

seems all the more curious when one notices the hundreds of small, dilapidated pagodas all over the country. These, although they may have been built by their own relatives, the Buddhists usually allow to perish from old age and the effects of the climate, and if one inquires into the reason one gets for answer that such repairs would go to the "merit" of the original builder, not to the repairer. They therefore, if they had the money available, prefer to erect another small pagoda or religious building, when they would be acquiring "merit" for themselves. But when money has to be spent over a famous shrine like the one at Pegu, they seem to have a national, rather than a religious, motive in co-operating, and giving what they can afford—it may be a rupee, or a thousand rupees. Hence money for such an object is always forthcoming.

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THE NITROGEN PROBLEM.

UNDER this term we have come to denote a question of most pressing importance at the moment. It not only affects our present and prospective national welfare; our very existence as an Empire is directly and immediately concerned with it. This arises from its bearings upon war and agriculture. Nitrogen compounds are absolutely necessary to the manufacture of munitions; they are no less indispensable to the production of food. All nations, therefore, and, for obvious reasons, especially those which are locked together in a life-and-death struggle, are eager to solve it, and under the compelling strain of a dire necessity an extraordinary measure of success is attending their efforts. This is more particularly the case with Germany, owing to the special circumstances of her position, and to the fact that she and the other Central Powers are practically cut off from external supplies of combined nitrogen products.

That Germany should be so far in advance of other nations in this respect is due to her prior recognition, years ago, of certain factors by which, under the very conditions which she dreaded might arise, and which have, in fact, arisen, her actual existence as a nation might be imperilled. The whole history of her association with the nitrogen problem shows that under the semblance of a peaceful venture it was part of the great conspiracy by which she sought to dominate the world. Her first efforts were made in Norway, when she secured a controlling interest in that country's abundant supply of hydro-electric energy, and took the fullest advantage, as is her method, of other people's originality and pioneering efforts. As the problem evolved itself and the political situation became apparently clearer, in proportion as manufacturing processes passed beyond the experimental stage, the great combines, financial and industrial, at the back of the enterprise gradually unloaded their interests in Norway upon an unsuspecting world. It is doubtful whether the whole of the synthetic stages from atmospheric air to ammonia and nitric acid were in full working order at the time the Serajevo tragedy forced the Kaiser's hand; but, as the

sequel has shown, they were so far advanced that under the stress of compulsion, aided by the financial support of the State and with no hampering commercial restrictions, they could be made to serve the necessity of the nation. We all remember with what a glow of pride Bethmann-Hollweg revealed to the world that Germany's chemists had at length solved the great nitrogen problem, and thereby secured, henceforth and for all time, as he said, her national security.

Owing largely to our command of the sea, our position, and that of our Allies, in respect to this matter is less acute than that of our enemies. At the same time, apart from the submarine menace, which is transitory, there are elements in the situation which require us to pay very serious heed to it. It would be the greatest possible folly on our part to neglect its study. For there can be no doubt whatever that this question of the fixation of nitrogen and the production of synthetic ammonia and nitric acid has come to stay. Matters of this kind have hitherto been considered as outside the business of the State. Government had no direct interest in them. They were subjects to be left to private enterprise and individual effort. But the circumstances of the time have changed much in our time-honoured and traditional view of the mutual relations of the individual and the State. Public opinion, under the hustling influence of the moment, now compels the State to accept responsibilities and exercise initiative to an extent hitherto undreamt of. Accordingly, a number of official bodies connected with the Government are engaged in the consideration of the nitrogen problem, and we are given to understand that a gratifying measure of success has already attended the systematic research work which has been undertaken at their instance. The attempt should now be made to co-ordinate this business with a view to economy of effort and to bring the whole to a common focus. Government Departments are too apt to encase themselves in water-tight compartments, and departmental jealousies are prone to interfere with unity of action.

We trust that, in view of the urgency and serious nature of the matter, no such trivial considerations will be allowed to operate. The Nitrogen Products Committee of the Ministry of Munitions, constituted more than a year ago under the auspices of the Munitions Inventions Department, is no doubt primarily concerned with the matter, for at the moment the question affects the prosecution of the war and is, therefore, of the first consideration, and every agency should be directed to that issue. In solving the problem as it affects war we incidentally go far to solve it as it affects peace and agriculture. The Comptroller of Munitions Inventions has just issued a report giving a general account of the action which has been taken by his Department in dealing with the subject, and he promises a more complete report based upon the work of the various sub-committees which have been instituted to deal with its several aspects.

We have already directed attention to the action which the United States has taken in connection with the same subject, even before its entrance into the war. A report to his Government by Dr. C. L. Parsons, which has recently been published, contains a mass of valuable information as the result of inquiries and visits to manufacturing plants in various European countries. As regards the account of the arc process of synthesising nitric acid, there is little that is not generally known to experts in this country. Its position as a permanent industry depends largely on local conditions, which are now well understood. Of the Haber process for the production of ammonia, to which the German Chancellor referred in such exulting terms, we have as yet no very precise information concerning plant construction and operation. The method is not at present at work as a manufacturing process outside Germany, and its post-war use in other countries will probably be restricted owing to the practically prohibitive royalty demanded by the Badische Company. It is, however, known to be a difficult, and even dangerous, process to work. Its technical control requires so high a degree of training and skill that Dr. Parsons is assured that if the Badische people were to lose their present staff many months would be required to train another. There can, however, be no doubt of its success. It was first commercially installed in Germany in 1913, when it was said to have produced 20,000 tons of ammonium sulphate. In 1914 this grew to 60,000 tons, in 1915 to 150,000 tons, and in 1916 to 300,000 tons. With the new works recently completed by the Badische Company the 1917 output will be equivalent to upwards of 500,000 tons of ammonium sulphate. As regards cost, it is stated that pure anhydrous ammonia can thus be produced in liquid condition at less than 4 cents per lb. If such is the case, the Haber method is the cheapest process yet known for the production of synthetic ammonia.

The cyanamide process for producing ammonia resembles the arc process of making nitric acid in requiring cheap power for its successful development. In special circumstances it may be able to hold its own with the Haber process, as seems to be realised in Germany, where the method has been subsidised by the Government. It is said that the 1917 German production of cyanamide will be not far short of 400,000 tons. Agrarian interests are endeavouring to induce the Government to establish a nitrogen monopoly to ensure the continuance of the cyanamide industry in Germany, in view of the competition of the Haber process and of coke-oven ammonia after the war.

As regards by-product ammonia and the cyanide process, and the methods of transforming ammonia into nitric acid, there is little in Dr. Parsons's report which is not now common knowledge. Naturally his conclusions and recommendations are more particularly applicable to the circumstances of America, but there is much in his arguments and in the details of his estimates of

construction and of operating costs that will necessitate, and will doubtless receive, sympathetic attention in this country.

One fact clearly emerges from this consideration of the nitrogen problem. The combined efforts of the warring nations in seeking the means for their mutual destruction will inevitably ensure the future position of agriculture and the production of cheap food to those who come after us. Out of this evil at least this good will come.

SCIENCE AND OTHER HUMANISTIC STUDIES IN SCHOOLS.¹

THE report edited by Sir Frederic Kenyon gives evidence of progress towards that agreement among educational experts which is necessary if the construction of a scheme designed for general adoption is to meet with general acceptance. A serious obstacle to this progress is "the great mass of ill-informed public opinion, which distrusts or despises all education, or measures its value by its immediate money-earning capacity." This remark, to be found on the first page of the report, is perfectly true; but it is equally true that another serious hindrance has been the obstinate refusal of so many of the supporters of the old-established classical system to yield ground and to recognise the claims of modern subjects, especially science, to any considerable share in the time, emoluments, and honours which have so long been the portion of the older studies. "The object of the present pamphlet is to record certain attempts that have been made to give a healthier tone to the discussion; to show that a large measure of agreement is possible, . . . and to bring the weight of this agreement to bear on the solution of the outstanding problems which have been the cause of bitter controversy in the past."

The starting point of the movement here described was a letter which appeared in the *Times* of February 2, 1916, in which the educational claims of science were put forward with considerable emphasis. This was followed by the meeting at the Linnean Society on May 3, which has been completely reported in a pamphlet entitled "The Neglect of Science." A rejoinder was published in the Press of May 4, 1916, signed by Lord Bryce and a number of other eminent persons. This letter, though containing some statements which were open to criticism, was conceived in a liberal and conciliatory spirit, which could not fail to have a good effect.

A movement was then begun with the object of securing co-operation among the principal bodies representing "humanistic" studies in their educational aspect, and a conference was held on June 17, 1916, in which representatives of the Classical, English, Geographical, Historical, and Modern Language Associations took part. The result was

¹ "Education, Scientific and Humane." A Report of the Proceedings of the Council for Humanistic Studies. Edited by Sir Frederic G. Kenyon. Pp. 32. (London: John Murray, 1917.) Price 6d. net.—Committee on the Neglect of Science. Report for the Year 1916-17. (Hon. Sec. 17 Grosvenor Road, Westminster, S.W. 1.)