THURSDAY, JANUARY 21, 1915.

THE MANUFACTURE OF DYESTUFFS IN BRITAIN.

A Summary and an Appeal.

THE speech of Lord Moulton in Manchester on December 8, 1914, was a notable event, even in these days of strenuousness and surprise. For although he was careful to disclaim any official sanction of the views he expressed, it was common knowledge that the Government had requisitioned his services in investigating the question of the shortage of dyestuffs, and had based its policy largely on the advice he gave as the outcome of his investigation.

The general outline of the crucial position in which the British textile trades are placed at the present time is well known. At least 1,500,000 operatives are engaged in the various branches of the trade, which has an annual value of 200,000,000*l*. Nearly the whole of this vast industry depends for its commercial success upon the use of dyestuffs, which cost about 2,000,000*l*. per annum, and only about 10 per cent. of the necessary quantity of dyestuff is made in this country. Before the war, between 80 and 90 per cent. of our dye-wares was imported from Germany, and this supply is now entirely cut off. Unless, therefore, immediate steps are taken greatly to increase our national output and the supply from neutral countries (chiefly Switzerland), a catastrophe will very quickly overtake the great textile and associated industries.

The magnitude, gravity, and imminence of the crisis clearly pointed to the necessity for Government action, and a "Chemical Supplies Committee" was appointed to confer with the Board of Trade on the position. This committee included a number of well-known chemists, and manufacturers and users of chemicals and dyestuffs. The investigations of Lord Moulton and of this committee are understood to have formed the basis from which the offer of the Government was developed, but the committee was apparently not responsible for the details of the scheme for the establishment of a large Joint-Stock Dye Manufacturing Company, which was made public on December 22, 1914.

Prior to this, on December 10, 1914, a meeting of large users of dyes was held at the Board of Trade, at which a resolution was unanimously passed welcoming the assistance of the Government in a national effort to increase the British supply of dyes. A small committee, representative only of the users of dyes, was appointed, and elaborated the scheme to which reference has already been made for the formation of a manufacturing company.

An influential committee, appointed by the Society of Dyers and Colourists, has also made exhaustive inquiries on the technical side and has accumulated much valuable information.

It is well known that the difficulties involved in establishing on a permanent basis the manufacture of dyes on a scale adequate to supply our needs are enormous, and that without Government or legislative assistance they might well prove insurmountable; and the action of the Government in proffering such broad-minded and generous support has received, as it deserved, the recognition of all parties.

The German colour industry is probably the most complicated, most highly developed, and most profitable of all her great industries. The capital invested in it is about 12,000,000*l*., and the German exports of dyes and associated products in 1912 were valued at 10,600,000*l*. The organisation, both for production and for marketing and distribution, is wonderfully efficient, and above all the Germans have long realised that in this branch of industry the scientific mind and scientific method must be predominant, not only in the laboratory and in the works, but in the management. The boards of directors of their large works are virtually committees of technical and commercial experts who are in intimate touch with the respective branches of the works of which they have special knowledge. In a word, the trained man of science has in these works come to his own, and a proper recognition of the necessity of this is vital to the development of the British colour industry.

The reasons for the predominance of Germany in this particular industry have been frequently and variously stated, but it is now generally conceded that there is no lack of highly-trained chemists in this country competent to build up a commercially successful enterprise. With regard to other factors, we have, of course, a superabundance of the coal-tar products which form the basis of the manufacture, but the manufacture of certain essential reagents, *e.g.*, fuming sulphuric acid, though already existing, may have to be increased.

Government assistance will be required in regard to the provision of cheap alcohol, and the resources and skill of the chemical engineer will be

heavily drawn upon to provide the essential apparatus. A great number of chemists will be needed to work out the details of known processes, first on the laboratory scale, and later on a bulk basis, and the well-equipped laboratories and staffs of the universities and larger technical institutions might well be pressed into service for much of the preliminary work. Many chemists will also be required for developing new processes and other research work, because of no other industry can it be so truly said that stagnation spells failure.

The great complexity of the manufacture of dyestuffs is not due to the use of a large number of raw materials, the direct products from coal tar being only nine or ten. By chemical treatment these are, however, transformed into 250 to 300 different intermediate products which, in their turn, yield some 1200 chemically distinct dyestuffs. In some processes of manufacture high temperatures and pressures are required; in others the temperature must be reduced, and a large refrigerating plant is an essential feature of a colour works.

Surely, then, it is abundantly evident that the technical expert must be the preponderating element in the dye factory, and that he must have a large share in the management and control. The British custom of entrusting the management of large concerns to financiers, commercial magnates, and "men of affairs" has done much to retard the scientific development of our industries, and the adequate representation of the technical expert on the directorate is vital to the success of the new scheme.

Lord Moulton laid down three propositions with regard to the proposed new British dye manufacturing company. It must be large enough to be able to face severe competition at the end of the war. It must be, and must remain, entirely British, and, it must be co-operative; and all these conditions are fulfilled by the scheme put forward. It is proposed that the share capital shall be 3,000,000*l.*, and the Government offers to supplement this by a loan of 1,500,000*l.* at 4 per cent. and repayable in twenty-five years. The four and a half millions of capital thus proposed is probably ample to establish and develop an industry which would make us independent of imported products.

The proposals with regard to co-operation are that dyers and others associated with the consumption of the products, *e.g.*, spinners, manufacturers, merchants, textile machinists, etc., should take shares in the new company and thus become interested in its success. This is quite sound and receives general acceptance, but certain suggestions in the prospectus with regard to a *pro rata* subscription appear to be unworkable.

The Government reserves the right of appointing two directors of the company, and it is much to be regretted that the opportunity has not been taken of giving a wise lead in regard to the character of the directorate, by stipulating that the scientific technologist should be adequately represented.

Another feature of the scheme propounded by the committee is that certain existing colour works are to be taken over by the new company to form the nucleus of development. The resources of these works are to be extended as rapidly as possible in order to cope with immediate necessities and prevent an actual famine in dye-wares—in fact, large extensions are at the present moment being made.

A point which presents some difficulty in adjustment is the relationship of the new company to existing British dye-producing firms, or such as may be established in the future. It is obviously not desirable to stifle private enterprise by anything in the nature of a monopoly supported by the Government, but the existence of successful German firms which are outside the two great "Interessengemeinschäfte," or rings, indicates that the difficulty is more apparent than real. A somewhat cognate matter is the future relationship of the new company to the Swiss firms which are importing to us during the present crisis.

The various criticisms of the Government scheme which have been offered, refer, not to general principles, but in almost all cases to more or less important details. The general outlines of the scheme—the establishment by co-operation of those specially concerned, of a new company with great resources and financially aided by the Government—has received general approval, and the unprecedented step taken by the Government has been applauded by men of all parties, as meeting an industrial crisis in a bold and statesmanlike manner. In response to this, and in recognition of a national emergency, it is the obvious duty of all who are commercially interested, to deal with the question from the national rather than from the individual point of view. Support of a scheme for the manufacture in Britain of British used dyes is, at its lowest estimate, an essential business insurance, and on a higher plane it is helping forward a movement to free our great textile industry from the danger

of German domination. Apart altogether from the commercial aspect, there is, therefore, a great obligation of patriotism involved. The scheme put forward—possibly as a *ballon d'essai* as regards details—certainly requires modification, but from it can be elaborated a national and co-operative effort which is bound to succeed.

Even to discuss the question of the breakdown of the proposal to make ourselves independent of German products, is almost a triumph for the enemies of our country, and a national humiliation for us. Let us all take as a starting-point of our deliberations that the thing *must be done*, and then the details of how to do it will fall into proper perspective.

Finally it may be pointed out that incidental advantages of enormous national value will accrue as the result of the successful fruition of this dye-ware manufacture scheme. The necessity for dealing with our industries from a national, rather than an individualistic, point of view will be more fully recognised by the Government and by the public. The necessity for the use of scientific method and control of our industries will be strongly emphasised. The claims of patriotism and the value of co-operation in commercial matters will receive fuller consideration, and lastly, the establishment of a powerful company for the manufacture of organic dyestuffs will afford protection to our great industries concerned in the manufacture of inorganic chemicals, an attack on which was beginning to be organised.

Now is our opportunity, and everything is propitious. Patriotism and self-interest are alike clamouring for the establishment of a large dye manufacturing concern, and the Government offers its support. One essential thing may, however, be overlooked—the new company is foredoomed to failure unless a scientific, rather than a purely commercial spirit permeates the management, and an appeal is made to the Government and to the eminent business men forming the committee who have issued the scheme that in its final form it may include a full recognition of this fundamental point.

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ELECTROMAGNETIC WAVES.

Electromagnetic Theory. By O. Heaviside. Vol. iii. Pp. ix+519. (London: *The Electrician* Printing and Publishing Co., Ltd., n.d.) Price 21*s.* net.

IT is scarcely necessary to recommend to those interested in electromagnetic theory any book or article written by Dr. Oliver Heaviside. Since 1899 the scientific world has had in possession the first and second volumes of his "Electromagnetic Theory"; and these volumes hold a unique place in the literature of the subject. The first volume was reviewed in NATURE of 1894 (see vol. li., p. 171), and the second in 1899 (see vol. lx., p. 589). Now, after fourteen years of waiting, the world is enriched with the third and presumably the last volume containing the author's views upon the later developments of this ever-growing science.

The third volume is marked by all the characteristics of the earlier volumes. There is shown the same powerful grasp of the great principles of Maxwell's theory, the same intuitive intimacy with the hidden features of the electromagnetic field, the same boldness in materialising the mathematical conceptions, the same fearlessness in attacking really difficult problems, inventing new mathematics if necessary, or ingeniously turning to account old results got in different lines of inquiry. Every now and again he runs off into a side alley, at first sight quite away from the natural highway, but out of which he leads us back with some substantial gain, fitting us the better for the strenuous work to come. And we need all our best powers to follow his lead. There is no shirking of difficulty; there is no yielding to authority. Every new fact or hypothesis in electromagnetism must pass through his critical mind, every new theory be looked at carefully and the evidences for and against balanced against each other. The book is indeed the product of a hard-working and ingenious mind, and bears throughout the unmistakable marks of the personality of the author.

The modified quaternion analysis which Dr. Heaviside introduced into the earlier volumes is used with good effect when occasion demands. There is, of course, nothing talismanic in the particular notation which Dr. Heaviside has adopted; and it seems a pity to stir up old controversy by reproducing letters written last century. When the author accuses Tait of viewing the same thing quite differently according as it is clothed in his (Tait's) favourite quaternion garb or in so-called vectorial vestments, he uses a sword with a cutting edge in the hilt. We have simply to change Tait to Heaviside and interchange the words quaternionic and vectorial, and the truth remains. And the curious thing is that all the change which Dr. Heaviside makes in the Hamiltonian notation is to drop the S for scalar and change the sign. Meanwhile more recent vector analysts equally despise Hamilton and Heaviside, and add to the confusion by inventing their own precious notations.

The subject-matter of the present volume is very simply described. It has to do with the