products, in finding new uses for products, and in searching for new and useful products, for twenty-five American industrialists.

[Dr. Scholes gave here a brief discourse on the work of the Mellon Institute of Industrial Research (see THIS JOURNAL, 7, 343-7), illustrating its activities by means of sixty lantern slides.]

MELLON INSTITUTE OF INDUSTRIAL RESEARCH
PITTSBURGH

THE BRITISH NATIONAL DYE SCHEME

By D. GEDDES ANDERSON

Received April 6, 1915

Towards the end of the first month of the war, the British Board of Trade appointed a committee, with Lord Moulton as president, to consider and advise as to the best means of obtaining for the use of British industry sufficient supplies of chemical products, colors and dyestuffs of kinds hitherto imported from countries with which at present a state of war existed. It was brought out that British industries use annually dyes to the value of nearly \$13,000,000, and of this total about \$10,000,000 came from Germany, about \$850,000 from Switzerland, and only about \$1,000,000 were of British home production. It was further estimated that an adequate supply of dyestuffs was essential to an industry with a turnover of \$10,000,000 per annum, and that 1,500,000 employees were directly or indirectly interested.

The first proposal of the Government was to subsidize the establishment of a British dye industry by the creation of a new joint stock company to increase the output of existing dye works. The company was to have a working capital of \$26,000,000, of which \$15,000,000 was to have been subscribed by the public (principally the dye-users), and \$11,000,000 by the Government in the shape of a loan bearing interest at 4 per cent, repayable in 25 years. The Government was to have two nominees on the Board of the company with a right of veto on three points: (1) That the concern should remain permanently under British control; (2) that no arrangement should be made with any foreign producers as to keeping up the price or delimiting the area of activity; (3) a right by veto over all contracts so that no large consumers should be given an advantage in price over the small consumer.

Users of dyes were also asked to bind themselves to take their requirements from this company for a period of five years after the war.

This scheme did not prove acceptable to those interested. The directors of the influential Bradford Dyers' Association in a letter to the Board of Trade summarized the main objections as follows:

"(1) The failure of the Government to take their fair share of responsibility, and merely subscribing for debentures, wholly or mainly secured.

"(2) The stipulation by the Government, extraordinary and novel on the part of debenture holders, that they should not only nominate two directors, but that in these nominees should be vested impracticable and dangerous rights of veto.

"(3) The stringency and impracticability of the agreement for the supply of colors, the agreement being also exclusive in regard to existing makers and effectively preventing the establishment of new ventures.

"(4) The lack of advantages to the investing consumer.

"(5) The power of veto by the Government nominees and encroachment on the businesses of manufacturers of produce other than dyes and colors, by which proviso the 'working up' of by-products would be restricted and the most economic production of the staple articles rendered impossible.

"(6) The lack of information as to the intended acquisition by the proposed company and the basis as well as apprehension of the type of director possibly constituting the Board."

This letter went on to state what in the opinion of the directors

were the main objects in any movement for procuring and maintaining supplies of aniline colors, namely:

"(1) The immediate increase of the British production.

"(2) The immediate increase of supplies from Switzerland.

"(3) The establishment in this country of the color-making industry on an adequate scale and on permanent and progressive lines. The attainment of the first and second of these essentials should be governed wholly by urgency. The third should be approached with the least disturbance to ordinary business procedure and conditions. It must be borne in mind that existing plants, supplemented by the maximum supplies which can be reasonably expected from Switzerland, fall woefully short of the requirements of the dependent trades. Consequently even at otherwise unreasonable cost, every possible and immediate step should be taken to increase production—by temporary extensions, by emergency production, by rapid installation of equipment for the production of intermediaries without consideration, if it means delay of the possibility of subsequent removal or concentration of equipment so provided.

"These objects can be attained only by liberal and continued outlay. If the requisite funds are to be either wholly or partly provided from private sources the invitation to subscribe must carry with it some of the assurances usually required by investors. Here we may concede a difference between the interested and the ordinary subscriber. To the former an indirect inducement may appeal; to the latter a direct attraction is essential. To the one the depreciation or loss of his investment may not mean so much if in the process he has obtained all necessary supplies on competitive terms. To the other, direct inducements must be offered by way of security of capital and prospective returns, or by reasonable security and relatively higher returns. But, owing to the inevitable losses on establishment, especially under emergency conditions, owing to the possible initial mistakes in staffing and organization, owing to the likelihood of the re-entrance of German competition in all its ruthlessness before the new conditions have been successfully established and organized, the British efforts must contemplate and prepare for initial losses probably heavy in the earliest years. It is, therefore, difficult to believe that, without special inducements, capital would be attracted.

"The circumstances, the urgency, and the magnitude of the situation call for Government aid, and in some other and more effective form than that merely of lenders on first charge security. Such aid may be applied by any of the following means:

"(1) Protective tariffs; (2) grants in aid; (3) lending schemes. Although aware that, owing to the exceptional circumstances, many who have hitherto resolutely opposed any system of protection are convinced that this form of assistance is the likeliest to be effective and to attract capital, we feel and recognize the obvious objections to advancing it. As between the remaining two courses we prefer a system of grants in aid, and beg to submit for consideration a suggested method by which such a system may be established and worked, namely: (I) That a Commission should be established to administer a fund for the objects as stated hereafter, and raised on the lines indicated. The number of the Commission should be small, and the members certainly active and experienced. (II) That the Government should make an immediate grant in aid up to, say, \$2,500,000, to be administered by the Commission on the lines of the suggestions in clause 4, more particularly to objects *a* to *c* inclusive. (III) That the Government should for ten years make an annual grant of equal amount to that voluntarily raised by the trades interested, such sums to be administered by the Commission, with more particular regard to objects *d* and *e* of clause IV. (IV) That the objects of the Commission should be (a) immediately to stimulate the maximum of effort by the British color-makers to increase their production of colors by way (1) of plant extensions; (2) coördination of production and

by mutual supply and exchange of intermediary products; (b) to assist any color-making concern or concerns, either independently or through any company which may be formed, to acquire or establish such concerns by means of conditional contributions towards equipment, by guarantee of interest on prior charges, or by such other means as may be effective; (c) to make such arrangements, financial or otherwise, as would ensure effective coöperation by the Swiss makers; (d) to encourage and develop the industry on progressive and extended lines by grants on production, and for enterprise and initiative; (e) to establish and maintain, or to assist in establishing and maintaining research laboratories, and to encourage by grants scientific work and study.

"We respectfully submit that the very necessary assistance of the Government would be much more effective and much more rapid in attaining the desired objects if in such a form as we have here indicated than by a state-controlled company, with its unavoidable concomitants. It may be well to reiterate that in the consideration of any schemes for the relief of the situation in the color-producing industry it is understood as essential that the existing Patent Acts should be amended to ensure that the patented article shall be produced in this country from the raw material, and that any existing restrictions on the use of alcohol or other restrictions bearing unfavorably on British, in contrast with German, producers be removed. Incidentally we would respectfully remind you that the immediate position would be considerably ameliorated by the coöperation of the Government department whose assistance is necessary to facilitate the export of raw materials to Switzerland essential to the receipt of larger supplies of colors from that country."

The criticisms directed against the Government scheme by the various committees appointed to consider the question, and by the different Chambers of Commerce follows somewhat along the same lines as those taken by the directors of the Bradford Dyers' Association, but it is interesting to note that the Chambers of Commerce of London, Leeds and Bristol each advocated adequate tariff protection for some time after the war.

A second Government scheme was propounded, and on February 8th the President of the Board of Trade went into the details as follows:

"The original scheme for the development of the dye-making industry in this country on a larger scale, which was framed by a representative committee of users of dye in consultation with the Board of Trade, has now been modified, as it appeared that, owing to difficulties arising in connection with some details of the proposal, it was improbable that the amount of capital contemplated would be raised.

"The new scheme which has the approval of the enlarged committee of users, provides for an original share capital of \$10,000,000, of which, in the first instance, \$5,000,000 would be issued. The amount of capital to be subscribed at the outset is thus smaller than in the earlier scheme, but power is taken to extend the operations of the company as occasion may justify. The Government is prepared to advance \$1 for every \$1 of share capital raised, up to a maximum of \$5,000,000; should it subsequently be found necessary, the Government will further contribute \$1 (up to a maximum sum of \$2,500,000) for every \$20 further share capital subscribed. The effect of this arrangement will be that, if full advantage is taken of the Government offer, the company will ultimately have a share capital of \$15,000,000 and a loan capital of \$7,500,000 as in the original scheme. In the meantime, however, the new financial arrangements will, it is believed, be more manageable, and make subscription by those interested much easier.

"The Government advance will bear interest at the rate of 4 per cent and be repayable within 25 years. But whereas under the original scheme, the interest on the advance and the

requisite sinking fund for repayment were to be cumulative, though payable only out of net profits, under the new arrangement the payment of interest will be non-cumulative for the first five years, and there will be no compulsory sinking fund. On the other hand, the interest on the ordinary shares will be limited to six per cent per annum so long as any part of the Government's advance is outstanding.

"Further, with a view to the promotion of research, the Government have undertaken to make a grant to the company during a period of 10 years of a sum not exceeding in the aggregate \$500,000 to be devoted exclusively to experimental and laboratory work. The company will be required to show, to the satisfaction of the Treasury, that the amounts granted from time to time have been expended solely for the prescribed purposes. This is a new feature of the scheme.

"The agreement proposed to be made between consumers of dyes and the company has been modified in some respects and will, it is believed, be more acceptable to consumers than that originally proposed.

"An option has already been obtained for the acquisition by the company, when formed, of important dye-making works, and negotiations for other options of the kind are in progress, and there is reason to believe that satisfactory arrangements can be made with important producers in Switzerland. The new company will be able immediately on its formation to take advantage of these arrangements, should the directors think it expedient to do so, and to take such other steps as may be thought expedient to develop the supply of dyes both by the enlargement of the plants of the undertakings acquired, and in other ways.

"The scheme, like the original scheme, provides for the nomination by the Government so long as any part of the Government advance is outstanding, of two directors who will have the ordinary powers of directors and also certain special powers to prevent undue preference or encroachment on the business of undertakings non-concerned with the making of dyes and colors, but there is not, nor has there ever been, any intention to utilize these powers so as to hamper the business management of the company in such matters as the working-up of by-products or the giving of priority in supply to shareholders in the company.

"I share in the belief of the committee that the new scheme, and the subsidiary arrangements which I have mentioned, will provide both for the immediate and effective utilization of existing sources of supply and for their expansion with as much rapidity as is compatible with sound development."

The agreement referred to by the president of the Board of Trade is as follows:

"Memorandum of Agreement made this.....day of..... 191.. between British Dyes Ltd. whose registered office is at in the.....of.....(hereinafter called 'the Company') of the one part and.....of.....in the.....of.....(hereinafter called 'the Customer') of the other part.

"WHEREAS the Company has been incorporated since the commencement of the present war for the purpose among other things of producing, manufacturing and selling dyes, colors and other chemical substances (hereinafter collectively referred to as dyes) which previously to the war were exclusively or principally manufactured in Germany and sold by Germans and German companies and firms. And whereas under the provisions of the contracts at which particulars are set out in the schedule hereto the customer is or may be bound after the war to take delivery of the goods specified in the third column of the said schedule. And whereas the company has supplied and (or) agreed to supply the customer with certain of the dyes required by the customer for the purposes of the customer's business but it was stipulated by the company and accepted by the customer as one of the terms and conditions upon which

such supply would be made that this agreement between the parties hereto should be executed.

"Now it is hereby agreed and declared by and between the company and the customer as follows; that is to say:

"1—The consideration for this agreement is the supply by the company to the customer of certain of the dyes required by the customer and the mutual accommodation of the parties hereto by the sale and purchase of such dyes during the continuance of the present war.

"2—The customer undertakes with the company that as from the conclusion of the present war and for a period of five years thereafter or until five years have elapsed from the last delivery to the customer pursuant to the terms of the contracts set out in the schedule hereto or until five years have elapsed from the determination of the said contracts, whichever shall be the longest period, the customer (a) will purchase from the company all dyes which may be required by the customer for the purposes of the customer's business or such amounts and quantities thereof respectively as the company may from time to time be able and willing to supply to the customer of good quality and suitable for the purposes of the customer's business and at reasonable prices within a reasonable time after the same shall be ordered having regard to the obligation and requirements of the customer and (b) will not purchase from any company firm or person (other than the company) any dyes which may be so required as aforesaid excepting only such amounts and quantities thereof respectively as the company may from time to time be unable and (or) unwilling so to supply to the customer. Provided, always that the fulfilment by the customer of his legal obligations under the contracts set out in the schedule hereto shall not be deemed a breach of this clause.

"3—The prices to be charged by the company and paid by the customer to the company for the dyes during the period referred to in the preceding clause hereof shall be reasonable prices from time to time fixed by the directors of the company. Provided, that if the customer shall consider such prices unreasonable he shall in writing notify the fact to the company within seven days after being informed of the said prices indicating in such notice the prices he is willing to pay and in the event of the company being unwilling to accept the prices named by the customer he shall be at liberty to call upon the company to submit the question of whether the directors' prices are reasonable or not to the decision of a referee appointed by the president for the time being of the Association of Chambers of Commerce of the United Kingdom. The referee shall decide whether the prices charged by the directors are reasonable and in so deciding he shall have regard to all the circumstances including the fair current prices at which dyes are being sold by other suppliers and if he shall come to the conclusion that they are not reasonable he shall prescribe what prices shall be charged by the company to the customer.

"4—Strikes, breakdowns, war, fire, flood and all similar occurrences which might curtail or render impossible either the manufacture or the consumption of the dyes shall be regarded as *force majeure* and as mutually releasing either party from its obligations in respect to the time stipulated for delivery of any dyes bought or sold in pursuance of this agreement during the period of derangement.

"5—The expression the company and the expression the customer shall respectively include their respective successors in business where the context so admits.

Date of contract	THE SCHEDULE ABOVE REFERRED TO		
	With whom contract was made	Description of goods and quantity remaining undelivered under contract	Period over which undelivered goods are to be delivered"

The question of the national dye scheme came up for full

discussion in Parliament, on February 23rd, and Mr. Runciman, the president of the Board of Trade, went into further details. He said: "The Government had entered into an arrangement with the Swiss manufacturers for new and intermediate products to go out immediately, and arrangements had been made for those products to pass through France. They had organized at home the production of some of these raw materials on a wider basis, and although some of these bases were necessary for the production of explosives, they had seen to it that the manufacture of explosives should not altogether exclude the possibility of their having some of the surplus produce to send to Switzerland to be turned into finished dyes. The gas companies had helped them in nearly all the great centers where they had been invited to put up a plant. The coke oven owners had turned over to the Government practically the whole of their benzoline, from which they had drawn a large percentage of toluol. The Government had obtained an option on the works of Messrs. Read, Holliday, and Sons (Limited), of Huddersfield, producers of dyes and intermediate products. The Government wanted these works to be specialized more highly on the later processes. The firm had been a well-managed and profitable concern and had shown that it was possible, even under the hottest German competition, to make a creditable profit out of the manufacture of dye products in the United Kingdom without any import tariff. The option enabled the Government to take over that firm at a price in relation to which the average annual profits during the last six years represented about six per cent. He did not think the Government had driven a bad bargain, though naturally they had had to pay more than their nominal capital. The money would be paid in cash. The Government made an outright purchase, but the staff of Messrs. Read, Holliday & Sons would assist the new company, and the organization of the old company would not be broken up. The proprietors would be eliminated, and the managers and staff retained. There were other concerns in pretty much the same position.

"Provisional agreements had been entered into with one or two concerns in England for the purchase of intermediate products. They had also made arrangements with the gas companies and these would go on in conjunction with the control exercised by the High Explosive Committee. None of these arrangements could go through unless they were linked up. The only way to bring about an increase in the production of the dyes we needed was by reorganizing these concerns under one control so that the best was produced from them. They had also to safeguard the small consumer and must see that he was not 'squeezed out.' The severest criticism of this scheme had come from the three greatest dye users in the United Kingdom. These great concerns could, to a large extent, take care of themselves. If the scheme fell to the ground the large consumers would not regret it anything like so much as the small consumers.

"The success of the concern would depend largely on the way in which the German patents were administered. The Act passed last autumn as an emergency measure provided that the operators of German patents in this country should have a full chance of conducting them under license, and it was the intention of the Government not to cripple this company when the war was over, but to give them every opportunity of making the most of German patents. They would leave over for discussion as between Germany and this country the payment of royalty in respect of these patents. There were English patents in Germany on which he hoped a royalty was being paid there. We should hand over these royalties if Germany would bargain fairly with us. But the operating of these patents which would be undertaken by the new company would proceed after the war was over without interruption and without hindrance. The regulations of the Board of Customs with regard to alcohol would enable the company to obtain permission to use alcohol for

industrial purposes free from duty by arranging that the denaturing of such alcohol should be carried out under conditions which would not hamper the industry."

The company, British Dyes, Ltd., was registered at Somerset House on March 4th, and the prospectus advertised on March 6th.

A meeting of the subscribers was held on March 4th to consider the question of the failure to raise sufficient capital. It was there resolved unanimously that the company should be proceeded with and the meeting pledged itself to use its best endeavors to support it, and further asked the directors to consider the advisability of dropping the agreement between the users of dyes and the company.

It was announced later that, in view of the fact that, of 1,000,000 \$5 shares offered only 571,000 had been applied for, and 83,000 of these conditionally, the directors did not feel justified in proceeding to allotment.

NOTE (Received May 12, 1915)

The flotation of the company British Dyes, Ltd., has been carried through. The clause restricting shareholders of the new Company from buying dyes from outside sources was abandoned and the removal of this restriction probably was one of the chief reasons why the later appeal of the directors of the Company to subscribers met with success.

A meeting of subscribers was held on March 24th to consider the situation, and the chairman, Mr. James Falconer, M. P., put the following figures before the meeting.

Practically \$2,400,000 had been offered to the company, eliminating subscriptions that were conditional and those they did not propose to allot upon. This result would give them \$600,000 of paid-up capital, and the Government advance of \$2,400,000 would make a total of \$3,000,000. They had asked the

Government if they would increase their advance, but they did not see their way to do so. The Grants Committee had agreed to advance \$1,000,000 for the extension of Read Holliday's business in order that these extensions should proceed, and they had agreed to allow the \$1,000,000 to remain if the directors took over Read Holliday's business on the same terms as a Government loan. That would make their total available cash capital \$4,000,000.

The directors had carefully considered the position, and did not think that was enough to justify them in going on. The meeting would sympathize with the board in the feeling that they ought not to undertake what was going to be an arduous and difficult task, and be constantly begged for want of capital. It was not in the interests of the subscribers or the trade. It was absolutely necessary to increase the capital. They ought to aim at getting at least \$1,000,000 more, and if what had been said with regard to the withdrawal of the agreement was general that amount ought to be reached. That would give them \$250,000 of called-up capital, and \$1,000,000 Government loan, which would be \$1,250,000 additional. With that he thought the board could quite comfortably proceed to do their best to carry out the program they had put before the subscribers in the prospectus.

It was announced later, at a meeting of the directors of the Company, that new subscriptions to the extent of \$780,000 had been received and that further applications were expected. The Calico Printers' Association, and also practically all those who had at first made conditional applications, including the Bradford Dyers' Association, Ltd., had now subscribed. The directors therefore decided to go to allotment.

10 WENDOVER CRESCENT, MT. FLORIDA
GLASGOW, SCOTLAND

CURRENT INDUSTRIAL NEWS

By M. L. HAMLIN

CONTINUOUS PRODUCTION OF WATER GAS

The Société Française d'Exploitation de Fours Spéciaux à Haute Température, in association with M. Antoine Verzier, have taken out a French patent (No. 473,149 of 1914) for apparatus for the continuous production of water gas. The patentees claim that their plant makes it possible to vaporize water contained in a chamber in the ash-box and also superheat the steam produced at a constant temperature by mere radiation, during its passage under pressure in the collector, from the combustion substances provided by the gasifying plant itself

—thus dispensing with a separate boiler. They also claim that they can obtain, as required (by conveying the excess of superheated steam, produced as already explained, through the incandescent layer of fuel), decomposition of the steam, the necessary quantity of air being supplied by a fire-clay pipe which runs across the collector, and the air being superheated before being brought into contact with the fuel. Apparatus thus constructed obviates the period of transition due to the introduction of cold air to complete the reaction.

A form of plant constructed according to this invention is shown in the accompanying illustrations, taken from the *J. Gas Lighting*, 130 (1915), 31; Fig. 1 is a longitudinal section, Fig. 2 a section on the line X, and Fig. 3 a front view.

The plant comprises a combustion chamber, A, into which the fuel, resting on the grate B, is introduced by charging-boxes C. Below the fuel is a chamber, D, always full of water. The gas liberated by the incandescent fuel issues from the chamber A through a channel, E, and then passes into a pipe, G, provided with a damper, by which it is conveyed into a collector, H, communicating with a compartment, I, under D, which is thus heated by simple radiation from the hot gases coming from the fuel in the collector and the compartment I. Doors J (Fig. 3) hermetically close the front of the ash-box and chamber, and the latter also closes the compartment I. The fire-clay pipe H' conveys hot air to the fuel.

The water in the chamber is continually and naturally converted into steam, which is automatically superheated in passing through the incandescent fuel above, where the oxygen and hydrogen are separated, as previously described. The chamber D, in the ash-box, may be of any suitable shape favoring the evaporation of water.

AUTOMATIC MEASURING OF THE MOISTURE CONTENT OF CELLULOSE

An apparatus described in the *Papierfabrikant*, 13 (1915), 33 and 50, has been built by O. Nordström for automatically measuring the moisture content of cellulose during manufacture. It is based on the principle that the dry substance is electrically non-conducting. Since the conductivity, how-