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British Dyes and Dyestuffs.

THE Sub-committee appointed on December 2, 1919, by the Standing Committee on Trusts to "ascertain to what extent supplies, prices, and costs of dyes and dyestuffs in this country, and profits thereon, are affected by any trade combination" has now reported under date May 18, 1921. The Report (Cmd. 1370, 4d. net) comprises fifty-five clauses, from which are drawn twenty conclusions, these being widely traversed in a minority report presented by Major Harry Barnes, M.P.

The first fourteen clauses reveal nothing which is not already familiar to those who have given more than superficial attention to the subject. A synopsis of the factors which had placed this country in a position of such complete inferiority to Germany as that which existed prior to the war brings out from their stable the two familiar stalking-horses, patent law and industrial alcohol.

"Further to these it has been said that in the early days there was a certain slackness and a lack of organisation on the part of the British manufacturers, who were content, for instance, to send out circulars whilst the Germans sent out travellers who were not only salesmen but skilled chemists; and it is asserted that the whole course of the development of synthetic dyes in this country subsequent to the initial discovery exhibits a lack of properly directed scientific research. But whether these were contributory causes of the passing of the dyes industry out of

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this country, or whether they were accompaniments or results of the heavy handicap of unfair patent arrangements and unintelligent prevision as regards the use of industrial alcohol, is a matter on which there are differences of opinion" (clause 3).

This lengthy passage has been quoted because it offers an example of the confused thinking which it appears to be the fate of the dye-making industry to receive. Moreover, it is characteristic of the whole Report, which studiously avoids arriving at a conclusion that is not open to contradiction elsewhere in its pages; Major Barnes is more direct. Thus the Sub-committee is unable or unwilling to determine the relative value of the contributions to the industry made by duty-free alcohol on one hand, and by "properly directed scientific research" on the other. Perhaps it was not represented to the Committee that if the textile manufacturers of the sixties of last century had possessed imagination enough to set aside only 1 per cent. of their profits to develop what might then have been regarded as a branch of their own industry, Hofmann, Brunck, Caro, Martius, and Böttinger need never have left this country to build up the chemical industry of Germany, and a brisk demand for young chemists might have led Oxford and Cambridge then to weigh their responsibility towards that branch of knowledge which underlies all modern industry and all forms of life.

This nice reluctance to face an issue characterises also the treatment accorded by the thirteen agreed members to the main question upon which their deliberation was invited—namely, the extent to which the supply and cost of dyes have been affected by "any trade combination," otherwise the British Dyestuffs Corporation. Rightly declaring that "If the Corporation is over-capitalised its ability to sell at a reasonable price, while making a reasonable profit, will be in so far diminished" (clause 17), the Committee proceeds to analyse the financial basis of the amalgamation between British Dyes, Ltd., and Messrs. Levinstein which followed from the rejection in August, 1918, by the shareholders in the former company, of the alternative scheme proposed by the board of directors. The analysis recalls the fact that, the nominal capital of Messrs. Levinstein having been divided into 3000 preference shares (10l.) and 6000 ordinary shares (10l.), the preference shareholders received in exchange preference shares in the Corporation of an equal nominal amount, or cash at their option.

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The holders of ordinary shares were more fortunate. The valuation of the net assets available for distribution to them showed a total of 348,000*l.*, and for this they received 174,000*l.* of 7 per cent. preference, 174,000*l.* of 8 per cent. preferred ordinary, and 450,000*l.* of 8 per cent. deferred ordinary shares, the last-named representing "goodwill, patent and other rights." Evidently the Sub-committee felt that such generosity requires an explanation, particularly as "It has been alleged that for fifteen years before the war Messrs. Levinstein's had not paid a dividend"; but the members were satisfied with the reflection that "the policy of the company had in general been not to pay out profits in dividends, but to put the profits back into the business" (clause 21). Fifteen years' abnegation of all dividends would certainly appear to merit recompense, but the fact that the present market valuation of the 798,000*l.* scarcely exceeds 100,000*l.* is a curious comment on the propriety of the original allocation. "The net value of the assets of British Dyes, Ltd., showed a total of 1,143,580*l.* available for distribution to the ordinary shareholders, and this was satisfied as to one-half by the issue of preference shares and as to the other half by the issue of preferred ordinary shares in the Corporation. In addition, the shareholders in British Dyes, Ltd., were entitled to an issue of 550,000 deferred ordinary shares in respect of goodwill, patent and other rights" (clause 20). Thus 1,000,000*l.* of deferred ordinary shares were created, adding 80,000*l.* per annum to the interest charges.

The Report is not so clear as to the allocation made to the Government. The statement that "The Government subscribed for 850,000 preference and 850,000 preferred ordinary shares in substitution for the loan on debentures to British Dyes, Ltd., of 1,700,000*l.* to which they were committed" (clause 10), does not reveal the proportion of the 1,700,000*l.* which had been loaned to British Dyes, Ltd.; the sum mentioned is that "to which they were committed," and it has not been publicly stated that the amount actually loaned was in excess of 1,200,000*l.* Remembering that the Government debenture was at 4 per cent., and that the average nominal rate of the preference and preferred ordinary shares is $7\frac{1}{2}$ per cent., it will be recognised that this allocation represented an additional interest charge of at least 60,000*l.* per annum on the earning capacity of the Corporation.

Conclusion (7), nevertheless, states that the thirteen agreed members "do not consider that

the Corporation is under the handicap of over-capitalisation, except in so far as the buildings, plant, etc., of the British Dyestuffs Corporation, Ltd., were erected at a time of high prices and feverish conditions," whilst Major Barnes's conviction is that "the Corporation is over-capitalised, and the Government, before investing public monies in same, should have insisted on the buildings and plant provided out of the abnormal war profits being written down to pre-war costs." Those who have difficulty in deciding between these conflicting opinions may be assisted by the recollection that the German companies, with which the Corporation must ultimately find itself in competition, have consistently practised the policy of under-capitalisation by returning a large proportion of their profits to the business in the form of expenditure on development and research. The Sub-committee is silent on this point. One of the inducements to potential subscribers offered by the prospectus of the British Dyestuffs Corporation in 1919 was a synopsis of the profits earned by the German "Big Four" during 1913, showing 2,499,592*l.* to have been the fruit of share capital and reserves aggregating 9,886,318*l.*; owing to the prudent policy indicated above, however, the nominal ten millions were notoriously nearer twenty millions in actual value, thus reducing the profit to the neighbourhood of 12 per cent., which is not an excessive figure for an industry which was virtually a world-monopoly.

In addition to the capital inflation indicated above, one most regrettable feature of the amalgamation was the destruction of the co-operative character of British Dyes, Ltd. Shareholders in that company were confined to dye-users, and the rate of interest was limited to 6 per cent. so long as the Government debenture remained unredeemed. Consequently, there was no inducement to charge prices higher than would pay this modest interest and provide funds for the prosecution of research and the development of new processes. "The influence of the amalgamation on prices is submerged by the other influences at work, and our attempts to single it out for separate examination have proved fruitless" (clause 39). Nevertheless, the schedule of prices for dyes is a startling contribution to the Report, showing percentage increases in March, 1921, over July, 1914, which are seldom less than 500, and often exceed 1000; but there is no evidence to show that they are in any way due to the combination. That is really the conclusion of the whole matter, and whilst the sessions of the Sub-

committee were doubtless full of interest and information to the members, it unfortunately happens that the Report will not contribute anything substantial towards a solution of the desperate problem with which the country remains confronted.

A War Memorial.

The Scientific Papers of Bertram Hopkinson.

Collected and arranged by Sir J. Alfred Ewing and Sir Joseph Larmor. Pp. xxvii + 480 + plates. (Cambridge: At the University Press, 1921.) 63s. net.

BERTRAM HOPKINSON'S scientific friends, including his Cambridge staff, decided well when they determined that no memorial could be more suitable or permanent than a collected edition of his writings on mathematical and engineering science. The editors and the syndics of the Cambridge University Press alike have earned our thanks by the manner in which their shares of the publication have been carried out.

There is no need to tell at length the tragic story of his life. Called home from Aden in 1898 by the death of his father, brother, and two sisters on the Dents de Veisivi, he took up his father's work as a consulting engineer with the aid of his uncle Charles, and carried out various important undertakings. Five years later he became professor of mechanism at Cambridge, and in the same year he married. For the next eleven years he was fully occupied in the development of the work of his chair. The papers in the volume under review form his contributions to science during that time, but they do not constitute by any means the whole of the debt we owe to him. To quote from Prof. A. V. Hill's appreciation in the *Alpine Journal*, at Cambridge

"a professor of mechanism can hope to make a school essentially in touch with the traditions of the place only on condition that his interests are largely, if not mainly, scientific. In Hopkinson Cambridge had an ideal professor, and the pupils trained in his school have already, especially during the war, raised a memorial to him by their work."

The war, when it came, claimed him at once, at first as a teacher at Chatham, then at the Admiralty, where he conducted some most important experiments which led to the modern methods of protection of large ships against torpedoes. Finally he joined the Royal Air Force as an officer in charge of experimental work of all kinds, becoming in June, 1918, Deputy Con-

troller of the Technical Department; on August 26 of that year he was killed in a flying accident.

The papers in the volume fall naturally into three main groups, dealing respectively with electrical engineering, with certain metallurgical questions, and with the problems of the internal-combustion engine. In addition, the first paper of the series, one on sources and vortices, which was contributed to the London Mathematical Society in 1898, deserves mention as indicating the width of his knowledge and interests. He was an electrical engineer by profession; his father had placed the construction of electrical machinery on a scientific basis by the paper on dynamo-electric machines written in conjunction with his uncle Edward, and published in the *Phil. Trans.*, and it was not unnatural that the son's early work as professor should deal with similar problems.

His first paper in the Proceedings of the Royal Society on the shunting of alternate-current machines gave a satisfactory explanation of the phenomenon, and seems to have been inspired in part by the behaviour of a small machine in the Wimbledon Power House near his home.

Electrotechnics did not for long retain his main attention. Papers on the elastic properties of steel at high temperatures, brittleness and ductility, and the endurance of metals under alternating stresses of high frequency, followed during the next few years, and each served to bring out his versatility and his power of getting at the heart of a subject and of explaining in clear and concise language the results of his investigations.

Two remarkable papers on the magnetic properties of iron and its alloys in strong magnetic fields, and on manganese steels, were published with Sir Robert Hadfield in 1911 and 1914, and have added greatly to our knowledge of magnetism. Hopkinson was able to show that the magnetism of saturation might, in the case of the carbon steels, be predicted from the composition by treating each steel as a mixture of iron and of less magnetisable carbide. With manganese, however, no such simple relation was found to follow.

The work, however, by which Hopkinson will probably be best remembered is that on the internal-combustion engine. It began with a British Association paper in 1904, which led in 1907 to an investigation into the efficiency of the gas engine; in the course of this research the well-known Hopkinson indicator was developed, and it was shown that indicator diagrams, properly drawn, could be used satisfactorily for the measurement of efficiency. In 1906 a most im-