sullivan, Ltd., H. W.
 Telsen Electric Co., Ltd.
 Toubkin, J.
 Tower Radio Supplies.
 Ultra Electric, Ltd.
 Webb Condenser Co., Ltd.
 Wilkins & Wright, Ltd.
 Williams & Moffat, Ltd.
 Wingrove & Rogers, Ltd.
 W.R.C., Ltd.

CORDS

(battery, headphone and speaker).

Altham Radio Co.
 Belling & Lee, Ltd.
 British General Mfg. Co., Ltd.
 British Insulated Cables Ltd.
 Bromley Langton Electric Wire & Insulator Co., Ltd.
 Bulgin & Co., Ltd., A. F.
 Concordia Electric Wire Co., Ltd.
 Elektra Supplies.
 Elvy, C. L.
 Geipel, Ltd., W.
 General Electric Co., Ltd.
 Hart Bros. Electrical Mfg. Co., Ltd.
 Ivory Electric.
 Johnson & Phillips, Ltd.
 Kniveton Cable Wks., Ltd.
 Lever (Trix), Ltd., Eric J.
 London Electric Wire Co. & Smiths, Ltd.
 London Electric Co. (Sherborne Lane), Ltd.
 McLeod & McLeod.
 Midland Electric Wire Co., Ltd.
 Millet, J.
 Phoenix Telephone & Electric Works, Ltd.
 Reliance Electric Wire Co.
 Remax Cables.
 Standard Telephones and Cables, Ltd.
 Taylor, F.
 Toubkin, J.
 Trent Electric Wire Works, Ltd.
 Ward and Goldstone, Ltd.

CRYSTAL (quartz oscillating).

Blue Comet, Ltd.
 Brookes' Measuring Tools.
 Hilger, Ltd., Adam.
 Ivory Electric.
 Millet, J.
 Quartz Crystal Co.
 Radiolab Mfg. Co.
 Standard Telephones & Cables, Ltd.
 Sullivan, Ltd., H. W.
 362, Radio Valve Co., Ltd.

DIALS (standard, slow motion).

Alpha Products.
 British Radio Gramophone Co., Ltd.
 British Radiophone, Ltd.
 Burndep, Ltd.
 Burne Jones & Co., Ltd.
 Chorlton Metal Co., Ltd.
 Emkabe Radio Co., Ltd.
 Formo Co.
 General Electric Co., Ltd.
 Graham Farish, Ltd.
 Gresley Radio.
 Harlie, Ltd.
 Harrison & Co., A. T.
 Harwol Specialties Co.
 Igranice Electric Co., Ltd.
 Ivory Electric.
 Jackson Bros. (London), Ltd.
 Lissen, Ltd.
 McLeod & McLeod.
 Merrington Bros., Ltd.
 Money Hicks, Ltd.
 Morton, Ltd., E. R.
 Nassak Mfg. Co., Ltd.
 Ormond Engineering Co., Ltd.
 Plessey Co., Ltd.
 Radiamp Co.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Ready Radio, Ltd.
Standard Telephones & Cables, Ltd.
Stratton & Co., Ltd.
Telsen Electric, Ltd.
Webb Condenser Co., Ltd.
Wilkins & Wright, Ltd.
Williams & Moffat, Ltd.
Wingrove & Rogers, Ltd.
W.R.C., Ltd.

DIALS (drum control).

Crystalate Gramophone Record Mfg. Co., Ltd.
Emkabe Radio Co., Ltd.
Formo Co.
General Electric Co., Ltd.
Igranic Electric Co., Ltd.
Jackson Bros. (London), Ltd.
Lissen, Ltd.
Money Hicks, Ltd.
Morton, Ltd., E. R.
Nassak Mfg. Co., Ltd.
Ormond Engineering Co., Ltd.
Plessey Co., Ltd.
Radiamp Co.
Standard Telephones & Cables, Ltd.
Reliance (Name Plates), Ltd.
Webb Condenser Co., Ltd.
Wilkins & Wright, Ltd.
Williams & Moffat, Ltd.
Wingrove & Rogers, Ltd.
W.R.C. Ltd.

DIAPHRAGMS (headphone and speaker).

Amplion (1932) Ltd.
General Electric Co., Ltd.
Ivory Electric.
Lamphugh Radio, Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
National Radio Service Co.
Nelson & Co., J. H.
Rothermel Corporation, Ltd.
Sankey & Sons, Ltd., Joseph.
Standard Telephones & Cables, Ltd.
Taylor & Petters, Ltd.
Voigt Patents, Ltd.

EARTH TUBES (plates and mats).

Altham Radio Co.
Bate & Co., Ltd., Jabez.
British Insulated Cables, Ltd.
Clifford Pressland (Sales), Ltd.
Climax Radio Electric, Ltd.
Custerson, R.
Dyson & Co. (Works), Ltd., J.
Eastick, J. J., & Sons.
Enderlein, E.
Gee (Birmingham), Ltd.
General Electric Co., Ltd.
Gresley Radio, Ltd.
Gripso Co.
Harris, G. & R.
Hillman Bros.
Ivory Electric.
Laker Co., Ltd., J. & J.
Lamphugh Radio, Ltd.
Lever (Trix), Ltd., Eric J.
Lilley & Son, Ltd., S.
Linolite, Ltd.
Midland Radio & Television, Ltd.
Millet, J.
Radiamp Co.
Spong & Co., Ltd.
Toubkin, J.
Ward & Goldstone, Ltd.
Wright & Weaire, Ltd.

EBONITE (panel, sheet, rod and tube).

Altham Radio Co.
American Hard Rubber Co. (Britain), Ltd.
A.E.G. Electric Co., Ltd.
British Ebonite Co., Ltd.
British Goodrich Rubber Co., Ltd.
British Hard Rubber Co., Ltd.

Chorlton Metal Co., Ltd.
Clayton (Rubber Sales) Ltd.
General Electric Co., Ltd.
Kay Brothers, Ltd.
Kemp's Vulcanizing Co., Ltd.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
McLeod & McLeod, Ltd.
Marks & Son, S.
Maul & Murphy, Ltd.
Mountford Rubber Co., Ltd.
Peto-Scott Co., Ltd.
Redfern's Rubber Works, Ltd.
St. Helen's Cable & Rubber Co., Ltd.
Siemens Electric Lamps & Supplies, Ltd.
Spicers, Ltd.
Trelleborgs Ebonite Works, Ltd.

EBONITE (mouldings and turnings).

American Hard Rubber Co. (Britain), Ltd.
British Ebonite Co., Ltd.
British Goodrich Rubber Co., Ltd.
British Hard Rubber Co., Ltd.
British Radio Gramophone Co., Ltd.
Clayton Rubber Sales, Ltd.
General Electric Co., Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
McLeod & McLeod, Ltd.
Marks & Son, S.
Maul & Murphy, Ltd.
Merrington Bros., Ltd.
Mountford Rubber Co., Ltd.
Patton, Ltd., David J.
Radiamp Co.
Redfern's Rubber Works, Ltd.
St. Helen's Cable & Rubber Co., Ltd.
Siemens Electric Lamps & Supplies, Ltd.
Trelleborgs Ebonite Works, Ltd.
Walter, Ltd., J. & H.

EBONITE CEMENT.

Kay Brothers, Ltd.
Maul & Murphy.
Walter, Ltd., J. & H.

ELECTRIC CLOCKS.

A.E.G., Electric Co., Ltd.
Bilou Radio Co.
Blue Comet, Ltd.
British Electric Meters, Ltd.
Brown, Brew & Co., Ltd.
Bulle Co., Ltd.
Empire Trading Co.
E. Enderlein.
Everett, Edgcombe & Co., Ltd.
Ferranti, Ltd.
G.E.C., Ltd.
Gent & Co., Ltd.
Joseph, H.
McWhirr, Paterson & Co.
Muirhead & Co., Ltd.
Phillips Lamps, Ltd.
Rothermel Corporation, Ltd.
Stockall, Mcrplies & Co., Ltd.
Telephone Mfg. Co., Ltd.
Time Recorder & Equipment Co.

ELECTRO-PLATING.

Bi-meta's.
British Ideal Patents, Ltd.
Cann, Ltd., J. Churly.
General Electric Co., Ltd.
Morton, Ltd., E. R.
Ormond Engineering Co., Ltd.
Wilkins & Wright, Ltd.
Yorkshire Radio Co.

ENGRAVING.

Automobile Accessories (Bristol), Ltd.
Belling & Leo, Ltd.
Bird & Sons, W.
Burndept, Ltd.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Celluloid Printers, Ltd.
Clarke & Co. (Manchester), Ltd., H.
East Ham Wireless Supplies.

THREE MILLION AERIALS CAN'T BE WRONG

General Electric Co., Ltd.
Gould, Harper & Co., Ltd.
Jeacock, W.
Lectro Linx, Ltd.
Limit Engineering Co., Ltd.
Limit Radio, Ltd.
Marks & Son, S.
Money Hicks, Ltd.
Rich & Bundy, Ltd.
Stebbing, J. R.
Stilwell & Sons.
Trelleborgs Ebonite Works, Ltd.
Yorkshire Radio Co.

ENGRAVING MACHINES.

Automobile Accessories (Bristol), Ltd.
Gould, Harper & Co., Ltd.

ERINOID AND CASEIN PRODUCTS.

Belling & Lee, Ltd.
Elliott, E.
Francis, E. J.
Fred, S. R. F.
General Electric Co., Ltd.
Lever (Trix), Ltd., Eric J.
Lilley & Son, Ltd., S.
McLeod & McLeod, Ltd.
Patton, Ltd., David J.
Radiamp Co.
Trelleborgs Ebonite Works, Ltd.

FIBRE.

Attwater & Sons.
Diamond Fibre Co., Ltd.
General Electric Co., Ltd.
McEchern & Co., Ltd.
McLeod & McLeod, Ltd.
Micanite & Insulators Co., Ltd.
Mountford Rubber Co., Ltd.
Speckers, Ltd.
Trelleborgs Ebonite Works, Ltd.
Weedon Power Link Radio Co.
Wilmott, Son & Phillips, Ltd.

FILTERS (output).

British Radio Mfg. Co. (L'pool), Ltd.
Bulgin & Co., Ltd., A. F.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Daly, H. C.
General Electric Co., Ltd.
Johnson & Phillips, Ltd.
Lissen, Ltd.
Midland Radio & Television Co.
Pepper, T.
Sjektun Products, Ltd.
Varley.
Willis & Co. (Meritus), Ltd.
Wright & Weaire, Ltd.
Zenith Electric Co., Ltd.

FITTINGS (for portable set cases).

Aladdin Gramophone & Accessories Co.
Beddoes, Ltd. J. G.
Harris, G. & R.
Lissen, Ltd.
Lockwood Casework Mfg. Co.

FUSES.

Altham Radio Co.
Artic Fuse & Electrical Manufacturing Co., Ltd.
Belling & Lee, Ltd.
Beswick, Ltd., K. E.
British Insulated Cables, Ltd.
Bulgin & Co., Ltd., A. F.
Burne-Jones & Co., Ltd.
Crabtree, J. A. & Co., Ltd.
Edison Swan Electric Co., Ltd.
Enderlein, E.
Ferranti, Ltd.
General Electric Co., Ltd.
Ivory Electric.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
McLeod & McLeod.
Merrington Bros., Ltd.
Microfuses, Ltd.
Millet, J.

Nassak Mfg. Co., Ltd.
Radiolab Mfg. Co.
Reliance Mfg. Co. (Southwark), Ltd.
Sifam Electrical Instrument Co., Ltd.
Standard Telephones & Cables, Ltd.
Telsen Electric Co., Ltd.
Tunewell Radio, Ltd.
Ward & Goldstone, Ltd.

GENERATORS.

Electro Dynamic Construction Co., Ltd.
General Electric Co., Ltd.
Higgs Motors.
Lancashire Dynamo and Crypto, Ltd.
Lever (Trix), Ltd., Eric J.
Mortley, Sprague & Co., Ltd.
Philco, Ltd.
Rotax, Ltd.
Willis & Co. (Meritus), Ltd.

GRID LEAKS.

Altham Radio Co.
Ashley Wireless Telephone Co. (1925), Ltd.
British N. S. F. Co., Ltd.
Bulgin & Co., Ltd., A. F.
Daly, H. C.
Edison Swan Electric Co., Ltd.
Enderlein, E.
Eric Resistor, Ltd.
Ferranti, Ltd.
Franklin Electric Co., Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Harrison & Co., A. T.
Igranite Electric Co., Ltd.
Imo Radio Co.
Ivory Electric.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Loewe Radio Co., Ltd.
McLeod & McLeod.
Millet, J.
Orion Lamps, Ltd.
Pepper, T.
Philco, Ltd.
Pye Radio, Ltd.
Radio Resistor Co.
Ready Radio, Ltd.
Reliance Mfg. Co. (Southwark), Ltd.
Siemens-Schuckert (Gt. Britain) Ltd.
Six-Sixty Radio Co., Ltd.
Shearn, Ltd., A. E.
Sovereign Products, Ltd.
Telsen Electric Co., Ltd.
Tunewell Radio, Ltd.
W.R.C., Ltd.

HEADPHONES.

Bowerman, Ltd., G.
Edison Swan, Electric Co., Ltd.
Ericsson Telephones, Ltd.
General Electric Co., Ltd.
Gen' & Co., Ltd.
Kolster-Brandes, Ltd.
Lissen, Ltd.
Multitone Electric Co., Ltd.
National Radio Service Co.
Siemens-Schuckert (Gt. Britain), Ltd.
Standard Telephones & Cables, Ltd.
Sullivan, Ltd., H. W.
Toumbkin, J.

HOME TALKIE APPARATUS.

Bijou Radio Co.
Blue Comet, Ltd.
British Talk tone, Ltd.
Lever (Trix), Ltd., Eric J.
Plessey Co., Ltd.
R.C.A. Photophone, Ltd.
Synchronophone, Ltd.
Wright & Weaire, Ltd.

HYDROMETERS.

Chloride Electric Storage Co., Ltd.
Chorlton Metal Co., Ltd.
Collie & Co., J. H.
Cookson and Co.
Gordon, Fredk. J.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Guiterman & Co., Ltd.
Ivory Electric.
Lever (Trix), Ltd., Eric J.
Lucas, Ltd., J.
Millet, J.
Newtons of Taunton, Ltd.
Partridge, Wilson & Co., Ltd.
Stadium, Ltd.
W.R.C., Ltd.
362 Valve Co., Ltd.

INSULATORS.

Aerialite, Ltd.
Aladdin Gramophone & Accessories Co.
Altham Radio Co.
Bate & Co., Ltd., Jabez.
Birkby's Ltd.
Bullers, Ltd.
Crystalate Gramophone Record Mfg. Co. Ltd.
De La Rue & Co., Ltd., T.
Ebonestos Insulators, Ltd.
Elliott, E.
Ellison Insulations, Ltd.
Enderlein, E.
General Electric Co., Ltd.
Ivory Electric.
Jobling & Co., J. A.
Joseph, H.
Junction Engineering Co., Ltd.
Laker Co., Ltd., J. & J.
Lectro Linx, Ltd.
Lesingham, F. L.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Litholite Insulators, Ltd.
Merrington Bros., Ltd.
Micante & Insulators Co., Ltd.
Millet, J.
New London Electron Works, Ltd.
Patton, Ltd., David J.
Robinson & Co., Lionel.
Saxon Radio Co.
Taylor & Petters, Ltd.

INSULATING COMPOUNDS AND MATERIALS (other than ebonite).

A.E.G. Electric Co., Ltd.
Birkby's Ltd.
British Insulated Cables, Ltd.
Callenders Cable & Construction Co., Ltd.
Clarke & Co. (Manchester), Ltd., H.
Crystalate Gramophone Record Mfg. Co., Ltd.
Ellison Insulations, Ltd.
Elvy, C. L.
Erinoid, Ltd.
Gelpel, Ltd., W.
General Electric Co., Ltd.
Ioco Rubber & Waterproofing Co., Ltd.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
McLeod & McLeod.
Maul & Murphy, Ltd.
Micante & Insulators Co., Ltd.
Pomona Rubber Co.
Webster & Co., Ltd., T.

INTERFERENCE SUPPRESSORS.

Austin, Mills & Co.
Automobile Accessories (Bristol), Ltd.
Bayliss, Ltd., W.
Belling & Lee, Ltd.
British Radio Mfg. Co. (L'pool), Ltd.
Custerson, R.
Daly, H. C.
Dubilier Condenser Co. (1925) Ltd.
Enderlein, E.
Eric Resistor, Ltd.
General Electric Co., Ltd.
Healey, Ltd., P.
Kolster-Brandes, Ltd.
Lamphugh Radio, Ltd.
Lyons, Ltd., Claude.
Midland Radio & Television Co.
Mile End Radio Co.

Pepper, T.
Philco, Ltd.
Radio Resistor Co.
Rotax, Ltd.
Sifam Electrical Instrument Co., Ltd.
Wade & Co. (Burnley) Ltd., A.
Ward & Goldstone, Ltd.
Wego Condenser Co., Ltd.
Willis & Co. (Meritus), Ltd.
Zenith Electric Co., Ltd.

KIT SETS.

Aerialite, Ltd.
Andrews & Co., A. E.
Blue Comet, Ltd.
British Lumophon, Ltd.
Burne-Jones & Co., Ltd.
City Accumulator Co.
Clarke & Co. (Manchester), Ltd., H.
Cossor, Ltd.
Custerson, R.
Electric Lamp Service Co., Ltd.
Ferranti, Ltd.
Forbat, Eugen.
Formo Co.
General Electric Co., Ltd.
Hartley-Turner Radio, Ltd.
Haynes Radio.
Heayberd & Co., F. C.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
Lyons, Ltd., Claude.
Merrington Bros., Ltd.
Midland Radio & Television Co.
Nassak Mfg. Co., Ltd.
Peto Scott Co., Ltd.
Plessey Co., Ltd.
Ready Radio, Ltd.
Shearing, Ltd., A. E.
Six-Sixty Radio Co., Ltd.
Stonehouse Radio Supplies.
Stratton & Co., Ltd.
Telsen Electric Co., Ltd.
Tunewell Radio Ltd.
United Radio Manufacturers, Ltd.

KNOBS AND DIALS.

British RadioGram Co., Ltd.
British Radiophon, Ltd.
Celluloid Printers, Ltd.
Crystalate Gramophone Record Mfg. Co., Ltd.
Elliott, E.
Formo Co.
General Electric Co., Ltd.
Harlie, Ltd.
Harrison & Co., A. T.
Ivory Electric.
Jackson Bros. (London), Ltd.
Lissen, Ltd.
Lyons, Ltd., Claude.
McLeod & McLeod.
Merrington Bros., Ltd.
Millet, J.
Money Hicks, Ltd.
Morton, Ltd., E. R.
Nassak Mfg. Co., Ltd.
Ormond Engineering Co., Ltd.
Precision Radio & Mfg. Co., Ltd.
Radiamp Co.
Reliance Mfg. Co. (Southwark), Ltd.
Stratton & Co., Ltd.
Trelleborgs Ebonite Works, Ltd.
Webb Condenser Co., Ltd.
Webster & Co., Ltd., T.
Wilkins & Wright, Ltd.
Williams & Moffatt, Ltd.
W.R.C., Ltd.

LABELS AND SCALES.

Celluloid Printers, Ltd.
Elliott, E.
Gripso Co.
Ivory Electric
Jackson Bros. (London), Ltd.
McLeod & McLeod.
Money Hicks, Ltd.
Stilwell & Sons.

MULLARD—THE GREATEST NAME IN RADIO

LABORATORY INSTRUMENTS.

Anglo-Swiss Electrical Co., Ltd.
Bi-Metals.
Castagnoli, G.
Cale, Ltd., E. K.
Cossor, Ltd., A. C.
Custerson, R.
Ferranti, Ltd.
General Electric Co., Ltd.
Godfrey (Radio) Ltd., F. E.
Hartley Turner Radio, Ltd.
Healey, Ltd., P.
Hilger, Ltd., Adam.
Lyons, Ltd., Claude.
Mervyn Sound & Vision Co., Ltd
Muirhead & Co., Ltd.
Quartz Crystal Co.
Radiolab Mfg. Co.
Siemens-Schuckert (Gt. Britain), Ltd.
Standard Telephones & Cables, Ltd.
Sullivan, Ltd., H. W.
Voigt Patents, Ltd.
Weston Electrical Instrument Co., Ltd.
Zenith Electric Co., Ltd.

LEAD-IN TUBES.

Aladdin Gramophone & Accessories Co.
Alham Radio Co.
Attwater & Sons.
Automobile Accessories (Bristol), Ltd.
Bate & Co., Ltd., Jabez.
Bird & Sons, W.
Birmingham Products, Ltd.
Blue Comet, Ltd.
British Hard Rubber Co., Ltd.
Bullers, Ltd.
Cann, Ltd., J. Churly.
Clifford Pressland (Sales), Ltd.
Coates, Ltd., J. G.
Eastick & Sons, J. J.
Elektra Supplies.
Enderlein, E.
Francois, E. J.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Ivory Electric.
Laker Co., Ltd., J. & J.
Lever (Trix), Ltd., Eric J.
Lilley & Son, Ltd., S.
McWhirr, Paterson & Co.
Millet, J.
Pioneer Mfg. Co.
Radlamp Co.
Redferns Rubber Works, Ltd.
Siemens Electric Lamps & Supplies, Ltd.
Sparkes & Co., J.
Stott, J. E.
Stratton & Co., Ltd.
Toubkin, J.
Trolleborgs Ebonite Works, Ltd.
Ward & Goldstone, Ltd.
Wright & Weaire, Ltd.
Yeldon (Radio) Ltd.

LIGHTNING ARRESTERS.

Aladdin Gramophone & Accessories Co.
Andrews & Co., A. E.
Automobile Accessories (Bristol), Ltd.
Bate & Co., Ltd., Jabez.
Blue Comet, Ltd.
British Insulated Cables, Ltd.
Bulgin & Co., Ltd., A. F.
Cann, Ltd., J. Churly.
Castagnoli, G.
Chalkley, O. G.
Christie & Sons, Ltd., Jas.
Clifford Pressland (Sales) Ltd.
Cooke & Co., Howard S.
Eastick & Sons, J. J.
Elektra Supplies.
Enderlein, E.
General Electric Co., Ltd.
Gould, Harper & Co., Ltd.
Graham Farish, Ltd.
Healey, Ltd., P.
Ivory Electric.
Joseph, H.

Laker Co., Ltd., J. & J.
Lamplugh Radio, Ltd.
Lever (Trix), Ltd., Eric J.
McWhirr, Paterson & Co.
Millet, J.
Phillips Lamps, Ltd.
Pioneer Mfg. Co.
Sovereign Products, Ltd.
Willmott, Son & Phillips, Ltd.
Yeldon (Radio), Ltd.

MAGNETS (telephone and speaker).

Allen & Co., Ltd., E.
Darwins, Ltd.
English Steel Corporation.
Film Industries, Ltd.
General Electric Co., Ltd.
Goodmans (Clerkenwell), Ltd.
Neill & Co. (Sheffield), Ltd., James.
Swift Levick & Sons, Ltd.
Watson, Saville & Co., Ltd.

MAINS SUPPLY UNITS A.C.

Automobile Accessories (Bristol), Ltd.
Baty, E. J.
Bijou Radio Co.
Bligh, S. W.
Blue Comet, Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Brown, Brew & Co., Ltd.
Bullphone Radio.
Burne-Jones & Co., Ltd.
Castagnoli, G.
City Accumulator Co.
Clarke & Co. (Manchester), Ltd., H.
Clifford Pressland (Sales), Ltd.
Cole, E. K., Ltd.
Commercial Engineering Co.
Custerson, R.
Duray.
Dyson & Co. (Works), Ltd., J.
East Ham Wireless Supplies.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Eon Vacuum Wireless Co.
Fel-Electric Radio.
Ferranti Ltd.
Formo Co.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gresley Radio, Ltd.
Hartley Turner Radio, Ltd.
Heayberd & Co., F. C.
H.O.H. Co.
Johnson & Phillips, Ltd.
Junction Engineering Co., Ltd.
Lanchester Laboratories, Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane) Ltd.
Mains Power Radio, Ltd.
Merrington Bros., Ltd.
Midland Radio & Television Co.
Mile End Radio Co.
Partridge & Mee, Ltd.
Pepper, T.
Philomel Radio Equipment Co.
Plessey Co., Ltd.
Radio Development Co.
Radio Instruments, Ltd.
Rectifiers, Ltd.
Regentone, Ltd.
Smurthwaite, Ltd., F.W.
Sound Sales, Ltd.
Sovereign Products, Ltd.
Standard Telephones & Cables, Ltd.
Stratton & Co., Ltd.
Supremus Specialities, Ltd.
Tarry, F. L.
Telsen Electric Co., Ltd.
Tunewell Radio, Ltd.
Wade & Co. (Burnley), Ltd., A.
Wills & Co. (Meritus), Ltd.
Wood, L. R.
Yeldon (Radio), Ltd.

MAINS SUPPLY UNITS, D.C.

Automobile Accessories (Bristol), Ltd.
Baty, E. J.
Bijou Radio Co.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Bligh, S. W.
 Blue Comet, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Bullphone Radio
 Castagnoli, G.
 Clarke & Co. (Manchester), Ltd., H.
 Clifford Pressland (Sales), Ltd.
 Climax Radio Electric, Ltd.
 Cole, E. K., Ltd.
 Commercial Engineering Co.
 Custerson, R.
 Duray.
 Dyson & Co. (Works), Ltd., J.
 East Ham Wireless Supplies.
 Edison Swan Electric Co., Ltd.
 Electric Lamp Service Co., Ltd.
 Eon Vacuum Wireless Co.
 Fel-Electric Radio.
 Formo Co.
 Franklin & Freeman, Ltd.
 General Electric Co., Ltd.
 Gresley Radio, Ltd.
 Hartley Turner Radio, Ltd.
 Heayberd & Co., F. C.
 Johnson & Phillips, Ltd.
 Lever (Trix), Ltd., Eric J.
 Lisson, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 Mains Power Radio, Ltd.
 Merrington Bros., Ltd.
 Midland Radio & Television Co.
 Partridge & Mee, Ltd.
 Pepper, T.
 Plessey Co., Ltd.
 Radio Instruments, Ltd.
 Regentone, Ltd.
 Rotax, Ltd.
 Smurthwaite, Ltd., F. W.
 Sovereign Products, Ltd.
 Standard Telephones & Cables, Ltd.
 Stratton & Co., Ltd.
 Supertone Pianos, Ltd.
 Tannoy Products.
 Telsen Electric Co., Ltd.
 Tunewell Radio, Ltd.
 Wade & Co. (Burnley), Ltd., A.
 Westinghouse Brake & Saxby Signal Co., Ltd.
 Willis & Co. (Meritus), Ltd.
 Wood, L. R.
 Yeldon (Radio) Ltd.

MASTS (aerial).

Abbey Engineering Works.
 Accles & Pollock, Ltd.
 Bullers, Ltd.
 General Electric Co., Ltd.
 Hildick & Hildick.
 Ivory Electric.
 Laker Co., Ltd., J. & J.

METALS, RARE.

Hilger, Ltd., Adam.
 Johnson, Mathew & Co., Ltd.
 Phillips Industrial.
 Siemens-Schuckert (Gt. Britain), Ltd.

METERS.

Altham Radio Co.
 Anglo-Swiss Electrical Co.
 A.E.G. Electric Co., Ltd.
 Benoit, M.
 British Electric Meters, Ltd.
 British Insulated Cables, Ltd.
 Bulgin Co., Ltd., A. F.
 Cambridge Instrument Co., Ltd.
 Dixon Switchgear Co., Ltd.
 Ernest Turner Electrical Instruments, Ltd.
 Everett, Edgecumbe & Co.
 Evershed & Vignoles, Ltd.
 Ferranti, Ltd.
 General Electric Co., Ltd.
 Hartley Turner Radio, Ltd.
 Hcaley, Ltd., P.
 Howard, Butler, Ltd.
 Impex Electrical, Ltd.
 Johnson & Phillips, Ltd.
 Lamplugh Radio, Ltd.
 McLeod & McLeod.
 McMillan & Co., J.
 Millet, J.
 Pepper, T.
 Peto-Scott Co., Ltd.
 Philco, Ltd.
 Radiolab Mfg. Co.
 Siemens Electric Lamps & Supplies, Ltd.
 Sifam Electrical Instrument Co., Ltd.
 Stadium, Ltd.
 Sullivan, Ltd., H. W.
 Ward & Goldstone, Ltd.

MICA.

Attwater & Sons.
 Clarke & Co. (Manchester), Ltd., H.
 Harris, G. & R.
 Lissen, Ltd.
 Micanite & Insulator Co., Ltd.
 Taylor & Petters, Ltd.
 Vandervelde, L.

MICROPHONES.

Adolph, C. F.
 Castagnoli, G.
 Correx Amplifiers.
 Edison Swan Electric Co., Ltd.
 Epoch Radio Mfg., Co., Ltd.
 General Electric Co., Ltd.
 Harlie, Ltd.
 Improved Wilson Microphone & Electrical Co., Ltd.
 Ivory Electric.
 Johnson & Phillips, Ltd.
 London Electric Co. (Sherborne Lane), Ltd.



CLIX

PLUGS & SOCKETS

The Clix range covers all known requirements of set manufacturers and home constructors.

Special quotations to manufacturers. Trade terms and Literature on request. (For other Clix lines see pages 248, 254, 255).

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Lyons, Ltd., Claude.
 Marconiphone Co., Ltd.
 Metal Agencies Co., Ltd.
 Millet, J.
 National Radio Service Co.
 Philips Lamps, Ltd.
 Plessey Co., Ltd.
 R. C. & Wilson Electric, Ltd.
 Savage, W. B.
 Scientific Supply Stores (Wireless), Ltd.
 Siemens-Schuckert (Gt. Britain), Ltd.
 Standard Telephones & Cables, Ltd.
 Telephone Mfg. Co., Ltd.
 Universal Gramophone & Radio Co., Ltd.
 Voigt Patents, Ltd.

MOULDINGS (other than ebonite).

Alpha Products.
 Ashley Wireless Telephone Co. (1925), Ltd.
 Birkby's Ltd.
 Clarke & Co. (Manchester), Ltd., H.
 Clayton Rubber Sales, Ltd.
 Cole, Ltd., E. K.
 Crystalate Gramophone Record Mfg. Co., Ltd.
 Daly, H. C.
 De-La-Rue & Co., Ltd., Thos.
 Ebonestos Insulators, Ltd.
 Elliot, E.
 Ellison Insulations, Ltd.
 Ernest Turner Electrical Instruments, Ltd.
 Ferranti, Ltd.
 General Electric Co., Ltd.
 Gresley Radio, Ltd.
 Harlie, Ltd.
 Harrison & Co., A. T.
 Lissen, Ltd.
 Litholite Insulators, Ltd.
 Lorival Mfg. Co. (1921), Ltd.
 Lucas, Ltd., J.
 McLeod & McLeod.
 McWhirr, Paterson & Co.
 Merrington Bros., Ltd.
 Mica Mfg. Co., Ltd.
 Ormond Engineering Co., Ltd.
 Phillips Industrial.
 Pooley, G. J.
 Precision Radio & Mfg. Co., Ltd.
 Redfern's Rubber Works, Ltd.
 Radiamp Co.
 Reliance Mfg. Co. (Southwark), Ltd.
 St. Helen's Cable & Rubber Co., Ltd.
 Shearing, Ltd., A. E.
 Stadium, Ltd.
 Stratton & Co., Ltd.
 Webster & Co., T.
 Westinghouse Brake & Saxby Signal Co.
 Whiteley Electrical Radio Co., Ltd.
 Wilkins & Wright, Ltd.
 W.R.C., Ltd.

MOULDING POWDERS.

Attwater & Sons.
 A.E.G. Electric Co., Ltd.
 Bakelite, Ltd.
 Birkby's, Ltd.
 British Celanese, Ltd.
 Clarke & Co. (Manchester), Ltd., H.
 General Electric Co., Ltd.
 Sicaloid, Ltd.

PHOTO-ELECTRIC CELLS.

General Electric Co., Ltd.
 Lyons, Ltd., Claude.
 Phillips Lamps, Ltd.
 Westinghouse Brake & Saxby Signal Co., Ltd.
 362 Valve Co., Ltd.

PLUGS AND JACKS.

Alpha Products.
 Amplifiers, Ltd.
 Ashley Wireless Telephone Co. (1925), Ltd.
 Bulgin & Co., Ltd., A. F.
 Cossor, Ltd., A. G.
 Ericsson Telephones, Ltd.
 Francois, E. J.
 General Electric Co., Ltd.
 Harmo Products.
 Harris, G. & R.
 Igranite Electric Co., Ltd.

Ivory Electric.
 Lamplugh Radio Ltd.
 Lessingham, F. L.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Millet, J.
 Nassak Mfg. Co., Ltd.
 Ormond Engineering Co., Ltd.
 Plessey Co., Ltd.
 Radiamp Co.
 Romac Motor Accessories, Ltd.
 Standard Telephones & Cables, Ltd.
 Telephone Mfg. Co., Ltd.
 Wright & Weaire, Ltd.

PLUGS AND SOCKETS (not jack or wander plugs).

Amplifiers, Ltd.
 Anglo-Swiss Screw Co., Ltd.
 Ashley Wireless Telephone Co. (1925), Ltd.
 Bate & Co., Ltd., Jabez.
 Belling & Lee, Ltd.
 Bonson, E. W.
 British General Mfg. Co., Ltd.
 Bulgin & Co., Ltd., A. F.
 Crabtree, J. A., & Co., Ltd.
 Eastick, & Sons, J. J.
 Elliott, E.
 Enderlein, E.
 Francois, E. J.
 General Electric Co., Ltd.
 Gripso Co.
 Ivory Electric.
 Joseph, H.
 Lamplugh Radio, Ltd.
 Lectro Lux, Ltd.
 Lessingham F. L.
 Lever (Trix), Ltd., Eric J.
 Lilley & Son, Ltd., S.
 Lissenin Wireless Co.
 Lissen, Ltd.
 Lundberg & Sons, Ltd., A. P.
 Meyer, E.
 Millet, J.
 Nassak Mfg. Co., Ltd.
 Ormond Engineering Co., Ltd.
 Plessey Co., Ltd.
 Radiamp Co.
 Sovereign Products, Ltd.
 Standard Telephones & Cables, Ltd.
 Telephone Mfg. Co., Ltd.
 True Screws, Ltd.
 Ward & Goldstone, Ltd.
 Wright & Weaire, Ltd.
 W.R.C., Ltd.

POTENTIOMETERS.

Belling & Lee, Ltd.
 Bowyer-Lowe & A. E. D., Ltd.
 British N.S.F. Co., Ltd.
 British Radiophone, Ltd.
 Bulgin & Co., Ltd., A. F.
 Burne-Jones & Co., Ltd.
 Castagnoli, G.
 Colvern, Ltd.
 Cosmocoord, Ltd.
 Enderlein, E.
 Ericsson Telephones, Ltd.
 Eric Resistor, Ltd.
 Ferranti, Ltd.
 Franklin Electric Co., Ltd.
 General Electric Co., Ltd.
 Graham Farish, Ltd.
 Harrison & Co., A. T.
 Haynes Radio, Ltd.
 Igranite Electric Co., Ltd.
 Imp Radio Co.
 Lechner & Co., F. W.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 London Electric Wire Co. & Smiths, Ltd.
 Lyons, Ltd., Claude.
 Merrington Bros., Ltd.
 Millet, J.
 Nassak Mfg. Co., Ltd.
 Orion Lamps, Ltd.
 Ormond Engineering Co., Ltd.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Pepper, T.
 Plessey Co., Ltd.
 Radlamp Co.
 Radio Instruments, Ltd.
 Radio Resistor Co.
 Ready Radio, Ltd.
 Reliance Mfg. Co. (Southwark), Ltd.
 Rothermel Corporation, Ltd.
 Rotor Electric, Ltd.
 Siemens-Schuckert (Gt. Britain), Ltd.
 Sovereign Products, Ltd.
 Standard Telephones & Cables, Ltd.
 Tunewell Radio, Ltd.
 Varley.
 Wright & Weaire, Ltd.
 W.R.C., Ltd.
 Zenith Electric Co., Ltd.

PRESSINGS.

Alpha Products.
 Baker & Finnemore, Ltd.
 Beddoes, Ltd., J. G.
 Benjamin Electric, Ltd.
 Bromley Langton Electric Wire & Insulator Co., Ltd.
 Burne-Jones & Co., Ltd.
 Busby & Co., Ltd.
 Christie & Sons, Ltd., Jas.
 Custerson, R.
 Edmonds, Ltd., G.
 Elldons.
 Ellmar Mouldings Co.
 Elvy, C. L.
 Ernest Turner Electrical Instruments, Ltd.
 Gee (Birmingham), Ltd.
 General Electric Co., Ltd.
 Graham Farish, Ltd.
 Gresley Radio, Ltd.
 Harris, G. & R.
 Harris & Co. (Birmingham), Ltd.

Harrison & Co., A. T.
 Haynes Radio, Ltd.
 Ivory Electric,
 Jackson Bros. (London), Ltd.
 Lamplugh Radio, Ltd.
 Lilley & Son, Ltd., S.
 McLeod & McLeod, Ltd.
 Marks & Son, S.
 Mervyn Sound & Vision Co., Ltd.
 Morton, Ltd., E. R.
 Ormond Engineering Co., Ltd.
 Person & Son, L.
 Radlamp Co.
 Reliance Mfg. Co. (Southwark), Ltd.
 Righton & Co., Ltd., Henry.
 Ross Courtney & Co., Ltd.
 Sankey & Sons, Ltd., Joseph.
 Shearing, Ltd., A. E.
 Standard Telephones & Cables, Ltd.
 Toubkin, J.
 True Screws, Ltd.
 Walvis Engineering Co., Ltd.
 Webster & Co., Ltd., T.
 Whiteley Electrical Radio Co., Ltd.
 Wilkins & Wright, Ltd.
 Williams & Gray, Ltd.
 Williams & Moffat, Ltd.

PUBLIC ADDRESS EQUIPMENT.

Austin Mills & Co.
 Automobile Accessories (Britol), Ltd.
 Birmingham Sound Reproducers.
 Bligh, S. W.
 Blue Comet, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Castagnoli, G.
 Correx Amplifiers.
 Donophone P. A. Co., Ltd.
 Edison Swan Electric Co., Ltd.
 Electrect Radio Co.
 Emerson, R. Waldo.
 Epoch Radio Mfg. Co., Ltd.

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Film Industries, Ltd.
General Electric Co., Ltd.
Godfrey (Radio), Ltd., F. E.
Gramplan Reproducers, Ltd.
Hacker & Sons, H.
Hartley Turner Radio, Ltd.
Hill & Co., Ltd., F. O.
Igranic Electric Co., Ltd.
Improved Wilson Microphone & Electrical Co., Ltd.

Johnson & Phillips, Ltd.
Lancashire Dynamo and Crypto, Ltd.
Lever (Trix), Ltd., Eric J.
London Electric Co. (Sherborne Lane), Ltd.
Londona, Ltd.
Lyons, Ltd., Claude.
Magnavox (Gt. Britain), Ltd.
Marconiphone Co., Ltd.
Midgley Harmer, Ltd.
Midland Radio & Television Co.
Partridge & Mee, Ltd.
Pearson Bros. (Nottingham), Ltd.
Phillips Industrial
Phillips Lamps, Ltd.
Philomel Radio Equipment Co.
Plessey Co., Ltd.
Radio Development Co.
Radio Gramophone Development Co., Ltd.
Ray Engineering Co.
R.C.A. Photophone, Ltd.
Savage, W. B.
Scientific Supply Stores (Wireless), Ltd.
Siemens-Schuckert (Gt. Britain), Ltd.
Smurthwaite, Ltd., F. W.
Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Tannoy Products.
Tarry, F. L.
Universal Gramophone & Radio Co., Ltd.
Voigt Patents, Ltd.
Triotron Radio Co., Ltd.
Webber, Ltd., R. A.
Zimba Radio Co.
362 Valve Co., Ltd.

RECEIVERS (crystal).

Amplifiers, Ltd.
Automobile Accessories (Bristol), Ltd.
Bird & Sons, W.
Blue Comet, Ltd.
Burne-Jones & Co., Ltd.
Burwoods Wireless.
Castagnoli, G.
Chalkley, C. G.
City Accumulator Co.
Custerson, R.
East Ham Wireless Supplies.
Elliott Radio Mfg. Co., Ltd.
Improved Wilson Microphone & Electrical Co., Ltd.
Ivory Electric.
Lever (Trix), Ltd., Eric J.
Liverpool Radio Supplies.

London Electrical Co. (Sherborne Lane), Ltd.
Merrington Bros., Ltd.
R. C. & Wilson Electric Ltd.
Ward & Goldstone, Ltd.
Wood, L. R.

RECEIVERS (valve, all-wave).

Balcome, Ltd., A. J.
Blue Comet, Ltd.
British Lumophon Co.
Bulmer, F.
Burne-Jones & Co., Ltd.
Burrell Radio, Ltd.
City Accumulator Co.
Cossor, Ltd., A. O.
Custerson, R.
East Ham Wireless Supplies.
Eldeco Radio, Ltd.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Eon Vacuum Wireless Co., Ltd.
Forbat, E.
General Electric Co., Ltd.
Gramplan Reproducers, Ltd.
Gresley Radio, Ltd.
Hacker & Sons, H.
Harken Electrical Co., Ltd.
Hart Collins, Ltd.
Johnson & Phillips, Ltd.
Kolster Brandes, Ltd.
Lampex Radio & Electric Co.
Lissen, Ltd.
Liverpool Radio Supplies.
Loewe Radio Co., Ltd.
London Radio Co. (Leeds), Ltd.
Mains Radio Mfg. Co.
Majestic Electric Co., Ltd.
Midland Radio & Television Co.
Northampton Plating Co.
Phileo, Ltd.
Radio Acoustic Productions.
Shalles & Evans.
Smurthwaite, Ltd., F. W.
Sovereign Products, Ltd.
Standard Telephones & Cables, Ltd.
Stratton & Co., Ltd.
Tarry, F. L.
Taylor, F.
Truphonic Radio Co.
Union Radio Co., Ltd.
Wood, L. R.
Yorkshire Radio Co.

RECEIVERS

(valve, standard battery type).

Abingdon Wireless Supplies.
Adey Protable Radio.
Aerodyne Radio.
Altham Radio Co.
Automobile Accessories (Bristol), Ltd.
Balcome, Ltd., A. J.
Beardsall & Co. Ltd., W. E.
Bird & Sons, W.
Bligh, S. W.

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PRODUCTS SUPPLIED

Blue Comet, Ltd.
 British Blue Spot Co., Ltd.
 British Ideal Patents, Ltd.
 British Lumophon Co.
 Bullphone Radio.
 Bulmer, Fred.
 Burgoyne Wireless (1930), Ltd.
 Burndept, Ltd.
 Burne-Jones & Co., Ltd.
 Burrell Radio, Ltd.
 Burton, C. F. & H.
 Burwoods Wireless.
 Bush Radio, Ltd.
 Butcher & Sons (Ross), Ltd., W.
 Castagnoli, G.
 Chalkley, C. G.
 City Accumulator Co.
 Clarke & Co. (Manchester), Ltd., H.
 Climax Radio Electric, Ltd.
 Coates, Ltd., J. G.
 Cole, Ltd., E. K.
 Columbia Graphophone Co., Ltd.
 Cossor, Ltd.
 Cromwell (Southampton), Ltd.
 Custerson, R.
 Dagnall, Ltd., S.
 Distavox, Ltd.
 Eagle Engineering Co., Ltd.
 East Ham Wireless Supplies.
 Edge Radio, Ltd.
 Eldeco Radio, Ltd.
 Electrical & Radio Products (1931), Ltd.
 Elliott Radio Mfg. Co., Ltd.
 Eon Vacuum Wireless Co.
 Faraday Allwave Wireless, Ltd.
 Fallowfield, Ltd., Jonathan.
 Ferranti, Ltd.
 Fletcher, H. J.
 General Electric Co., Ltd.
 Godfrey (Radio) Ltd., F. E.
 Gould, Harper & Co., Ltd.
 Gresley Radio, Ltd.
 Grippall Electric Products, Ltd.
 Hacker & Sons, H.
 Hart Collins, Ltd.
 Haynes Radio, Ltd.
 Higgs (Gt. Britain), Ltd.
 Impex Electrical, Ltd.
 Johnson & Phillips, Ltd.
 Kenwell Radio, Ltd.
 Kolster Brandes, Ltd.
 Lampex Radio & Electric Co.
 Lawrence P. Harold.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Liverpool Radio Supplies.
 London Electrical Co. (Sherborne Lane), Ltd.
 London Radio Co. (Leeds), Ltd.
 McLeod & McLeod, Ltd.
 McMichael Radio, Ltd.
 Marconiphone Co., Ltd.
 Master Radio Co.
 Merrington Bros., Ltd.
 Midland Radio & Television Co.
 Montague Radio Inventions & Development Co., Ltd.
 Murphy Radio, Ltd.
 Northampton Plating Co.
 Orr Radio, Ltd.
 Paramount Gramophone Co.
 Peto Scott Co., Ltd.
 Philco.
 Philips Lamps, Ltd.
 Plessey Co., Ltd.
 Portadyne Radio, Ltd.
 Pye Radio, Ltd.
 Radio Instruments, Ltd.
 Radiomonic, Ltd.
 Riley & Son., W.
 Scott, Sessions & Co., G.
 Shallees & Evans.
 Six Sixty Radio Co., Ltd.
 Slektun Products, Ltd.
 Smurthwaite, F. W.
 Sovereign Products, Ltd.
 Standard Telephones & Cables, Ltd.

Stratton & Co., Ltd.
 Sunbeam Electric Ltd.
 Supertone Planos, Ltd.
 Tarry's.
 Taylor, F.
 Telsen Electric Co., Ltd.
 Toubkin, J.
 Truphonic Radio Co.
 Ultra Electric, Ltd.
 Union Radio Co., Ltd.
 Wendell Radio, Ltd.
 Whetton & L. Gold, E. P.
 Yeldon (Radio), Ltd.
 Yorkshire Radio Co.

RECEIVERS (valve, short wave).

Aerodyne Radio.
 Baty, E. J.
 Beacon Radio Mfg. Co., Ltd.
 Bijou Radio Co.
 Blue Comet, Ltd.
 British Lumophon Co.
 Bulmer, Fred.
 Burne-Jones & Co., Ltd.
 Burrell Radio Ltd.
 Castagnoli, G.
 Chalkley, C. G.
 City Accumulator Co.
 Commercial Engineering Co.
 Custerson, R.
 Eagle Engineering Co., Ltd.
 East Ham Wireless Supplies.
 Electric Lamp Service Co., Ltd.
 Elliott Radio Mfg. Co., Ltd.
 Faraday Allwave Wireless, Ltd.
 Ferranti, Ltd.
 Forbat, E.
 General Electric Co., Ltd.
 Godfrey (Radio), Ltd., F. E.
 Gramplan Reproducers, Ltd.
 Gresley Radio, Ltd.
 Harken Electrical Co., Ltd.
 Hart Collins, Ltd.
 Haynes Radio.
 Johnson & Phillips, Ltd.
 Kolster-Brandes, Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Liverpool Radio Supplies.
 London Electrical Co. (Sherborne Lane) Ltd.
 McLeod & McLeod, Ltd.
 McMichael Radio, Ltd.
 Mechanical Utilities Co., Ltd.
 Midland Radio & Television Co.
 Peto Scott Co., Ltd.
 Philco.
 Philips Lamps, Ltd.
 Pye Radio, Ltd.
 Quartz Crystal Co.
 Radiomonic, Ltd.
 Scott, Sessions & Co., G.
 Smurthwaite, F. W.
 Standard Telephones & Cables, Ltd.
 Stonehouse Radio Supplies.
 Stratton & Co., Ltd.
 Truphonic Radio Co.
 Union Radio Co., Ltd.
 Wood, L. R.
 Yeldon (Radio) Ltd.

RECEIVERS (valve, D.C. mains).

Aerodyne Radio.
 Automobile Accessories (Bristol), Ltd.
 Balcombe, Ltd., A. J.
 Baty, E. J.
 Bayliss, Ltd., W.
 Beardsall & Co., Ltd., W.E.
 Bligh, S. W.
 Blue Comet, Ltd.
 British Lumophon Co.
 Brown, Brew & Co., Ltd.
 Burrell Radio, Ltd.
 Burton, C. F. & H.
 Castagnoli, G.
 Cifel Products, Ltd.
 City Accumulator Co.
 Clarke & Co. (Manchester), Ltd., H.
 Climax Radio Electric, Ltd.

THREE MILLION AERIALS

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MULLARD MASTER VALVES

Cole, E. K., Ltd.
Columbia Graphophone Co., Ltd.
Cossor, Ltd., A. C.
Custerson, R.
Distavox, Ltd.
Donophone, P. A. Co., Ltd.
Eagle Engineering Co., Ltd.
East Ham Wireless Supplies.
Electric Lamp Service Co., Ltd.
Electrical & Radio Products (1931), Ltd.
Eon Vacuum Wireless Co.
Fallowfield Ltd., Jonathan.
Faraday Allwave Wireless, Ltd.
Ferranti, Ltd.
Forbat, E.
General Electric Co., Ltd.
Godfrey (Radio), Ltd., F. E.
Goodwin Radio, Ltd.
Gould, Harper & Co., Ltd.
Greatrex & Co., R. G.
Gresley Radio, Ltd.
Gramophone Co., Ltd.
Hacker & Sons, H.
Harken Electrical Co., Ltd.
Hart, Collins, Ltd.
Hartley Turner Radio, Ltd.
Haynes Radio.
Higgs (Gt. Britain), Ltd.
Impex Electrical, Ltd.
Johnson & Phillips, Ltd.
Kenwell Radio, Ltd.
Lampex Radio & Electrical Supply.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Liverpool Radio Supplies.
London Electrical Co. (Sherborne Lane), Ltd.
London Radio Co. (Leeds), Ltd.
McLeod & McLeod, Ltd.
McMichael Radio, Ltd.
Mains Power Radio, Ltd.
Mains Radio Gramophones, Ltd.
Mains Radio Mfg. Co.
Marconiphone Co., Ltd.
Master Radio Co.
Merrington Bros., Ltd.
Midland Radio & Television Co.
Murphy Radio, Ltd.
Paramount Gramophone Co.
Philco.
Philips Lamps, Ltd.
Philomel Radio Equipment Co.
Plessey Co., Ltd.
Precision-Electric, Ltd.
Pye Radio, Ltd.
Radio Acoustic Productions.
Radio Instruments, Ltd.
Radio Mfg. Co.
Radiomonic, Ltd.
Riley & Son, W.
Smurthwaite, F. W.
Standard Telephones & Cables, Ltd.
Stonehouse Radio Supplies.
Sunbeam Electric, Ltd.
Supertone Pianos, Ltd.
Truphonic Radio Co.
Tunewell Radio, Ltd.
Tyrela Electric, Ltd.
Ultra Electric, Ltd.
Wade & Co. (Burnley), Ltd., A.
Whetton & L. Gold, E. P.
Wood, L. R.
Wurlitzer Lyric Radio, Ltd.
Yeldon (Radio), Ltd.
Yorkshire Radio Co.

RECEIVERS (valve, A.C. mains).

Abingdon Wireless Supplies.
Aerodyne Radio.
Automobile Accessories (Bristol), Ltd.
Bacombe, Ltd., A. J.
Baty, E. J.
Bayliss, Ltd., W.
Beacon Radio Mfg. Co., Ltd.
Beardsall & Co., Ltd., W. E.
Bljou Radio Co.
Birmingham Sound Reproducers.
Bligh, S. W.
Blue Comet, Ltd.
British Clarion Co., Ltd.

British Lumophon Co.
Brown, Brew & Co., Ltd.
Burndept, Ltd.
Burne-Jones & Co., Ltd.
Burrell Radio, Ltd.
Burton, C. F. & H.
Burwoods Wireless.
Bush Radio, Ltd.
Chalkley, C. G.
City Accumulator Co.
Clarke & Co. (Manchester), Ltd., H.
Clifford Pressland (Sales), Ltd.
Climax Radio Electric, Ltd.
Coates, Ltd., J. G.
Cole, E. K., Ltd.
Columbia Graphophone Co., Ltd.
Cossor, Ltd.
Cromwell (Southampton), Ltd.
Custerson, R.
Distavox, Ltd.
Donophone, P. A. Co., Ltd.
Eagle Engineering Co., Ltd.
East Ham Wireless Supplies.
Edge Radio, Ltd.
Eldeco Radio, Ltd.
Electric Lamp Service Co., Ltd.
Electrical & Radio Products (1931), Ltd.
Elliott Radio Mfg. Co., Ltd.
Eon Vacuum Wireless Co., Ltd.
Fallowfield, Ltd., Jonathan.
Faraday Allwave Wireless, Ltd.
Ferranti, Ltd.
Fletcher & Co., Ltd., H. J.
Forbat, E.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Godfrey (Radio), Ltd., F. E.
Goodwin Radio, Ltd.
Gould, Harper & Co., Ltd.
Gramophone Co., Ltd.
Gramplan Reproducers, Ltd.
Greatrex & Co., R. G.
Gresley Radio, Ltd.
Hacker & Sons, H.
Halford Radio, Ltd.
Harken Electrical Co., Ltd.
Hart, Collins, Ltd.
Hartley Turner Radio, Ltd.
Haynes Radio.
Higgs (Gt. Britain), Ltd.
Impex Electrical, Ltd.
Johnson & Phillips, Ltd.
Kenwell Radio, Ltd.
Kolster-Brandes, Ltd.
Lampex Radio Supply Co., Ltd.
Lawrence, P. Harold.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Liverpool Radio Supplies.
Loewe Radio Co., Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
London Radio Co. (Leeds), Ltd.
McLeod & McLeod.
McMichael Radio, Ltd.
Mains Power Radio, Ltd.
Mains Radio Gramophones, Ltd.
Mains-Radio Mfg. Co.
Majestic Electric Co., Ltd.
Marconiphone Co., Ltd.
Master Radio Co.,
Merrington Bros., Ltd.
Midland Radio & Television Co.
Montague Radio Inventions & Development Co., Ltd.
Murphy Radio, Ltd.
Orr Radio, Ltd.
Paramount Gramophone Co.
Peto Scott Co., Ltd.
Philco.
Philips Lamps, Ltd.
Philomel Radio Equipment Co.
Plessey Co., Ltd.
Portadyne Radio, Ltd.
Precision-Electric, Ltd.
Pye Radio, Ltd.
Radio Acoustic Productions.
Radio Instruments, Ltd.
Radio Mfg. Co.
Radiomonic, Ltd.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Regentone, Ltd.
 Riley & Son, W.
 Scott Sessions & Co., G.
 Shalless & Evans.
 Smurthwaite, F. W.
 Standard Telephones & Cables, Ltd.
 Stonehouse Radio Supplies.
 Stott, J. E.
 Stratton & Co., Ltd.
 Supertone Pianos, Ltd.
 Tarry's.
 Taylor, F.
 Telsen Electric Co., Ltd.
 Truphonic Radio Co.
 Tunewell Radio, Ltd.
 Tyrella Electric, Ltd.
 Ultra Electric, Ltd.
 Union Radio Co., Ltd.
 Varley.
 Wade & Co. (Burnley) Ltd., A.
 Wendell Radio, Ltd.
 Whetton & L. Gold, E. P.
 Wood, L. R.
 Wurlitzer Lyric Radio, Ltd.
 Yeldon (Radio) Ltd.
 Yorkshire Radio Co.
 Zetavox Radio & Television, Ltd.

RECEIVERS (Universal).

Distavox, Ltd.
 Fletcher & Co., H. J.
 Hart Collins, Ltd.
 Higgs (Gt. Britain), Ltd.
 Radio Acoustic Productions.
 Radio Development Co.
 Sovereign Products, Ltd.
 Sunbeam Electric, Ltd.

RECEIVERS

(valve, portable and transportable).

Adey Portable Radio.
 Aerodyne Radio.
 Baker & Co., Ltd., G. F.
 Beardsall & Co., Ltd., W. E.
 Bligh, S. W.
 Blue Comet, Ltd.
 British Lumophon Co.
 Bulmer, Fred.
 Burgoyne Wireless (1930), Ltd.
 Burne-Jones & Co., Ltd.
 Burrell Radio, Ltd.
 Clifford Pressland (Sales) Ltd.
 Columbia Graphophone Co., Ltd.
 Custerson, R.
 Detex (1931), Ltd.
 Eagle Engineering Co., Ltd.
 Edge Radio, Ltd.
 Eldeco Radio, Ltd.
 Electric Lamp Service Co., Ltd.
 Electrical & Radio Products (1931), Ltd.
 Elliott Radio Mfg. Co., Ltd.
 Eon Vacuum Wireless Co.
 Faraday Allwave Wireless, Ltd.
 Ferranti, Ltd.
 Fletcher & Co., Ltd., H. J.
 General Electric Co., Ltd.
 Goodwin Radio, Ltd.
 Gramophone Co., Ltd.
 Greatrex & Co., R. G.
 Grosley Radio, Ltd.
 Hart-Collins, Ltd.
 Higgs (Gt. Britain), Ltd.
 Impex Electrical, Ltd.
 Kenwell Radio, Ltd.
 Kolster Brandes, Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Liverpool Radio Supplies.
 London Electrical Co. (Sherborne Lane), Ltd.
 London Radio Co. (Leeds), Ltd.
 McLeod & McLeod, Ltd.
 McMichael Radio, Ltd.
 Mains Radio Gramophones, Ltd.
 Mains-Radio Mfg. Co.

Majestic Electric Co., Ltd.
 Mall Radio & Electric, Ltd.
 Marconiphone Co., Ltd.
 Master Radio Co.
 Merrington Bros., Ltd.
 Midland Radio & Television Co.
 Montague Radio Inventions & Development Co., Ltd.
 Multitone Electric Co., Ltd.
 Paramount Gramophone Co.
 Philco, Ltd.
 Plessey Co., Ltd.
 Portadyne Radio, Ltd.
 Pye Radio, Ltd.
 Radio Instruments, Ltd.
 Radiomonic, Ltd.
 Shalless & Evans.
 Slektun Products, Ltd.
 Standard Telephones & Cables, Ltd.
 Supertone Pianos, Ltd.
 Truphonic Radio Co.
 Ultra Electric Ltd.
 Whetton & L. Gold, E. P.
 Wood, L. R.
 Wurlitzer Lyric Radio, Ltd.
 Zetavox Radio & Television, Ltd.

RECTIFIERS (metal and dry contact).

Blue Comet, Ltd.
 Formo Co.
 Merrington Bros., Ltd.
 Millet, J.
 Partridge & Mee, Ltd.
 Rectifiers, Ltd.
 Supremus Specialties, Ltd.
 Westinghouse Brake & Saxby Signal Co., Ltd.

RELAY APPARATUS

Belling & Lee, Ltd.
 Birmingham Sound Reproducers.
 Blue Comet, Ltd.
 British Radio Mfg. Co. (L'pool), Ltd.
 Bulgin & Co., Ltd., A. F.
 Castagnoli, G.
 Coates, Ltd., J. G.
 Correx Amplifiers.
 Custerson, R.
 General Electric Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Gramplan Reproducers, Ltd.
 Igranic Electric Co., Ltd.
 Johnson & Phillips, Ltd.
 Marconiphone Co., Ltd.
 Philips Lamps, Ltd.
 Reproducers & Amplifiers, Ltd.
 Savage, W. B.
 Siemens-Schuckert (Gt. Britain), Ltd.
 Standard Telephones & Cables, Ltd.
 362 Radio Valve Co., Ltd.

REMOTE CONTROL UNITS.

Bulgin & Co., Ltd., A. F.
 Castagnoli, G.
 Custerson, R.
 Enderlein, E.
 Geipel, Ltd., W.
 General Electric Co., Ltd.
 Lesingham, F. L.
 Marconiphone Co., Ltd.
 Plessey Co., Ltd.

REPAIRS FOR THE TRADE.

Aladdin Gramophone & Accessories Co.
 Alpha Coll & Component Co.
 Amplion (1932), Ltd.
 Austin, Mills & Co.
 Automobile Accessories (Bristol), Ltd.
 Beacon Radio Mfg. Co.
 Bligh, S. W.
 Blue Comet, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Brown, Brew & Co., Ltd.
 Castagnoli, G.
 Chalkley, C. G.
 Custerson, R.
 East Ham Wireless Supplies.
 Eon Vacuum Wireless Co.

THE TILL WILL TELL YOU MULLARD

Evac, Ltd.
Fletcher & Co., Ltd., H. J.
Godfrey (Radio) Ltd., F. E.
Goodmans (Clerkenwell) Ltd.
Gould, Harper & Co., Ltd.
Hill & Co., Ltd., F. C.
London Electrical Co. (Sherborne Lane), Ltd.
Londona, Ltd.
Lyons, Ltd., Claude.
Mason, E.
Metal Agencies Co., Ltd.
Midland Radio & Television Co.
Mile End Radio Co.
National Radio Service Co.
Paramount Gramophone Co.
Plessey Co.
Precision-Electric, Ltd.
Radio Development Co.
Riley & Son, W.
Scott Sessions & Co., G.
Tarry's.
Wade & Co. (Burnley), Ltd., A.
Weedon Power Link Radio Co.
Yeldon (Radio) Ltd.
Zimba Radio Co.

REPETITION WORK.

Anglo Swiss Screw Co., Ltd.
Atalanta, Ltd.
Automobile Accessories (Bristol), Ltd.
Belling & Lee, Ltd.
Bijou Radio Co.
Blue Comet, Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Buck & Hickman, Ltd.
Busby & Co., Ltd.
Christie & Sons, Ltd., Jas.
Custerson, R.
Elvy, C. L.
Fenriss (1932), Ltd.
Francois, E. J.
General Electric Co., Ltd.
Goodmans (Clerkenwell), Ltd.
Grayson & Co.
Grippall Electric Products, Ltd.
Harris, G. & R.
Henderson & Co., D. M., Ltd.
Holmes Bros. (London), Ltd.
Jackson Bros. (London), Ltd.
Lectro Linx, Ltd.
Lilley & Son, Ltd., S.
Limit Engineering Co., Ltd.
Limit Radio, Ltd.
Lissen, Ltd.
McLeod & McLeod, Ltd.
Marks & Son, S.
Merrington Bros. Ltd.
Mervyn Sound & Vision Co., Ltd.
Meyer & Co., E.
Muller & Co. (England), Ltd.
M. C. L. & Repetition, Ltd.
Ormond Engineering Co., Ltd.
Patton, Ltd., D. J.
Person & Son, L.
Phoenix Telephone & Electric Works, Ltd.
Prideaux, Junr., R.
Radiamp Co.
Reliance Mfg. Co. (Southwark), Ltd.
Righton & Co., Ltd., H.
Ross, Courtney & Co., Ltd.
R.A.M.S. Metal Works, Ltd.
Shearing, Ltd., A. E.
Simpsons Electricals, Ltd.
Telephone Mfg. Co., Ltd.
Toubkin, J.
True Screws, Ltd.
Wilkins & Wright, Ltd.
Williams & Moffat, Ltd.
Wright & Weaire, Ltd.
Yorkshire Radio Co.
Zimba Radio Co.

R.C. COUPLING UNITS.

Abingdon Wireless Supplies.
Altham Radio Co.
Burne-Jones & Co., Ltd.
Custerson, R.
Elliott Radio Mfg. Co., Ltd.
Franklin Elec. Co., Ltd.

Graham Farish, Ltd.
Igranice Elect., Co., Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Merrington Bros., Ltd.
Mile End Radio Co.
Plessey Co., Ltd.
Telsen Electric Co., Ltd.
Varley.

RESISTANCES (heavy duty).

Abingdon Wireless Supplies.
Alpha Coil and Component Co.
Altham Radio Co.
A.E.F. Manufacturing Co.
Bayliss, Ltd., W.
British Electric Resistance Co., Ltd.
Bulgin & Co., Ltd., A. F.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Curtis Manufacturing Co., Ltd.
Custerson, R.
Elliott Radio Mfg. Co., Ltd.
Erie Resistor, Ltd.
Ferranti, Ltd.
Franklin Elec., Ltd.
Geipel, Ltd., W.
General Electric Co., Ltd.
Graham Farish, Ltd.
Harrison & Co., A. T.
Igranice Electric Co., Ltd.
Imp Radio Co.
Le Carbone, Ltd.
Lechner & Co., F. W.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Lyons, Ltd., Claude.
Mansell & Ogan, Ltd.
Millet, J.
Morton, Ltd., E. R.
Orion Lamps, Ltd.
Peace, Ltd., Henry
Pepper, T.
Phileo.
Pye Radio, Ltd.
Radiamp Co.
Radio Resistor Co.
Ray Engineering Co., Ltd.
Reliance Mfg. Co. (Southwark), Ltd.
Rotor Electric, Ltd.
Siemens Schuckert (Gt. Britain), Ltd.
Ultra Electric, Ltd.
Varley.
Watmel Wireless Co., Ltd.
Willis & Co. (Meritus), Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.

RHEOSTATS.

Altham Radio Co.
Automatic Coil Winder & Elec. Equipment Co., Ltd.
Bowyer-Lowe & A. E. D., Ltd.
British Electric Resistance Co., Ltd.
Burndept, Ltd.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Clarke & Co. (Manchester), Ltd., H.
Colvern, Ltd.
Cressall Mfg. Co.
Custerson, R.
Erie Resistor, Ltd.
Geipel, Ltd., W.
General Electric Co., Ltd.
Harrison & Co., A. T.
Igranice Electric Co., Ltd.
Lechner & Co., F. W.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Lyons, Ltd., Claude.
McLeod & McLeod, Ltd.
Millet, J.
Morton, Ltd., E. R.
Nassak Manufacturing Co., Ltd.
Ormond Engineering Co., Ltd.
Pepper, T.
Plessey Co., Ltd.
Radiamp Co.
Radio Resistor Co.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Reliance Mfg. Co. (Southwark), Ltd.
 Robinson & Co., Lionel.
 Rotor Electric, Ltd.
 Siemens Schuckert (Gt. Britain), Ltd.
 Sovereign Products, Ltd.
 Sullivan, Ltd., H. W.
 Varley.
 Watmel Wireless Co., Ltd.
 Wright & Weaire, Ltd.
 W.R.C., Ltd.
 Zenith Electric Co., Ltd.

SCREENS.

Andrews & Co., A. E.
 Bate & Co., Ltd., Jabez.
 Benjamin Electric, Ltd.
 British General Mfg. Co., Ltd.
 British Radio Gramophone Co., Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Burne-Jones & Co., Ltd.
 City Accumulator Co.
 Colvern, Ltd.
 Custerson, R.
 General Electric Co., Ltd.
 Harrison & Co., A. T.
 Ivory Electric, Ltd.
 Jackson Bros. (London), Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod, Ltd.
 Marks & Son, S.
 Paroussi, E.
 Plessey Co., Ltd.
 Radioamp Co.
 Ready Radio, Ltd.
 Sankey & Sons, Ltd., J.
 Scott & Co., S. W.
 Six-Sixty Radio Co., Ltd.
 White Bros. & Jacobs, Ltd.
 Whiteley Electrical Radio Co., Ltd.
 Wright & Weaire, Ltd.

SHORT WAVE COMPONENTS.

Berclif, Ltd.
 British Radio Gramophone Co., Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 British Radiophone, Ltd.
 Bulgin & Co., Ltd., A. F.
 Burne-Jones & Co., Ltd.
 Colvern, Ltd.
 Custerson, R.
 Eastick & Sons, J. J.
 Elliott Radio Mfg. Co., Ltd.
 Ferranti, Ltd.
 General Electric Co., Ltd.
 Igranic Electric Co., Ltd.
 Jackson Bros. (London), Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 Ormond Engineering Co., Ltd.
 Poolley, G. J.
 Quartz Crystal Co.
 Radiamp Co.
 Radio Gramophone Development Co., Ltd.
 Radio Instruments, Ltd.
 Shearing, Ltd., A. E.
 Slektun Products, Ltd.
 Stonehouse Radio Supplies.
 Stratton & Co., Ltd.
 Telsen Electric Co., Ltd.
 Tunewell Radio, Ltd.
 Ward & Goldstone, Ltd.
 Whiteley Electrical Radio Co., Ltd.
 Wilkins & Wright, Ltd.
 Williams & Moffat, Ltd.
 Wright & Weaire, Ltd.

SLEEVING (insulating).

A.E.G. Electric Co., Ltd.
 Bate & Co., Ltd., Jabez.
 Bromley-Langton Electric Wire & Insulator Co.
 Ltd.
 Clarke & Co. (Manchester), Ltd., H.

Elliott Radio Mfg. Co., Ltd.
 Elvy, C. L.
 General Electric Co., Ltd.
 Hart Bros., Electrical Mfg. Co., Ltd.
 Ivory Electric, Ltd.
 London Electric Wire Co., & Smiths, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod.
 Micanite & Insulators Co., Ltd.
 Millet, J.
 Radiamp Co.
 Reliance Electrical Wire Co., Ltd.
 Remax Cables, Ltd.
 Robinson & Co., Lionel.
 Spicers, Ltd.
 Sterling Varnish Co.
 Toubkin, J.
 Ward & Goldstone, Ltd.

SOLDERING MATERIALS.

Ardea Vulcanizer Syndicate, Ltd.
 Automatic Coil Winder & Electric Equipment Co.
 Ltd.
 Bate & Co., Ltd., Jabez.
 Bi-metals.
 British Insulated Cables, Ltd.
 Buck & Hickman, Ltd.
 Fluxite, Ltd.
 General Electric Co., Ltd.
 Gre-Solvent.
 Improved Wilson Microphone & Electrical Co.
 Ltd.
 Ivory Electric, Ltd.
 Johnson Matthey & Co., Ltd.
 Rawplug Co., Ltd.
 R. C. & Wilson Electric, Ltd.
 Standard Telephones & Cables, Ltd.
 Ward & Goldstone, Ltd.

SPEAKERS (cone type).

Amplion (1932), Ltd.
 Appletons (Leeds), Ltd.
 Automobile Accessories (Bristol), Ltd.
 Baty, E. J.
 Beardsall & Co., Ltd., W. E.
 Blue Comet, Ltd.
 British Blue Spot Co., Ltd.
 British Lumophon Co.
 Celestion, Ltd.
 Chorlton Metal Co., Ltd.
 Collings & Co., N. R.
 Columbia Graphophone Co., Ltd.
 Cossor, Ltd.
 Custerson, R.
 Donophone, P. A. Co., Ltd.
 Dr. Nesper, Ltd.
 East Ham Wireless Supplies.
 Edison Swan Electric Co., Ltd.
 Electric Lamp Service Co., Ltd.
 Elektra Supplies.
 Eon Vacuum Wireless Co.
 Ferranti, Ltd.
 Film Industries, Ltd.
 Fletcher & Co., H. J.
 General Electric Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Goodwin Radio, Ltd.
 Gramphian Reproducers, Ltd.
 Grosley Radio, Ltd.
 Imp Radio, Co.
 Ivory Electric, Ltd.
 Johnson & Phillips, Ltd.
 Joseph, H.
 Lamplugh Radio, Ltd.
 Lissen, Ltd.
 London Radio Co. (Leeds), Ltd.
 Lugton & Co., Ltd.
 McLeod & McLeod, Ltd.
 Mackintosh & Co., E. V.
 Marconiphone Co., Ltd.
 Marks & Son, S.
 Millet, J.
 Motor Radio & Electric Products.
 Nassak Mfg. Co., Ltd.
 Northampton Plating Co.
 Olympia Radio, Ltd.
 Ormond Engineering Co., Ltd.
 Plessey Co., Ltd.
 Reproducers & Amplifiers, Ltd.

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Ripaults, Ltd.
Siemens-Schuckert (Gt. Brit.), Ltd.
Six-Sixty Radio Co., Ltd.
Slektun Products, Ltd.
Sovereign Products, Ltd.
Telsen Electric Co., Ltd.
Thompson, Diamond & Butcher.
Toubkin, J.
Trio-tron Radio Co., Ltd.
Whiteley Electrical Radio Co., Ltd.
W.R.C., Ltd.
Yorkshire Radio Co.

SPEAKERS (inductor dynamic).

Eon Vacuum Wireless Co.
Ferranti, Ltd.
Film Industries, Ltd.
General Electric Co., Ltd.
Goodmans (Clerkenwell), Ltd.
Imp Radio Co.
Johnson & Phillips, Ltd.
Lamplugh Radio Ltd.
London Radio Co. (Leeds), Ltd.
McLeod & McLeod, Ltd.
Millet, J.
Nassak Mfg. Co., Ltd.
Phillips Industrial.
Reproducers & Amplifiers, Ltd.
Thompson, Diamond & Butcher.
Toubkin, J.

SPEAKERS, MOVING COIL (P.M. TYPE).

Altham Radio Co.
Amplion (1932), Ltd.
Appletons, (Leeds), Ltd.
Automobile Accessories (Bristol), Ltd.
Baker's Selhurst Radio.
Beardsall & Co., Ltd., W. E.
British Blue Spot Co., Ltd.
British Lumophon Co.
British Rola Co., Ltd.
Celestion, Ltd.
Chorlton Metal Co., Ltd.
Clarke & Co. (Manchester), Ltd., H.
Collings & Co., N. R.
Cossor, Ltd., A. C.
Custerson, R.
Dent & Co., and Johnson, Ltd.
East Ham Wireless Supplies.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Eon Vacuum Wireless Co.
Epoch Radio Mfg. Co., Ltd.
Ferranti, Ltd.
Film Industries, Ltd.
Forbat, F.
General Electric Co., Ltd.
Gent & Co., Ltd.
Godfrey (Radio) Ltd., F. E.
Goodmans (Clerkenwell), Ltd.
Grampian Reproducers, Ltd.
Gramophone Co., Ltd.
Harlie, Ltd.
Hicking, H. B.
Igranic Electric Co., Ltd.
Imp Radio Co.
Johnson & Phillips, Ltd.
Lamplugh Radio Ltd.
Lanchester Laboratories, Ltd.
Lissen, Ltd.
London Radio Co. (Leeds), Ltd.
Londona, Ltd.
Lugton & Co., Ltd.
McLeod & McLeod, Ltd.
Magnavox (Gt. Britain), Ltd.
Majestic Electric Co., Ltd.
Marconiphone Co., Ltd.
Metal Agencies Co., Ltd.
Midgely Harmer, Ltd.
Midland Radio & Television Co.
Millet, J.
Motor Radio & Electric Products.
National Radio Service Co.
Nuvolion Electrics, Ltd.
Ormond Engineering Co., Ltd.

Partridge & Mee, Ltd.
Pepper, T.
Peto-Scott Co., Ltd.
Philco.
Phillips Industrial.
Pye Radio, Ltd.
Radio Gramophone Development Co., Ltd.
Ray Engineering Co., Ltd.
Reproducers & Amplifiers, Ltd.
Rothermel Corporation, Ltd.
Savage, W. B.
Siemens-Schuckert (Gt. Brit.,) Ltd.
Sinclair Speakers.
Sonochorde Reproducers, Ltd.
Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Thompson, Diamond & Butcher.
Toubkin, J.
Ultra Electric, Ltd.
Universal Gramophone & Radio Co., Ltd.
Webber, Ltd., R. A.
Wharfedale Wireless Works
Whiteley Electrical Radio Co., Ltd.
362 Radio Valve Co., Ltd.

SPEAKERS, MOVING COIL (ENERGISED).

Baker's Selhurst Radio.
Beardsall & Co., Ltd., W. E.
British Blue Spot Co., Ltd.
British Lumophon Co.
British Rola Co., Ltd.
Celestion, Ltd.
Clarke & Co. (Manchester), Ltd., H.
Correx Amplifiers.
Cossor, Ltd.
Custerson, R.
East Ham Wireless Supplies.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Eon Vacuum Wireless Co., Ltd.
Epoch Radio Mfg. Co., Ltd.
Ferranti, Ltd.
Forbat, F.
General Electric Co., Ltd.
Godfrey (Radio), Ltd., F. E.
Goodmans (Clerkenwell), Ltd.
Grampian Reproducers, Ltd.
Harlie, Ltd.
Hartley Turner Radio, Ltd.
Hicking, H. B.
Igranic Electric Co., Ltd.
Imp Radio Co.
Johnson & Phillips, Ltd.
Lamplugh Radio, Ltd.
Lissen, Ltd.
London Radio Co. (Leeds), Ltd.
McLeod & McLeod, Ltd.
Magnavox (Gt. Britain), Ltd.
Mains Radio Gramophones, Ltd.
Majestic Electric Co., Ltd.
Midgely-Harmer, Ltd.
Midland Radio & Television Co.
Millet, J.
Motor Radio & Electric Products.
Nuvolion Electrics, Ltd.
Ormond Engineering Co., Ltd.
Partridge & Mee, Ltd.
Peto Scott Co., Ltd.
Phillips Industrial,
Pye Radio, Ltd.
Radio Gramophone Development Co., Ltd.
Reproducers & Amplifiers, Ltd.
Rothermel Corporation, Ltd.
Siemens-Schuckert (Gt. Britain), Ltd.
Sinclair Speakers.
Sonochorde Reproducers, Ltd.
Sound Sales, Ltd.
Squire, Frederick Ltd.
Standard Telephones & Cables, Ltd.
Thompson, Diamond & Butcher.
Toubkin, J.
Ultra Electric, Ltd.
Universal Gramophone & Radio Co., Ltd.
Voigt Patents, Ltd.
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" FR6—PM (7½ in. dia.)	39/6
" F6 —PM (7½ in. dia.)	49/6
" F7 —PM (9 in. dia.)	60/-
ROLA CLASS B SPEAKER AMPLIFIER UNIT (less valve)	57/-

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" F6—FE (7½ in. dia.)	35/-
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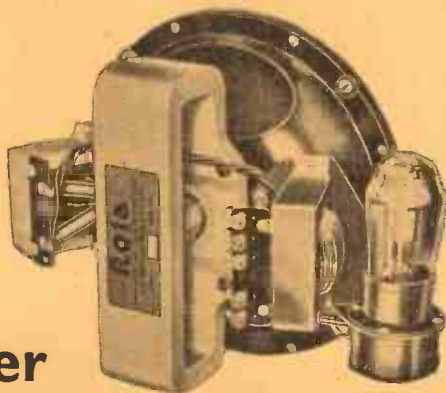
8 ohm. field (6-10 volts D.C.), 2,500 ohm. field (110-175 volts D.C.), 4,700 ohm. field (150-200 volts D.C.), 6,500 ohm. field (200-250 volts D.C.).

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	The Pair.
2 F5—FE Speakers as above	£2 12 6
2 FR5—PM " "	£2 17 6
2 F6—FE " "	£3 7 6
1 F6—FE and 1 F7—FE Speaker as above	£4 0 0
2 FR6—PM Speakers as above	£3 17 6
1 F6—FE and 1 F7—PM, Speaker as above	£4 12 6
1 F6—PM and 1 F7—PM, Speaker as above	£4 17 6

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PRODUCTS SUPPLIED

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Amplion (1932), Ltd.
 Blue Comet, Ltd.
 Bridger & Co., R. O.
 British Blue Spot Co., Ltd.
 British Lumophon Co.
 Celestion, Ltd.
 Clarke & Co. (Manchester), Ltd., H.
 Custerson, R.
 Dr. Nesper, Ltd.
 Dux Chemical Solutions Co., Ltd.
 Elektra Supplies.
 Epoch Radio Mfg. Co., Ltd.
 General Electric Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Gramplan Reproducers, Ltd.
 Ivory Electric, Ltd.
 Lamplugh Radio, Ltd.
 Lever (Trix), Ltd., Erie J.
 Lissen, Ltd.
 McLeod & McLeod, Ltd.
 Millet, J.
 National Radio Service Co.
 Nelson & Co., J. H.
 Olympia Radio, Ltd.
 Ormond Engineering Co., Ltd.
 Plessey Co., Ltd.
 Reproducers & Amplifiers, Ltd.
 Rothermel Corporation, Ltd.
 Six-Sixty Radio Co., Ltd.
 Sylvex, Ltd.
 Thompson, Diamond & Butcher.
 Toubkin, J.
 V.G. Mfg. Co., Ltd.
 Walter, Ltd., J. & H.
 Whiteley Electrical Radio Co., Ltd.

SPEAKER UNITS.

Aerodyne Radio.
 Amplion (1932), Ltd.
 Beardsall & Co., Ltd., W. E.
 Bowerman, Ltd., G.
 British Blue Spot Co., Ltd.
 British Lumophon Co.
 Celestion, Ltd.
 Clarke & Co. (Manchester), Ltd.
 Custerson, R.
 Dr. Nesper, Ltd.
 East Ham Wireless Supplies.
 Epoch Radio Mfg Co., Ltd.
 Ericsson Telephones, Ltd.
 General Electric Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Goodwin Radio, Ltd.
 Gramplan Reproducers, Ltd.
 Gresley Radio, Ltd.
 Imp Radio Co.
 Ivory Electric, Ltd.
 Johnson & Phillips, Ltd.
 Joseph, H.

Lamplugh Radio, Ltd.
 Lanchester Laboratories, Ltd.
 Limit Radio, Ltd.
 Lissen, Ltd.
 Londona, Ltd.
 London Radio Co. (Leeds), Ltd.
 McLeod & McLeod, Ltd.
 Marconiphone Co., Ltd.
 Marks & Son, S.
 Millet, J.
 Motor Radio & Electrical Products.
 Nasak Mfg. Co., Ltd.
 Olympia Radio, Ltd.
 Ormond Engineering Co., Ltd.
 Philips Lamps, Ltd.
 Plessey Co., Ltd.
 Reproducers & Amplifiers, Ltd.
 Six-Sixty Radio Co., Ltd.
 Slektun Products, Ltd.
 Sound Sales, Ltd.
 Sovereign Products, Ltd.
 Standard Telephones & Cables, Ltd.
 Telsen Electric Co., Ltd.
 Thompson, Diamond & Butcher.
 Truphonic Radio Co.
 Universal Gramophone & Radio Co., Ltd.
 Walter, Ltd., J. & H.
 Weedon Powerlink Radio Co.
 Whiteley Electrical Radio Co., Ltd.
 W.R.C., Ltd.
 362 Radio Valve Co., Ltd.

STAMPINGS.

Alpha Products.
 Andrews & Co., A. E.
 Beddoes, Ltd., J. G.
 Benjamin Electric, Ltd.
 Bijou Radio Co.
 British Pens, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Burne-Jones & Co., Ltd.
 Busby & Co., Ltd.
 Clarke & Co. (Manchester), Ltd., H.
 Custerson, R.
 Eagle Engineering Co., Ltd.
 Eldons.
 Elvy, C. L.
 Ernest Turner Electrical Instruments, Ltd.
 Francois, E. J.
 Geo (Birmingham), Ltd.
 General Electric Co., Ltd.
 Goodmans (Clerkenwell), Ltd.
 Graham Farish, Ltd.
 Gresley Radio, Ltd.
 Harris & Co. (Birmingham), Ltd., A. E.
 Harris, G. & R.
 Harrison & Co., A. T.
 Ivory Electric, Ltd.
 Jackson Bros. (London), Ltd.
 Johnson Matthey & Co., Ltd.
 Lamplugh Radio, Ltd.
 Lilley & Son, Ltd., S.
 Limit Engineering Co., Ltd.



CLIX TERMINALS

The illustration shows our Type "B" with 2BA stem, two locknuts and wiring slot. Non-removable head. Hexagonal shoulder to facilitate mounting.

Special quotations to manufacturers. Trade terms and Literature on request. (For other Clix lines see pages 236, 254, 255).

IMPORTANT NOTICE :—Clix components for perfect contact are covered by patents, provisional patents and registered designs.

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Lissen, Ltd.
McLeod & McLeod, Ltd.
Magnetic & Electrical Alloys, Ltd.
Marks & Son, S.
Mervyn Sound & Vision Co., Ltd.
Meyer & Co., E.
Morton, Ltd., E. R.
Ormond Engineering Co., Ltd.
Patton, Ltd., D. J.
Person & Son, L.
Plessey Co., Ltd.
Reliance Mfg. Co. (Southwark), Ltd.
Righton & Co., Ltd., H.
Ross, Courtney & Co., Ltd.
R.A.M.S. Metal Works, Ltd.
Sankey & Sons, Ltd., Joseph.
Simpson Electricals, Ltd.
Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Telephone Mfg. Co., Ltd.
Toubkin, J.
True Screws, Ltd.
Waivis Engineering Co., Ltd.
Walter, Ltd., J. & H.
Whiteley Electrical Radio Co., Ltd.
Wilkins & Wright, Ltd.
Williams & Moffat, Ltd.
Wright & Weaire, Ltd.
Yorkshire Radio Co.

SWITCHES.

Aerodyne Radio.
Alpha Products.
Altham Radio Co.
Amplifiers, Ltd.
Andrews & Co., A. E.
Automobile Accessories (Bristol), Ltd.
Benjamin Electric, Ltd.
British Radio Gramophone Co., Ltd.
British Radiophone, Ltd.
Bulgin & Co., Ltd., A. F.
Burndept, Ltd.
Burne-Jones & Co., Ltd.
Busby & Co., Ltd.
Cann, Ltd., J. Churly.
Castagnoli, G.
Chalkley, C. G.
Chorlton Metal Co., Ltd.
Christie & Sons, Ltd., Jas.
Coates, Ltd., J. G.
Colvern, Ltd.
Cook & Co., H. S.
Crabtree & Co., Ltd., J. A.
Custerson, R.
Edmonds, Ltd., G.
Enderlein, E.
Francois, E. J.
Franklin & Freeman, Ltd.
Gee (Birmingham), Ltd.
General Electric Co., Ltd.
Goodmans (Clerkenwell), Ltd.
Graham Farish, Ltd.
Gripso Co.
Harrison & Co., A. T.
Hewitt, Ltd., A. J.
Igranic Electric Co., Ltd.
Ivory Electric, Ltd.
Joseph, H.
Lamplugh Radio, Ltd.
Lechner & Co., F. W.
Lever (Trix), Ltd., Eric J.
Lilley & Son, Ltd., S.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
Lundberg & Sons, Ltd., A. P.
Lyons, Ltd., Claude.
McLeod & McLeod, Ltd.
Millet, J.
Morton, Ltd., E. R.
Nassak Mfg. Co., Ltd.
Ormond Engineering Co., Ltd.
Person & Son, L.
Pioneer Mfg. Co.
Plessey Co., Ltd.
Radiamp Co.
Ready Radio, Ltd.
Saxon Radio Co.

Shearing, Ltd., A. E.
Sovereign Products, Ltd.
Stadium, Ltd.
Sullivan, Ltd., H. W.
Toubkin, J.
Telsen Electric Co., Ltd.
Tunowell Radio, Ltd.
Wade & Co. (Burnley), Ltd.
Ward & Goldstone, Ltd.
Whiteley Electrical Radio Co., Ltd.
Wilkins & Wright, Ltd.
Willis & Co. (Meritus), Ltd.
Wright & Weaire, Ltd.
W.R.C., Ltd.
Zimba Radio Co.

TAPE (insulating).

A.E.G. Electric Co., Ltd.
Blue Comet, Ltd.
British Insulated Cables, Ltd.
Bromley-Langton Elec. Wire & Insulator Co., Ltd.
Clarke & Co. (Manchester), Ltd.
Concordia Electric Wire Co., Ltd.
Connollys (Blackley), Ltd.
Goipel, Ltd., W.
General Electric Co., Ltd.
Hart Bros. Electric Mfg. Co., Ltd.
Hellesens, Ltd.
Ioco Rubber & Waterproofing Co., Ltd.
Ivory Electric, Ltd.
London Elec. Wire Co. & Smiths, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
McLeod & McLeod, Ltd.
Micante & Insulators Co., Ltd.
Millet, J.
Pomona Rubber Co.
Rawplug Co., Ltd.
Rodferns Rubber Works, Ltd.
Remax Cables, Ltd.
Ripaults, Ltd.
Romac Motor Accessories, Ltd.
St. Helens Cable & Rubber Co., Ltd.
Siemens Electric Lamps & Supplies, Ltd.
Spicers, Ltd.
Toubkin, J.
Ward & Goldstone, Ltd.
Wilmott, Son & Phillips, Ltd.

TERMINALS AND TAGS.

Andrews & Co., A. E.
Anglo-Swiss Screw Co., Ltd.
Belling & Lee, Ltd.
Birmingham Products, Ltd.
Bulgin & Co., Ltd., A. F.
Cann, Ltd., J. Churly.
Charles (Redditch), Ltd.
Crystallate Gramophone Record Mfg. Co., Ltd.
Davis & Timmins, Ltd.
Edmonds, Ltd., G.
Elliott, E.
Fenriss (1932), Ltd.
Francois, E. J.
Gee (Birmingham), Ltd.
General Electric Co., Ltd.
Goodmans (Clerkenwell), Ltd.
Gripso Co.
Harris & Co. (Birmingham) Ltd., A. E.
Harris, G. & R.
Igranic Electric Co., Ltd.
Kniveton Cable Works, Ltd.
Lectro Linx, Ltd.
Lever (Trix), Ltd., Eric J.
Lilley & Son, Ltd., S.
Lissen, Ltd.
McLeod & McLeod, Ltd.
McWhirr, Paterson & Co.
Meyer & Co., E.
Millet, J.
Muller & Co. (England), Ltd.
M.C.L. and Repetition, Ltd.
Nassak Mfg. Co., Ltd.
Ormond Engineering Co., Ltd.
Plessey Co., Ltd.
Prideaux, Junr., R.
Radiamp Co.
Remax Cables, Ltd.
Ross, Courtney & Co., Ltd.
Toubkin, J.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

True Screws, Ltd.
Ward & Goldstone, Ltd.
Webster & Co., Ltd., T.

TIME SWITCHES.

A.E.G., Electric Co., Ltd.
Bulgin & Co., Ltd., A. F.
Custerson, R.
Everett, Edgecumbe & Co., Ltd.
General Electric Co., Ltd.
Millet, J.
Sifam Electrical Instrument Co., Ltd.
Telephone Mfg. Co., Ltd.

TINSEL (for speakers).

Altham Radio Co.
Ashton & Co. (Est. 1787), Ltd.
Blue Comet, Ltd.
Concordia Electric Wire Co., Ltd.
General Electric Co., Ltd.
Frost Radio Co.
Hart Bros. Electrical Manufacturing Co., Ltd.
Hercus Mfg. Co.
Ivory Electric, Ltd.
Lamplugh Radio, Ltd.
Leibovici, J.
Lever (Trix), Ltd., Eric J.
Lockwood Casework Mfg. Co.
London Electric Wire Co. & Smiths, Ltd.
Margolin, J. & A.
Olympia Radio, Ltd.
Phoenix Telephone and Electric Works, Ltd.
Pioneer Mfg. Co.
Reliance Electric Wire Co., Ltd.
Sylvex, Ltd.
Wilkinson, L.
Zimba Radio Co.

TONE CONTROLS.

Bowyer-Lowe & A. E. D., Ltd.
British Radio Gramophone Co., Ltd.
Bulgin & Co., Ltd., A. F.
Castagnoli, G.
Custerson, R.
Duray.
Enderlein, E.
Ferranti, Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Harlie, Ltd.
Igranie Electric Co., Ltd.
Ivory Electric, Ltd.
Junction Engineering Co., Ltd.
Lechner & Co., F. W.
Lever (Trix), Ltd., E. J.
Lissen, Ltd.
Loewe Radio Co., Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
Lyons, Ltd., Claude.
Merrington Bros., Ltd.
Multitone Electric Co., Ltd.
Orion Lamps, Ltd.
Pooley, G. J.
Reliance Mfg. Co. (Southwark), Ltd.
Rothermel Corporation, Ltd.
Rotor Electric, Ltd.
Sovereign Products, Ltd.
Standard Tels. & Cables, Ltd.
Telsen Electric Co., Ltd.
Tunewell Radio, Ltd.
Voigt Patents, Ltd.
Ward & Goldstone, Ltd.
Wright & Weaire, Ltd.

TOOLS.

Bi-Metals.
Britannia Lathe & Oil Engine Co., Ltd.
British Ideal Patents, Ltd.
Buck & Hickman, Ltd.
Clarke & Co. (Manchester), Ltd., H.
Eldons.
Ellin (Footprint Works), Ltd., Thos.
Eta Tool Co.
Frys (London), Ltd.
General Electric Co., Ltd.
Grayson & Co.

Harris, G. & R.
Harrison & Co., A. T.
Henderson & Co., D. M., Ltd.
Lehmann, Archer & Co., Ltd.
Line & Co., F.
Marks & Son, S.
Mervyn Sound & Vision Co., Ltd.
Philomel Radio Equipment Co.
Plessey Co., Ltd.
Precision Radio Mfg. Co., Ltd.
Rawplug Co., Ltd.
Shearing, Ltd., A. E.
Simpson's Electricals, Ltd.
Whiteley Electrical Radio Co., Ltd.
Willis & Co. (Meritus), Ltd.
Yorkshire Radio Co.

TRANSFERS.

Eagle Transfer, Ltd.
Plessey Co., Ltd.

TRANSFORMERS (Class B).

Aerodyne Radio.
Amplion (1932), Ltd.
British Radio Gramophone Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
British Radiophone, Ltd.
Brown, Brew & Co., Ltd.
Bulgin & Co., Ltd., A. F.
Castagnoli, G.
Clarke & Co. (Manchester), Ltd., H.
Clifford Pressland (Sales) Ltd.
Concerton Radio & Electrical Co., Ltd.
Custerson, R.
Daly, H. C.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg., Co., Ltd.
Epoch Radio Mfg. Co., Ltd.
Ferranti, Ltd.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Gramplan Reproducers, Ltd.
Gresley Radio, Ltd.
Igranie Electric Co., Ltd.
Ivory Electric, Ltd.
Johnson & Phillips, Ltd.
Kimber, Allen & Co., B.
Lamplugh Radio, Ltd.
Lanchester Laboratories, Ltd.
Lissen, Ltd.
Mile End Radio Co.
Multitone Electric Co., Ltd.
Ormond Engineering Co., Ltd.
Pepper, T.
Phileo.
Radio Instruments, Ltd.
Reproducers & Amplifiers, Ltd.
Rich & Bundy, Ltd.
Savage, W. B.
Shearing, Ltd., A. E.
Sound Sales, Ltd.
Sovereign Products, Ltd.
Standard Tels. & Cables, Ltd.
Telsen Electric Co., Ltd.
Ultra Electric, Ltd.
Varley.
Whiteley Electrical Radio Co., Ltd.
Wright & Weaire, Ltd.
362 Radio Valve Co., Ltd.

TRANSFORMERS H.F.

Aerodyne Radio.
Amplion (1932), Ltd.
Berclif, Ltd.
Brown, Brew & Co., Ltd.
Bulgin & Co., Ltd., A. F.
Bullphone Radio, Ltd.
Castagnoli, G.
Chorlton Metal Co., Ltd.
Clarke & Co. (Manchester), Ltd., H.
Colvern, Ltd.
Custerson, R.
Eagle Engineering Co., Ltd.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Emkabe Radio Co., Ltd.
Faraday Allwave Wireless, Ltd.
Ferranti, Ltd.

MULLARD MEANS BUSINESS

Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Graham Farish, Ltd.
Gresley Radio, Ltd.
Harrison & Co., A. T.
Hewitt, Ltd., A. J.
Igranic Electric Co., Ltd.
Ivory Electric, Ltd.
Johnson & Phillips, Ltd.
Kimber, Allen & Co., B.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electric Wire Co. & Smiths, Ltd.
Mains Radio Gramophones, Ltd.
Merrington Bros., Ltd.
Mile End Radio Co.
Nassak Mfg. Co., Ltd.
Philips Industrial.
Plessey Co., Ltd.
Radiamp Co.
Radio Instruments, Ltd.
Shearing, Ltd., A. E.
Slektun Products, Ltd.
Sovereign Products, Ltd.
Stratton & Co., Ltd.
Supertone Pianos, Ltd.
Tunewell Radio, Ltd.
Ultra Electric, Ltd.
Varley.
Ward & Goldstone, Ltd.
Whiteley Electrical Radio Co., Ltd.
Wilson, W. H.
Wright & Weaire, Ltd.
W.R.C., Ltd.
Zimba Radio Co.

TRANSFORMERS L.F.

Aerodyne Radio.
Amplion (1932) Ltd.
Andrews & Co., A. E.
Benjamin Electric, Ltd.
Birmingham Sound Reproducers.
British Radio Mfg. Co., Ltd.
Brown, Brew & Co., Ltd.
Bulgin & Co., Ltd., A. F.
Bullphone Radio, Ltd.
Castagnoli, G.
Chorlton Metal Co., Ltd.
Clarke & Co. (Manchester), Ltd.
Clifford Pressland (Sales) Ltd.
Climax Radio Electric, Ltd.
Concerton Radio & Electrical Co., Ltd.
Cossor, Ltd.
Custerson, R.
Daly, H. C.
Eagle Engineering Co., Ltd.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Emkabe Radio Co., Ltd.
Fel-Electric Radio.
Ferranti, Ltd.
Formo Co.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Goodwin Radio, Ltd.
Graham Farish, Ltd.
Gresley Radio, Ltd.
Harrison & Co., A. T.
Heayberd & Co., F. C.
Hewitt, Ltd., A. J.
Hill & Co., Ltd., F.C.
Igranic Electric Co., Ltd.
Impex Electrical, Ltd.
Ivory Electric, Ltd.
Johnson & Phillips, Ltd.
Kimber, Allen & Co. B.
Lever (Trix), Ltd., E. J.
Lissen, Ltd.
London Electric Wire Co. & Smiths, Ltd.
McLeod & McLeod, Ltd.
McWhirr, Paterson & Co.
Merrington Bros., Ltd.
Mile End Radio Co.
Multitone Electric Co., Ltd.
Nassak Mfg. Co., Ltd.
Northampton Plating Co.

Ormond Engineering Co., Ltd.
Partridge & Mee, Ltd.
Pepper, T.
Person & Son, L.
Philips Industrial.
Plessey Co., Ltd.
Powertone Products.
Pye Radio, Ltd.
Radio Instruments, Ltd.
Ready Radio, Ltd.
Savage, W. B.
Shearing, Ltd., A. E.
Slektun Products, Ltd.
Sound Sales, Ltd.
Sovereign Products, Ltd.
Standard Telephones & Cables, Ltd.
Telsen Electric Co., Ltd.
Toubkin, J.
Tunewell Radio, Ltd.
Ultra Electric, Ltd.
Varley.
Whiteley Electrical Radio Co., Ltd.
Wilson, W. H.
W. R. C., Ltd.
Zimba Radio Co.

TRANSFORMERS (mains).

Aerodyne Radio.
Alpha Coil & Component Co.
Ashley Wireless Telephone Co. (1925); Ltd.
Austin Mills & Co.
Bayliss, William, Ltd.
Birmingham Sound Reproducers.
British Radio Gramophone Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Brown, Brew & Co., Ltd.
Burnand & Co., W. E.
Burndept, Ltd.
Castagnoli, G.
Chorlton Metal Co., Ltd.
Clarke & Co. (Manchester), Ltd., H.
Clifford Pressland (Sales), Ltd.
Coates, Ltd., J. G.
Commercial Engineering Co.
Concerton Radio & Electric Co., Ltd.
Custerson, R.
Daly, H. C.
Eagle Engineering Co., Ltd.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Emkabe Radio Co., Ltd.
Epoch Radio Mfg. Co., Ltd.
Fel-Electric Radio.
Ferranti, Ltd.
Formo Co.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Gresley Radio, Ltd.
Hartley Turner Radio, Ltd.
Heayberd & Co., F. C.
Hill & Co., Ltd., F.C.
H.O.H. Co.
Igranic Electric Co., Ltd.
Ivory Electric, Ltd.
Johnson & Phillips, Ltd.
Junction Engineering Co., Ltd.
Kimber, Allen & Co., B.
Lanchester Laboratories, Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
Lyons, Ltd., Claude.
McLeod & McLeod, Ltd.
Mains Radio Gramophones, Ltd.
Mains Radio Mfg. Co.
Merrington Bros., Ltd.
Metal Agencies Co., Ltd.
Midland Radio & Television Co.
Mile End Radio Co.
Partridge & Mee, Ltd.
Partridge, Wilson & Co.
Peace, Ltd., Henry.
Pepper, T.
Philips Industrial.
Plessey Co., Ltd.
Postlethwaite Bros.
Pye Radio, Ltd.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Radio Development Co.
Radio Instruments, Ltd.
Ready Radio, Ltd.
Rectifiers, Ltd.
Regentone, Ltd.
Rich & Bundy, Ltd.
Rotax, Ltd.
Savage, W. B.
Saxon Radio Co.
Sifam Electrical Instrument Co., Ltd.
Slektun Products, Ltd.
Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Supertone Pianos, Ltd.
Supremus Specialities, Ltd.
Tannoy Products.
Tarry's.
Telsen Electric Co., Ltd.
Tod, T. M.
Tunewell Radio, Ltd.
Ultra Electric, Ltd.
Varley.
Voigt Patents, Ltd.
Whiteley Elec. Radio Co., Ltd.
Willis & Co. (Meritus), Ltd.
Wilson, W. H.
Wright & Weaire, Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.

TRANSFORMERS (output).

Aerodyne Radio.
Amplion (1932), Ltd.
Austin Mills & Co.
Bayliss, William, Ltd.
Birmingham Sound Reproducers.
British General Manufacturing Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Castagnoli, G.
Celestion, Ltd.

Chorlton Metal Co., Ltd.
Clarke & Co. (Manchester), Ltd.
Clifford Pressland (Sales) Ltd.
Correx Amplifiers.
Custerson, R.
Eagle Engineering Co., Ltd.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Emkabe Radio Co., Ltd.
Epoch Radio Mfg. Co., Ltd.
Ferranti, Ltd.
Franklin & Freeman, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Graham Farish, Ltd.
Gramplan Reproducers, Ltd.
Gresley Radio, Ltd.
Hartley Turner Radio, Ltd.
Hill & Co., Ltd., F. C.
H.C.H., Co.
Igranic Electric Co., Ltd.
Ivory Electric, Ltd.
Johnson & Phillips, Ltd.
Kimber, Allan & Co., B.
Lanchester Laboratories, Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Lyons, Ltd., Claude.
Mains Radio Gramophones, Ltd.
Merrington Bros., Ltd.
Midland Radio & Television Co.,
Mile End Radio Co.
Ormond Engineering Co., Ltd.
Pepper, T.
Phillips Industrial.
Plessey Co., Ltd.
Pye Radio, Ltd.
Radio Gramophone Development Co., Ltd.
Radio Instruments, Ltd.
Reproducers & Amplifiers, Ltd.
Rich & Bundy, Ltd.
Savage, W. B.



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Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Supremus Specialities, Ltd.
Tarrys.
Telsen Electric Co., Ltd.
Tunewell Radio, Ltd.
Varley.
Voigt Patents, Ltd.
Whiteley Elec. Radio Co., Ltd.
Wilson, W. H.
Wright & Weaire, Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.
362 Radio Valve Co., Ltd.

TRANSFORMERS (push-pull).

Aerodyne Radio.
Birmingham Sound Reproducers.
Castagnoli, G.
Chorlton Metal Co., Ltd.
Clifford Pressland (Sales), Ltd.
Concerton Radio & Electric Co., Ltd.
Custerson, R.
Daly, H. C.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Emkabe Radio Co., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Gresley Radio, Ltd.
Hartley Turner Radio, Ltd.
Hill & Co., Ltd., F. C.
Igranie Electric Co., Ltd.
Ivory Electric Ltd.
Johnson & Phillips, Ltd.
Kimber, Allen & Co., B.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Merrington Bros., Ltd.
Mile End Radio Co.
Multitone Electric Co., Ltd.
Ormond Engineering Co., Ltd.
Partridge & Mee, Ltd.
Plessey Co., Ltd.
Pye Radio, Ltd.
Radio Instruments, Ltd.
Reproducers & Amplifiers, Ltd.
Savage, W. B.
Sifam Electric Instrument Co., Ltd.
Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Tunewell Radio, Ltd.
Varley.
Whiteley Elec. Radio Co., Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.
362 Radio Valve Co., Ltd.

TRANSFORMERS (Q.P.P.).

Aerodyne Radio.
Amplion (1932), Ltd.
British Radio Gramophone Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
Clarke & Co. (Manchester), Ltd., H.
Clifford Pressland (Sales), Ltd.
Concerton Radio & Electric Co., Ltd.
Custerson, R.
Electric Lamp Service Co., Ltd.
Elliott Radio Mfg. Co., Ltd.
Epoch Radio, Mfg. Co., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Gresley Radio, Ltd.
Hill & Co., Ltd., F. C.
Igranie Electric Co., Ltd.
Johnson & Phillips, Ltd.
Kimber, Allen & Co., B.
Lissen, Ltd.
Mile End Radio Co.
Multitone Electric Co., Ltd.
Ormond Engineering Co., Ltd.
Radio Instruments, Ltd.
Reproducers & Amplifiers, Ltd.
Rich & Bundy, Ltd.

Savage, W. B.
Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Varley.
Whiteley Electrical Radio Co., Ltd.
Wright & Weaire, Ltd.
Zenith Electric Co., Ltd.
Zimba Radio Co.

TRANSFORMER PARTS.

Concerton Radio Elec Co., Ltd.
Custerson, R.
Emkabe Radio Co., Ltd.
General Electric Co., Ltd.
Gresley Radio, Ltd.
Harrison & Co., A. T.
Hill & Co., Ltd., F. C.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
Magnetic & Electrical Alloys, Ltd.
Merrington Bros., Ltd.
Mile End Radio Co.
Nurolion Electricals, Ltd.
Ormond Engineering Co., Ltd.
Plessey Co., Ltd.
Reproducers and Amplifiers, Ltd.
Sankey & Sons, Ltd., Joseph.
Savage, W. B.
Slektun Products, Ltd.
Sound Sales, Ltd.
Standard Telephones & Cables, Ltd.
Tunewell Radio, Ltd.
Webster & Co., Ltd., T.
Whiteley Elec. Radio Co., Ltd.
Zimba Radio Co.

TRANSMITTING APPARATUS.

British Radio Mfg. Co. (Liverpool) Ltd.
Castagnoli, G.
Edison Swan Electric Co., Ltd.
Johnson & Phillips, Ltd.
Lyons, Ltd., Claude.
Marconi's Wireless Telegraph Co., Ltd.
Muirhead & Co., Ltd.
Olympia Radio, Ltd.
Plessey Co., Ltd.
Quartz Crystal Co.
Radio Development Co.
Standard Telephones & Cables, Ltd.
Stratton & Co., Ltd.
Ward & Goldstone, Ltd.
362 Radio Valve Co., Ltd.

TURNTABLES (for portables).

Blue Comet, Ltd.
British Radiophone, Ltd.
Burndept, Ltd.
Chapman, Ltd., A. W.
General Electric Co., Ltd.
Lissen, Ltd.
McLeod & McLeod, Ltd.
Merrington Bros., Ltd.
Ormond Engineering Co., Ltd.
Plessey Co., Ltd.
Precision Radio & Mfg. Co., Ltd.
Pye Radio, Ltd.
Six-Sixty Radio Co., Ltd.

VALVES (standard battery type).

Adey Portable Radio.
British Pix Co., Ltd.
Clarion Radio Valve Co.
Concerton Radio & Electrical Co., Ltd.
Cossor, Ltd.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Electrical Trading Association, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
High Vacuum Valve Co., Ltd.
Impex Electrical, Ltd.
Lissen, Ltd.
London Radio Co. (Leeds), Ltd.
Lustrolux, Ltd.
Lyons, Ltd., Claude.
Marconiphone Co., Ltd.
Mullard Wireless Service Co., Ltd.
M.O. Valve Co., Ltd.
Neutron (1927), Ltd.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

Octron, Ltd.
Philco.
Six-Sixty Radio Co., Ltd.
Standard Telephones & Cables, Ltd.
Triotron Radio Co., Ltd.
Tungsram Electric Lamp Works (Gt. Britain), Ltd.
362 Radio Valve Co., Ltd.

VALVES (A.C.).

British Pix Co., Ltd.
Clarion Radio Valve Co.
Concerton Radio & Electrical Co., Ltd.
Cossor, Ltd.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Electrical Trading Association, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
High Vacuum Valve Co., Ltd.
Impex Electrical, Ltd.
Lissen, Ltd.
Lyons, Ltd., Claude.
Majestic Electric Co., Ltd.
Marconiphone Co., Ltd.
Mullard Wireless Service Co., Ltd.
M.O. Valve Co., Ltd.
Octron, Ltd.
Philco.
Six-Sixty Radio Co., Ltd.
Standard Telephones & Cables, Ltd.
Triotron Radio Co., Ltd.
Tungsram Electric Lamp Works (Gt. Britain), Ltd.
362 Radio Valve Co., Ltd.

VALVES (multiple).

Cossor, Ltd., A.C.
Electrical Trading Assoc., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
High Vacuum Valve Co., Ltd.
Impex Electrical, Ltd.
Lissen, Ltd.
Loewe Radio Co., Ltd.
Lyons, Ltd., Claude.
Majestic Electric Co., Ltd.
Marconiphone Co., Ltd.
Mullard Wireless Service Co., Ltd.
M.O. Valve Co., Ltd.
Philco.
Six-Sixty Radio Co., Ltd.
Standard Telephones & Cables, Ltd.
Tungsram Electric Lamp Works (Gt. Britain), Ltd.

VALVES (A.C. rectifier).

British Pix Co., Ltd.
Clarion Radio Valve Co.
Concerton Radio & Electrical Co., Ltd.
Cossor, Ltd., A.C.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.

Ferranti, Ltd.
General Electric Co., Ltd.
High Vacuum Valve Co., Ltd.
Impex Electrical, Ltd.
Lissen, Ltd.
Loewe Radio Co., Ltd.
Lyons, Ltd., Claude.
Majestic Electric Co., Ltd.
Marconiphone Co., Ltd.
Mullard Wireless Service Co., Ltd.
M.O. Valve Co., Ltd.
Octron, Ltd.
Olympia Radio, Ltd.
Philco.
Philips Industrial.
Philips Lamps, Ltd.
Six-Sixty Radio Co., Ltd.
Standard Telephones & Cables, Ltd.
Willis & Co. (Meritus) Ltd.
Triotron Radio Co., Ltd.
Tungsram Electric Lamp Works (Gt. Britain), Ltd.
362 Radio Valve Co., Ltd.

VALVES (Universal).

Adey Portable Radio.
Cossor, Ltd., A.C.
Electric Lamp Service Co., Ltd.
Ferranti, Ltd.
Forbat, E.
Impex Electrical Ltd.
Lissen, Ltd.
Lyons, Ltd., Claude.
Marconiphone Co., Ltd.
Mullard Wireless Service Co., Ltd.
M.O. Valve Co., Ltd.
Philco.
Standard Telephones & Cables, Ltd.
362 Radio Valve Co., Ltd.

VALVE-HOLDERS.

Aerodyne Radio.
Arctic Fuse and Electrical Manufacturing Co.
Automobile Accessories (Bristol), Ltd.
Benjamin Electric, Ltd.
Berclif, Ltd.
Bowerman, Ltd., G.
British Radio Mfg. Co., (Liverpool), Ltd.
Bulgin & Co., Ltd., A.F.
Christie & Sons, Ltd., Jas.
Crystalate Gramophone Record Mfg. Co., Ltd.
Electric Lamp Service Co., Ltd.
Elektra Supplies.
Enderlein, E.
Ferranti, Ltd.
General Electric Co., Ltd.
Goodmans (Clerkenwell), Ltd.
Graham Farish, Ltd.
Gripso Co.
Harrison & Co., A.T.
Ivory Electric, Ltd.
Lectro Linx, Ltd.
Lever (Trix), Ltd., Eric J.
Lissen, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.

CLIX

Special Quotations to manufacturers.
Trade terms and Literature on request.

Chassis Mounting VALVEHOLDERS

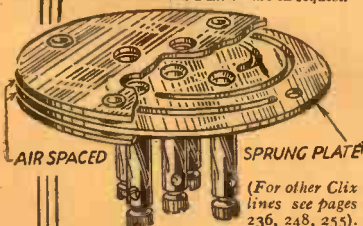
In addition to the four models listed below, we supply, to manufacturers only, a range of standardised valveholder plates and Clix patented sockets. Full details sent on request.

"AIRSPRUNG"	STANDARD
Antimicrophonic - Non -	4 and 5-pin types.
Metal 4 and 5-pin types.	AMERICAN
FLOATING 7-pin type.	4, 5 and 6-pin types.

IMPORTANT NOTICE :—Clix components for perfect contact are covered by patents, provisional patents and registered designs.

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

Telephone :
Victoria 3541/2.



(For other Clix
lines see pages
236, 248, 255).

Lyons, Ltd., Claude.
McLeod & McLeod, Ltd.
McWhirr, Paterson & Co.
Marks & Son, S.
Millet J.
Nassak Mfg. Co.
Pepper, T.
Person & Son, L.
Philco.
Plessey Co., Ltd.
Pye Radio, Ltd.
Radiamp Co.
Ready Radio, Ltd.
Standard Telephone & Cables, Ltd.
Stratton & Co., Ltd.
Telsen Electric Co., Ltd.
Toubkin, J.
Tunewell Radio, Ltd.
Whiteley Elec. Radio Co., Ltd.
Wright & Weaire, Ltd.
W.R.C., Ltd.
362 Radio Valve Co., Ltd.

VALVE TESTERS.

Bulgin & Co., Ltd., A. F.
Clifford Pressland (Sales) Ltd.
Custerson, R.
Emerson, R. W.
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General Electric Co., Ltd.
Godfrey (Radio), Ltd., F. E.
Hartley Turner Radio, Ltd.
Lamplugh Radio, Ltd.
Lyons, Ltd., Claude.
McLeod & McLeod, Ltd.
Millet, J.
Pepper, T.
Radiamp Co.
Radiolab Mfg. Co.,
Siemens Schuckert (Gt. Britain), Ltd.
Sifan Electrical Instrument Co., Ltd.
Six-Sixty Radio Co., Ltd.
Wood, L. R.

VARNISHES, INSULATING.

A.E.G., Electric Co., Ltd.
Bakelite, Ltd.
Birkbys, Ltd.
British Insulated Cables, Ltd.
Clarke & Co. (Manchester), Ltd., H.
Crane Chemical Co., Ltd., Frederick.
Ellison Insulations, Ltd.
General Electric Co., Ltd.
Ioco Rubber & Waterproofing Co., Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
Micanite & Insulators Co., Ltd.

VOLUME CONTROLS.

Abingdon Wireless Supplies.
Altham Radio Co.
Amplion (1932), Ltd.
Belling & Lee, Ltd.
Bowyer, Lowe & A. E. D., Ltd.
British Electric Resistance Co., Ltd.

British N.S.F. Co., Ltd.
British Radio Mfg. Co. (Liverpool), Ltd.
British Radiophone, Ltd.
Bulgin & Co., Ltd., A. F.
Burndept, Ltd.
Burne-Jones & Co., Ltd.
Castagnoli, G.
Chorlton Metal Co., Ltd.
Cosmocord, Ltd.
Cossor, Ltd.
Edison Swan Electric Co., Ltd.
Electric Lamp Service Co., Ltd.
Enderlein, E.
Erie Resistor, Ltd.
Ferranti, Ltd.
Franklin Electric Co., Ltd.
General Electric Co., Ltd.
Graham Farish, Ltd.
Harlie, Ltd.
Haynes Radio.
Ivory Electric, Ltd.
Lechner & Co., F. W.
Lever (Trix), Ltd., E. J.
Limit Radio Co., Ltd.
Lissen, Ltd.
London Electric Wire Co., & Smiths, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
Lyons, Ltd., Claude.
McLeod & McLeod, Ltd.
Merrington Bros., Ltd.
Morton, Ltd., E. R.
Nassak Mfg. Co., Ltd.
Orion Lamps, Ltd.
Ormond Engineering Co., Ltd.
Plessey Co., Ltd.
Precision Radio & Mfg. Co., Ltd.
Pye Radio, Ltd.
Radiamp Co.
Radio Instruments, Ltd.
Radio Resistor Co.
Ready Radio, Ltd.
Reliance Mfg. Co. (Southwark), Ltd.
Reproducers & Amplifiers, Ltd.
Rothermel Corporation, Ltd.
Savage, W. B.
Siemens Schuckert (Gt. Britain), Ltd.
Sovereign Products, Ltd.
Standard Telephones & Cables, Ltd.
Telsen Electric Co., Ltd.
Tunewell Radio, Ltd.
Varley.
Voigt Patents, Ltd.
Whiteley Electrical Radio Co., Ltd.
Wilkins & Wright, Ltd.
Wright & Weaire, Ltd.
W.R.C., Ltd.

WANDER PLUGS.

Altham Radio Co.
Amplifiers, Ltd.
Andrews & Co., A. E.
Anglo-Swiss Screw Co., Ltd.
Bate & Co., Ltd., Jabez.



CLIX WANDER PLUGS

Our well-known Clix "Master Plugs" are suitable for use with all sockets with internal diameters from $\frac{1}{4}$ in. to $\frac{5}{8}$ in. Two types available. Long shank and short shank with insulators.

Special quotations to manufacturers. Trade terms and Literature on request.
(For other Clix lines see pages 236, 248, 254).

IMPORTANT NOTICE:—Clix components for perfect contact are covered by patents, provisional patents and registered designs.

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

Telephone :
Victoria 3547/2.



PRODUCTS SUPPLIED

Belling & Lee, Ltd.
 Blue Comet, Ltd.
 Bulgin & Co., Ltd., A. F.
 Eastick & Sons, J. J.
 Elektra Supplies.
 Elliott, E.
 Francois, E. J.
 General Electric Co., Ltd.
 Gripso Co.
 Henderson & Co., Ltd., D. M.
 Igranic Electric Co., Ltd.
 Ivory Electric, Ltd.
 Joseph, H.
 Kniveton Cable Works, Ltd.
 Lectro Linx, Ltd.
 Lesingham, F. L.
 Lever (Trix), Ltd., E. J.
 Lilley & Son, Ltd., S.
 Lisenin Wireless Co.
 Lissen, Ltd.
 McLeod & McLeod, Ltd.
 McWhirr, Paterson, & Co.
 Meyer & Co., E.
 Millet, J.
 Nassak Mfg. Co., Ltd.
 Olympia Radio, Ltd.
 Ormond Engineering Co., Ltd.
 Radiamp Co.
 Toubkin, J.
 True Screws, Ltd.
 Ward & Goldstone, Ltd.
 W.R.C., Ltd.

WASHERS.

Anglo-Swiss Screw Co., Ltd.
 Baker & Finnenore, Ltd.
 Belling & Lee, Ltd.
 Blue Comet, Ltd.
 Birmingham Products, Ltd.
 Busby & Co., Ltd.
 Cookson & Co.
 Elldots.
 Francois, E. J.
 Gee (Birmingham), Ltd.
 General Electric Co., Ltd.
 Henderson & Co., Ltd., D. M.
 Ivory Electric, Ltd.
 Lever (Trix), Ltd., E. J.
 McLeod & McLeod, Ltd.
 McWhirr, Paterson & Co.
 Ormond Engineering Co., Ltd.
 Prideaux, Junr., R.
 Redfern's Rubber Works, Ltd.
 Toubkin, J.
 True Screws, Ltd.
 W.R.C., Ltd.

WAVEMETERS.

British Radio Mfg. Co. (Liverpool), Ltd.
 Burne-Jones & Co., Ltd.
 Castagnoli, G.
 Custerson, R.
 Elliott Radio Mfg. Co., Ltd.
 Ferranti, Ltd.
 General Electric Co., Ltd.
 Hartley Turner Radio, Ltd.
 Ivory Electric, Ltd.
 Johnson & Phillips, Ltd.
 Lyons, Ltd., Claude.
 Muirhead & Co., Ltd.
 Plessey Co., Ltd.
 Quartz Crystal Co.
 Radiolab Mfg. Co.
 Stratton & Co., Ltd.
 Sullivan, Ltd., H. W.
 Wilson, W. H.

WAVE TRAPS.

Automobile Accessories (Bristol), Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Brown, Brew & Co., Ltd.
 Burne-Jones & Co., Ltd.
 Chalkley, C. G.
 Custerson, R.
 Elliott Radio Mfg. Co., Ltd.
 Ferranti, Ltd.

General Electric Co., Ltd.
 Harlie Ltd.
 Ivory Electric, Ltd.
 Johnson & Phillips, Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 Merrington Bros., Ltd.
 Nassak Mfg. Co., Ltd.
 Ormond Engineering Co., Ltd.
 Radiamp Co.
 Scott & Co., S. W.
 Shearing, Ltd., A. E.
 Sovereign Products, Ltd.
 Ward & Goldstone, Ltd.
 Wilson, W. H.
 Yorkshire Radio Co.

WIRE (aerial).

Aerialite, Ltd.
 Altham Radio Co.
 Amplion (1932), Ltd.
 Blue Comet, Ltd.
 British Aluminium Co., Ltd.
 British Insulated Cables, Ltd.
 British Radiophone, Ltd.
 British Ropes, Ltd.
 Bromley-Longton Electric Wire & Insulator Co. Ltd.
 Concordia Electric Wire Co., Ltd.
 Connollys (Blackley), Ltd.
 Coquantin & Co., Ltd., M.
 Elliott Radio Mfg. Co., Ltd.
 Elvy, C. L.
 Enfield Cable Works, Ltd.
 Geipel Ltd., W.
 General Electric Co., Ltd.
 Graham Farish, Ltd.
 Green & Son, D.
 Hart Bros. Electrical Mfg. Co., Ltd.
 Ivory Electric, Ltd.
 Kniveton Cable Works, Ltd.
 Laker Co., Ltd., J. & J.
 Lamphugh Radio, Ltd.
 Lesingham, F. L.
 Lever (Trix), Ltd., E. J.
 London Electric Wire Co., & Smiths, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 London Metal Warehouses, Ltd.
 McLeod & McLeod, Ltd.
 Midland Electric Wire Co., Ltd.
 Millet, J.
 New London Elctron Works, Ltd.
 Reliance Electrical Wire Co., Ltd.
 St. Helen's Cable & Rubber Co., Ltd.
 Saxon Radio Co.
 Saxonia Electrical Wire Co., Ltd.
 Siemens Schuckert (Gt. Britain), Ltd.
 Trent Electric Wire Works, Ltd.
 Ward & Goldstone, Ltd.
 Wireless Electric (Wholesale) Ltd.
 Wood, L. R.

WIRE (connecting).

Aerialite, Ltd.
 Blue Comet, Ltd.
 British Insulated Cables, Ltd.
 British Radiophone, Ltd.
 British Ropes, Ltd.
 Bromley-Longton Electric Wire & Insulator Co., Ltd.
 Concordia Electric Wire Co., Ltd.
 Coquantin & Co., Ltd., M.
 Elvy, C. L.
 Enfield Cable Works, Ltd.
 Geipel, Ltd., W.
 General Electric Co., Ltd.
 Hart Bros. Electrical Mfg. Co., Ltd.
 Ivory Electric, Ltd.
 Lesingham, F. L.
 Lever (Trix), Ltd., E. J.
 London Electric Wire Co., & Smiths, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McLeod & McLeod, Ltd.
 Midland Electric Wire Co., Ltd.
 Millet, J.
 Olympia Radio, Ltd.
 Radiamp Co.
 Reliance Electrical Wire Co., Ltd.
 Remax Cables, Ltd.

BETTER TRADE WITH THE BETTER RADIO BRIGADE

St. Helens Cable & Rubber Co., Ltd.
Saxon Radio Co.
Saxonia Electrical Wire Co., Ltd.
Siemens Schuckert (Great Britain), Ltd.
Standard Telephones & Cables, Ltd.
Trent Electric Wire Works, Ltd.
Ward & Goldstone, Ltd.
Wood, L. R.

WIRE (galvanised stay).

British Ropes, Ltd.
Bruntons (Musselburgh) Ltd.
Coquantin & Co., Ltd., M.
Geipel, Ltd., W.
General Electric Co., Ltd.
Ivory Electric, Ltd.
Laker Co., Ltd., J. & J.
Midland Radio & Television Co.
Ward & Goldstone, Ltd.

WIRE (instrument).

Aerialite, Ltd.
British Insulated Cables, Ltd.
British Ropes, Ltd.
Bromley-Langton Electric Wire & Insulator Co.
Ltd.
Concordia Electric Wire Co., Ltd.
Connollys (Blackley), Ltd.
Coquantin & Co., Ltd., M.
Elvy, C. L.
Enfield Cable Works, Ltd.
Ferranti, Ltd.
Geipel, Ltd., W.
General Electric Co., Ltd.
Hart Bros. Electrical Mfg. Co., Ltd.
Ivory Electric, Ltd.
Johnson, Mathey & Co., Ltd.
Johnson & Phillips, Ltd.
Kent Bros. Electric Wire Co. & E. H. Phillips
Ltd.
London Electric Wire Co., & Smiths, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
McLeod & McLeod, Ltd.
Midland Electric Wire Co., Ltd.
New London Electron Works, Ltd.
Radiamp Co.
Saxon Radio Co.
Saxonia Electrical Wire Co., Ltd.
Siemens Schuckert (Great Britain), Ltd.
Trent Electric Wire Works, Ltd.
Ward & Goldstone, Ltd.

WIRE (Litz).

Aerialite, Ltd.
British Insulated Cables, Ltd.
Bromley-Langton Electric Wire & Insulator Co.,
Ltd.
Concordia Electrical Wire Co., Ltd.
Coquantin & Co., Ltd., M.
Elvy, C. L.
Geipel, Ltd., W.
General Electric Co., Ltd.
Hart Bros. Electrical Mfg. Co., Ltd.
Ivory Electric, Ltd.
London Electric Wire Co., & Smiths, Ltd.
McLeod & McLeod, Ltd.
Saxonia Electrical Wire Co., Ltd.
Trent Electric Wire Works, Ltd.
Ward & Goldstone, Ltd.

WIRE (resistance).

British Insulated Cables, Ltd.
British Ropes, Ltd.
Bromley-Langton Electric Wire & Insulator Co.,
Ltd.
Bruntons (Musselburgh), Ltd.
Concordia Electric Wire Co., Ltd.
Connollys (Blackley), Ltd.
Coquantin & Co., Ltd., M.
Elvy, C. L.
Geipel, Ltd., W.
General Electric Co., Ltd.
Hart Bros. Electrical Mfg. Co., Ltd.
Imp Radio Co.
Ivory Electric, Ltd.
Johnson, Mathey & Co., Ltd.
London Electric Wire Co. & Smiths, Ltd.
London Electrical Co. (Sherborne Lane), Ltd.
McLeod & McLeod, Ltd.

Maul & Murphy, Ltd.
Midland Electric Wire Co., Ltd.
Radiamp Co.
Radio Resistor Co.
Rotor Electric, Ltd.
Saxonia Electrical Wire Co., Ltd.
Scott & Co., Ltd., A. C.
Trent Electric Wire Works, Ltd.
Ward & Goldstone, Ltd.

GRAMOPHONE SECTION.

CABINETS.

Aladdin Gramophone & Accessories Co.
Appletons (Leeds), Ltd.
Automobile Accessories (Bristol), Ltd.
Balcombe, Ltd., A. J.
Bligh, S. W.
Bond & Sons, Ltd., V. C.
Boumphrey, Arundel & Co., Ltd.
Bradnam & Co.
British East-Light, Ltd.
Calders, Ltd.
Carrington Mfg. Co., Ltd.
Castagnoli, G.
Caxton Wood Turnery Co.
Collings & Co., N. R.
City Accumulator Co.
Dallas & Sons, Ltd., J. E.
Disque Cabinet Co., Ltd.
Doherty & Sons, Edward.
Eastham, Thos.
E.M.G. Hand Made Gramophones, Ltd.
Fairfield Mfg. Co.
Goodwin Radio, Ltd.
Gould, Harper & Co., Ltd.
Gresley Radio, Ltd.
Haynes Radio.
Holmes Bros. (London), Ltd.
Hyatt & Co., Ltd., J.
Joseph, H.
J. B. Mfg. Co. (Cabinets), Ltd.
Lathwood, J.
Lawson & Raphael.
Lissen, Ltd.
Lock, Ltd., W. & T.
Lockwood Casework Mfg. Co.
London Electrical Co. (Sherborne Lane), Ltd.
Margolin, J. & A.
Merrington Bros., Ltd.
Morton & Co., Ltd., E. R.
Murdoch Trading Co.
O'Brien, Ltd., T.
Osborn, C. A.
Peto-Scott Co., Ltd.
Philomel Radio Equipment Co.
Portable Gramophone Co., Ltd.
Radiocabinets (Walsall), Ltd.
Ramsey, F. W.
Regent Fittings Co.
Six-Sixty Radio Co., Ltd.
Stanton, T.
Storarr & Balls.
Supertone Pianos, Ltd.
Tyrela Gramophones, Ltd.
Woodware Supplies, Ltd.

GRAMOPHONE FITTINGS.

Aladdin Gramophone & Accessories Co.
Balcombe, Ltd., A. J.
Beddoes, Ltd., J. G.
Bradnam & Co.
Bulgin & Co., Ltd., A. F.
Diehl, H.
Gresley Radio, Ltd.
Harris, G. & R.
Lilley & Son, Ltd.
Limit Engineering Co., Ltd.
Lockwood Casework Mfg. Co.
Margolin, J. & A.
Merrington Bros., Ltd.
Osborn, C. A.
Regent Fittings Co.
Thompson, Diamond & Butcher.
Williams & Gray, Ltd.

MULLARD THE MASTER VALVE

PRODUCTS SUPPLIED

GRAMOPHONES (acoustic).

Aladdin Gramophone & Accessories Co.
 Appletons (Leeds), Ltd.
 Baker & Co., Ltd., G. F.
 Balcombe, Ltd., A. J.
 Baxter, Stavridi & Craies, Ltd.
 Columbia Graphophone Co., Ltd.
 Coppock, J. T.
 Dallas & Sons, Ltd., John E.
 Decca Gramophone Co., Ltd.
 Dulcetto-Polyphon, Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Fletcher & Co., Ltd., H. J.
 Garnersound, Ltd.
 Gilbert & Co., Ltd., C.
 Gramophone Co., Ltd.
 Itonia, Ltd.
 Johnson Talking Machine Co., Ltd.
 Leibovici, J.
 Lever (Trix), Ltd., E. J.
 Lissen, Ltd.
 Lugton & Co., Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Murdoch Trading Co.
 Paramount Gramophone Co.
 Regent Fittings Co.
 Robertshaw & Co., Ltd., E.
 Ruhl (1922), Ltd., O.
 Segal & Co., R.
 Stockall, Marples & Co., Ltd.
 Thompson, Diamond & Butcher.
 Tyrela Gramophones, Ltd.

GRAMOPHONES (electric reproducing).

Baxter, Stavridi & Craies Ltd.
 Birmingham Sound Reproducers.
 Bligh, S. W.
 Blue Comet, Ltd.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Columbia Graphophone Co., Ltd.
 Coppock, J. T.
 Correx Amplifiers.
 Dallas & Sons, Ltd., J. E.
 Decca Gramophone Co., Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Gilbert & Co. (Ltd.), C.
 Godfrey (Radio), Ltd., F. E.
 Gramophone Co., Ltd.
 Harlie, Ltd.
 Hartley Turner Radio, Ltd.
 Higgs (Gt. Britain), Ltd.
 Igranic Electric Co., Ltd.
 Itonia, Ltd.
 Leibovici, J.
 Lever (Trix), Ltd., E. J.
 Lissen, Ltd.
 London Elec. Co. (Sherborne Lane), Ltd.
 McMichael Radio, Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Midland Radio & Television Co.
 Murdoch Trading Co.
 Philips Industrial.
 Precision Electric, Ltd.
 Radio Gramophone Development Co., Ltd.
 Regent Fittings Co.
 Savage, W. B.
 Tannoy Products.
 Thompson, Diamond & Butcher.
 Tyrela Gramophones, Ltd.
 Whetton & L. Gold, E. P.

GRAMOPHONES (portable).

Aladdin Gramophone & Accessories Co.
 Appletons (Leeds), Ltd.
 Baker & Co., Ltd., G. F.
 Balcombe, Ltd., A. J.
 Brunswick, Ltd.
 Columbia Graphophone Co., Ltd.
 Coppock, J. T.
 Dallas & Sons, Ltd., J. E.
 Decca Gramophone Co., Ltd.
 Dual Motors, Ltd.

Dulcetto-Polyphon, Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Fletcher & Co., Ltd., H. J.
 Garnersound, Ltd.
 Gilbert & Co., Ltd., C.
 Gramophone Co., Ltd.
 Itonia, Ltd.
 Leibovici, J.
 Lever (Trix), Ltd., E. J.
 Lissen, Ltd.
 Lugton & Co., Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Millards.
 Murdoch Trading Co.
 Paramount Gramophone Co.
 Portable Gramophone Co., Ltd.
 Regent Fittings Co.
 Rex Gramophone Co.
 Robertshaw & Co., Ltd., E.
 Ruhl (1922), Ltd., O.
 Stead & Co., Ltd., J.
 Stockall, Marples & Co., Ltd.
 Thibouville-Lamy & Co.
 Thompson, Diamond & Butcher.
 Tyrela Gramophones, Ltd.

HORNS.

Aladdin Gramophones and Accessories Co.
 Appletons (Leeds), Ltd.
 Bradman & Co.
 Correx Amplifiers.
 Diehl, H.
 Film Industries, Ltd.
 Garnersound, Ltd.
 J. B. Mfg. Co. (Cabinets), Ltd.
 Limit Engineering Co., Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Murdoch Trading Co.
 Oppenheim & Co., Ltd., E.
 Portable Gramophone Co., Ltd.
 Regent Fittings Co.
 R.A.M.S. Metal Works, Ltd.
 Savage, W. B.
 Thompson, Diamond & Butcher.
 Universal Gramophone & Radio Co., Ltd.

MOTORS (electric A.C.)

Balcombe, Ltd., A. J.
 Baxter, Stavridi & Craies, Ltd.
 Calvete, Ltd., I.
 Collaro, Ltd.
 Corona Engineering & Motor Co., Ltd.
 Dual Motors, Ltd.
 Edison Swan Electric Co., Ltd.
 Garrard Engineering & Manufacturing Co., Ltd.
 General Electric Co., Ltd.
 Gramophone Co., Ltd.
 Grosvenor Works (Holloway), Ltd.
 Harlie, Ltd.
 Lyons, Ltd., Claude.
 McLeod & McLeod, Ltd.
 Margolin, J. & A.
 Regent Fittings Co.
 Rotax, Ltd.
 Siemens-Schuckert (Gt. Britain), Ltd.
 Simpsons Electricals, Ltd.
 Univolt Electric, Ltd.

MOTORS (electric D.C.)

Balcombe, Ltd., A. J.
 Baxter, Stavridi & Craies, Ltd.
 Calvete, Ltd., I.
 Dual Motors, Ltd.
 Garrard Engineering & Mfg. Co., Ltd.
 General Electric Co., Ltd.
 Gramophone Co., Ltd.
 Limit Radio, Ltd.
 Margolin, J. & A.
 Regent Fittings Co.
 Siemens-Schuckert (Gt. Britain), Ltd.
 Univolt Electric, Ltd.

MOTORS (spring).

Aladdin Gramophone & Accessories Co.
 Balcombe, Ltd., A. J.
 Baxter, Stavridi & Craies, Ltd.
 Collaro, Ltd.

EVERY MULLARD VALVE SOLD HELPS TO SELL ANOTHER

Fletcher & Co., Ltd., H. J.
Garrard Engineering & Manufacturing Co., Ltd.
Lugton & Co., Ltd.
McLeod & McLeod, Ltd.
Margolin, J. & A.
Regent Fittings Co.

MOTORS (universal).

Garrard Engineering & Mfg. Co., Ltd.
General Electric Co., Ltd.
Margolin, J. & A.
Univolt Electric, Ltd.

NEEDLE CUPS AND CONTAINERS.

Aladdin Gramophone & Accessories Co.
Baxter, Stavridi & Craies, Ltd.
Beddoes, Ltd., J. G.
British Goldring Products, Ltd.
Bulgin & Co., Ltd., A. F.
Diehl, H.
Elliott, E.
Gilbert & Co., Ltd., C.
Grosvenor Works (Holloway), Ltd.
Harris, G. & R.
Lilley & Sons, Ltd.
Limit Engineering Co., Ltd.
Lockwood Casework Mfg. Co.
Lugton & Co., Ltd.
Margolin, J. & A.
Oppenheim & Co., Ltd., E.
Regent Fittings Co.
Tyrela Gramophones, Ltd.
Wendell Radio, Ltd.

NEEDLES (fibre).

Amplifiers, Ltd.
Daws, Clarke & Co.
Electrocolor Products, Ltd.
E.M.G. Hand-Made Gramophones, Ltd.
Gramophone Co., Ltd.
Hartley Turner Radio, Ltd.
Lissen, Ltd.
Mellow Tone Co., Ltd.
Murdoch Trading Co.
Regent Fittings Co.

NEEDLES (steel).

Aladdin Gramophone & Accessories Co.
Allwood Blackband & Co.
Balcombe, Ltd., A. J.
British Homophone Co., Ltd.
British Needle Co., Ltd.
British Zonophone Co., Ltd.
Brunswick, Ltd.
Crystalate Gramophone Record Mfg. Co., Ltd.
Decca Gramophone Co., Ltd.
Fletcher & Co., Ltd.
Gilbert & Co., Ltd., C.
Gramophone Co., Ltd.
Guillaume & Sons, Ltd.
Itonia, Ltd.
Lissen, Ltd.
Lugton & Co., Ltd.
Mellow Tone Co., Ltd.
Murdoch Trading Co.
Oppenheim & Co., Ltd., E.
Parlophone Co., Ltd.
Regent Fittings Co.
Stead & Co., Ltd., J.
Terry & Sons, Ltd.

NEEDLES (semi-permanent).

Balcombe, Ltd., A. J.
British Needle Co., Ltd.
British Zonophone Co., Ltd.
Decca Gramophone Co., Ltd.
Gramophone Co., Ltd.
Mellow Tone Co., Ltd.
Murdoch Trading Co.

PICK-UPS.

Altham Radio Co.
Amplifiers, Ltd.
Amplion (1932), Ltd.
Balcombe, Ltd., A. J.
Baxter, Stavridi & Craies, Ltd.
Belling & Lee, Ltd.
Bowyer Lowe & A.E.D., Ltd.
British Blue Spot Co., Ltd.
British Clarion Co., Ltd.

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The popularity of the Unigram can be readily understood:—The Unigram at £4 19s. 6d. brings within the reach of all, first-class Radio-Gram reproduction without the necessity of buying an expensive Radio-Gram. Model "T.I." includes a first-class electric motor, fully automatic stop, Universe Pick-up and Rest and Potentiometer-type Volume Control. Housed in an attractive modern cabinet. Just place the Set on top of the Unigram and you have a Radio-gram. Voltages 100/130 and 200/250, 50 cycles.

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COSMOCORD LTD., Universe Works, Enfield, Middlesex

PRODUCTS SUPPLIED

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 British Ideal Patents, Ltd.
 British Lumophon Co.
 British Radiophone, Ltd.
 British Zonophone Co., Ltd.
 Bulgin & Co., Ltd., A. F.
 Chorlton Metal Co., Ltd.
 Colassi, W. L.
 Collaro, Ltd.
 Columbia Graphophone Co., Ltd.
 Cosmocord, Ltd.
 Cossor, Ltd., A. C.
 Edison Swan Electric Co., Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Garrard Engineering & Mfg. Co., Ltd.
 General Electric Co., Ltd.
 Gramophone Co., Ltd.
 Grosvenor Wks. (Holloway), Ltd.
 Harlie, Ltd.
 Hartley Turner Radio, Ltd.
 Igranio Electric Co., Ltd.
 Johnson & Phillips, Ltd.
 Kolster-Brandes, Ltd.
 Lamplugh Radio, Ltd.
 Lissen, Ltd.
 Loewe Radio Co., Ltd.
 Lugton & Co., Ltd.
 Lyons, Ltd., Claude.
 Marconiphone Co., Ltd.
 Margolin, J. & A.
 Midland Radio & Television Co.
 Oppenheim & Co., Ltd., E.
 Parlophone Co., Ltd.
 Person & Son, L.
 Philco.
 Phillips Lamps, Ltd.
 Powertone Products.
 Radio Gramophone Development Co., Ltd.
 Regent Fittings, Co.
 Ripaults, Ltd.
 Siemens-Schuckert (Gt. Britain), Ltd.
 Varley (Proprietors, Oliver Pell Control, Ltd.)
 Wendell Radio, Ltd.
 W.R.C., Ltd.

PICK-UP ARMS.

Altham Radio Co.
 Amplifiers, Ltd.
 Belling & Lee, Ltd.
 Bowyer-Lowe & A. E. D., Ltd.
 British Ideal Patents, Ltd.
 British Lumophon, Co.
 Bulgin & Co., Ltd., A. F.
 Cossor, Ltd., A. C.
 Edison Swan Electric Co., Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Garrard Engineering & Mfg. Co., Ltd.
 General Electric Co. Ltd.
 Grosvenor Works (Holloway), Ltd.
 Harlie, Ltd.
 Igranio Electric Co., Ltd.
 Kolster-Brandes, Ltd.
 Lissen, Ltd.
 Oppenheim & Co., Ltd., E.
 Parlophone Co., Ltd.
 Philips Lamps, Ltd.
 Radio Gramophone Development Co., Ltd.
 Regent Fittings Co.
 Varley (Oliver Pell Control, Ltd.)
 Wendell Radio, Ltd.
 W.R.C., Ltd.

PLAYING DESKS.

Balcombe, Ltd., A. J.
 Baxter, Stavridi & Craies, Ltd.
 Bowyer Lowe & A. E. D., Ltd.
 Castagnoli, G.
 Collaro, Ltd.
 Collings & Co., N. R.
 Cosmocord, Ltd.
 Dallas & Sons, Ltd., J. E.
 E.M.G. Hand Made Gramophones, Ltd.
 Garnersound, Ltd.
 General Electric Col., Ltd.
 Gramophone Co., Ltd.
 Hartley Turner Radio, Ltd.
 Itonia, Ltd.
 Kolster Brandes, Ltd.

Lawson & Raphael.
 Lockwood Casework Mfg. Co.
 London Electrical Co. (Sherborne Lane), Ltd.
 Lugton & Co., Ltd.
 Margolin, J. & A.
 Midland Radio & Television Co.
 Thompson Diamond & Butcher.
 Voigt Patents, Ltd.
 Wurltzer Lyrio Radio, Ltd.

RADIO-GRAMOPHONES (Spring and Battery).

Automobile Accessories (Bristol), Ltd.
 Balcombe, Ltd., A. J.
 Bligh, S. W.
 Blue Comet, Ltd.
 Bradnam & Co.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Castagnoli, G.
 Columbia Graphophone Co., Ltd.
 Disque Cabinet Co., Ltd.
 Edge Radio, Ltd.
 Electrical & Radio Products (1931), Ltd.
 Elliott Radio Mfg. Co., Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Fallowfield, Ltd., Jonathan.
 Fletcher & Co., Ltd., H. J.
 Godfrey (Radio), Ltd., F. E.
 Hacker & Sons, H.
 Hartley Turner Radio, Ltd.
 Haynes Radio.
 Goodwin Radio, Ltd.
 James & Co., W. H.
 Johnson Talking Machine Co., Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Midland Radio & Television Co.
 Millards.
 Murdoch Trading Co.
 Paramount Gramophone Co.
 Precision-Electric, Ltd.
 Rex Gramophone Co., Ltd.
 Slektan Products, Ltd.
 Smurthwaite, Ltd., F. W.
 Tannoy Products.
 Truphonic Radio Co.
 Union Radio Co., Ltd.
 Wendell Radio, Ltd.

RADIO-GRAMOPHONES (A.C.).

Automobile Accessories (Bristol), Ltd.
 Balcombe, Ltd., A. J.
 Birmingham Sound Reproducers.
 Bligh, S. W.
 Blue Comet, Ltd.
 Bradnam & Co.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Brunswick, Ltd.
 Burndept, Ltd.
 Burrell Radio, Ltd.
 Castagnoli, G.
 City Accumulator Co.
 Climax Radio Electric, Ltd.
 Cole, Ltd., E. K.
 Columbia Graphophone Co., Ltd.
 Custerson, R.
 Decca Gramophone Co., Ltd.
 Disque Cabinet Co., Ltd.
 Edge Radio, Ltd.
 Electrical & Radio Products (1931), Ltd.
 Elliott Radio Mfg. Co., Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Fallowfield, Ltd., Jonathan.
 Fletcher & Co., H. J.
 General Electric Co., Ltd.
 Godfrey (Radio), Ltd., F. E.
 Goodwin Radio, Ltd.
 Gould, Harper & Co., Ltd.
 Gramophone Co., Ltd.
 Gresley Radio, Ltd.
 Hacker & Sons, H.
 Halford Radio, Ltd.
 Hart Collins, Ltd.
 Hartley Turner Radio, Ltd.
 Haynes Radio
 Higgs (Gt. Britain), Ltd.
 James & Co., W. H.

MULLARD—THE VALVE OF THE PAST,
 THE PRESENT, THE FUTURE

Johnson Talking Machine Co., Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McMichael Radio, Ltd.
 Mains Radio Gramophones, Ltd.
 Mains Radio Mfg. Co.
 Majestic Electric Co., Ltd.
 Marconiphone Co., Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Midgley Harmer, Ltd.
 Midland Radio & Television Co.
 Murdoch Trading Co.
 Paramount Gramophone Co.
 Partridge & Mee, Ltd.
 Philco.
 Phillips Industrial.
 Precision Electric, Ltd.
 Pye Radio, Ltd.
 Radio Acoustic Productions.
 Radio Instruments, Ltd.
 Rex Gramophone Co., Ltd.
 Riley & Son, W.
 Scott Sessions & Co., G.
 Smurthwaite, Ltd., F. W.
 Synchronophone, Ltd.
 Tannoy Products.
 Truphonic Radio Co.
 Tunewell Radio, Ltd.
 Tyrela Gramophones, Ltd.
 Union Radio Co., Ltd.
 Varley (Oliver Pell Control, Ltd.).
 Yorkshire Radio Co.

RADIO-GRAMOPHONES (D.C.).

Automobile Accessories (Bristol), Ltd.
 Balcombe, Ltd., A. J.
 Bligh, S. W.
 Blue Comet, Ltd.
 Bradnam & Co.
 British Radio Mfg. Co. (Liverpool), Ltd.
 Burrell Radio, Ltd.
 Castagnoli, G.
 Climax Radio Electric, Ltd.
 Cole, Ltd., E. K.
 Columbia Graphophone Co., Ltd.
 Custerson, R.
 Disque Cabinet Co., Ltd.
 Electrical & Radio Products (1931), Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Fallowfield, Jonathan.
 Fletcher & Co., Ltd., H. J.
 General Electric Co., Ltd.
 Godfrey (Radio) Ltd., F. E.
 Gould, Harper & Co., Ltd.
 Gramophone Co., Ltd.
 Gresley Radio, Ltd.
 Hacker & Sons, H.
 Hart Collins, Ltd.
 Hartley Turner Radio, Ltd.
 Haynes Radio.
 Higgs (Gt. Britain), Ltd.
 Lever (Trix), Ltd., Eric J.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 McMichael Radio, Ltd.
 Mains Radio Gramophones, Ltd.
 Mains Radio Mfg. Co.
 Marconiphone Co., Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Midland Radio & Television Co.
 Paramount Gramophone Co.
 Philomel Radio Equipment Co.
 Precision Electric Ltd.
 Radio Acoustic Productions.
 Radio Gramophone Development Co., Ltd.
 Radio Instruments, Ltd.
 Rex Gramophone Co., Ltd.
 Riley & Son, W.
 Smurthwaite, Ltd., F. W.
 Tannoy Products.
 Yorkshire Radio Co.

RADIO-GRAMOPHONES (universal).

Forbat, E.
 Hart Collins, Ltd.
 Hacker & Sons, H.
 Higgs (Gt. Brit.), Ltd.
 Radio Acoustic Productions.

RADIO-GRAMOPHONES (portable).

Blue Comet, Ltd.
 Custerson, R.
 Gramophone Co., Ltd.
 Lever (Trix), Ltd., E. J.
 Merrington Bros., Ltd.
 Midland Radio & Television Co.
 Millards
 Slektun Products, Ltd.

RECORDS (Standard).

British Homophone Co., Ltd.
 British Talkatone, Ltd.
 British Zonophone Co., Ltd.
 Brunswick Ltd.
 Columbia Graphophone Co., Ltd.
 Crystalate Gramophone Record Mfg. Co., Ltd.
 Decca Gramophone Co., Ltd.
 Edison Bell (1933), Ltd.
 Gramophone Co., Ltd.
 Murdoch Trading Co.
 Parlophone Co., Ltd.

RECORD ALBUMS.

Acme Album Service.
 Aladdin Gramophone & Accessories Co.
 Avis (Rugby), Ltd., A.
 Bournemouth, Arundel & Co., Ltd.
 British East Light, Ltd.
 British Homophone Co., Ltd.
 British Ideal Patents, Ltd.
 Columbia Graphophone Co., Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Fletcher & Co., Ltd., H. J.
 Gramophone Co., Ltd.
 Lugton & Co., Ltd.
 Murdoch Trading Co.
 Regent Fittings Co.

RECORD CARRYING CASES.

Acme Album Service.
 Aladdin Gramophone & Accessories Co.
 Avis (Rugby), Ltd., A.
 Bournemouth, Arundel & Co., Ltd.
 British East Light, Ltd.
 Brown, A. A.
 Columbia Graphophone Co., Ltd.
 Disque Cabinet Co., Ltd.
 E.M.G. Hand Made Gramophones, Ltd.
 Gramophone Co., Ltd.
 Holmes Bros. (London), Ltd.
 Hyatt & Co., Ltd., J.
 J. B. Mfg. Co. (Cabinets), Ltd.
 Lugton & Co., Ltd.
 Millards.
 Regent Fittings, Co.
 Richardsons (R.M.L.), Ltd.
 Rondo Co., Ltd.
 Segal & Co., R.
 Thompson, Diamond and Butcher.
 Wood, E. A.

RECORD CHANGERS.

Blue Comet, Ltd.
 Brunswick, Ltd.
 Decca Gramophone Co., Ltd.
 Garrard Eng. & Mfg. Co., Ltd.
 General Electric Co., Ltd.
 Midland Radio & Television Co.
 Regent Fittings Co.

RECORD CLEANING ACCESSORIES.

Electrocolor Products, Ltd.
 E. M. G. Hand Made Gramophones, Ltd.
 Gramophone Co., Ltd.
 Knopf, A.
 Lington & Co., Ltd.
 Record Autobrush Co.
 Richardsons (R.M.L.), Ltd.
 Wood, E. A.

RECORD FILING CABINETS.

Automobile Accessories (Bristol) Ltd.
 Baxter, Stavridi & Craies, Ltd.
 Bournemouth, Arundel & Co., Ltd.
 British East Light, Ltd.
 Brown, A. A.
 Carrington Mfg. Co., Ltd.

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PRODUCTS SUPPLIED

Dallas & Sons, Ltd., J. E.
 Decca Gramophone Co., Ltd.
 Disque Cabinet Co., Ltd.
 Edward Doherty & Sons.
 E. M. G. Hand Made Gramophones, Ltd.
 Fairfield Mfg. Co.
 Fletcher & Co., Ltd., H. J.
 Hyatt & Co., Ltd., J.
 Itonia, Ltd.
 J. B. Mfg. Co., Ltd.
 Lissen, Ltd.
 Lock, Ltd., W. & T.
 Longley Radio Mfg. Co.
 Margolin, J. & A.
 Millards.
 Merrington Bros., Ltd.
 Murdoch Trading Co.
 Osborn, C. A.
 Pearson Bros. & Co.
 Rondo Co., Ltd.
 Shapland & Petter, Ltd.
 Thompson, Diamond and Butcher.
 Wood, E. A.

RECORDING SYSTEMS.

British Radio Mfg. Co. (Liverpool), Ltd.
 E. M. G. Hand Made Gramophones, Ltd.
 Fay Home Recorders, Ltd.
 Green, A. W.
 Murdoch Trading Co.
 Siemens Schuckert (Gt. Britain), Ltd.
 Speakeasie Home Recorders, Ltd.
 Voigt Patents, Ltd.
 Wright & Weaire, Ltd.

SCRATCH FILTERS

Automobile Accessories (Bristol), Ltd.
 Bijou Radio Co.
 Birmingham Sound Reproducers.
 British Radio Mfg. Co. (Liverpool), Ltd.
 A. F. Bulgin & Co., Ltd.
 Castagnoli, G.
 Custerson, R.
 Harlie, Ltd.
 Johnson & Phillips, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 Lyons, Ltd., Claude.
 Midland Radio & Television Co.
 Multitone Electric Co., Ltd.
 Postlethwaite Bros.
 Radiamp Co.
 Reliance Mfg. Co. (Southwark), Ltd.
 Wright & Weaire, Ltd.
 Zenith Electric Co., Ltd.

SOUND BOXES.

Aladdin Gramophone & Accessories Co.
 Amplifiers, Ltd.
 Balcombe, Ltd., A. J.
 Baxter, Stavridi & Craies, Ltd.
 British Goldring Products, Ltd.
 British Ideal Patents, Ltd.
 Columbia Graphophone Co., Ltd.
 Diehl, H.
 Fletcher & Co., Ltd., H. J.
 Gilbert, C. & Co., Ltd.
 Grosvenor Works (Holloway) Ltd.
 Itonia, Ltd.
 Limit Engineering Co., Ltd.
 Lissen, Ltd.
 Margolin, J. & A.
 Murdoch Trading Co.
 Oppenheim & Co., Ltd., E.
 Parlophone Co., Ltd.
 Regent Fittings Co.
 Stead and Co., Ltd., J.
 Stockall, Marples & Co., Ltd.
 Taylor & Petters, Ltd.
 Thompson, Diamond & Butcher.

SPEED TESTERS.

Baxter, Stavridi & Craies, Ltd.
 Columbia Graphophone Co., Ltd.
 E. M. G. Hand Made Gramophones, Ltd.
 Gramophone Co., Ltd.

SPRINGS (motor).

Aladdin Gramophone & Accessories Co.
 Crystallate Gramophone Record Mfg. Co., Ltd.
 Diehl, H.
 Emmott (Pawsons), Ltd., G.
 Garrard Engineering & Manufacturing Co., Ltd.
 Gilbert & Co., Ltd., C.
 Lissen, Ltd.
 Lugton & Co., Ltd.
 Margolin, J. & A.
 Murdoch Trading Co.
 Regent Fittings Co.
 Stead and Co., Ltd., J.

STOPS (automatic).

Aladdin Gramophone & Accessories Co.
 Amplifiers, Ltd.
 Collaro, Ltd.
 Dual Motors, Ltd.
 Garrard Engineering & Manufacturing Co., Ltd.
 General Electric Co., Ltd.
 Harlie, Ltd.
 Itonia, Ltd.
 Lissen, Ltd.
 Lugton & Co., Ltd.
 Margolin, J. & A.
 Murdoch Trading Co.

TONE ARMS.

Aladdin Gramophone & Accessories Co.
 Baxter, Stavridi & Craies, Ltd.
 Belling & Lee, Ltd.
 British Ideal Patents, Ltd.
 Diehl, H.
 Garnersound, Ltd.
 Gilbert, C. & Co., Ltd.
 Grosvenor Works (Holloway), Ltd.
 Harlie, Ltd.
 Limit Engineering Co., Ltd.
 Lissen, Ltd.
 Lugton & Co., Ltd.
 Mains Radio Gramophones, Ltd.
 Margolin, J. & A.
 Merrington Bros., Ltd.
 Oppenheim & Co., Ltd., E.
 Regent Fittings Co.
 Siemens-Schuckert (Gt. Britain), Ltd.

TONE COMPENSATORS.

British Radio Mfg., Co. (Liverpool), Ltd.
 Castagnoli, G.
 Correx Amplifiers.
 E. M. G. Hand Made Gramophones, Ltd.
 General Electric Co., Ltd.
 Lissen, Ltd.
 London Electrical Co. (Sherborne Lane), Ltd.
 Lyons, Ltd., Claude.
 Multitone Electric Co., Ltd.
 Rotor Electric, Ltd.
 Ward & Goldstone, Ltd.

TURNTABLES.

Aladdin Gramophone and Accessories Co., Ltd.
 Baxter, Stavridi & Craies, Ltd.
 Blue Comet, Ltd.
 Collaro, Ltd.
 Diehl, H.
 Dual Motors, Ltd.
 Garrard Engineering & Manufacturing Co., Ltd.
 Grosvenor Works (Holloway), Ltd.
 Harlie, Ltd.
 Limit Engineering Co., Ltd.
 Lissen, Ltd.
 Luxton & Co., Ltd.
 Margolin, J. & A.
 Oppenheim & Co., Ltd., E.
 Regent Fittings, Co.
 Rose, Morris & Co., Ltd.

TURNTABLE BRAKES.

Aladdin Gramophone & Accessories Co.
 Baxter, Stavridi & Craies, Ltd.
 Collaro, Ltd.
 Diehl, H.
 Garrard Engineering & Manufacturing Co., Ltd.
 General Electric Co., Ltd.
 Lissen, Ltd.
 Lugton & Co., Ltd.
 Regent Fittings Co.
 Rose, Morris & Co., Ltd.

CUSTOM SAYS MULLARD

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