

THE
GEOLOGICAL MAGAZINE

NEW SERIES. DECADE VI. VOL. V.

No. XI.—NOVEMBER, 1918.

I.—THE IRON-FIELDS OF LORRAINE.

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RECENT events have again called attention to the enormous strategic and economic importance of the iron-fields of Lorraine; on these much of the commercial prosperity of Germany has been built up in the past, and on their possession her future as an industrial nation largely depends. For many years the output of iron-ore from the part of Lorraine under German control has been immense: in 1912, German Lorraine produced approximately 20,000,000 tons, while the output of Luxemburg, which, for all practical purposes, is German, was about 6,500,000 tons. In the same year the French portion of the Lorraine iron-field yielded 17,300,000 tons, making a grand total for this area of 43,800,000 tons of ore. During the War the whole of the French productive region has been occupied by the enemy, and there is no means of ascertaining what has actually happened there, but certain inferences can be drawn from published facts and on a basis of probability.

First, however, it is necessary to consider briefly the geographical distribution and geological structure of these regions. The Briey plateau forms a somewhat elevated region extending from the southern border of the Ardennes to a little south of Metz: it is dissected by the valleys of several rivers, including the Moselle, Orne, Fensch, Algringen, and Meurthe. Geologically the plateau is composed of Jurassic rocks, chiefly Lias and Dogger, and it is near the boundary of these two series that the beds of iron-ore occur. By German geologists they are referred to the Dogger, by French authorities mostly to the Lias. According to Van Werveke they belong to the zone of *Ammonites Murchisonæ*.

The Briey field is nearly 40 miles long, with a width of about 15 miles, within which the ore is believed to be payable; south of it comes a barren region extending for some 15 miles and then the Nancy field, which is about 13 miles long. The Lorraine plateau as a whole is divided by rivers and other natural boundaries into several subsidiary regions, while the basins of Longwy and Crusnes are of considerable importance. In the French portion of the Briey field the chief subdivisions recognized are those of Orne, Landres, and Tucquegnieux.

The general geological structure is very simple, as the whole series dips gently to the west. The iron-bearing beds outcrop on the eastern side of the plateau a few miles east of the frontier and in the south of Luxemburg, hence they naturally become deeper and

deeper towards the west in French territory. On the east and south the thickness is from 50 to 70 feet, but this increases to about 200 feet westwards and in Luxemburg, with a corresponding falling off in quality. The ferruginous series consists of an alternation of beds of oolitic iron-ores of various colours with limestones and occasional marls. The iron-ores, which are locally known as Minette, have been formed by metasomatic replacement of calcareous oolitic grains, probably consisting originally of aragonite, while the cement has chiefly remained calcareous. As before stated, the percentage of iron varies regularly from north to south, and this has a most important economic bearing. In Luxemburg the average iron-content is 30 per cent or less, while in the south of the Briey plateau it rises to as much as 40 per cent, with 9 to 14 per cent of lime and 4 to 7 per cent of silica. In the Longwy and Crusnes fields the ores contain less lime, while the silica rises to 20 per cent in some cases; the proportion of phosphorus remains very constant throughout, averaging about 1·8 per cent.

Hence the ores must be regarded as distinctly phosphatic, and it was the introduction of the Thomas-Gilchrist process in 1882 that led to the vast industrial development of this area.

Several careful computations of reserves have been made, and the following figures are estimates of ore still available in the different districts and workable under present economic conditions :—

	TONS.
Briey	2,000,000,000
Longwy	275,000,000
Crusnes	500,000,000
German Lorraine and Luxemburg	2,000,000,000
Total	<u>4,775,000,000</u>

Of this total considerably more than half was in French territory, including practically the whole of the higher-grade portion. The potentialities of the western portion of the Briey plateau were not known to the German authorities when peace was concluded in 1870, and an endeavour to rectify the mistake then made must certainly be regarded as one of the causes of the present War. The whole of the Briey field as well as those of Longwy and Crusnes are occupied by the Germans, and it is of interest to consider what is now going on there. Lately published statistics relating to Luxemburg throw some indirect light on the matter. In 1912 the output of Luxemburg was 6,511,000 tons, and in 1916 6,752,000 tons. In 1917 the output fell suddenly to 4,502,000 tons, and in August, 1918, some 450,000 tons still remained unsold in that country, owing to excess of supply over demand. The consumption of iron-ore in Germany at the present time is undoubtedly very great, and the natural inference is that Germany is now exploiting as largely as possible the richer ores of the Briey plateau and neglecting the poorer ones of German Lorraine and Luxemburg. It is also stated that there is an active demand for siliceous ores, as opposed to the more calcareous varieties, and it is a natural inference that ore of this kind is being obtained from the Longwy

and Crusnes fields. Hence it is clear that German munitions of war are being very largely manufactured from French ore, thus diminishing the potential mineral wealth of that country, in addition to the actual damage inflicted by the said munitions during the War. These are facts which will have to be taken into consideration at the Peace Conference.

II.—ADDITIONAL NOTES ON THE PETROGRAPHY OF SOUTH GEORGIA.

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THE rocks which form the subject of this paper were collected by the captain of a whaling vessel belonging to the fleet of Messrs. Salvesen & Co., of Leith, stationed at Leith Harbour, South Georgia. The collection reached me, for description, through the kind offices of Mr. D. Ferguson, Mem. Inst. M.E., who recently visited the island, and who has described its geological features.¹ Two previous collections of rocks from South Georgia have been described by me, one collected by Mr. Ferguson during his visit,² the other collected in the same way as the present set.³

The collection consists of twenty-six specimens, nineteen of which are from Larsen Harbour, at the extreme south-eastern end of the island, in the midst of the "altvulkanischer" area found by Heim.⁴ Three specimens are from Gold Harbour, on that part of the coast that trends nearly due north and south near the south-eastern end; and four specimens are from King Haakon Harbour, about the middle of the long, icebound, southern coast. Most of the material is igneous, or derived from igneous rocks by alteration; the few remaining specimens belong to the sedimentary series of which the greater part of South Georgia is built. The rocks may be classified as follows:—

1. IGNEOUS ROCKS AND THEIR DERIVATIVES.

- (1) Spilite.
- (2) Soda-felsite (Quartz-felsite of previous paper).⁵
- (3) Greenstone (Albite-dolerite?).
- (4) Epidosite and other Vein Rocks.

2. SEDIMENTARY ROCKS.

1. IGNEOUS ROCKS.

(1) *Spilite*.—Several specimens belong to this type, all derived from Larsen Harbour. They are compact, grey-green, non-porphyrific rocks, carrying veins of quartz, chlorite, and epidote. In some specimens small amygdales of dark-green chlorite or yellowish-green epidote occur.

¹ "Geological Observations in South Georgia": Trans. Roy. Soc. Edin., vol. 1, pt. iv, pp. 797-814, pls. lxxxi-xci, 1915.

² "Petrography of South Georgia": *ibid.*, pp. 823-36, pl. xciv.

³ "Further Notes on the Petrography of South Georgia": GEOL. MAG., dec. VI, Vol. III, 1916, pp. 435-41.

⁴ "Geol. Beob. ü. S. Georgien": Zeit. Ges. Erdk., 1912, pp. 451-6.

⁵ *Op. cit.*, p. 438.