

produces upwards of 70 per cent. of the steel of that country. That army was brought to action and defeated at the battle of the Marne, but, owing to the trench war which developed shortly afterwards, it remained in possession—and still does—of by far the greater part of that particular area in France which produced steel before the war. In other words, Germany, though defeated in a military sense, achieved a metallurgical victory of stupendous value. Metallurgists have never been in any doubt why Germany invaded France through Belgium. By obtaining possession of nearly three-fourths of the French production of steel, Germany struck a blow from which it must be considered as very remarkable that France was able to recover. The price in blood has been terrible; in money, enormous. But under M. Albert Thomas, the Minister of Munitions, a new steel industry has been created. Ores in the fields remaining to France have been exploited to the utmost, new works have been erected, and the most modern methods adopted. The results are such as to elicit the highest admiration for the way in which, under the stress of necessity, very great difficulties have been overcome.

Can it be wondered at if France is deeply anxious as to the future of that portion of Lorraine which was annexed by Germany in 1871? If she recovers it she obtains almost complete possession of the most important iron-ore deposits in Europe that are being worked at the present time, a source of enormous wealth both in steel and in phosphate fertiliser. Thereby also she becomes second in the list of the steel-producing countries of the world, with most pregnant consequences to her future as an industrial nation.

Limits of space do not permit any reference to the other metallurgical industries with which Dr. Guillet's lectures deal. They will repay study by those who are interested in the future of French metallurgy.

H. C. H. CARPENTER.

THE DEVELOPMENT OF BRITISH OIL-SHALE RESOURCES.

THE rapid expansion in the use of liquid and gaseous fuels during recent years, as a result of the introduction of the internal-combustion engine and the replacement of coal by oil and gas in many of the industries, has easily kept pace with the world's production of these materials. There is no doubt that this production will continue to expand for some time as new sources are tapped in excess of those which are giving out; but it is equally certain that the world's needs will continue to grow enormously. Thus the production of hydrocarbon fuels is becoming a more and more vital factor in the industries as their utilisation is extended, and those countries which are well favoured in the possession of fuels of these types are extremely fortunate.

Although the British Isles have been plentifully endowed with coal and iron, our resources in free

liquid and gaseous fuels are poor in the extreme; one might almost say they are non-existent. However, if there are practically no commercial supplies of free hydrocarbons, there are abundant stores of materials from which these fuels can be produced, and it is our business to see that these resources are developed to the utmost and with rigid economy in the near future. There is no doubt that the day is not far distant when an important step will be taken in the conservation of our coal supplies; the present wasteful method of burning in open fires will be abandoned, and the energy of the coal will be utilised in the form of oil, gas, coke, and other valuable products. Similarly the large areas of peat, at present of so little value, are immense reservoirs of energy which will be utilised in the same way. But it is to the question of the extent and utilisation of our oil-shale resources that attention is here directed.¹

Oil-shales—that is to say, shales which when subjected to destructive distillation will yield oil and gas (as well as other products like ammonia)—have been worked in Scotland for more than fifty years. It is not our intention to follow the history of the industry through its various vicissitudes; it is the future that matters. This Scotch shale industry has maintained its own, and is producing almost 2,000,000 barrels of crude oil per annum. Yet when we realise that the world's output of oil in 1912 was approximately 351,000,000 barrels, the smallness of Britain's quota becomes painfully obvious. The shale bands which form the source of the products in Scotland occur in the Lower Carboniferous of the Lothians, and the ultimate extent of the producing areas is limited. No great expansion of the output in the future can be foreseen, and it behoves us to look farther afield.

A survey of the geological column will suggest some of the measures of the Carboniferous, as well as the Jurassic beds of the North of Scotland as possible oil-producers, but at present the most probable horizons lie in the Kimmeridge shales of England. These series of shales extend as a belt of discontinuous outcrops from Dorsetshire to Yorkshire, varying in thickness up to 1000 ft. or more. Eastward and south-eastward they dip gently under the overlying Upper Jurassic and Cretaceous horizons, so that, apart from the effects of early Cretaceous erosion, which has locally removed the series, they extend as a broad sheet under the eastern and south-eastern counties. However, it is only a very small proportion of the whole thickness which is economically valuable as a possible source of oil, probably not more than 12 ft.; and, in addition, the lateral extent of these rich beds is at present unknown. They have been located over more or less widespread areas in South Dorsetshire and West Norfolk, and have been proved in some of the Wealden borings; but in each case the lateral extent of the proved area is limited not so much because the shales do not exist farther afield as that they have not been

¹ "The Norfolk Oil-Shales." By W. F. Leslie. Read before the Institution of Petroleum Technologists on October 17, 1916.

traced. The horizons are not conspicuous lithologically, and it is not easy to detect them except in a country of good exposures—a feature which is not usually found in areas covered by Kimmeridge Clay.

The lateral extent of these oil-shales is certainly greater than the present evidence will allow us to assert with any definiteness, but they will probably be found to vary in richness when traced along their strike and dip, and, in addition, the unconformably overlying Lower Greensands will have eliminated them in certain areas. But when the technical difficulties in the purification of the oil have been overcome, there is every prospect of an industry of important dimensions springing up in Dorsetshire and West Norfolk, and perhaps being linked up by similar industries in Berkshire, Oxfordshire, etc.

The one great drawback, which is at present prohibitive to the general use of this Kimmeridge shale oil, is the abnormal percentage of sulphur present. This exists in a very stable form, and has baffled the commercial attempts to eliminate it; but there is little doubt that a solution will be found, and it is suggested that it will probably lie in changed methods of retorting. The fact that the shale yields upwards of 60 gallons of oil per ton, more than twice the average yield in Scotland, indicates that when the difficulty of the sulphur content has been overcome it will become an important asset in the economic development of the country.

V. C. I.

NOTES.

A BOARD of Fuel Research has been appointed by the Committee of the Privy Council for Scientific and Industrial Research on the recommendation of their Advisory Council. Sir George Beilby will act as director of the new organisation, and be assisted by the Hon. Sir C. Parsons, Mr. R. Threlfall, and Sir R. Redmayne as members of the board. By arrangement with the governors of the Imperial College of Science and Technology, Prof. W. A. Bone will be retained as consultant to the Board of Fuel Research under the Department of Scientific and Industrial Research, continuing to hold his chair at the Imperial College.

SIR ARTHUR LEE has been appointed by the President of the Board of Agriculture Director-General of Food Production; the Hon. E. G. Strutt and Mr. A. D. Hall will, for the period of the war, be additional Agricultural Adviser and Scientific Technical Expert respectively, and the Duke of Marlborough has been appointed Joint Parliamentary Secretary to the Board of Agriculture, representing the department in the House of Lords. All the posts named are unpaid.

THE Board of Trade is taking possession of all the coal mines in the United Kingdom for the period of the war, and a new department is being set up to control the mines and to deal with production, output, distribution, finance, wages, and the price of coal. Mr. Guy Calthrop, general manager of the London and North-Western Railway Company, has been appointed head of the new department, and is designated Controller of Coal Mines. He will be assisted by Sir R. Redmayne, H.M. Chief Inspector of Mines, and an advisory committee consisting of persons selected

to represent coal-owners and coal-miners. Mr. Walker, the Deputy Chief Inspector of Mines, will act as Chief Inspector for the period of the war.

SIR BAMFYLDE FULLER has undertaken the charge of the department of the War Office which is dealing with the supply of timber for the use of the Army; the control of the use of timber in the United Kingdom with the view of effecting economy in its use for all purposes; the regulation of the purchase of such timber as may be imported from sources outside the United Kingdom, whether on Government or private account; and the stimulation of the felling of timber in the United Kingdom. Sir B. Fuller will be assisted by an Advisory Committee, composed of timber merchants chosen by the Timber Federation, and by others representing firms of repute which do not belong to the federation. The address of the department is Caxton House, Tothill Street, Westminster.

SIR ROBERT HADFIELD is succeeding the Rt. Hon. H. E. Duke, K.C., M.P., as president of the Society of British Gas Industries.

WE regret to learn of the death, on February 17, at the age of sixty-seven years, of Mr. George Massee, formerly of the Royal Botanic Gardens, Kew.

FROM Königsberg comes the news of the death of Dr. Friedrich Hahn, who occupied the chair of geography at the University there. He was born in 1852, began his academic career at Leipzig in 1879, and went to Königsberg in 1885. Hahn was a great traveller, having visited Australia, Polynesia, and Africa. He was a prolific writer, his principal work being the great collection, "Die landeskundliche Literatur der Provinzen Ost- und Westpreussen." Among his other books may be mentioned "Ueber Aufsteigen und Sinken der Küsten" (1870), "Inselstudien" (1883), "Die Städte der norddeutschen Tiefebene" (1885), and "Topographischer Führer durch Nordwest-Deutschland" (1895).

A MEETING of the Refractory Materials Section of the Ceramic Society will be held at the University, Leeds, on March 13 and 14, when the following papers will be read:—"The Dressler Kiln," Mr. Dressler; "The Spalling of Magnesite Bricks," Dr. J. W. Mellor; "A Process of Manufacturing Heavy Fireclay and Similar Articles," Mr. B. J. Allan; "Geology of Clays of Central Yorkshire," Prof. Kendall and Mr. Gilligan; "The Use of Zirconia as a Refractory Material," Mr. J. A. Audley; and "Temperature Measurements on Clay Works Practice," Prof. Cobb.

MR. A. CHASTON CHAPMAN will deliver a lecture, entitled "Some Main Lines of Advance in the Domain of Modern Analytical Chemistry," to the Chemical Society on March 15, and Dr. Horace T. Brown will lecture on "The Principles of Diffusion: their Analogies and Applications" on May 17. The following changes in the officers and council of the Chemical Society for 1917-18 have been proposed by the council:—*President*, Prof. W. Jackson Pope; *New Vice-Presidents*, Col. A. Smithells and Prof. Sydney Young; *New Ordinary Members of Council*, Prof. H. C. H. Carpenter, Prof. A. Findlay, Prof. A. Harden, and Dr. T. A. Henry.

SIR ALFRED KEOGH, Director-General of the Army Medical Service, presiding at a lecture at the Royal Institute of Public Health on February 14, stated that in France at that moment there were only five cases of enteric fever and eighteen cases of paratyphoid fever, with seventy or eighty doubtful cases. He attributed this result to inoculation, and the general