brought to the surface a fresh lot of seed which, though having lain buried in the soil for a quarter of a century, has retained its germinating capacity.

JOHN PARKIN.

The Gill, Brayton, Cumberland, September 9

Rock-disintegration by Salts.

THE reference in NATURE for September 19, p. 50, to Mr. J. T. Jutson's paper dealing with the influence of the crystallisation of soluble salts in promoting the weathering of rocks reminds me of Il Fungo, an isolated mushroom-shaped rock opposite Lacco Almeno, on the north shore of Ischia. Formed of porous volcanic tuff. the sea-water rapidly ascends by capillarity, and, being evaporated, large crystals of salt are produced on the face of the rock. As these natural processes are most active over an area about midway between the sea and the summit, the sides there are being hollowed out very rapidly, large flakes of rock constantly falling.

In 1892 the late Dr. Johnston-Lavis gave me a photograph of, and much valuable information respecting, this rock.

C. CARUS-WILSON.

September 20.

GERMAN INDUSTRY AND THE WAR.

I.

A RECENT issue of the Bulletin de la Société d'Encouragement pour l'Industrie Nationale[1] —the French counterpart of our Journal of the Society of Arts—contains two interesting and important articles on the present and future influence of the war on German industry, written by MM. Jaureguy, Froment, and Stephen, which make known a number of facts concerning the means by which Germany has attempted, with more or less success, to evade efforts to isolate her during the war. In spite of the rigour of the blockade to which she has been subjected, there can be little doubt that, thanks to the knowledge, skill, and ingenuity of her chemists and engineers, encouraged and aided financially by the State, she has hitherto managed to provide herself with the means of carrying on the war—not only as regards munitions, in which she has been eminently successful, but also in regard to the alimentation of her people, in which, of course, owing to the complexity of the problem and to natural conditions beyond her control, her success has been less conspicuous. The new industries which have been created, and the great development of those already in existence, would, apparently, enable Germany to prosecute the war almost indefinitely. The determining factors will be the exhaustion of her man-power and the gradual weakening of her *moral*. Both these causes are beginning to tell, and it is abundantly evident from a variety of signs that the Higher Command is realising that the rot has set in. Junkerdom is now fighting only for its existence. The steady and persistent pressure of the Allies will accelerate the advent of the inevitable *débâcle*. The end will come when the remnants of the German armies are driven back to the Rhine.

In the meantime it is instructive to note what Germany is doing in her efforts to stave off the disaster which assuredly awaits her. It is always wise to learn from your enemies when you can, and Germany has much to teach us concerning the manner in which Science may be made subservient to War and to the conditions which war produces.

We have already dwelt, on former occasions, on the importance of the nitrogen problem in the war, and have given some account, in the light of such information as was available, of the methods by which Germany has attempted to solve it. The communication before us contains a number of statistical statements respecting the development and present position of the several synthetic processes of utilising atmospheric nitrogen which are of interest at this present juncture. It appears that the Birkeland-Eyde process, which in 1913 furnished Germany with some 5000 tons of calcium nitrate from the Norwegian factories still worked to a limited extent in Saxony, where a manufactory was established before the war at Muldenstein, employing lignite as a source of power. Ostwald's process of oxidising ammonia catalytically—or rather the Frank-Caro modification of it—is in operation at Spandau, Höchst, Griesheim, and at works belonging to the Badische Aniline Company. Kayser, at Spandau, employs apparatus capable of oxidising 370 kilos. of ammonia in twenty-four hours with a yield of from 90 to 95 per cent. The Badische Company makes use of plant constructed by the Berlin-Anhaltische Maschinenbau, oxidising about 750 kilos. of ammonia in twenty-four hours. The heat furnished by the reaction suffices to maintain the catalyser at a constant temperature of 700° C. The main catalytic agent is said to be one of the oxides of the iron group containing bismuth or one of its salts. During 1915 some thirty installations of this system were erected, each capable of oxidising more than 12 million kilos. of ammonia annually. In the more recent forms of the apparatus the yield has been increased to 17 million kilos. Before the war the main source of supply of ammonia was from coke-ovens and from the gasworks, which in the aggregate furnished about 500,000 tons of sulphate of ammonia, of which agriculture absorbed 450,000 tons.

The Haber process of combining nitrogen, obtained by the fractional distillation of liquid air, with hydrogen procured by the electrolysis of water, as worked out by Bosch and Mittasch, chemists of the Badische Company, was already in operation before the war, but has now been greatly extended. The factory at Oppau has been much enlarged at the Government expense, and other factories have been erected. The capital of the Badische Company has been increased from 14 to 90 million marks. The firms of Bayer, Meister Lucius, Casella, Weiler-Termeer, Kalle, and the Griesheim-Elektron Company have also augmented their capital, and are work-

[1] Bulletin de la Société d Encouragement pour l'Industrie Nationale, 129, 416. (Paris, 1918.)

ing in a consortium representing a capital of upwards of 1 milliard of marks.

In addition to the Haber process, ammonia is being produced by the cyanamide method. The factories employing this process are mainly erected in the neighbourhood of lignite deposits, in localities furnishing supplies of natural gas, or where hydraulic power is available. Before the war the principal factories were the Bayerische Stickstoffwerke at Trostberg, the A.G. für Stickstoffdünger at Knapsack, and the Mitteldeutsche Stickstoffwerke at Gross-Kayna (Geiseltal). The development of the cyanamide industry is encouraged by the Government. The Bavarian Company received a subsidy of 40 million marks and undertook the erection of two large factories in proximity to deposits of coal and lignite. These were completed towards the end of November, 1915. The net profits of the Bayerische Stickstoffwerke in 1914-15 were 653,185 marks; in 1916-17 they were 1,547,261 marks. In 1915 the company at Knapsack raised its capital from 3 to 8 million marks. In 1916 the total production of cyanamide had increased to 400,000 tons, practically a hundred times greater than it was in 1913. There is no doubt that it has since been considerably augmented.

Such are the means by which Germany has meanwhile rendered herself independent of Chile saltpetre, or, indeed, of any outside source of nitric acid or ammonia, and has provided herself with one of the essential munitions of war. So absolutely necessary is the production of nitric acid that, in its absence, no army could hold together for a week under modern conditions. This enormous development of the synthetic production of ammonia and nitric acid is of great economic interest, and is bound to have a profound effect on industry after the war. The economic aspect of the matter, however, does not now concern us. We may return to its consideration on another occasion.

Scarcely less important, in view of the war, is the problem of sulphur and sulphuric acid, to which we have already directed attention. Our blockade practically suppressed all German importation of pyrites, of which in time of peace she received upwards of 10 million quintals, 8½ millions coming from Spain. Germany was thus restricted to her own poor deposits in Thuringia, in the Lahn basin, at Tessenberg in Bavaria, and at Meggen in Westphalia. The important deposits of cupreous pyrites of Styria and Hungary were at once exploited, as were those of sulphur in Anatolia. The roasting of blende at Vieille-Montagne and in Silesia had already furnished considerable quantities of sulphuric acid before the war: by intensive working the yield was considerably increased. Processes like those of Schaffner and Helbig and of Chance and Claus were worked on a large scale. The Badische Company utilised the method of Walther Feld, in which crude coal-gas is made to yield its ammonia and sulphur in the form of ammonium sulphate. This is effected by agitating the gas with a solution of ammonium tetrathionate, which absorbs the hydrogen sulphide and ammonia, giving ammonium sulphate, hyposulphite, and free sulphur. By boiling the ammonium tetrathionate with the hyposulphite, ammonium sulphate, sulphurous acid, and sulphur are obtained. By making the two last-named substances react upon the hyposulphite arising from the purification, the tetrathionate is regenerated. The Badische Company has also attempted to prepare sulphuric acid from gypsum or anhydrite, of which Germany has considerable deposits, by roasting the gypsum either alone or mixed with coke, whereby it is transformed into calcium sulphide, which can then be treated by any of the established sulphur-recovery processes, or converted into lime or sulphurous acid, to be either utilised in the manufacture of wood-pulp for paper-making or transformed into oil of vitriol.

So important is sulphuric acid for the purposes of war that its production is controlled by a War Committee, and the Society for the Production of War Chemicals has created a special section known as the Department of the Administration of Sulphur. As in the case of other chemical products, the manufacture and sale are regulated, and fixed prices have been legalised.

In a subsequent article we propose to show how Germany has dealt with the problems of combustibles, metals, alcohol, oils, fats, soap and glycerin, textiles, wood and wood-pulp, caoutchouc, turpentine and lubricants, food, fodder and manures—all of which are more or less essential to her, and of which she has been largely deprived by her own action in embarking upon a war which will prove her ruin.

MEDICAL EDUCATION IN ENGLAND [1]

THE issue of the modestly named paper before us marks a new stage in the relation of the State to English education. In no merely official style, but with the breadth and freshness of outlook proper to a prophet of reform, Sir George Newman reviews the "undone vast" in the training of medical practitioners for national service. He gives due credit to the great achievements of English medicine, as they have been wrought out by private enterprise, for until comparatively late years the schools of medical craftsmanship were in their essence proprietary, and their system was but a modified apprenticeship. In Scotland doctors were trained at the universities and caught something of the university spirit. The last generation has seen a change, in provincial England at least: London is still in the stage of painful emergence. When grants to the medical schools were first made by the Board of Education in 1908, the State necessarily assumed the duty of watching their application to productive uses. A universities branch of the Board was formed, and Sir George Newman became its medical

[1] "Some Notes on Medical Education in England." A Memorandum addressed to the President of the Board of Education by Sir George Newman, K.C.B., Chief Medical Officer, Principal Assistant Secretary of the Board of Education, etc. Presented to both Houses of Parliament by command of His Majesty. (Cd. 9124.) (London: Stationery Office, 1918. Price 9*d.*