

Iron Ore in Europe.¹

By Prof. J. W. GREGORY, F.R.S.

THE political redistribution of the iron ores and coal supplies of Central Europe by the late war was one of the results of most portentous import to the future of the world. A clear summary of the available evidence by a well-qualified expert who represents so impartial an authority as the Geological Survey of the United States, is a valuable addition to the literature of political geology. The evidence on which the memoir is based is of very unequal value, for any individual synopsis of the iron ore position must be based on the published records, which are of varying quality in different countries; moreover, the author remarks that the Russian and Slavonic literature is available to him only at second hand.

Despite its deficiencies, inevitable in any review of the ore supplies of a continent which is such a political patchwork as Europe, Roesler's memoir is a valuable supplement to the monograph on the iron ores of the world which was published in 1910 by the International Geological Congress. Mr. Roesler has brought the information up to date and presents it in a more compact form. Moreover, he expresses the results graphically in a series of sixteen clear and instructive maps which show the distribution of the ore fields and the known and estimated qualities of ore in each.

The outstanding feature of the present position is the overwhelming predominance of France in Europe as regards supplies of iron ore. In this respect France among the nations of the world stands second only to the United States. "France has the largest reserves. She stands so clearly above the other countries of Europe that there is no question of her holding first place." The French known, probable, and possible iron ores are estimated at a total of 4,369,600,600 metric tons, a total which amounts to 35.2 per cent of the iron ore reserves of Europe; the British Isles take the second place with 18.2 per cent., Sweden is third with 12.5 per cent., the German Republic fourth with 11.1 per cent. According to the author's classification of European countries Spain is fifth with 5 per cent., for he subdivides Russia, with a total of 8.3 per cent. into the Central, Southern, and Ural regions. The Russian iron fields are so scattered that it is a great convenience to keep them distinct, for they may be developed as separate industrial areas each supplying a different group of provinces.

The British supplies accepted by Roesler are smaller than some estimates; he admits that the iron included in these estimates is present, but he considers that some of the material is of so low a grade that it should not be regarded even as possible ore. He remarks that his own figure for possible ore, 2254 million metric tons, may be too large.

Germany has fallen to the fourth place, and the unfavourable conditions of a large proportion of its ore has led to the prediction that it cannot be worked and that the future of Germany is "only that of an agrarian state." The author dismisses this hypothesis with the remark that Germany "has shown her capacity to use her resources thoroughly enough to justify the conclusion" that the ores left her will be fully exploited.

The large volume of French ores is due to the sedimentary ores in the Jurassic field of Lorraine. The sedimentary ores of Europe range from the pre-Cambrian beds at Krivoi Rog in Southern Russia to the Pliocene ores of Kerch in the Crimea, and

representative beds occur in most of the geological periods; but the most important supply comes from the Jurassic, which contains 46 per cent. of the European sedimentary ores. These ores contribute 70 per cent. of the total; the replacement ores amount to 12 per cent.; the contact deposits and magnetites, of which the genesis is doubtful, amount to 16 per cent.; in reference to these ores the author appears to have overlooked the fact that some of the large Lapland masses consist of titaniferous magnetite, and to overstate the strength of the case for the magmatic origin of the Kiruna ores.

The iron ore reserves are best known in Europe, and taking this quantity as the unit, the supply in North America would be represented by three, in South America by two, in Asia by three-quarters, and in Africa by one-sixth. In both Africa and Asia, however, the amount may be expected to be increased greatly by further exploration.

The reserves of iron ore in the world are estimated as sufficient to maintain the production of 1913 for 1000 years; but if the output of iron increases at the pre-war rate of 5 per cent. per annum, the supply would be exhausted in about 130 years; but a fall in the rate of increase appears inevitable, and consequently the ore reserves will have a longer duration.

The progress of the iron industry is of primary importance to the world and its future, and is especially difficult to forecast. Hitherto, Europe has had the advantages over the United States of cheap labour and of the proximity of ore and coal. In spite of this, the United States has gained the supremacy in the iron industry through economy in labour by mass production and through the large local market for manufactured goods which is maintained by the high wages paid. Europe has now to face conditions when labour is no longer cheap, and when the low efficiency that accompanies low wages cannot be as quickly altered. The main European iron field is now separated politically from the Westphalian coal field. The part of the Lorraine field which was French before 1914 was handicapped by lack of labour, and most of the miners were Italian; and unless adequate labour can be secured for the mines, and the Westphalian coal and the Lorraine iron can be brought together under favourable economic conditions, the development of the field will be jeopardised. The Belgian iron industry is dependent on German coal and on imported ore. Austria has no coal, and her considerable iron ores will probably be exported to feed the German furnaces. The three chief ore-exporting countries, Sweden, Spain, and Norway, will probably be but little disturbed by the new conditions, which will help the Norwegian ores, since most of them need concentration and briquetting.

The large British reserves of ore, though they have the advantage of proximity to coal, may be useless should the high price of fuel render it profitable only to melt high-grade ores which must be imported. The British iron industry will no doubt adjust itself to the new conditions, but Mr. Roesler predicts that the transition will be troublesome and painful. The outlook of the iron industry in this country is indeed dismal if costs of production can be lowered only at the expense of coal and labour. That there are opportunities for saving in other ways appears clear from the fact that whereas in the United States each blast furnace has an output of 120,000 tons per annum, in Germany it is 55,000 tons, and in England only 28,000 tons.

Mr. Roesler's work concludes with an excellent bibliography.

¹ "The Iron-Ore Resources of Europe," by Max Roesler, Dept. of the Interior, U.S. Geol. Surv. Bull. 706, 1921, pp. 152+xix. pls.+32 figs.