tungsten and molybdenum wire and glass bulbs and tubing (see Chapter 10) charge the Controlled Companies prices below those charged to other E.L.M.A. members and to Independent Manufacturers, but they would still have made profits without this assistance. It has been suggested to us by Independent Manufacturers that the companies are primarily fighting companies whose purpose is to do as much damage as possible to the Independent Manufacturers, a purpose which would be in accordance with the old Phoebus policy. E.L.M.A. has told us that the companies were not, and are not, intended to sell at a loss, but to make a profit. It is an inevitable consequence of E.L.M.A.'s policy of exclusive dealing (see Chapter 11) that the lamp market is largely split in two, and that the lamps of the Controlled Companies (not being E.L.M.A. lamps) are sold mainly in the same markets as those of the Independent Manufacturers. The Controlled Companies offer similar discounts on their own branded lamps to those offered by the Independent Manufacturers (who offer bigger discounts than does E.L.M.A.—see Chapters 11 and 14) but we have received no evidence to support the allegation that these discounts are varied in order to detach customers from the Independent Manufacturers. The selling prices of lamps bearing customers' brands and of unbranded lamps are more variable, and there is some evidence that the Controlled Companies have in the last ten years become increasingly predominant in this market at the expense of such Independent Manufacturers as formerly catered for it. Since the Controlled Companies make lamps which are retailed at prices below E.L.M.A.'s, their products clearly compete with the E.L.M.A. members' for the custom of the general public. So far as sales to distributors are concerned these companies compete mainly with the Independent Manufacturers, and not with E.L.M.A. members, but the evidence does not support the view that they compete by quoting artificially low prices or selling at a loss.

CHAPTER 9: QUALITY AND STANDARDS

123. The subject of quality and standards of filament lamps is relevant to our enquiry in respect of three matters, namely the proceedings of the Phoebus organisation, the proceedings of E.L.M.A. in relation to the British Standards Institution (B.S.I.) specifications for filament lamps, and the division of the lamp market into E.L.M.A. lamps on the one hand and lamps made by the Independent Manufacturers and the Controlled Companies on the other.

124. B.S.I.'s organisation and constitution and the way in which its standard specifications are prepared are fully described in the Report of the Cunliffe Committee (1950)* which explains that the standards are produced by representatives of all interests concerned, whether as producers or users or both. It has not been the practice in B.S.I. for the staff to initiate projects for standardisation, and in the committees which prepare and consider draft standard specifications the principle of consent broadly applies. Once a standard specification is published, as is the case for many types of lamps, it is open to all manufacturers to comply with it if they wish and to describe their products as complying with it. There are in addition for certain goods, including general service filament lamps, schemes under which B.S.I. owns and administers certain certification trade marks which can be used in conjunction with a specification as evidence that the product complies with the specification, and manufacturers can obtain licences to apply the mark to their products, provided they apply certain tests and keep records of them open for inspection; B.S.I. requires to be satisfied that the factories are so

* Report of the Committee on the Organisation and Constitution of the British Standards Institution (H.M.S.O.: 1950).

organised that the necessary control of the manufacturing process is possible and reserves the right to make purchases in the open market, at the expense of the manufacturer, for testing. Even where there is such a marking scheme it is still open to manufacturers to manufacture to B.S.I. specification without applying for a licence; the licence is an authority to apply the certification trade mark to the product, not an authority to manufacture to the specification.

125. The main factors in the design of a filament lamp are its life on the one hand and its luminous efficiency, i.e. the amount of light per unit of power (watt), on the other. A lamp designed to give high luminous efficiency has a shorter life than one designed to give a lower luminous efficiency and a long life; in other words, an increase in the life of a lamp can only be obtained at the expense of efficiency. The cost of production of the lamp would be much the same whatever the life. For ordinary lighting, therefore, the relative importance of luminous efficiency and of long life (from the consumer's point of view) depends on the relative costs of replacing lamps and of power. Where power is relatively expensive it is more economical to use high efficiency lamps and *vice versa*. In practice a single standard only of life has been adopted both here and in many other countries. The current B.S.I. specification for ordinary lamps, No. 161, lays down a minimum life of 1,000 hours and minimum values of luminous efficiency. The life of 1,000 hours is adopted as a standard in many countries though the United States adopts a lower figure for some ratings; it has been used in the United Kingdom since 1921, during which period the luminous efficiency has been substantially increased. Any figure chosen must be a compromise as the cost of power to different classes of consumer varies considerably and there is, therefore, no single optimum.* Some commercial users, however, have told us that they obtain longer life by "under-running" lamps (i.e. using lamps designed for, say, a 240 volt system on a 230 volt supply), particularly in positions where the cost of replacing lamps is considerable.†

126. One of the first actions of the Phoebus organisation when it was created in 1925 was to lay down a standard life of 1,000 hours—then already in common use in the United Kingdom and elsewhere—for general service filament lamps; it was provided that no mention of "long life" should be made in any advertisement for lamps. A scheme for penalising excessive life or short life was worked out and after 1929 there were fines for a life in excess of 1,500 hours and fines on a lower scale for a life shorter than 800 hours unless the manufacturer had given notice that he had economic justification for making the life shorter. The Phoebus organisation did not at that time prescribe any minimum (or maximum) luminous efficiency, but if all manufacturers employed the best techniques of design and manufacture known at the time this system would indirectly ensure lamps of reasonable luminous efficiency, and we have obtained no evidence that it injured consumers. No doubt the prescription of a maximum life without a minimum luminous efficiency had potential dangers. In the United Kingdom, however, a B.S.I. specification, including a minimum luminous efficiency, existed before the Phoebus Agreement was made and was from time to time improved. No United Kingdom manufacturer incurred fines under the Phoebus system for either short or excessive life. At the present time, except for the "Type B" lamps described in the next paragraph, there are no fines for long life lamps and the specifications to

* For a fuller discussion of this problem see "The Electric Lamp Industry" by Arthur A. Bright, Junior (Macmillan, New York, 1949—pages 330 to 335).

† See also the views of the Railway Executive and the Ministry of Works, recorded in paragraph 226.

which all E.L.M.A. members work contain minima, but in no case maxima, for life and luminous efficiency.

127. In 1935, under pressure from the Incorporated Municipal Electric Association for a cheaper lamp, E.L.M.A. decided to introduce a lamp, to be known as "Type B", not designed to comply with the B.S.I. specification and made to an agreed maximum luminous efficiency and life. It was not intended to compete with E.L.M.A.'s higher-priced lamps, but with imported lamps and the products of independent manufacturers, which it was to equal or better in efficiency. The life aimed at was 900 hours, with a maximum of 1,000 hours, there were to be fines for excess life which were increased if at the same time the limit on luminous efficiency was exceeded, and a member's sales of Type B lamps were not to exceed 25 per cent. by quantity* of his sales of higher-priced lamps of corresponding ratings. Early in 1940 a decision was taken to withdraw Type B lamps other than "Kye" brand† as from September, but when the time came this was postponed as E.L.M.A. thought that the Government might allow imports (presumably of cheap lamps) as a result. Withdrawal was again postponed in 1945 when the Board of Trade were in correspondence with E.L.M.A. about the price of lamps. The system of fines for excessive life is still nominally in force, but we are informed that no fines have been imposed and that the lamps are now practically non-existent except for "Kye" brand.

128. All E.L.M.A. members make lamps to B.S.I. specifications where these exist, and they have played a considerable part in the modification and improvement of these specifications. The specifications for general service filament lamps have been revised frequently, and it has been suggested to us that one effect of these frequent revisions, which are said to have been made at the instance of E.L.M.A. members, has been to harass competitors. The E.L.M.A. minutes show that the members were very much aware of the possible effects of the steady improvement of the minimum standard on their competitors. We must record, however, that we have found no evidence that the effect of the revisions has been to raise the cost of lamps or that competitors have been unable to keep pace.

129. Some Independent Manufacturers have suggested to us that a simpler and, in some respects, less exacting specification would provide adequate protection for the consumer. In particular, it is argued that very small tolerances may lead to higher costs and embarrass manufacturers with less accurate machinery without giving a corresponding benefit to the consumer, since there is by statute a relatively wider tolerance on the supply voltage. It is also pointed out that the widespread use of fittings which may reduce luminous efficiency by as much as 25 per cent. indicates that many consumers are not primarily concerned with maximum luminous efficiency. We regard these matters as proper for the consideration of B.S.I., on the technical committee of which sit representatives of the Independent Manufacturers and of users as well as of E.L.M.A.

130. In 1933 E.L.M.A. was concerned about the claims made by some non-E.L.M.A. manufacturers that their lamps complied with the B.S.I. specification when E.L.M.A. believed they did not. E.L.M.A. decided to ask for the introduction of a B.S.I. marking scheme for general service filament lamps (see paragraph 124) and, when a scheme was introduced, most of the members made provisional application for such licences. Doubts were, however, expressed in E.L.M.A. whether the scheme was wise, since the

* Calculated in Phoebus units—see paragraph 91.

† Made by Crompton before joining E.L.M.A. and continued thereafter.

technical committee felt that "the levels of efficiency in the present B.S.S. 161–1934 [i.e. the B.S.I. specification] may not prevent the outside manufacturer from obtaining a licence". At this time Phoebus policy was "to try to prevent by any means the introduction of a quality mark in all countries. If Phoebus agrees that this introduction seems unavoidable, and in this case only, the negotiations should be handled towards the adoption of the highest standard possible." Discussions in E.L.M.A. continued over a long period. On the one hand, it was thought that "the fact that E.L.M.A. members have got a licence will give [outsiders] a greater urge to improve their quality, and if outsiders did obtain a licence, Members of E.L.M.A. will be unable to say that the outsiders are supplying inferior lamps". On the other hand, the London County Council had decided to buy lamps from licence-holders only. By October, 1936, all members except Cryselco, Aurora and B.E.L.L. had obtained licences.* Fears expressed in 1936 that some of the newer members of E.L.M.A. might not be able to get licences, which would make it appear that some E.L.M.A. lamps were better than others, did not materialise. Members had, however, agreed not to use in any way the fact that they held the licences unless a non-member got one, and this agreement has been renewed periodically up to the present time. We understand that at the present time one Independent Manufacturer holds a licence and another has applied. The certification mark does not appear to be used, except for London County Council contracts, by any licence-holder.

131. There is, as we have said, nothing to stop anyone from manufacturing general service filament lamps to B.S.I. specification without applying for a licence, the purpose of the licence being to allow the holder to apply the certification mark to the lamp. Many of the Independent Manufacturers supply lamps as conforming to the specification, but have told us that they regard the testing procedure for licence-holders as a useless expense.

132. E.L.M.A. has told us that the Controlled Companies make a lower quality lamp than do E.L.M.A. members. We have no means of checking whether this is so. We note, however, that they comply with the B.S.I. specification when fulfilling orders from Government Departments, the Railway Executive and other public bodies, and further that one of them (which supplies the bulk of its output to a chain store under the store's brand name) describes in its price list lamps sold under its own brand name as "manufactured in accordance with the B.S.I. specification". Most of their customers appear to be under the impression that lamps supplied by Splendor and Ismay, whether branded or not, comply with the specification: some say that they have had oral assurances to this effect and one has supplied us with a written assurance from Splendor dated 1st September, 1950. These companies say that in their ordinary business they do not carry out the full tests prescribed in the specification after manufacture, though generally speaking the materials and methods are the same as when they are fulfilling orders to the specification. It is clear from the evidence that the Controlled Companies supply substantial quantities of lamps as complying with the B.S.I. specification and that their lamps are of satisfactory quality.

133. The E.L.M.A. Rules provide that "Lamps must be made to comply with specifications agreed to by E.L.M.A. and not to any other specifications. All current B.S.I. specifications for lamps are agreed to by E.L.M.A." (Appendix 6, Section II, paragraph (6)). Further, "Members must not sell lamps deviating in any respect from the recognised E.L.M.A. standard except in such cases where deviations are taken care of in the Rule Book" or in

* Cryselco and Aurora have since obtained licences. B.E.L.L. does not make lamps of the types to which the B.S.I. standard No. 161 and the certification mark are applicable.

experimental quantities not exceeding one dozen (Appendix 6, Section II, paragraph (7)). A similar provision governed British Luma under its patent licence (Appendix 11). The effect of these provisions is that members of E.L.M.A. may not compete with each other by the production of different kinds of lamps without the consent of E.L.M.A. In addition, "Advertisements must not indicate that any individual make of Association lamp possesses any advantage over or is better than another" (Appendix 6, Section II, paragraph (9)), but numerous advertisements implying the superiority of particular brands are in fact widely used by E.L.M.A. members.

CHAPTER 10: LAMP COMPONENTS

134. The principal semi-manufactured components used in the making of lamps are listed in paragraph 6 and more fully described in Appendix 2. Before the 1914–18 war British manufacturers were largely dependent for their supplies of components on imports or, in the case of glass bulbs, on mouth-blown production. Between 1918 and 1939 members of E.L.M.A. developed the manufacture of components on a considerable scale. The British patent rights for the Westlake bulb-blowing machine, which originated in the United States, were acquired by a company sponsored by some of the members; and in 1919 G.E.C. and B.T.H. began to produce machine-blown bulbs in their respective glassworks under licence from that company.* In 1925 the same two E.L.M.A. members jointly promoted a company, Lamp Caps Ltd., to undertake the manufacture of caps. G.E.C. and B.T.H. also produced tubing and rod in their glass works, and they and other E.L.M.A. members greatly developed their wire-drawing capacity. The non-E.L.M.A. manufacturers did not develop the manufacture of components to any extent.

135. By 1939 the E.L.M.A. members were jointly almost self-sufficient. The producing companies sold very little to non-members, and Independent Manufacturers relied on imports, mainly from Europe. Primarily as the result of war conditions, the position has since radically changed. When in 1939 it became necessary to reduce imports, E.L.M.A. told the Board of Trade that as regards lamp components its members were "probably in a position to meet the whole requirements of the country from British sources". In 1940 imports from Europe ceased entirely, and during the war years, accordingly, the Independent Manufacturers became almost completely dependent on the E.L.M.A. members for their supplies of lamp components. From 1942 to 1945 the supply of lamp components and in particular glass bulbs and tungsten and molybdenum wire was controlled by the Government and there was an allocation system among all lamp manufacturers.† Although restrictions on imports have now been greatly relaxed, we are told that the prices of such components as are available from abroad are in some cases higher than E.L.M.A.'s prices and that the quality is not always satisfactory: there are some independent sources of certain components in the United Kingdom (see paragraph 142) but the Independent Manufacturers continue to depend very largely on E.L.M.A. members. One independent component manufacturer has suggested that this may be because E.L.M.A. members make the supply of one component conditional upon the purchase of another. We have found no evidence to support this view and consider that the sales of the component manufacturer concerned have been affected rather by the change in ownership of two former customers who, as Controlled Companies, can now buy their components from E.L.M.A. members at preferential terms (see paragraph 139).

* We are told by E.L.M.A. that all patents on the Westlake machine had expired by 1932.

† The allocation of tungsten wire and glass bulbs was subsequently resumed. Allocation of tungsten finally ended in 1948: the scheme for bulb allocation is nominally still in existence.