

created feeder units in areas where labour for the delicate assembly work is easier to find and train. Considerable space is needed for the mass production of cathode ray tubes, and the larger manufacturers of tubes have had to take new premises for this purpose.

CHAPTER 3. THE PRESENT POSITION OF THE BVA MEMBERS AND OF THE NON-MEMBER MANUFACTURERS

Number of manufacturers

52. There are sixteen manufacturers of valves and tubes in the United Kingdom who supply these products to others. Our investigation is concerned with the "supply" of valves and tubes, and in computing total production we have taken no account of the activities of a few companies which are not suppliers but which manufacture special types of valves and tubes, in small quantities, for incorporation in equipment or plant of their own manufacture. The figures for total supply differ from the figures for total production largely on account of the inclusion of substantial imports in the figures for total supply. Some of the valve and tube manufacturers sell part of their production in complete equipment. The figures for sales by individual companies are also complicated by inter-trading between the manufacturers.

53. Of the sixteen manufacturers, six are members of the BVA, four are closely associated with the members of the BVA and the other six are independent of the BVA. The BVA has three other members who do not make valves or tubes although two of them did so formerly. The ten manufacturers who are either BVA members or associated with members accounted in 1954 for 97 per cent. by quantity of the total production of both valves and tubes.

54. The members of the BVA and the other ten manufacturers of valves and tubes are as follows:—

A. BVA MEMBERS

(i) *Manufacturers of Valves and Tubes*

Edison Swan Electric Co. Ltd. (Edison Swan)
Ferranti Ltd. (Ferranti)
General Electric Co. Ltd. (G.E.C.)
Marconiphone Ltd. (Marconiphone)
Mullard Ltd. (Mullard)
Standard Telephones & Cables Ltd. (Standard)

(ii) *Non-Manufacturers of Valves and Tubes*

A.C. Cossor Ltd. (Cossor)
Ever Ready Radio Valve Co. Ltd. (Ever Ready)
Philips Electrical Ltd. (Philips)

B. *Subsidiaries and Associates of BVA Members*

Electronic Tubes Ltd. (Electronic Tubes)
M.O. Valve Co. Ltd. (M.O. Valve)
British Thomson-Houston Co. Ltd. (B.T.H.)
British Tungstam Radio Works Ltd. (British Tungstam)

C. Other Manufacturers

Hivac Ltd. (Hivac)
Cathodeon Electronic Ltd. (Cathodeon)
Cinema-Television Ltd. (Cinema-Television)
English Electric Valve Co. Ltd. (E.E. Valve)
Ericsson Telephones Ltd. (Ericsson)
20th Century Electronics Ltd. (20th Century)

Company links

55. The biggest single producer is Mullard, a wholly-owned subsidiary of the large manufacturer of electrical goods, N.V. Philips of Eindhoven, Holland. Philips and British Tungsram are also subsidiaries in the N.V. Philips group. Ever Ready is historically linked with Mullard in that it is the successor company to an early manufacturer which became a wholly-owned subsidiary of Mullard and was later sold to the Ever Ready group. Mullard nominates one member of the Ever Ready Board of Directors and is the exclusive supplier of valves to the Ever Ready companies. Each of Mullard's principal competitors is part of some other large group in the electrical industry most of which have wide interests in the field of electronics. Edison Swan (and B.T.H.) are subsidiaries of A.E.I., which has recently acquired Siemens Electric Lamps and Supplies Ltd. (now Siemens Bros. Ltd.). The latter company is an important distributor of valves and the sole distributor of maintenance valves in the home market for British Tungsram. Standard is a subsidiary of the International Standard Electric Corporation of New York, itself a subsidiary of the International Telephone and Telegraph Corporation. Electronic Tubes and Marconiphone are companies in the E.M.I. group which until July, 1956, also owned, jointly with G.E.C., another manufacturer, M.O. Valve. G.E.C. controls a large group of companies in the electrical industry. Cossor and Ferranti both have their subsidiary companies. The interests of the English Electric group in this industry are represented by E.E. Valve and Marconi. The Pye group owns Cathodeon. The J. Arthur Rank Organisation owns Cinema-Television. Hivac is a subsidiary of Automatic Telephone and Electric Co. Ltd.

Set-making Interests of the Valve and Tube Manufacturers

56. The other interests of the valve and tube manufacturers and their associated companies are mostly within the electrical and electronic industries (see paragraph 60). With the exception of Edison Swan, all the manufacturers making common types of receiving valves and television tubes either make domestic receivers or are associated with other companies which make them. English Electric, G.E.C., Cossor, Ever Ready, Ferranti, Philips and Pye make sets for the domestic market under their own names. Companies in the E.M.I. group make sets and equipment under the names "Marconiphone", "His Master's Voice" and "Columbia" among others; Philips owns the company making "Stella" sets; Standard has Kolster-Brandes Ltd. as a set-making subsidiary, and Cinema-Television controls Bush Radio Ltd. The Pye group also makes sets under several other names, including "Cameo", "Invicta", and "Pam". During the 1930s the BVA estimated at various times that its members and associated companies produced 60 to 70 per cent. of the output of domestic receiving sets but in post-war years the proportion has fallen markedly and is now less than 25 per cent. The set makers not associated with BVA members have, therefore, increased their share of the market in post-war years.

Concentration of Production

57. Details of the production of the various groups of manufacturers in 1954 are given in Appendix 9A (ii). Total production in that year was 54 million valves and 1½ million tubes. Mullard is by far the largest manufacturer of the common types of receiving valves; it makes over four times as many as the next largest manufacturer of these types, Edison Swan, which also belongs to the BVA. Between them the two companies account for roughly 73 per cent. of the total production of common types of receiving valves. The same two companies account for roughly 70 per cent. of the total production of television tubes, Edison Swan in this case producing in 1954 nearly as much as Mullard. M.O. Valve is responsible for over half the total production of industrial valves and is by far the largest manufacturer of these types. There is much less concentration in the relatively small production of industrial cathode ray tubes.

58. The total production in 1954 was distributed among the various groups of companies in the following percentages:—

<i>Company group</i>	<i>Valves</i>	<i>Tubes</i>
N.V. Philips (Mullard, British Tungfram)	58.5	37.1
A.E.I. (Edison Swan and B.T.H.)	13.2	31.2
International Telephone and Telegraph (Standard)	13.3	4.5
E.M.I. (Marconiphone, Electronic Tubes, half M.O. Valve)	8.0	16.8
G.E.C. (G.E.C., half M.O. Valve)	3.7	4.8
Ferranti	} 3.3	} 5.6
English Electric		
Pye (Cathodeon)		
Rank Organisation (Cinema-Television)		
Automatic Telephone and Electric (Hivac)		
Others		

Range of Production of the Individual Companies

59. The range of types of both valves and tubes made by any one manufacturer varies but in general the larger manufacturers make a wide range and the smaller producers tend to be specialists. For any particular type of valve or tube there are not likely to be more than six suppliers and there may only be two, particularly for the larger industrial valves, such as high-power transmitting valves. All the manufacturers make most of their own components, although some buy tungsten filaments from others in the lamp and valve industries and many buy bulbs for valve envelopes. Micas for spacing the electrodes are usually bought; there is one principal supplier, Copeland & Jenkins Ltd. Pilkington Bros. Ltd. supply nearly all the pressed glass for the manufacture of cathode ray tubes; this company supplies both complete bulbs and parts of bulbs. There is some inter-trading between the manufacturers in metal components and in glass tubing but virtually none in the special plant used in valve and tube manufacture. Some special plant is imported from valve manufacturers overseas but all the manufacturers in this country design or make much of their own plant, buying such items as pumps which are of general application and fitting these components into units of their own design.

60. *The range of production of each manufacturer is as follows:—*

- (a) *Mullard* makes a very wide range of valves of all types except the largest types of transmitting valves. Its interests are discussed in greater detail in Chapter 12. Its production of cathode ray tubes is mostly of television tubes and at present its interest in industrial tubes is relatively small. It prepares tungsten and molybdenum right through from the ores and has recently extended its activities to include the manufacture of glass tubing. Valves and tubes account for over 80 per cent. of its total sales. About one-tenth of its production is supplied to its associated company, Philips. *Philips* makes neither valves nor tubes but sells certain rectifying valves, largely imported from Holland. *British Tungsram's* principal business has always been the manufacture and supply of maintenance valves to the distributive trade and, under long-standing agreements, all these sales of maintenance valves to the home market are made through Siemens Electric Lamp and Supplies Ltd. (now Siemens Bros. Ltd.). *British Tungsram* has no interests outside the valve industry. It ceased manufacture at the end of April, 1956, when the factory was closed and the production of Tungsram valves was taken over by Mullard. *Ever Ready* is a wholly-owned subsidiary of Ever Ready (Great Britain) Ltd. which is, among other things, the successor to the set maker Lissen Ltd., which was for a short period a member of the BVA as a valve manufacturer. It does not make valves or tubes but, by long-standing agreements which preclude it from manufacturing valves, obtains all its valves for Ever Ready battery sets from Mullard. These valves bear the Ever Ready trade name.
- (b) *Edison Swan* also makes a wide range of types of valves and tubes, and sales of valves and tubes form roughly half of its total sales. It has no associated company making domestic receivers. Its other interests include electric lamps and cables. The other valve manufacturer in the A.E.I. group, *B.T.H.*, makes special types of industrial valves, such as thyratrons and magnetrons which are sold to Government Departments and equipment makers or retained for incorporation in equipment of its own manufacture. Valves form a very small part of its total trade, and none of its valve production is for the domestic trade.
- (c) *Standard's* main interests are in telecommunication systems, including radio, and power cables and many associated products. It makes a wide range of industrial valves as well as ordinary receiving valves and television tubes under the name "Brimar". For a time in the early 1930s it dropped out of the radio receiver industry and concentrated on industrial applications of valves, in which it has always had large interests. In 1938 it acquired a set manufacturing subsidiary, Kolster-Brandes Ltd., with which it had previously been associated in the international group of which Standard is a part. Valves and tubes form about one-tenth of Standard's total trade.
- (d) *The E.M.I. group* makes gramophone records and gramophones, radio and television products, household appliances and various kinds of engineering and electronic equipment. Apart from its interest in Electronic Tubes (acquired in 1949) E.M.I. does not manufacture ordinary receiving valves for general sale. Its valve production is confined to special types such as klystrons. It buys its receiving valves from M.O. Valve and others. It makes

television and other cathode ray tubes using the names "Emitron" and "Emiscope". Valves and tubes form just over 3 per cent. of the total sales of the E.M.I. group. *Electronic Tubes*, which was once the valve and tube department of Cossor but which was sold to E.M.I. in 1949, is wholly engaged in valve and tube production, making industrial and domestic types. It is a general supplier to the trade although a big proportion of its sales goes to Cossor and the E.M.I. companies, including Marconiphone.

- (e) *M.O. Valve*, jointly owned by G.E.C. and E.M.I. until July 1956, when it became a subsidiary of G.E.C., is wholly engaged on valve production, making both industrial and domestic types. The bulk of its production is used by G.E.C. and E.M.I. but appreciable quantities are sold to Marconi (in which case the valves bear the Marconi name) and to Government Departments.
- (f) *G.E.C.* makes its own television tubes and other cathode ray tubes but does not make valves in commercial quantities; it has always regarded *M.O. Valve* as its production unit for valves of all types. *G.E.C.* has wide interests in the electrical and electronic fields including the manufacture of dynamos, electric supply meters, switch gear, transformers, industrial and domestic electric appliances, electric lamps and light fittings, telephones and radio and television sets. Tubes form a small part of its total trade.
- (g) *Cossor* still has a financial interest, as a preference shareholder, in *Electronic Tubes* and has continued to use it as an important source of valves and tubes for the *Cossor* production of radio and television sets. These valves and tubes bear the *Cossor* name. Other interests include electronic instruments, radar, and communication and navigation equipment.
- (h) *Ferranti* makes all types of valves and tubes and is a general supplier to the trade. It uses part of its production for its own radio and television sets. Its other interests include heavy electrical plant, meters and instruments, domestic electric appliances and electronic equipment. *Ferranti* does a considerable amount of electronic development work for Government Departments.
- (i) The English Electric Co. Ltd.'s subsidiary, *E.E. Valve*, is wholly engaged on valve and tube production. It makes a wide range of valves and cathode ray tubes, including television tubes, for the other companies in the English Electric group including *Marconi*, for Government Departments and for other special customers. It does not make any domestic receiving valves.
- (j) *Cathodeon*, a company in the *Pye* group, makes special types of valves, such as klystrons and T.R. cells, and all types of cathode ray tubes, including part of the *Pye* group's requirements of television tubes. It is almost wholly engaged in valve and tube production.
- (k) *Cinema-Television*, part of the J. Arthur Rank Organisation, makes mostly industrial types of cathode ray tubes sold to the Government and equipment makers. Tubes form about one-third of its total trade. Its other interests include electronic instruments and television transmission equipment and, through *Bush Radio Ltd.*, domestic receiving sets.

- (l) *Hivac* specialises in the manufacture of very small valves which are sold to the parent company (Automatic Telephone and Electric Co. Ltd.), to equipment makers such as hearing aid manufacturers, and to Government Departments. Valves account for about half its total trade.
- (m) *Ericsson's* main activity is the manufacture of telephone equipment, and its production of cold cathode valves forms a minor part of its trade.
- (n) *20th Century* specialises in the manufacture of Geiger Muller tubes of all types and in cathode ray tubes, with particular reference to the application of these devices to radar and atomic energy plants. It is wholly engaged on valve and tube production, but not for domestic receivers.

Differences between total quantities manufactured and supplied

61. The differences between the figures for total production and those for total supply (see paragraph 52) are largely attributable to the following factors :

- (a) *Inter-trading between BVA members.* Since the war BVA members have inter-traded in valves and tubes to a considerable extent. In 1954, out of a total production by BVA members (and their subsidiaries) of over 50 million valves and about 1,600,000 tubes, 5 million valves and 100,000 tubes were sold to other manufacturing members of the BVA. Where one BVA member buys valves and tubes, unbranded, from another we have, except where otherwise indicated, regarded these goods as "supplied" only by the purchasing member.
- (b) *Imports.* Since the war several BVA members have imported substantial quantities of valves and Mullard has imported substantial quantities of tubes. These imported valves and tubes are sold by the purchasers under their own brand names. In 1954 BVA members imported either directly, or indirectly through other importers, roughly 8 million valves and 400,000 tubes. A further 1½ million valves were imported and distributed independently of the BVA.
- (c) *Sales of Government surplus.* Seven BVA and three non-BVA manufacturers are parties to a scheme for buying back from the Government valves found to be surplus and re-selling them as new, under their own brand names, after sorting and testing them, etc. In 1954 BVA members sold 1¼ million Government surplus valves. In the five years 1950 to 1954 the members sold 14¼ million of these valves, which represented over 90 per cent. of the total sales of surplus valves.

62. For the reasons given in the previous paragraph the figures for total sales are different from the figures for total production and similarly the proportion of the sales made by any one member or any one group of companies is not necessarily the same as its proportion of total production. Since Mullard's proportion of total imports is even greater than its proportion of total production, it so happens that this company accounts for a larger proportion of the total sales than its proportion of total production.

The following is an analysis of the valves and tubes produced and supplied in 1954:

	<i>Valves</i> millions	<i>Tubes</i> thousands
Total production in United Kingdom	54.2	1,640
Sales by manufacturers ex-Government stocks ...	1.2	negligible
Retained imports (Annual Statement of Trade) ...	8.5	404
Total supply	63.9	2,044
Total supply by BVA members and subsidiaries ...	58.2	1,797
Total supply by Mullard	38.1	1,000

Exports have been incorporated in the above figures because of the difficulty of isolating them accurately from the data available to us. The BVA say that their members exported 7.3 million valves and 17,000 tubes in 1954. These figures include valves and tubes sold to associate companies in the United Kingdom and incorporated in equipment exported by them; comparable sales to non-BVA set makers, however, might not be so classified.

Labour employed

63. In 1954 about 23,500 persons were employed in the industry on the production of valves and tubes of all kinds; of these about 20,000 were employed directly on production, nearly 2,000 on research, and the rest on distribution. The principal trade unions with members who are engaged in this industry are: Amalgamated Engineering Union, Association of Engineering and Shipbuilding Draughtsmen, Association of Scientific Workers, Association of Supervisory Staffs, Executives and Technicians, Electrical Trades Union, National Union of General and Municipal Workers, and Transport and General Workers Union.

CHAPTER 4. THE HISTORY AND PRESENT CONSTITUTION OF THE BVA

The Formation of the Association

64. The British Radio Valve Manufacturers' Association (BVA) was constituted in July, 1926 and registered as a trade union, and it has operated continuously since that date. The Association was reconstituted in 1932 and again in 1936; the present constitution is that adopted in 1936 with certain amendments. At its formation in 1926, the BVA had the following membership:

- British Thomson-Houston Co. Ltd.
- Burndept Wireless Ltd.
- Cleartron Radio Ltd.
- A.C. Cossor Ltd.
- Edison Swan Electric Co. Ltd.
- Electron Ltd.
- General Electric Co. Ltd.
- Marconi's Wireless Telegraph Co. Ltd. and Marconiphone Co. Ltd.
- Mullard Radio Valve Co. Ltd.
- Standard Telephones and Cables Ltd.