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IRON ORE DEPOSITS IN FOREIGN
COUNTRIES.

REPORTS

ON

IRON ORE DEPOSITS
IN FOREIGN COUNTRIES

COMPILED AT THE

BOARD OF TRADE

FROM INFORMATION COLLECTED BY

H.M. DIPLOMATIC AND CONSULAR OFFICERS.

Presented to both Houses of Parliament by Command of His Majesty.



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1905.

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To the Secretary of the Board of Trade.

SIR,

THE volume which I have the honour to present herewith, with regard to Iron Ore deposits in foreign countries, has been prepared in the Commercial Intelligence Branch of this Department from information collected by H.M. Representatives abroad in response to the circular from the Foreign Office and Memorandum of questions printed on the following page.

The inquiry was undertaken in consequence of representations received by the Board of Trade from the British Iron Trade Association, and the questions addressed to H.M. Representatives were based on the suggestions made by that Association.

It is evident that the usefulness of the present digest of reports to those interested in the British iron trade consists almost wholly in the details of the replies received from each district to a series of specific questions. Any general summary would therefore be of little value for the purpose for which the inquiry was made, and no such summary has been attempted. The replies from each district are arranged in the numerical order of the questions contained in the Memorandum.

A number of samples, maps, and miscellaneous enclosures referred to in the various reports may be seen by persons interested in British trade at the Office of the Commercial Intelligence Branch, 73, Basinghall Street. E.C.

It is hoped that the results of the inquiry will be of some service to the trade on behalf of which it was undertaken.

I am, &c.,

H. LLEWELLYN SMITH.

June, 1905.

Copy of Circular Despatch from the Foreign Office to various Diplomatic and Consular Officers.

Circular.

Commercial.

Foreign Office,

11th September, 1903.

SIR,

I AM directed by the Marquess of Lansdowne to state that information is desired by the British Iron Trade Association as to the extent and character of iron ore supplies in foreign countries, and to transmit herewith copy of a Memorandum containing questions to which answers are desired.

I am to instruct you to endeavour to obtain such information as is in your power respecting iron ore within your Consular district, and to furnish his Lordship with a Report on the subject.

I am, &c.,

F. A. CAMPBELL.

His Majesty's Consul

MEMORANDUM.

IN the interests of the iron industry of the United Kingdom, the British Iron Trade Association are desirous of obtaining information as to the extent and character of the ascertained iron ore supplies in a number of countries.

The information sought is described in the following questions, each of which should be answered directly and precisely for purposes of tabulation. Any additional information, which will likewise be welcomed, should be given separately under the last heading (9):—

1. Are any deposits of iron ore reported to exist in your Consular district?
2. Where are they? What is the nearest shipping port capable of admitting ocean steamers? and how far is it away from the ore deposits?
3. What would the transport of ore cost to the port per ton? State if by rail, road, or canal.
4. What is the character and cost of labour available for mining (or quarrying) and loading? Give estimate, if possible, of cost of mining (or quarrying) and loading in carts or on railway trucks per ton.
5. Are any official analyses of the ore obtainable? If so, copies of same should be forwarded; or, if not, average samples should be sent.
6. Are the proprietors of the deposits rich or poor? In other words, are they likely to be sellers of the deposits on reasonable terms or not?
7. Have any of the deposits been worked hitherto? If they have, give quantities and destinations of shipments, if possible, for five years.
8. Are there any special obstacles in the way of successful continuous and unencumbered mining in your district?
9. Please give any additional information in your possession with regard to the iron ore supplies in your district.

List of (A) Samples, (B) Maps, and (C) Miscellaneous Enclosures referred to in the various Reports, and to be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

A.—SAMPLES.

- Ore from Wimille, near Boulogne.
 „ Corsica.
 „ Oporto.
 „ Brussa (Asia Minor) [5 samples].
 „ Rubigo, near Scutari (Albania).
 „ Adis Ababa (Abyssinia).
 „ Harrar
 „ Copiapo (Chile) [2 samples].
 Iron Sand from Costa Rica (referred to in Report from Mr. Sanderson, H.M. Consul-General at New York).
 Ore from Guadeloupe.
 „ Tegucigalpa (Honduras).
 „ Peru [5 samples].
 „ Muscat (Arabia).
 „ Wuhu (China).

B.—MAPS.

- Eastern Bohemia.
 Siegerland (Germany).
 Lower Rhine and Westphalia.
 Greece.
 Kragerö and neighbourhood (Norway).
 S.E. Norway.
 Chile (2 maps).
 Mexico (2 maps).
 N. Carolina and Tennessee.
 Michigan and Lake Superior Districts (2 copies).
 Kiangsi (China).
 Yokohama Consular District.
 Besh Parmak District (Smyrna).

NOTE.—Several other maps will be found in the Reports and other publications referred to below, under the head of "Miscellaneous Enclosures."

C.—MISCELLANEOUS ENCLOSURES.

- Analyses of Bohemian Iron Ore deposits.
 Pamphlet on Iron Ore deposits in Bulgaria.
 Books, Russian Iron Mining (6).
 Pamphlets of Dunderland Iron Ore Company.
 Pamphlets on Swedish Iron Ore Fields (with maps).
 Pamphlet on Iron Ores of Brazil.
 Photographs of Mining in Santiago de Cuba.
 Bulletin on N. Carolina district.
 Report on Iron Ore Deposits in Philippine Islands.

**List of Consular Districts as to Deposits in which Reports
have been received.**

EUROPE.	EUROPE— <i>cont.</i>	AFRICA— <i>cont.</i>
AUSTRIA-HUNGARY :— Bohemia. Bosnia and Herzegovina. Budapest. Trieste. Vienna.	RUSSIA—<i>cont.</i> Rostov-on-Don— Mariupol. Kertch. St. Petersburg. Warsaw.	FRANCE (Possessions of) :— Algeria— Algiers. Bône. Oran. Philippeville. Madagascar— Antananarivo. Tamatave. Senegal— Dakar. Grand Bassam.
BULGARIA.	SERVIA.	GERMAN EAST AFRICA.
DENMARK. Faroe Islands. Iceland.	SPAIN :— Barcelona. Bilbao— Castro-Urdiales. San Sebastian. Santander. Cadiz— Cordoba. Seville. Huelva. Corunna— Vivero. Malaga— Aguilas. Almeria. Carthagena. Garrucha. Granada. Marbella. Mazarron.	LIBERIA.
FRANCE :— Ajaccio (Corsica). Bayonne. Bordeaux. Boulogne. Calais. Cherbourg. Havre. Lille. Marseilles. Nantes. Paris. Toulouse.	SWEDEN AND NORWAY :—	MOROCCO :—
GERMANY :— Dresden. Dusseldorf. Frankfort-on-Main. Hamburg. Mannheim. Munich. Stuttgart.	Christiania— Bergen. Bodö. Arendal. Christiansund, N. Egersund. Kragerö. Laurvig. Lofoten Islands. Mosjöen. Namsos. Porsgrund. Risör. Tromsö. Vadsö. Gothenburg. Stockholm.	Dar-al-Baida— Mogador. Tangier.
GREECE :— Cephalonia. Piraeus. Syra (Cyclades) Seriphos. Thermia. Zea.	SWITZERLAND :— Zurich— Lucerne.	PORTUGAL (Possessions of) :— Loanda. Lourenço Marques.
HOLLAND :— Amsterdam.	TURKEY :—	TUNIS.
ITALY :— Elba. Leghorn. Lombardy. Naples. Rome.	Constantinople— Rodosto. Scutari. CRETE (Canea).	AMERICA.
PORTUGAL :— Lisbon. Oporto.	AFRICA.	ARGENTINE REPUBLIC :— Buenos Ayres— Cordoba.
ROUMANIA :— Galatz.	ABYSSINIA :— Adis Ababa. Harrar.	BOLIVIA.
RUSSIA :— Batoum. Helsingfors. Odessa— Nicolaieff.		BRAZIL :— Rio de Janeiro. Rio Grande do Sol. Santos.
		CHILE :— Coquimbo. Valparaiso— Caldera. Copiapo.
		COSTA RICA :— San José.
		COLOMBIA (including PANAMÁ).
		CUBA :— Havana— Cienfuegos. Matanzas. Santiago de Cuba.
		ECUADOR :— Guayaquil.
		FRANCE (Possessions of) :— Martinique— Guadeloupe

List of Consular Districts as to Deposits in which Reports
have been received—*continued.*

AMERICA— <i>cont.</i>	AMERICA— <i>cont.</i>	ASIA— <i>cont.</i>
HOLLAND (Possessions of) :— Surinam— Paramaribo.	UNITED STATES— <i>cont.</i> New Orleans— Arkansas. Alabama. New York. Philadelphia. Portland (Oregon)— Seattle. Porto Rico. San Francisco— California. Nevada. Arizona. Utah.	FRANCE (Possessions of) :— Pondicherry.
HONDURAS :— Puerto Cortes. Tegucigalpa.		HOLLAND (Possessions of) :— Batavia.
MEXICO :— Ensenada. Tampico. Vera Cruz.		JAPAN :— Kobe. Shimonoseki. Yokohama.
NICARAGUA :— Managua.	VENEZUELA :— Cuidad Bolivar.	PERSIA :— Kerman.
PANAMA.	ASIA.	SIAM :— Bangkok.
PARAGUAY.	ARABIA :— Muscat.	TURKEY IN ASIA :— Aleppo and Adana. Bagdad. Brussa. Damascus. Dardanelles. Erzeroum. Hodeidah. Jerusalem. Smyrna— Samos.
PERU.	CHINA :— Amoy. Chinkiang. Foochow. Hainan. Hankow. Kiangsi. Kuangsi. Newchwang. Ningpo. Pakhoi. Tien-tsin. Wuhu.	UNITED STATES (Possessions of) :— Manila.
SAN DOMINGO.		
SAN SALVADOR.		
UNITED STATES :— Baltimore. Charleston. Chicago— St. Louis. Galveston— Texas. New Mexico.		

List of principal Foreign Moneys, with their approximate
English Equivalents, used in the Reports.

Foreign Countries.	Money.	Approximate par Value.
Russia	Rouble ($\frac{1}{15}$ of Imperial) ...	£ s. d. 0 2 1 $\frac{1}{3}$
Finland	Mark (100 Penni)	About 0 0 9 $\frac{6}{10}$
Norway	Krone	} 0 1 1 $\frac{1}{3}$ or 18 to the £
Sweden	Krona	
Denmark	Krone	
German Empire	Mark	
Holland	Gulden	0 1 0 0 1 8 or 12 to the £
Belgium	} Franc	0 0 9 $\frac{6}{10}$ or 25 to the £
France		
Algeria		
Tunis	} Milreis	0 4 6 (currency value about 3s. 7d. in 1903).
Switzerland		
Portugal		
Spain	Peseta	0 0 9 $\frac{6}{10}$ (currency value about 7d. in 1903).

List of principal Foreign Moneys, with their approximate English Equivalents, used in the Reports—*continued.*

Foreign Countries.	Money.	Approximate par Value.	
Italy	Lira	£ s. d. 0 0 9 ⁶ / ₁₀	
Austria	Krone (100 Heller)	0 0 10	
Hungary	Korona (100 Filler)	} or 24 to the £	
Greece	Drachma	0 0 9 ⁶ / ₁₀ (currency value about 6·14 <i>d.</i> in 1903).	
Bulgaria	Lew	0 0 9 ⁶ / ₁₀	
Servia	Dinar	0 0 9 ⁶ / ₁₀	
Roumania	Leu	0 0 9 ⁶ / ₁₀	
Turkey	Piastre	0 0 2·16 or 100 Piastres equal 18 <i>s.</i>	
Egypt	L. Egyptian (100 Piastres) Piastre.	1 0 6 ¹ / ₄ 97 ¹ / ₂ Piastres to the £	
United States	} Dollar	0 4 2	
Porto Rico			
Cuba			
Mexico			Dollar (Silver)
Venezuela	Bolivar	0 0 9 ⁶ / ₁₀ (in 1903).	
Costa Rica	Colon	0 1 10 ¹ / ₆	
Chile	Peso Fuerte	0 1 6 0 1 4 ¹ / ₂ - ³ / ₄ (currency value in 1903).	
Peru	Libra (10 Soles)	1 0 0	
Brazil	Milreis	0 2 3 (currency value about 1 <i>s.</i> in 1903).	
Uruguay	Peso Fuerte	0 4 3 ¹ / ₆	
Argentine Republic	Peso	0 4 0 (currency value about 1 <i>s.</i> 9·12 <i>d.</i> in 1903).	
Paraguay	Peso	0 4 0 (currency value 4 ¹ / ₂ <i>d.</i> to 5 <i>d.</i>).	
China	} Dollar	About 1 <i>s.</i> 8 ¹ / ₂ <i>d.</i> in 1903.	
Japan			Shanghai Tael (= 1000 cash)
Japan			Yen (100 sen.) ... ..	2s. 4^{1}/_{4}d. to 2s. 4^{1}/_{2}d. 0 2 0^{1}/_{2}

List of principal Foreign Weights and Measures, with their approximate English Equivalents, used in the Reports.

Metric Ton	2,204 lbs. avoird.
Kilogramme	2·204 " "
Metric Quintal... ..	220·4 " "
Kilometre	·621 miles.
Metre	1·09 yards.
Hectare	2·47 acres.
Poud (Russia)	36 lbs. avoird.
Oke (Greece)	2·75 " "
Cantar (Egypt)... ..	99·05 " "
Catty (China and Japan)	1·33 " "
Picul " " "	133 ¹ / ₃ " "



IRON ORE DEPOSITS IN FOREIGN COUNTRIES.

REPORTS ON IRON ORE DEPOSITS IN FOREIGN COUNTRIES,

COMPILED AT THE BOARD OF TRADE FROM INFORMATION COLLECTED
BY H.M. DIPLOMATIC AND CONSULAR OFFICERS.

(For List of Questions, see page 4.)

EUROPE.

AUSTRIA HUNGARY.

BOHEMIA.

(Captain Forbes, Consul.)

1. Yes, Bohemia is particularly rich in iron ore deposits, and they are to be met with in all parts of the kingdom.

2. These ores occur in primary rock, in transition rock, as also in more recent formations, and are found in beds, lodes, masses and accumulated veins. The silurian strata are the richest in ores. The iron ore deposits in Bohemia consist for the most part of dense and lenticular granular red ores, which are frequently to be met with in such abundance that, although they have been worked for centuries, the supply is assumed to be practically inexhaustible. In the silurian formation these deposits are chiefly found to cross it in two directions almost parallel with each other. The northern vein begins at Hruschna Hora. In it are the mines of Hrebiny, Hredl, Wossek, and Klabava. The southern commences at Nutschitz, and is being worked by the mines at Horowitz, Straschits and Holloubkau. There also frequently occurs a very ferruginous magnetic green stone in large masses, which, on account of its being easily smelted, is not* worked off. The yield of the Bohemian ore varies from 25 to 50 per cent. and over. In some parts of the country, particularly in the district of Budweis, the mines are greatly scattered. The lodes are intermissive and not of great thickness, and, moreover, the means of communication between the mines and the smelting works are inadequate.

The following is taken from the publication issued by the Imperial Office of Mines in Vienna for the year 1837,* and will be of interest as locating the richest iron ore deposits in this country. It states, speaking of the Austrian Empire generally, that the occurrence of iron ore in the strata of the silurian formation is most frequent in Bohemia, where the basin extends from S.W. to N.E., from Bischofteinitz over Pilsen, Beraun and Prague as far as the river Elbe at Celakowitz, for a distance of over 20 miles. It attains its greatest breadth, 10 miles, in the neighbourhood

* *Sic* in original.

of Pilsen, whilst towards the Elbe it gradually narrows down to 4 miles. The silurian basin contains an almost inexhaustible quantity of iron ore. The iron ore beds between Prague and Beraun are now being worked, and produce more than one-third of the total output in Bohemia. Beside the underlying beds with fine-grained hematite, giving over 50 per cent. of iron, two hanging beds are being worked containing reddish-brown oolitic hematite of great purity, yielding as high as 52 per cent. of iron, but more frequently red clay iron ore, with a yield of from 30 per cent. to 40 per cent. of iron. This ore chiefly forms the richness of the silurian beds of Bohemia. Next of importance to the Neucic mines, between Prague and Beraun, is the occurrence of iron ore on the Hruschna Hora mountain, a ridge of about 2,000 fathoms in length, and here there are three parallel beds. The main, or underlying bed, has a thickness of from 5 to 6 fathoms, and sometimes even 10 fathoms, the middle bed of one fathom and the hanging bed of half a fathom. The beds strike parallel with the mountain ridge, and incline in all directions from 35° to 50° with the hanging wall. Grey slate forms the underlying bed and almond stone-like diorite the hanging wall. The occurrence of iron ore has a length of 1,600 fathoms, with a development depth of 120 fathoms. The ore occurs also on the Skalka and Studney mountains, on which are the Zdic and the Giftberg mines respectively, on the Wostrey mountain, near Wisek, the Hlava mine, near Homorsko, the Ilwain mine, near Zbiron, also in the neighbourhood of Klabawa Eipowitz, Hischitz, and at Brezina, near Bras.

Brown iron ores occur in the silurian formation chiefly in beds, or in accumulated veins, masses and bog lodes, they are nowhere as thick as the lenticular red iron ore deposits, but richer in yield. Such beds chiefly occur in the Rac mountains, near Glashutten, Hocanda, Lhota, accumulated veins and masses at Witeinka, Seskov, Svejtovice, St. Jakob and Rakova.

Magnetites occur in the silurian basin only at one place, *i.e.*, near Glashutten. Brown iron ore occurs partly in beds, partly in masses and accumulated veins on the Geissberg mountain and at Stolkaberg, between Eisenhutten and Kohentz in the silurian formation.

In this report attention is only drawn to those mines which have ceased to be worked on account of the scarcity of wood for fuel for smelting purposes, and to these might be added many others which, on account of the existing commercial depression, could now be purchased far below their real value.

Neudeck on the Prindlberg.

This mine was worked for magnetic iron. The Prindlberg ore connected with rock consisting of amphibole, actinolite, chrysolite and granite. The lode strikes from north to south, and inclines from 70° to 80° towards the east, its thickness being from 15 to 19 metres, but also often 13 metres in thickness, and the lode appears perfectly filled up with ore. From the granite the mass of the lode is separated by a thick wall-like layer consisting of a mixture of felspar quartz and a chlorite-like mineral. In the N.W. of Joachimsthal and at Goldenhoh, magnetic iron ore also occurs in a rock formation of amphibole, actinolite, sometimes in granite, and in some places diorite bedded parallel to the strata of the partition rock consisting of mica slate. It strikes eastward, dipping towards the north; the ore impregnated with the ingredients of the mass of the layer forms deviations to 0.3 metres in thickness.

One of the more important beds of ore is in the so-called Maze, reaching from Jugenhengst, Irrgang, Hengstererben, Merlsgrun as far as Pfaffengrun, with a main striking 9 to 10 h. and falling S.W. with 61° to 71° was worked in a thickness of 9 to 10 metres. The ores, mostly red iron ores, are in accumulated veins, extending to four or more metres in thickness, or in layers separated in the lode mass, consisting of hornstone quartz, clay, and some manganese ore containing an average of 40 per cent. to 50 per cent. of iron.

The occurrence of clay, iron ore and sphaerosiderites in the brown coal formation situated in the districts of Falkenau, Elbogen, and Karlsbad must also be mentioned. These ores, designated locally as diluvial ores, occur not only in the sandstone of hanging wall, but also in the centre of the formation, and sometimes in the midst of the coal itself as well as in the midst of the underlying ore, also in scattered accumulated veins and as independent seams, frequently but a few metres under the surface of the soil. The thickness of these varies from 0.3 to 1.3 metres. The ores are easily smelted and contain 28 to 30 per cent. of iron.

Iron ore deposits occur at Zieditz, Grasseth, Thein, near Falkenau, Littnitz, Albernhof, Rossmesl, Taschwitz, Wintergrun, Unter Chodan, Bergaus, Grausau, Neusattl, near Ellbogen, Lossau, Rossnitz, Ottowitz, Dollwitz and Fischern, near Karlsbad.

The Erzgebirge.

The south-west and middle of the Erzgebirge range consist chiefly of gneiss, granulite, glimmer slate and primeval clay slate, but gneiss prevails. Here also magnetic iron ores occur in connection with actinolite, amphibole, granite, chlorite and other minerals, and are worked at Sebatiansberg, Ulmbach, Zobietits, Radis, Wohlan, Dorusdorf, Kupferberg, Kleinthal, Ober and Unterhals, Orpus, Pressnitz and Pleil, also in the Kremsig and Auspach mountains.

Near Orpus the ore is combined with a mixture of amphibole, actinolite, chlorite and granite; and it begins in the glimmer slate on the border of the gneiss and continues from Gross Spitzberg southward through Schmiedeberg as far as Oberhals.

The lode contains accumulated veins of magnetic iron ore, with 50 per cent. to 60 per cent. of iron, is two metres thick, and more or less mingled with the partition rock. On the eastern side of the layer a crystalline limestone occurs; these contract so much, that as the ore increases in thickness the other decreases. On a deeper plane the ore changes to a red iron ore, as a shaft sunk to 60 metres shows, having struck such a lode, striking 10 to 11 h. Between Orpus and Kupferberg the magnetic iron ore forms, with the above-named minerals, a layer 1.3 to 2 metres in thickness in the glimmer slate, which has a S.E. striking and S.W. flattening of 20° to 25°. In the underlying wall granulated limestone and also dolomite occur.

Near Kupferberg, on the so-called red Sudelheath, magnetic iron ore occurs in beds, accumulated veins, and also disseminated in an elementary manner, consisting of amphibole, actinolite, glimmer and sometimes chlorite, which begins in a not inconsiderable quantity in glimmer slate, not far from the border of the gneiss. Here, also, the ores in the deeper beds change over into red iron ore, the better sorts of which contain from 50 to 60 per cent. of iron.

The average striking of the red iron ore lodes is from 9 to 11 h., the flattening partly S.W. and partly N.E. One of these lodes reaches a thickness of 2 metres with a N.E. falling of 15° to 20°. In addition to the red iron ore the lode consists of quartz, hornstone, dolomite, red and brown clay, and in some places manganese ore, brown spar and calc spar; fragments of amphibole and chlorite are not infrequent. At Oberhals a red iron ore lode, 2 to 2½ metres thick was developed at a perpendicular depth of 14 metres, striking 7 to 8 h., and falling in under 40° to 45° to N.N.E. The lode consists of beds and accumulated veins of red iron ore and clay, quartz and hornstone from 0.2 to 0.3 metres in thickness. At a depth of 28 metres a second lode was struck, 16 metres thick, with a similar occurrence of ore, &c. Both beds are near the surface of contact between the strata of glimmer slate and the gneiss. Between Kleinthal and Hudorf there is a red iron lode, which, besides the ore, contains quartz and hornstone.

The extensive bed occurring at Pressnitz is 9.5 metres thick, and with regard to its mineral ingredients equals that of Orpus. The magnetic iron ores yield 30 per cent., and occur layer-like and parallel to the wall of the mass. A similar ore is to be found in the Kremsig mountains; the elementary matter of the bed may well be designated as eilogite; the magnetic iron ore beds are from 0.05 to 0.07 metres thick.

To the N.W. of Pressnitz, in the Auspach mountains, glimmer, red hematite, iron ochre, spar ironstone and dense brown iron ore occur, the thickness of which varies between 0.3 and 0.4 metres, but also extends from 2 to 2½ metres.

Besides the preceding there are, in the Erzgebirge and its vicinity, many other ironstone deposits; concessions have been granted to individuals, to mining companies and to syndicates. This is the case in the districts of:—

Wildstein—Watzkenreuth.

Falkenau—Grasuth, Zieditz, Bleistadt, Hloku, Zwodau, Lanz, Thein, Pochlowitz, and Dassowitz.

Ellbogen—Littnitz, Ziegelhütten.

Graslitz—Hochgart, Weizengrün.

Neudeck—Neudeck, Platten, Baringen.

Pressnitz—Pressnitz, Pleil, Zobietitz, Oberhals.

Haaden—Radis, Tschachowitz.

Kommotau—Strosan, Skyrl-Priesen.

Gorkau—Horena.

Eastern Bohemia.

In the east of Bohemia iron mining up to the year 1876 was not of importance, and in that year ceased entirely in consequence of the lack of communication. The nearest railway station to the mines was Kuttenberg, on the N. W. Railway, 40 kilometres distant. A local railway line has now been built leading direct to the mining district, and was completed on the 1st August, 1903. This will now enable the excellent magnetic iron ore lode on Mount Fidnik to be worked. The many small heaps and sinkings show that magnetic iron ore was obtained by open workings, which only reached a depth of from 20 to 25 metres below the surface, the bulk of the lode lying deeper, not having, as yet, been touched. Judging from these old workings, it would appear that they were carried on in three principal groups. The northern group, situated in the Stollen forest, is at present entirely abandoned, as also the middle group, but there are still old miners living in the neighbourhood who remember the small shafts near the church, and the excellence of the ore obtained. The third group, near the market town of Hammerstadt, on the Thalberg, was worked as late as the year 1876; here there are three open shafts at a distance of 22 metres from each other, the shallowest having a depth of 15 metres, the next of 22 metres, and the third, the drawing shaft, of 50 metres. In all these shafts the ores stand on the level, the thickness increasing with the depth, and in the 50 metres drawing shaft the lode is from 9 to 20 metres thick. The ironstones in the heaps around these three shafts are chiefly coarse to fine-grained magnetic iron ores, but the so-called black and granite iron ores are also to be found among them. The fastness of the ground through which the shafts are sunk renders timbering unnecessary. According to extant analysis, the magnetic iron ore here contains in its purer varieties—

Iron, 60.43 per cent.

Phosphorus, 0.027 per cent.

Copper, 0.009 per cent.

Silicic acid, 7.72 per cent.

with traces of manganese and sulphur.

These Fidnik ores were difficult of fusion, and were mixed with easily fused limonite ores obtained from the left bank of the river Sazava, near Frennystovsko, and at Konitz, Seboric and Horka.

Notwithstanding the high percentage of silicic acid, the presence of lime was not excessive, which may be explained by the presence of amphibole and granite with the ore containing basic additions. The N. W. Railway having now brought its line to Hammerstadt in the immediate vicinity of the mines, the greatest obstacle to their further development has been removed. For this purpose little capital would be required, as the strong current of the Sazava would be utilized, and the whole layer could be worked by a short and cheap shaft of 150 to 200 metres. The value of the magnetic ore from Fidnik is, at the lowest, worth 2 kronen per metric centner (about 17s. a ton), and the cost of obtaining it is as follows:—

	Kronen.
For one metric centner (220½ lbs.)	0.50
For amortization	0.10
Freight to frontier	0.80
	<hr/>
Cost per metric centner	1.40
	<hr/>

The profit would therefore be per metric centner, 0.60 kronen, or about 5s. per ton.

Rockycan District.

Near Rockycan, to the west of Hlabava, an arch-like bed of ore crops out, the underlying wall of which is formed of flinty slate. This bed is 9 to 12 metres thick, showing in its middle part a striking to 9 h., with a S.W. flattening of 30° to 40°, and in its western part a striking to 7 h., with a southern falling in of 50° to 60°. Above the underlying wall of the bed of flinty slate there is: first, hornstone, 5 to 9 metres thick, then a bed of clay slate from 2 to 11 metres thick. The bed consists of dark grey, partly lenticular sphaeroidites, but changes towards the underlying strata to lenticular red iron ore. In the striking and flattening several disturbances and fissures occur. Also on the left bank of Hlabava broad beds of ore are found under the same conditions.

The Bohmerwald (Bohemian Forest).

Many of the iron mine concessions in this district are now being worked for coal, as also the districts of Horkan, Neucen, Mies, Stab and Tuschkan, on its eastern border, more particularly the two latter, which are in the S.W. sphere of the Pilsen coal basin, and owe their origin only to the sphaeroidites there occurring. For mining purposes, only the following are of interest. In the vicinity of Altzetlisch, Otracin, and Wikan is found hematite formed in decomposed gneiss, in horn-blend slate, and elementary clay slate in irregular lodes and masses. Brown iron ore also occurs at Gross- and Kleinwoneditz, Elsch, Strachowitz, Pernarditz, Mayerhofen, Waltschina, Neudorf. Near St. Katherina several beds are formed in crystalline limestone with hornblend slate between strata of glimmer slate. These are rich in rough granite, which decomposes into brown iron ore; there are also to be found in the slate, magnetite, magnetic iron, copper pyrites and bisulphate of iron. Near Eisendorf on the Bavarian frontier spathic carbonate was worked, it is finely disseminated in gneiss; and there is also brown iron ore, which occurs in irregular accumulated veins in decomposed gneiss and hornblend slate near Amplatz, Widlitz and Abelwitz, at Mirkowitz and Schlattin, to the N.W. of Bischofteinitz, and at Schweissing and Kochenz, to the N.W. of Mies.

Eastern Bohemia and the Riesengebirge.

The Riesengebirge is composed of crystalline slate, the occurrences of iron ores here are similar to those on the Erzgebirge, but far inferior in yield of iron. The clay-slaty formation on the southern slope of the Riesengebirge contains numerous beds of brown iron ore, but there are no mines of any importance.

In the mountain district of Kamenitz the lodes have a thickness of 1.6 to 4 metres, and are bedded in clay slate between limestone. They decline southward under 70° and consist of decomposed clay holding hard rock of brown iron ore, and excellently adapted for smelting, possessing a yield as high as 50 per cent. and more of iron.

Near Wrath there are two beds of brown iron ore, yielding from 25 per cent. to 35 per cent. of iron. The beds of brown iron ore developed at Jessecnac, Roztok and Haratitz, are 1.9 and 2.9 metres in thickness, and yield from 25 per cent. to 30 per cent. of iron. They are favourably situated with light freightage, and the frequent occurrence of limestone makes them more valuable, so that both iron and limestone could be drawn from the same mine.

In the tertiary strata of the Wittingau and Budweis basin, clay iron ores occur. The northernmost layer of the strata consists of a series of thick beds of rough sand mixed with clay, which is more or less fast. The clay often sandy, also often fine, plastic and fire-proof, contains 4 or 5 metres beneath the surface beds of iron ore 0.2 metres at the thickest. These have been worked by numerous mines, but are of little value owing to the small yield of iron and the irregularity of the deposits.

The nearest seaport capable of admitting ocean steamers is Hamburg, to which the ore could be conveyed by barges from Laube, on the frontier of Bohemia, on the river Elbe, having been brought to that place from the mining districts by rail.

3. Taking Pilsen as the most central point, the freight by rail per metric ton of ore to Laube is 6 marks (6 shillings). The freight from Laube to Hamburg by river varies from 3.50 to 6.50 marks per ton of ore, according to the water conditions, therefore, the total cost per ton freightage from Pilsen to Hamburg is from 9.50 marks to 12.50 marks, or from 9s. 6d. to 12s. 6d. Of course, this could be very considerably reduced by owning barges.

4. The character of the labour is that which is usually to be found in mining countries on the Continent, and is plentiful and cheap; the following is an estimate:—

	Kronen.
Miners' wages per ton of iron ore	3.
Material (dynamite, oil, iron, wood, &c.) ...	0.12
Bringing to the surface	0.70
Management and administration, &c. ...	1.48
Total	5.30

or 4s. 5d. per ton.

5. Numerous analyses obtained from the Government and from other reliable sources accompany this report.

6. As previously mentioned, proprietors of deposits would certainly be sellers on reasonable terms.

7. The Government report published for the year 1902 shows that there were in Bohemia in that year 78 mining undertakings, of which 10 only were being worked.

The export of iron ore from Bohemia is to Saxony, but the quantity is trifling.

8. None whatever, and the mining laws are favourable to mining ventures.

9. Transport facilities will be greatly increased as the regulation of the rivers Moldau and Elbe are completed, and the cost of freight lessened by the lessening of the distance that the ore has now to be carried by rail.

A sketch map showing the mines being worked and those that have ceased to be worked is also included in this report, and any further information that may be required, I shall be, at all times, glad to furnish, if it is procurable.

BOSNIA AND HERZEGOVINA.

(*Consul-General Freeman.*)

1. Numerous deposits of iron ore exist within the Consular district of Bosnia and the Herzegovina.

2. The deposits are in the districts of Banjaluka, Prijedor, Sanskimost and Kostajnica, in the north-west of Bosnia, and in the districts of Fojnica and Visoko, in the south of Bosnia, but by far the most extended deposit is at Vares, in the district of Visoko. The ore at the last-mentioned place is chiefly red hematite, with a substratum of sparry iron, and yields from 55 to 65 per cent. pure iron. The deposit is estimated at not less than 25,000,000 tons. The nearest port of shipping to the deposits in the north-west of Bosnia, capable of admitting ocean steamers, would be either Fiume or Trieste, which are respectively about 250 and 290 miles distant by rail; whereas the nearest port to the deposits in the south of Bosnia is Gravosa, which is 208 miles by rail from Vares.

3. The cost of transport of iron ore by rail to the above-mentioned ports is as follows:—

Banjaluka to Fiume 110 Austrian hellers per metric quintal, which is equal to about 9s. 5d. per ton.

Banjaluka to Trieste 127 hellers per metric quintal, or 10s. 8d. per ton.

Vares to Gravosa 87 hellers per metric quintal, or 7s. 6d. per ton.

These are special rates for iron ore. Naturally, the deposits do not all lie close to a line of railway, and the ore would, in most cases, have to be carried a certain distance by road, but in no case would the distance be great, and the roads are good. The iron mines of Vares are in the immediate vicinity of the town and railway station.

4. Native workmen in sufficient numbers are available both for mining and loading. The miners are almost exclusively taken from the Christian population, but for loading, &c., Mohammedans are also employed. The native workman, whether Christian or Mohammedan, is abstemious, intelligent, and physically suited to the work. When he has once learnt his work he is in no way inferior to the European workman, and is therefore paid the same wages. At piecework a miner earns from 2s. 6d. to 3s. a day. Shunters and loaders are paid from 1s. to 1s. 8d. per day of eleven hours. An estimate per ton for mining and loading is not procurable. A few years ago the mineowners paid for extracting and carrying

down to the smelting furnaces in Vares a so-called "Nado" of ore, which is sixty horseloads, or about 75 metric quintals (7 tons 7 cwts.), from fl. 7.20 to fl. 9.20 (12s. to 15s. 4d.), according to the quality of the ore. The cost may now be a trifle less owing to the improved means of transport, although, on the other hand, the price of labour has risen.

5. The following are the official analyses of iron ore from the mines near Vares:—

Rotheisenstein (red hematite) from the mine of Drozkovac:—

	a.	b.
Eisenoxyd (iron oxide)	77.44	75.84
Manganoxyduloxyd (manganese oxide)	2.26	1.20
Kieselsäure (silicic acid)	12.28	16.80
Thonerde (alumina)	1.36	1.76
Kalkerde (calcium oxide)	1.01	2.61
Magnesia	Traces	Traces
Schwefel (sulphur)	0.20	0.14
Phosphor (phosphorus)	0.16	0.12
Glühverlust (loss in calcination) ...	5.27	1.57
	<u>99.98</u>	<u>99.98</u>

Brauneisenstein (brown hematite) from the mine of Drozkovac:—

	a.	b.
Eisenoxyd (iron oxide)	71.14	71.57
Manganoxyduloxyd (manganese oxide)	3.33	6.00
Kieselsäure (silicic acid)	8.97	10.63
Thonerde (alumina)	3.00	3.26
Kalkerde (calcium oxide)	0.44	1.63
Magnesia	Traces	Traces
Schwefel (sulphur)	Traces	0.25
Phosphor (phosphorus)	Traces	0.11
Glühverlust (loss in calcination) ...	12.98	6.51
	<u>99.86</u>	<u>99.96</u>

Rotheisen (red hematite) from the mine of Smreka:—

Eisenoxyd (iron oxide)	85.15
Manganoxyduloxyd (manganese oxide)	3.66
Kieselsäure (silicic acid)	2.47
Thonerde (alumina)	1.18
Kalkerde (calcium oxide)	3.42
Magnesia	Traces
Schwefel (sulphur)	0.06
Phosphor (phosphorus)	0.15
Glühverlust (loss in calcination) ...	3.88
	<u>99.97</u>

6. The chief deposits belong to the State, and mining concessions can be obtained on reasonable terms. Deposits in the hands of companies or private individuals are mostly so under concessions from the Provincial Government, but for want of sufficient capital are little worked, and the concessions could probably be taken over on favourable terms.

7. The only deposits extensively worked are those in the neighbourhood of Vares, in the district of Visoko.

The amount of iron ore exported is not obtainable, as the official statistics, which are very imperfect, class all ores together, but in any case it is not great. Nearly all is smelted in the country, the remainder being mostly sent to Austria-Hungary by rail.

The total output of iron ore in Bosnia during the five years 1897-1901 was as follows:—

Years.				Iron Ore.	Iron Pyrites.
				Tons.	Tons.
1897	...	...	...	36,509	3,612
1898	...	...	...	58,533	240
1899	...	...	...	67,085	430
1900	...	...	...	133,454	1,700
1901	...	...	...	122,569	4,570

8. There are no special obstacles in the way of successful, continuous and unencumbered mining in Bosnia and the Herzegovina.

BUDAPEST.

(Mr. Consul-General Stronge.)

1. The principal deposits of iron ore in Hungary now being worked are situated in the north and in the south-east of the country. Other deposits may possibly exist in other places, but if they had been of any importance they would have been worked before this.

2. The iron ore deposits which are worked are situated in the counties of Szepes, Gömör and Krassó, and the ore is mainly treated in the country itself. Some, however, which belongs to the Borsoder Mining Company, is sent to Wittkowitz (Austria), and some which belongs to the Arch-Duke Friedrich, and comes from Zips, is sent to Trzyenitz, in Austrian Silesia. No Hungarian iron ore is exported to places outside the Monarchy, for, apart from the fact that there is no demand for it, the great distance from the mines to the only port, viz., Fiume, renders export impossible. Fiume is 945 kilometres from Márkusfalva, 820 kilometres from Barczika, and 819 kilometres from Tiszolcz.

3. The railway is the only means of transport to Fiume, and the average cost per ton would be K. 14.70.

4. The mining is carried on by adits and shafts, and the ore is extracted more by machinery in the mine itself than by manual labour. The cost of production varies so much that no precise figures can be given.

5. The ores are mostly brown iron ore and spathic iron ore, which contain from 36 to 40 per cent. of iron in a raw state. An answer respecting analyses, and also the furnishing of samples are superfluous, for there is no possibility of a sale.

6. The owners of the ore are large joint stock companies, and owners of entailed property, and, as above stated, they do not sell their ore. There are, it is true, some professed owners of small mines in Southern

Hungary, who endeavour to find purchasers, but they cannot be taken seriously, as both the quantities and qualities exclude export.

7, 8, and 9. Inapplicable to existing circumstances, and explanations on the subject would only be of value if some special mine were indicated as having been offered for sale. According to expert opinion there can be no question of exporting iron ore from Hungary at a profit.

TRIESTE.

(*Mr. Consul Churchill.*)

1. Deposits of iron ore are reported to exist in my Consular district.
2. Kotlenice (in Dalmatia), near Spalato, from which it is distant $9\frac{1}{2}$ kilometres (by carriage road).
3. Three shillings per ton. By road and rail.
4. Miners are paid 2s. 6d. per day. Expenses of loading in carts 1s. per ton.
5. Analysis enclosed.
6. Not likely to be sellers.
7. Yes, 5,000 tons; commencing to export.
8. No.
9. In the Austrian Littoral ("Litorale Austro-Illirico") there are no deposits of iron ore. Lately, it seems that in the province of Istria, mines have been discovered, but they are of no importance.

In the province of Carniola there are no iron mines except those belonging to the "Krainische Industrie Gesellschaft," and as they are working them themselves, do not wish to give any information on the subject.

In Dalmatia there are some iron mines. According to the Trieste Chamber of Commerce, with small outlay, good results could be obtained. At "Kotlenice," in the Political Commune of Clissa, District of Spalato (Dalmatia), there is a mine. "Kotlenice" is distant from Spalato $9\frac{1}{2}$ kilometres (carriage road), and 28 kilometres (by rail). The transport of iron ore, from "Kotlenice" with carts to the railway station, costs about 1s. 8d. per ton; and afterwards by rail to Spalato, 1s. 4d. per ton. Miners are paid 2s. 6d. daily. Expenses of loading on carts, on railways, and afterwards on board the ship are calculated at 1s. per ton.

The iron ore mine of "Kotlenice" belongs partly to Signor Luigi Miotto, an Industrial, living at Spalato, and partly to several other proprietors who, though not wealthy, do not intend to effect any sale of their portion for the present. The mine has so far produced 5,000 tons of mineral, which they now begin to export.

At "Meleda," in the district of Ragusa (Dalmatia), there is also an iron mine. The iron ore of "Meleda" is quite close to the sea; this mine belongs to Signor Miotto, above mentioned. At "Meleda," 500 to 600 tons have been already produced. This mineral will be sent at present to the "Krainische Industrie Gesellschaft," to Trieste (Servola), towards whom the proprietor of this mine is not under contract. There are no special obstacles, as in none of these two mines have they to contend against water.

There are many other iron ore veins ("giacimenti di ferro") in several parts of Dalmatia, and especially in the district of Sinj. There are also some in the island of Lissa, but only in the two above named has work begun.

Copy of the analysis of the two minerals of "Kotlenice" and of "Meleda" is herewith enclosed.

Analyses.

COPY OF AN ANALYSIS OF MINERAL FROM KOTLENICE.

Moisture at 100° C.	1.65 per cent.
Loss in calcination	13.71 "
Silicic acid (SiO ₂)	2.09 "
Sesquioxide of iron (Fe ₂ O ₃)	82.21 "
Protoxide of iron (FeO)	1.54 "
Alumina (Al ₂ O ₃)	0.186 "
Manganese (Mn ₃ O ₄)	Traces.
Lime (CaO)	"
Phosphorus (P)	0.299 "
Sulphur (S)	imponderable quantity.
Corresponding to metallic iron (Fe)	58.75 per cent.

MINERAL FROM MELEDA.

Sesquioxide of iron (Fe ₂ O ₃)	59.87 per cent.
Silicic acid (SiO ₂)	7.76 "
Phosphorus (P)	0.226 "
Sulphur (S)	imponderable quantity.
Corresponding to metallic iron (Fe)	41.91 per cent.

VIENNA.

(Mr. Consul-General Schoeller.)

1. Yes.

2. In Eastern Bohemia, Upper Styria, Carinthia and Carniola. The nearest shipping port for the Bohemian mines is Hamburg; for Upper Styria, Carinthia, Carniola, and other Alpine districts, Trieste.

The Bohemian mines are about 200 kilometres (125 miles) distant from the Elbe wharves.

The distance of the Upper Styrian ore deposits from Trieste is about 500 kilometres (312 miles).

3. From Bohemia to Hamburg, per rail and boat, kronen 10 to 15 (8s. to 12s.).

From Upper Styrian stations to Trieste, exclusively by rail, kronen 10 to 12 (8s. to 10s.) per ton.

4. Machinery driven by steam power.

(a) Wages about kronen 2 to 3 (1s. 8d. to 2s. 6d.) per man per day of 10 hours.

(b) Kronen 3.6 to 5 (3s. to 4s. 2d.) per ton, loaded on railway trucks.

5. Yes; but are not at my disposal. Generally speaking the Bohemian ore is rich in sulphur and phosphorus, whereas the Alpine ores (Styria, &c.) show only slight traces of these elements.

6. The principal ore deposits are owned by Joint Stock Companies, which would hardly be induced to sell.

7. The chief ore deposits, the Styrian in particular, have been worked for many years.

Export 1901—2,296,237 quintals (220½ lbs.).

„ 1902—2,418,056 „ „

9. In the statistical tables the price of iron ore is quoted at kronen 23 (19s. 3d.) per ton from the frontier station.

BULGARIA.

(*Sir F. Elliot.*)

1. Yes.

2.

Locality.	Nearest Port.	Distance.
Breznik	Bourgas or Varna ...	20 kilometres road and 590 railway.
Kosovtzi in the Arrondissement of Drenovo, Prefecture of Tirnovo.	Varna	25 kilometres road and 250 railway.
Enina (called "Bizek") in the Arrondissement of Kazanlik, Department of Stara Zagora.	Bourgas	35 kilometres road and 200 railway.

3. Impossible to say. Road and rail in all cases.

4. The various workmen at the coal mines at Pernik received, in 1898, an average wage of 1 fr. 51½ cents per working day. For further particulars see accompanying pamphlet.

5. Analysis of a sample taken from the mine at Breznik, which yielded 52.3 per cent. of iron:—

Gangue insoluble in HCl	18.65 per cent.
Oxide of iron	74.70 „
Oxide of aluminium	1.20 „
Loss in calcination	5.84 „
Sulphur	Traces.

Neither analyses nor samples available from other mines.

6. The proprietor of the deposits at Breznik, Drenovo and Bizek is the Bulgarian Government.

7. The deposit at Breznik was worked for a short time, but was eventually abandoned owing to difficulties of transport.

The other deposits have never been worked.

8. Difficulties of transport and absence of coal.

9. Additional information will be found in the accompanying pamphlet, which was prepared for the Paris Exhibition of 1900.

DENMARK.

FAROE ISLANDS (THORSHAVN).

(*Mr. Consul Villiers.*)

Mr. Villiers reports that there seems to exist no local knowledge whatever on the subject of iron ore deposits in the Faroe Islands.

Geological study of these islands seems to have been made by British subjects, however, from time to time.

A paper "On the geology of the Faroe Islands," read March 15, 1880, by James Geikie, LL.D., F.R.S., seems to be the most authoritative and exhaustive document on the subject, and mentions the presence of "iron-stone." Mr. Villiers has found a fragmentary copy of this paper, with maps and diagrams, marked IX., Vol. XXX., Part I., page 217. It has no publisher's name, nor does it state to whom the paper was read, but probably to the Royal Society of Edinburgh.

ICELAND (REYKJAVIK).

(*Mr. Acting-Consul Thorvaldsson.*)

Mr. Thorvaldsson reports that only two kinds of iron ore, viz., magnolite and limonite, are known in Iceland.

The former is common in the basalt, the principal species of rock in this country; but being spread in very small, often microscopical, grains in the rocks, though in different quantities, it is, as far as ascertained, nowhere to be found to such an extent that it could yield a supply sufficient for mining purposes, and consequently there is no question of any deposits of this kind of ore in Iceland.

The latter species of iron ore, the limonite, or swamp ore, is frequently to be found in swamps and ponds in this country, but, as far as ascertained, nowhere in such quantities that it would cover expenses to work it.

FRANCE.

BAYONNE.

(*Mr. Vice-Consul Schoedelin.*)

1. Yes.

2. At Osse, in the department of the Basses Pyrénées. The nearest shipping port capable of admitting ocean steamers is Bayonne, about 33 miles from the ore deposits.

3. The transport could only be done by rail, special rates would have to be obtained from the railway company.

4. Unable to obtain the character and cost of labour available for mining and loading.

5. Official analyses of the ore, and average samples can only be obtained from the Directors of the Company, Compagnie des Acières de France, Quai de Javel, Paris.

6. The proprietors of the mines are reported to be rich, and are not considered likely sellers, at any rate for the present.

7. The deposits have been worked for some time, but only on a very small scale, no shipments are reported to have taken place.

8. It is not expected that any ore will be shipped from Bayonne, nor any development in the working of the mines until the Maritime Station is completed, so that the ore can be brought alongside the quay in railway trucks. It is expected that the Maritime Station will be finished in about 18 months' time.

9. It is not expected that any large quantities of ore will be shipped from Bayonne, as the Forges de l'Adour require for their own use large quantities.

BORDEAUX.

(Mr. Acting-Consul Palmer Samborne.)

1. In the Departments of Dordogne and Ariège considerable deposits of iron ore are known to exist, especially in Ariège, where there are millions of tons of good material.

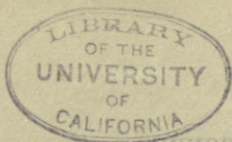
2. The nearest shipping port is Bordeaux, where ocean steamers can come to, and the distance is about 340 kilometres from the Ariège. As large quantities of coal are imported into Bordeaux yearly (600,000 tons to 700,000 tons), cheap freight should be obtainable, as the ships which bring the coal generally leave in ballast for Bilbao or neighbouring ports for cargo.

3. The cost of transport from the Ariège would be about 5s. per ton, and from the Department of the Dordogne, a distance of only 150 kilometres, only about 3s.

4. The cost of labour is much cheaper than in England, miners getting from 3s. to 4s. per day, and labourers 2s. 6d.

5. The ore of the Dordogne Department is a silicious one, but free from phosphorus, and contains a high percentage of pure iron (analysis No. 1). The iron ore from the Department of the Ariège gives a lower percentage of iron—as per analysis No. 2.

6. Some of the deposits are being worked, but the ore is only sold to the Ariège furnaces; no mineral has been exported, as the existing mines have not been properly worked, and scarcely any capital spent in developing the rich deposits.



Further information or any possible assistance will be willingly rendered to any person or persons interested, on application to this Consulate.

ANALYSIS No. 1.				ANALYSIS No. 2.			
Analyses of Iron Ore from the Dordogne.				Analyses of Iron Ore from the Ariège.			
Silica	6.00	8.84	9.70	Loss in Furnace ...	10.00	7.75	
Iron	57.	54.70	52.19	Silica	4.56	6.20	
Manganese ...	1.51	1.19	0.48	Aluminium	3.67	2.07	
Phosphoric Acid	0.077	0.080	0.052	Chloride of Lime ...	0.64	0.34	
Sulphur	0.110	0.028	0.021	Magnesium	Nil.	Nil.	
				Protoxide of Iron ...	Nil.	Nil.	
				Peroxide of Iron ...	72.86	78.24	
				Redoxide of mineral ...	0.71	1.80	
				Sulphur	0.27	0.42	
				Oxide of Zinc	1.19	3.18	
				Metallic Iron	51.00	54.77	
				Manganese	4.83	1.30	
				S... ..	Nil.	Nil.	
				Ph	Nil.	Nil.	
				Zinc	0.95	2.50	

BOULOGNE-SUR-MER.

(Mr. Vice-Consul Farmer.)

1. Yes.
2. Within 5 miles of Boulogne-sur-Mer.
3. Would have to be carted.
4. Agricultural labourers and quarrymen of cement factories, at about 2s. 6d. per day.
5. No official analyses obtainable, the sample sent is from Wimille, about 4 miles from Boulogne; it is considered too phosphoric, and average yield only 30 per cent.
6. Deposits are in agricultural land; holdings are relatively small.
7. Not worked for about 20 years.
8. No special obstacles.
9. No lack of ore in the Wealden formation round Boulogne, but the quality is poor, and deposits vary greatly in depth; those most readily accessible were exhausted some twenty years ago.

Small stocks of extracted ore are scattered about the neighbourhood; the manager of the Outrean Ironworks, near Boulogne, does not consider them worth collecting.

Spanish ore is imported from Bilbao, average freight about 6s. per ton (1902).

CALAIS.

(*Mr. Consul Payton.*)

1. Yes.
 2. Near Marquise, halfway between Calais and Boulogne-sur-Mer. Also Wimille, about 4 miles from Boulogne (see reply from that port).
Nodules of iron, apparently hematoid, are found at the base of the cliffs at Blanc-Nez, about 6 miles from Calais.
Shipping ports, Calais and Boulogne.
Distance—Marquise 12 miles, Wimille 4 miles.
 3. Probably 2s. 6d. rail from Marquise. Cartage from Wimille.
 4. Agricultural labourers and quarrymen, about 2s. 6d. a day.
 5. No analyses: sample from Wimille.
 6. The iron foundry at Marquise is reported to be the proprietor of some land containing deposits.
 7. Not worked for twenty years.
 8. Only the quality of the ore.
-
9. Supplies, Calais:—
 1898—24,480 tons from Spain.
 1899—5,461 tons from Spain.
 1900—29,363 tons from Spain and Italy.
 1901—None reported.
 1902—4,309 tons from Spain and Italy.

CHERBOURG.—DEPARTMENT OF ILLE ET VILAINE.

(*Mr. Consul Loftus.*)

1. Yes.
2. Forêt de Paimpont, near Rennes, 6,070 hectares in extent, the remainder of an immense forest. Nearest ports Le Legué (St. Briec), Jôtes du Nord, at 72 kilometres, and St. Malo-St. Servan, Ille et Vilaine, at 103 kilometres.
3. From Mauron Station, Morbihan, to Le Legué, about 2 frs. per French ton, and to St. Malo-St. Servan 2 frs. 80 c. Rail only, but reaching Mauron Station by means of a Decauville track.
4. Plenty of labourers, wages 2 francs 50 cents. to 3 francs per day of ten hours. Skilled a little dearer. Costs about 5s. per ton (French) to put on truck at railway station, including 15 cents for the transfer from Decauville to railway trucks.

5. No analysis exists.

6. The owners of the forest are very wealthy business men, of Nantes. But probably open to sell concessions, as they have already done to the present working firm.

7. Yes. In 1902 about 3,500 tons; in 1903 about 9,000; the working firm stating, that in 1904 they expect to ship at least 20,000 tons. All the shipments have gone to the United Kingdom, with the exception of a small quantity to Boulogne-sur-Mer and Rotterdam; Grangemouth, Ardrossan, and Cardiff (the latter only one cargo), being the ports of destination.

8. Not that I know of, beyond the dislike of any foreign element in the trade of the country, which most of those taking up trade in this country find, both with the workpeople, and the commercial people.

9. M. Joanne remarks in his guide of 1896, that 12 iron mines have been, or are being, worked in this department, but, although it is possible that in the neighbourhood of St. Aubin-du-Cormier, such deposits may exist, I cannot ascertain anything definite, although at Tremblay lead ore is being extracted, and the old lead and silver mines of Pont Peán, near Bruz, still work; no further working for iron exists. The Prefect of Ille et Vilaine says, in his report to the General Council for 1902:—

“The working of the Paimpont mine, the only one working in the department, has only up to now given rise to work for its making a start, during which about 3,500 tons of hydroxidized and carbonated iron have been extracted. The number of workmen employed has been 139.”

The working of iron in the Fôret de Paimpont was commenced in the year 1633, and continued for many years, the last man in charge having employed about 400 men, but was abandoned many years ago, being, I am told, supposed to be worked out. Three years ago the present owners thought of utilizing the scoria, lying in heaps in the forest, and came to the conclusion that there was still iron worth working, and, as stated in my report for the year 1900,* a Decauville railway was established to Mauron Station, Morbihan, between Vannes and St. Meen, with a view to taking the ore to Legué (Saint Briec); but the people to whom the concession has been made—Messrs. Monin, Pralon & Co., 91, Rue Miromesnil, Paris—inform me that the port of Legué is unsuitable, and that they have been compelled, in view of increasing trade, to abandon it, not intending to return there, a statement which is borne out by the fact, that during 1903 several steamers, mostly British, have loaded at St. Servan, where the firm have established a steam crane of their own for the purpose of loading the ore, which in the early part of the year was loaded by the coal merchants.

Messrs. Monin, Pralon & Cie., inform me, that the simplicity of the transfer of the ore, from their Decauville to the railway trucks, is a saving, consisting, as I understand it, in emptying the swinging trucks into the railway plant from a platform or raised siding.

I am told that some delay in the work was caused by an action at law, between the proprietors—Messrs. Levéque, of Nantes, whose name I omitted to mention—and the above-named Paris firm; I do not, however, know the cause of the dispute, having understood that the work had stopped from want of funds. The agent, for these shipments, in London is Mr. Haerberlin, 5, Whittington Avenue, Leadenhall Street, E.C.

* *Annual Series of Diplomatic and Consular Reports*, No. 2,670.

CORSIKA (AJACCIO.)

(Mr. Consul Holmes.)

1. A deposit (black oxide or magnetite) is reported to exist.

2. Near the village of Farinole-Olmetta (Canton, St. Florent, Cap Corse).

The nearest port is St. Florent, $8\frac{1}{2}$ miles distant; but here there are no quays or jetties.

The port of Bastia, which can be entered by ocean steamers, and where loading facilities exist, lies about 15 or 16 miles distant by road.

3. To St. Florent, by road, 4 to 5 francs per ton. To Bastia, by road, 7 to 8 francs per ton.

4. Italians are principally employed in the Cape Corse mines and give satisfaction. In the interior of the island Corsican peasants are generally employed. The latter require, perhaps, more supervision than the former, but as foremen, fitters and time-keepers they are said to be superior.

Miners receive from 2.50 to 2.75 francs (2s. to 2s. $2\frac{1}{2}$ d.) per diem. Loading and general labourers 2.25 to 2.50 francs (1s. $9\frac{1}{2}$ d. to 2s.). Boys from 1 to 2 francs ($9\frac{1}{2}$ d. to 1s. 7d.). Women (surface work only) from 1 to 1.50 francs ($9\frac{1}{2}$ d. to 1s. 2d.). Smiths and carpenters receive about 4 francs (3s. 2d.) and foremen from 4 to 6 francs (3s. 2d. to 4s. $9\frac{1}{2}$ d.) a day.

The cost per ton of ore placed on the cart may be estimated at from 5 to 8 francs (4s. to 6s. $4\frac{1}{2}$ d.) (hand labour only).

5. No analyses are obtainable. Some average samples of the ore, however, have been forwarded.

6. I am unable to say whether the proprietors of the mine at Farinole are rich or poor. (See also No. 9.)

7. The deposit at Farinole has not been worked for 50 years.

8. None, I am informed, as regards Farinole.

Opposition is sometimes offered in Corsica by the owners or occupiers of the land adjoining the mine to the transport of the ore across their property. It is advisable, therefore, to come to an agreement with the neighbouring landowners before the purchase of the concession has been completed.

9. The mine (concession) at Farinole has come by succession into the possession of several persons or families, and is in charge of a Notary at Bastia, who is precluded from selling without the consent of all the owners.

Some three or four months ago the property was leased to a syndicate of engineers in Paris, who are said to be examining the mine in order to decide whether there is any prospect of working it successfully.

Mining laws in Corsica are the same as in France.

HAVRE.

(Mr. Consul-General Hearn.)

1. The deposits of iron ore in this district are, so far as I can learn, entirely in the Department of Calvados, and are very extensive. Workings have been discovered dating back to the time of the Romans.

2. The deposits extend from six miles south of Caen to the limits of the Department of Calvados to the south and west. Thirteen mining concessions have been granted of over seventeen thousand acres in extent, the official details of which are given in the Schedule appended to this report. The nearest shipping port capable of admitting steamers up to two thousand tons burden is Caen. The distance of this port from the ore district varies from six miles to the mine at St. André to thirty-five miles to the south and sixty miles to the west.

3. The transport would be entirely by rail at a cost of 6 centimes per ton, per kilometre, or, roughly, $9\frac{1}{2}$ centimes (a fraction less than a penny) per mile, by the tramway line which traverses a large region of deposit, down to about a halfpenny per ton per mile by the railway from the other districts. To this there has to be added 40 centimes (4d.) per ton terminal charges, and 50 centimes (5d.) per ton traction from the railway station at Caen to the quay.

4. The extraction is made by means of galleries, pits and quarrying. The cost of extraction and loading into trucks is estimated at from 4 shillings to 5 shillings per ton.

5. No official analyses are obtainable.

6. The proprietors of the concessions are wealthy persons who have associated themselves together for the purpose of working the mines, and it is probable that would-be buyers would find that they have rather an exaggerated opinion as to the value of their holdings.

7. Only three of the concessions have been worked on commercial lines; they are those of St. André, St. Rémy and May-sur-Orne, distant six, twenty and twenty-two miles, respectively, from Caen. The following are the exports from these three mines, together, for the last five years:—

1898	...	...	...	...	95,973 tons.
1899	...	...	...	...	89,427 "
1900	...	...	...	...	111,185 "
1901	...	...	...	...	123,980 "
1902	...	...	...	...	143,188 "

Nearly the whole of this was shipped to Rotterdam, it is said for account of Messrs. Krupp's works, but in 1902 a certain small quantity went to Middlesbro' and Swansea.

8. The chief obstacles to the full working of these, apparently, very valuable deposits, are, I am informed, shyness on the part of local capitalists, the difficulty of access to the railways from some of the properties, and the low grade of some of the ore, which would not bear the cost of transport to the distant blast furnaces.

9. The deposits in question vary in richness from fifty to fifty-five per cent. in the hematite, to thirty-eight or forty per cent. in the carbonate, the latter forming, I am told, the principal part of the whole. To make the transport of this low grade ore profitable, it would have to be calcined.

Mr. Frank Lethbridge, British Vice-Consul at Caen, to whom I am indebted for the above information, thinks that a company with a capital, say, of eight hundred thousand pounds might be able to buy up the most valuable concessions, and, if they were to build large iron works, they would do a very profitable business.

SCHEDULE of the Iron Mining Concessions in the Department of
Calvados, France.

Name of the mine.	Acreage.	Communes comprised in the area conceded.
	Acres.	
St. Rémy	1,853	St. Rémy.
St. André	728	St. André de Fontenay, St. Martin de Fontenay, May sur Orne.
May sur Orne	929	May sur Orne, Bully, Clinchamps sur Orne, Laize la Ville, Fontenay le Marmion.
Jurques	902	Jaques and Brémoy.
Gouvix	812	Bretteville sur Laize, Barbery, Gouvix, Urville.
Urville	630	Bretteville le Rabat, Gouvix, Urville.
Bully	993	Amayé sur Orne, Bully and Teugnerolles sur Orne.
Barbery	803	Barbery, Moulines, St. Germain le Vasson Fontaine le Pin.
Montpinçon	1,495	Plessis, Grimoult, St. Jean le Blanc, Roucamps, Campaudré, Valcongrain.
Perrières	3,607	Perrières, Epaney, Oleudon, Soumont, St. Quentin, Ouilly le Tesson, Rouvres and Sassy.
Maltot	1,062	St. André de Fontenay, Maltot, Teugnerolles sur Orne and Eterville.
Oudefontaine	1,381	Roucamps, Oudefontaine, La Terrière, Duval and Danvou.
Soumont	1,910	St. Germain le Vasson, Grainville, Lougannerie, Estrées la Campagne, Ouilly le Tesson, Soumont St. Quentin, Potigny, and Toutaine le Pin.

LILLE.

(Mr. Vice-Consul Walker.)

Mr. Walker reports that there are no iron ore deposits in the department of the Nord. A vein was found near that department, but in the Pas de Calais, at Dontainghin, containing, at a depth of 134 metres, dolomite (magnesian limestone), together with ferric hydrate, yielding 38 per cent.; but lower, at 148 metres, carboniferous limestone appeared, and the mine was abandoned.

Consumers of iron ore are works at Isbergues, Denain, Anzin, Nord et Est, and Maubeuge. Quantity consumed, about 600,000 tons per annum. The greater quantity comes from the "Est" district by rail, and the remainder from Spain (Bilbao) *viâ* Dunkirk.

Kuhlmann's large chemical works at Lille send their non-laxivated iron pyrites to Denain-Anzin, and the laxivated to Germany.

MARSEILLES.—

(Mr. Consul-General Gurney.)

1. Deposits of iron ore exist in the following Departments of this Consular District:—

Var.

Vaucluse.

Gard.

Ardèche.

Aveyron.

Tarn.

Pyrénées Orientales.

2. In the Department of Var there is one mine, that of Beau Soleil, situated at Chateaudouble, twelve and a half miles north of Draguignan. It is connected with the railway at Figanières by overhead wire-rope railway. The nearest seaport is St. Raphael, about 30 miles away. Efforts have been made to ship the ore at this port, but have been abandoned on account of the difficulties in the way, presumably the exposed position and lack of facilities of the harbour. The present intention is to ship the ore at Nice, some 48 miles distant.

In the Department of Vaucluse a deposit of iron ore is reported at Rustrel, near Apt, 29 miles east-south-east of Avignon. It is no longer worked, and I understand that the ore is of poor quality.

In the Department of Gard there are five concessions, namely:—

(i.) Concession of Alais, 25 miles north-west of Nîmes. The nearest shipping port would be Cette, some sixty miles distant.

(ii.) Concession of the Deux-Jumeaux, at Ganges, 25 miles west-north-west of Montpellier. The nearest port would be Cette, from which Ganges is distant about forty miles. The route by rail, however, is considerably longer.

(iii.) Concession of Pierre-Morte, near Gagnières, which is twenty miles north-west of Alais. The nearest port would be Cette, and the distance from the mines approximately eighty miles.

(iv.) Concession of Valmy at l'Estréchure, 21 miles from Anduze. The nearest port would be Cette, about fifty miles from Anduze.

(v.) Mines of St. Felix de Pallieres near Anduze. The nearest port is Cette.

In the Department of Ardèche there are four concessions, forming the Privas mines. They are approximately 100 miles from Marseilles or Cette.

In the Department of Aveyron there are two mines, those of Kaymar and Mondalazac. They are situated in the valley of the Dourdon, near Marcillac, which is 11 miles north-north-west of Rodez. The nearest port is Cette, about 100 miles distant from the mines.

In the Department of Tarn three concessions have been granted to the north of Castres. Only one of these is being worked. Castres is some 75 miles from Cette, and a little less from Lanouvelle.

In the Department of Pyrénées Orientales there are three beds of iron ore:—

(i.) Puymorens, close to the peak of this name. Exportation of the ore would be impracticable, owing to the distance to the sea and the lack of a railway at hand. This would also be the case for the ore from the mines of Aveyron and Tarn mentioned above.

(ii.) Mines in the valley of the Agly. These are 42 miles by rail from the port of Lanouvelle.

(iii.) The Canigou group, consisting of 28 concessions, situated in the valleys of the Tet and Tech. The ore is sent to Port-Vendres, either by Arles-sur-Tech, which is 32 miles by rail from Port-Vendres, or by Ria or Prades, which are 47 and 44½ miles respectively.

3. The means and cost of transport to the shipping ports would be as follows, as far as I am in a position to give this information:—

Beau Soleil (Var).—By rail from Figanières to Cette, 7.20 frs. per ton.

Alais (Gard).—By rail to Cette, 4.15 frs. per ton; by rail to Marseilles, 5.20 frs. per ton.

Deux-Jumeaux (Gard).—From Ganges to Cette by rail, 4.10 frs.; from Ganges to Marseilles by rail, 5.50 frs.

Pierre-Morte (Gard).—From Gagnières to Cette by rail, 4.75 frs.; from Gagnières to Marseilles by rail, 5.80 frs.

Valmy (Gard).—From Anduze to Cette by rail, 3.95 frs.

St. Felix de Pallieres (Gard).—From Anduze to Cette by rail, 3.95 frs.

Privas Mines (Ardèche).—From Privas to Cette by rail, 6.40 frs.; from Privas to Marseilles by rail, 6.40 frs.

Kaymar (Aveyron), Mondalazac (Aveyron).—The ore from the above mines is consumed by the blast furnaces of Decazeville, to which the mines belong. Export would, in any case, appear to be impracticable, on account of the distance from the sea.

The cost of transport to Decazeville per ton is as follows:—

(i.) *Kaymar.*—By cart from the mine to railway ($8\frac{3}{4}$ miles), 3.30 frs.; by rail to the furnaces ($6\frac{3}{4}$ miles), 0.94 fr.

(ii.) *Mondalazac.*—By horse-tram from the mine to Marcillac Station ($4\frac{1}{2}$ miles), 1.050 frs.; by rail from Marcillac to the furnaces ($13\frac{1}{2}$ miles), 1.690 frs.

Castres Mines (Tarn).—The blast furnaces of Sault-du-Tarn own the only one of the three concessions which is being worked, and consume the ore which comes from it. The distance from the coast would, moreover, render export impracticable.

Puymorens (Pyrénées Orientales).—Export impracticable, on account of absence of railway and distance from the coast.

Agly Valley Deposits.—These have been very little worked, and I have no means of knowing what the cost of transport to Lanouvelle would be.

Canigou Mines.—Rail from Arles-sur-Tech to Port-Vendres (32 miles), 2.15 frs. per ton.

4. I have been able to obtain the following particulars with regard to the cost of labour, loading, &c.:—

Beau Soleil.—The cost price of production is five francs per ton of ore.

Alais.—The ore is consumed by the forges of Alais, which work the mines and are situated on the iron-field. The cost of production is from six to seven francs on rails at Alais.

Deux-Jumeaux.—The cost price of the ore on rails at Ganges is from eight to nine francs. The neighbouring works buy it at about 15 frs.

Pierre-Morte.—The cost price on rails at Gagnières is about nine francs.

Valmy.—The ore is delivered to the iron-works of the district for about 16 to 18 frs. On rails at Anduze the cost price is 12 frs. This should, however, be lowered by two francs a ton when the new line from Anduze to St. Jean du Gard is finished.

St. Felix de Pallieres.—The ore is delivered to the iron-works of the district for from 10 to 12 frs. The cost price on rails at Anduze is about eight francs.

Privas Mines.—The ore from these mines is consumed by the blast furnaces of Le Pouzin. It is delivered on rails at Privas at a cost of between six and seven francs a ton.

Kaymar.—The cost of production is as follows:—

Quarrying	...	...	4.45 frs. per ton.
Labour and other expenses	...	...	7.17 frs. per ton.

Mondalazac.—The cost of production is as follows:—

Quarrying	...	...	0.87 fr. per ton.
Labour and other expenses	...	...	1.86 frs. per ton.

Castres Mines.—The cost of production is about nine francs the ton.

Puymorens, Agly Valley, and Canigou.—The cost of production in the mines in the Department of Pyrénées Orientales is approximately 6.50 frs. per ton. This is inclusive of general working expenses.

5. The description of the ores in the various mines, with analysis where to hand, is as follows:—

Rustrel.—Ore of poor quality, with silicious waste.

Beau Soleil.—This mine produces brown hematite, containing over 55 per cent. of iron, less than 0.50 per cent. of sulphur, and from 0.03 per cent. to 0.06 per cent. of phosphorus.

Alais and St. Florent.—A ferruginous deposit in limestone.

Deux-Jumeaux.—A deposit of ore in limestone. It contains about 50 per cent. of iron and a little zinc.

Pierre-Morte.—The deposit consists of two strata in a jurassic bed; one of oligist, containing 45 per cent. of iron, and one of poor phosphorus ore, with 25 per cent. of iron.

Valmy.—This deposit is a heap of carbonate of iron, lying in the old schists. The ore contains 48 per cent. of iron and 2 per cent. of manganese; also a little copper.

St. Felix de Pallieres.—The ore is similar to that of Alais and St. Florent.

Privas Mines.—The deposit consists of two strata in a jurassic bed, the ore containing 40 to 45 per cent. of iron, and 0.11 per cent. of phosphorus.

Kaymar.—This deposit lies in a bed of lias or permian, and consists of manganeseiferous and rather too silicious hematite. An average analysis of the ore is as follows:—

Silica.	Alumin.	Chalk.	Manganese.	Iron.	Phosphorus.	Loss.
22.00	8.00	2.00	7.50	35.00	0.20	8.00

Mondalazac.—This deposit also lies in a bed of lias or permian. It is composed of oolitic ores of poor quality and impure. An average analysis is as follows:—

ROASTED ORE.

Silica.	Alumin.	Chalk.	Manganese.	Iron.	Phosphorus.	Magnesia.	Sulphur.	Loss.
11.00	8.00	19.00	0.18	30.50	0.57	7.3	0.13	8.00

CRUDE ORE.

Silica.	Alumin.	Chalk.	Manganese.	Iron.	Phosphorus.	Magnesia.	Sulphur.	Loss.
9.50	7.00	16.50	0.15	26.20	0.51	6.6	0.13	22.00

Castres Mines.—Unimportant quantities of brown hematite containing a large proportion of manganese of good quality, but too much silica, are found in the quartz formation of the mica schists.

Puymorens.—Magnetic oxide of iron with spathic iron lying in the silurian schists, the ore containing 50 per cent. of iron and 1 per cent. of manganese.

Agly Valley.—Oligist, iron, pure, but no manganese, and very silicious (15 to 40 per cent. of silica).

Canigou Mines.—Brown manganeseiferous hematite and spathic iron. The deposits lie in silurian limestone.

The mines in the Department of Pyrénées Orientales yield ore containing, generally speaking, when dry, 48 to 52 per cent. of iron and 2 per cent. of manganese for the hematite, and 52 to 54 per cent. of iron with 2 to 3 per cent. of manganese for the roasted spathic. Moisture varies from 10 to 12 per cent.

6. I have no means of knowing in the generality of cases whether the owners would be disposed to part with the deposits or not. The following information may be of use:—

Beau Soleil.—The mine belongs to the “Société des Mines de Beau Soleil,” 17, Boulevard Haussmann, Paris, with a capital of 500,000 frs. It is possible that this company might be willing to sell. The ore is at present sold to the blast furnaces of Givors and Chasse, near Lyons, and to the Creuzot Works at Cette. The price paid in the former case is 10.75 frs. on rails at Figanières for ore with 55 per cent. of iron and 30 centimes supplement for each additional unit. Transport to Givors and Chasse from Figanières is 8.85 frs. per ton. The sale price at Cette is 16 frs. delivered on rails for ore with 55 per cent. of iron and 30 centimes supplement for each additional unit.

Rustrel.—The mines were formerly worked by the “Hauts Fourneaux de Rustrel.” These no longer exist, and the mines are shut down.

Alais and St. Florent.—The output of these mines is consumed by the “Forges d’Alais,” whose smelting works are on the spot. The iron-works are at Bessèges and Tamaris.

Deux-Jumeaux.—The concession belongs to Mr. Charles Méjean, of Ganges. The ore is sold at about 15 frs. to the neighbouring iron-works.

Pierre-Morte.—Belongs to the Compagnie des Forges d’Alais.

Valmy.—Belongs to Mr. Georges Maes, of Clichy la Garenne (Seine), who is represented by Mr. Pascal, Notary, of Estréchure (Gard).

St. Felix de Pallieres.—Belongs to Mr. Chauvet, at Tornac, near Anduze (Gard).

Privas Mines.—Belong to the “Société Nouvelle des Etablissements de l’Horme et de la Buire.” The whole output is consumed by the blast furnaces of Le Pouzin, some 13 miles from the mines, and belonging to the same company.

Kaymar and Mondalazac.—Belong to the “Société-Commentry-Fourchambault-Decazeville,” which consumes in its own works the whole output of the mines.

Castres Mines.—Belong to the “Société des Hauts Fourneaux, Forges et Aciéries du Sault du Tarn” (two concessions), and one concession to Mr. P. E. Martin. The company consumes the whole output of the mines.

Puymorens, Agly Valley, and Canigou Mines.—The owners of the various concessions are as follows:—

Société des Mines de Fillols	...	2	concessions.
J. Holtzer Dorian et Cie.	...	3	„
Société des Mines de Riols	...	3	„
Société de Hauts Fourneaux de			
Paillac	...	2	„
Le Creuzot	...	1	„
Mr. Monin	...	14	„

Of these the Paillac Company consumes the ore from its own mines; the Creuzot concession appears to be nearly worked out, and is abandoned; the rest sell their ore.

The concessions of La Pinouse, Velman and Crouanques might be open to purchase; also those of Escoumps and Puymorens. The last, however, would be too far from the railway to make export of the ore feasible.

7. All the deposits mentioned have been worked. The figures for the yield during the last five years (where obtainable) are as follows:—

Beau Soleil.—During 1901 and 1902 the yield was 18,063 tons. Work had been stopped, and the Société de Beau Soleil only started again three years ago. An annual yield of 40,000 to 50,000 tons is expected.

Alais.—The yield during the last five years was 265,000 tons.

St. Florent.—The yield from 1877 to 1899 was 20,000 tons.

Deux-Jumeaux.—The yield from 1864 to 1902 was about 75,000 tons.

Pierre-Morte.—The supply of ore is diminishing rapidly on all sides, and would seem to be exhausted. Between 1841 and 1870 25,000 tons were extracted.

Valmy.—On account of the difficulties of access and transport this mine has not so far been worked in a serious manner. I have no figures regarding the output.

Privas Mines.—The production since 1843 has been 5,500,000 tons of ore. During the last five years the output has been 235,000 tons. It is calculated that the mine still contains 500,000 tons of ore.

Kaymar.—The yield for the last five years has been:—

1898	...	...	...	...	...	8,660 tons.
1899	...	...	...	...	...	11,747 „
1900	...	...	...	...	...	10,242 „
1901	...	...	...	...	...	7,368 „
1902	...	...	...	...	...	6,365 „
						44,382 tons.

Mondalazac.—The yield for the last five years has been:—

1898	...	...	...	...	...	28,402 tons.
1899	...	...	...	...	...	44,617 „
1900	...	...	...	...	...	56,140 „
1901	...	...	...	...	...	41,479 „
1902	...	...	...	...	...	26,928 „
						197,566 tons.

Castres Mines.—The yield of hematite during the last five years has been:—

1898	...	...	...	...	...	10,087 tons.
1899	...	...	...	...	...	11,004 „
1900	...	...	...	...	...	11,062 „
1901	...	...	...	...	...	9,416 „
1902	...	...	...	...	...	5,752 „
						47,321 tons.

Puymorens, Agly Valley, and Canigou Mines.—The yield for the last five years has been:—

—			1898.	1899.	1900.	1901.	1902.
			Tons.	Tons.	Tons.	Tons.	Tons.
Hematite	...	...	101,673	137,927	190,715	178,975	186,438
Spathic	...	...	35,361	25,310	55,386	61,663	49,508
			137,034	163,237	246,101	240,638	235,946
Total	...	...	1,022,953.				

8. With regard to the Department of Var (Beau Soleil), the nearest port to the workings, St. Raphael, is unsuited for shipment on account of its lack of facilities and its position. Large ships anchor in the roads in eight or nine fathoms, one and a half cables' length from the pier. Small vessels only can come alongside. The holding ground is good, but the harbour is exposed to the south. As mentioned in the answer to Question 2, it is intended to ship the ore shortly from Nice.

No obstacle exists in the way of successful and unencumbered mining in the Departments of Gard and Aveyron. The concession of Valmy is handicapped by its distance from Anduze. This will shortly be remedied by a branch line from Anduze to St. Jean du Gard.

In Aveyron the output might be largely increased, but I hardly think that, for purposes of export, the Aveyron coalfield is likely to be of importance. The distance from the coast is too great, and, as already mentioned, the iron-works of the district consume the ore.

The Canigou group, in the Department of the Pyrénées Orientales, is the most susceptible of giving good results for the purposes of export. The mines are all connected with the railway at Arles-sur-Tech, Prades or Ria by tramways or overhead trolley cables, and there is every prospect of the output increasing, should sufficient outlets be created. At present the industry is seriously handicapped by the absence of proper plant at Port Vendres, but it is proposed shortly to supply this port with proper shoots and other apparatus for loading large vessels.

NANTES.

(*Mr. Consul Warburton.*)

1. Yes.

2. They are in three places: the district of Chateaubriant, Loire Inferieure; that of Anjou, Maine and Loire; and in that of the Berry, in the Department of the Cher.

The nearest ocean port is Nantes, which is about 20 to 25 miles from the two first named places, and 100 miles from the last.

3. From the district of Anjou and that of Chateaubriant, about four shillings per ton where the deposits are near the rivers Loire or Mayenne and the ore can be loaded directly from the mine into barges, and carried to Nantes without transshipment. Where there is some distance to the river it would be more for cartage, but it is impossible to fix the exact cost, as these places are naturally neglected, in consequence of the increased cost of carriage, in favour of the more favourably situated spots. In the case given the cost is by river.

In the district of the Berry the cost would be much greater: carriage by rail from Bourges, six shillings per ton to Nantes, besides the charge for loading into carts and waggons and unloading, of which I can get no estimate, but which would probably be very great. No ore comes to Nantes from the Department of the Cher, all being smelted on the spot, and therefore no figure can be fixed.

4. These questions have been asked, and the owners and workers of concessions have not given and do not appear disposed to give answers. The Government returns for iron mines give the number of miners in France as about 9,000, and the average wages as three shillings and ten pence for underground miners and two shillings and eight pence for surface men per day, for skilled labour.

It is impossible to give the cost of mining in the general way suggested in the question. It depends on the class of mine, but for the ore likely to be available in this district, which is calcined, and can be extracted very cheaply, the value of the ore at the pit's mouth is given by the Government return at between four and five shillings, and in this instance, as it can be loaded from the mine into barges, there would be no cost for loading into waggons or carting.

5. The analysis of this ore is as follows:—

Analysis.

Silica	...	...	...	...	...	16.22
Titanic acid	...	...	...	...	...	0.33
Aluminium	...	...	...	...	...	1.95
Peroxide of iron	...	...	...	...	...	78.77
Lime	...	...	...	...	...	0.24
Magnesia	...	...	...	...	...	0.25
Sulphuric acid	...	...	...	...	...	0.17
Phosphoric acid...	...	...	...	...	...	0.31
Loss in calcining	...	...	...	...	...	1.77
						<hr/> 99.61 <hr/>

6. The owners of the concession of which particulars are given above, and which is the only one as to which any willingness to sell has been expressed by the proprietors, say that they would sell them with the works they have established at a reasonable price.

7. As I understand, there has not been much work done, and any ore that has been extracted has not been shipped but used in the country.

The concession is situated on both sides of the River Mayenne, near Angers; the principal deposits or lodes, which are about seven feet wide, crop up at an elevation of about 130 feet above the river, and are worked by means of open trenches which are sunk to the level of the towing path, so that the ore, as already stated, can be loaded into boats on the spot.

8. I have never heard of any, but so little mining has been done in it, that there has not been much opportunity for any experience of this description.

9. There is very little more to give in addition to what has been already given in reply to the questions asked.

Generally speaking, it is not a mining district, and the mines now working are carried on by a company formed for the purpose of smelting and making iron from its ores. This company is called "La Société des Aciéries et Hauts Fourneaux de Trignac."

A considerable part of the remaining concessions appear to be held as speculations, with a view to selling them as opportunity offers.

There are considerable works in preparation for deepening the River Loire, so as to allow large vessels to get up to Angers, and it is expected that when this is done the value of these concessions will appreciate considerably, owing to the facilities for sending the ore direct from the mines to foreign countries.

Any buyers of concessions should first send over competent persons to examine into the whole question. I shall be very happy to be of use to anyone who may wish to do so, and advise them to the best of my ability as to the most likely directions to work in.

PARIS.

(Mr. Consul-General Inglis.)

1. Yes.
2. In the Department of Vosges, two mines.
 - „ „ „ „ Cote d'Or, two at Marsannay et Villecomte.
 - „ „ „ „ Haute Saone, six of small importance.
 - „ „ „ „ Meurthe et Moselle, 92 mines, with an annual output of about 3,000,000 tons of ore.
 - „ „ „ „ Haute Marne, deposits exist at Sommevoire, Vassey, Fleury-les-Tavernay, and Jussey.
 - „ „ „ „ Marne, deposits of middling importance.
 - „ „ „ „ Meuse, deposits at Abainville, Commercy, and Tusey.
 - „ „ „ „ Belfort, at Grabonnières.

The nearest shipping ports are Dunkirk and Antwerp.

5. Official analyses are obtainable from the Ecole des Mines.

NOTE.—Exports of iron ores from France for the five years ending 1903 (*Tableau Général du Commerce et de la Navigation, 1903*):—

1899	...	...	...	...	292,000 tons.
1900	...	...	...	...	372,000 „
1901	...	...	...	...	259,000 „
1902	...	...	...	...	423,000 „
1903	...	...	...	...	714,000 „

Of the 714,000 tons thus exported in 1903, there went to

Belgium	...	...	...	364,000 tons.
United Kingdom	...	...	...	145,000 „
Germany	...	...	...	120,000 „
Netherlands	...	...	...	84,000 „

The imports of iron ore in 1903 amounted to 1,833,000 tons. The home production in 1902 was 5,004,000 tons (*Statistique de l'Industrie Minérale, 1902*).

The principal deposits of iron ores are, as has been stated, in the Department of Meurthe-et-Moselle, on the extreme eastern frontier. The total output of the mines in that district was 4,129,000 tons in 1902, the most recent date for which detailed statistics are available.

TOULOUSE.

(Mr. Vice-Consul Huggins.)

1. Yes.
2. In the Departments of the Higher Garonne and Ariège, shipping ports Bayonne and Bordeaux, about 250 to 300 kilometres.

3. Transport expenses, two francs per cart and six francs per ton (eight francs per ton); average time, five days.

4. Miners are paid 3.50 frs. and labourers or handymen 2.50 frs. per diem. Price put on railway truck about 11 frs. per ton for ore analysing 50 per cent. iron.

5. The iron ore in the Ariège gives about 55 per cent. metal, 0.15 per cent. sulphur, and 0.012 per cent. phosphorus; all the ore is consumed on the spot, and there is an active and continuous output.

Most of the known iron deposits in the Higher Garonne are in the hands of Mr Emile Tuteur. Deposits in Fos—worked about 100 years ago—hydrolietic iron analysing:—

Metal, 56 per cent. iron.

0.001 sulphur.

0.002 phosphorus.

0.8 per cent. silica.

With the argut deposit of iron are connected the well known carbonate of manganese mines:—

Manganese metal, 35 per cent.

Silica, 7 per cent.

Phosphorus, 0.003.

Deposits at Milhas analyse:—

67 per cent. iron metal.

0.012 sulphur.

0.01 phosphorus.

0.8 per cent. silica.

6. The proprietors are not exactly poor, and would be quite willing to sell or let out on reasonable terms.

7. None of these deposits have been worked extensively.

8. The only obstacles up till now have been the cost of transport, the deposits being generally situated in high altitudes, requiring putting up of cables, expenses which the present owners have shrunk from incurring, but which would be very feasible with a powerful organisation of capital.

9. Andorra contains enormous deposits of excellent iron ore, which is situated in the continuation of the Palleresa chain of iron mountains or Spanish territory, but this great wealth is totally lost to mankind by reason of the absence of all communication. Closely intermingled with these unique iron ore deposits of exceptional quality are the very important coal and lignite deposits, two elements important in the establishment of blast furnaces to make pig iron for Spanish and export purposes. But without a railway it is useless to think of exploiting these rich deposits. Mr. Emile Tuteur has been charged by the authorities of the province of Lerida to procure the capital for this railway (length 156 kilometres).

There is an enormous supply of iron ore for many years, I am told by competent persons.

From what I can learn there are many annoying formalities to be feared from the French authorities, such, for instance, as the necessity of getting permission to sell iron when once procured, but these difficulties can be overcome by persons properly initiated.

Another difficulty would be in the supply of coal, which is charged ten francs per ton freight, but doubtless special conditions might be obtained if applied for in an intelligent way.

There seems to be a number of persons who know all about iron deposits, but who have not sufficient means to work mines properly. I can give two or three addresses, if necessary, of gentlemen who possess experience, local standing and sufficient knowledge to be useful to the British Iron Trade Association.

It appears to me that persons sent out from the United Kingdom without knowledge of the language, country or local customs and laws, would probably fail to succeed in their mission, if not ably seconded in their efforts by someone who knows and lives in the country.

GERMANY.

DRESDEN.

(*Mr. Consul Palmié.*)

Mr. Palmié states that in Saxony only two deposits of iron ore exist, viz., at Schwarzenberg, Saechs-Erzgebirge, the owners of which are Messrs. Breitfeld and Son, and at Berggiessshubel, near Pirna, owner Saechs-Guss-Stahl Fabrik, Doehlen near Dresden.

The iron ore found in these mines is not exported to foreign countries, but is handled in the factories of the above-named owners of the mines.

DUSSELDORF.

(*Mr. Vice-Consul F. P. König.*)

1. There are extensive iron ore fields in the part of the Rhine province known as the Siegerland, the valley of the river Sieg, a tributary of the Rhine, the district of Olpe and Altenkirchen; in some of the coal-mining districts of Westphalia iron ore is found and worked; besides these there are very considerable iron ore fields in Lothringen and Luxemburg.

2. The nearest shipping ports are Rotterdam, Antwerp and Emden.

The average distance from the iron ore deposits to the ports would be about 150 miles, say, from Wanue in Westphalia to Emden; for the Rhine provinces the average distance would be about 220 miles, say, from Coblenz to Rotterdam.

3. The cost of transport would vary according to quantities and according as it took place by rail or canal to the seaport. In many cases it would form a matter of special arrangement by contract with the State Railways and shipowners, in proportion to quantities. In the case of Westphalia the ore could be transported, for transshipment to Emden, the greater part of the way by canal; and in the case of the Rhënish provinces, the greater distance by Rhine barge (of 300 to 1,000 tons) to Rotterdam or Antwerp, as the case may be. So far there are no statistics available to show that the Siegerland ore has been shipped for export; up to the present the tables issued only quote the amounts of pig-iron exported.

But I am informed that quite recently iron ore has been shipped to England and in increasing quantities. The ore in the Siegerland is at present, for the most part, smelted in the blast furnaces of that district; of late years about 60 per cent. of the ore has been smelted in local furnaces, and only 40 per cent. has been sent to the Westphalian blast furnaces. The transportation of iron ore from the Siegerland to the Ruhr, Saas, Lothringen, Luxemburg and Aachen districts would, according to the preferential tariff, cost 1.25 pf. per metric ton and kilometre, and another 60 pf. per metric ton terminal charges extra.

The transport of coke from Westphalia to the Siegerland costs 22 pf. ($2\frac{3}{4}$ d.) per ton kilometre, and another 70 pf. ($8\frac{1}{2}$ d.) per ton terminal charge extra. Since August last this coke tariff has been reduced by 3 pf. per 100 kilometres, by 4 pf. ($\frac{1}{2}$ d.) from 100-200 kilometres, and by 5 pf. for over 200 kilometres per ton kilometre. The transport of coals costs 22 pf. per ton kilometre up to 350 kilometre; 14 pf. per ton kilometre over 350 kilometres, and 70 pf. per ton terminal charge extra.

4. For the most part the iron ore is excavated and extracted from underground through shafts. The average yearly wages or earnings of the miners in the Siegerland are as follows:—

	£	s.	d.
1894	38	3	7
1895	37	13	5
1896	45	17	6
1897	50	7	6
1898	52	6	10
1899	58	11	5
1900	61	14	9

These wages amount to, in shillings:—

1894	4.11	1898	6.22
1895	4.32	1899	6.55
1896	4.85	1900	6.84
1897	5.58		

per ton of iron ore at the face of workings.

The following table shows the cost in shillings of mining per ton of 1,000 kilograms, in mines of small (Nos. 1-3), medium (Nos. 4-6), and large extent (7-8), loaded in truck:—

Number.	1893.	1895.	1897.	1899.	1900.
1	—	6.528	—	—	9.110
2	—	6.830	—	—	9.596
3	6.130	6.080	7.550	8.120	9.270
4	—	6.198	—	—	11.580
5	5.760	6.010	8.050	8.510	8.240
6	4.860	5.650	6.700	7.770	9.480
7	—	5.550	—	—	8.250
8	6.300	6.330	9.360	9.630	9.800

The above costs of production are composed of the following items:--

		Shillings.
		Per ton.
Wages and Salaries	... ..	4.95 to 7.47
Pit timber	... ..	0.155 „ 0.329
Coal	... ..	0.370 „ 1.209
Materials (other)	... ..	0.763 „ 1.720
Compulsory Insurance Expenses	...	0.120 „ 0.430
Taxes and Rents	... ..	0.050 „ 0.100
Preparatory Works...	... ..	0.450 „ 0.500
Carting to station	... ..	0.210 „ 9.190*

* *Sic* in manuscript.

The following figures are given by one mine as its wages bill for an 8 hours' day:—

	Shillings.
1893	2.58
1894	2.57
1895	2.65
1896	3.15
1897	3.48
1898	3.54
1899	4.20
1900	4.02

The average value of a ton of iron ore in railway truck amounted to in shillings: 11.15 in 1899; 12.10 in 1900; 14.45 in 1901; 11.72 in 1902.

5. The following figures are taken from official statistics of average analyses of iron ore in the Siegerland:—

	Iron.	Magnesia.
	Per cent.	Per cent.
Raw spathic iron stone	33—35	5—6
Roasted iron stone	45—48	7—9
“Glanz” iron ore	52—56	traces only
“Braun” iron ore	43—57	traces only

The following percentages of iron are obtained:—

Out of Raw Spathic Iron Ore	... 35—37 per cent. Iron.
„ Roasted	... 47—49 „ „
„ “Glanz”	... 50—53 „ „
„ “Braun”	... 41—43 „ „

According to Dr. Schwartz's analyses in Siegen (published in 1887) (pages 42, &c.) which have been proved correct by Berthier, Karsten, and Schnabel, the following are the percentage constituents of iron ore:—

—	Fe.	Mn.	SiO ₂ .	CaO.	Mg.	Cu.	S.	P ₂ O ₅ .
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Raw	38.86	9.20	0.224	0.70	2.51	0.026	0.027	Traces only.
Roasted ..	49.71	10.12	0.570	0.25	1.92	0.112	0.257	Traces only.

Brown iron ore contains varying percentages of magnesia (according to Schwartz) between 2.21 and 8.29 per cent. Mn₂O₃ (Oxide of magnesia).

Schwartz gives, further, the percentage of sesquioxide of iron (Fe₂O₃) on an average 60.81 per cent., in the case of six analyses of "Braun" iron stone, with a large proportion of magnesia (15.49 per cent. of Mn₂O₃); further, in the case of eight other analyses of brown iron stone we find a low percentage of magnesia (3.9 per cent. Mn₂O₃), and as much as (69.94 per cent.) 70 per cent. of Fe₂O₃—an exceptionally high percentage.

6. The iron ore deposits were originally, like all other minerals, the property of the State, but concessions have been granted to private individuals and companies to exploit. For the greater part the iron mines that are, and have been, worked are the property of great iron and steel works in the Rhenish Westphalian district, such as Gebrüder Stumm, Rothe Erde at Aachen, Krupp, Phönix, Dortmund Union, Hoerde, Bochumer Gusstahl, Gutehoffnungshütte, &c.

There are smaller companies and individual owners, who are not, perhaps, all wealthy, who would probably be prepared to sell their concessions or mines. For many years the iron-stone mines and concessions in Germany were rather a drug in the market, not being prosperous, the larger works importing ores from Bilbao and Sweden; but as applied science has advanced in the manufacture of iron and steel, they have been able to make use of ores which formerly were not manufactured into iron on account of their insufficiently pure quality.

7. Iron-ore mining operations in the Siegerland have been carried on for many hundred years. The Müsener Stahlberg is mentioned in the archives of the year 1313. In the 15th century a great number of iron ore mines were started, which are still being worked, and some of which have lately had a run of great prosperity. The "Eisenzecher Zug" mine, in the Siegerland, produces 20,000 tons of iron ore per month, and pays £50,000 in dividends per annum.

The iron ore production of the Siegerland in recent years has been as follows:—

1890	...	...	...	...	1,765,509 tons.
1897	...	...	...	...	1,794,457 "
1898	...	...	...	...	1,640,877 "
1899	...	...	...	...	1,800,980 "
1900	...	...	...	...	1,841,618 "
1901	...	...	...	...	1,668,683 "
1902	...	...	...	...	1,394,209 "

The reduction of the output of late is due to the depression in the market, which caused some works to reduce the production voluntarily and under syndicate regulations and agreements, by 25-50 per cent. per annum.

The following amounts were sold and transported in the Siegerland :—

1898	...	...	...	...	1,635,073 tons.
1899	...	...	...	...	1,782,449 „
1900	...	...	...	...	1,796,786 „
1901	...	...	...	...	1,600,421 „
1902	...	...	...	...	1,288,285 „

Of these quantities the following were smelted in the blast furnaces of the Siegerland :—

1898	...	...	...	...	905,577 tons.
1899	...	...	...	...	1,033,383 „
1900	...	...	...	...	1,027,061 „
1901	...	...	...	...	928,594 „
1902	...	...	...	...	730,196 „

The following quantities were transported to the more distant furnaces of the Rheinland and Westphalia :—

1898	...	...	...	...	729,496 tons.
1899	...	...	...	...	749,066 „
1900	...	...	...	...	769,725 „
1901	...	...	...	...	671,826 „
1902	...	...	...	...	558,089 „

8. There are no particular impediments in the way of successful mining operations. The iron ore is of a suitable consistency for mining purposes, neither too hard nor too soft.

There is seldom any trouble underground with water, and the layers and seams of iron ore are mostly of considerable thickness. The value of the iron ore mines would be considerably enhanced if the State Railway Administration would still further reduce its freights. Whereas the freight rates for iron ore from Siegerland to Westphalia are moderate, those for coke and coal from Westphalia to the Siegerland are still too high, so that the iron ore and the iron industry of that district is at a disadvantage compared with Westphalia. However, it is considered only a matter of time to accomplish an improvement in this direction. The furnace owners of the Siegerland expect to be treated on a par with those of Westphalia.

9. Iron ore mining in the Rhenish provinces and Westphalia dates as far back as the times of the Romans. In the district of Düsseldorf iron ore mining dates back to 1772; but here the mining operations have not increased owing to the inferior quality of the ore compared to that found in the valley of the Sieg, Rhenish province; the foundries find it profitable to buy their supplies mainly from the Siegen district or from Spain and Sweden, owing to the superior quality of the ore. In Lothringen and Alsace there are also extensive iron-ore fields, but the freights are still too high, so that mining operations in these provinces seem to offer less likelihood of success. Should, however, the freights hitherto maintained be reduced, Lothringen would rank first in the list of prosperous iron-ore fields. Round about Aachen (Kreis Düren and Schleiden) there is but little iron ore. On the right bank of the Rhine, near Coblenz and Wiesbaden, in the valleys of the Lahn and Dill, iron ore mining has been carried on for centuries, as far back as 1219. The iron ore mining districts of Witzlar, Alténkirchen and Neuwied, Rheinland, are of considerable importance. The district of Arnsberg, Westphalia and Siegen contain some of the most extensive iron-ore fields, some of which are well known for the small quantities of phosphorus contained in them. The mines in the valley of the Sieg produced, in the year 1820, about £75,000 worth of iron ore; in the year 1900 this same district produced as much as £600,000 worth.

The district known as the Siegerland contains a practically unlimited supply of very good iron ore. The iron ore deposits in Westphalia are less rich, but still they are found to be worth working; they are found in the districts about Stadtberge, Olpe, Arnsberg, Hagen.

The following table gives quantities of iron ore produced in the Rhenish provinces, Westphalia and Hessen-Nassau, in millions of tons (1,000 kilograms):—

Iron Ore.	1885.	1890.	1900.
	Million tons.	Million tons.	Million tons.
Rhenish provinces	1·02	1·13	1·16
Westphalia	0·94	1·12	1·22
Hessen-Nassau	0·50	0·61	0·59

The above amounts are valued in millions of marks (one million of marks = £50,000):—

Iron Ore.	1885.	1890.	1900.
	Million marks.	Million marks.	Million marks.
Rheinland	7·01	10·83	13·18
Westphalia	6·76	10·07	12·79
Hessen-Nassau	3·01	4·30	5·48

The production of iron ore in the districts of Wiesbaden, Trier and Coblenz does not suffice to cover the local demand of the blast furnaces which, in 1900, were supplied with 10½ million tons; the deficit came from Lothringen and foreign countries. German blast furnaces produced in 1900, 7.55 millions of tons of pig-iron,* valued at £23 millions. Over half the German iron produced (4.62 millions of tons), is smelted in this consular district of the Rhenish provinces and Westphalia.

Of late years the owners of blast furnaces have taken up again, and worked, their own iron ore mines, and have also bought up coal mines to a large extent, thus amalgamating three formerly separate industries.

Besides the Siegerland (Rheinland), Westphalian and Hessen-Nassau iron-ore fields, which may be considered the most important in Germany, there are the following well-known important centres of the iron industry: the Saarbezirk, Luxemburg-Lothringen and Upper Silesia.

The recent development of the iron-ore fields of Luxemburg and Lothringen has been quite astonishing; should the exploiting of these two districts increase in the same proportion for a few years, these provinces will head the list of iron-ore producers in this part of the continent.

According to Kohlmann's estimate, the wealth of iron ore is of vast extent; the deposits are said to amount to 1,800 millions of tons in Lothringen, and 300 millions of tons in Luxemburg. These ores contain a large amount of phosphorus, but the Thomas-Gilchrist process has altogether removed that impediment. In 1901 the principality of Luxemburg and the province of Lothringen together produced 12 millions of tons of iron ore and nearly 2½ millions of tons of pig-iron.

* In 1903 the German production of pig iron was over 10 million tons.

An important iron district in Germany is that of Upper Silesia, which, however, possesses the disadvantage that its coal and coke are not of as good quality as in the Rhenish-Westphalian mining centres, but Silesia has the advantage of having its coal and iron-ore fields in proximity to each other.

The total amount of iron ore smelted in the blast furnaces of Silesia amounted, in 1902, to 1,099,381 tons.

The following table shows the development of the iron ore industry from 1885 to 1900 in this Consular district (Rhenish provinces and Westphalia) and Hessen-Nassau (in millions of marks and of tons):—

RHENISH PROVINCES.

Iron ore of all sorts.	1885.	1890.	1900.
Number of works No.	33	32	35
Average number of daily hands ..	7,300	9,267	12,672
Amount produced ... <i>Million Tons</i>	1.16	1.56	2.92
Value <i>Million Marks</i>	51.60	92.23	191.01
Value per ton <i>Marks</i>	44.61	59.19	65.15

WESTPHALIA.

Iron ore of all sorts.	1885.	1890.	1900.
Number of works No.	28	25	24
Average number of daily hands ..	4,369	4,263	6,089
Amount produced ... <i>Million Tons</i>	0.90	0.99	1.68
Value <i>Million Marks</i>	40.6	61.69	114.87
Value per ton <i>Marks</i>	44.99	62.00	68.17

HESSEN-NASSAU.

Iron ore of all sorts.	1885.	1890.	1900.
Number of works No.	8	5	4
Average number of daily hands ..	1,311	961	144
Amount <i>Million Tons</i>	0.01	0.02	0.02
Value <i>Million Marks</i>	1.97	1.87	1.5
Value per ton <i>Marks</i>	134.97	120.89	67.69

Iron Ore Mines.

Table showing the number of works, number of hands, amount and value of iron ore produced from 1892 to 1901 in Germany:—

Years.	Number of works.	Average number of hands.	Production.	
			Quantity.	Value.
1892	702	36,032	1,000 tons. 11,539	1,000 marks. 41,280
1893	619	34,845	11,457	39,801
1894	580	34,912	12,392	42,178
1895	543	33,556	12,349	41,076
1896	634	35,223	14,162	51,399
1897	708	37,991	15,466	60,088
1898	635	38,320	15,901	60,825
1899	706	40,917	17,989	70,170
1900	712	43,803	18,964	77,628
1901	598	40,802	16,570	71,999

Table showing the imports and exports of the year 1902 of iron ores into and from Germany, from and to different countries:—

Imports from—	Quantity.	Value.
	Tons.	1,000 marks.
Belgium	110,001	935
France	54,260	705
Austria-Hungary	251,331	4,147
Russia	52,758	976
Sweden... ..	1,144,006	17,160
Spain	1,918,003	28,770
Algeria	113,528	1,816
Total Imports	3,957,403	59,235

Exports to—	Quantity.	Value.
	Tons.	1,000 marks.
Belgium	1,661,824	5,484
France	1,153,535	3,807
Austria-Hungary	28,121	478
Total Exports	2,868,068	10,095

FRANKFORT-ON-MAIN.

(*Mr. Consul-General Oppenheimer.*)

1. The only deposits, so far as known at present, exist in the mountainous districts (Bergrevier) around and near Diez and Weilburg on the Lahn.

2. The nearest shipping ports admitting ocean steamers would be those situate on the lower Rhine.

3. These ports are at a very considerable distance, and are not, for practical purposes, available for the poor deposits above mentioned, as will be gathered from what follows. Nor is there any serviceable river port within practicable distances.

4. The wages paid for mining proper vary from 2.20 marks to 2.80 marks per shift of eight hours. The cost of labour for loading amounts, on an average, to three marks per day.

5. According to an analysis privately obtained (there being no official analysis nor samples obtainable), the highest percentage of ore is 60 per cent.; the average, however, is 40-50 per cent.; in some cases the mines yield even below 40 per cent. of ore.

6. The proprietors of these deposits are throughout very powerful and rich companies, like Krupp at Essen. These companies have secured these mines for purposes of reserve, but as the yield is poor and better mines situate in other places yield better results, these reserve deposits are little, if at all, drawn upon. The mines at present most popular with these large companies appear to be those situate in Lorraine (Germany), Spain, and Sweden.

7. The following are the figures for the mines worked:—

In the district of Diez, out of 702 shafts—

1901—18 shafts were worked with 409 hands.

1902—18 shafts were worked with 316 hands.

In the district of Weilburg, out of 1,371 shafts—

1901—74 shafts were worked with 1,640 hands.

1902—54 shafts were worked with 1,442 hands.

8 and 9. As there are no coal deposits within easy distance, and the percentage of ore is so low, there is no likelihood of successful continuous mining in these districts, much to the detriment of the local population, who appear to be willing workers. To encourage their employment the State Railways have, since August 10th, 1902, granted an exceptional tariff for ore shipped from these parts, amounting to 1.6 pfennig per ton kilometre, with the implied understanding of a possible further reduction. But the impetus which such a concession might have given to the local mining industry appears counterbalanced by the transport concessions granted from time to time to the Alsace-Lorraine iron works, which ship their ore for 1.20 marks per ton the whole distance to the Rhenish Westphalian centres of the iron industry. As heretofore, then, the yield from these mines, such as it is, appears still to be locally disposed of.

This yield amounted in

1900 to 267,650 tons, value 2,467,312 marks.

1901 to 223,754 tons, value 2,013,428 marks.

1902 to 220,444 tons, value 1,635,367 marks.

It will thus be gathered that the value of this mining enterprise has receded very considerably.

HAMBURG

(Comprising the Free Cities of Hamburg, Lubeck, and Bremen; the Prussian Provinces of Hanover, Schleswig-Holstein, and Lauenburg; the Grand Duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz; the Grand Duchy of Oldenburg; the Duchy of Brunswick; and the Principalities of Lippe and Waldeck).

(*Mr. Consul-General Ward.*)

1. Yes; in the Harz Mountains, which are situated chiefly in the province of Hanover, and partly also in Brunswick.

2. The deposits are in various parts of the Harz Mountains, viz., at Lauterberg, at Elbingerode (flinty ore), at Harzburg (limy ore), at Dörnten-Salzgitter (acid ores), at Ilsede (basic ores), and at Schwarmstedt Wietze (acid ores).

The nearest ports capable of admitting ocean steamers are Hamburg (distant about 160 miles) and Bremen-Bremerhaven (distant about 140 miles).

3. The transport of ore to the ports before mentioned would be effected partly by rail and partly by river to Hamburg, and by rail to Bremen. The freight to Hamburg would be from 4s. 11½d. per ton, and to Bremen about 3s. per ton.

4. The labour employed consists in German miners and carters. The miners receive 3s. per day, and the carters from 2s. to 3s. per day.

5. Analyses or samples of the ores cannot be sent, but might possibly be obtained by intending purchasers at the respective works on personal application.

The percentage of iron found in the ore deposits at the different localities enumerated above (Answer 2) is as follows:—

Lauterberg	...	...	...	30 to 45 per cent.
Elbingerode	...	...	...	ditto
Harzburg	...	...	...	35
Dörnten-Salzgitter	...	...	...	35
Ilsede	...	...	...	35
Schwarmstedt Wietze	...	...	...	50

6. The proprietors of the deposits at Lauterberg, Harzburg, and Schwarmstedt Wietze are not wealthy; whilst those of the deposits at Elbingerode, Dörnten-Salzgitter, and Ilsede are very wealthy. Whether they would sell on reasonable terms or not cannot be stated.

7. The deposits in all of the localities mentioned (in Answer 5) are being worked, and have been worked for a long time already, excepting those at Schwarmstedt-Wietze, which are very limited in quantity. The production of the mines at Lauterberg and Elbingerode is comparatively small; that of the Harzburg works is rather more important; but the yield at Dörnten-Salzgitter, and above all of the Ilsede mine, is very considerable. The output of the latter amounts to about 330,000 tons per annum.

The quantities and destinations of shipments made from these mines are not ascertainable, as no information is given to outsiders on this and most other business matters.

8. There are no obstacles in the way of successful continuous and unencumbered mining in this district, excepting that, apart from the two mines last mentioned in the preceding answer, the deposits are limited in quantity.

9. The increase of output at the Ilsede mine, by far the most important of this district, was 24,000 tons in the year 1902, as compared with the previous year; and a dividend of 40 per cent. was paid to the shareholders for the past year. The Ilsede ore is stated to contain a considerable percentage of phosphorus, thus favouring the production of Thomas pig iron.

MANNHEIM.

(*Mr. Consul Ladenburg.*)

1. Several small iron ore deposits exist in Baden; but these mines are of no importance for the market. The mining, after having been stopped for centuries, was taken up again some years ago, and is done at present by 20 workmen only. The output is very small, and the ore entirely consumed in the small Württemberg furnaces.

Large deposits of iron ore exist in Lorraine.

2. The nearest port to Lorraine is Antwerp. The average distance from the mines to that place is about 155 miles.

3. The ton of Lorraine ore is shipped to Antwerp for about five to six shillings by rail; shipment on canal boat costs about one to two shillings less.

4. Wages for mining the iron ore run up from 1 to 3 marks a ton; loading on railway trucks averages between 40 to 60 pfennige per ton.

5. This ore is generally known under the name of brown iron ore; it means a hygroscopic oxide of iron, very high in phosphorus and low running in iron. The Lorraine ores are called "minette." They consist mostly of ortoclas, hornblende, and biotite.

The analysis shows the following composition:—

SiO ₂...	...	...	...	45 to 60	per cent.	
Al ₂ O ₃	...	...	...	10	„ 16	„
Fe ₂ O ₃	...	...	...	2	„ 9	„ + FeO.
CaO...	...	...	...	5	„ 11	„
+ MgO	...	...	...	5	„ 11	„
K ₂ O...	...	...	...	3	„ 5	„
Na ₂ O	...	...	...	2	„ 3	„

6. Most of the Lorraine iron ore deposits are in the hands of large German steel concerns, who, since the discovery of the basic Bessemer process, have bought and control to-day nearly all of these ore deposits; this high-phosphorus ore forming the most valuable base of the Thomas steel process. It is not likely that these proprietors would ever sell their deposits.

7. There are only a few deposits in Lorraine which have not been worked; the great majority supplies the blast furnaces with sufficient ore. It is impossible to state quantities or destination of shipment.

8. No; the German iron-masters think they will have an inexhaustible source of iron ore for at least, say, three hundred years. Mining is done with the utmost economy and technical care, and with all possible mechanical help.

9. The Lorraine iron ore is not likely to be exported to any other country; it is only fit for the German Thomas process, and could not be used for any acid steel process, neither open-hearth nor Bessemer. Therefore its market will always remain in its neighbourhood among the German mills on the Saar-rivers, on the Rhine and in Westphalia.

MUNICH.

(Mr. Consul Buchmann.)

1. There are 651 iron ore deposits in Bavaria, including the Bavarian Palatinate.

2. (a.) The 651 iron ore deposits in Bavaria are situated in the following districts:—

- 246 in the Upper Palatinate (near Amberg and Sulzbach);
- 262 in Upper Franconia (near Kulmbach, Weidenberg, and Hof);
- 65 in Lower Franconia (near Aschaffenburg);
- 30 in Middle Franconia (near Lauf and Hersbruck);
- 3 in Upper Bavaria (near Laufen and Traunstein);
- 13 in Suabia (near Dillingen);
- 32 in the Bavarian Palatinate (near Kaiserslautern and Bergzabern).

651.

(b.) As no Bavarian iron ore is ever sent to any seaport, no information can be obtained on the subject. Trieste and Hamburg are the nearest seaports, the distance from the centre of Bavaria being about 500 English miles to either place.

3. The railway freight in Bavaria for iron ore amounts for one ton to 3.60 marks (3s. 6d.) for 100 kilometres (about 62 English miles), and 5.60 marks (5s. 6d.) for 200 kilometres (about 124 English miles), so that the freight for one ton of iron ore sent to Hamburg would come to about 15s.

4. (a.) The highest wages paid in Bavaria for miners amount to 3s. per day.

(b.) Details as to cost of mining are not obtainable; the loading of trucks is done by day labourers, earning from 1s. 6d. to 2s. per day.

5. The following tables show the official analyses of Bavarian iron ore:—

(a.) *Iron Ore from Amberg.*

Ordinary ore:—

Peroxide of iron	71.32	per cent.
Peroxide of manganese	0.61	„
Phosphoric acid	1.98	„
Clay mixed with silicon	2.93	„
Silicic acid	12.82	„
Hydrate (Fe ₂ O ₃)*	9.71	„
Organic matter and water mixed with Al ₂ O ₃	0.60	„
	<hr/>	
	99.97	per cent.
	<hr/>	

(b.) *Average taken from several analyses of iron ore.*

Peroxide of iron	73.00	per cent.
Peroxide of manganese	0.50	„
Phosphoric acid	1.80	„
Water in general	10.30	„
Organic and indissoluble matter ...	14.40	„
	<hr/>	
	100.00	per cent.
	<hr/>	

* *Sic* in original.

6. A number of iron ore deposits in Bavaria are owned by the Government, as "Maximilianhuetten" and "Fichtelberg," whilst the "Koenigin Marienhuetten" is owned in Zwickau (Saxony). As to private owners (the addresses of whom are known at this Consulate), their pecuniary circumstances are not exactly known, yet most of the owners would be inclined to sell if any acceptable offers were made.

7. In 1898, 45 mining concerns were worked, yielding	175,023 tons.
" 1899, 36 " " " " " "	184,019 "
" 1900, 35 " " " " " "	179,918 "
" 1901, 34 " " " " " "	160,440 "
" 1902, 22 " " " " " "	157,374 "
(With an average of about 700 miners.)	
Total 	856,774 "

to the value of 3,764,155 marks (= £188,208).

The above shows that the quantity extracted is gradually diminishing from year to year. Most of the iron ore serves manufacturing purposes in Bavaria, a small quantity only being exported to Bohemia.

8. There seem to be no serious obstacles in Bavaria preventing iron ore mines being worked more successfully than hitherto, bad trade and lack of capital in general accounting most probably for the want of more enterprise in that direction.

It may be added here that the yearly Government tax amounts to 26.7 pfennigs per hectare (an acre).

STUTT GART.

(Mr. Consul Rose.)

1. Yes.

2. In the neighbourhood of the railway stations of Aalen, Wasseralfingen, Geislingen, Kuchen, Hausen.

The nearest shipping port capable of admitting ocean steamers would be Rotterdam.

3. It is unnecessary to answer this question, as, owing to the poor quality of the Württemberg iron ore and the great distance to Rotterdam, a profitable export is altogether impossible. The transport facilities are by rail and river.

4. The ores occur in almost horizontal layers of from one to two yards thickness; the cost of labour for mining and loading is five shillings per ton.

5. The following analysis gives the average quality of the Württemberg iron ore:—

S_1O_2	=	34.09	per cent.
MnO	=	0.46	"
CaO	=	1.69	"
P_2O_5	=	0.68	" (= 0.298 P)
MgO	=	0.90	"
Al_2O_3	=	8.44	"
Fe_2O_3	=	53.68	" (= 37.57 Fe)
		99.94	

The yield in the blast furnace is 33 to 35 per cent. iron.

6. The proprietors are the State of Württemberg and some private persons in Westphalia.

7. The State of Württemberg has worked these ores in a small blast furnace in Wasseralfingen; 11,000 tons were worked in the year 1901.

8. The obstacle to successful mining is the poor quality of the ores and the impossibility of working them in open quarries.

GREECE.

CEPHALONIA.

(*Mr. Vice-Consul Saunders.*)

1. Iron ore, along with manganese, is reported to exist in this island.

2. These deposits are to be found in the districts of Leo, Pronos, and Samos. The nearest shipping place for the ore from Leo and Pronos is Catoló Harbour, so called, which is close to the Cacava shoals off Munda Point, and lies from about five to eight miles distant from these deposits; no steamer can, however, approach within half a mile of this little harbour to the west of the said shoals.

The deposits in the district of Samos are from six to ten miles inland from Samos harbour, which is capable of admitting steamers of any size outside the lighthouse pier.

3. It is impossible to state exactly what the transport of ore would cost to the ports per ton. The only means available for transport are mule carts, carrying from 600 to 1,000 lbs. weight, according to the distance. Roads, however, do not approach several of these deposits, some of which are difficult of access, and the transport, where this is possible, by mule loads would be very slow and expensive.

4. The cost of manual labour available for mining and quarrying would be about four drachmes, say, 2s. per man per day. No estimate of the cost of mining or quarrying can be given; the cost, however, of loading, and of transport in carts, as above stated, to the place of loading, would be about ten drachmes, say 5s. per cart load, which would be equivalent to 15s. per ton net weight.

No lighters, or large sailing boats, are at present available for shipping the ore, &c., either from Catoló or Samos harbour.

5. Several applications, accompanied with samples and analyses by recognised chemists were presented at the Prefecture, and they have been forwarded to Athens; but no permission to work the ore has been granted as yet to any of the applicants. No analyses of the ore can, however, be obtained here, as these have been sent to Athens, and no copy of them has been kept at the Prefecture.

6. The ore becomes the property of the person or persons who discovered it, and have obtained permission from Government to work it; the owners of the soil, whether rich or poor, having no other claim beyond 5 per cent. on the net profits made from the sale of the ore.

7. The area covered by this ore is put down approximately at 25,000 acres, which are partly under cultivation; but it is impossible as yet to say anything regarding the quantity to be obtained, and whether the quality of this ore will turn out to be such as to be worth the working of it. Beyond the samples sent to Athens, not a pound of this ore has gone out of the island.

PIRAEUS.

(Mr. Consul Walsh.)

1. Deposits of manganese and hematite iron ore are known to exist in several places in the consular district of Piraeus, which comprises the provinces of Attica and Boeotia, Laurium, Phiotis, and Phokis in Continental Greece, and the Island of Euboea.

2. A rough map is forwarded herewith in order to show clearly where these deposits exist. In this map, which gives the whole of Continental Greece and the Peloponnesus, the deposits in this consular district, which is enclosed in yellow, are marked with a green bar, and are numbered for the sake of reference. These places may be briefly enumerated, beginning first with the district of Laurium, which embraces the south-eastern peninsula of Continental Greece. The deposits here are all being worked by companies or individuals.

Name of Mine.	Number of reference.	By whom Worked.
Allegrana	1	Owned by the Contractor of the "Société Hellenique de Plouton."
Vromopoussi	2	Belongs to "La Société Française des Mines de Sunium," but worked by M. Monin.
Placa	3	Anonymous.
Spilioseza	4	Small area (380 acres) worked by "La Société des Mines de Seriphos et Spilioseza."
Dardesa	5	Belongs to "La Société Française de Dardesa."
Dascalio	6	Belongs to and worked by "La Société Hellenique des Mines des Laurium."
Port Rafti	7	Belongs to Mr. Gianopoulos (apparently not worked now).

The principal port is Laurium itself, which, though not big, is well sheltered, and has anchorage for ships of any draught. In several cases, however, there are jetties along the coast nearer to some of the mines and deposits enumerated above, where, for the most part, ships of big tonnage can load, though in stormy weather they may have to put into Laurium.

Such are at:—

Avlaki Connected with Spilioseza by a private Décauville railway, and also with Vromopoussi.

Allegrana $2\frac{1}{2}$ miles from the mine of that name. Ores conveyed in carts.

Larymna Connected with the mines of the French and Greek companies in that district.

Leaving the Laurium district and proceeding further up the east coast, we come to the hematite iron ore mine Grammatico (No. 8), where a line $11\frac{1}{2}$ miles in length has been constructed from the mine to Limiona. Here there is a jetty at which ships of large tonnage may load.

In the island of Euboea, north-east of Grammatico, there are two places where iron ore deposits are known to exist, "Politica" (No. 14), and "Psachna" (No. 15), but these are not worked.

Opposite to these on the mainland again iron ore deposits are to be found round the Lake Copais district (Nos. 9, 10, 11). Here six concessions have up to the present been granted by the Greek Government: One to a Greek Company, "La Société des Entreprises" (A); one to a French Company, "La Société des Mines de Larymna" (B); one to a group, and called

“Tsouka” concession (c); one called the “Rota Patrinos” concession (d); another called the “Papazaphiropoulos” concession (e); the name of the sixth I have not been able to find out. So far, only the “Société des Entreprises” and the “Société des Mines de Larymna” are working these concessions, which are situated at the mountain of Louza. The Greek company has a jetty at Larymna, connected with the mine by a private single line of $7\frac{1}{2}$ miles. The French company is constructing a line from the mine to the same place, a distance of $6\frac{3}{4}$ miles. For the other concessions the Bay of Vivos would be the most handy, but there is not water there for ships of large draught.

Other deposits known are those at Antikyra (No. 12) and at Daphné (No. 13), near Athens and Piraeus. At Antikyra, which is on the shores of the Gulf of Corinth, and where I believe the deposits are not yet worked, no line exists for conveyance of ores, nor is there any port.

The concession at Daphné is only $2\frac{1}{2}$ miles from Piraeus, and was worked for a short time, but without success, the low percentage of iron ore making the undertaking unprofitable.

3. This question is almost impossible to answer satisfactorily, for two reasons, the first and principal being that the information required is just that which proprietors are most loth to give, and the second is the variety of the means of transport; in the case of one mine there may be just a private railway of a mile or so straight from the mine to the loading jetty, in another the ore may be conveyed down inclined planes into carts and thence again into railway trucks and so to the port. I am told that in the case of the Larymna concession the French Compagnie des Mines de Larymna has given a contract for working, transport and loading at 3s. 7d. per ton, but I cannot vouch for the accuracy of this statement.

4. The cost of labour for mining and loading ranges from 1s. 9d. to 2s. 3d., or 2s. 6d. to 5s. per ton delivered to trucks.

5. I have been unable to obtain official analyses of the ores. But those given here were supplied to me by Mr. Gianopoulos, to whom I am indebted for much valuable help. Mr. Gianopoulos has only just retired from the post of Chief of Section in the Government Mining Department, and has surveyed the mines and mineral deposits of the whole of Greece.

			Average.
Spilioseza (No. 4) ...	} Manganese ...	...	14—15 per cent.
Dascalio (No. 6) ...		} Iron Manganese ...	52—54 "
Vromopoussi (No. 2) ...			
Dardesa (No. 5) ...	} and	Iron	42.50 "
Placa (No. 3) ...		Manganese	11.50 "
		Silica	5.24 "
		Iron	43.80 "
	Manganese	8.40 "	
Allegrana (No. 1) ...	} ...	Iron	52 "
		Phosphorus	0.084 "
		Arsenic	0.80—1.00 "
		Sulphur	0.13 "
		Silica	5 "
Port Rafti (No. 7) ...	} ...	Manganese	19 $\frac{1}{2}$ "
		Iron	36 "
Grammatico (No. 8) ...	} ...	Iron	52—55 "
		Silica	5 "

		Average.	
Locris (No. 10)	...	{	Iron 4 per cent.*
			Silica 5.50 "
			Chrome 2.5 "
			Phosphorus 0.025 "
			Titanic Acid 0.48 "
Daphné (No. 13)	...	{	Iron 44—46 "
			Silica 12—16 "
			Chrome 2.5—3.5 "
			Nickel 0.3—0.50 "

6. In nearly every case applications are made to the Greek Government for concessions with a view to their being subsequently sold or leased, but, as will have been observed, most of the valuable concessions have already been sold or leased, generally to companies. Probably their definition of the word reasonable would be somewhat liberal.

7. Nearly all the deposits in the Laurium district are being worked. Those further north are in some cases quite undeveloped.

8. There is not, so far as I am aware, any special obstacle in the way of continuous and unencumbered mining in this district. Disputes, however, arise from time to time, and particularly when a mine is started, between the owners of the mine and the owners of the surface, and perhaps also with the inhabitants of the district on one pretext or another. On these occasions compromise is the only possible solution of the difficulty.

9. Some of the manganese and hematite iron ores from the Laurium district have for some years past found a ready market in the United Kingdom; they may be said to have an average yield of 50 per cent. of iron. In the case of the ores of Placa, Dascalio, Sunium, and Allegrana, their contents in silica, phosphorus, and arsenic make them less marketable in the United Kingdom, and they are mostly exported to Holland and Belgium.

The ores of Grammatico have a steady sale in Glasgow.

Probably few people are better qualified to give information on the subject of the ores from Greece than the two London firms Messrs. H. Borner and Company, Limited, of 14, St. Mary Axe, and J. Dupré and Company, of 93, Billiter Buildings, through whose hands respectively most of the Greek ore trade passes.

SYRA ISLAND.

(*Mr. Consul Cottrell.*)

1. Two mines, close to one another.
2. Situated about one mile north of the commercial harbour; the latter is the shipping port of the island, admitting ocean steamers.
3. As the mines are near the sea-shore, the ore is shipped close by in lighters.
4. Blasting and manual labour from 2.50 to 3 francs per ton. From mines to the lighters in carts at 30 centimes per ton, and lighterage one franc per ton.
5. Official analyses are appended.
6. One proprietor, Mr. E. E. Kéhayà, who is a man of capital, but willing to rent or sell on reasonable terms.

* *Sic* in manuscript.

7. The above mines have been exploited since 1901. Three cargoes have been shipped to Glasgow, aggregating 6,640 tons, and three more are ready for shipment.

8. No special obstacles in the way. Inundations and such catastrophes unknown.

9. Another mine exists at the south-west end of the island, distant from the harbour ten miles by land and eleven nautical miles by sea. It has been worked at intervals only, the distance from the town augmenting the expenses of labour and transport compared with the two mines above mentioned. The average yield is reported to be from 40 to 50 per cent. of iron. Two cargoes, about 4,800 tons, were shipped to Trieste in 1899, and again the same quantity in 1900. After a lapse of two years, in April, 1902, a cargo of 3,100 tons was sent to Middlesborough, and since then this mine has been at a standstill, owing to lack of ore and capital. The present proprietor is endeavouring to sell his rights.

Analyses of Iron Ore from Syra.

	In the Sample as Received.	In the Sample Dried at 212° F.
Iron	Per cent. 43·80	Per cent. 44·40
Moisture	1·36	—
Manganese	2·23	2·26
Silica	8·06	8·17

	In Sample as Drawn.	In Sample Dried.
Iron	Per cent. 45·56	Per cent. 49·70
*Insoluble	6·05	6·60
Moisture	8·33	—
Manganese	2·47	2·70
Phosphorus	·066	·072
*Contains Silica	5·50	6·00

	In Sample as Drawn.	In Dried Sample.
Iron	Per cent. 42·95	Per cent. 44·37
*Insoluble	8·66	8·95
Moisture	3·20	—
Manganese	2·09	2·16
Phosphorus	·015	·016
*Contains Silica	7·93	8·20

Analyses of Iron Ore from Syra—continued.

	In Sample as Drawn.	In Dried Sample.
	Per cent.	Per cent.
Iron	41.23	42.36
*Insoluble	13.43	13.80
Moisture	2.66	—
Manganese	1.36	1.40
*Contains Silica	12.26	12.60

ZEA ISLAND.

(Mr. Consul Cottrell.)

1. There are many deposits in Zea and the adjoining island of Makronisi.
2. At Cape Spathi, Oreos, Schino, and Petrussa, all along the eastern coast of Zea. Distant from the commercial port of St. Nikolo from nine to fourteen nautical miles.
3. This port is of no value to the mines, as there are no means of transport thither. Shipments are effected on the spot close by the deposits.
4. Blasting and local labour. From 2s. to 3s. per ton. Shipment is done by means of Decauville portable railroad and trucks at from 15 to 25 centimes per ton.
5. Analysis of Spathi mines is appended. Those of Oreos and Schino are not obtainable; the reported yield is from 55 to 65 per cent. of iron.
6. It is said proprietors would only be too pleased to sell or lease their mines on reasonable terms.
7. Nearly all the mines have been worked hitherto, and a total of 25,000 tons been exported, mostly to the United Kingdom, since 1898.
8. None, as far as can be ascertained.
9. Work on the Spathi, Oreos and Petrussa mines has been at a standstill for some time past, owing to lack of capital and scarcity of ore. At Schino the work is only in an experimental stage at present.

*Analysis of Spathi (Zea) Iron Ore.**(Analysed at the Chemical, Analytical, and Technological Laboratory, Trieste.)*

Result of the chemical analysis of two mineral samples.

Sample of iron ore:—

Iron	48.93 per cent.
Manganese	22.05 "
Silica	3.70 "

THERMIA ISLAND.

(Mr. Consul Cottrell.)

1. Three iron ore deposits exist in this island.
2. Two are situated close to the port of St. Stephen, and the third close to the port of Irene, average 500 yards distant.

3 and 4. The ore is conveyed to the sea-shore in two cases by means of a portable railway and trucks, thence by shoots direct into the ships. In the other case an aerial line is employed. Cost of labour, from 1s. to 2s. 3d., miners receiving an average of 2s. and common labourers 1s. 3d. per diem. The total cost of mining, transport and loading is about 3s. 9d. per ton. The price fetched for the ore is usually 6s. 6d. per ton on basis of 50 per cent. iron and manganese, with 3d. scale for every unit above or below standard limit, and 10d. per ton paid for loading expenses.

5. Analysis is appended.

6. Proprietors: F. Serpieri, of Athens, Wm. H. Müller, of Rotterdam, and the "Société de Travaux Technique," as leaseholders until exhaustion of mines. They are of good standing, but willing to entertain offers on reasonable terms.

7. All three mines are being worked. The total output since the first was started in 1896 until the end of 1902 amounts to 106,500 tons, and was shipped to Glasgow, St. Nazaire, Dunkirk, and Rotterdam. The output this year is expected to reach over 75,000 tons, as two of the mines are very busy; the third will commence to export next year.

8. It is alleged that there are no obstacles in the way of successful, continuous and unencumbered mining.

9. The three above mines are estimated to still contain 500,000, 100,000 and 60,000 tons of ore respectively. The amount paid by the present leaseholders to the land proprietors is about 7d. per ton of ore exported by the former.

Analysis of Thermia Iron Ore.

Iron	...	...	...	44.50	to 48	per cent.
Manganese	...	...	...	1.50	„ 2	„
Silica	...	...	...	8	„ 11	„
Phosphorus	...	...	...	0.025	„ 0.03	„
Sulphur	...	...	...	0.06	„ 0.1	„
Arsenic	...	...	...	0.07	„ 0.12	„
Lime	...	...	...	0.04	„ 0.07	„

SERIPHOS ISLAND.

(Mr. Consul Cottrell.)

1. The chief iron ore deposits of Seriphos occur in the limestone on the west part of the island; in the centre and south-east coast some small veins of magnetite are found in an eclogitic state.

2. Five good harbours taking the largest steamers in this trade facilitate the export.

3 and 4. Cost of mining, transporting and loading on board ship is 3s. 9d. per ton.

5. Analyses supplied by the manager of the said mines are appended.

6. Proprietors: "Société des Mines de Serifos et de Spiliozéa," a French Company, and the "Société Générale d'Entreprises," a Greek concern. Apparently they are not disposed to sell their rights.

7. The total output of the Seriphos mines, from their systematic opening in 1880 until the end of 1902, amounts to 1,932,600 tons, of which 851,700 were shipped to the United Kingdom, 500,900 to Germany, 275,300 to United States, 225,800 to France, 78,900 to Trieste.

The present average exportation is 150,000 tons per annum.

8. No special obstacles.

9. The probable quantity of commercial ore remaining to be exploited from these mines is estimated at one million tons.

Analysis of Seriphos Iron Ore.

	Brown ore.	Red ore.
	Per cent.	Per cent.
Iron... ..	52·19	47·05
Manganese... ..	0·58	2·72
Lime	1·16	6·73
Silica	6·27	4·22
Sulphur	0·18	0·12
Phosphorus	0·04	0·02

HOLLAND.

AMSTERDAM.

(*Mr. Consul Robinson.*)

1. The sole source of supply of iron ore in this consular district is from the very limited deposits of so-called "bog ore" existing principally in the provinces of Drenthe and Overijssel, mostly in the neighbourhood of the towns of Meppel and Compascuum, in the former province. This ore, which is found on the surface of the country, and which is simply a precipitate from the inundations of past ages, probably from the rivers Rhine and Yssel, lies at a shallow but fairly equal depth, spread over large tracts of the land in the district in question. It has been used formerly locally, and in the blast furnaces of Westphalia, principally in combination with other ores, and there is a considerable demand for it in many quarters from gas works, in which it is used for purifying purposes. The stock is naturally steadily diminishing in quantity, and the disposable quantity, which is nearly altogether monopolised by one firm, the "Eerste Hollandsche Yzererts Maatschappij" (First Holland Iron Ore Company) in Rotterdam, is inconsiderable.

2. In the provinces of Drenthe and Overijssel. Nearest shipping ports are Rotterdam or Amsterdam, distant about 80 to 100 miles.

3. Freight by canal and river to Amsterdam or Rotterdam, about 2s. to 2s. 6d. per 1,000 kilograms.

4. Cost of quarrying and loading too variable to quote, depending on local circumstances.

5. Official analyses show about 60 per cent. oxide of iron in the dry ore and about 30 per cent. moisture.

6. The ore can only be obtained in any quantity from the firm mentioned above (*see* reply to Question 1), and the total supply is quite insignificant.

7. Deposits have been worked (very irregularly) for very many years past.

8. Continuous and unencumbered supply doubtful and difficult, owing to nature of the deposits.

9. This ore is supplied by the firm named at the price of about 10s. per ton delivered free on board at Rotterdam.

ITALY.

ISLAND OF ELBA.

(*Mr. Vice-Consul Tonietti.*)

1. The Island of Elba contains important deposits of iron ore, known as the Elba Iron Ore Mines.

2. The iron ore deposits extend from north to south almost parallel to the eastern coast of the island; they extend to the sea on the northern and southern coasts; the most important deposits are in close proximity to or at the utmost not more than a mile distant from the coast.

The ore is shipped, along the coast, by means of wooden or iron piers situate as near as possible to the mines.

Ocean steamers are loaded in the roadsteads of Riomarina, Rioalbano, Calamita, and Terranera, by lighters carrying about fifty tons each.

The nearest two ports are Portolongone, half-way between the two extremities of the mines, and Portoferraio, seven miles from the northern end and about twenty miles from the southern end of the mines.

3. At present the transport of the ore to Portoferraio, alongside the pier, or to a steamer in that harbour, costs as follows:—

	s.	d.
From the quarries to the depôts near the sea	1	0
Loading lighters at the piers	0	2½
Freight to Portoferraio	1	0
	2	2½

The unloading of ore in the depôts of the blast furnaces at Portoferraio, or in the hold of an ocean steamer anchored there, costs 3½d.

Loading a steamer anchored at Riomarina, Calamita, Rioalbano, Terranera, and Portolongone would cost about 3d. less.

According to estimates, a railway could be constructed from all the mines to Portolongone or to Portoferraio, and the cost of the ore shipped on board would be per ton:—

	s.	d.
Portoferraio	1	6
Portolongone	1	0

The weather allows loading the lighters from all the piers of the coast, about 230 days a year, without taking into account Sundays and holidays.

4. The mines are entirely worked on the surface by digging and blasting. The refuse is thrown away into the sea or discharged near the mines at places where no minerals are supposed to exist. The extracted ore is sent down to the depôts near the sea by railway tracks, inclined planes, suspended wires, carts, &c. The loading is carried out in carts or on railway trucks.

Generally the miners are good workmen; murder and other crimes are unknown. Some strikes occurred last year, following the example of the greater part of the labourers of the world, but now they appear to be rather tired of strikes.

The cost of quarrying is not the same in all the mines, and on an average it amounts, for labour only, including the expenses for clearing the refuse, to about 2s. 4d. per ton of ore. The cost of loading has been already given in my answer to question 3.

Should there be a railway made to pass through the mines for the purpose of loading the ore at Portolongone, or carrying it to the blast furnaces at Portoferraio, an additional expense of about 3d. per ton will have to be added to the expenses referred to in my answer to question 3 for loading trucks in places far away from the mines or at a different level.

5. There are official analyses of the ore; copies of same are hereto annexed.

6. The Elba mines belong to the Italian Government, which has granted them on lease for a term of 25 years from 1896 to the "Elba Società Anonima di Miniere ed Alti Forni."

7. The central mines have been worked from the time of the Romans, and probably even before then.

For the last five years, the following quantities of ore have been shipped from the Elba mines to—

—	1898.	1899.	1900.	1901.	1902.
England	110,960	102,711	89,216	66,802	189,946
Italy	16,785	24,280	40,225	15,700	80,107
United States of America ...	—	41,674	13,967	—	—
France	28,279	29,164	11,770	13,296	1,164
Germany (via Netherlands) ...	72,225	53,266	45,810	41,816	19,557

8. There are no special obstacles in the way of successful continuous and unencumbered mining in the island.

9. The Elba Iron Mines are estimated still to contain, within a certain limited space, from eight to ten million tons of iron ore.

The exploiting company (Elba Società Anonima di Miniere ed Alti Forni) has erected in Portoferraio two blast furnaces, which at present produce about 450 tons of pig iron per diem, and will shortly reach 700 tons.

Steel works will be shortly erected in Portoferraio, so it is now difficult to foresee whether the Elba mines will be sufficient to supply the ore to the furnaces for nineteen years, as the demands from the iron works of the continent of Italy are gradually and constantly increasing. For this reason shipments of iron ore to foreign countries are absolutely at a standstill, and the whole output of the Elba mines (about 300,000 tons per annum) is shipped to Portoferraio or to other Italian ports.

Some private iron ore mines outside the geological circumference of the Royal mines are just being opened up, and as they are my own property, it is probable that their output will be sold to foreign countries, I having already made a special agreement with the Italian Government.

No data can as yet be given as to their possibilities, but they appear to be of some importance, and the ore is proved by analyses to be of good quality.

Analysis of Commercial Cargo of Iron Ore from Elbu.
 Moisture 5·18 per cent.

	Dried at 212° F.	Moist.
Metallic iron	62·83	59·57
Phosphorus	0·023	0·022
Sulphur	0·057	0·054
Silica	5·11	4·84
Oxide of copper	·325	
Ferrous oxide of iron	2·351	
Oxide of iron	87·144	
" " aluminium	1·552	
" " lime	0·244	
" " magnesium... ..	0·290	
" " phosphorus	0·052	
" " sulphur	0·142	
Combined water	2·60	
Oxide of manganese	0·140	
Silica	5·11	
	99·950	

The following analysis was executed in the laboratory of the School of Mines of Paris.

	RIO.			RIO ALBANO.				
	Mineral ore of			Mineral ore of				
	Rio, un-washed.	Rio, washed.	Rosseto.	Calen-do-zio.	Pistello.	Grat-tarino.	Grotta.	Taram-bano.
Silica	5·60	6·60	3·66	4·60	4·30	5·00	4·00	4·00
Aluminium	1·80	1·96	Traces	—	0·60	1·30	—	—
Peroxide of iron	91·60	90·20	85·60	88·00	93·33	93·00	92·60	94·40
Oxide of manganese	—	—	—	—	—	Traces	0·30	—
Lime	—	—	0·40	—	—	—	0·30	—
Magnesium	—	—	Traces	Traces	—	—	—	—
Sulphuric acid	—	—	0·05	Traces	—	—	—	—
Phosphoric acid	0·01	0·02	0·04	0·04	0·03	Slight traces	Slight traces	0·03
Loss by calcination	0·80	1·00	10·00	6·50	1·50	0·40	2·50	1·50
Copper	—	—	Traces	0·50	—	—	0·08	—
	99·31	99·78	99·75	99·64	99·76	99·70	99·78	99·93

In all the samples, except those of Rosseto and Calendozio, were found appreciable traces of titanium.

An analysis of the mineral ore of Rosseto, made in the laboratory of the Superior School of Engineers of Turin, gave the following results:—

Water	...	...	...	9.38
Oxide of iron	...	...	...	87.55
Insoluble matter	...	...	...	2.76
Manganese	...	...	...	Unappreciable traces.
Sulphur	...	...	...	—
Phosphorus	...	...	...	—
				99.69

LEGHORN.

(*Mr. Vice-Consul Carmichael.*)

I have the honour to report that my inquiries would seem to show that there are no iron ore mines being worked in the district. There are, no doubt, small deposits in the neighbourhood of Campiglia and Massa Maritima, in the province of Pisa, but owing to the poor quality of the ore (limonite) and to the fact that it is found in small pockets rather than in regular seams, any attempt to work it has singularly failed. A mine known as Forno Volasca, in the province of Lucca, was worked many years ago by a French Company, but was abandoned, it is believed, because the ore was found to contain barite.

The questions of the British Iron Trade Association would, therefore, scarcely seem applicable to my district, seeing that, on the best information which I have been able to obtain, it practically contains no workable iron ores.

LOMBARDY.

(*Mr. Vice-Consul Carmichael.*)

1. There are several spathic ore (CO_3Fe) mines in Lombardy, and the number of concessions on the 31st December, 1902, was 43.

2. From the administrative point of view the mines are situated in the provinces of Bergamo and Brescia, but topographically they may be divided generally into three groups, viz.:—

(a) Highlands of the Val Seriana (Bondione Lizzola) province of Bergamo.

(b) In the valley of the Dezzo (Bergamo) or Val di Scalsa and in the valley of the Allione (Bergamo).

(c) Val Trompia (Brescia) or valley of the Mella (Brescia).

The second is the most important of the above three groups.

The nearest ports would be Genoa and Venice, according to destination of shipments.

3. The ore extracted from the numerous mines is smelted partly in the furnace at Dezzo, commune of Arzone (province of Bergamo). These ores are converted locally into pig iron, which also locally is used for castings and for eventual conversion by puddling into steel or iron. The ore is carried away from the deposits by road, on the backs of animals and in carts. They are not exported, but, in any case, the railway stations to which these ores

might be sent would be Ponte della Silva for the first group, Iseo (Brescia) for the second, and Gardone Val Trompia (Brescia) for the third.

4. The number of workmen employed varies very much. In 1899 it was 210, in 1900 584, in 1901 257, and in 1902 155. These figures represent, approximately, the average for the whole year; as, however, the mines are, generally speaking, only worked during the winter months, *i.e.*, for about 100 working days in each year, the actual numbers of workmen employed during the periods when the mines are working are about three times as many as those stated. These workmen consist, for the greater part, of local peasants, who become temporary miners when the inclemency of the weather prevents them from working in the fields. Their remuneration is therefore limited, and may be taken as 1.85 lire (1s. 6d.) per day of ten hours for the miners, and 1.35 lire (1s. 1d.) for other workers.

5. Official analyses are obtainable, and some of them are given below.

Analyses.

METALLIFEROUS.				STRATIFIED.			
Carbonate of iron	...	...	96.00	Carbonate of iron	...	...	80.60
" manganese	...	...	1.60	" manganese	...	...	9.10
" lime	...	...	1.10	Dolomite	...	...	2.10
Insoluble matter (silica)	...	...	0.25	Alumina	...	...	1.20
Water, &c.	...	...	1.05	Insoluble matter	...	...	2.50
				Water, &c.	...	...	4.50

STRATIFIED.				—			
Ferrous oxide	...	...	50.13	Ferrous oxide	...	...	55.80
Manganous oxide	...	...	7.07	Manganous oxide	...	...	4.80
Silica	...	...	14.25	Lime	...	...	2.30
Lime	...	...	0.57	Magnesia	...	...	1.20
Magnesia	...	...	0.42	Alumina	...	...	Trace.
Alumina	...	...	1.10	Carbon dioxide, water, &c.	...	...	32.80
Carbonic anhydride, water, &c.	...	...	26.46	Not determined	...	...	3.10

Carbonate of iron	...	...	36.10	Carbonate of iron	...	...	81.90
" manganese	...	...	5.10	" manganese	...	...	1.50
" magnesia	...	...	15.10	Dolomite	...	...	2.40
" lime	...	...	31.00	Insoluble matter	...	...	12.40
Insoluble matter, not determined	...	...	4.00	Water, &c.	...	...	1.80
Water, &c.	...	...	8.70				

6. A great part of the mines of the second group is in the possession wholly or in part of the firm of Messrs. G. A. Gregorini, of Lovere (Bergamo), while Messrs. Fratelli May, of Schilpario (Bergamo), are largely interested in others. Some of the mines of the third group are under concession to the "Società degli Alti forni," of Terni.

Small mines in all the three groups belong to one or more well-known persons, and could, perhaps, be purchased. The proprietorship of others is not easily defined.

In any case a number of these mines are too small to permit of profitable working, and the number of part owners too numerous to make negotiations for purchase an easy matter.

I am told that if there be a desire to purchase it would, perhaps, be well in the first instance to examine the mines in the Commune of Pisogne (Brescia).

7. The deposits have been worked, and the output of ore from all the deposits during the last four years was as follows:—

In 1899	...	...	...	...	9,304 tons.
„ 1900	...	...	...	...	15,192 „
„ 1901	...	...	...	...	14,449 „
„ 1902	...	...	...	...	10,467 „

Particulars and cost of shipments cannot be given, as there is no exportation, the ore being, as already stated, treated locally and used in the Kingdom.

8. The difficulties in the way of a proper working of the mines seem to be numerous. Foremost, among others, is the fact that property is split up into small ownerships, and, moreover, there is a large number of persons interested therein whose claims are sometimes not very clear, but who have become absolute proprietors by ancient rights more than concessionary ones. For this reason the necessity of entering into negotiations with so many individuals whose rights at times do not exceed 100 lire (£4) in value is an almost insurmountable obstacle to purchasers. Furthermore, some of the mines are in a very bad condition, and some of the beds, that are already worked, have pits on their slopes resulting from the primitive methods followed, and these are often flooded with water.

Before the proper working of many of these deposits could be undertaken long and costly preliminary labour would be necessary. This cannot be undertaken by the present concessionnaires or owners, who not infrequently work in the mines themselves, and to whom the working of these mines is possible by reason of the neighbouring woods, the charcoal of which they utilize, as it could not bear the cost of transport elsewhere.

NAPLES.

(*Mr. Consul-General Neville-Rolfe.*)

1. Yes.

2. At Monte Stella, near Pazzano, in the province of Reggio-Calabria, 11 kilometres from the anchorage of Monasterace, on the Ionian Sea. There is no port which could take ocean-going steamers nearer than Messina, which is, roughly, 80 miles off. There is a railway station on the Reggio-Metaponto line at Monasterace.

3. The transport of the mineral from the mine to the rail would cost six lire (4s. 8d.) per ton, in carts.

4. The cost of the mineral at the pit's mouth is about 5 lire (4s.), so that it could be delivered at Monasterace for about 11 lire (8s. 8d.) per ton.

5. Do not know of any official analysis. The minerals found are peroxide of iron hydrate, compact or brown hematite, and earthy limonite, in strata, inclined at an angle of about 45 degrees, and varying in depth from one inch to a yard or more. The rocks which contain it are of calcareous dolomite and "scisti serici psammitici." The mixture of these minerals in powerful furnaces has given from 40 to 50 per cent.

6. The proprietors of the mines are the "Credito Mobiliare Italiano" and the "Banca Toscana," both well-to-do concerns, but the mine is not being worked.

7. The north-east side of the mountain was worked out by Signor Fazzari, by a shaft about 350 metres (385 yards) long and about 1,500 feet above sea level.

8. No.

9. There are pockets of minerals, iron bauxite, near Pietrarroia, in the province of Benevento, which have given the following results on analysis:—

Alumina	...	...	...	...	45 per cent.
Sesquioxide of iron	...	...	...	...	22 "
Titanic anhydride, with silicate anhydride	...	...	...	...	21 "
Loss by calcination (water combined)	...	...	...	...	10 "
Hygroscopic water	...	...	...	...	2 "
					100 "

No mining operations have ever been attempted.

ROME.

(Mr. Acting-Consul Johnson.)

1. Yes.
2. Iron ore deposits of Pian Ceraso and Sbroccate, near Tolfa (Province of Rome). Owner: Count Pietro Chiassi, Piazza Strozzi, Rome. The nearest shipping port is Civitavecchia, 15 kilometres (about 10 miles) from the deposits.
3. Transport, which can only be effected by cartage, would cost about six shillings per ton.
4. The deposits are not being worked.
5. Official analysis of the ore:—

	Pian Ceraso.	Sbroccate.
Water	15.09	14.42
Sesquioxide of iron	81.45	80.86
Insoluble parts	2.56	2.40
Sulphur, arsenic, and manganese	Traces.	Traces.
Loss	0.90	2.32
	100.00	1000.0

6. It is not impossible that the owner might transfer his interest in the deposits on reasonable terms.

7. A very small quantity of ore (about 200 tons) was extracted in 1901 for purposes of analysis.

8. No.

PORTUGAL.

LISBON.

(*Mr. Consul Cowper.*)

The information the British Iron Trade Association are desirous of obtaining in regard to the extent and character of the ascertained iron ore supplies in a number of countries, as set forth in their memorandum of queries addressed to Consuls through the Foreign Office, could not, as far as this consular district is concerned, be answered in a reliable or practical manner, except by an expert mining engineer after prolonged local inquiry, investigation and prospecting in the various localities where the deposits exist.

The memorandum of the Association was submitted to the Mining Department of the Portuguese Government; the only source from which a Consul can, as a rule, obtain any information relating to mining matters, but no satisfactory answers to the queries could be obtained from the officials. I therefore find it impossible to give complete and categorical replies to all the queries contained in the memorandum, and am obliged to limit myself to a few general statements and facts on the subject of iron ore in these districts as these have come to my knowledge in the course of conversation with gentlemen connected with mining matters.

I may commence this statement by remarking that, in consequence of the glowing reports circulated in recent years in connection with alleged extensive iron ore deposits in the district of Southern Portugal, several syndicates in the United Kingdom have sent mining engineers to examine and report on these deposits, and the following is a summary of the statements made to me by several of these gentlemen after careful examination of the various deposits situated within this district.

1. There are numerous so-called iron ore deposits in the southern districts of Portugal, but none of them are of any value with the exception of two acquired and now being worked by British companies, viz.:—

(*a*) The "Monges Mine" in the Alemtejo district, now the property of Messrs. Baldwins, Limited, of Landore, near Swansea; and (*b*) The "San Thiago Mines," worked by The Minerals, Limited.

The ores of both these mines are similar in character, being a brown hematite and magnetic, running about 54 per cent. of metallic iron. Messrs. Baldwins, Limited, have smelted these ores for some years.

2. These mines are situated about 84 and 91 kilometres respectively from the shipping anchorage of Barreiro, the terminus of the Southern Railroad, on the south side of the River Tagus, opposite Lisbon.

The ores are brought to Barreiro by the Southern railroad, the only line tapping the southern districts of Portugal. There are no shipping facilities at Barreiro, and steamers have to lie about 500 yards from the railway wharf and ship the ore from lighters, at a cost of about 1s. 9d. per ton. The loading facilities might be greatly improved at Barreiro, which is the only place in this district where minerals are shipped. There is a project now on foot for improving the tidal approaches to Barreiro, so as to enable steamers

to receive ore from alongside the railway wharves. The other so-called deposits are at varying distances from Barreiro, from 100 to 250 kilometres, and are so far removed from all lines of communication that under present circumstances the transport of ore would be impracticable.

3. The Southern Railroad supply wagons for the transport of ore to Barreiro from the different stations along their line, and charge 5.8 reis (about one farthing) per metric ton of 1,000 kilogrammes per kilometre.

4. The character of the labour is fairly good and the cost varies from 400 to 550 reis per diem (about 1s. 5d. to 2s.).

6. The proprietors of the registered mines are generally poor, and their rights are, as a rule, obtainable on reasonable terms.

7. The "Monges" and "San Thiago" are the only deposits being worked at present; they have been worked at various times for the last 20 years. The shipments are mostly to the United Kingdom, and a few have been sent to Rotterdam; the quantities cannot be given. No other iron ore deposits have been worked.

8. Beyond the question of transport in the outlying districts unconnected by highways, rivers, canals, or rail, there are no special obstacles in the way of successful continuous and unencumbered mining in this consular district.

9. With the exception of the two mines referred to no iron ore deposits of any commercial value exist within this district, as far as my information goes; but at the same time it must be noted that the rural districts of Southern Portugal have been very imperfectly prospected in modern times, and there is no knowing what discoveries may not be made later on.

For a good deal of the information contained in this memorandum I am indebted to Mr. George Bargate, of 20, Bucklersbury, London, E.C. This gentleman is a mining engineer, and has, for the last three years, been examining the alleged iron ore deposits in the south of Portugal.

OPORTO.

(Mr. Consul Grant.)

1. Yes; two.

2. One at Moncorvo, administrative district of Bragança; the other at Rates, administrative district of Oporto. The nearest port is Oporto, from which the Moncorvo mine is about 112, and the Rates mine about 26 miles distant.

3. The cost of transport from the first named mine is estimated by Government engineers at 950 reis per ton, and by a private engineer at \$1.080 per ton. When the railway line from Pocinho to Miranda goes as far as Moncorvo, it will considerably cheapen the carriage of ore. With regard to the second named, the present rate would be 618 reis per ton, but if the mines were worked on any scale, it would become a matter of arrangement with the railway company and the cost would probably be less than half the present tariff rates. Transport from both is by rail.

4. The Portuguese are said to be good miners. The average cost is 400 reis per day per man. According to estimate of Government engineers, the cost of quarrying and loading would be 200 reis per ton; unloading and shipping at Oporto, 80 reis per ton.

5. The following is a copy of the analyses contained in the official report of the Portuguese Government prepared for the Philadelphia Exhibition of 1876 (with regard to the Moncorvo deposits).

"The assays made with some samples give the following results for metallic iron:—

Fragoas dos Opriscos...	...	...	53.6	per cent.
"	...	...	48.0	"
"	...	...	43.3	"
Alto do Chapeu	...	...	59.2	"
Cabeço da Mua	...	...	55.8	"
"	...	...	42.5	"
"	...	...	47.4	"
"	...	...	47.0	"
"	...	...	47.0	"
"	...	...	39.0	"
"	...	...	46.0	"
"	...	...	53.3	"
Carvachal e Carvochosa	...	...	52.4	"
"	...	...	40.0	"
"	...	...	53.0	"
"	...	...	44.3	"
"	...	...	28.0	"

A complete assay gave the following results:—

Magnetic oxide	...	...	...	0.1294
Sesqui-oxide of iron	...	...	...	0.6585
Lime	...	...	...	0.0050
Insoluble waste	...	...	...	0.1645
Loss by fire	...	...	...	0.0395
Phosphoric acid	...	...	...	Traces.
				<hr/>
				0.9969
				<hr/>
Yield in metallic iron	...	...	...	0.5495."

In a newspaper article, the following analyses are given as having been made in England:—

	No. 1.	Per cent.
Oxide of iron, magnetic (Fe_3O_4)	...	79.59
Phosphoric acid (P_2O_5)	...	0.74
Water	...	1.26
Silica	...	18.08
		<hr/>
		99.67

Corresponding to 57.63 per cent. metallic iron.

	No. 2.	Per cent.
Peroxide of iron	...	49.72
Protoxide of iron	...	30.20
Manganese	...	0.80
Lime	...	6.00
Magnesia	...	4.34
Sulphur	...	0.00
Phosphoric acid	...	0.09
Silica	...	0.43
Water	...	9.00
		<hr/>
		100.58

No. 3.

Peroxide of iron...	...	...	...	...	76.28
Protoxide of iron	...	...	...	...	1.29
Oxide of manganese	...	...	...	...	0.00
Lime	...	...	...	...	Traces.
Magnesia	...	...	...	...	Traces.
Phosphoric acid	...	...	...	...	0.76
Sulphur	...	...	...	...	0.00
Alumina	...	...	...	...	5.23
Silica	...	...	...	...	16.42
					100.—

No official analysis of the Rates deposit is obtainable.

Two samples are sent, marked 1 and 2. These are of Moncorvo and Rates respectively.

6. Moncorvo—rich; not likely to be sellers. Rates—rich, but probably is obtaining concession for the purpose of selling.

7. No; have never been really worked.

8. No; as regards Moncorvo, the great drawback is the distance from port of shipment.

9. The Moncorvo deposits are practically in the hands of Messrs. Schneider and Company (Creusot). It is reported that they are holding them in the hope of more practical results being obtained from the electrolysis system of extraction of the metal, as under other conditions the cost would be too great. I understand that samples were sent to an important London house, and also (by other parties) to Krupps, but that both declared them to be unsatisfactory, chiefly, it is said, owing to the presence of too much silica.

The Rates deposit seems to have been at one time much thought of; so much so that the railway line from Oporto to Pova, when it was extended as far as Famaticas, was made to go near Rates, in the hope of facilitating the exploitation of this deposit, but it would appear that all attempts to sell the deposit have been fruitless. These deposits were declared free. Subsequently Jayme Arthur da Costa Pinto, a Portuguese Deputy and President of the Municipality of Cascaes (near Lisbon), applied for the right of discovery, which application is still pending.

Should it be desired to consult publications with full particulars of the Moncorvo mines, the following can be consulted:—

(1) "Catalogo da Seccão de Minas da Exposição Industrial de Lisboa em 1888."

(2) "Conferencias sobre as Minas de Moncorvo pelo Engenheiro M. Rodrigues de Miranda, Jr., publicadas no Boletim do Atheneu Commercial do Porto, 1892."

(3) "Relatorio sobre as Minas de Ferro de Moncorvo por Lourenço Matheiro e Pedro Victor da Costa Sequeira. Revista dos Obras Publicas e Minas Anno de 1880."

(4) "Catalogo da Seccão Mineira Portugueza na Exposição de Philadelphia de 1876" (also printed in English).

ROUMANIA.

GALATZ.

(Mr. Vice-Consul Dundas.)

1. Yes, one.
2. In the district of Dobrogea, 25 miles from Braila, which is the nearest port admitting ocean steamers.
3. Five shillings and seven pence per ton. By road.
4. Labour is abundant. A miner is paid from 3s. 2d. to 4s. a day (of ten hours).
5. Statistics are not available.

6. Poor! They would probably grant concessions to *bonâ fide* parties, but it must be borne in mind, however, that by Article 7 of the Roumanian Constitution, no foreigner can purchase land in rural districts.

7. No, exploring only having been done up to date.
8. There are no special obstacles in the way. The Roumanian mining laws would have to be respected, and great care taken with regard to title deeds.

9. I am disposed to believe that it would be worth the while of the British Iron Trade Association to send an expert to this country, provided they desire to acquire fuller information. I would also venture to suggest that no exploration should be done, even on a small scale, until options have been obtained in proper and legal form, according to Roumanian law. It is highly desirable, if business is thought of, that a respectable local firm should be consulted.

RUSSIA.

BATOUM.

(Mr. Consul Stevens.)

Mr. Stevens forwards the appended list of the localities in the district of this Consulate in which there are indications of the existence of iron ore, and reports as follows:

The nearest shipping port to those deposits which are situated in the Government of Tchernomoria would be Novorossisk, and the ports of Batoum and Poti would be best suited for shipping the ores coming from the other Governments and Provinces of the Caucasus.

As the outcrops of ore given in the list are distributed over the Caucasus, in many cases in outlandish localities which, in view of the absence of roads, are only accessible by dangerous zig-zag cattle tracks, or bridle paths, it is impossible to here give their respective distances from, or cost and means of transport to, the seaboard.

As far as my inquiries have elicited, none of the deposits have ever been worked, and no labour is to be found in their vicinity; under these conditions generally speaking no estimates of the cost of mining, quarrying, and loading on to carts, pack horses and railways can be formed.

No official analyses of the ores are obtainable. In many instances the outcrops of iron ore given in the list are situated on Government lands, but the proprietors of those deposits which are not on lands belonging to the State belong, in most cases, as I am informed, to the poorer classes, who would doubtless be willing to sell their rights, although, if the price paid in the Caucasus in present years for copper and manganese ore deposits is taken as a criterion, I should think the owners of such deposits would not be

likely to grant mining rights on their lands, except on very advantageous terms to themselves.

As far as concerns the obstacles in the way of mining, I beg to refer the Iron Trade Association to an Imperial decree of the 29th of May, 1898, whereby all foreigners are prohibited from acquiring by purchase, or otherwise, in certain districts of the Caucasus, (*i.e.*, the Kuban territory, the Government of Tchernomoria, the district of Soukhoun, province of Batoum, the Government of Kutais, the province of Kars, and the Governments of Erivan, Elizavetpol, and Baku) any lands situated outside the limits of towns and settlements, except under special certificates granted, in each separate case, by the Governor-General of the Caucasus.

LIST OF LOCALITIES IN THE BATOUM CONSULAR DISTRICT IN WHICH IRON ORE IS REPORTED TO EXIST.

PROVINCE OF DAGHESTAN.

District of Temir-Khan-Shura.

Ten versts to the south-west of the town of Petrovsk, on the south-east slopes of the Narat-Tuve range.

In Mount Tepseli-Tau, to the north-west of the town of Temir-Khan-Shura.

In Goumali Valley, to the north-east of the village of Miatla.

On the slopes of Mount Karaoul-Tube, to the south-west of the town of Temir-Khan-Shura.

District of Avar.

Near the village of Takajda.

District of Gounib.

On the right bank of the River Kara-Koisou, twenty versts above Gounib.

District of Kaitago-Tabasar.

Near the village of Tchoumla, in the Yarahmant-Katta Valley.

District of Kurin.

Two versts to the south-east of the village of Tirkal.

Near the villages of Makar and Hepitar. In forests known under the name of Illiksk.

District of Samour.

On the right bank of the River Ahti-tchai.

GOVERNMENT OF TCHERNOMORIA.

District of Novorossisk.

In the fields of the Stanitza (Cossack village) of Shapsoug.

In the fields of the Stanitza of Podhrebtev.

In the fields of the village of Pshada.

District of Soukhoun.

In the upper reaches of the River Bzib, at the pass of Adange.

In Mount Apshra.

In a gorge on the northern slopes of Mount Dzishra.

Along the River Galzga to the north-east of the village of Tkvartcheli.

Along the banks of the River Kodor, near the villages of Tchortqli and Okoumi, right bank of the River Okoum.

PROVINCE OF BATOUM.

District of Atvin.

Near the village of Tchahlet, along the left bank of the River Mourgoul-Sou.

Near the village of Keoul, along the right bank of the River Mourgoul-Sou.

In the upper reaches of the Hatil gorge, in the locality known under the name of Nadar Bazevi, near the village of Thenart.

In the same gorge, in the locality known under the name of Naarvnev, at the hamlet of Molas.

From two to three versts from the village of Beshau, right bank of the River Tchorokh, in the locality known under the name of Sakerneti.

Along the River Tchorokh, near the village of Singot.

Between the villages of Petrou and Ebrika, along the left bank of a tributary of the River Tchorokh, in the locality known under the name of Kaban.

From four to five versts from the village of Irsa, in the locality known under the name of Mamissaheli and Nagomar.

District of Batoum.

Along the Black Sea coast, extending the whole distance between the town of Batoum and the village of Kobouletti.

In the locality known under the name of Bourtchounati, near the village of Duskoï.

GOVERNMENT OF KUTAIS.

District of Ozourgheti.

Along the Black Sea coast, between the mouths of the Rivers Soupsa and Notanebi.

District of Zoughdidi.

On the lands of the village of Redout-Khale, along the Black Sea coast.

District of Kutais.

In the upper reaches of the River Tkvibouli in Mount Ourghevi.

Near the village of Satziri, about 8 versts distant to the south-west of the village of Tkvibouli.

10 versts to the south-west of the village of Satziri, near the village of Gourna, district of Sharopan.

Near the village of Tzeva, on the right bank of the River Tcheremela in the vicinity of the railway station of Dzerouli—Trans-Caucasian Railway.

On lands belonging to the village of Soshebi, left bank of the River Dzerouli.

Near the village of Shroshi, at the point at which the Rivers Dzerouli and Matcharouma meet.

In the gorge of the River Katzaoura, near the monastery of the village of Katzni.

District of Ratcha.

3 versts to the south-east of the village of Tzedisi, right bank of the River Djodjora.

Near the village of Tchasval, two versts to the south of it, along the left bank of the River Djorjora.

GOVERNMENT OF TIFLIS.

District of Ghori.

Two versts distant from the railway station of Kaspi, Trans-Caucasian Railway.

District of Tiflis.

From six to seven versts to the south-south-west of the town of Gori, in Mount Madeni-Seri.

To the south-west of the village of Kldeisi, in the peak of Mount Bedeni.

District of Bortchalin.

Near the village of Ahpad.

In the estates of Ahtalsk.

In the forest of Shinih.

In the peak of Mount Damir-Dagh.

Along the right bank of the River Bollis-tchai, two versts from the village of Prevolnoe, in the upper reaches of the River Mishana.

District of Tionet.

In the vicinity of the village of Upper-Pankisi.

GOVERNMENT OF ELIZAVETPOL.

District of Kazah.

In the upper reaches of the River Indja-Sou.

In the locality known under the name of Revazli-Yourt.

In the localities known under the names of Tzokeri-Kent and Varti-Keg.

2 versts from the post station of Delijan, in the valley of Koshtajan.

In the watershed of the Rivers Hunzoukrout and Kizdorboulag.

District of Elizavetpol.

Near the village of Djagir, right bank of the River Djagir-Tchai.

Along the left bank of the River Djagir-Chai, at the villages of Youhari-Aipli and Moroul.

In Has-mahmed, 4 versts to the westward of the Kedabeg copper mines, basin of the River Shannor.

Along the right bank of the River Shannor, in the highlands between the villages of Seifali and Nousger.

At the village of Tiaknali, along the River Shannor.

Near the station of Alabashli, Trans-Caucasian Railway, in the locality known under the name of Tchi-Arlidja.

In the gulleys of Mount Kunak-Germaz, along the River Hatch-Boulag.

On the slopes of Mount Pir-Sultan, in the locality known under the name of Zagadara, six versts to the south of the village of Dashkesan.

Near the village of Upper-Dashkesan, along the River Katchkar-Chai.

In the gorge of the River Katchkar-Chai, at the point at which its tributary the Toutounz-Aru runs into it.

On both banks of the River Katchkar-Chai, near the village of Kouschi, and on the lands of the village of Byan.

Near the village of Baltchali.

Near the village of Zournabat.

In the Katchki-Dzor Gorge, near the village of Zournabat.

Near the German Colonists' village of Melenendoff.

District of Djevanshir.

In the locality known under the name of Maloukli.

In the locality known under the name of Gairoun-Kumeran-Guney.

District of Zangezour.

On the right bank of the River Ohtchi-Tchai.

GOVERNMENT OF BAKU.

District of Djevat.

On the Government lands of Kirrich.

District of Lenkoran.

Along the coast of the Caspian Sea, near the town of Lenkoran.

GOVERNMENT OF ERIVAN.

District of Alexandropol.

Near the village of Bolshoi Karaklis and Yagouli.

In the forests of Agri-Yourt.

In the copper deposits of Sisimadan.

In the peak of Mount Pumb.

District of Novo-Bayazet.

In the upper reaches of the River Souk-Boulag.

District of Nahitchevan.

Near the village of Chengje.

PROVINCE OF KARS.

In Mount Tara, six versts to the east of the ruins of the town of Ani.

HELSINGFORS (FINLAND).

(*Mr. Consul Cooke.*)

Within my immediate consular district there has been as yet no iron ore whatever found, and, taking the whole of Finland, the results of prospecting have hitherto been very meagre.

I now proceed to reply to your memorandum in detail, from answers given to me at the Finnish Board of Industry.

1. Yes, a few, but generally rather poor ones.
2. The greater number are situated in the south-west of the country, the largest supply of iron ore being on a little island called "Jussaro," in the Gulf of Finland, off the little town of Ekenas.
3. From Jussaro, nothing at all, as the ore is situated on a small islet in the open sea.
4. Labour, from 2.50 to 4 Finnish marks (2s. to 3s. 6d.) per day.
5. Yes, but they are all very poor. The only large deposit of ore in Finland contains about 37-42 per cent. of iron. Nearly the whole reef at Jussaro consists of ore.
6. The proprietors would probably sell, they being poor.
7. Yes, but very little and for local use.
8. No obstacles, and the laws are very liberal.
9. As stated above, there are none in *my district*, and the supplies of such are very small throughout Finland.

For a more complete account of the mining industries of the Grand Duchy, I may refer to the book on "Finland," by Professor Fredriksen, published last year by Edward Arnold, London.

ODESSA.

(Mr. Consul-General Smith.)

In the Odessa district, although small pockets of iron ore are reported in Bessarabia, Volhynia and Kherson, the only place where iron ore is worked to any extent is in the north-east corner of the latter Government, that is, at Krivoi Rog. Much detailed information regarding the mineral resources of South Russia will be found in a book called "Géologie de Krivoi Rog et de Kertsch," by M. Jules Cordeweener, Engineer, published (in French) by A. Monceaux, 3, Rue des Minimes, Brussels.

1 and 2. There are considerable deposits at Krivoi Rog, and there are small pockets in other parts of Kherson, in Bessarabia and Volhynia. Odessa and Nicolaiev would be the nearest shipping ports.

5. See books sent herewith, a list of which follows:—

LIST OF BOOKS dealing with Russian Iron Mining (which may be consulted on application to the Commercial Intelligence Branch of the Board of Trade).

(1.) Report of the Delegates to the 17th Conference of the South Russian Miners, presented to the 18th Conference: Results of the petitions regarding the wants of the southern mining and metallurgical industry.

(2.) Report of the Council of the Conference to the 18th Conference of Miners of South Russia for the period from 1st-14th September, 1902, to the 1st-14th September, 1903.

(3.) Statistique des Sociétés par Actions en Russie. III. Emission, 1901. Sous la rédaction du Chef du Bureau Statistique, Ing. de Min. N. de Dittmar.

(4.) L'Industrie de Manganèse dans la Russie Méridionale pour l'année 1901. Sous la rédaction du Chef du Bureau Statistique, Ing. de Min. N. de Dittmar.

(5.) L'Industrie de minerai de fer dans la Russie Méridionale pour l'année 1901. Sous la rédaction du Chef du Bureau Statistique, Ing. de Min. N. de Dittmar.

(6.) L'Industrie Sidérurgique en Russie pour l'année 1901. Sous la rédaction du Chef du Bureau Statistique, Ing. de Min. N. de Dittmar.

9. Small pockets mentioned in No. 2 are not mined. In Volhynia there were formerly works for smelting local bog ore with charcoal, but neither ore nor fuel were plentiful and the works have been abandoned.

(For replies to the remaining questions, see the Reports from Nicolaiev and from Ekaterinoslav, below.)

NICOLAIEV.

(Mr. Vice-Consul Woodhouse.)

1 and 2. There are deposits of iron ore at and near Krivoi Rog,* a village situated in the north-eastern corner of the Province of Kherson, about 130 miles by rail from Nicolaiev, from which port the ore has of late been exported to the United Kingdom and to the Continent.

3. The cost of transport from the mines to this port is about 4s. 3d. per ton; discharging from trucks and loading on board ship, harbour dues, &c., come to about 1s. 9d. a ton; the total cost is therefore about 6s. a ton.

4. I have as yet been unable to obtain any reliable data regarding the cost of mining, &c. It is known, however, that the price of ore ranges from 6s. to 8s. 6d. a ton, free in railway trucks. The cost of mining varies with the depth of the deposits. In some places the ore lies a few feet under the surface, and is quarried at a low cost, whereas in others it lies at a depth where it can only be worked by mining. The miners are peasants belonging for the most part to the district itself.

5. The following are copied from analyses of samples of iron ore, taken from mines worked by the companies whose names are given at the head of each analysis:—

Briansk Co. (French capital.)

Name of Property whence sample taken.	Loss in smelting.	SiO ₂ .	MgO ₂ .	Fe ₂ O ₃ .	CaO.	Mn.	Fe.	Pb.
Poschmerky	1·84	2·75	1·54	93·16	0·38	0·08	65·21	0·058
Karnavatka	1·35	4·93	1·78	91·97	0·16	0·18	64·38	0·041
Sukhaya Balka	2·07	6·69	3·15	87·94	0·41	0·06	61·56	0·072

Krivoi Rog Co. (French.)

—				I.	II.
Silica ... ..	...	...	...	3·58	2·83
Sulphur ... ..	...	...	...	0·28	0·027
Phosphorus ... ..	...	...	...	0·04	0·022
Iron ... ..	...	...	...	67·06	66·40

* For further information relating to the Krivoi Rog deposits, see the Report from EKATERINOSLAV, below.

Kalachevsky. (Russian.)

	I.	II.	III.
Silica	1	2.12	7.00
Peroxide of iron	98.40	96.57	91.97
Phosphoric acid	0.025	0.032	0.039
Phosphorus	0.011	0.014	0.017
Sulphur	0.011	0.019	0.022
Combined water	0.55	0.57	0.33
Moisture	0.15	0.23	0.12
Metallic Iron	68.88	67.60	64.38

Doobovaya Balka and Ushakov. (French.)

	I.	II.	III.
Silica	3.50	3.00	0.65
Phosphorus	0.006	0.020	0.023
Sulphur	0.06	0.100	—
Iron	67.00	66.00	69.37

6. The proprietors of the deposits are, (1) sharehold companies with more or less capital, and (2) peasants.

In 1901 there were 48 mines working in Krivoi Rog, belonging to 23 firms, as against 79 mines and 35 firms in 1900. These mines are on 5,785 acres of freehold land, and 43,090 acres of leasehold property. The actual known area, containing deposits of the ore, is only 783 acres, of which 335 acres were being quarried and 39 mined in 1901. Private firms possessed 12 miles of branch lines and ten locomotives. There were 46 steam winding machines, 73 horse ditto, and one electric ditto, with 55 steam engines and 83 boilers, aggregating 1,590 horse power, in the said year. The number of miners employed was 2,959, and labourers 1,267.

7. In 1896 the mines produced 1,137,760 tons of ore.

„ 1897	„	„	1,727,330	„	„
„ 1898	„	„	1,943,000	„	„
„ 1899	„	„	2,571,620	„	„
„ 1900	„	„	2,551,690	„	„
„ 1901	„	„	1,795,180	„	„

The total deposits in the Krivoi Rog district are estimated at 55,000,000 tons now, though formerly the amount was said to be over 86 million tons.

8. There are no special obstacles in the way of successful continuous and unencumbered mining in the said district.

9. For additional information I would beg to suggest a reference to my commercial report for 1902,* beyond which I have nothing to remark.

* *Annual Series of Diplomatic and Consular Reports*, No. 3128

ROSTOV-ON-DON.

(Mr. Consul Brophy.)

The known deposits of iron ore in the Don Cossack territory are relatively unimportant and of poor quality, containing only from 35 to 40 per cent. of iron.

In the Kuban and Ter Governments, although other minerals exist, it would appear that no large deposits of iron ore have been discovered up to the present. In the Vorenesh and Orenburg Governments iron mines are worked, but, so far, I have not been able to procure sufficiently detailed information respecting them.

PROVINCE OF EKATERINOSLAV.

(Mr. Vice-Consul Walton.)

1. Yes. The deposits in the Mariupol district are insignificant, and the ore is of poor quality; but in accordance with the instructions of H.M.'s Consul at Rostov-on-Don, I am also giving the desired information for other parts of the Province of Ekaterinoslav, and also for the Krivoi Rog region.

2. (a) Olga, Alexander and Nicholas mines, district of Mariupol, near the Elenovka and Veliko-Anadol stations, 70 and 65 miles distant from the port of Mariupol.

(b) Stilov, Karakubsk and Novotroitsk mines, district of Bachmut, near the Hughesovo and Elenovka stations, about 80 miles distant from Mariupol.

(c) Krivoi Rog region (details are given in annexed table), on the borders of the Provinces of Ekaterinoslav and Kherson. Nicolaiev is the nearest port, the distance is about 135 miles.

3. (a) About 6s. 6d. per ton by road and rail—the mines are some distance from the railway.

(b) About 7s. per ton by road and rail—the above remark also applies.

(c) About 4s. per ton (*see also* p. 76).

4. The ore is mined by hand; gunpowder is used in soft strata and dynamite in hard or where water is found. Drilling is exclusively by hand. The ore is raised to the surface by means of steam, electricity or horse power, the latter predominates. The loading on trucks is done by hand or by shoots; the price of labour fluctuates with the season, but about 1s. 9d. per day may be taken as the average. The cost of mining and loading on trucks (rent and royalty not included) is about 3s. to 4s. per ton.

The price of 60 per cent. Krivoi Rog ore, free on board steamer Nicolaiev, would be about 12s. per ton, and 45 per cent. Donetz ore about 11s. f.o.b. steamer Mariupol.

5. (a and b) The Donetz ores are of the brown quality, with a fair percentage of lumps.

The analysis is as follows:—

	1st Sample.	2nd Sample.
	Per cent.	Per cent.
Fe ₂ O ₃	63·43	68·57
Al ₂ O ₃	6·86	3·91
CaO	0·76	0·72
P	0·219	0·270
SiO ₂	18·24	14·26
MnO ₂	0·95	0·98
Mn	0·60	0·62
MgO	0·63	0·99
S	0·17	0·041
SO ₃	0·42	0·09
P ₂ O ₅	0·60	0·62
Loss in calcination	8·70	9·60
Metallic iron	44·40	48

(c) The Krivoi Rog deposits chiefly consist of specular iron, magnetic iron and red hematite ores. The bulk of the ore is in lumps, but some, especially Kolatchevski's, is in the form of powder.

The analyses from five mines are given below:—

Kolatchevski's Mines.

No. 1.

Fe	68·5	per cent.
MnO ₂	0·06	"
SiO ₂	1·55	"
P	0·02	"
S	0·08	"

No. 3.

Fe	64·00	per cent.
MnO ₂	0·02	"
SiO ₂	5·80	"
P	Traces	"
S	0·04	"

Kopilov's Mines.

(1.) Krivoi Rog Station.

Fe ₂ O ₃	92·10	per cent.
Al ₂ O ₃	0·25	"
CaO	0·18	"
P	0·029	"
SiO ₂	6·13	"
MnO ₂	0·02	"
Loss in calcination	1·35	"
Metallic iron	64·70	per cent.

(2.) Station Schimanovski.

Fe ₂ O ₃	...	...	...	...	95.14 per cent
CaC	0.24 "
P	0.024 "
SiO ₂	3.70 "
Loss in calcination	1.05 "

Metallic iron	66.60 per cent.
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(3.) Jeltaya Réka.

Fe ₂ O ₃	91.83 per cent.
P	0.011 "
SiO ₂	4.39 "

Metallic iron	64.28 per cent.
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Taking the whole of the Krivoi Rog region, the percentage of metallic iron fluctuates between 50 and 68 per cent. The average may be taken as 60 per cent.

6. Most of the mines are owned or rented by metallurgical companies, which supply the ore to their own works, and naturally they would only sell at enhanced prices, but private concerns could, no doubt, be obtained at reasonable rates.

7. Most of the above deposits have been worked, and the outputs, &c., are given in the annexed tables.

8. There are no special obstacles in the way of successful mining. The mining laws are reasonable and not over stringent; all foreign companies must obtain the sanction of the Government before they are allowed to commence work, but, as a rule, that is readily granted. Taxes are not heavy.

9. *Donetz Ores.*—As stated above, the Donetz iron ore is of little importance, and the supply is restricted, but at the same time it enables the local metallurgical works to be less dependent upon Krivoi Rog ores, and, to a certain extent, reduces their cost of production. The ore is found in pockets, and the deposits are some distance from the railway stations, consequently, the high expenses preclude all possibility of profitable export. The annual output of this ore has dropped from 67,350 tons in 1901 to 38,840 tons in 1902. The production of each mine for the years 1899 to 1902, inclusive, is given in the annexed table. For 1903 the returns have not yet been published. The ore was exclusively supplied to the New Russia Company at Hughesovka, and to the two metallurgical works at Mariupol.

Brown iron ore, similar to that found in the Mariupol and Bakhmut districts, also exists in the Slaviansoserbsk district of the Province of Ekaterinoslav. A few years ago there was great activity on these deposits, the ore being supplied to the Donetz-Uriefka Metallurgical Company, at Uriefka, but on the appearance of the metallurgical crisis, all the mines were shut down and have remained idle for the last three years. In 1899 the output was 77,625 tons, and in 1900 10,790 tons. These mines are situated some distance from a seaport, and present no interest to exporters of ore.

Krivoi Rog Ores.—The largest and most important deposits of iron ore are to be found in the Krivoi Rog region, on the borders of the Provinces of Ekaterinoslav and Kherson. The ore bed lies along the rivers Saksagan, Ingulez and Jeltaya, in the form of a narrow strip, for a distance of about 40 miles, the total extent of actual ore-bearing land being about 792 acres.

In 1902 there were in all 78 mines, of which 41 were in operation, and the remainder were idle. These mines belong to 36 different companies or individuals, who own 7,786 acres of land and rent another 41,739 acres from landed proprietors and peasants.

When the ore was first worked the rent of the land was exceedingly low (about 4s. per acre), but with the development of the industry rents rapidly rose, and towards the end of the nineties 1s. 4d. to 2s. per ton was freely paid, eventually reaching 4s. per ton, in some instances being coupled with guarantees of minimum annual payments of £8,000 to £12,000; the latter works out at about £75 per acre per annum. The demand for Krivoi Rog ore was enormous, and even surpassed the supply, notwithstanding that the production, which in 1895 stood at about 900,000 tons, had, in 1899, already reached 2,550,000 tons. The whole of the nineteen metallurgical works in South Russia, with a potential consumption of about 2,600,000 tons of ore, with the sole exception of the Kertch works, almost exclusively employ Krivoi Rog ore, and even the works at Mariupol and Taganrog, which were built with the intention of working exclusively on Kertch ores, consume a large quantity of Krivoi Rog ore. The crisis in the metallurgical world has been severely felt in Krivoi Rog; in 1899 all the mines were working full time, but in 1901 31 fully-equipped mines were shut down, and the remainder were putting out only about a third of their possible production. In 1902 work was suspended at 22 additional mines.

Of the total output of iron ore in South Russia, 94 per cent. falls to the share of Krivoi Rog, 3.5 per cent. to Kertch, and the remaining 2.5 per cent. to Donetz ores.

The ore is principally worked out of open quarries, which have a maximum depth of 280 feet; the earth covering is small (14 to 70 feet), and the seams of ore run from 35 to 75 feet deep, although in some parts even 280 feet seams are met with. Where the seams are shallow (5 to 20 feet) and the covering large, or where the upper seams have already been worked to a considerable depth, then recourse is had to underground work. In 1902 this latter method of extracting the ore was only to be found at ten mines, occupying about 40 acres of land, whereas open quarries accounted for about 335 acres.

Generally speaking the mode of working the ore is very primitive; the cover is always removed by manual labour, with spades, and only in two instances were steam excavators employed. The ore is raised to the surface by means of inclined planes or shafts. There are in all 120 elevators, of which 41 are worked by steam, 6 by electricity, and 73 by horses. On the inclined planes where steam or electricity is used, from 300 to 800 waggonettes, each carrying 1 to 1½ tons, can be brought to the surface each shift, but where horses are employed, the quantity, per shift, does not exceed 100 one-ton waggonettes.

Miners are drawn from the central provinces, and generally arrive in *artels* or gangs, leaving their families at home. The piece-work system is in vogue, and each labourer earns about 30s. to 50s. per month, out of which he pays from 12s. to 15s. per month for food. Barracks are provided by the mines, free. Artisans receive 50s. to 70s. per month and free quarters of one or two rooms. Taking the annual production of ore and the number of men actually engaged in mining operations, the average share of the output, of each man, works out at about 500 tons per annum.

The total possible annual production of all the mines in the Krivoi Rog region is set down at about 5 million tons. In 1902 the 42 mines in operation, with a possible output of about 4,360,000 tons, produced only 1,803,484 tons; 1,941,760 tons were dispatched from the mines during the same period, while the stock at the mines on the 1st January, 1903, stood at about 360,000 tons.

It is computed that the Krivoi Rog deposits are still capable of yielding a total of over eighty million tons of ore.

For the years 1897 to 1902 the output of the iron ore mines in the Krivoi Rog region was as follows:—

Year.				Output.	Despatched from mines.
				Tons.	Tons.
1897	...	...	...	1,727,230	?
1898	...	...	...	1,946,228	?
1899	...	...	...	2,571,642	?
1900	...	...	...	2,519,437	2,391,801
1901	...	...	...	1,795,185	1,895,865
1902	...	...	...	1,803,484	1,941,760

The destination of the ore sent away from the mines in 1901 and 1902 was as follows:—

	1901.	1902.
	Tons.	Tons.
Metallurgical works:—		
South Russia... ..	1,680,000	1,710,000
Remainder of Russia	280,000	180,000
Other works	45,000	72,000
Abroad (principally Germany and Austria).	3,500	49,000
*Total	2,008,500	2,011,000

* These figures are taken from another source and do not quite correspond with those given above.

Production of Donetz Iron Ore.

Mines.	1899.	1900.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.
Olga	190	10,800	3,850	940
Alexander	10,000	6,600	8,500	1,500
Nicholas	5,000	4,000	4,800	6,400
Stilov	23,100	18,300	27,500	15,500
Karakubsk	7,950	6,300	7,950	4,000
Novotroitsk	9,200	10,700	14,750	10,500
Total	55,440	56,700	67,350	38,840

Production, &c., of Krivoi Rog Ore.

Name of Firm.	Number of Mines.	Estimated total possible yield of Mines.	Possible Annual Production.	Production.		
				1900.	1901.	1902.
New Russia Company	2	Pouids.* 242,000,000	Pouids.* 30,600,000	Pouids.* 12,151,545	Pouids.* 6,683,235	Pouids.* 6,558,400
South Russian Dnieper Company	2	750,000,000	36,000,000	23,952,240	22,791,180	20,763,360
Briansk Company	5	{ 102,000,000 155,000,000	{ 16,000,000 6,000,000	{ 8,657,533	7,763,783	3,863,911
Krivoi Rog Mining Company ...	3	494,000,000	30,000,000	7,070,923	5,916,402	10,032,827
Donetz Company	1	98,500,000	2,000,000	1,036,804	1,190,110	1,660,305
Société Russo-Belge	2	308,000,000	7,500,000	2,102,070	6,110,490	3,935,855
Société Generale	1	13,000,000	4,000,000	775,573	1,072,493	335,576
Almaznoe Company	3	64,000,000	5,500,000	—	—	3,004,740
Nicopol-Mariupol Company ...	2	22,000,000	5,000,000	2,500,000	—	385,000
Société Providence Russe ...	1	6,000,000	1,000,000	939,457	1,032,933	438,374
Konstantinowka Works	2	?	1,500,000	121,000	1,200,000	1,018,417
Krivoi Rog Iron Ore Company ...	6	362,000,000	26,700,000	20,477,123	13,098,861	10,647,605
Ostrovetz Company	2	63,000,000	3,500,000	3,145,272	749,292	—
Taganrog Metallurgical Company	2	17,400,000	3,500,000	1,812,522	—	—
Bielaya Company	1	?	8,000,000	500,000	—	—
Total — Mines owned by Metallurgical Company }	35	2,696,900,000	186,800,000	85,242,062	67,608,779	62,644,370
M. S. Kopilov	7	380,000,000	14,700,000	11,289,164	7,944,580	7,839,520
Perry & Brailovski	5	16,100,000	4,600,000	2,050,000	1,848,915	1,709,757
S. Kolatchevski	1	400,000,000	24,000,000	16,146,800	7,889,280	10,077,787
U. Galkovskaya	1	500,000,000	3,000,000	2,000,800	2,198,490	1,442,770
Michailov	1	10,000,000	2,500,000	2,000,000	1,181,510	856,000
South Russian Mining Company	5	120,500,000	15,500,000	5,526,946	2,113,760	4,776,941
Duboyaya Balka Company ...	2	290,000,000	26,000,000	16,868,367	12,241,215	14,719,635
Rakhmanovo-Krivoi Rog Company	3	223,000,000	12,000,000	4,179,686	845,000	1,200,000
Kovalevski & Karpas	2	85,500,000	5,000,000	2,365,214	1,077,750	985,000
Jeltaya Réka Company	1	300,000,000	12,000,000	5,841,477	3,472,281	4,914,250
Dikanski & Minuxhin	1	15,000,000	2,000,000	614,476	680,000	400,000
Kamenkovich	1	10,000,000	4,000,000	—	2,200,000	250,000
Lubarovski	4	10,000,000	2,750,000	573,131	—	—
Lewinsow	1	2,000,000	1,000,000	—	—	—
Sinaiski & !liev	2	500,000	500,000	258,042	—	—
Menzon & Golodetz	1	2,000,000	?	80,000	—	—
Aizenstein & Strongin	1	4,000,000	1,000,000	508,916	—	—
Kravtsov	1	4,500,000	—	—	—	—
Kogan-Bernstein & Brodski ...	1	15,000,000	—	310,000	—	—
Laptey	1	65,000,000	—	350,000	—	—
Vilechur	1	?	?	—	—	—
Total other Firms	43	2,453,100,000	130,550,000	70,963,019	43,692,711	49,171,660
GRAND TOTAL	78	5,150,000,000	317,350,000	156,205,081	111,301,490	111,816,030
TOTAL—Tons	—	Tons. 83,064,516	Tons. 5,118,548	Tons. 2,519,437	Tons. 1,795,185	Tons. 1,803,484

* 62 pouds = 1 ton.

KERTCH.

(*Mr. Acting Vice-Consul Costala.*)

1. Yes. The Kertch metallurgical works, having the entire monopoly in their hands for thirty years.
2. All round the town.
Kertch roadstead.
Between 2 and 7 miles.
3. From the different spots to the roads between 1s. 6d. and 2s. per ton f.o.b.
By carts to the piers and thence by lighters to the roads.
4. Mining and loading of ore on trucks are effected by means of a machine, similar to the one in use by the metallurgical works, requiring no hand labour.
5. The following is a copy of an official analysis of the ore obtained from the Kertch Metallurgical Works:—

Fe	...	...	...	...	...	40—45 per cent.
Mn	...	...	...	...	...	0.75—2.50 "
Si	...	...	...	...	...	15.00 "
Mo	...	...	...	...	...	5.00 "
Co	...	...	...	...	...	2.00 "
Mg	...	...	...	...	...	0.50 "
P	...	...	...	...	...	1.25 "
Ho	...	...	...	...	...	10.00 "

NOTE.—Owing to presence of a considerable amount of Phosphorus, the Kertch ore is treated by the Thomas' process.

6. See last paragraph, No. 9.
7. The metallurgical works have worked the deposits for the period of only two years. During this period they have shipped about 450,000 tons of pig-iron to Russia, England, France and Italy.
[Shipments abroad were insignificant, mostly for testing purposes.]
8. No obstacles whatever.
9. As stated above, the Kertch Metallurgical Works have obtained from the town a special licence for thirty years, consequently, they are the sole proprietors for this period of time.
The works have been now closed for the last year, having stopped payment. All the necessary means for recommencing work are in good and workable condition. The creditors are to sell the works this February or next May by public auction, for 17,000,000 roubles, obligations for the sum of 6,000,000 roubles are in the hands of the State Bank, and now the Russian Ministry of Finances is pressing for a speedy and final settlement. Besides the iron ore mining round Kertch, the works possess, on the opposite side of Kertch, at the town of Saman, about 70 acres of iron ore of the very best quality, surnamed by the works—Horn Iron. This, also, is to be sold, inclusive, in the same bargain.

ST. PETERSBURG.

(Mr. Consul-General Michell.)

Mr. Michell reports that deposits of iron ore exist in the province of Olonetz and in the northern portion of the province of St. Petersburg, near Lake Ladoga. The deposits in question may be classified as those of lake iron ore, with the usual proportion of phosphorus in it.

The above deposits mainly belong to the Crown, and are now leased by it to private iron works, situated in the vicinity of this city.

The average yield of the deposits above referred to is 24,194 tons per annum, and the quantity of iron produced may be reckoned at about 12,097 tons. None of the above ore is exported abroad.

WARSAW.

(Mr. Consul-General Murray.)

1. Yes, of brown iron ore and of common clay iron stone.

2. In the governments of Radom and Kielce, and in parts of the governments of Piotrkoff and Kalisz.

The nearest shipping ports are Dantzic and Stettin. 330 miles, more or less, the exact distance depending on the position of the deposits.

3. About 5s. 6d. per ton. By rail.

4. Polish peasants, who are paid :—

For mining, 1d. per cwt. of ore extracted;

For carrying out the ore, $\frac{1}{2}$ d. per barrow;

For clearing off surface earth, 3d. to 5d. per cubic foot;

For loading on trucks, 1s. per $12\frac{1}{2}$ tons (truck load).

The cost of ore, loco mine, is 5s. 10d. to 6s. 6d. per ton.

5. No official analyses or samples to be had, but analyses made at the works show 33.40 per cent. of metallic iron for the brown iron ore, and 25.32 per cent. for the clay iron stone.

6. Most of the mines belong to works, but the mining industry is not fully developed, as the profits are very small, and most of the deposits belong to people who are not well off, and would willingly sell.

7. Yes. No ore is exported; on the contrary it is imported from the Donetz basin and Krivoi Rog, a distance of over 800 miles.

8. The deposits are not rich, and their exploitation is difficult.

Production :—

1898	...	...	...	...	396,640 tons.
1899	...	...	...	...	455,071 „
1900	...	...	...	...	454,659 „
1901	...	...	...	...	312,173 „
1902	...	...	...	...	238,405 „

9. The exportation of ore from here is not, as a rule, allowed, and requires a special permission of the Minister of Agriculture for each shipment.

Taking all the above into consideration, it is evident that there is no possibility of an export of ore in any quantity from this district.

SERVIA.

(Mr. Vice-Consul Thesiger.)

1. Serbia is rich in iron ore, but the deposits are practically untouched. The absence of good coal and want of capital has hitherto prevented any regular attempt to exploit this branch of the mining industry, especially as the treatment of the ore is complicated by the admixture of a large proportion of sulphur. Want of research prevents the full value and extent of the various deposits from being definitely known. The most important deposits are said to be those of magnetic iron present in the crystalline earths.

2. (a) *Ventchatz*.—30 kilometres west of Mladenovatz station. Ores have been found in the crystalline schists showing an extent of from 600 to 700 metres.

Analysis.

Fe ₂ O ₃	...	...	...	53·79 to 75·35 per cent.
FeO	...	...	...	7·92 „ 24·15 „
Al ₂ O ₃	...	...	...	8·87 „ 0 „
P ₂ O ₅	...	...	...	0·63 „ 0 „

A narrow gauge railway runs to Arandjelovatz, 6 kilometres distant from the deposits. Distance to port (i) if shipped *viâ* Salonika—

Mladenovatz to Ristovatz	...	...	...	K. 298
Ristovatz to Salonika	...	...	...	333
Total	...	...	...	<hr/>631 <hr/>

(ii) if shipped *viâ* Fiume—

Mladenovatz to Belgrade	...	...	...	K. 68
Belgrade to Fiume	...	...	...	663
Total	...	...	...	<hr/>731 <hr/>

(b) *Kupaonik*.—Ore deposits of Suvo Rudischte. Height above sea level 2,135 metres. Distance from railway station 102 kilometres. The roads in this district are little more than tracks. Large heaps of scoria show that in olden days these mines were worked, and the ore smelted at Samokov. The deposits here can be worked as open mines, and are said to have a thickness of 20 metres and to extend for some 300 to 400 metres.

Analysis.

Fe ₂ O ₃	...	...	...	...	66·43 per cent.
FeO	...	...	...	...	30·61 „
Insoluble residue	...	...	...	...	1·68 „
S	...	...	...	...	0·08 „
Cu	...	...	...	...	0·55 „
Phosphoric acid	...	...	...	...	0·23 „
Oxyde of magnesia	...	...	...	...	0·21 „

Distance to port—

Nisch to Ristovatz	...	...	...	...	K. 122
Ristovatz to Salonika	...	...	...	...	333
Total	...	...	...	...	<hr/>455 <hr/>

(c) *Tchrnaja*.—Situated in the west of Serbia, 35 kilometres from the Danube. Deposits of magnetic iron ore.

Analysis.

Fe ₂ O ₃	...	...	...	55·66 to 60·68	per cent.
FeO	...	...	...	17·57	„ 25·78 „
Cu	...	...	...	0·89	„ 3·21 „
S	...	...	...	0·53	„ 3·44 „
MgO	...	...	...	0·18	„ 0·57 „
Insoluble residue	...	...	...	12·16	„ 20·48 „

The ore would have to be brought by river to Belgrade, and from there to Fiume, 663 kilometres; to Salonika the distance is 699 kilometres. The cheapest outlet for the produce of this mine and (d) below would probably be by river to Galatz.

(d) *Brza Palauka*, 6 kilometres from the Danube, micaceous iron ore found in the crystalline earths near the village of Kupusiste.

Analysis.

Fe ₂ O ₃	...	...	...	94·03 to 95·61	per cent.
Insoluble residue	...	...	...	3·28	„ 3·66 „
Al ₂ O ₃	...	...	...	0	„ 2·82 „
S	...	...	...	0	„ 0·05 „

(e) *Metaruge*.—These deposits, which lie 10 kilometres south of Kraljevo, contain irregular masses of magnetic iron ore, isolated in the serpentine.

Analysis.

Fe ₂ O ₃	...	...	...	...	64·32	per cent.
FeO	...	...	...	...	2·68	„
Al ₂ O ₃	...	...	...	...	2·08	„
CoO	...	...	...	...	0·83	„
MgO	...	...	...	...	0·64	„
S	...	...	...	...	0·51	„
Insoluble residue	...	...	...	...	2·82	„
Cu	...	...	...	...	0·46	„

Some 800 to 900 tons of this ore have been already extracted, and are now lying round the deposits, but the distance to the nearest railway station is 45 kilometres.

Distance from station to port—

to Fiume—

Kraguevatz to Lapevo	...	...	...	40
Lapevo to Belgrade	...	...	...	110
Belgrade to Fiume	...	...	...	663
Total	...	...	...	813

to Salonika—

Kraguevatz to Lapevo	...	...	...	40
Lapevo to Ristovatz	...	...	...	256
Ristovatz to Salonika	...	...	...	333
Total	...	...	...	629

(f) *Guberevatz-Ralja*.—Both these deposits are about 30 kilometres from Belgrade, the latter is on the line and is being worked in a tentative fashion.

Analysis.

Fe ₂ O ₃	74.44 to 76.91 per cent.
FeCr ₂ O ₄	2.21 ,, 1.71 ,,
Insoluble residue	15.16 ,, 16.41 ,,

Distance to port—

to Fiume—

Ralja to Belgrade	30
Belgrade to Fiume	663

Total	693
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to Salonika—

Ralja to Ristovatz	336
Ristovatz to Salonika	333

Total	669
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(g) *Zidilje*.—30 kilometres north of Tchoupria railway station, and 9 kilometres from the coal pits of Senje, which are connected with Tchoupria by a narrow gauge line. These deposits extend for some 3 kilometres, and are said to have a depth of 8 metres.

The limonites of *Zidilje* contain a good percentage of iron.

Analysis.

Fe ₂ O ₂	84.12 to 83.83 per cent.
Al ₂ O ₂	0.16 ,, 1.03 ,,
CaO	0.21 ,, traces
MgO	0.26 ,, "
S	0.28 ,, 0.13 ,,
P ₂ O ₅	0.48 ,, 0.26 ,,
Water	11.73 ,, 10.46 ,,
Insoluble residue	3.08 ,, 4.72 ,,

Distance to port—

to Fiume—

Tchoupria to Belgrade	148
Belgrade to Fiume	663

Total	811
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to Salonika—

Tchoupria to Ristovatz	148
Ristovatz to Salonika	333

Total	481
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3. A preliminary condition for the export of Servian iron ore would have to be the construction of narrow-gauge railways to the main line, as bad weather renders Servian roads impassable for heavily-loaded waggons.

With regard to the Kupaonik and Metaruge deposits (*b* and *e*), entirely new lines, covering distance of 102 and 45 kilometres respectively, would have to be built.

The Ventchatz and Zidilje mines (*a* and *g*) could be connected with already existing narrow-gauge lines by branch lines of 6 and 9 kilometres.

The Tchnaja and Brza Palauka deposits (*c* and *d*) would have to find an outlet on the Danube, the distances to be covered being 35 and 6 kilometres, respectively.

Transport of iron ore on the Servian railways costs 3 centimes per ton per kilometre, and 1 franc per ton for loading.

The transit from Belgrade to Semlin costs 70 centimes per ton, and from Semlin to Fiume the rate per ton amounts to 13.50 krone.

From Belgrade to the Servian frontier station at Ristovatz the cost of sending one ton of ore would be 12 francs 10 centimes, and from Ristovatz to Salonika 14 francs 50 centimes.

4. Servian labour can be found for the mines at rates varying from 1.70 francs to 2 francs per day of 10 working hours, for the ordinary workman, and 3 francs for the head of the gang. A certain proportion of men with previous experience of mining and quarrying could be found.

Carriage by road, for which oxen are used, is usually contracted for on the spot, the price varying with the district and the distance to be covered, an average price would be 10 francs per ton for a distance of 15 kilometres, this would include loading, unloading, and driving.

5. The analysis of each deposit is given in the answers to question 2.

6. All the mineral wealth of Servia belongs to the State, from which concessions for the working of the deposits must be obtained.

The only concessions granted at present for the working of iron ore are for the deposits marked "*e*" and "*f*" (question 2). The owners of these concessions have not means sufficient for the working of the mines, and would be glad either to come to terms or sell outright.

The following are the conditions on which the State grants concessions either for prospecting or working a given deposit:—

Prospecting rights are of two kinds—ordinary and exclusive. The first grants the right of prospecting in three contiguous "communes," and lasts for one year, and can be obtained for 50 francs. It is renewable for another two years on payment of 100 francs a year. The exclusive right can be obtained for an indefinite number of mining fields, of 500,000 square metres each, cost 250 francs for the first year and 500 francs for every following year, plus a rate of 10 francs for each mining field.

Concessions for the exploiting of a mine are granted for fifty years on a certain number of mining fields of 100,000 square metres each, the boundaries of which must be delimited by a competent commission. The payment for each mining field is 12 francs a year and a royalty of 1 per cent. on the gross revenue. Proof must be given that the deposits are capable of exploitation; that the person to whom the concession is granted possesses the necessary capital and knowledge of mining; and a plan of the projected works submitted to the mining authorities.

If work is carried on regularly for 15 consecutive years, without breach of the prescribed conditions, the person to whom the concession was granted becomes the owner of the mine, but continues to pay the royalty.

Necessary lands can be bought from private owners by agreement or expropriation.

The supreme administrative and judiciary power is in the hands of the Minister for Agriculture and Mines.

The mining law insists upon regular work; the insurance of workmen, an annual report of work executed; and the submission of a plan of the projected works for the following year.

7. There has never been any export of iron ore from Servia, nor have any of the deposits been worked to a degree sufficient to form the basis of any statement as to their value or prospects.

8. It is difficult to define the obstacles which nearly all foreign companies, who have hitherto obtained concessions in Servia, have to contend against. Jealousy on the part of the Servians towards foreigners, who make money in the country, is a source of many difficulties, which are usually only to be solved by the Turkish system of "backsheesh," the desire for which is often the cause of their origin.

The Government certainly desires to encourage the spirit of enterprise, but the powers which lie in the hands of the administration of mines and of the Minister for Agriculture and Mines, as well as the procedure, by which all difficulties between them and the holders of the concession are arranged, places the latter at a disadvantage.

It is very necessary for anyone wishing to hold a Servian concession of any kind to foresee as far as possible every eventuality, and to protect himself against them by special contract.

As regards physical causes of delay of work, the condition of Servian roads is such that bad weather makes them unserviceable and, as already mentioned, light railways would be an absolute necessity in the case of most of the iron ore deposits; but careful surveying would be necessary to decide whether the mountainous nature of the country in places would not render their construction too costly.

SPAIN.

BARCELONA.

(*Mr. Consul-General Roberts.*)

1. Iron ore is to be found in various parts of Catalonia.

To refer first to the deposits nearest to this port, they are situated principally on the border of the provinces of Barcelona and Gerona, the nearest railway stations being Ripol and Manresa, distant, respectively, one hundred, and sixty kilometres from Barcelona; from Manresa there is a narrow-gauge mineral line to Berga—fifty kilometres—near which one of the largest deposits at present known in this district is situated.

3. Transport may be calculated at 5 centimos per ton per kilometre by rail; thus, from Berga to Barcelona the transport would cost about 5 pesetas per ton; there are no available canals.

4. Labour is good, cheap and plentiful; for ordinary labour $2\frac{1}{2}$ to 3 pesetas a day may be calculated. The cost f.o.b. Barcelona, may be estimated about as follows: mining $2\frac{1}{2}$ pesetas, rail to Barcelona 5 pesetas, shipping 0.50 centimos, taxes 0.50 centimos, general charges 0.50 centimos, total, say, 9 pesetas per ton.

5. An analysis made by Messrs. Patison, of Middlesboro', of some iron ore from the district named, gave, I am told (I regret to say that I

could not get a copy of the analysis nor sample of the ore), the following results :—

Peroxide of iron	...	...	76.00	per cent.
Peroxide of manganese	...	...	1.46	„
Silica	...	...	7.57	„
Alumina	...	...	1.59	„
Chalk	...	...	0.11	„
Magnesia	...	...	0.12	„
Sulphur	...	...	0.03	„
Phosphoric acid	...	..	0.04	„
Water in combination	...	...	9.57	„
Hygroscopic water	...	...	0.93	„
<hr/>				
Metallic iron	...	...	53.20	„

6. The owners of these mineral properties are mostly well-to-do people, some even rich, but most of them would, I think, be ready to sell the properties on fair terms for cash, or on the basis of receiving a royalty.

7. The deposits I refer to have not yet been worked, but have been opened out for inspection, and I am told that there is calculated to be two million tons of ore in sight on one property, and five times this quantity on another.

8. There are stated to be no obstacles to working open galleries.

9. I may mention that there is great difficulty in getting thoroughly trustworthy information upon this subject without visiting the properties, which entails time and expense, for if one applies to the agents here for information, they are very chary about giving it, saying, as one did to me on this occasion, "it is all very well, but if I give you minute information as to names, exactly where situated, and so forth, it will be known in England, and persons will come out and deal direct, and I lose my profits as acting as intermediary."

Tarragona.—I am informed that innumerable deposits of iron ore are reported to exist in the province of Tarragona in most of the hill ranges, within a radius of twenty-five miles of Tarragona, which is the nearest shipping port for ocean steamers, and the transport of ore to the port would cost ten pesetas per ton; but no mining labour could be got, the Vice-Consul informs me, within the Tarragona districts, nor can he obtain any official analyses, nor samples of the ore.

Generally speaking the proprietors in that district are poor. None of the deposits of iron ore have been worked. There are two special obstacles in the way of successful working in the Tarragona district; firstly, the assumed poor quality of the ore, and, secondly, the great cost of transport owing to want of good means of communication with the hill districts.

Mining claims are continually being notified in the Government Office, but no one as yet has ever seriously prosecuted his claim; it having become merely a practice to notify a claim in order to prevent others from doing so.

The best deposits of iron ore in the Tarragona district are reported to exist near the village of Geuamets, between Falseh and Mora de Ebro, and it may be mentioned that lead mines are now being worked in that neighbourhood, which is not far from a railway.

The hills near the source of the river Francoli, at Espleega, are said to be full of iron, but it is said that the ore is unworkable.

The British Vice-Consul at Tarragona concludes by saying that the quality of the deposits could only be obtained reliably by means of an expert's opinion.

Zaragoza, Huesca and Teruel.—In these provinces there are reported to be important deposits of iron ore.

An important mine, called "Ojos Negros," is being worked near Teruel, at a distance of some twelve miles from a station on the Central Aragon Railway. A line is being constructed to carry the ore to Valencia, but it will take two to three years to complete it. Very important deposits of good quality are reported, and great results are expected. The proprietors, Messrs. Larranaga, Lota and Echevarruta, of Bilbao, are possessed of ample capital, and it is doubtful if they would sell on easy terms. Another deposit in the Moncayo mountains, near Tarragona, has been worked by a company called the "Minera de Moncayo," and has a branch line from the mines to Castejon, on the North Spanish Railroad. It is stated that the analysis of the ore gave the largest percentage of iron in Spain, but neither copy of the analysis nor a sample of the ore has been able to be obtained by the British Vice-Consul at Saragossa.

The work on these mines ("Minera de Moncayo") came to a standstill about the middle of September, 1903. The distance from Castejon to Bilbao or Pasages is some 250 kilometres, and the cost of transport may be calculated at about 40* centimos per ton per kilòmetre.

On the other side of the Moncayo range, and on the Madrid, Zaragoza and Alicanté Railway, at Illueca, near Catalayud, rich deposits are reported to have been found; a Madrid syndicate has the matter in hand and, it is said, purpose putting up blast furnaces and working on a large scale.

Deposits of iron ore are also reported to exist in the following places: Utrillas, Agreda, Olrego, and Ciria, all near the Moncayo range, in the west of the province of Saragossa. All these deposits have been registered at the offices of the "Ayuntamiento" at Teruel.

At Bielsa, in the north of the province of Huesca, very large quantities of iron ore have been found, but the great difficulty is the want of means of transport. From Alicante I hear that fifty-five iron ore mines in different parts of that district have been officially registered by owners of the properties wishing to protect their mining claims; that a few of these have been opened out a little, but none actually worked, and no shipments made, and that many attempts at working have been relinquished, the quantity of ore proving too small to pay.

The report from Alicante is very vague, and does not point to any important deposits of iron ore in that district, nor does it go into any details.

From the other centres of this Consular district, namely, Burriana, Denia, Gandia, Iviza, Mahon, Palamos, San Feliu de Guixols, and Valencia, I am informed that no iron ore deposits exist, as far as is known at present, in those districts.

In conclusion, I venture to remark that the deposits of iron ore existing in this province (Barcelona), and the neighbouring province of Gerona, mentioned in the first part of this report, are, I believe, those most worthy of serious attention.

* *Sic* in original, ? 4, p. 99, § 3.

BILBAO.

(Mr. Consul Wood.)

1. The following tables will show the numbers, &c., of the iron ore mines registered within this district:—

Province.	Mines working.		Mines not working.	
	Number.	Area.	Number.	Area.
		Acres.		Acres.
Viscaya	226	7,525	1,530	51,638
Guipuzcoa	18	766	706	30,969
Alava	—	—	167	8,785
Santander	61	3,168	962	38,713
Burgos	—	—	159	8,836
Logrono	2	116	219	20,294
Avila	—	—	12	541
Soria	3	437	96	17,368
Segovia	—	—	42	3,279
Palencia	—	—	41	2,875
Valladolid	—	—	1	29
Total	310	12,012	3,935	183,328

2. The Bilbao, Regato, Gueñes, Somorrosto, Galdames, Sopuerta Arcentales deposits are the most notable.

The deposit at Rigoitia is said to be an important one in quantity, but the poor quality of the ore and the proportion of phosphorus has not, so far, encouraged enterprise.

A deposit exists at Axpe, Arrazola, in the neighbourhood of Durango, for the exploitation of which a branch line has been opened, but, for the present it is difficult to judge of its importance.

Bilbao is, of course, the chief port for ocean steamers; whilst Santander and Pasages come in the second rank.

There are other ore-shipping places on the coast, such as Salta Caballo, Castro-Urdiales, Poveña, Dcido, Castro Alen and Onton, all of which are in close proximity to each other, where loading, however, can only be carried out in fine weather. The arrangements in these localities, are, nevertheless, such that from 2,000 to 3,000 tons can be placed on board ship during the working day in fine weather.

The distances between the deposits on the coast and the principal ports, above mentioned, as well as between the places last alluded to, are from three to twenty-four miles.

Burgos.—Rich deposits, such as "Basconcillos de Toro," "Riocabado," "Monterrubio," "Barbadillo de Herreros," "Huerta de Arriba" and "Huerta de Abajo" are reported to exist. The Sierra Company,

Limited, opened two mines in 1901, but had to suspend works for various reasons; one of which was the high cost of transport of ores to Bilbao, by the Northern Railway. To solve this difficulty a direct railway line to Bilbao is in course of construction.

Preliminary workings in "Basconcillo de Toro" and "Riocabado" mines, are said to have been unsatisfactory.

Logroño.—The deposits in this district are situated in the following localities: "Ezcaray," "Canales," "Villabelayo," "Mansillas" and "Las Viniegras," but these mines also await more economical transport to shipping places, and their proprietors are watching the progress of the direct line from Burgos to Bilbao.

There were only two mines worked in 1902, in a small way, but their output was sent to the iron works in Araya, in the province of Alava.

Soria.—Several deposits of iron ore were denounced a few years ago at "Velilla de Medinaeli," "Somaen," "Jubera" and "Olvega-Noviercas." No work of any kind has yet been carried out in the former mines, but the proprietors of the "Olvega" and "Novierca" mines, a firm established in Brussels under the title "Sociedad Minera del Moncayo," have constructed a railway line from them to Castejon Station, on the Northern Rail. About 2,005 tons of ore were raised from these mines in 1902.

No iron ores of any importance are reported officially in Alava, Avila, Palencia, Segovia, or Valladolid.

There exists in Madrid an Official Board called "Comision del Mapa Geologico," which has published maps of every province and explanations to them, which might prove of great utility in ascertaining the actual position of the ore deposits. The high price of these maps and their explanatory books, have, however, prevented my purchasing them.

3. Transport from working mines along the coast, is from $*1\frac{1}{2}$ to 4 pesetas the ton, according to distance and means of carriage to the railway lines. Such means are either mechanical, such as aerial trams, inclined ways, endless chains, or bullock traction, for there are no canals.

The charges of the Northern Railway are $12\frac{1}{2}$ centimos pesetas per ton per kilometre, prices which may be reduced according to importance of the quantities transported, and mine owners can still further lessen their transport expenses by possessing private trucks on the line.

4. The labour is good, miners being strong and willing workers. Wages are paid according to special lines of employment, as follows:—

	Pesetas.	s.	d.	s.	d.
Common or surface work	2.75	=1	$7\frac{1}{2}$		
Ore assorting or superior work ...	3.25 to 3.50	=1	11	to 2	$0\frac{1}{2}$
Manual boring... ..	3.50	,, 4	=2	$0\frac{1}{2}$	,, 2 4
Underground labour	4.0	,, 5	=2	4	,, 2 11
Stable attendants and watchmen ...	3.25	,, 3.50	=1	11	,, 2 $0\frac{1}{2}$
Loading, attendance on transport of ore and task work.	3.70	,, 4	=2	2	,, 2 4

The cost of quarrying varies, naturally, according to the purity of the ore, and is from 2 to 4 pesetas (1s. 2d. to 2s. 4d.) per ton, including the washing of product. Mining, driving galleries, section 2 square metres, is, as a rule, a matter of special arrangement with the men, and amounts to about 75 pesetas (£2 4s. $1\frac{1}{2}$ d.) per metre, and is based upon the nature of the material, earth or rock, to be removed.

* $10\frac{1}{2}$ d. to 2s. 4d.; exchange 34 pesetas per £1.

Loading carts or railway trucks may be estimated at 50 cts. ($3\frac{1}{2}$ d.) per ton, on levels, but it amounts to much less when these operations are carried on from heights by means of shoots.

5. Analysis of the different classes of Ore extracted in Province of Bilbao.

	Spathic.		Vena or Purple Hematite.	Campanil or Red Hematite.	Rubio or Limonite.	
	Superior.	Inferior.			Superior.	Inferior.
Peroxide of Iron ...	1.400	2.850	81.157	75.357	78.514	72.950
Protoxide ...	52.070	37.300	—	—	—	—
Peroxide of Manganese.	1.480	1.100	1.340	2.110	0.900	0.780
Peroxide of copper...	—	—	—	—	—	—
„ „ lead ...	—	—	—	—	—	—
Alumina ...	0.170	0.300	1.200	1.840	1.250	1.700
Lime ...	1.700	1.560	1.310	5.530	0.850	0.500
Magnesia ...	0.450	0.870	0.450	1.540	0.550	0.250
Sulphuric acid ...	0.351	0.675	0.042	0.035	0.058	0.095
Phosphoric acid ...	0.040	0.045	0.035	0.025	0.031	0.055
Arsenic „ ...	—	—	—	—	—	—
Carbonic „ ...	33.633	32.957	0.100	0.093	0.650	0.850
Titanic „ ...	—	—	—	—	—	—
Silica... ..	6.590	8.990	6.210	5.300	7.120	9.750
Combined water ...	0.480	1.480	0.120	0.700	4.100	6.950
Moisture ...	1.620	1.950	8.150	7.470	6.100	6.100
	99.984	100.077	100.114	100.000	100.123	99.980
Metallic iron ...	41.474	38.780	56.809	52.749	54.959	51.065
Manganese ...	0.935	0.695	0.846	1.333	0.568	0.492
Phosphorus ...	0.017	0.019	0.015	0.010	0.013	0.024
Sulphur ...	0.140	0.270	0.016	0.014	0.025	0.040
Loss in calcination ...	32.270	32.480	—	—	—	—
Metallic iron in calcined ore.	58.100	55.500	—	—	—	—

6. Proprietors of working mines are exceedingly wealthy, possessing, as they do, the treasures of the land, and would be unlikely to part with it at prices which could be considered reasonable by would-be buyers.

Owners of unworked mines would, of course, have less pretensions, but purchasers would be assuming some risks, as results could only be matter of speculation.

7. Quantity and destinations of iron ore shipped from Bilbao during the last five years :—

Destination.	Quantity.				
	1898.	1899.	1900.	1901.	1902.
United Kingdom	Tons. 3,060,801	Tons. 3,966,129	Tons. 3,101,563	Tons. 2,281,198	Tons. 2,996,908
Netherlands	830,311	861,669	703,766	651,473	672,368
Germany	11,618	32,821	66,401	636,509	57,688
Belgium	154,526	205,953	207,925	193,372	224,570
France	285,561	282,109	200,222	196,072	199,305
Italy	976	—	—	—	14
United States	3,042	59,657	49,445	90,565	45,998
Austria-Hungary	1,382	—	—	—	—
Norway	—	4,425	—	—	—
Canada	—	—	—	7,512	—
Total	4,348,217	5,412,763	4,329,322	4,056,701	4,196,851

On the whole some 70 or 80 per cent. of the shipments from the three provinces of Viscaya, Guipuzcoa and Santander, has been consigned to the United Kingdom, whilst the remainder has chiefly gone to Germany via Holland and Belgium, small quantities only going to the United States.

8. None, for the Spanish Government recognizes the right of property to foreigners and willingly facilitates enterprise when legal regulations and stipulations are accepted and complied with.

Foreigners are on a complete equality with natives in taking out claims for mines.

The fees for surveys, &c., amount to some 75 pesetas for a surface of 120,000 square metres, whilst the superficial tax on working or non-working mines is 8 pesetas per annum per 10,000 square metres.

In addition to these dues, working mines pay 3 per cent. on the value of the ore at the pit mouth, when calculations are based upon the deduction from the market price of the ore, free on board, of transport and shipping expenses. The quality of the ore is, however, now being taken into consideration when calculating these dues.

Mines, unworked by their original concessionaries, when transferred, leased, or sold, almost always entail a payment of "royalty"—called "Canon" here—of so much per ton produced, and varying with the quality of the ore, amounting from 50 cts. to 2 pesetas, with, however, an obligatory minimum export rate per annum.

9. The following is what I have been able to gather in regard to the iron ore mining industry in this district, and I trust that there may be some points which may prove interesting, if not useful. I shall begin with the nature of the mineral in these parts.

Class of Mineral.—There are four kinds of ores worked in Viscaya, and these are "Vena," or purple hæmatite, "Campanil," red hæmatite, "Rubio," or limonite, and "Carbonato," or siderite. "Vena" is of two qualities, hard and soft. It is the purest ore in Biscay, and was the only one used or worked at a time when its production was limited to the demand of the primitive and ancient forges of this country.

Campanil ore was first employed in great quantities when, thanks to the establishment of the Bessemer process, the mineral exploitation of this district was enormously increased.

At the present time it is being fast exhausted, and being in great demand for certain manufactures, it is much costlier than all other ores. It is an epigenesis or outgrowth of carbonate of iron.

Rubio.—This ore often presents itself in a cellular and concreted form much mixed with clay and silica in its cavities; and, at times, with iron pyrite crystals, which make it often difficult to sort. Where Rubio is poor in quality and contains many pyrite crystals, it is calcined after the manner of "Carbonato"—carbonate of iron.

It is generally found on the surface, in contradistinction to Campanil, and in contact with great lumps of clay, lime, and sandstone.

Siderite, or carbonate of iron, often appears in small quantities surrounded and covered by Campanil or Rubio. At other times in pockets with other ores; as a rule, however, it is encountered below these. At one time, even after calcination, this ore was of small marketable value, but at present it obtains the best prices.

It must be understood that the above classes of minerals are seldom shipped alone, being generally mixed with the products of two or three mines.

It is known that the Bilbao ores are sold on a 50 per cent. basis of metallic iron; and, in many cases, a proportion of inferior ores is shipped with those of good quality in order to keep the average analysis to the above percentage. Very much depends, naturally, in such cases, on the care used in the mining and picking, as well as on the state of the weather during extraction and shipment, a most important consideration.

The Outlook in regard to the Supply of Ore.

According to expert opinion given some years ago, the supply of ore in Viscaya will probably hold out for another ten or twenty years, whilst that of Santander may fail much faster, and that of Guipuzcoa sooner still, on the basis, of course, of the present annual output. The quantities of ore presumed to be still in deposit, were put down in 1897 at forty or fifty million tons, in Biscay; but over thirty million tons have been worked out since then. The indications of exhaustion, however, appear to be still similar to those on which calculations had been based in the above year, judging from the fact that the exploitation and shipments still nearly keep up to the level of previous years, *i.e.*, at the rate of about four or five million tons annually.

The latest expert opinion asserts, however, the existence of fifty million tons of available iron ore in the actual mining district of Bilbao.

Engineering is an exact science, but how far experts in it may be trusted when they take to divination, no one can safely say. There is little doubt, however, that new mines as well as old ones, make up among them for the lesser quantities produced by the failing or already exhausted ones.

It is useless, on the other hand, to gain or proffer any information as to the probable importance or the production of non-working mines, for the proprietors themselves can only judge by the surface production or aspect of their property.

CASTRO URDIALES.

1. There are iron ore deposits in the Vice-Consular district of Castro Urdiales.

2. These deposits are situated at distances varying from 3 to 15 miles from the shipping port of Castro Urdiales.

3. The transport is by rail; the cost of transport, including loading on board ship, is about 3 pesetas (1s. 9d.) per ton.

4. The cost of the labour chiefly employed is: for unskilled labour about 3.50 pesetas (2s. 0½d.) per diem; for miners about 4.50 pesetas (2s. 7¾d.) per diem; for mechanics and others from 5 pesetas to 6 pesetas (2s. 11¼d. to 3s. 6½d.) per diem.

The cost of mining is greatly dependent on local conditions, and ranges from 5 pesetas to 8.50 pesetas (2s. 11¼d. to 5s.) per ton, inclusive of the work of loading into railway trucks.

5. No official analyses are obtainable, but it is well known that the average amount of metallic iron in the ore is about 44 per cent., as received, or about 48 per cent. in the dry, and silica from 12 per cent. to 15 per cent.

6. Some of the proprietors would no doubt be willing to sell their deposits or mines at a fair price.

7. Several of these deposits have been worked for a good number of years, as will be seen by the following:—

Table showing the destination and quantities, in English tons, of iron ore shipped during the last five years from the port of Castro Urdiales:—

To—	Quantity in English Tons.				
	1898.	1899.	1900.	1901.	1902.
United Kingdom	323,771	514,656	436,986	313,141	409,088
France	16,900	28,218	58,571	13,328	21,361
Holland	69,295	92,524	177,228	200,492	162,343
Belgium	2,710	13,160	13,949	—	26,802
Spain	693	—	1,395	2,998	—
Total	413,369	648,558	688,129	529,959	619,594

8. There are no special obstacles in the way of successful, continuous and unencumbered mining in this district.

9. The best and most important deposits of iron ore are the property of two mining companies, viz.: The Dicedo Iron Ore Company, Limited, of London, who have been working their properties since 1880 at the rate of over 150,000 tons yearly, and the Compañía Minera de Setares, of Bilbao, who started working in 1886 with a similar output.

The quality of these ores is superior to that of other deposits in the district, the metallic iron being over 49 per cent., as received, and silica 9 per cent.

SAN SEBASTIAN.

(Major Nutt, Vice-Consul.)

1. Deposits of iron ore exist in the watersheds of the Rivers Bidasoa, Urumea, and Oria, extending to the frontier of Navarre.

2. The nearest shipping port would be Pasages, distant from about 8 to 35 kilometres (4 to 21 miles). A mineral railway to Pasages is now in course of construction, and a special wharf and suitable crannage is being constructed for the shipment of mineral.

3. The cost of transport at present averages about four centimos a ton per kilometre by rail, and by load according to agreement and distance to station or railhead. There is no canal.

4. Labourers would get about two pesetas (1s. 2d.) a day, and experienced miners $2\frac{1}{2}$ to 4 pesetas (1s. $5\frac{1}{2}$ d. to 2s. 4d.). The labour in this district is plentiful.

The cost of quarrying and mining the ore, and loading it on wagons and trucks varies from about 4 to 7 pesetas (2s. 4d. to 4s. 1d.) per ton.

6. The proprietors, whether rich or poor, have not hitherto been generally disposed to work or prove their mining concessions, but are slowly beginning to see that they must accept reasonable terms for virgin mines.

7. Hitherto they have hindered the industry by asking unreasonable terms for the privilege of proving their properties.

8. Beyond this I am not aware of any special obstacles in the way of successful mining in this district.

9. Taking this district as a whole, I should consider it to be practically unexplored in the sense of there being any serious works of investigation. The mines near Irun, so far as they have been proved up to date, would show that spathic or carbonate of iron predominate, and I am informed that the system of calcining the ore has not yet been perfected, on account of the great amount of "smalls." If the calcining process could be carried out to avoid the making of so large a percentage of "smalls" by transforming the calcined ore into "briquets" or by any other means, a much larger export might ensue.

From the Bidasoa district alone, but for the above-mentioned difficulty, I am informed that from 200,000 to 300,000 tons of iron ore per year ought to be available.

There have been twelve shipments of iron ore from Pasages since the commencement of last year, chiefly to Workington, and two to Rotterdam.

SANTANDER.

(Mr. Vice-Consul Single.)

1. Yes.

2. In the neighbourhood of Santander. Nearest shipping port, Santander, and on river. Mines are within a radius of five miles from where mineral is shipped.

3. The cost of transport would depend upon the quantity to be shipped. This would be by rail, over private or other railroads, the price of about 1s. per ton for $2\frac{1}{2}$ or 3 miles might be taken.

4. A labourer working in the quarries is paid from 2.75 to 3.25 pesetas (1s. $7\frac{1}{4}$ d. to 1s. $11\frac{3}{4}$ d.) a day; he can load into waggons from four to five tons of

ore clays per day under fair circumstances. Mineral, after being washed, can be loaded into waggons at, say, 0.60 pesetas ($4\frac{1}{4}$ d.) per ton, and under. Most of the mines are open workings.

5. *Report of a Sample of Iron Ore from Minas de Heras.*

—	In sample as received.	In sample, dried.
Iron	52.36	56.61
Manganese	1	1.08
Copper, zinc, &c.	None.	None.
Sulphur	0.96	0.104
Phosphorus	0.44	0.48
Moisture	7.50	—

Result of Analysis of a Sample of Iron Ore drawn at Rotterdam.

—	As received.	Dried.
Net iron	52.63	57.73
Moisture	8.82	—

Report on a Sample of Iron Ore drawn at Glasgow.

—	As received.	Dried.
Iron	53.12	57.71
*Insoluble	2.62	2.85
Moisture	7.94	—
*Contains silica... ..	2.20	2.40

Result of Analysis of Iron Ore drawn at Rotterdam.

—	As received.	Dried.
Net iron	52.90	57.41
Moisture	7.84	—

Report of Sample of Iron Ore drawn at Glasgow.

—	As received.	Dried.
Iron	50.04	55.44
*Insoluble	5.68	6.30
Moisture	9.74	—
*Contains silica... ..	5.05	5.60

Analyses of Complemento Washed Ore.

Sample Number.	Natural State.					Dried.			
	Iron.	Insoluble.	Moisture.	Silica.	Phosphorus.	Iron.	Insoluble.	Silica.	Phosphorus.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	53·94	3·85	7·00	2·88	·044	58·00	4·15	3·10	·048
2	54·06	4·25	6·40	3·22	·043	57·76	4·55	3·45	·046
3	52·67	4·11	7·60	3·46	·043	57·01	4·45	3·75	·045
4	53·33	4·19	6·67	3·03	·042	57·15	4·50	3·25	·044
5	53·02	3·69	7·70	3·13	·042	57·45	4·00	3·40	·045
6	54·28	3·63	6·86	2·88	·037	58·28	3·90	3·10	·040
7	53·24	3·51	7·58	3·04	·042	57·61	3·80	3·30	·045
8	54·41	3·13	6·50	2·57	·041	58·20	3·35	2·75	·044

6. Most of the mines are being worked by companies (the larger being English). Heavy prices have been paid for mining property in this district.

7. The larger mines have been working for the last twelve years; previous to that, only the lumpy ore was worked.

Companies ship individually from 50 to 200,000 tons per year to United Kingdom, Germany, and Holland. Total shipments for past five years, about four million tons.

8. The great obstacle to mining in Santander district is the difficulty to obtain depositing ground for the slimes from the washers.

9. The formation is dolomite. The mineral has to be separated from the clay by washing. The average percentages of clays to mineral run from 15 to 35 per cent.

CADIZ.

(Mr. Consul Keyser.)

Mr. Keyser transmits Reports from CORDOBA, SEVILLE, and HUELVA.

CORDOBA.

1. Yes, but so far as known they are of slight importance.

2. (I.) Three miles to north of this city there is a small deposit, the nearest port being Seville, which is 140 kilometres (88 miles) away.

(II.) There is a mine just being opened up by a Spanish Company at a place called Salobral, in the township of Luque, but it is very doubtful whether it will prove successful. The nearest port is Malaga, which is 176 kilometres (110 miles) from the station.

3. (I.) Two shillings per ton by carts, and three shillings and fivepence per ton by rail.

(II.) Three shillings and twopence per ton by rail.

4. Character excellent. Miners, 2s. per day. Labourers, 1s. 5d. per day. Cost of quarrying and loading in carts or trucks, about 3s. 6d. per ton.

5. There are no official analyses of the ore. I cannot obtain average samples at present, but quality of ore is said to be exceptionally good at both places.

6. (I.) There are various proprietors of claims on the small deposit near here, the chief one a powerful British firm, the others poor and willing to sell cheap.

(II.) The Luque deposit is in the hands of a Spanish Company, who would probably only sell for an exaggerated figure, or because they find it to be worthless.

7. I understand that iron mines have never been worked in this province up to date.

8. Yes. The very great difficulty in obtaining possession of the surface, which is held separately from the subsoil; the unsatisfactory administration of law; a tax of 3 per cent. of the gross value of all ore produced; scarcity and dearness of railway communication; and badness, or non-existence of roads. All these are obstacles which have to be reckoned with.

SEVILLE.

1. There are several iron ore deposits in this district.

2. They are situated in El Pedroso, San Nicolas del Puerto, Constantina, Guadalcanal, and Cazalla de la Sierra, in this province. The nearest shipping port capable of admitting ocean steamers is Seville. The distance from this port to the several ore deposits is as follows:—

38	miles	by rail	from	El Pedroso.
41	"	"	"	San Nicolas del Puerto.
37	"	"	road	Constantina.
60	"	"	rail	Guadalcanal.
47	"	"	"	Cazalla de la Sierra.

3. The cost of transport of the ore is 4 cents of a peseta per ton per kilometre in railway company's waggons, or 3 cents per ton per kilometre in the traders' waggons. The transport would be by rail, as there is a line traversing the district where the deposits are situated, and in the event of any of them being too distant from the line, they would be connected with it by means of a branch line.

4. The labour available is by hand. Wages for ordinary labour are from pesetas *2 to pesetas 2.50 per man per day, according to class of work. Mining might also run from 4 to 5 pesetas per ton, which is variable, according to whether ore is in pockets or deposits, or in veins or lodes.

5. There are no official analyses of the ore, but according to those obtained privately, the iron percentage ranges from 45 to 65 per cent.

6. Some of the proprietors are rich and some poor, but the majority would be disposed to sell their deposits on reasonable terms.

7. The deposits that have hitherto been worked are those of the "Cerro del Hierro," in San Nicolas del Puerto, which are leased by Messrs. William Baird and Company, of Glasgow, who have exported during the last five years over 1,500,000 tons of ore, destined to Glasgow, Ardrossan, Ayr and Boness.

8. There are no special obstacles which might interfere with successful constant mining in this district.

* Exchange : about 34 pesetas to £1.

HUELVA.

1. Of this mineral there are enormous quantities in the province of Huelva.

2. All the "outcrops" ("crestonages") of the pyrites mines which are disseminated through the whole province are composed of peroxide of iron, and a large proportion of the "overburden," which is removed for working the pyrites by "open casts."

All the pyrites mine owners have large heaps of mineral, but not in a fit state for immediate shipment, having been dumped down anywhere and anyhow, neither cleaned nor classified, but mixed with any other stones which may have come down with it. One exception is a large mining corporation here, who have very important quantities stored, cleaned and classified, but neither particulars of analysis nor samples are forthcoming, in spite of my applications. The nearest shipping port is Huelva; the average distance from the mines from 40 to 70 kilometres (25 to 43 miles), according to the mines. Beyond that distance and west of the Tharsis mines shipment takes place by the Guadiana.

The Cala mines, on the extreme border of the province of Huelva, a large property producing hematite and magnetic iron ore, are shipping or will immediately commence to ship, by their own private line from the port of Seville, which is the more direct route.

3. Transport may be calculated at an average of pesetas 7 (say 4s. at the present exchange) f.o.b. Huelva, by rail. There are no canals, and road carriage is so dear, and road so bad, as to be impracticable.

4. The character of the labour is practically quarrying; owing to strikes and combinations of workmen, wages are higher than of late years. I regret I am unable to give a reliable reply to the last part of this question regarding the cost of mining or quarrying and loading per ton, as those people from whom I could obtain information show some reserve on the subject.

5. I have nowhere been able to obtain official analyses.

6. The proprietors of the mines range from companies of such importance as Rio Tinto, Tharsis, and Peña de Hierro, to the very small owners, who only find it profitable to work even their copper ore when the price of copper is high, at least above £50 to £55.

Owners of reasonably sized deposits being mine owners, would probably only sell by contract, but would most likely be glad to make favourable terms.

7. Large quantities have been shipped at intervals up to 1895, when the export fell off. The destination was principally Dutch ports, for German works, but I have no exact figures, except as follows: The exportation ceased in 1899 with a contract of 25,000 tons shipped by an important company to Rotterdam with a view to remove economically some "overburden." In the year previously, 1898, the shipments amounted to 20,000 tons. In 1897, 27,000 tons were shipped, and in 1896, 17,000 tons.

8. The principal obstacle in the way of successful continuous and unencumbered mining, in this district, of iron ore, is probably the quantity of sulphur contained in the mineral.

Another obstacle will always be that it will pay both the private and public railway lines better to handle, as they do at present, to their full capacity, the copper ore and precipitates, rather than low grade iron ore.

9. Should particulars be required of "iron pyrites" and "cupreous iron pyrites," I can furnish them in a supplementary report.

CORUNNA.

(*Mr. Consul Trayner.*)

1. Yes. There are many iron deposits in this district.

2 and 3. The deposits are principally in the provinces of Corunna and Lugo.

Province of Corunna.—Municipalities of Castro, Puente deume, Monfero, Ortigueira, San Saturnino, Carballo, Malfica, Arteijo, Oza and Oleiros.

Province of Lugo.—Municipalities of Parga, Baamonde Guitiriz, Villalba, Muros, Lugo, Sania, Samos, Germade, Vivero, Riotorto, Villaodrid, Meira, Incio, Castro Verde, Puebla del Brollon, Monforte, Fonsagrada, Pol and Rivadeo.

The Puebla del Brollon and Incio deposits are some 207 kilometres from Corunna or Vigo, and 67 kilometres from Rivadeo.

Transport would be either by sea in lighters or small steamers at a cost of 2 pesetas 30 centimos per ton, or by rail at a cost of 40 centimos per ton and kilometre

See also under 9.

4. Cost of labour is about 1 peseta 50 centimos to 2 pesetas 50 centimos per man per diem. Boys and girls from 50 centimos to 1 peseta per diem.

The cost of raising the ore, including labour, tools, explosives and the Government tax of 3 per cent. on the rough value of the ore at pit's mouth or workings, would be 3 pesetas per ton. All the mineral would have to be carted to the railway station, or be shipped in small places on the coast. Cost of carting, including loading carts, can be averaged from 75 centimos to 1.50 pesetas per ton.

5. No official assays are available. Private ones are as follows: basic ores from 45 to 64 per cent.; magnetic ores from 60 to 70 per cent.

See also under 9.

6. There are rich and poor proprietors, who would only be too glad to sell, or lease on condition of receiving a small royalty per ton.

7. No.

8. There are no obstacles in the way at present or likely to be.

9. From the Castro and Puente deume districts ore could be put on the quay at Corunna for 9 pesetas the ton of 1,015 kilos., brought by lighters or small steamers, and deposited at Corunna, until a cargo of 3,000 tons were ready for shipment. Steamers not drawing more than 18 feet at low water, could load always afloat, alongside the wharves of Corunna.

The new quay now building will have 26 feet at dead low water. There are also three steam cranes, and loading could be effected at the rate of 300 to 350 tons per day.

For the time being this would be the only way, but there is a railway in construction between Ferrol and Betanzos, which, it is supposed, will be finished in two years time. Once this line is completed, ore could be put on Corunna quay, or on board ship, from the railway truck, for 7 pesetas per ton, including all expenses.

The Villaodrid Company ship the ore at the port of Rivadeo, where they have built a pier and a mining railway from their mines.

The Baamonde basic ores average from 50 to 55 per cent. of metallic iron, with 3 per cent. of manganese, and about 0.3 per cent. of phosphorus.

The Puebla del Brollon and Incio basic ores average from 53 to 64 per cent. of metallic iron and 5 per cent. of manganese and very little phosphorus.

There are no turnpike roads or railway line at present, only bad and rough country roads. Rope ways could easily be made, as there is considerable altitude available.

From these deposits it is a distance of 17 kilometres to the railway station at Puebla del Brollon, on the railway line from Madrid to Corunna, and which branches off at Monforte on to Vigo.

VIVERO.

(*Mr. Vice-Consul Lopez.*)

1. There are important deposits of iron ore in the Consular district of Vivero.

2. The mines named "Maria Antonia," of 6 hectares (the hectare=10,000 square metres), "Nueva Unión," of 13 hectares, "La Benigna," and others, form the first group of mines, which commence from the sea coast at Punta de Socastro, a distance of about 2 kilometres from the harbour of Vivero. Their mineral could be shipped direct from the mines into barges or ships of small draft, not because there is not sufficient depth, but owing to their exposed position to the open sea.

The owners are Don Juan Varela, resident of Lugo, and Don Rodriguez Villanueva, of Bilbao, who resides in Madrid.

These mines are, at the present time, the subject of negotiations with the firm of Larios, for their lease.

Next to these mines and continuing the same lode, come those worked by the Vivero Iron Ore Company, Limited, named "Coto de la Silvarosa," which ship their mineral through the port of Vivero, by means of an aerial tramway of 5 kilometres in length.

After these and continuing on the same lode, towards the interior, are those named "La Robada," of 72 hectares, and "La Juana," of 18 hectares, also the "Manuel Juan," Nos. 1, 2 and 3, which are all together. In these mines, works of importance have been done, both in the surface and by galleries. The two first-named were measured in 1900, by the mining engineers Don Rafael Saenz Diaz and Don José Revilla, who reported that they contained some 17,000,000 tons of ore, and classified the mineral as follows: "brown hæmatite," "magnetic iron," and "siderites." These mines belong to the minors of Don Juan and Don Manuel de Barandica y Llano, the heirs of Don Ricardo de Llano.

The plans, &c., for constructing a railway, of 12 kilometres in length, for transporting their mineral from the furthest end of the lode, to the proposed shipping quay in the harbour of Vivero, have already been made, and many plots of ground have already been expropriated for this object, and arrangements have also been made with the owners of the remaining ground.

Following the lode towards the interior comes the mine named "Continuación à la Juana," of 90 hectares, owned by Don Ramon Z. Diaz and Company, in which, one may say, no works have been done; but the quality of the mineral is very similar to the former mines. With this mine, the lode disappears at a distance of some 16 kilometres from Vivero, being the total length of the lode, commencing on the sea coast at Punta de Socastro.

Muras Group.

At some 36 kilometres from Vivero the same lode again appears, on which the following mines are situated: "Atlanta," "Cantabria," and "Basconia," owned by Don Ramón de la Sota, resident of Bilbao; "Peña

Feneña," "Visura," Nos. 1 and 2, "Peña de Rays," 1 and 2, and "Peña Salgaez," owned by the heirs of Don Ricardo de Llano; and the "Actividad" and "Fonte," owned by Don Ramón N. Soler, resident of Lugo.

Group of Villalba.

In this district and at some 40 to 50 kilometres from Vivero, there are some ten mines belonging to the aforesaid minors of Don Ricardo Llano; and three others owned by Don Ramón Z. Diaz and Company; and although some works of investigation have been done, they have not been of any importance.

The mineral lodes in this district are of much less importance than those of Vivero, but their mineral is much superior.

The port of Vivero is called to be the port for shipping the mineral of all the aforesaid mines, as far as the termination of the Muras group, and probably the shipping port for the Villalba group.

The Vivero Iron Ore Company, Limited, employs, for exporting their mineral, steamers of three to four thousand tons, but it has also employed some of over five thousand tons, without the slightest difficulty. The port of Vivero is the most important in all the district, owing to its shelter and free entrance. The mineral steamers always enter the port without taking pilot, either by day or night.

3. Assuming that there is no other way for transporting the mineral but by constructing a railway, with the exception of the mines on the sea coast we might take as a guidance the actual tramway used by the Vivero Iron Ore Company, which gives a result of a cost of 50 centimos per ton.

4. Taking as an example the mines which are actually being worked, we may say, that the works carried on are on the surface, and the cost of labour, including all materials, is about 4 pesetas 25 centimos per ton, put on the loading deposit of the tramway.

5. Many analyses have been made, both in Spain and abroad, of the aforesaid mines, all giving different results, according to the place where the sample was taken. It is not difficult, however, to find a stone containing from 56 to 60 per cent., and by its side another which would not contain 40 per cent., but on an average the mineral gives the following:—

Vivero District.

Metallic iron	...	...	from 46 to 48 per cent.
Siliceous matter	...	...	„ 14 to 17 „
Phosphorus...	...	...	„ 1 to 1.20 „

According to an analysis made at Rotterdam from a sample taken from the mine named "Robada," it gave the following result:—

Iron	...	...	...	...	53.30 per cent.
Phosphorus	...	...	...	...	1.15 „

The mineral of the Muras group is very similar to the foregoing, although it is richer in iron and contains less phosphorus.

That of the Villalba group, although there are no analyses, is of first quality, and one can safely say it contains from 56 to 60 per cent.

6. The proprietors of the mines actually working, viz.: The Vivero Iron Ore Company, Limited, are rich, the company having been floated in London, with a capital of £70,000.

The proprietors of the rest of the mines are, on the whole, rich, but this is no reason why negotiations, with all of them, should not be entertained.

The most important mines, as we have already stated, are those belonging to the heirs of Don Ricardo de Llano, who are minors. Their trustee, Don Ignacio de Arias y Menchacatorre, a lawyer and resident of Bilbao, will sell any of the groups, preferably on a royalty, and his representative, Don Augustin Asta, who resides in Lugo, puts at the disposal of anyone, plans, reports, proposed railway, analyses, and all the information he may be asked for, with the condition, that whatever negotiation may take place, they must be by public auction, as it is required according to Spanish law, when dealing with property belonging to minors. An American trust has lately asked for details with regard to these mines, and preferring those close to the sea coast.

Don Juan Varela and his partner, Don Francisco G. Rodriguez Villanueva, residing in Madrid, will also sell theirs.

The proprietors of the mines named "Dolores," of 40 hectares, and "Carolina," of 89 hectares, would also willingly sell theirs, and anyone wishing to buy them, should apply to Don Antonio Maseda, Registrador de Vivero.

7. About a century ago mineral was shipped in lighters for the Real Fabrica de Sargadelos, some 20 kilometres from Vivero, from the mine "Maria Antonia," situated in Punta de Socastro.

Since then no more mineral was taken out of the mine, until some four years ago, when the Vivero Iron Ore Company, Limited, commenced working, and has already exported some 400,000 tons, the greater part to Germany and the rest to Great Britain.

8. No.

9. During the last four or five years many engineers, both Spanish and foreign, have visited the iron deposits of this district, but no one remained more than two or three days, which naturally is not sufficient to form a true idea of the mineral richness which exists. The majority of them simply visited some of the galleries and no more.

The highest outcrop of the Silvarosa is at about 400 metres above the level of the sea. The lode is exposed for a distance of 1,000 metres, with a width varying from 35 to 10 metres; there are signs of mineral having been extracted at levels of 150 metres below the highest outcrop, and all this in continuous mineral rock. In the Muras group there are outcrops at a height of over 1,000 metres above sea level.

The people in general, if, perhaps, at one time they were indifferent to all mineral exploitation, when they saw the good results which the Vivero Iron Ore Company, Limited, gave to the district, have entirely changed, and to-day, not only could one count upon their support, but capital would also willingly be invested with this object, but not in large sums, as they do not exist.

MALAGA.

(*Mr. Consul Finn.*)

1. Many iron ore deposits have been explored and opened up in this immediate district, but few, if any, of them are in full working order. The following mines are at present being worked:—

"Cuevas de la Infanta," Campillos district, by a French Company; near Antequera, by the Soci ete de Altos Hornos.

"Elector Galdos," French Company.

"Golondrinas," near Archidona, by Cumming and Vaudulken.

Group (Marbella district), near Ojen, by the Marbella Iron Ore Company.

Nuestra Se nora de Lourdes, Velez, Malaga, recently working.

In the province of Malaga I am given to understand that the engineering department of the province have registered as unworked some 200 mines classified as iron mines.

2. The port of Malaga covers the shipping needs of this district, and large steamers can load direct at quays.

Velez Malaga is close to Torre del Mar, whence shipping is done from the beach in lighters.

3. With regard to railway facilities from the mines to Malaga it may be noted that there is no station close to any of the mines. The tariff for carriage varies from $2\frac{1}{2}$ to 4 centimos per ton and average.

5. No official analysis exists here, each shipment being subject to analysis on arrival at destination. Owners and holders retain their iron analyses for private requirements, and are not usually inclined to communicate with public.

6. The mines are generally held for sale or lease, with owners participating.

7. A few working with direct shipment—principally trials, or for realization to cover working expenses.

8. No special obstacle now since the Spanish Government abandoned their intention of obliging foreign enterprises to have their business under foreign control.

AGUILAS.

(*Mr. Vice-Consul Naftel.*)

1. Very large and important deposits of iron ore exist in this consular district.

2. In this immediate neighbourhood and its surroundings. This is the nearest port for shipping, and is the centre of about 200 miles, branching in different directions; and in the course of the next two years it is destined to become the second in importance in the whole of Spain.

3. Transport is chiefly by rail, but also by road. Cost thereof varies according to distance from mines to port.

4. I am not in a position to give estimates of this, as private contracts are made, known only to interested parties, especially in the matter of cartage.

5. No official analyses are obtainable, but I enclose copies of three private ones, made in England, of ore produced generally in this district. (See next page.)

6. As a rule moderately rich, and certainly open to sell or lease.

7. Many have been and are being worked, and many are passive, awaiting development. I enclose statement of shipments for the past five years. (See next page.)

8. No, but means and facilities of transport are as yet deficient in some parts, although improving daily.

Analyses of the three kinds of Iron Ore more generally produced in the Aguilas District.

	No. 1.	No. 2.	No. 3.
Peroxide of iron	65·	61·50	60·
„ manganese	2·43	5·	8·60
Silica	8·50	8·65	8·54
Alumina and magnesia	4·82	3·38	5·32
Lime	6·38	10·45	5·52
Water and carbonic acid	12·79	10·20	11·75
Metallic iron	45·50	43·	42·
„ manganese	1·70	3·50	6·20

NOTE.—In some mines exist veins of carbonate of iron, which are subjected to calcination, as at Bilbao.

Shipments of Iron Ore at Aguilas for five years, 1898—1902, inclusive.

Year.	To Great Britain.	To France.	To Holland.	To Belgium.	Total.
1898	Tons. 47,180	Tons. 10,250	Tons. 2,250	Tons. —	Tons. 59,630
1899	78,750	19,950	2,430	—	101,130
1900	115,600	12,700	7,000	2,850	138,150
1901	86,940	8,100	17,570	—	112,610
1902	120,580	—	5,000	—	125,580

ALMERIA.

(*Mr. Vice-Consul Lindsay.*)

1. Yes.

2. In this province, the port of Almeria; distant from 10 to 60 kilometres.

3. The transport of ore per ton depends entirely upon the distance. Both by rail and road.

4. Manual labour is chiefly employed for mining and loading. The cost of mining (or quarrying) and loading in carts or railway trucks varies from two to about three pesetas per ton.

5. I send forward official analyses (see next page).

The yield of metallic iron in the ores throughout the district ranges between 45 per cent. and 60 per cent.

6. The deposits are owned both by companies and by private individuals. The probabilities of their selling the deposits depend upon the necessity they have for selling and the price offered.

7. Many mines and deposits have been worked up to the present, the principal being those of Alguife, Humeja, Gergal, Sierra Alhamilla, Lucainena, Beires, &c. The quantity exported from this district can be stated as follows:—

Year.	Tons.
1898	135,000
1899	179,860
1900	248,440
1901	230,000
1902	300,000

8. Yes; the continued and vexatious interference of the Government officials and the impecuniosity of the poorer owners.

9. For further details see Consular Reports, Numbers 2,289, 2,420, 2,636, 2,824, and 3,008.

Twelve Samples of Iron Ore taken in February, 1896, by Mr. Herdsman, from Mines in the District of Gergal, and analysed by Edward Riley, Esq., F.C.S.

—	1.	2.	3.	4.	5.	6.	6a.	7.	8.	9.	10.	11.
Metallic iron ...	58·93	58·41	52·51	57·87	58·00	60·64	58·80	53·72	56·28	60·99	62·28	59·30
„ manganese	·54	·97	1·63	·90	2·08	·43	·28	·32	1·83	—	—	—
Siliceous residue	3·80	3·35	8·52	3·55	2·30	2·57	2·90	7·79	4·20	5·06	3·33	5·33
Sulphur ...	·074	·121	·041	·097	·087	·067	·108	·095	·035	—	—	—
Phosphorus ...	·042	·033	Trace	·011	Nil	·025	·030	·015	·018	—	—	—
Copper ...	·33	·16	·44	·04	1·09	·10	·11	·07	·30	—	—	—
Moisture ...	1·00	·96	·91	·85	1·89	·87	1·03	1·74	·98	·79	·95	1·15

Analyses of Five Samples of Iron.

No. 1 consists of a mixture of Nos. 1, 2, 3, 4, 5, 6, 6a, 7, and 8 of foregoing; No. 2 consists of a mixture of Nos. 9, 10, and 11 of id., by Dr. Riley. Nos. 3, 4, and 5 are from a mine at Fiñana, and are by Mr. E. J. Altpeter, of Garrucha.

—	1.	2.	3.	4.	5.
Silica ...	3·85	3·80	3·16	1·85	2·98
Alumina ...	1·17	·67	—	—	—
Peroxide of iron ...	81·60	86·14*	60·30	62·46	60·52
Protoxide of iron ...	Nil.	Nil.	—	—	—
Oxide of manganese ...	1·15	·95	3·70	2·77	2·06
Lime ...	·88	·78	—	—	—
Magnesia ...	·21	·39	—	—	—
Phosphoric acid ...	·057†	·028‡	·005	·004	·005
Arsenic acid ...	·162§	Nil.	·041	·036	·039
Sulphur ...	·096	·066	Nil.	Nil.	Nil.
Carbonic acid ...	Nil.	Nil.	—	—	—
Oxide of copper ...	·34||	Nil.	·106	·094	·094
Oxide of zinc ...	Nil.	Nil.	—	—	—
Combined water ...	9·21	6·48	—	—	—
Moisture ...	1·24	1·12	—	—	—
	100·424	99·965	—	—	—

* = 60·30 per cent. metallic iron.
§ = 0·106 per cent. arsenic.

† = 0·025 per cent. phosphorus.
|| = ·275 per cent. copper.

‡ = ·012 per cent. phosphorus.

CARTHAGENA.

(Mr. Vice-Consul Gray.)

1. Yes.

2. The iron and manganiferous iron ore deposits in this vicinity are situated at about eight miles to the eastward of this city, and run on to near Cape Palos, a distance of about 20 miles from here, diminishing in number and importance as they near the cape. The width of this mining district is narrow, not exceeding $2\frac{1}{2}$ miles. In the district referred to the mines are all small, and their number is legion, and are much divided up as to proprietorship. The nearest ports of shipment are Portman and Carthagena. Both ports can admit of ocean-going steamers of large size. Alongside the quays in Carthagena Harbour, which is enclosed, the depth of water is about 22 to 24 feet, according to berth, but vessels of any size can be loaded at anchor within the port. Portman Bay has no artificial protection, and although there have been one or two disasters during the last 30 years, ships ride out bad weather pretty safely. The drawback in loading is caused by the surf on the beach during bad weather. Very large steamers would have to lie a good way out, and, in consequence, would be less protected from easterly and south-westerly winds.

There are also deposits of micaceous iron ore at Perrin, to the westward of this place, but they are not extensive, and have not been largely worked, as the ore, when dry, is so fine as to be objectionable to smelters, notwithstanding that it contains about 60 per cent. of metallic iron. The place is about ten miles away from here, and the ore is brought by carts to this port. Another deposit is being worked at the Cabezo Gordo, about 13 or 14 miles to the northward of this city, but the quantity is not great. At one time it was thought that the ore would run deep and regular, but it has been found to be superficial, and to be much divided up by limestone. It contains about 45 per cent. of metallic iron, and the remainder practically lime. There are various iron deposits throughout the province, within this vice-consular district, all claimed and pegged out, but they do not seem to be of any great importance, as nobody has cared to attempt to work them, with one or two exceptions, which have turned out unprofitable. Apart from the former, the great iron ore deposits in this vice-consular district lie between Calasparra and Cehegin. The distance between the mines and Calasparra railway station varies between 10 and 20 miles, the distance between latter and Carthagena being 90 miles. At present Carthagena is the only possible port of shipment.

3. In the Carthagena mining district part of the ore, especially from the seaward side of the mountains, is taken to Portman for shipment. Some of the ore is carried on donkeys to a cable starting from the highest part of the Sierra above Portman, and from there by the cable to Portman beach. The transport of this ore to place of shipment costs about three pesetas per ton, including donkeys and cable. Ore from mines not in the vicinity of the cable—which, by the way, is private property, and was put up to work a mine which is now played out—is carried to Portman principally on donkeys, and the transport costs from $2\frac{1}{2}$ to 4 pesetas per ton, according to the distance of the mines from the port. The ore from the land side of the mountains is almost all brought to the stations of the Carthagena and Iferrerrias Steam Tramways Company at La Union, Descargador, Mendoza, and Los Blancos, and from there to this port by the steam tramway. Cost of transport to the above named varies between 2.50 and 3.50 pesetas per ton, and from 2.35 to 3.25 pesetas from the stations to this port according to distance. A comparatively small quantity is brought direct from some of the favourably situated mines for the purpose by carts, costing four to five pesetas per ton. Until about three years ago all the ore from the Calasparra-Cehegin district was brought in carts to Calasparra railway station, costing on an average six pesetas per ton, but from the time mentioned a cable was constructed from

the principal mine being worked to the main road, about one-third of the distance to the railway station, and from there the transport was effected in carts. The cost of transport by cable and carts to the station is calculated at about $4\frac{1}{2}$ pesetas a ton.

From Calasparra railway station to Carthagena the railway rate is $5\frac{1}{2}$ pesetas for 100 kilos., but if a quantity of over 40,000 is brought down the railway company concedes a reduction of 0.75 pesetas per 1,000 kilos. The cable referred to is being continued to the Calasparra railway station, and, when finished, it is calculated the transport from the mines to the station will cost about two pesetas per ton.

Ore from Cabezo Gordo is carried in carts to Balsicas railway station, and thence per rail to this port, costing 3.75 pesetas per 1,000 kilogs. for transport from the mines to Carthagena.

4. The great majority of the iron ore mines in this immediate vicinity were worked as quarries, the work being done by blasting, but now a great number are worked by underground mining. All, or nearly all, the manganese ore is got by underground mining. The mines away from this immediate district are worked in the form of quarries. Miners' wages vary according to the usefulness of the individual and the kind of work he is put to, from two pesetas for boys and three pesetas for men.

Cost of mining, including cleaning or picking the ore when mine worked as a quarry, three pesetas a ton; when worked by underground mining, five pesetas a ton.

Transport to railway depôt: *see* above. Loading trucks, railway freight and unloading are included in railway rates stated in answer to Question 3.

5. Considering that the mines are so numerous, that the quality of ore varies in different mines, and even in the same mine, and that analyses and assays would really convey no idea of the composition, say, of a steamer's cargo, I think the production of a number would be of no practical use. I do not quite understand what is meant by official analysis and assay, but if it means that these are done by a Government chemist, then there is no such thing to be got here. When merchants want an ore of a certain type they do not go to one ore mine for it, but have men on the watch to find out what is being cut in different mines, and secure the actual ores being cut to make up in conglomerate the type they want. Frequently in the same mine the type of ore changes, and they have to look somewhere else. Formerly the standard for iron ore was 50 per cent. of metallic iron, phosphorus not exceeding 0.04; but now ore containing 48 per cent. of metallic iron is very difficult to get in any considerable quantity. The cargoes of the different grades of manganese ore are all made up by the mixture of various ores.

Regarding the forwarding of samples, the same applies as to what I have said *re* analysis and assays, plus the fact that it would take weeks or months to collect samples from all the mines and forward them and the operation would be very costly, with considerable doubt about accuracy,—by which I mean that it would be almost, if not altogether, impossible to find a capable man who would really visit all the mines and take proper samples from each.

6. The proprietors of the various mines include rich men, men of moderate means, and poor men. Most mines are owned by societies or companies more or less in want of money, but I am certain of one thing, and it is that all of them would try to get as much as they could for their property.

7. Yes. All the deposits in the immediate neighbourhood of Carthagena have been worked for about 32 years. The Perrin deposits have been worked intermittently for about 20 years, and the Cabezo Gordo for three or four years. Part of the Calasparra-Cehegin deposits have been worked for the past six years.

The following quantities of all kinds of iron ores have been shipped from Carthagena and Portman, during the five years from 1898 to 1902, inclusive, to the undermentioned countries:—

	1898.	1899.	1900.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.	Tons.
Great Britain	317,710	415,050	415,491	385,765	380,363
Holland (for Germany) ...	56,380	118,225	53,990	89,048	37,750
France	26,450	70,450	20,990	4,810	12,180
Belgium	23,460	16,900	4,100	2,550	10,904
United States America ...	3,950	93,280	106,455	37,715	42,490
Austria-Hungary	2,800	—	—	—	—
Canada	—	—	—	—	10,000
Total	430,750	713,905	601,026	519,888	493,687

Of these quantities there were about 125,000 tons of Cehegin ore, 10,000 tons of Perrin, and 5,000 tons of Cabezo Gordo, all the rest being from this Sierra.

8. No, unless Government taxes on mining property, tax on mineral extracted, the compulsory use of monopoly explosives, which are dear in price and indifferent in quality, and the division of mining property—so many small mines being in so many different hands—be considered as such.

9. The ore deposits in the immediate Carthagena district are being gradually played out, and it is difficult—almost impossible—to now get large quantities of high grade ores. In fact, the percentage of iron contained in the ore has fallen off considerably from what it used to be. There is a great field in the Cehegin-Calasparrá district, where it is averred by experts there are millions of tons of magnetic ore containing in the neighbourhood of 60 per cent. of metallic iron.

GARRUCHA.

(*Mr. Vice-Consul Pecket.*)

1. There are several important iron ore deposits in this district.

2. They are situated in the Sierras of Bedar, Almagrera, Lucainena, and Herrerias de Cuevas. The nearest port to the Bedar deposits is Garrucha, at a distance of 15 miles from the mines. The nearest shipping place for those of Almagrera and Herrerias de Cuevas is Villaricos, about four miles from the mines; and from the Lucainena deposits, Agua Amarga, about 17 miles south of this port, and about 23 miles from the mines. All these places are connected with the deposits by railways, tramways, or overhead wire rope tramways.

3. The transport of the ore to the coast varies, and is only known exactly to the companies working the mines. The ore from a group of mines at Serena in the Bedar Hills costs about one shilling per ton by road to the railway head, and thence by contract with the railway owners, 2s. 6d. per ton into steamers at Garrucha,—all charges, carriage, lighterage, and stowing included.

4. There are abundance of mines of all classes to be had in the district. The cost of mining varies according to the nature of the works from, say, 1s. in open cast quarrying to as much as 2s. in mining workings underground.

5. A copy of analyses of the various mining sets of the Serena group is printed below. Neither analyses nor samples of the other mines, which are worked by wealthy companies, are obtainable.

Analyses of Samples of Garrucha Ore.

	Number 1.	Number 2.	Number 3.	Number 4.
Peroxide of iron	75.29	71.71	77.86	78.43
Protoxide of iron... ..	2.31	13.37	Nil.	Nil.
„ of manganese... ..	2.23	1.58	3.02	3.77
Alumina	2.80	0.35	1.19	0.25
Lime	5.40	5.26	0.90	4.11
Baryta	Trace.	Trace.	Trace.	0.06
Magnesia	0.94	0.36	0.68	2.20
Silica	3.05	1.45	4.65	2.00
Sulphur	0.02	0.03	0.02	0.04
Phosphoric acid	0.030	0.008	0.044	0.030
Oxide of copper	0.004	Nil.	0.031	0.002
„ „ zinc	0.06	0.06	0.05	0.08
„ „ nickel	Trace.	Trace.	0.12	Trace.
Arsenic	Nil.	Trace.	0.016	Trace.
Carbonic acid	4.65	2.15	1.25	4.80
Combined water	3.30	3.70	9.95	4.35
	100.084	100.028	99.781	100.122
Yield of metallic iron ...	54.50	60.60	54.50	54.90

6. The proprietor of the Serena group, consisting of mines, workings and concessions covering 628 acres of ground, would be willing to sell on reasonable terms; many other sets, belonging both to rich and poor proprietors, could be obtained on reasonable terms, and a large mineral bearing estate formed.

7. Nearly all the deposits are being worked. The following table, extracted from my consular commercial reports, shows the quantities and destinations of shipments for the last five years.

Countries to which Exported.	1898.		1899.		1900.		1901.		1902.	
	Number of Vessels.	Tons.	Number of Vessels.	Tons.	Number of Vessels.	Tons.	Number of Vessels.	Tons.	Number of Vessels.	Tons.
United Kingdom ...	87	202,479	115	273,500	118	280,983	56	172,973	84	215,664
France	27	31,777	12	26,773	17	25,208	16	39,609	8	23,277
Belgium	1	2,868	1	1,750	—	—	—	—	1	3,872
Holland	14	35,750	25	87,450	20	53,748	18	65,120	33	98,112
Germany	—	—	1	2,400	—	—	1	2,300	1	3,200
Austria-Hungary ...	—	—	8	13,350	1	1,800	1	3,000	1	2,250
Canada	—	—	—	—	—	—	4	16,976	—	—
United States	—	—	1	2,600	3	8,000	10	39,918	9	44,018
Total	129	272,874	163	407,823	159	369,739	106	339,896	137	390,393

8. There are no special obstacles in the way of successful and unencumbered mining in this district.

9. These deposits have been fully described in my commercial reports for the year 1888, and following ones. The mines at Bedar are now worked by two large companies, one a French Company domiciled in Paris, the other a rich Bilbao one. Both have their mines connected with Garrucha, the former by a wire rope cable line, the latter by a railway. The mines near Villaricos are connected with it by tramways and cable lines, and are worked by an English Company and others. The Lucainena mines are worked by a very wealthy Bilbao firm. The group not entirely in connection with Garrucha is the Serena one above referred to, but a very short cable (about a mile) would put them in communication with the railway, or, if sufficient ore was found to warrant the outlay, an independent cable line could be easily constructed to Garrucha, where vessels of any size can load, as it is an open roadstead with good holding anchorage, protected by headlands to the north and south.

GRANADA.

(*Mr. Vice-Consul Davenhill.*)

1. Yes.

2. There are numerous iron mines in the province, principally in the neighbourhood of Guadix and in the district of the Alpujarra. Some of great importance are being worked, such as those of the Société de Creusot and that of the Alquife Mine (Limited). The last mentioned possesses a railway of its own of some 30 kilometres length, which joins that of Linares to Almeria. The same company is constructing a wharf at Almeria, the cost of which is calculated at £200,000. The Creusot Company also is about to construct a railway which will run from its mines to the post of Calahonda (Motril).

3. The cost of transport is difficult to calculate, but on an average may be said to be as follows:—In carts loaded with about 1,200 to 1,500 kilos., the transport per ton and per kilometre is a peseta. On animals, on an average loaded with 100 kilos., the transport for every 10 kilometres costs 1.50 pesetas. Transport by railway is four centimos per ton.

4. The extraction of iron from the deposits may, as a rule, be calculated at a peseta a ton.

5. The iron ores of this province are of 55 to 70 per cent. richness.

6. There are a large number of mines the proprietors of which are rich, whilst others are of small means. Probably as a rule sales would not be difficult if serious offers were made.

7. See answer to Question 2 above.

8. There should be no special obstacles to the successful working of mines in this province, if business is carefully undertaken with a due knowledge of the laws of the country affecting mining. Companies should, if possible, send out men to represent them who are familiar with the language.

MARBELLA.

(Mr. Vice-Consul Calzado .)

1. There are two deposits of iron ore.
2. In the Marbella and Ojen districts. Marbella port is the nearest; by rail about $6\frac{1}{2}$ kilometres and by road 4.
3. About one peseta per ton by rail.
4. Good miners scarce; wages run from three to four pesetas.
5. No official analysis can be obtained. I calculate the ore to be about 50 to 56 per cent.
6. They are not likely to be sellers. The proprietors are the Marbella Iron Ore Company and Messrs. Heredia.
7. The two deposits have been and are worked by the Marbella Iron Ore Company. The quantities and destinations of shipment for the last five years are as follows:—

Countries to which Exported.	1898.	1899.	1900.	1901.	1902.
	Metric Tons.	Metric Tons.	Metric Tons.	Metric Tons.	Metric Tons.
Great Britain	10,897	17,699	11,099	13,167	21,850
Holland	10,505	5,957	2,642	3,978	13,587
United States	—	5,009	12,752	8,331	9,345
France	—	—	—	—	1,860
Germany	—	—	—	—	2,053

8. None.

MAZARRON.

(Mr. E. G. Pearse, Consular Agent.)

1. Some deposits of iron exist in this consular district, but are comparatively of little importance.
2. They are to be found at El Cañar, Balsicas, Morata, &c., all within easy reach of their respective loading stations, part being shipped in the eastern corner of Mazarron Bay, part in the western and part at Parazudos, which lies at about eight miles to the west of this port. At all the loading stations ocean steamers can lie and effect shipment by means of lighters. The deposits are at three, four and more miles from loading stations.
3. Transport is effected by means of donkeys and carts, cost of same varying according to the distance the ore has to be carried.
4. Miners are employed in quarrying and common labourers in loading; wages vary, but on an average ore can be cut and loaded on donkeys or carts at about 3.50 pesetas per ton.
5. No official analyses of the different ores are obtainable, but the average contents of iron may be about 48 per cent. to 50 per cent., and silica runs at from 5.46 per cent. to 11.412 per cent.

6. Some rich and others poor. All the mines are leased and none are for sale, as far as my information goes.

7. Most have been and still are being worked. The following is a statement of quantities and destinations of shipments for five years:—

—	1898.	1899.	1900.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.	Tons.
Barrow-in-Furness	2,000	9,000	10,150	9,360	—
Maryport	—	2,170	9,555	2,200	—
Mostyn Quay	—	1,625	—	—	—
Cardiff	—	3,800	3,150	—	—
Newport	—	3,400	2,500	—	—
Stockton-on-Tees	3,830	—	—	—	—
Tyne Dock	3,200	2,000	—	—	—
West Hartlepool	4,100	—	—	—	—
Middlesboro'-on-Tees	—	—	11,575	—	3,400
Glasgow	6,050	22,970	47,110	25,495	26,900
Ayr	—	—	2,030	—	—
Antwerp	2,300	—	—	—	—
Rotterdam	4,750	2,050	8,410	15,103	15,860
Cette	1,780	—	—	—	—
Marseilles	—	300	—	—	—
Total	28,010	46,315	94,480	52,158	46,160

8. It would appear that the greater part of the mines now being worked are gradually becoming exhausted, and if those which have not yet been properly opened up should not in due course, when worked, answer expectations, then it is very probable that within a few years the iron ore industry will disappear entirely in this district.

SWEDEN AND NORWAY.

NORWAY.

CHRISTIANIA.

(Mr. Vice-Consul Gray.)

Mr. Gray encloses the following documents:—

A. Report for Christiania and district.

B. Report from Mr. Vice-Consul Gran, of Bergen, with copy of four analyses and "Report on mining claims in Western Norway."

C. Digest of reports by British Vice-Consuls in Norway, including information derived direct from the Dunderland Iron Ore Company, of London, and other sources.

D. A general report on the iron ore deposits of Northern Norway, by Mr. Puntervold, an official connected with the Trondhjem and Tromsø mining districts.

Mr. Gray observes :

“While no insurmountable obstacles to mining in Norway appear to exist, I have to draw attention to the formalities of Norwegian law, which render the acquisition of mining rights by foreigners dependent on the consent of the King; and, further, to a recent proposal, now dropped for the time being, to place what practically amounts to an export duty on ore, in the form of altering the clause of the Customs tariff, under which partial exemption from tonnage and light dues is at present accorded to vessels exporting ore from this country.”

Further information on the subject of Norwegian iron ore deposits is contained in the reports, dated October—November, 1903, from the Superintendents of Mines in various mining districts of Norway, translations of which are appended to this report (*see p. 131 et seq.*).

A.—REPORT FROM CHRISTIANIA AND DISTRICT.

1. Yes, but none are now being worked.

2. The following are the principal old workings :—

(a) *Hakedalen Iron Works*, near Hakedal railway station, about 22 kilometres north of Christiania. This was the centre for working the deposits for a radius of 10 to 20 kilometres.

(b) *Barum Iron Works*, in the centre of deposits of about 10 kilometres radius, 5 to 10 kilometres from Sandviken, a small port on the Christiania fjord.

(c) *Hassel Iron Works*, north of Drammen, by the Drammen River, with old workings up to a distance of 20 kilometres.

Other deposits occur, sporadically, near the Swedish frontier (*Brandvald* and *Vinger*) the ore from which was once smelted in Sweden; also at *Askin* and *Vestby*, in the Smaalenene district (S.E. of Christiania); and near *Skreia*, in the Mjösen district. The Hassel deposits and those on the Swedish frontier are regarded by a mining expert here as probably the largest in extent, but “not of great importance.”

Ocean steamers can enter the ports of Christiania, Drammen, and lesser steamers at Sandviken.

3. Rail and/or road. Carting averages about 5s., railway freight, per 50 kilometres, about 2s. 3d. per ton.

4. Specifications for each deposit are unobtainable. Generally speaking wages are about 3s. 6d. per diem for skilled workmen, and 2s. 6d. to 3s. for ordinary men.

5. It is found impossible to obtain analyses of the deposits, and it is doubtful if any have been preserved. Moreover, water in the old workings would, in most cases, prevent the obtaining of samples without a previous expenditure of capital. The ore is, however, stated generally to be magnetic, occasionally hematite and hementite, and “in many places very rich.”

6. Often poor people, who would probably sell on reasonable terms.

7. Yes, but not of late years. Work chiefly stopped owing to rise in wood prices, causing a corresponding increase in the cost of charcoal used for smelting.

8. The smallness and scattered nature of the mines, and want of capital in Norway. It is thought, however, that if many concessions were gathered in one hand there might be a chance of working at a profit.

B.—REPORT FROM BERGEN.

(*Mr. Vice-Consul Gran.*)

1. Yes.
2. In the district of Söndfjord. Various safe harbours at a distance of from 100 to 1,000 metres from the ore deposits.
3. Unknown.
4. Unknown.
5. Yes. Copies of four analyses are forwarded (*see below*).
6. Rich; but most likely to be sellers on reasonable terms.
7. No. Only some mining costeaning.
8. No.
9. Copy of "Report on Mining Claims in Western Norway," by F. Logan Lobley, F.G.S., F.R.G.S., is herewith forwarded for further information (*see next page*).

Analyses.

[*See answer to Question 5.*]

I.—Kristiania Universitets Metallurgiske Laboratorium, Kristiania, 9 Marts, 1901.

Analysis *Sellevoid*:—

Titansyre (titanic acid)...	...	8.04	per cent.
Svovl (sulphur) ...	...	0.27	"
Fosfor (phosphoric acid) ...	...	0.067	"
Jern (iron) ...	...	59.25	"

Analysis, 8/2, 1901. *Sellevoid*:—

Titansyre (titanic acid) ...	...	9.06	"
Svovl (sulphur) ...	...	0.23	"
Fosfor (phosphoric acid) ...	...	0.052	"
Jern (iron, metallic) ...	...	60.50	"

II.—Analysis by Edward Riley, Esq., London.

Analysis *Sordalen*:—

Silicic acid ...	...	1.11	per cent.
Peroxide of iron...	...	39.18	"
Protoxide of iron ...	...	30.73	"
Clay ...	...	6.18	"
Titanic acid, with a little vanadous acid ...	...	18.82	"
Manganese oxide ...	...	0.51	"
Nickel and cobalt protoxide ...	...	0.07	"
Magnesia ...	...	4.04	"
Sulphur ...	...	0.02	"
Phosphoric acid ...	...	0.08	"
Water ...	...	0.26	"

101 00

Consequently metallic iron—51.53 per cent.

III.—Analysis by Edward Riley, Esq., London, 14th September, 1903.

Analysis, Norwegian Iron Ore (*Gjølanger*):—

Silica	...	...	...	4.67	per cent.
Peroxide of iron	...	...	...	36.63	„
Protoxide of iron	...	...	...	27.41	„
Oxide of chromium	...	...	...	1.98	„
Titanic acid	...	...	...	15.43	„
Alumina	...	...	...	5.91	„
Oxide of manganese	...	...	...	0.50	„
Lime	...	...	...	Traces.	„
Magnesia	...	...	...	6.62	„
Phosphoric acid...	...	...	...	Traces.	„
Arsenic acid	...	...	...	Nil.	„
Sulphur	...	...	...	0.018	„
Carbonic acid	...	...	...	Traces.	„
Combined water	...	...	...	0.60	„
Moisture	...	...	...	0.07	„
				<hr/>	
				99.838	„
				<hr/>	

Metallic iron, 46.96 per cent.

Metallic Chromium, 1.36 per cent.

IV.—Analysis by Messrs. Johnson & Sons, London, October 26th, 1900.

Analysis *Loland*:—

Iron	...	...	...	56.91	per cent.
Titanium	...	...	...	8.54	„
Alumina	...	...	...	3.40	„
Silica	5.10	„
Magnesia	1.51	„
Sulphur	0.70	„
Phosphorus	Traces.	„
Oxygen, &c.	23.84	„
				<hr/>	
				100.00	„
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REPORT on Mining Claims in Western Norway inspected during the month of June, 1903.

By J. Logan Loble, Esq., F.G.S., F.R.G.S.

The mining claims that are the subject of this report may be conveniently considered as forming four groups, with the following designation:—

1. The Sellevold group of claims.
2. The Sordalen group of claims.
3. The Georlanger group of claims.
4. The Loland group of claims.

1. The Sellevold group of mining claims.—The claims forming the Sellevold group are in the district lying to the north and west of the Ski Fjord, which is a small fjord two kilometres north of the Aa Fjord. The distance between the claims furthest apart is about 4 kilometres.

The exposures of ore in these claims, that were first inspected were those near to the farm of Sellevold, which is at the termination of the northern extension of the Ski Fjord.

These exposures show massive titaniferous iron ore, in some places beds of 12 feet thickness of compact ore, in others less compact ore with contiguous beds of ore and unproductive rock intermingled.

The masses of ore are interbedded with the country rock, which consists of micaceous and talcose schists and gneisses of pre-Cambrian or Archæan geological age. At places these rocks are largely felspathic, and the beds adjacent to the beds of ore are highly garnetiferous, the mica schists especially containing great numbers of garnets in their usual crystalline form of rhombic dodecahedrons. Some of the talc schists pass into well-developed actinolite, especially at the higher levels, the schists at the lower levels being more micaceous in character.

The Sellevold exposures clearly indicate the existence here of a large amount of good ore, and their position is most favourable, as they are at a suitable elevation above sea level, from 100 to 300 feet, and are within a kilometre from the shore of the fjord, near to which large ships could be safely moored, for the northern extension of the fjord forms a land-locked harbour, with a deep-water entrance from the sea, except in one place, where the depth is not more than 22 feet, but a little blasting of the bottom rocks would give ample depth. The claims at a distance of two and four kilometres from Sellevold exhibit similar ore and rocks of the same geological character and age, but they are not so well situated for economical working. The claims at two kilometres distance are on mountain land 1,000 feet above sea level, and about $1\frac{1}{2}$ kilometres from the nearest point of the Ski Fjord.

The furthest west of these claims, 4 kilometres from Sellevold, at Tipheien, near Folkestad, is at an elevation of about 700 feet above the level of the sea, which is not far distant, about half a kilometre, and it might possibly be worked with advantage, as the exposure shows a very fine massive bed of compact ore, but there is no evidence of its extension. The whole of the Sellevold claims are along a line running east by north to west by south, and the ore may be continuous along this line, if followed below the surface, in which case there would be a very great development of valuable ore, but from the varying quality of the ore and the mode of its occurrence, I am of opinion that although following the strike of the rocks, which dip at a high angle, the masses of ore are not continuous. There is, however, a sufficient amount of good ore at Sellevold to justify mining operations, which could be here commenced at very little cost, and from the suitable elevation of the ore above the level of the fjord, it could be most conveniently and economically shipped.

2. The Sordalen group of mining claims.—The Sordalen group of claims lies about two kilometres to the east of Hellevik, a post-station and landing-place on the south side of the Dals Fjord. Sordal is distant about eight kilometres across the land from Sellevold, and about 30 kilometres by sea.

The claims included in the group are situated in a valley extending from the Sordal Lake, or Vand, along the north side of the Lonehej mountain, which is a ridge rising to a height of over 1,000 feet above sea level.

The exposures of ore are at separate points along the side of the mountain for a distance of 600 metres, and at various elevations from a little above the level of the surface of the lake to a height of 600 feet.

The exposures nearest to the Sordal Lake are at old workings where mining operations were carried on about 30 years ago, and a considerable amount of ore was then removed and smelted at the side of the fjord, about two kilometres distant, where there is much old slag yet to be found.

At Sordal the ore is seen to be of the same character as that at Sellevold, namely, titaniferous iron ore, and the rocks in which the ore occurs are similar also. These rocks are, however, less talcose than at Sellevold, and the garnets of the garnetiferous schists, or eclogite, are not so abundant.

The masses of ore seen at the principal old working attain a thickness of from 9 to 10 metres, and in other places, though they are not seen so fully as the exposures are not so large, they show at one place a bed

4 metres in thickness, and at another, the furthest west and at the greatest elevation, 600 feet, two beds, one about 2 metres and the other nearly 3 metres in thickness.

The ore seen at all the exposures is good and compact, and more distinctly separated from the country rock than at Sellevold. The rocks and the inter-bedded masses of ore dip at the high angle of 60° , and the direction of the dip and the position of the outcrop of the ore is favourable for easy and economical working and transport.

The neighbouring Sordal Lake is only separated from the fjord by a ridge of rock of but a few metres width and height, across which a lock could easily be constructed, giving direct access to the sea.

The lake would also supply moderate water-power, and a chain of lakes by its discharge into the fjord at about $1\frac{1}{2}$ kilometres distance, would give a much greater amount of water-power if required.

The uniform character and compactness of the ore, and the position of its various exposures, give me a very favourable opinion of the value of the Sordalen claims, and I think that the amount of good ore available in this district may be safely estimated, if only worked to a depth of 60 metres, at over 1,000,000 tons.

3. The Georlanger group of mining claims.—The area containing what are here termed the Georlanger claims is situated on the northern side of the Georlanger Fjord, which is a small fjord that is a short branch of the Dals Fjord, and in a straight line across the fjord and the Sordal Vand, the Georlanger claims are only about $2\frac{1}{2}$ kilometres from Sordal.

The land here rises very steeply from the fjord to a great elevation, forming the mountain called Vardehej, and descends equally steeply below the surface of the water, so that large ships can lie close to the land from which they can take in cargoes of ore with the greatest facility and economy.

The exposures of ore are near the small farm of Langnæs, in one case close to the water level, and in another at an elevation of full 300 feet on the mountain side.

Very little has been done here to expose the ore, but it is seen to be quite similar to that at Sellevold and Sordalen, and is contained in similar rocks. It may therefore be concluded that it also occurs in massive beds, and that a large quantity of ore may be depended upon at this locality.

There is not sufficient data to justify an estimate of the amount of ore here available, but the position of the outcrop is so favourable and the facilities for shipment are so great that mining operations may be commenced with confidence in a successful result, and should the working prove that there is a large development of ore at this place, its advantageous position for both working and shipment must ensure important financial results.

4. The Loland group of mining claims.—The extensive district through which the Loland group of claims is spread has a length of about 12 kilometres from the shore of the lake called Espelands Vand, at Loland, on the west, to the precipitous highlands overlooking the great Sogne Fjord at Raa, on the east. By the side of the Espelands Vand ore is exposed in a small, old working, and is seen there to be massive, compact titaniferous iron ore, of similar character to the ores of the three previously-mentioned areas, and it is inter-bedded with the same Pre-Cambrian or Archæan schistose and gneissic rocks.

The bed of ore is about 2 metres in thickness, and it is also seen exposed at the surface of the ground at a little distance at a higher level. The surface of Espelands Vand is about 350 feet above sea level, and from this elevation to a height of 700 feet exposures of ore are seen along the mountain side, bounding the southern side of the valley between Loland and Hiemeland, a distance of about 4 kilometres.

At all these exposures the ore is of quite the same character, good and compact.

The same ore is seen at Molmesdal, 3 kilometres further in the same direction, that is, eastwards, and also as far as Raa on the Sogne Fjord, about 5 kilometres east of Molmesdal.

As these various exposures are along a line following the strike of the rocks, and as the ore is of the same character at each place, there is evidence of continuity of the deposit, and this evidence is strengthened by the magnetic indications along the line.

The most western claim by Espelands Vand is about 2 kilometres from the excellent harbour of Lervik, on the Bø Fjord, where there is deep water close to the land.

Espelands Vand is one of a chain of lakes, some of which are at high levels, giving lofty water-falls of great volume, and the whole of the water is discharged into the sea at Lervik, where enormous water-power may therefore be secured.

The ore at Raa, at the east end of the district, could be readily shipped from the adjacent shore of the Sogne Fjord, where there is deep water. The distance of Raa from Lervik is about 22 kilometres.

Should the beds of ore prove to be continuous throughout the district, the amount of available ore must be over 20,000,000 tons.

From the above statement it will be seen that the ore of all the district is titaniferous iron ore, and that it occurs in schistose and gneissic rocks of pre-Cambrian or Archæan geological age.

The ore does not occur in lodes or veins crossing the rocks, but in masses inter-bedded with the rocks. These masses may not be continuous, but may be separated by stretches of unproductive rock.

The position of the ore is in every case above sea level, and above the level of the surface of adjacent lakes, so that the mining would be by open workings to a large extent.

C.—DIGEST of REPORTS by H.B.M. Vice-Consuls at the under-mentioned places.

ARENDALE.

1. Yes.
 2. Near Braastad, Arendal. Arendal. About one hour's drive.
 3. About 10d. to 1s. by road. Rails are building, and transport by rail will be cheaper.
 4. Vice-Consul Kalling is unable to reply to this question.
 5. Yes.
 6. Proprietors are likely to sell on reasonable terms.
 7. Not for some years.
 8. The Vice-Consul states "none whatever."
 9. The ore is said to be of excellent quality.
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CHRISTIANSUND, N.

1. Yes.
2. Near Eidsören, close by the water; about 50 miles up the Sundal Fjord. The water is deep enough for all vessels.
3. Practically nothing. Ore could be transmitted direct from mine into vessels' hold by shoots.
4. Cannot say.
5. No, nor samples. The owner declines to give any information whatever, and the Government District Mining Inspector professes inability to do so either. Mr. Vice-Consul Parelius, however, believes there is "plenty of the ore"—"the whole mountain is said to consist only of iron ore." The analyses are believed to be "very profitable," but with a large admixture of titanium.
6. Poor, but likely to be very unreasonable. Purchasers should approach him carefully, as he is suspicious of buyers.
7. Yes. The owner now and then exports a few hundred tons. Samples have been sent to various European ports without result. Owner will give no information.
8. The Vice-Consul knows of none.
9. Situation very convenient.

EGERSUND.

1. Yes.
2. Near (A) Egersund, and (B) Soggendal. Egersund ore is shipped from Skivoldsvig, three miles from Egersund, and one to six miles from the harbour, the lode running about six miles east to west, with 25 mines. Much the same appears to apply to the Soggendal ore. Both Egersund and Skivoldsvig admit ocean steamers.
3. Five shillings per ton from furthest point, carted by road or by tramway.
4. Cost of mining, 3s. to 4s. per ton.
5. Following analyses made in England:—

—	Per cent.	Per cent.	Per cent.
Oxide of titanium	43·73	43·24	41·57
Protoxide of iron	13·57	27·21	29·47
Peroxide of iron	42·70	28·60	24·81
Metallic iron	40·44	41·18	40·29

6. The deposits are probably for sale at a reasonable price.

7. Work was stopped for several years, partly owing to the small demand for titanic ore. The deposits were once worked on a large scale, sending several thousand tons to England and Belgium. Only a few thousand tons have been exported in the last five years, chiefly to Fiume.

8. "None known."

KRAGERÖ.

1. Yes.

2. At Sjaaen, Langö, Grönaasen, and Dobbe.

The Dobbe deposits are rather over 1,000 yards from the sea where ore could be loaded, and the Grönaasen and Sjaaen deposits about 300 and 450 yards respectively, and all more than 100 metres above sea level.

3. For the above reason there would be no need to transport the ore to Kragerö for loading. An aerial railroad could bring the ore from all the deposits down to the ship.

4. Cost of labour at the mines, 3s. to 4s. per man.

5. Yes, as follows:—

Grönaasen (1).

Iron	...	...	...	...	55—62 per cent.
Sulphur	...	...	...	...	0·052 "
Phosphorus	...	...	...	...	0·040 "
Titanic acid	...	...	...	...	1·020 "
Lime	...	...	...	...	3·200 "

Grönaasen (2).

Iron	...	...	...	...	50·50—57 per cent.
Sulphur	...	...	...	...	0·140 "
Phosphorus	...	...	...	...	0·027 "

Sjaaen.

Iron	...	...	...	...	70·300 per cent.
Silica	...	...	...	...	0·640 "
Sulphur	...	...	...	...	0·140 "
Phosphorus	...	...	...	...	0·006 "

Dobbe.

Iron	...	...	...	...	65—67 per cent.
Titanic acid	...	...	...	...	6—8 "
Phosphorus	...	...	...	...	0·024 "
Sulphur	...	...	...	...	0·066 "

The ore at Langö is stated to contain 40 to 55 per cent. iron, free from sulphur, phosphorus, or titanic acid.

The Grönaasen ore contains 50-67 per cent. iron, and can be traced for ten miles.

6. Yes, they are likely to be sellers on reasonable terms.

7. Yes, but Grönaasen not since 1640, and Langö not since 1866. Dates as to the others not ascertainable. But it is thought that Langö could ship about 40,000 tons a year, Grönaasen about the same amount, Dobbe

about 50,000 tons per annum, with up to 67 per cent. of iron and 7-8 per cent. of titanitic acid.

8. None known.

9. An electric power station is contemplated near Dalsfös. If electric power be available, all the ore from the deposits could be smelted on the spot.

LAURVIG.

1. Yes.

2. In the Hedium district. Laurvig; about 12 miles.

3. Vice-Consul Nielsen cannot say.

4. Cost of labour for mining, about 3s. per diem.

5. Yes.

6. The deposits are owned by a syndicate who are likely to sell on reasonable terms.

7. No.

8. No.

9. The Vice-Consul states: "The syndicate has also a waterfall about two miles from the deposits, whence power can be had to crush the ore and furnish electricity for a railway to Laurvig, without which the transport would be too expensive. As far as can be judged, there are millions of tons of iron ore, but the quality is questionable."

LOFOTEN ISLANDS.

1. Only one of any significance.

2. At Imorten, in Lofoten. Ships can approach close to deposits.

3. Vice-Consul Dombrain cannot form estimate. Transport by road, if ever mined.

4. Mostly fishermen, who are, however, hard to obtain. No estimate of the cost of mining can be formed as the chances of serious working are slight.

5. Neither analyses nor samples appear obtainable.

6. Not likely to sell.

7. Apparently not.

8. Vice-Consul Dombrain states: "Foreigners are now prohibited from owning land in Norway. Even if they could, the experience of the Gellivara Iron Ore Company is not likely to encourage investors."

9. Small pockets are known to exist in many places, but until capital is employed to test them, their capabilities are not known. Within a mile of Brettesnees there is a titanium ore which, with chromium, Mr. Dombrain understands, is a drawback to any further trials of known deposits.

MOSJÖEN.

1. Yes.

2. Dunderland dalen.

Guldsmedrik, on the Ranen fjord; about 17 miles to first deposits. Harbour and pier constructed by the Dunderland Iron Ore Company, and available for large vessels.

3. The Company cannot answer this question as to cost until it has actual experience of working and transporting. Railway nearly finished.

4. Labour adequate. As to cost, see above (No. 3).

5. Two of the Company's pamphlets are enclosed herewith.

6. Not for sale.

7. No; shipments not yet commenced.

8. None, except possibly climatic, snow, &c.

9. Contained in enclosed pamphlets.

NAMSOS.

1. Yes, a few, but only one of large extent or richness.

2. On the farm "Grandaune," Overhalden. Namsos, 17 miles away.

3. Cannot say; no road, rail, or canal existing, but ore could be brought by road to River Namsen (one mile) and taken to Namsos (16 miles) by boats.

4. Cannot be given; usual wages, 3s. to 3s. 6d. per diem.

5. No analyses known of. Ore believed to contain high percentage of iron.

6. Owned by farmers; terms probably reasonable.

7. Deposits worked a little some years ago, but only for trial.

8. "No obstacles."

9. Mr. Vice-Consul Sommerschild is of opinion that this deposit ought to be thoroughly investigated by clever and practical engineers.

PORSGRUND.

1. Yes, several; but only one that is rendering sufficient to export.

2. Ulefoss. Skien, 2½ hours distant by water.

3. Probably about 2s. 6d. per ton. By water.

4. Wages, about 3s. to 4s. per diem. Cannot give estimate.

5. Yes, but neither analysis nor samples obtainable, the owner not considering it in his interests to give them.

6. Said to be very wealthy.
7. The shipments have been about 60,000 tons per annum for the last two or three years to Holland, and a small quantity to Middlesbrough.
8. No.
9. Many small deposits in the district might prove worthy of investigation. Produce could easily be shipped from Skien and Porsgrund.

RISÖR.

1. Yes.
2. Novestad mines, seven miles from Risör; *steamers can load about one mile from mines.
Oen mine, on Söndeled fjord, four miles from Risör; steamers can load near mine.
Tjendal mine, one mile from Risör; steamers can load near mine.
Staalkjend mine, near Egeland's ironworks, eight miles from Risör. (Works closed 20 years ago.) From this mine the transport would be too expensive.
3. Cannot say. An aerial railway could possibly be constructed from the first three mines mentioned.
4. Difficult to say, but labour is "very reasonable."
5. The ore has been analysed, but copies cannot at present be obtained. Water in the pits prevents obtaining samples.
6. Yes, undoubtedly.
7. Yes. Eighty years ago thousands of tons were shipped from Novestad to Ulefos, near Skien. The Oen mine supplied Egeland works about 60 years ago, but was closed on discovery of the closer deposits at Staalkjend. The Tjendal mine has not been worked. Large quantities have been taken from the Staalkjend mine in the past.
8. No.
9. The Novestad workings are 40-50 feet deep, veins about seven feet broad, and can be traced several miles. Samples are said to contain 62 per cent. iron.
The Oen mine is said to be 30 metres wide and to contain 52-62 per cent. iron.
The Tjendal mine, not worked, 55-58 per cent. iron.
The Staalkjend mine is said to be rich, but transport is an obstacle.
The old ores were found difficult of fusion.
A map of the mines is transmitted herewith.

TROMSÖ.

Vice-Consul Graver reports that no deposits of iron mines have been reported in his district, but that at two places "notifications" have been secured and negotiations for placing the same have been going on for the last two years, but without any sale up to date.

VADSÖ.

1. The Vice-Consul at Vadsö reports that there are iron deposits at Sydvaranger, about 50 to 60 miles from Vadsö, but that they have not yet been worked, nor does there exist any means of transport to the sea.

2. Pasvik fjord and Langfjord, Sydvaranger, Finmarken, extending towards the Russian frontier. It is understood that the deposits are very scattered. The exact distance of the nearest deposits from the sea where steamers could load is not known, but is believed not to be very far. Situation said to be favourable.

3. Cannot say.

4. Ditto.

5. Samples are reported to show from 40 to 50 per cent. iron, mixed with a considerable quantity of manganese, but little sulphur, phosphorus, or titanium.

6. Believed to be rich. Mr. Christian Anker, of Fredrickstad, is said to be the owner of the deposits, and to be anxious to acquire further deposits in the neighbourhood on State land, in order to sell as a whole. Americans are, however, believed to be in treaty for the purchase.

7. No.

8. The Norwegian Government is believed to view with disfavour the acquisition of mining influence by foreigners so close to the Russian frontier, and Mr. Anker complains of the conditions demanded by the late Government. It is not known how far the present Government insist on the terms of their predecessors. *Inter alia*, a royalty of three öre per ton raw ore extracted has been spoken of.

9. Water power is thought to be available from the Pasvik River for electricity, should electric works be established to furnish power.

D.—GENERAL REPORT on the Iron Ore Deposits of NORTHERN NORWAY, forwarded to Mr. Falck, H.M. Vice-Consul at Bodö by Mr. PUNTERVOLD, an official connected with the Trondhjem and Tromsö Mining Districts.

1. Yes.

Literature of reference:—

(a) Professor Joh. H. L. Vogt: Det nordlige Norges-Malmforekomster og Bergverksdrift. (Ore Deposits and Mining of Northern Norway.)

(b) Professor Joh. H. L. Vogt: Zeitschrift für praktische Geologie. 1900, August and continuation thereof.

(c) The Engineering and Mining Journal, No. 8, for August 25, 1894. Scandinavia as a source of iron ore supply, by Jeremiah Head, M. Inst. C.E.

(d) Tabeller vedkommende Norges-Bergvarksdrift. Udgivne af Det statistiske central bureau, 1866-1900. (Statistics relating to Mining in Norway. Edited by the Central Statistical Bureau, 1866-1900.)

(e) Th. Hiortdahl: Forsög til en norsk bergstatistik, 1851-75. (Attempt at Norwegian Mining Statistics, 1851-1875.)

(f) Amund Helland: Lofoten og Oesteraalen. (Lofoten and Oesteraalen.)

(g) Norges Geologiske Undersøgelse. No. 1-33. Norway's Geological Investigations. Nos. 1-33.)

(h) Norges Land og Folk. (The Land and People of Norway.)

2. So far, as I know, all the Norwegian iron ore deposits south of Sannassjöen, Helgeland and all along the coast until you reach Egersund and Soggendal, are either titaniferous or too small to come into consideration.

(a) Dunderlands-dalen, Toniö-Dönnesö, Naverhougen pr. Bodö, Ofoten (Osmark, Bergvik, Haafjeld, Harjangen), Ibbestad, Salangen, belong all of them to the same kind of deposits. The ore averages 40-45 per cent. of iron, and in order to get marketable products the ore will have to be crushed and concentrated magnetically, and thereafter it is made into bricks (briquettes). The only place where work is going on is at Dunderlands-dalen, Moi Ranen, where they are constructing the electro-magnetic works for the treatment of the ore, according to the Edison patent; until yet they have neither treated nor shipped any ore.

For further particulars see the prospectus of the Dunderland Iron Ore Company, Limited, 6, Clement's Lane, Lombard Street, London.

The distance from the port of Guldsmedviken, Moi Ranen, to the Dunderland iron ore deposits is about 20 kilometres, and they are now constructing a railway for the transport of the ore.

At the other places the deposits are emerging into the sea.

(b) All the deposits of iron ore in Lofoten are titaniferous, with the exception of one small deposit of hematite in Astnasfjord, which is 87 metres long by 2 metres wide. The distance to the sea is a little above one kilometre.

(c) Close by Hammerfest they have recently discovered some magnetic iron ore deposits which do not seem to contain any titanium. They have not yet been examined by professional men.

(d) Syd-Varanger deposits contain the same kind of ore as at Dunderland. I have been told that the distance to Kirkenas is about eight kilometres.

(e) Stjernö, Seiland, Tappeluft, &c., are all of them titaniferous.

3 and 4. No ore is being worked, and therefore I can only give suppositions.

5. Analyses may be got by buying Professor Vogt's "Det Nordlige Norges Malmforekomster og Bergvarksdrift," Cammermeyers Boghandel, Kristiania.

6. The proprietors are mostly small syndicates, and they are not likely to be sellers on reasonable terms.

7. Practically taken, the deposits have not been worked.

8. There is every facility for the working of the deposits, the price of labour is about kr. 3.00-3.50 a day, and there is plenty of labour available.

Mr. Vice-Consul Gray (Christiania) also forwards the following translations which he has prepared for four reports from the Superintendents of Mining in Norway, which have been furnished to him by the Norwegian Government, and which supplement the particulars already sent.

- (i) TRANSLATION OF LETTER from Herr A. Backe, Superintendent of Mines in the District of Tromsö, to the Department of Commerce, dated 21st October, 1903.

With reference to the application from the British Consulate-General received in your letter of the 16th instant, relating to information concerning Norwegian iron ore deposits and their importance, I have the honour to refer to the printed annual reports on mining in Norway, and to furnish the following particulars relating to the most important deposits of iron ore in this district.

These are:—

1. South Varanger iron fields on the Pasvik peninsula, near the Russian frontier, which contains millions of tons of "magnetite" of very pure character. After concentration the ore could be delivered by rail near Krikenes, where vessels of any size can load.

2. In the County of Tromsö:—

(a) Ibbestad iron fields—

i. At Andorp, parish of Ibbestad.

ii. Near Salangen.

Far extending fields of the same nature as the Dunderland ore, but containing more manganese.

(b) Dyrö iron field, in Tranö parish.

(c) Bjarkö iron field, in Bjarkö parish.

These are as yet little explored. The ore requires concentration.

(d) Kvædfjord iron fields, on Kvædo and Kjengsnes, in the parish of Kvædfjord—two lesser fields lately prospected.

3. In the County of Nordland:—

(a) Vesteraalen iron fields, in Öksnæs and Bö parishes; rather much titanium.

(b) Lofoten iron deposits in Flakstad and Gimsö; partly titanitic "magmatic" secretions.

(c) Ofoten iron fields in Ofoten parish:—

i. Bergvik field, a fine field in Liland, recently subjected to comprehensive investigations.

ii. Osmark field, similar to Liland; layer containing manganese of large extent, but less strength.

iii. Haafjeld iron fields, on the south side of the Ofoten fjord, followed for thirty kilometres.

All these have the same geological character as the Dunderland field. The ore must be prepared, but occurs in large masses. The same may be said to a certain degree of:—

iv. Harjangen and

v. Sjommen ores.

(d) Næverhangen iron ore field, at Skjarstad, in Salten, known from several printed reports. Geological character identical with the Dunderland iron field.

(e) Beieren iron deposits, belonging to the same geological level as Dunderland, but of less strength and extent.

(f) Tomöens iron ore field, at the entrance to the Ranen fjord, to which the same remarks as to Beieren apply.

(g) Dunderland, extensive iron ore deposits, largely owned by the Dunderland Iron Ore Company, Limited, from whose prospectus they will be known.

(h) Fuglestrand deposits, at Hemnes, Ranen, owned by the Dunderland Iron Ore Company.

- (i) Dönnes deposits, Nesne parish, and
- (k) Vefsen deposits, Vefsen parish, belonging to the same geological level as Dunderland.

From the above observations it will be seen that a number of iron deposits occur in this district, many of which will be of importance when the demand for iron increases and technical knowledge develops, as most of them are favourably situated at comparatively short distances from the sea; only short railways or aerial tramways are necessary, so that cost of transport will not have to be taken into account in calculating cost of production. With the exception of the Dunderland, Naverhangen, Bergvik, and part of the South Varanger deposits, too little labour has as yet been expended to be able to determine the amounts of ore that can be reckoned upon from each field, as capital has been wanting. It is therefore, as yet, impossible to form any estimate as to costs of working; they would, however, probably be about the same as in the case of the Dunderland deposits, with, however, the differences which may be entailed by their position and the weaker strength of the ores.

- (ii) TRANSLATION OF LETTER, dated October 19th, 1903, from the Superintendent of Mines for the District of Trondhjem to the Department of Trade and Commerce.

In reply to your enquiries of the 16th instant, relating to iron ore deposits in the Trondhjem district, I would refer to the Norwegian mining statistics for 1899 and 1900, and beg to report as follows:—

1 and 2. There are several iron ore deposits in this district, *e.g.*, on Hitteren in the Trondhjem fjord, parish of Næssel; Romsdalen, in Örskong and Skodje; Söndmöre, in Ytre Holmedal and Hyllestad, Nordfjord, in Ladvig and Lekanger in Sogn; in Manger and Alversund near Bergen, in Skaanevig and Ölve in Hardanger, in Lesje, Gudbrandsdalen, and other places. All near the sea except Lesje. Several very considerable.

3 and 4. Cannot be answered except on further investigations and conference with owners.

5. Analyses and samples can only be supplied by owners. Most of the deposits are magnetic iron, with more or less titanium.

6. Cannot reply. All owners would, however, be glad to sell.

7. Several deposits have been worked for longer or shorter periods; none worked now. Cannot state more.

8. Foreigners must have Royal consent to purchase ore deposits, but in other respects they are subject to the same laws and have to pay the same taxes as Norwegian subjects.

- (iii) TRANSLATION OF LETTER from Herr L. Meinich, Superintendent of Mines for the South-East of Norway, to the Department of Commerce, dated 23rd October, 1903.

In reply to your letter of the 16th, containing questions relating to iron ore, I beg to reply as follows:—

1 and 2. There are several iron ore deposits in this district from which iron ore was once procured for the iron works of the district until the latter were closed about the middle of the last century. The chief deposits are:—

Ramsö and Spetal mines, near Vinger, about 100 kilometres by railway from Christiania.

Hakedal Works mines, at Gjerdrum, about 25 kilometres by rail from Christiania.

Sigdal iron ore deposits, about 33 kilometres by railway to Drammen.

Hassel ironworks' mines, in Modum and Eker, about 27 kilometres by rail to Drammen.

Eidsfos ironworks' mines in Eger, reaching up to 40 kilometres by rail from Drammen.

There is also a drive of a few kilometres from the mines to the nearest railway station.

3 and 4. Impossible to state, as none of the mines have been worked for a long time.

5 and 6. Do not know.

7. Yes. But no ore, as far as I know, has been shipped.

8. No.

9. Further information can be had from the owners. A list of these could be obtained from the District Superintendent of Mines.

(iv) TRANSLATION OF LETTER from Herr Carl Paaske, Superintendent of Mines for South-West Norway, to the Department of Commerce, dated 30th November, 1903.

The iron ore deposits in my district are as follows:

(a) On the farm of Nes, Strømmen parish; a lesser deposit of red iron-stone, about two kilometres from the sea. Not being worked.

(b) In Skoger parish, not far from Drammen. Various small deposits, partly owned by Eidsfos Works. Not being worked.

(c) In Gjerpen parish, near Skien; a small deposit formerly owned and worked by Fossum Iron Works. Not worked at present.

(d) The Fehn field, in Hollen parish, close to the lake of Nordsjö, in Telemarken, where a Mr. Cappelen at present carries on considerable workings with an annual production of 40,000 to 50,000 tons hæmatite.

(e) Langö fields, on Langö Island, near Kragerö, in the parish of Skaatö. At present managed by Herr H. Björn, of Kragerö. Not being worked, but capable of producing some 20,000 to 30,000 tons per annum of magnetic iron-stone. Two smaller fields also exist near Kragerö, Kalstad and Rönningen, not worked.

(f) Arendal field, at Oiestad, Froland, Tromö and Stokken. Chiefly magnetic iron-stone, with quite considerable capabilities of production and favourable position for exportation; only one mine ("Klodeberg") is working.

(g) Söftestad field, in the Nisserdal, close to Nisservand lake, about 80 kilometres from Arendal. Magnetite and iron glance. Unworked, but probably capable of producing 20,000 tons per annum; but working here is dependant on obtaining some railway connection to the sea, either at Arendal or Grimstad.

(h) The great Egersund titanite iron field in the Egersund and Sogndal districts. The ore contains about 40 per cent. titanium. This has not been worked since 1876, but it has great powers of production. About eight kilometres from port where steamers could approach.

I would refer to the following publications, which contain information on several of the above-mentioned deposits:—

(a) "Iron ores near Arendal, Nes, and Kragerö," by Th. Kjerulf and T. Dahll.

- (b) "Norwegian Ores (1884) and the Nissedal iron deposit," by Professor Vogt.
- (c) "The Land and People of Norway," by Helland.
- (d) The official mining statistics and the Mining Superintendents' reports.

SWEDEN.

GOTHENBURG.

(*Mr. Consul Duff.*)

Mr. Duff reports that the only iron ore deposits in this district are situated in the county of Wermland, and belong to the iron furnaces in the neighbourhood, which consume all the ore raised, the annual average output during the last five years amounting to 78,000 tons.

Göteborg, which is about 200 miles from the ore deposits, is the nearest shipping port capable of admitting ocean steamers, but since the iron furnaces consume all the ore raised, no shipment has taken place; besides, the shipment of ore would not prove remunerative, on account of the expensive transit by rail and canal to Göteborg.

STOCKHOLM.

(*Mr. Consul MacGregor.*)

REPORT ON SWEDISH IRON ORE DEPOSITS.

1. The largest known individual deposits in Scandinavia, with not many equals in size in Europe or America, are in this district.

At Kyrönavaara-Luossavaara the estimated amount of ore above the level of the lake, besides incalculable quantities below that level, is 233* million tons.

2. The chief deposits are at Grängesberg (Central District) and Gällivare, Kyrönavaara, Luossavaara, Svappavara, and Routivare (Lapland).

Nearest ports and distance from the mines:—

For Grängesberg ore, Oxelösund, Baltic, 170 miles; also Stockholm, 102 miles, and Gefle, 77; for Gällivare ore, Luleå, Gulf of Bothnia, 140 miles; for Kyrönavaara-Luossavaara ore, Narvik, Ofoten Fjord, Norway, 113 miles. The two last-named fields are 148 to 160 miles from Luleå.

3. Kyrönavaara† to Narvik, about 4s. 6d. per ton; Gällivare to Luleå, about 3s. 2d.; Grängesberg to Oxelösund, owing to circumstances of ownership, almost optional; all by rail to the various ports.

4. At Grängesberg, Kyrönavaara, and Gällivare the ore is at present almost entirely obtained by quarrying. The cost of this, including transport to railway trucks and loading therein varies, but averages about 3s. per ton.

5. See pamphlet "The Iron Ore Fields" for analyses of the ores (pages 59-74), views of the places, map of the country, &c., &c.

6. The four first-mentioned ore fields belong to different companies, but the controlling majority of the shares is in one ownership, the financial position of which is reported to be very strong, and it seems highly improbable that they would sell the deposits.

* See accompanying pamphlet "The Iron Ore Fields," a Memorial to the King, etc., by Hjalmar Lundbom, 1898.

† Kiruna, name of station near the mines.

The Svappavara mines, it appears, might perhaps be purchased; and the Ruotivare* fields are now in the market for sale.

It is reported that the Ruotivare deposits are somewhat larger in area than the Gellivare, and that perhaps they might now be bought at a reasonable price. For particulars regarding the nature of the fields and ore at Ruotivare see the accompanying treatise in German: †“Berichte und Atteste betreffend Ruotivare-Vallatj-Eisenerzfeld,” by Mr. Landin, trade chemist, in Stockholm.

7. The export of Grängesberg ore began about 1884, Gellivare about 1890, but the Kärnavaara, on account of the want of railway communication, not until November 15th, 1902.

The following table shows the amount of Swedish iron ore exported during the last five years, and the countries to which it has been sent.

To—	1898.	1899.	1900.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.	Tons.
‡Norway	—	—	—	—	24,534
Finland	19,968	16,658	18,731	18,516	16,717
Germany	260,977	396,583	422,625	445,060	404,288
§Netherlands	997,510	1,007,051	967,249	1,073,805	954,670
Belgium	45,060	68,760	99,125	112,735	132,328
Great Britain	101,600	123,239	102,772	91,991	173,726
France	14,745	15,720	9,400	16,800	12,700
British North America ...	—	—	—	2,350	10,340
Total Tons	1,439,860	1,628,011	1,619,902	1,761,257	1,729,303

The bulk of the ore exported therefore goes to Germany.

8. As far as can be judged at present, there are no obstacles to successful continuous mining in this district.

The question of imposing an export duty on ore has been raised, but has hitherto not been favourably received.

9. Extensive and rich deposits in Lapland have not been worked hitherto, owing to want of means of transportation. As, however, the railway connecting the ports of Luleå and Narvik was opened for public traffic only about the end of last year, it is possible that in the future new branch lines may be constructed from some of the most favourably situated deposits, and ore taken from fresh fields.

ADDITIONAL INFORMATION.

1. In 1902 there were working in Sweden 332 mines, which yielded an aggregate of 2,896,208 tons of iron ore (viz., 2,615,533 tons magnetite and 280,675 tons hematite ore), valued at £798,181.

* The British Vice-Consul, at Luleå, Mr. A. Y. Westerberg, is well acquainted with the Ruotivare fields.

† Only one copy of the treatise obtainable.

‡ For export from the port of Narvik.

§ Exported to Rotterdam and Antwerp for use in Westphalia.

2. The chief deposits are in the centre of the country, 58° to 61° north latitude, and 14° to 18° east longitude, and in Lapland, north of the Arctic Circle, 66° to 68° north latitude, and 18° to 22° east longitude.

In the central district there are 16 ore fields and 85 mines, having an annual output each of from 1,500 to 130,000 tons, but only one of these supplies, viz., the Grängesberg, is available for export, the ore from the others being smelted in the country, and the pig-iron produced therefrom worked up at the local ironworks or exported in the form of "pig-plate," bar-iron, or steel ingots.

The ore from the Lapland mines is all exported, the Kårunavaara ore being shipped at Narvik and the Gellivare at Luleå.

Luleå is open only from June to November, but Narvik all the year round.

The quantities of ore recently proposed to be worked and exported annually were: From Kåruna, 1,500,000 tons; from Gellivare, 600,000 tons; and from Grängesberg, 600,000 tons.

3. The difference in the rates is explained by the fact that the line to Luleå is owned entirely by the State. To Narvik it is owned partly by the Norwegian State and partly by the Swedish. It has been difficult and costly to construct, and is very hard to work, owing to severe grading and adverse climatic conditions. From Grängesberg to Oxelösund the transport is over three private lines, whose shares are nearly all owned by the same company which owns the mines. This explains the almost optional rate on the line Grängesberg-Oxelösund.

4. Labour-saving machinery is utilised as much as possible. Rock-boring machines, either pneumatic or electrical, being in use, the electric power for these and all other requirements is generated at the mines or transmitted from a power-station in the neighbourhood.

5. At a meeting of the members of the Iron and Steel Institute, held at Stockholm, in September, 1898, a paper was read by Professor Gustaf Nordenström, entitled, "The Swedish iron ore deposits," and in it full analyses of the ores were given, together with other useful information, all of which has been published in the Proceedings of the Institute.

6. Foreigners are not allowed to hold land,* or, since 1895, to act as directors of public companies in Sweden, without the special permission of the King.

Foreign capital invested in Swedish mines has not, as a rule, proved remunerative.

In the Articles of Association of the body controlling the business of the export companies above mentioned it is agreed that the shares cannot be registered in the name of a foreigner.

Mining properties are occasionally offered for sale to foreigners, but such proposals should be treated with the greatest caution, on account of the difficulty of obtaining the necessary title.

It appears, therefore, that, while there might be very great difficulty in obtaining a good title to iron ore fields in Sweden—foreign capital, apparently, being little desired in this country, except under native management—yet there is nothing to prevent the output of ore from Swedish mines being, for due consideration, almost indefinitely increased. This as regards deposits already worked; and, with respect to unworked fields, foreign capital might perhaps be advantageously employed in developing them, if the ore in return were secured to the capitalist.

* Neither land nor mines. The latter are considered "moveable property," according to the law of Sweden.

SWITZERLAND.

ZURICH.

(*Mr. Consul-General Angst.*)

Mr. Angst forwards the following information upon the subject from the Swiss Federal Inspector of Mines:—

“As far as I know, there are no statistics regarding the matter in question which could serve as answers to all your questions. There are, indeed, a few iron ore deposits in this country, but they are apparently small; some of them are being exploited, but they furnish a very insignificant portion of the total consumption of iron ore in Switzerland. Perhaps at a later date, I may be able to give you more information.”

Mr. Angst also encloses the following report, drawn up by Mr. Falck, His Majesty's Consul at Lucerne, with reference to a deposit of iron ore situated partly in his district, and partly in the Consular district of Berne.

LUCERNE.

1. In the whole district of this Consulate there is only one deposit of iron ore reported to exist, and that in a mountain, belonging for its larger part to the Consular district of Berne.

2. The mountain (“Erzegg”) containing deposits is situated on the frontier between the Cantons Obwalden and Berne.

3. The nearest sea-port would be Genoa, but the ore should be worked on the spot at Innertkirchen, as reported under question 6.

The cost of transport of ore from deposits by aerial cable to Innertkirchen—at most 10 kilometres—has been calculated to amount to fr. 0.50 per ton ore, maximum.

4. The cost of mining and loading of ore for the aerial transport has been estimated at about frs. 2.90 per ton ore.

5. Official analyses are given in enclosure 2.

6. The proprietor of the license for working on the territory of the Canton of Berne, Mr. J. Robert Müller-Landsmann, Enge, Zürich, is a rich contractor. He informs* me that he has also the option of buying the license for mining in the Canton of Obwalden. It seems that Mr. Müller has, at the same time, obtained licenses not only for using the water-powers of the valleys surrounding Innertkirchen for melting the ore by electricity, but also for a railway from Innertkirchen to Meiringen, terminus of the narrow gauge Brünig railway beginning at Lucerne. He does not seem, therefore, to care to sell his mining license separately, but he wishes to find, by some Swiss or foreign company, the capital necessary for the purpose of making one enterprise of the three licenses.

7. Ore of these deposits seems to have been worked in the eighteenth century, probably only for local use. The works were stopped owing to the deficiency of firing materials.

8. It appears that a blast furnace in the Bernese Jura, producing about 8,000 tons of cast iron, is the only one in the whole of Switzerland, other deposits in the “Gouzen,” Canton St. Gall, having no water-power at

* October, 1903.

their disposal. The importation being valued at about 80 millions of francs, it seems that the Federal and Cantonal Governments would patronize a new industry in rather poor countries.

The ore being at a height of about 2,100 m. above the sea level, the cold in winter might prevent continuous mining.

TURKEY.

CONSTANTINOPLE.

(*Mr. Acting Consul Waugh.*)

1. Yes.

2. The iron mines of Little Samacov are situated between 41° 46'-57' N. and 25° 19'-36' E. (Paris meridian), in the "Vilayet" of Adrianople, "Sandjak" of Kirk Kilisseh, "Kaza" of Midia and "Nahieh" of Samacovdjik. The nearest port is Iniada, on the Black Sea, between Varna and Constantinople, some 50 miles north of the Bosphorus. Distance from ore deposits to port about 14 kilometres.

3 and 4. The prospects of the mine are exhaustively dealt with in a report by Mr. Brenton Symons, F.C.S., Assoc. Mem. Inst. C.E., of 7, Jeffrey Square, London, E.C., printed in Athens by Alexandre Papageorge, in 1889. He gives an estimate of the cost of production per ton, including the construction of a railway from the mine to the sea, as follows:—

	frs.	cs.
Management	0	50
Concentration	0	75
Railway freight to Iniada	0	45
Loading (by barges)	1	20
Fixed annual rental	0	11
Five per cent. royalty on ore exported	0	09
	<hr/>	
Total per ton f.o.b. Iniada	3	17

Calculated on an annual export of 100,000 tons.

The quantity of labour obtainable from the villages within the concession, which possess a population of 10,000, is not only ample, but is composed of men who have passed their lives in the washing and smelting of iron ores.

Wages: labourers 1 franc, washers 1½ franc per day.

5. Analysis of the iron:—

Sand washed in small quantities:—

Ferric oxide	29.00	per cent.
Peroxide of iron	69.00	„
Silica	2.00	„
	<hr/>	
	100.00	„
	<hr/>	
Metallic iron	70.85	„

Sand washed in large quantities :—

Ferric oxide	...	...	...	28.60	per cent.
Peroxide of iron	...	...	...	66.00	"
Lime	...	...	...	.45	"
Silica	...	...	...	4.95	"

100.00

Metallic iron ... 68.44

Magnetic iron sand in bulk :—

Insoluble silicates	...	...	...	5.146	per cent.
Proxide of iron	...	...	...	85.896	"
Lime	...	...	...	2.700	"
Magnesia	...	...	...	.500	"
Sulphuric acid	...	...	...	.111	"
Aluminium	...	...	...	—	"

94.353

Metallic iron ... 66.80

Schistose magnetite of marina :—

Silica	...	...	...	3.60	per cent.
Oxide of iron	...	...	...	76.50	"
Oxide of manganese	...	...	...	19.17	"
Sulphur	...	...	...	—	"
Phosphoric acid	...	...	...	—	"

99.27

Metallic iron ... 59.50

Metallic manganese ... 12.40

6. The present owner of the mine is the Imperial Artillery Department. Negotiations for purchase would probably be difficult and costly.

7. The report referred to gives the whole history of the working of the deposits. The furnaces and workshops were destroyed by the Russians in the last war, and have not been restored.

8. The Turkish Government is at present not inclined to favour foreign mining enterprise.

9. For information respecting the above-named Little Samacov mine, I cannot do better than refer to the report of Mr. Symons.

The Vice-Consuls at Dedeagatch, Enos and Gallipoli, and the Consular Agents at Ismidt, Ineboli, and Pandermi, state that no deposits of iron ore exist in their several districts.

For information as to other deposits in this Consular district, I refer to the special reports which are appended from the Dardanelles, Broussa, Rodosto, and Scutari (Albania).

In general, I may state that there are no iron mines actually being worked in Turkey.

RODOSTO.

(Mr. Vice-Consul Dussi.)

(Translation.)

Four years ago, at first a German engineer, and then an English engineer, came to see the quality and quantities of the layers of coal which are found in the different parts of the districts. In their investigations they have ascertained the existence of iron ore in the *Caza d'Inédjik*, distant from here from 20 to 25 kilometres. The roadway, which is in construction from here to *Malgara*, passes by *Inédjik* and should be a facility for the transport of the ore, which could come here in ox waggons carrying 600 to 900 kilos., and would cost 5s. to 7s. per ton. The hand labour is cheap—it would cost 1s. to 1s. 9d. per day of 8 hours work in winter, and 14 in summer.

Ships of various nationalities touch at our roadstead, to discharge cereals, and when it is required, at Constantinople.

The owners of these layers are numerous, and no one wishes to expend money in making excavations to see the richness of the ore. If there are people who would wish to make research, perhaps they would also find in the sides of the *Monts Rodognes*, quite near, layers of iron or other minerals, since the two engineers have also ascertained that argentiferous lead exists in the same *Caza*.

SCUTARI (ALBANIA).

(Mr. Shipley.)

1. Yes.

2. At *Rubigo*, in the district of *Alessio*. Nearest seaport, *San Giovanni di Medua*.

NOTE.—From *Rubigo* to *Alessio* is a distance of about five hours. From *Alessio* to *San Giovanni di Medua* is about two hours by road, but between these two latter places a better method of transport would be by the river *Drin*, the mouth of which is in the vicinity of *San Giovanni di Medua*.

3. From *Rubigo* to *Alessio* the ore (in the absence of a carriage road) would have to be transported on horse-back at a cost of about 2s. 6d. per 200 lbs. From *Alessio* to *San Giovanni di Medua* the cost by water would be about 5d. per 200 lbs.

4. Ordinary unskilled native labour at 11d. a day per man in summer and 9d. in winter.

5. No. A sample, for which I am indebted to the engineer of the vilayet, is forwarded herewith.

6. The deposit is the property of the community.

7. No.

8. No obstacle would be encountered on the part of the natives, but a concession for working the deposit would have to be obtained from the Turkish Government.

9. I am told that the *Scutari vilayet* has, on several occasions, been visited by mining engineers, who have been afforded facilities by the

Government for prospecting for minerals. The only place, however, in which ore has yet been found containing an appreciable quantity of iron is Rubigo, the district above referred to. I have no certain information as to the extent of the deposit.

CANEA (CRETE).

(*Mr. Howard.*)

Iron ore deposits exist in different parts of the island, especially in the province of Kissamo, and concessions were granted by the Cretan Government for the working of the mines. The proprietors, however, soon came to the conclusion that the ore existing was of so poor a quality, rarely, according to report, exceeding 40 per cent., that it was not worth while working them, and consequently all mining operations have been stopped for some time past.

There would be great difficulties both as to labour and transport in the island, as there are no railways and practically no roads.

The Laurium Mining Company of Athens sent experts to Crete as lately as eighteen months ago to make enquiries as to the possibilities of mining, but I understand that they have dropped all idea of starting operations of any kind in the island.

I regret that it has not been possible to obtain any more precise information.

AFRICA.

ABYSSINIA.

ADIS ABABA.

(*Mr. Clerk.*)

There is no doubt that the country is rich in iron ore, but, under present circumstances, the difficulties of obtaining a concession on fair terms, the enormous cost of importing machinery and exporting the ore, and the comparatively small demand for iron in the country itself, would entail a heavy deficit for many years on any company that undertook to work the mines. Moreover, prospectors of various nationalities have visited nearly the whole country, and the mineral rights of those districts which show most chance of paying have already been taken up by different groups of concessionaires.

Possibly the various British companies who have mineral prospecting rights in the west of Abyssinia might be willing to furnish the British Iron Trade Association with more detailed information, derived from their prospectors' reports. It is on the western side of Abyssinia, if anywhere, that the means of transport would promise any prospect of the profitable working of iron mines in the immediate future.

1. Yes. The local plough-shares and iron "shoes" which, on the end of a stout stick represent spades, crow-bars and most other agricultural implements, are smelted by the natives from the local ore.

2. In all the hills round Adis Ababa. Jibuti and Berbera are the nearest ports, both about 500 miles distant.

3. There is practically no difference in the cost of transport between the railway from Harrar to Jibuti or by camels from Harrar to Berbera, and, at the lowest, transport from Adis Ababa to either of those two ports would not cost less than £14 a ton. To Berbera, all transport is by camels or mules; to Jibuti, the same as far as the rail-head (20 miles north of Harrar), thence by the railway.

4. Mining labour could probably be furnished by Gallas or Guraguies, who are paid here at present, including their food, about sixpence per day per head. I can give no estimate of the cost of mining or loading.

5. No official analyses of ore are obtainable. I enclose some average samples taken from near Entotto, about two miles from this agency.

6. All land belongs to the Abyssinian Government, and no proprietary rights would be sold. Working rights for a limited number of years might be obtained.

7. All working is very primitive. No shipments have ever been made.

8. If the Emperor Menelek supports the mining company, the chief difficulty would be removed. But there would probably be, especially at first, endless minor difficulties, and such a company must remember that it is entirely dependent on the caprice of the Government of the country.

9. Only a competent mining engineer could give a proper estimate of the prospects of iron-mining in the regions of Abyssinia not already given to prospectors or concessionaires. My own untechnical opinion is

that until transport is cheaper and the country more educated, to attempt to work the iron here would be a dead loss; the only reason for applying for a concession would be to forestall others; to do so, a capitalist or syndicate must be prepared to lose money for many years in the faint hope of an eventual profit.

HARRAR.

(*Mr. Vice-Consul Gerolímato.*)

1. Yes, there are iron ores in Harrar district; in Hamoressa (7 miles from Harrar), in Gobeli-Amoressa (8 miles from Harrar), in Giarso, near Ghiri range (18 miles from Harrar), and it is just reported that new iron ores have been discovered near Boubassa (35 miles from Harrar).

2. The nearest shipping ports capable of admitting ocean steamers are Berbera, Aden and Jibuti. Berbera and Jibuti are about 200 miles from Harrar.

3. The transport of ore by railway to Jibuti would cost about £4 per ton, and about the same to Berbera by camels.

4. The available labour would be Gallas, and would cost sixpence per day for each man. I cannot give an estimate of cost of mining per ton.

5. There are not any official analyses of ore obtainable. There is sent a sample taken in the bed of the river Amoressa which, I think, may be classed Fe_3O_4 , which is not ore, as it is found in the sand on the bed of the river, but some 10 miles north of that river are mountains from where this stuff is carried away, from the crystalline schists and basalt visible to the eye.

6. These ore belong to Government, and it is not allowed to Europeans to buy land.

7. The natives collect the iron found in the bed of the river and make out of it their knives, spears and other tools, but the deposits have not at all been worked here.

8. There are no obstacles if Government allows the work.

FRANCE (POSSESSIONS OF).

ALGERIA.

ALGIERS.

(*Mr. Consul-General Hay Newton.*)

1. Deposits of iron ore exist.

2. They are:—

(1) *Sidi Abd-er-Rahman*.—16 kilometres west 15° of Ténès. Hematite with traces of copper pyrite, in thick layers. Evidence of ancient workings, at present unexplored.

(2) *Djebel Hadid* (conceded).—45 kilometres south 40° west of Ténès. Hematite forming successive deposits, partly at the contact of the cartenian and the limestone, perhaps nummulitic, themselves supported by the superior cretaceous shale, partly in the cartenian. Very completely explored, but working not yet begun.

- (3) *Temoulga*.—21 kilometres $\frac{1}{2}$ east 4° north of Orleansville, and 1,800 metres south of Temoulga station. Tender hematite more or less at the surface over a considerable area in the neocomian lime, apparently transformed. Rather fine ochre is found on one point. The ancients worked this deposit, and it has again been worked in the open air from 1872 to 1876.
- (4) *Tiberkanin*.—1,500 metres south of Orleansville. Tender hematite, apparently disposed in two big layers in the neocomian lime. Some open air workings in 1875.
- (5) *Les Attafs*.—28 kilometres east 8° north of Orleansville, and four kilometres south-west of Les Attafs Station. Tender hematite at the surface in the neocomian lime on the east side of the Djebel Temoulga, but over a restricted area. Slightly explored in 1875.
- (6) *Larrath*.—Three kilometres from Villebourg and 35 kilometres west 14° south of Cherchell. Vein of tender hematite with clay gangue more or less hardened in the senonian shale. Not worked.
- (7) *Messelmoun*.—19 kilometres west 18° south of Cherchell. Vein of clay gauged hematite, more or less hard, in the modified cartenian marls. One of the veins of the concession is galeniferous and in the senonian. This mine was actively worked originally; the works have been stopped since 1881.
- (8) *Soumah* (conceded).—Nine kilometres east 27° north of Blida. Vein consisting of hematite at the surface and carbonate in the thickness; the latter very oxidable and associated with pyrites; there are also traces of pyritic copper, the deposits are embedded in the galt. Originally was very actively worked, but the works have been stopped since 1883.

3. The shipping ports are:—

For Mouzaiaville	} Algiers Harbour.
For Les Attafs	
For Blida	
For Orleansville	
For Ténès, Ténès Harbour.	
For Cherchell, Cherchell Harbour.	

The cost of transport per railway is:—

Paris, Lyons, and Mediterranean Company (Algerian lines):—

By truck loaded to 8,000 kilos minimum, or paying for that weight, 4.90 francs. per ton and per 100 kilometres. By five trucks loaded each to 10,000 kilos minimum, or paying for that weight: Up to 25 kilometres, 0.06 francs. per ton and per kilometre; from 26 kilometres to 100 kilometres, per ton and per kilometre 0.03 francs. extra; over 100 kilometres, per ton and per kilometre 0.025 francs. extra.

East Algerian Company.—

(1) Up to 25 kilometres	...	0.10 francs. per ton.	} per wagons loaded to 10,000 kilos or paying for that weight. Minimum 1.50 francs. per ton.
26 kilometres to 50 kilometres	...	0.06 francs. extra.	
51 kilometres to 200 kilometres	...	0.04 francs. extra.	
Over 200 kilometres	...	0.02 francs. extra.	

(2) For at least 50,000 kilogs.: From 1 to 300 kilometres, 0.04 francs., with a minimum of 1.50 francs. per ton; over 300 kilometres, 0.02 francs. extra.

(3) Per despatch of at least 100,000 kilogs., or paying for that weight, and only from the 1st November to the 31st July (of each year). As Section 2 with a minimum of 1.90 francs. per ton, station dues included.

(4) Per despatch of at least 5,000 kilogs., or paying for that weight, if the sender finds an advantage, 0.10 francs. per ton and per kilometre, with a minimum of 1.50 francs. per ton, station dues included.

The cost of transport per road would be from 0.50 francs. to 1.00 francs. per ton and per kilometre, according to circumstances. There are no canals.

4. Miners, 6.00 francs.; labourers, from 2.00 francs. to 3.00 francs. per day. Arabs, Kabyles, Italians, French and a few Spaniards. The cost of handling, mining, or loading is dependent on the circumstances, but an average of 2.50 francs. per ton would be a fair one.

5. No official analyses are obtainable, and the (or any) samples forwarded would be unreliable unless picked by a competent person, on the spot of the mine or otherwise.

6. The proprietors of the deposits have in general too high an opinion of the values of their discoveries and properties; nevertheless, they would yield to reason if it were shown clearly to them that the deposit will, in all probability, yield so much profit and no more.

7. See reply No. 2. It would be nearly impossible to obtain accurate figures of the quantities shipped so long ago, the ports of destination were Holland, Belgium, France, Germany, and the United Kingdom.

8. There are no special obstacles to successful mining, only the rules and regulations on the matter have to be complied with.

9. The greatest difficulty resides in the means of transport, the railways and roads are rare, not to say nil. Nevertheless some of the mines are near a railway, but the cost of transport is too high for such a poor substance; the Chamber of Commerce, the "Délégations Financières," and the Government-General are petitioning the Minister for Public Works to obtain a large reduction of these costs.

The iron ore deposits are numerous in Algeria; their conditions and ages vary considerably. The surface veins of hematite are generally tender and extend over a large area in limestone of various ages; they supply ores nearly free from undesirable matters. These deposits are generally workable in the open air, in the west, the greater number of them are at close distances to the sea; at a certain depth the iron exists as carbonate, siderose and ankerites are also met with. In the interstratified deposits the ore is an association of oxydulised iron and red hematite or oligist; the most important of these is the Mokta el Hadia one at Aïn Mokra.

At Aïn-Oudrer (Algiers) the ore, remarkable exception, is localised in a quartz level, and has the same structure as the quartzites.

Besides the deposits recognised by the Mining Department, there exist others, the discoverers of which hesitate to declare them, owing to the grievances they have against the Mining Department; some of these are of considerable value.

BÔNE.

(*Mr. Vice-Consul Croix.*)

1. Important deposits of iron ore have recently been discovered.

2. "L'ouenza," between Morssot and Aïn-Juetar, "Djebel-Boukadra," at the south of L'ouenza. The nearest port is Bône.

"L'ouenza" is situated at 100 miles from Bône, "Djebel-Boukadra" at 115 miles from Bône.

3. No railway or good roads exist between these places and Bône. Should a railway be made the transport might cost about 4 centimes per ton per mile.

4. Natives, Italians and Maltese miners could be employed at the rate of 3s. to 4s. per day.

5. Official analyses cannot be obtained, but according to information the ore of L'ouenza contains 55 to 60 per cent., that of Djebel-Boukadra 50 to 55.

6. These deposits belong to the State and were to be put up for auction during 1904.

7. The deposits have not yet been worked.

8. Cannot answer.

9. The "Mokta" mines, situated at 25 miles from Bône, have been worked during 45 years. About 30 million tons have been shipped to Holland, France and the United States. The deposits being now almost exhausted, the works are to be stopped in 1904.

ORAN.

(*Mr. Vice-Consul Barber.*)

1. Yes.

2. Benisaf, Bourkourdane, and Bar-el-Maden, to the west, and Kleber-Orous to the east of the port of Oran; these deposits are being worked.

Benisaf has its own port, situated some 60 miles to the west of Oran.

Bourkourdane will ship from the port of Benisaf.

Bar-el-Maden ships from an open roadstead named Honäine, about 20 miles to the westward of Benisaf.

Kleber-Orous have not yet commenced shipping; they have projected a narrow-gauge railway from their mines to the port of Arzew, some 20 miles to the east of Oran; both Benisaf and Arzew are ports capable of admitting large ocean steamers, and the former is fitted with appliances for the rapid loading of steamers, some 2,000 tons a day being, as a rule, the quantity shipped.

Arzew is not yet supplied with any special appliances, but no doubt would speedily be so, if the shipments become sufficiently important to warrant such an expense.

Besides the above deposits which are being worked, there are numerous surface indications that iron ore exists in this Province, in fact, the whole of these indications or deposits have quite recently been prospected on behalf of British interests.

3. Everything, of course, would depend on the distance of the mine or deposit from the shipping port.

In the case of Benisaf and Bourkourdane the cost of carriage must be very small indeed, the deposits being close to the port from whence it is shipped.

In the case of Honäine, there is about 5 or 6 miles of ærian railway. I have no means of ascertaining cost, but it must be very low indeed.

4. Spaniards, Moors and Arabs; they earn about frs. 3 per day, and are good steady workmen. I cannot give cost per ton, but from above an idea can be formed as to what it would cost per ton for mining or quarrying, and also for loading on carts and railway trucks.

5. The following are analyses of Benisaf and Kleber-Orous, and Bar-el-Maden :—

The Benisaf mineral gives an average of 59 per cent. of iron and 2 per cent. of manganese.

Bourkourdane is the same as Benisaf.

Kleber-Orous :—

Peroxide of iron	...	...	54.035	per cent.
Bioxide of manganese	...	...	3.137	"
Oxygen	...	...	23.176	"
Magnesia	...	...	Traces.	"
Lime	...	...	5.350	"
Loss through calcination	...	...	9.000	"
Insoluble residue	...	...	4.702	"
			100.000	"

This mineral contains neither aluminium, sulphur, or phosphorus.

Bar-el-Maden :—

Iron shows an average of 53 per cent. and manganese 9 per cent., after calcination.

6. None of the above named, which are working, are in the market, only the unworked deposits, of which I am informed there are several, more particularly on the western limit of this province, and near the Morocco frontier (it is, however, perfectly safe there) there is to be found magnetic, hematite and manganiferous iron, I can obtain no analysis of the deposits. I do not know the financial position of the owners, nor is it possible for me to say what is, or would be, a reasonable price. Sellers' and buyers' opinion would probably differ on this subject, and buying an unopened or unworked deposit seems to me to be much like buying a "pig in a sack," for it is only after it has been opened up that its value can be ascertained, and only then would it be possible to say if price was reasonable or not.

7. The mines of Benisaf have been worked now some 30 years, and are still in full prosperity. That of Honäine some 5 years. The quantities that have been shipped are as follows :—

To—	QUANTITY.				
	1898.	1899.	1900.	1901.	1902.
United Kingdom	Tons. 190,083	Tons. 183,257	Tons. 127,594	Tons. 168,177	Tons. 203,218
Holland	103,925	141,635	198,566	198,232	113,858
France	39,265	28,714	21,786	41,677	32,868
Belgium	14,694	—	—	—	15,238
Germany	17,852	16,945	14,699	—	—
Austria-Hungary	1,100	—	12,128	4,352	3,114
America	—	22,592	20,324	—	26,401
Totals	366,919	393,143	395,097	412,438	394,697

Honäine (Bar-el-Maden); all to Rotterdam :—

1898	...	...	...	...	13,704 tons.
1899	...	...	...	...	68,944 "
1900	...	...	...	...	69,864 "
1901	...	...	...	...	38,490 "
1902	...	...	...	...	39,106 "

The Benisaf mine is the property of the "Compagnie des Minerais de Fer Magnétique de Mokta-El-Hadid."

The Bourkourdane is the property of Mr. Theys, of Brussels.

Bar-El-Maden (Honäine) is the property of Messieurs Muller, of Rotterdam.

Kleber-Orous belongs to the Société Franco-Algérienne.

8. I see no obstacle whatever to the continuation of mining in this district, on the contrary, I believe there is a good future in store for it, and that not only for iron but for lead and other ores, the configuration of our country being in every respect similar to that of the South of Spain, the which is so rich in these metals.

Our province is so sparsely peopled that immense tracts of territory have not yet received the prospector's visit.

PHILIPPEVILLE.

(Mr. Vice-Consul H. Scratchley.)

The Vice-Consul at Philippeville writes: "As regards the different questions asked in the memorandum, it is exceedingly difficult to give satisfactory and trustworthy answers. For the mines working, the only serious operations are those belonging to the Mokta el Hadid Company. The labour available is European, as miners, and Arabs, as labourers. Europeans expect to earn from 4 to 5 francs a day; Arabs, 1 franc 50 cents to 2 francs 50 cents. I have not been able to obtain any official analyses of the ore, or any sample."

The following list of Iron Ore Deposits in the Department of Constantine, Algeria, is attached to this Report.

(1.) Mines conceded and worked during the year 1903.

Name of Mine.	Name of Persons exploiting the Mine.	Address.	Port of Embarkment and Distance.	Observations.
Ain Mokra ...	Mokta el Hadid Company.	26, Avenue de l'Opera, Paris.	Bône, 32 kilom.	Has been worked successfully for the last forty years.
Korazas ...	"	" "	" 16 "	" "
Bon Hamra ...	"	" "	" 4 "	" "
La Mebondja ...	Sie. des Acieries et Forges de Firminy.	Firminy (Loire)	" 18 "	Recently commenced operations.
El M'kimen ...	Sie. des Hauts Fournaux.	Chasse (Isère) ..	" 20 "	—
Timezrit ...	M. Portalis ...	Poissy (Seine & Oise).	Bougie, 32 "	Recently commenced operations.
Djebel Anini ...	Cie. des Minerais de Fer de Djebel Anini.	St. Etienne (Loire)	" 110 "	Worked for the Blende ores. The distance from port renders the working of the iron onerous.
Ouenza ...	Sie. Africaine des Mines.	18me Grignan, Marseilles,	Bône, 170 "	This mine has been much spoken of of late, and is said to be a splendid concern.

(2.) Mines conceded and not worked during the year 1903.

Name of Mine.	Name of Persons exploiting the mine.	Address.	Port of Embarkment and Distance.	Observations.
Filfilah ...	M. Lesueur ...	Philippeville ...	Philippeville, 20 kilom.	No work has been done in the Filfilah mines for the past twenty years. The absence of a railway renders economical working impossible. The proprietors might be willing to sell if it were possible to get all three to come to terms, and sell to one company.
Ain ben Merouen	Sie. Anonyme de l'Halia Filfilah.	Lille (Nord) ...	Philippeville, 20 kilom.	
Fendeck ...	M. A. de Sonis ...	Jemmapes ...	Philippeville, 20 kilom.	
Ain Sedma ...	Sie. Anonyme Lièges de la Petite Kabylie.	60, Rue du Rocher, Paris.	Collo, 10 kilom.	Nothing has been done for a long time. Lavish expenditure ruined the company who started work.
Marouania ...	M. Jos. de Poorter.	1, Rue de Constantine, Bône.	Bône, 25 „	It is said that this mine is on the point of being worked by the Mokta el Hadid Company.

MADAGASCAR.

ANTANANARIVO.

(Mr. Consul Porter.)

1. Deposits of iron ore of excellent quality exist throughout the greater portion of the central provinces of Madagascar.

2. Of these the best known is situated about 30 miles east of Antananarivo, on the western border of the forest belt. The nearest shipping port capable of admitting ocean steamers is that of Tamatave, distant 200 miles.

3. Transport to Tamatave is by road, the rate being £5 per ton.

4. Native labour is obtainable at an average wage of 1s. per day. No estimate of the cost of mining can be given, as the deposits have never been properly worked.

5. No official analyses of ore from Madagascar appears to have been made.

6. All mines and mineral deposits in this Colony are the property of the Government. Permission to work minerals is granted to Europeans in accordance with the terms of the Mining Law of the 20th of July, 1897. Only one or two such permits have been applied for. The total output is insignificant.

7. Deposits of iron ore in the locality mentioned in paragraph 2 have been worked in a primitive manner by natives during the past 70 years. It is from this region that the ore has been obtained for the manufacture of native implements, such as spears, spades, hatchets, &c., which are used in the neighbourhood of Antananarivo. The amount of iron thus produced by the natives averaged from 12 to 14 cwt. per week.

8. The high rate of inland transport (£14 per ton up country, and £5 per ton to the coast) constitutes an insurmountable obstacle to successful mining in this district.

TAMATAVE.

(*Mr. Consul Sauzier.*)

I am unable to answer the questions in the memorandum, and this for the reason that, although iron ore is stated by the mining authorities to exist in almost every part of Madagascar, it is worked only in the central provinces, that is, in Tenerina and in the Betsileo country, or, in other words, in the district of Mr. Consul Porter.

I have never heard that iron ore was actually found and worked in my consular district; while it is well-known that several concessions were granted in 1900 to natives in the province of Manjakandriona, at about fifty kilometres from Antananarivo, on which iron ore has been found and worked; but it is not possible for me to say what quantity of iron ore was extracted or worked, nor can it be possible to say the weight of the iron produced, nor if official analyses of the ore has been made and can be obtained.

The quality of the iron, however, is poor, and this is no doubt due to the means by which the natives work the iron ore; for coals have not been found in Madagascar as yet, and as roads are almost unknown, the natives are obliged to remain in the vicinity of forests where the iron ore is smelted by rudimentary means, the principle of which is similar to the "méthode catalane," as was stated in 1898 by Captain Guyon, the then chief of the mining service of Madagascar.

At any rate what I am positive of is that the iron industry is in its infancy in this country, and cannot even suffice to meet the wants of the local consumption, say, of Antananarivo.

I can also say that the nearest port from the now known ore deposits would be "Adevoranto," which is at about two hundred and twenty kilometres, and that to reach the steamer the ore would have to come down by road and, for a short way, by water, thus making the transport cost at least £10 to £14 per ton, which would be quite prohibitive.

SENEGAL.

DAKAR.

(*Mr. H. G. Mackie.*)

EXTRACT from Letter received from the Director of Public Works for French West Africa, dated February 22nd, 1904.

You have asked from my Bureau of Mines some information regarding the extent and working of iron ore in Senegal and its dependencies.

I have the honour to inform you that there does not exist at the present time, in the territories of this Colony, any industrial working of this mineral.

The mineral, in the form of laterite, sometimes very compact, is found, nowever, in abundance in certain regions of Upper Senegal and Upper Gambia (Badon, Beledougou, Diebedougou, &c.). In these countries the extraction of the metal is made by the blacksmiths themselves; the method in use consists in treating this laterite by smelting in cylindrical earthen furnaces three to four metres high; the amount of production is small, for it is limited to the manufacture of native tools for local necessities. No official analysis has determined the exact composition of the ore, but several official assays have mentioned, it appears, a proportion of one-third pure metal.

Such is the information which it has been possible for me to furnish you in this matter.

GRAND BASSAM.

(Mr. Vice-Consul Armstrong.)

1. Yes; large deposits but segregated.
2. In the lower Sanwi Province of the Cote d'Ivoire. Assinie—20 miles by land, and 30 by water.
3. About £10 per ton. Land, carriers, and water, by launches.
4. Conditions here existing do not allow of a categorical answer.
5. No analyses.
6. Government land.
7. No.
8. No roads, and no cheap transport. If this were provided, there would be no difficulty.
9. Iron ore has not been explored for its economic value. There are large surface outcrops, but depths are unknown. The composition of the ore varies from pure FeO to anything below, and all admixture from FeO to Fe₂O₃.

The FeO appears like a furnace slag and is considered stigmatic, resulting from the decomposition of pyrite in overflowing Diabase rock long since entirely decomposed and now structureless. P. and S. contents are unknown, but these substances are probably absent.

GERMAN EAST AFRICA.

(Copy translation of a Letter from the Governor of German East Africa to Mr. Sinclair, Zanzibar.)

Besides many small lodes which are not of sufficient importance to be taken into account as far as European interests are concerned, there are three localities which, owing to favourable conditions for transport, &c., might be exploited with satisfactory results. So far no European trade in iron ore has been carried on.

The first of these iron fields is at Uluguru, near Hudussi (Mount Ludsanda) in Upper Mgeta; here the soil is heavily ferruginous, and there are large blocks of ironstone, and in Upper Mbakana, in the Uluguru Mountains, a lode of rich iron ore exceeding half a metre in thickness has been observed and traced for upwards of a hundred metres.

The chemical analysis of the Hundusi iron is as follows:—

FeO₂ 1·85, Fe₃O₄ 65·52, M₂O₃ ·16, CaO ·17, MgO ·69 : residue 30·88—
total 99·27.

The analysis of ore from the Mbakana-District is as follows:—

TiO₂ 25·31, Fe₂O₃ 63·49, M₂O₃ 0·22, CaO 0·38, MgO 2·15 : residue 7·43—
total 98·98.

From the above it will be observed that the first sample alone would be useful for smelting purposes, the high percentage of titanium in the latter rendering it unsuitable.

The port nearest these iron fields is Dar-es-Salaam, some 150 miles distant, and the transport to the coast would have to be made by porters at a cost of about two hundred and twenty-seven rupees per ton. When a railway is built connecting Uluguru with the coast the transit will, of course, be naturally reduced.

The two other iron fields are in the Kinga or Livingstone Mountains, not far from Lake Nyassa. At Mount Liganga there is a bed of iron ore some ten metres in depth, and extending over four miles. At Lipura there is a bifurcated lode several hundred metres in length averaging some fifteen metres in depth. Here, too, are large quantities of ore on the surface in the form of huge blocks.

The ore from these localities would appear to be clean and of good quality, but analyses have not yet been prepared. The Liganga Mountain may possibly be capable of being exploited with profit, owing to the small cost of working, as thousands of blocks of ore are lying on the surface. The transport, however, presents a difficulty, as Lake Nyassa is four days' journey distant, and the intervening country is rough and difficult.

At Lipura there are also rich blocks of ironstone, and the question of transit not so difficult. Lake Nyassa is only one day's journey distant, and the nature of the country is such that a trolley railway could be run with comparative ease.

LIBERIA.

(Mr. Consul MacDonell.)

1. In various parts of the Republic of Liberia deposits of iron ore exist.
2. No definite information is obtainable with regard to exact position of deposits; from enquiry, from natives and others, I have ascertained that large deposits are extant at about 200 or 250 miles from this port (Monrovia), in a north-easterly direction.
3. No means of transport exist, the roads are only native bush tracks. Cost of transport would be prohibitive, as ore would have to be carried on the backs of natives, and each load would not exceed 60 lbs.
4. Cost of native labour varies, but may be calculated at one shilling a day, exclusive of food. Cost of loading on trucks is inapplicable.
5. No analyses exist, either official or other.
6. The deposits are held by native chiefs, who are in no way subject to the Liberian Government. The West African Gold Concessions Company hold mining rights over the counties of Messurado and Maryland.
7. The deposits are worked by natives, who extract the ore in a most primitive manner. When worked into bars, the iron is used as currency.
8. The obstacles are many: (1) The intricacy and unsatisfactory condition of the Liberian laws; (2) The laws prohibiting foreigners holding property or trading in the interior; (3) The absolute lack of means of transport.
9. It is impossible to give any definite information with regard to the deposits. There is no doubt that they exist and are worked by the natives in their primitive way, but, up to the present, nothing has been attempted by Europeans. This is due to the local laws prohibiting foreigners from holding property in the country or trading with the interior, and for this reason, no roads, railways or other means of transit exist. The information given above I have obtained chiefly from one of the only educated men who has ever been to the place where the ore is mined, and from reports of natives. No official or authoritative reports are obtainable.

MOROCCO.

DAR-AL-BAIDA.

(*Mr. Consul Maclean.*)

I have caused inquiries to be made throughout this consular district, and the result is that I conclude that there are no iron ore supplies at present available.

There are numerous iron ore deposits, and there is ample evidence of ancient smelting works with mounds of tailings in their vicinity. Down to the present all prospectors have been regarded with great suspicion, and consequently no scientific investigations have been possible.

During the last year and quite recently parties of Frenchmen, at least one of which represented the Creusot works, have been exploring for the purpose of prospecting for minerals. Another of these parties came from Beni Saf, in Algeria.

I would recommend the British Iron Trade Association to send out one or two prospectors, young, energetic, and tactful men, who would not mind running certain risks, working on their own responsibility, but with the unofficial assistance of His Majesty's Consular Officers; these commissioners could obtain results which would be of considerable potential value. If they had experience of iron ore deposits in Algeria it would be of advantage.

Unless some such steps are taken, it will be found, when the moment for exploiting this country arrives, that competitors are in a superior position with regard to the possession of information.

With the exception of Mr. Madden, whose report is appended, all the Vice-Consuls under my superintendence have reported that they can obtain no information.

I have looked through an extensive reference library of works on Morocco with the object of tabulating all possible information bearing on iron ore deposits, but I find nothing on the subject which would be commercially useful, beyond the indication of localities where there are iron ore deposits. Their extent and the quality of the ore are only touched upon lightly.

Should the British Iron Trade Association act upon my suggestion, I would be in a position to give their commissioners considerable assistance, but the latter should be careful, on their way out, to avoid stating their business or profession.

REPORT FROM MR. MADDEN, Vice-Consul at MOGADOR.

1. Iron deposits exist in the "Djeibel Hadid," or iron mountain: clinkers are to be found there, remains of ancient workings, supposed to have been carried on by the Romans. A French geological party, now at work in South Morocco, recently visited the iron mountain and, I am informed, expressed a very poor opinion of the iron deposits there, saying it would not pay to work them.

2. Nearest port is Mogador. The iron mountain is about 20 miles north of Mogador. There is a spot on the sea-shore, called Point "Hadid," where the natives keep boats, which is in close vicinity to the iron deposits.

3. No railways, roads or canals exist; transport only by camel or mule, carrying 3 to 4 cwt. each.

4. No mining labour available, as mining is not allowed in Morocco. An expert prospector would be required to estimate cost of mining on the spot.

5. No.

6. Everything is in the hands of the Moorish Government, without whose permission mining could not possibly be undertaken.

7. No, with reservation in answer No. 1.

8. Same as No. 6; export of iron is not allowed.

9. Iron exists near Agadir, in Sus, so I learn from a British merchant here, who says he sent samples home years ago. It is surface iron in the form of "nodules," mixed with stone, and of a very pure quality. Agadir, however, is a closed port, and lies about 70 miles below Mogador.

TANGIER.

(*Mr. Consul White.*)

I have the honour to report that no trustworthy information is obtainable as to the existence of minerals in this consular district, as there exist no reports on the subject. So far as I am aware, no portion of this country has ever been thoroughly prospected by competent persons, or borings made, and therefore, beyond the existence of ferruginous springs and the general appearance of the soil, which would point to the existence of iron in some form in some districts, there are no data on which to base a report.

His Majesty's Vice-Consul at Fez informs me that amongst the natives iron ore deposits are believed to exist in the mountain ranges north and north-east of Fez, but no mining operations have ever been carried on, either there or elsewhere in this consular district. Should ore exist in this district, the port of shipment would be Tangier or Laraiche. Transport at present is entirely by camel, mule or horse, the cost varying; but it may be estimated at thirty to forty shillings per ton.

The natives have no experience of mining, but most of them are accustomed to agricultural labour, digging with hoes.

The cost of labour may be calculated at one shilling to eighteen pence a day, but would rise with an increased demand.

Except in certain districts where the land belongs to the Crown, it is generally held by small proprietors. No land, however, can be purchased by foreigners without the previous consent of the Moorish Government, which is never given except in the case of land in the immediate neighbourhood of Tangier.

Hitherto the Moorish Government has refused permission for mining operations in this country.

PORTUGAL (POSSESSIONS OF).

ANGOLA (LOANDA).

(*Mr. Acting-Consul Brock.*)

1. Deposits of iron ore are reported to exist in this consular district.
2. I have been unable to locate the exact positions.

3. It is impossible to estimate cost of transport to the coast, owing to the imperfect system of inter-communication. There is only one railway, roads are little more than bush paths, and canals there are none.

4. Native labour would cost about 1s. 6d. to 2s. per day, if it could be obtained; it is not plentiful, and it would take a long time to accustom the natives to work so foreign to them as quarrying or mining.

5. No official analyses of ore are available, as far as I can gather; the Lisbon Museum is the most likely place to see samples of ore, should there be any.

6. Proprietors of land bearing deposits of ore would be likely to sell on reasonable terms.

Should such deposits exist on Crown property, grants of land would be conceded; but a Portuguese subject should figure as the concessionaire.

7. There is no proof of ore ever having been seriously worked.

8. There are no special obstacles in the way of successful continuous and unencumbered mining, except the uncertainty of the existence of payable ore. It is, however, highly probable that, should mining be carried on here on any scale, the industry would be taxed in some way or other.

9. There is little or no reliable information available about the minerals of this country; they have never been systematically or continuously worked, and one is dependent upon tradition for most of the information.

It is said that the Marquez de Pombal, some 150 years ago, caused iron ore to be raised in the Luinha district, but the operations could never have been much more than experimental.

LOURENÇO MARQUES.

(*Mr. Acting Consul-General Baldwin.*)

1. Yes.

2. (a) District of Lourenço Marques. (b) Chibuto, district of Gaza. (c) Panda, Inhambane district.

Nearest ports and distances: (a) Lourenço Marques, about 25 miles. (b) Chai-Chai, about 25 miles. (c) Inhambane, about 60 miles.

3. (a) Road and rail, rate depends on the distance of mine from rail. (b) Road, rate depends on the distance. (c) River, uncertain.

4. Unskilled native labour. Cost, about £3 per month per man; cannot estimate cost of mining. Cost of handling into carts or trucks, about 5s. per ton.

5. No.

6. Proprietors are Portuguese Government.

7. No.

8. Yes.

TUNIS.

(*Mr. Consul-General Berkeley.*)

1. Yes.

2. Deposit A.—Rich iron ore. Several millions of tons in sight S.W. of Tunis port. About 140 miles.

Deposit B.—On the north coast of Tunisia, between Bizerta and Tabarka. Bizerta nearest available port. Tabarka is nearer but the port is not yet constructed for receiving large steamers. Bizerta 60 miles from the ore deposit.

3. No railway tariff on iron ore exists yet.

Deposit A.—A railway is in course of construction by the Government, which runs through this property, and will be completed in about two years. The rate would probably not exceed 5 francs per ton.

Deposit B.—Transport would not be possible except by construction of a railway; none exists yet.

4. Native and European labour obtainable at prices ranging from 1 franc and 50 centimes to 4 francs per day.

Deposit A.—Cost of quarrying and placing on truck would not exceed probably 2 francs and 50 centimes per ton.

Deposit B.—Government engineer estimates cost of working 2 francs and 50 centimes per ton, and value of same 9 francs per ton f.o.b. Bizerta, thus leaving a margin of 6 francs and 50 centimes for cost of carriage (by a railway, which may eventually be constructed) and for profit.

5. Deposit A.—Owners give analysis as—Iron 60 per cent., manganese 2 per cent., silica low percentage, and free of sulphur, phosphorus and arsenic.

Deposit B.—Quality rather inferior. The official samples give an average—Iron 50 per cent., silica 13.5 per cent., phosphorus 0.027 per cent., manganese 0.480 per cent., lime 0.700 per cent., sulphur 0.460 per cent., and arsenic 0.066 per cent.

6. Deposit A.—The owners are zinc and lead mine proprietors, in whose concession occurs the iron deposit in question. They are disposed to sell rather than work it themselves, but would probably ask a full price.

Deposit B.—The owners are a strong company, but await a solution of the railway question. They would be willing to enter into any reasonable scheme for the sale of all their output of ore to a firm willing to assist them in the construction of a private line to Bizerta, thus dispensing with Government intervention.

7. None have yet been worked in Tunisia.

8. The question of cost of transport is the only serious one.

9. As regards the more interesting deposit designated as "A":—

1. The value of the ore can be easily determined; also

2. Its cost of working and placing on truck.

3. A railway tariff would no doubt be arranged which would be amply covered by the margin resulting from the two first calculations. As stated above, the line in course of construction runs through this property, and the Government would be inclined to foster by a favourable tariff an industry which would be such a valuable source of revenue to them.

AMERICA.

ARGENTINE REPUBLIC.

BUENOS AYRES.

(Mr. Consul Ross.)

The Argentine Mining Department reports that iron ore exists in various parts of the Republic, but the extent is not known.

A copy of the report made by Mr. H. D. Hoskold, the Chief of the Mining Department in 1889 to the Paris Exhibition in regard to the Romay mines, Catamarca, is enclosed.

There is also enclosed a note containing specific replies to the questions asked by the British Iron Trade Association, which have been supplied by Mr. D. M. Munro, the British Vice-Consul at Cordoba.

The Mining Department further reports that in the Provinces of Cordoba and San Luis, deposits of Wolfgram are being worked, and small monthly shipments are being made under the name of iron ore.

According to the Customs returns, the export of iron ore during the past three years has been as follows:—

1901	...	...	...	...	...	568 tons.
1902	...	...	...	...	...	146 „
1903 (9 months)	...	...	...	...	...	153 „

In a report made on the Argentine exhibits at the Chicago Exhibition of 1894, it is stated that coal is found at San Rafael, Mendoza and San Juan, bituminous coal at Neuquen, and lignite in Tierra del Fuego.

Translation of Mr. H. D. Hoskold's Report on the Romay Iron Mines.

The Sierra de Ancaste rises at a short distance to the south of Balde de la Punta and, running in a northern direction, extends into the Province of Tucuman.

A little to the north of the town of Catamarca this chain of hills joins those of the great sierras de Ambato. Towards the east these hills, as generally happens, branch a great deal and extend over a vast tract of country, running nearly parallel with the northern railway (Central Cordoba) from Recreo Station. Frias is the name of the second station to the north of Recreo and thence, westward to the mountains, the distance is $2\frac{1}{4}$ leagues, according to the best maps.

A little further inside, the hills begin to rise, but do not reach a great height, in the neighbourhood of Albigasta. In some of these low hills veins of iron ore have been discovered, one of the well-known places in which it was found is called Sierras de los Altos.

The mines have been visited from time to time by various engineers, whose opinions are not unanimous, but there appears to be evidence that there are extensive and important mineral deposits.

They were discovered in 1873, and in that same year G. Romay obtained the concessions, and, as they are only some 18 leagues from Catamarca,

considerable interest was manifested in the concession. A preliminary company was formed to float the mineral property, but the shareholders of the Company, "Sud Americana," subscribed little capital, and, consequently resources gave out before much progress had been made in working.

The National Congress had previously issued a law, authorising the working of the mines and empowering the Government to spend (\$10,000) ten thousand dollars on the works. In the year 1875 the National Government authorised the subscription of (\$100,000) one hundred thousand dollars to a company formed with a capital of at least (\$1,000,000) one million dollars for the working of the mines and the construction of a foundry for the production of iron.

In the year 1883 the South American Company solicited from Congress a Government guarantee of 6 per cent. on the capital that would be invested up to (\$1,500,000) one million five hundred thousand dollars. In consequence, a project of law was drawn up which contained eight articles: the seventh abolished the former law that the National Executive subscribe (\$100,000) one hundred thousand dollars. For some reason which I do not know, the projected law was not put in force, and the mines were never worked.

A short time ago a Belgian mining engineer visited the mines and reported that the veins and mineral deposits were nearly inexhaustible. The discovery of one or more mines with an abundance of mineral would be of the greatest importance for the Republic, and for this reason the Government and National Congress have given every possible facility for this object.

The National Department of Mines and Geology had also had in view the general interest of the Republic with reference to mining, and in order to form a just opinion with respect to the mines of Romay, it commissioned one of the Assistant Engineers of the Mining Department to inspect them and report to the Department.

The report of the assistant engineer is dated 19th September, 1888, and shows a very favourable opinion of the mines. It says: "The amount of iron ore that exists is relatively great compared with the explorations made up to the present, and, taking everything into consideration, I am of opinion that if these were made on a larger scale, proportionate results would be obtained but, as these excavations are but small, a fair opinion cannot be formed with respect to the productive capability of the greater part of the mineral concessions which have not been explored."

The engineer adds, that want of time prevented him from obtaining more data and from making more minute investigations so as to confirm his opinion as to the great amount of mineral existing in other parts of the concession. The mineral is found in veins and deposits, but the investigations, as already stated, were not sufficient to determine the number or the general thickness. Nevertheless, portions of mineral were extracted in quantities from 3 to 5 tons, and this appears to indicate that the veins were of a fair thickness. To a question contained in the instructions given to the Government Assistant Engineer, he replied: "With reference to the veins and deposits, my opinion is that these mines offer the base of a large undertaking, which will last some considerable time." Before capital is invested in great expenditure of machinery, it is necessary to determine the extension of the mineral property, and make more genuine experiments in all its parts. In this manner the length and number of veins and other deposits will be investigated, and, consequently, the producing conditions will be found. It is very improbable that the product will be greater than can be expected from the mineral in sight.

It is necessary, therefore, to form a preliminary company and, when this has been done, to put up kilns and appliances sufficient to ensure the carriage of the products of the mines and the requirements of the markets of the Republic, without that undue outlay of capital which so frequently occurs in this class of business.

The mineral has been assayed and the result published on various occasions, and the following analysis is made by Dr. Kyle:—

Iron	52.64
Oxygen	19.18
Aluminium	1.80
Magnesia	2.46
Titanic Oxide	16.70
Sulphur	0.10
Silicate	6.40
Water	0.72
	<hr/>
	100.00

The following analysis was made by Mr. Riley, of London:—

Silicate	2.55
Peroxide of Iron	52.21
Protoxide	14.89
Aluminium	5.40
Titanic Acid	18.17
Manganese Oxide	0.97
Manganese	4.28
Water	0.93
	<hr/>
	99.40

Yield in metallic iron, 48.25 per cent.

Another analysis by Dr. Kyle is as follows:—

Water	11.10
Peroxide of Iron	63.57
Aluminium	1.58
Lime	0.33
Sulphur	0.24
Silicate	23.26
	<hr/>
	100.00

Dr. Kyle states that there is a species of iron ore, rich in quality, for the manufacture of iron, and which contains 44.53 per cent. of iron metal, without titanitic acid and without phosphorus. In the other analysis, which Dr. Kyle made in December 16th, 1886, he found 54.81 of iron in a state of oxide of iron and magnetic oxide.

A sample of iron ore, hydroxide of iron (hematites), for the same mines was analyzed by Dr. Puiggari in 1885, and contained 63.96 of peroxide of iron, and gave 44.76 of iron in metal. Consequently, there is no motive for doubting the quality of the iron ore, and it only remains to verify what quantity can be produced yearly during a series of years. But this is a question to which I personally cannot reply, nevertheless there is no reason to doubt the declarations given by the assistant engineer to the Government.

The general materials required for the smelting of iron, such as limestone and other flux, and wood for the charcoal, exist in abundance within the limits of the mine. The quality of the iron produced by charcoal will be of more value than that produced by coke.

The actual distance from the railway to the mines is comparatively short, so, consequently, the transport will be cheap. About $1\frac{1}{2}$ leagues to the south of the river de la Toma, which forms the southern limit of this same, are to be found other deposits of iron ore of the class called hidroxide of iron (hematites), it is of excellent quality, as shown by the analysis made by Dr. Puiggari above quoted. The assistant engineer, before mentioned, did not visit the locality in which the hidroxide of iron mines are situated, consequently I have no data to enable me to determine their productive condition.

It is some fifteen years ago that some miners employed themselves in experiments on a ferruginous mineral for the silver which it contained, and in this manner the hidroxide of iron deposits were discovered. The greater part of the rocks, of the locality in which Romays' mines are situated, consists of granite, mica, and schist, with veins of quartz of the primitive period. There are also to be found strata of schist, containing deposits of graphite between the layers, which do not appear to be of any commercial value. The owners of these mines have sent another petition to Congress asking for a guarantee of 6 per cent. on the capital invested, which is still under consideration.

The Department of Mines and Geology has shown itself in favour of the project of the Commission of Agriculture, but has suggested various modifications in the original project.

The nominal capital it is supposed is (\$2,000,000) two millions of dollars, and the South American Company have two years to collect sufficient capital and commence mining operations and the foundry.

REPORT from Mr. MUNRO, Vice-Consul at CORDOBA (Argentine Republic).

1. Yes, the "Romay" mines.
2. Situated in the Province of Catamarca, distant from Frias Station, Cordoba Central Railway, two and a quarter leagues west. The nearest shipping port is that of Rosario de Santa Fe, admitting ocean steamers, and distant from the above-mentioned Frias Station 477 miles.
3. The present rates from Frias Station to Rosario Port are:—
 - Rough ore, \$16.41, paper, per ton of 1,000 kilos, minimum 10,000 kilos.
 - Calcined ore, \$20.30, paper, per ton of 1,000 kilos (roasted), minimum 6,000 kilos.
 - Pig Iron, \$27.66 per ton of 1,000 kilos, minimum 6,000 kilos.
4. Common, native, labour is available at from \$30 to \$40, paper currency, per man per month. Miners are paid from \$20 to \$60 currency per metre of tunnelling, according to the hardness of the ore. Loading on carts may be paid by the month to the labourers, or contracts made per ton, but the cost would work out about the same.
5. See analysis on previous page.
6. The present proprietor is Senor Vicente Juez, of Tucuman. This gentleman would probably be willing to sell, but on what terms is not known. He has recently obtained from the Government of Catamarca the concession to work the mine, and is now endeavouring to form a syndicate for that purpose.

7. The deposits were worked superficially some fifteen years ago, a small quantity of machinery was brought up and is now useless. Some tons of ore were sent to Buenos Ayres, but Senor Juez states that no mineral was sent to England.

8. None. Fuel would be wood and charcoal.

9. Silicate of iron exists and composes the general formation of a range of hills about eleven leagues in length by two and half in breadth. It is stated that the ore gives 40 per cent. of iron. There are, moreover, fair quantities of peroxide of iron, which is found in large isolated masses, of a globular form, found also in veins of fair proportion. All the iron is what is called titanitic, *i.e.*, contains titanium. Iron pyrites are also found in small quantities; and it is probable that there are also deposits of permanganate of iron.

Since Senor Vicente Juez took up this mine, and while digging a well, he has come across several veins of ferruginous ore containing silver, and has great hopes that this silver may be found in sufficient quantity to pay for the extraction of the ore.

It is the general opinion that this property is of considerable value, and that it, and the adjacent hills, which are all more or less of the same formation, should be thoroughly surveyed and inspected by a competent mining engineer.

BOLIVIA.

(*Mr. Beauclerk.*)

1. There are undoubtedly deposits of iron ore existing in Bolivia.

2. They are mostly situated in the mountain districts, where other rich mines exist, *e.g.*, in the region of Potosi, &c.; but they have not hitherto been worked on account of the want of roads and communication with the coast. The nearest shipping port capable of admitting ocean steamers is Antofagasta—now belonging to Chili, and which is distant from the ore deposits, roughly speaking, some 450 miles, as the crow flies.

3 and 4. The labour available for mining, quarrying and loading would consist of the work of native Indians. The cost of labour, mining, and loading on reaching the railway, cannot at present be estimated, because the mines are unexploited.

5. I am unaware of any official analyses of the ore having been made.

6. At present the mines are Government property, and concessions would be granted to companies or private persons at a fixed royalty.

7. No deposits have been worked hitherto.

8. I am unaware of any special obstacles in the way of successful, continuous and unencumbered mining in Bolivia, except the perturbation occasioned by periodical revolutions; but the initial and serious difficulties of the want of roads and means of transport have first to be overcome, and the Government is not in a condition, financially, to aid in the construction of adequate means of communication.

BRAZIL.

RIO DE JANEIRO.

(Mr. Consul-General Chapman.)

1. There are extensive deposits of iron ore in the State of Minas Geraes. They also occur in São Paulo, Paraná, and in several other States.

2. What might be called the iron-ore zone in the State of Minas covers an area of considerably more than 3,000 square miles, and the Central Railway traverses the said zone for about 350 kilometres, extending from Barbacena, the nearest point to Rio de Janeiro (which is the nearest shipping port), to beyond Santa Luzia. Barbacena is distant from Rio 379 kilometres.

The principal deposits in Minas are found at Miguel Burnier, Itabira do Campo, Caraça, Gandarella, Antonio Pereira, as also at Congonhas do Campo, Taquaral, Cocaes, São Miguel de Piracicaba, Itabira de Matto Dentro, Viçosa, Uba, &c.

Many of these are favourably situated for transport by the aforementioned Central Railway, especially those of Miguel Burnier, Itabira do Campo and Caraça, and the vastness of the deposits combined with the purity of the ores constitute, probably, if not the most, at least one of the most important iron ore deposits in existence.

In the State of São Paulo, at a place called Itú, iron ore also occurs, and it is also found in the State of Paraná, near the coast, and in the vicinity of Paranaguá and Antonina.

These latter ores, however, should be classed as manganiferous iron ores owing to the varying, if low, quantities of manganese contained in same. Definite and reliable information concerning these deposits are not available.

3. With reference to the deposits of Minas Geraes and those most favourably situated, the ore would be transported by the Central Railway, which, as is known, belongs to, and is managed by, the Federal Government. The special tariff for the transport of manganese ore in vogue at the actual moment is a zone tariff, and is also applicable to iron ore, and, with exchange as at present at 12 pence, amounts to, say, Reis 6,000 (six milreis), or, say, 6s. per ton, irrespective of distance if in the zone. The elevation of the deposits, 4,000 to 4,500 feet above the sea level, facilitates considerably the cheap transport, the grade being in favour of the load.

The State Government impose a tax on mineral exported, which is generally calculated on a basis of 4 per cent. *ad valorem*.

4. The labour available is good (principally Italian), but not over abundant, and cost of same at present is reported to range from 2s. 6d. to 4s. per day.

The cost of mining, however, would greatly depend on the manner in which the deposits were worked. The outcrops are so extensive and the deposits occur under such favourable conditions for economical mining, that, providing same be initiated on a large scale, and the handling of the ore effected in a similar mechanical and economical way as occurs in the Lake Superior region and elsewhere, the cost could be calculated as inferior to that prevailing in the States, and very much below the mining costs in the Cleveland and other iron-ore regions in the United Kingdom.

5. Annexed are the analyses of the School of Mines, which are official, and also a report made by Mr. Goodchild, a chemist, on samples of ore from a property at Ubá, in Minas Geraes.

6. The owners of the properties are legion and, as a rule, poor, but they have a very clear idea of the value of their property. In the opinion of experts, however, it should be possible, dealing through some one who knows them well, to arrange purchases on reasonable terms. Possibly many would prefer to give leases of their properties on the basis of a reasonable royalty per ton.

7. Of the many deposits very few have been worked, and these only on a very small scale for local smelting, as at Ipiranga, in the State of São Paulo, and at Miguel Burnier, Itabira do Campo and São Miguel de Piracicaba, in the State of Minas.

8. Limestone of good quality is fairly abundant, but the want of a satisfactory fuel—the production of charcoal being so irregular and expensive—has greatly retarded the iron industry of Brazil, which can only be developed, to commercial advantage, locally, when the smelting of iron ore by electricity reaches industrial perfection.

But once titles are certain (Torrens registration can be obtained but not easily) there are no special obstacles to the continuous and successful mining of iron ore in Brazil, provided same be effected on a large scale and the ore handled economically, as in the United States. Factors to be borne in mind, however, are Inter-State taxation and the exchange, which, when low, favours mining in fixing cost of labour, a high rate acting in the reverse sense. The rate on London has, however, for some time past varied but little from 12 pence to the milreis (Reis 1,000).

9. A paper presented by Mr. Herbert Kilburn Scott, in May, 1902, to the Iron and Steel Institute, which contains much additional information of interest on the iron ores of Brazil, is annexed hereto.

Attention is also called to articles on coal and iron deposits and industries in Brazil, which have appeared in a new publication called the "Brazilian Mining Review." Copies can be obtained from Messrs. Ewen, Cattanach & Co., of 18, Great St. Helens, London, E.C.

Localidade	Estado	Superfície (Almódios)	Reservas (Almódios)	Produção (Tons)	Observações
Itabira do Campo	Minas	10.000	20.000	10.000	Produção local
Miguel Burnier	Minas	5.000	10.000	5.000	Produção local
São Miguel de Piracicaba	Minas	15.000	30.000	15.000	Produção local
Ipiranga	São Paulo	8.000	16.000	8.000	Produção local
...

ANALYSES OF SCHOOL OF MINES.

IRON ORES.	LOCALITIES.	COMPOSITION OF THE ORES.										TOTAL.	Corresponding to Metallic Iron.	REMARKS.
		Magnetic Oxide of Iron.	Peroxide of Iron.	Quartz and Silica.	Oxide of Manganese.	Limé.	Magnesia.	Alumina.	Titanic Acid.	Phosphoric Acid.	Loss on roasting.			
Magnetito...	Serra do Presidio.	74,022	23,292	1,623	0,000	0,000	1,02	0,000	0,000	0,000	0,3000	100,24	69,869	From the table by Dr. Paulo Ferrand, published in the <i>Revista Industrial</i> .
Itabirito ...	Gandarella	68,830	31,750	1,130	0,740	0,140	0,000	1,020	0,000	0,000	1,140	99,99	68,300	Idem.
Itabirito ...	Gandarella	Nil.	81,900	4,100	9,200	0,000	0,000	0,000	0,000	0,000	1,9000	100,100	59,400	Idem.
Itabirito compacto	Areado ..	Nil.	81,800	15,70	0,170	0,500	0,200	traces	0,000	0,000	0,500	99,070	57,260	Idem.
Oligisto granular...	Caraca ..	0,080	99,801	0,140	0,007	traces	0,000	0,000	0,000	0,005	0,000	99,953	60,860	Idem.
Hematita compacta	Itabira do Campo.	Nil.	94,000	3,400	0,000	0,080	0,000	2,400	0,000	0,000	0,000	99,800	65,800	Analysis made by Dr. A. Biot in the Usina Esperança.
Hematita compacta	Gandarella	Nil.	99,209	0,240	0,015	traces	0,000	0,000	0,005	0,455	0,000	99,924	69,666	From the table by Dr. Paulo Ferrand.
Canga ...	Ouro Preto	Nil.	79,177	9,250	0,073	traces	0,000	4,000	0,320	6,750	0,000	99,570	55,420	Idem.
Canga ..	Gandarella	Nil.	91,490	4,780	0,270	0,250	traces	0,740	0,000	2,620	0,000	100,150	64,0400	Idem.
Canga ...	Esperança..	Nil.	71,600	18,500	0,000	traces	0,0000	4,700	0,000	9,000	0,000	100,800	50,120	Idem.
Magnetito...	Ponte Soriano.	Nil.	93,842	3,500	0,000	0,400	0,200	0,000	0,000	0,000	0,165	98,107	50,120	Analysis made by Dr. H. Magalhães. (Geological Commission.)
Ferro magnetico...	"Usina Wigg" Miguel Burrier.	Nil.	98,800	1,700	0,000	0,000	0,000	0,000	0,000	0,3300	0,000	99,830	68,200	Analysis by Dr. A. Biot. (Ore analysed in the Usina Esperança.)
Itabirito compacto	Esperança..	75,020	23,980	0,500	0,000	0,000	0,000	0,000	0,000	0,000	0,000	99,500	70,00	Analysed by Dr. A. Biot. (Ore named Pico.)

0.7 per cent.
66 per cent.

{ Silica
{ Iron (metallic)

Iron ore from the town of Sabara, but presented by Sr. R. Joyeux
Analysed in the laboratory of the School of Mines in February, 1900, by Dr. Carlos Tomaz.

Report from Mr. Goodchild on three samples of iron ore, received from the quarries of Dr. Cesario Alvim (Ubá, Minas Geraes).

The samples, dried at 100 degrees Centigrade, give:—

V. 116. No. 1. Wired enclosure "Dionisio de Generoso," left side:			
	65.90	per cent.	iron ore.
V. 117. No. 2. Grotto of Domingues Pombo, left side:	68.70	per cent.	iron ore.
V. 118. No. 3. Grotto of the "Retiro Cabeceira de corugo," right side, as under:—			
Silica	...	...	2.57
Iron (ore)	...	...	69.26
Alumina	...	...	1.51
Oxide of manganese	...	...	.30
Chalk	...	...	Nil.
Magnesia	...	...	Traces.
Oxides of copper, nickel, &c.	...	...	Nil.
Arsenical acid	...	...	Nil.
Phosphoric acid	...	...	.063 (equal to .027 of phosphorus).
Carbonic acid	...	...	Nil.
Oxygen, combined with iron...	26.30		
Combined water	...	...	Nil.
			100.00

The iron is found in the form of peroxide and protoxide; and a little in the form of ore. The above analyses show that this is a first class mineral. The low percentage of silica and phosphorus, together with the absence of arsenic and sulphur, enhance the value of the mineral, which would be useful for the manufacture of Bessemer or Siemens-Martin steel. Owing to its hard and compact nature, it does not absorb water; and is consequently less liable to damage in transit.

RIO GRANDE DO SUL.

(Mr. Acting-Consul Booth.)

1. Yes.
2. The iron ore deposits known in Rio Grande do Sul are:—
 - (a) Deposits of magnetic and hematite ore in the Municipality of São Jeronymo. Transport by land, in carts, about 50 miles to Jacuhy River, from there, by water, another 50 miles to the port of Porto Alegre.
 - (b) Deposits of hematite ore in the Municipality of Cachoeira. Transport by land, in carts, about 40 miles to Jacuhy River, and by water about 200 miles to Porto Alegre.
 - (c) Deposits of rich magnetic ore at Vaccacahy, Municipality of São Gabriel. Transport by land about 10 miles, thence by rail to the seaport of Rio Grande, about 200 miles.
3. By rail probably about 20 milreis per ton.
By road probably about 30 milreis per ton.
By canal probably about 15 milreis per ton.
4. Good native miners 5 milreis per day; labourers 3 milreis per day.
5. No analysis obtainable.

6. The proprietors are poor and would sell at very low prices.
7. No.
8. The expensive transport by land and river to seaport, and high rate of freights would prevent the successful exportation of this ore to Europe.
9. The ore is known to be rich and of good quality, and the deposits are reported to be extensive, but as heavy transport expenses would make its exportation impossible, no attempt, so far, has been made at a closer investigation of these deposits. It might, however, be a lucrative undertaking to convert the ore into iron and steel on the spot, as coal, limestone, manganese and wolfram exist in the immediate vicinity of the deposits.

SANTOS.

(Mr. Consul Mark.)

Nos. 1, 2, 3, 4. In this district there are iron ore deposits at Ipanema, near Sorocaba, State of Saõ Paulo, situated at 210 kilometres by rail from Santos; at Iacupiranga, Iguape, State of Saõ Paulo, about 40 kilometres by river from Iguape; and at Antonina, State of Parana, about 20 kilometres from the port of Paranaguá. At Saõ Francisco, close by the latter in the State of Sta. Catherina, but beyond this Consular jurisdiction, are also deposits, 20 kilometres, more or less, from port.

These deposits are lying dormant, as the mining stage in this district has been little developed, so far, the enterprise having to be practically created afresh.

5. No analyses that could be considered as of industrial or commercial value (average cargo samples) are obtainable; nor could such samples be readily obtained. At all the localities mentioned the ores are magnetites, and are liable to be high in titanium (4 per cent., more or less, at Ipanema, 15 to 20 per cent., more or less, at Iacupiranga), and in phosphorus. From near Antonina and San Francisco, manganiferous magnetites are also known, but are thus far only known from small samples, which proved to be free from titanium and low in phosphorus, and these would offer the most promising field for prospecting.

6. The proprietors would doubtless ask a fairly high price for their lands, if the prospective purchaser were an outsider, and it were known or suspected that the land was desired for mining purposes.

7. Only the Ipanema deposit has been worked on a small scale by the Government, but no shipments have been made.

9. The most promising fields for iron ore prospecting in this district are in the neighbourhood of Antonina and Saõ Francisco, where the shipping facilities are excellent (or could be made so), and the ores are reported to be abundant at numerous localities. The majority of the samples that have thus far appeared from these districts are, however, highly titaniferous, and are suspected to be highly phosphoric as well. Nothing definite is known regarding the manganiferous ores, but there is a reasonable probability that they will prove to be abundant. The only way to obtain reliable information of industrial value regarding the ores of these districts, would be to send an expert to prospect them. The prospecting would be a prolonged and somewhat difficult task as the districts are

very mountainous, heavily wooded, and sparsely peopled, and no openings have been made into the ore deposits. Ores of good appearance are known to occur at various points within a short distance of the coast from Iguape to Santa Catherina, and although the greater part of them is not, perhaps, at present available industrially on account of titanium, it is quite possible that available ores will be found in sufficient quantities to be worked. Should this be the case, this region seems to be the most promising one in Brazil for the supply of shipping ores, on account of its nearness to the seaboard, and the excellence of its ports.

CHILE.

Coquimbo.

(*Mr. Consul Ansted.*)

1. Numerous deposits are known to exist in this district; not usually of great volume.
 2. Scattered over an exceedingly mountainous country, Coquimbo being the port of shipment. Distances, as the crow flies, are insignificant, but means of communication are deficient, as is also railway rolling-stock.
 3. Transport costs vary according to the situation of the deposits. An example can be given that might serve the present purpose, although the figures relate to ores other than those of iron. Mine situated some 40 miles inland. Ore carriage, on mule-back, to railway station, 9s. per ton. Railway rate to shipping port, over 45 kilometres of line, 3s. 8d. per ton. Shipping expenses about 1s. 6d. per ton.
From another deposit (of iron ore) the transport to the railway cost very little, the mine being near the line. Carriage on the State Railways over some 60 kilometres was 3s. 6d. per ton. The shipping expenses were at least 1s. 6d., as in the other case.
 4. Skilled labour mainly foreign. Manual labour scarce and not to be depended upon, population being sparse. Cost of labour, average 3s. per day, food included.
 5. The ore extracted has generally assayed upwards of 50 per cent.
 6. Owners of deposits not rich, but keenly alive to the value of their property, and usually holding exaggerated views on this point. Could best be dealt with by countrymen of their own.
 7. Deposits have been worked here and there, but not for iron smelting, the ore having been used as a flux for the silver and copper-smelting furnaces.
 8. Scarcity of labour and of water in the mining districts; a general absence of practicable roads across the uplands; and a want of adequate railway rolling stock, stand in the way of successful continuous and unencumbered mining in this district on the scale necessary for working iron ore.
 9. Extreme capacity of railways to handle iron ore would be from 3,000 to 4,000 tons per month.
-

VALPARAISO.

(*Mr. Acting Consul-General Rowley.*)

1. The following iron ore deposits are reported to exist in Chile, namely:—

- A. Picanitas.
- B. La Higuera.
- C. Cerro Grande.
- D. Romeral.
- E. Tambillos.
- F. El Peñon.
- G. Agua Blanca.
- H. Pan de Azucar.
- I. Lo Prado.
- J. Naltagua.

A.—*The Picanitas deposits.*

2. The Picanitas deposits are to be found in the district of Freirina, situated in the department of Freirina, Province of Atacama.

The nearest shipping port for ocean-going steamers is Carrizal Bajo.

The distance between the deposits and the port is 33 miles.

3. Transport has to be made by rail. The cost of transport is not known, as the "Chilian Manganese Mines, Limited," 52, Coleman Street, London, E.C., being the owners, have a special tariff.

4. There are mines in the vicinity, and the rate of wages is, more or less, two Chilian pesos per day, say, two shillings and ninepence.

5 to 9. Full information on these questions is no doubt in the possession of the owners.

The iron mines, belonging to the same Company, form seven legally-recognised claims, covering an area of 32 hectares.

B.—*La Higuera.*

2. These iron ore deposits are situated in the La Higuera District, Department of La Serena, Province of Coquimbo.

The nearest shipping port is Totoralillo, distant 10 miles.

3. Transport has to be made by carts on a badly-kept road. The cost of transport per ton may be reckoned at between two and three dollars (2s. 9d. and 4s. 2d.), according to the season.

4. Miners are to be found in the vicinity. The transport per ton in carts will cost about two dollars (2s. 9d.).

5. The following analysis has been made of the ore of the Juan Soldado mine, of this district, and copied from the official report of the Chilian Legation in France:—

Iron (metallic)	68.20 per cent.
Manganese (metallic)	Traces.
Sulphur	0.038 "
Phosphorus	0.011 "
Copper	0.011 "
Silica	1.200 "
Alumina	0.800 "
Lime	0.700 "
Magnesia	0.210 "

This sample, probably carefully chosen, would contain as oxydes 10.65 per cent. of protoxyde and 84.16 per cent. of peroxyde.

6. A certain M. Eulojio Cerda possesses seven claims, covering 32 hectares, and the others are owned by people whose names I have not been able to ascertain as yet. Mr. Cerda owns a real estate in the vicinity, estimated at about \$50,000. It is not probable that he would sell the deposits readily, as the mines are considered important.

7. The mines have been worked for obtaining fluxes for copper and silver smelting works. The output is a small one.

8. The only trouble for continuous working is the winter, during which period the cart road is impassable for two to three months.

C.—Cerro Grande.

2. These deposits are situated in the district of Pampa, department of Serena, Province of Coquimbo. The nearest shipping port is Coquimbo, distant 17 miles.

3. Transport, 6 miles by road and 11 miles by rail. The cost of transport may be calculated at 3 to 4 Chilian dollars per ton.

4. According to the aforementioned report, the cost ready for shipment at the mine would be about \$1 per ton.

5. The same report gives the following analyses, namely:—

	Per Cent.	Per Cent.	Per Cent.
Iron (metallic)	56.64	63.39	55.56
Manganese (metallic)	traces.	0.080	0.120
Sulphur	0.007	0.013	0.005
Phosphorus	0.039	0.210	0.029
Copper	0.070	0.140	0.075
Silica	9.800	3.400	12.300
Alumina	5.500	2.800	0.700
Lime	0.200	0.200	3.700
Magnesia	1.400	0.280	4.080

The iron is always found in the proportion of about one quarter protoxyde and three quarters peroxyde.

6, 7, 8. The mines belonged to Mr. Victor Sauvageot in 1890, but since that date they seem to have been abandoned.

H.—Pan de Azucar.

2. This group is situated in the Department and Province of Coquimbo. The nearest ports are Guayacan, distant $7\frac{1}{2}$ miles, and Coquimbo, distant 9 miles. There is a railway from Coquimbo to the Pan de Azucar station, the distance between the two places being 6 miles.

3. The total transport may be estimated at between 2 and 3 Chilian dollars per ton. (2s. 9d. and 4s. 2d.)

4. No details obtainable, but can be reckoned at, say, 1.75 to 2 dollars (Chilian) a day.

5. According to the report of the Chilian Legation in Paris, the following analysis is given, nearly all the iron appearing in the form of peroxyde in the ore:—

Iron (metallic)	68.81 per cent.
Manganese (metallic)	0.160 „
Sulphur	0.010 „
Phosphorus	0.036 „
Copper	Traces.
Silica	1.300 „
Alumina	1.900 „
Lime	0.300 „
Magnesia	0.560 „

6. The mines produce fluxes for the Guayacan smelting works.

7. The property, Santa Elena, belongs to Mr. Benjamin Amenabar.

8. No obstacles.

I.—*Lo Prado.*

2. The Lo Prado ore deposits are to be found in the Curacavi District, Department of Melipilla, Province of Santiago. The nearest shipping port is Valparaiso. The deposits are 22 miles from Santiago, connected by a good cart road. From Santiago to Valparaiso, 114 miles by rail.

3. The total transport will not be under \$7 per ton (say 9s. 9d.).

4. The native mining labour is cheap, being from 1 to 1.80 dollars per day. I have been unable to find out the cost of the ore.

5. Only known that the ore contains a large proportion of quartz.

6. Some of the ore has been used as flux in the smelting works round Santiago.

7. Two mines, Constitucion and San-Martin, belonging to M. Ambrosio Olivos, covering an area of about 5 hectares each. Also another mine, Manuel Guerrero, covering 3 hectares, the property of M. Jesus, Prado. Not much is known of these two gentlemen.

1.—*Naltagua.*

2. Situated in the district of Chocalan, Department of Melipilla, in the Province of Santiago. There is a cart road to Buin, distant 15 miles, then railway to Valparaiso, distant 134 miles.

3. Total cost of transport not less than 10 dollars per ton, say, 13s. 11d.

4. Refer to question 4 in the report on the Lo Prado deposits.

5. The ores are pure and contain 64 per cent. of metallic iron, in the form of peroxyde.

6. The exploitation of the mines has never been worked continuously, due to the great distance they are situated from a railway and a port.

7. The San Alejandro mine belongs to M. Daniel Charlin, and the San Jorge to the Catemu Copper Company. Each of these mines cover 2½ hectares.

Additional information.

There are, of course, many more iron-ore deposits in Chile, but they are not well known, and, being situated many miles from a railway, it is doubtful whether they would be worth working.

Only lately a French gentleman, a Monsieur Delaunay, has made a long inspection for studying the convenience of erecting iron works in Chile. The inspection has been made on behalf of the Creusot Company of France.

The Chilian dollar is worth, at the present rate of exchange, 1s. 4 $\frac{3}{4}$ d.

CALDERA.

(*Mr. Vice-Consul Beazley.*)

Translation of report kindly provided by Don Casimiro Domey Ro (? Romero), the rector of the Copiapo School of Mines.

There are numerous deposits of iron ores in this province, but owing to there being no demand for this class of minerals, they have not been properly studied.

The principal ones are as follows:—

Bandurrias.

Situated a short distance from the Chanarcillo Mineral and from the station of same. Nearest port of shipment is Caldera, 160 kilometres by railway.

Very large deposits of iron ores. Cost of extraction is estimated at \$15 per ton, of which the freight costs \$10.

The analysis gives 65 per cent. of iron. Some samples have given 3 per cent. of silica, without any trace of copper.

The ground belongs to the Government, and can be taken up by a payment of a tax of \$10 per hectare.

The mineral was worked from 1884 to 1889 for flux.

Chamonate.

Situated close to Copiapo, and 70 kilometres from Caldera. The lodes are from three to four metres wide, but in some parts run up to eight metres. Estimated cost of extraction, \$3, freight, \$2.70, in all \$5.70 per ton.

Analysis gives:—

Oxide of iron	...	...	...	...	60 per cent.
Oxide of manganese	...	...	...	...	25 „
Silica and silicates	...	...	...	...	6-8 „

Chanarcillito.

Situated 45 kilometres from Caldera. The lode is eight metres wide. Cost of extraction, &c., \$5.20 per ton. Analysis gives:—

Iron	...	...	...	...	37 per cent.
Lime	...	...	...	...	11 „
Copper	...	...	...	...	4 $\frac{1}{2}$ „
Insoluble	...	...	...	...	17 „

Lechusas.

Situated 50 kilometres from Caldera. Lode of two metres. Analysis gives no copper. Cost, \$5.20 per ton.

Tres Puntas.

Large lodes of oxide of iron almost chemically pure, but on account of distance from rail the cost makes the exploitation prohibitory.

Ojancos.

A large deposit situated about 100 kilometres from Caldera. Cost, \$8 per ton. There is no official analysis, but the ore is known to be fairly pure.

Toledo.

70 kilometres from Caldera. Lode three to four metres, in some places up to eight metres. Cost, \$5.70 per ton. Analysis gives:—

Oxide of iron	...	...	...	60 per cent.
Manganese	...	...	...	25 „
Silica and silicates	...	...	...	5-8 „

COPIAPO.

(*Mr. Holberton, Consular Agent.*)

Several deposits of iron ore exist in the Consular District of Copiapo, in the form of lodes or veins, the most common ores being "magnetic iron ore," spectacular iron ore "hematite." Many of the lodes, although carrying a high percentage of the iron, are often associated with carbonate of copper, varying from traces up to 4 per cent., and which are simply worked for fluxing purposes for the smelters in the copper industry. As these combined ores would probably not be serviceable for the iron industry, their existence calls for no special remarks beyond that the lodes are abundant, wide, and powerful, and actual sales of ore from them show an average percentage of iron to be 45 per cent. and above. Clear iron ores, in some cases associated with manganese, well suited for the production of pig-iron, are to be found in several localities, but, as no attempts have been made to utilise them in promoting the iron industry, they are, with few exceptions, virgin veins and open to ownership by simple denouncement under the mining laws of Chile.

The best known and most accessible of the lodes of clear iron ore are situated: (a) in the Mineral de Patacones; and (b) Mineral de Puquios.

(a) Mineral de Patacones.

1-2. Patacones is distant three leagues north of the station Carpa, No. 4, of the Copiapo Railway, and the latter is 45 miles to the Port of Caldera, the terminus of the railway.

3. The cart road from the mines to the station is on a down grade, but in places it is very sandy, so that by carting the cost per metrical ton amounts to about \$2. This, however, could be reduced by working on a large scale, and more especially by the use of the mono-rail or aerial ropeway, but both of the latter would require a large outlay of capital.

The railway freight to the port is \$4 per metrical ton.

4. The labour is "native." On "day work" \$2 per eight-hour shift, and although the Chilians are excellent miners, it is preferable to work on contract, even if they gain a higher wage.

I calculate the cost of mining both in Patacones and Puquios to be about \$3 per ton working superficially, but naturally this would increase with depth.

The loading and discharging, both by cart and rail, is included in the prices already given for carting and railway freight.

5. Account sales of the "fluxes," that is the iron and copper ores, examined by the writer, give 45 per cent. and above for iron, but the "clean" iron ores may safely be averaged at 50 per cent., while selected ore would give considerably higher. A small sample taken from the surface, and marked "A," is herewith forwarded from a lode in the Cerro "La Liga," Patacones, which lode varies from 10 to 15 metres wide, whilst the "croppings" on the surface can be clearly traced 500 metres, the rest of the length being covered with sand. The lode, at present, is unworked and open to denouncement.

6. Such lodes as are under denouncement could reasonably be obtained from the proprietors, all of whom are poor miners.

7. A few of the lodes have only recently been worked on the portion containing copper for "fluxing" purposes, and the ores shipped to Tacna. The lowest iron percentage being limited by the buyers to 40 per cent.

The "Iman" lode, in the Cerro "La Liga," has shipped some 200 tons in the past 12 months, averaging 45 per cent. iron.

8. There are no obstacles in the way of successful and continuous mining in this district. The mining laws are good, and on the whole they are well administered.

(b) *Mineral de Puquios.*

1. There are several lodes in the neighbourhood, the most important known being the "Manuel Antonio Matta," the property of Don Tiburcio Padilla.

2. This is situated 5 kilometres from Puquios station on the Copiapó Railway, 87 miles from the Port of Caldera.

3. The freight, by cart road on a down grade, to the station is \$1 per metrical ton, and the freight by rail to the port \$8.70. The latter could, however, be reduced by special concession from the Railway Company, probably to \$5 per ton.

5. There are no official assays, but samples seen by the writer will give from 50 to 70 per cent., the ores being remarkably pure. Samples from this lode will also be duly forwarded within a few days.

6. The owner would be open to sell for any reasonable offer, say, £500 maximum.

7. The lode is quite virgin, and no shipments have been made from it. It varies from four to eight metres wide and its outcrop can be clearly traced for 400 metres.

9. The department generally is worthy of prospecting and closer investigation, but this would take considerable time.

The principal question is whether local freights would permit the lodes to be utilised and leave a margin of profit. These freights would, however, be influenced according to the scale on which any particular lode would be worked.

The map attached to these notes will show where the two iron deposits mentioned are situated, and will give a general idea of the transport by rail to the port of Caldera.

COLOMBIA (including PANAMA).

(Mr. Consul Mallet.)

Mr. Mallet reports that the Consular Officers in the departments of Cauca, Bolivar, and Magdalena, have instituted careful enquiries, with the result that no deposits of iron ore are known to exist in their districts.

In the Republic of Panamá, iron has never been found in sufficient quantity to even denounce it, but it undoubtedly does exist, as well as in Colombia; if found, however, it could not be worked now, as there are no railroads, roads or canals, so that transport would have to be effected on mule back and by canoes.

At Nombre de Dios, about forty miles east of Colon, several manganese mines have been denounced close to the coast, and two of the principal ones, "Soledad" and "Concepcion," show workings below the surface of 250 feet, while the annual amount of production has been ten thousand tons, and total production, so far, fifty thousand tons.

The character of the ore mined is oxide, not sulphide, and is found in a decomposed shale, and at some points this rock has been metamorphosed into a jasper.

The Caribbean manganese mines, as they are called, are owned by United States citizens, but for upwards of two years past all work on them has ceased, it is said, owing to financial difficulties of the Syndicate, although I believe the difficulty of transport was a more powerful reason that influenced them to suspend operations.

Other mines in the neighbourhood have produced about ten thousand tons of manganese, so that the entire production of ore in the Colon Consular district has been sixty thousand tons.

 COSTA RICA.*

SAN JOSÉ.

(Mr. Consul Cox.)

1. One deposit reported only. Magnetic iron-sand.
2. Along the sea-shore at the mouths of the rivers in the Talamanca district, on the south-eastern frontier of Costa Rica. Nearest shipping port is Limon, 50 miles to the north.
3. The sand could not be taken to Limon; no roads exist.
4. No labour exists; a few Indians live in the forests of Talamanca.
5. No sample obtainable.
6. Deposits are on public land.
7. Deposits are merely known to exist.
8. Climate on that coast is very deadly.
9. M. Pittier, the head of the Science Department, mentions the existence of magnetic iron-sand along the beach in the vicinity of the mouths of the Talamanca rivers, in some cases he thinks half the sand is magnetic oxide. But he can give no idea of the amount of sand, nor has he samples.

* For further information relating to deposits of iron-sand in Costa Rica, see the Report from H.M. Consul-General at New York.

CUBA.

HAVANA.

(*Mr. Consul-General Carden.*)

1. Iron ore is reported to exist in the mountainous districts in the Province of Pinar del Rio at the western end of Cuba.

2. Mining rights have been taken out for the following deposits of iron ore in that Province:—

1.	In the Municipality of Cabañas	...	...	2 claims.
2.	„	„	Bahia Honda	... 1 claim
3.	„	„	Consolacion del Norte	1 „
4.	„	„	Viñales	... 10 claims.
5.	„	„	Mantua	... 12 „
6.	„	„	Pinar del Rio	... 4 „

all of which, with the exception of the last, are situated on the north coast of Cuba.

The Municipality of Cabañas is served by the Port of the same name, and those of Bahia Honda and Consolacion del Norte by the Port of Bahia Honda. Both these ports are capable of admitting ocean steamers.

In Viñales, Mantua, and Pinar del Rio, there are several small bays which serve as anchorages and landing places for coasting vessels.

The distances from the above-mentioned deposits to the nearest points where ore could be embarked, whether on coasting or ocean-going vessels, may be roughly estimated at from 5 to 20 miles.

3. It is impossible to give any useful estimate of the cost of transport of ore from the various points mentioned to the coast, as there are no railroads nor canals, and the roads for the most part are merely tracks available only for pack animals.

Pack mules will carry from 200 to 300 pounds between 18 and 25 miles a day, and can be hired at about 10s. a day. This form of transport is obviously too expensive for iron ore.

4. Experienced miners are not to be found in the western end of the Island, as the mining industry can scarcely be said to exist there. Ordinary labourers earn 3s. a day.

5. Copies of the analyses of the ores from the two deposits in the Municipality of Cabañas are hereto annexed (*see below*). I understand that they were made by a chemist employed by the owners, the originals having been sent in to the Department of Agriculture and Mines when application was made for mining rights over those deposits.

6. The proprietors of the deposits are men of property, and are disposed to sell. I have no means of knowing the terms they ask.

7. No.

8. None that I am aware of, except the difficulty of transport, owing to the want of good roads, which could be overcome.

9. The deposits in the Municipality of Cabañas, already mentioned, are the nearest to a deep-water harbour, being between 5 and 6 miles from the Port of Cabañas. There is a disused railway track belonging to the owner of the property, formerly used for agricultural purposes, which covers the greater part of the distance, and might be made available for the transport of ore at no great cost.

Mr. Federico Kohly, of No. 6, Carlos Tercero, Habana, is prepared to furnish full information about this property and many of the others mentioned, to any one who is interested in knowing about them, with a view to their purchase.

Copy of Analysis of iron ores from the mines of Buena Vista and Las Carboneras in the Municipality of Cabañas:—

Peroxide of iron	...	...	...	...	83.32	per cent.
Protoxide of iron	...	...	...	...	None.	
Silica	...	...	...	...	3.20	per cent.
Alumina	...	...	...	...	.49	„
Oxide of manganese	...	...	...	...	None.	
Lime	...	...	...	...	1.40	per cent.
Magnesia	...	...	...	...	.50	„
Phosphoric acid	...	...	...	...	.49	„
Sulphuric acid	...	...	...	...	.24	„
Loss on calcination	...	...	...	...	10.40	„
					<hr/>	
					100.04	
					<hr/>	
Iron (metallic)	...	...	...	...	58.35	per cent.
Insoluble matter	...	...	...	...	6.40	„
Phosphorus	...	...	...	...	.214	„
Sulphur	...	...	...	...	.096	„

CIENFUEGOS.

(*Mr. Acting Vice-Consul Entenza.*)

1. None of any consequence, that are yet discovered. Those discovered are distant from coast, and probably would not pay to operate.

3. Unknown.

5. No.

7. No.

9. There are a number of localities in this district where deposits of iron ore occur, some of considerable magnitude, but in no case have any operations of them been undertaken, and, generally, the difficulty and cost of transportation would at present prevent any profitable extraction of these ores.

(*Report on Deposits in Trinidad and Province of Santa Clara.*)

2. Situated in Trinidad and Province of Santa Clara. The nearest port is Casilda, 6 or 7 miles distant from the ore deposits.

3. There is no railroad. Transportation by road may be estimated at from \$1.50 to \$2.00 per ton.

4. Rate of wages in that district is from \$18.00 to \$20.00 or £3 15s. to £4 3s. 4d. per month.

5. Copy of analyses included (*see next page*).

6. The proprietor is willing to sell on reasonable terms.

7. The property has not been worked.

9. Name of property "Altamira." Owner, Antonio Altamira, c/o Cuban Consulate, 96, Wall Street, New York.

Analysis made by Durand Woodman, 80, Beaver Street, New York, July 15, 1899:—

Moisture and organic matter	...	...	7.25	per cent.
Silica	...	...	11.20	„
Alumina	...	...	2.50	„
Lime	...	...	.10	„
Magnesia	...	...	.40	„
Manganese	...	...	Trace.	
Alkalis (potash soda)	...	...	0.44	per cent.
Phosphoric acid	...	...	0.65	„
Sulphuric acid	...	...	0.48	„
Bromo oxide of iron	...	...	76.21	„
			<hr/>	
			99.23	„

Equivalent to metallic iron, 53.35 per cent.

MATANZAS.

(*Mr. Vice-Consul Knight.*)

1. According to data from the Civil Government of this city, there have been reported seven mines of iron, iron and chromate of iron, and iron and copper.

2. They are located from eight to twelve miles from this city, and in the neighbourhood of the villages of Corral-Nuevo and of Canasé, on the north coast of the island.

3. The transport of ore would have to be done by pack mules or carts to this city.

4. There are no available data as to cost of labour for mining and loading.

5. No official analysis has been made of these ores.

6. The proprietors of the lands where the mines are located belong to the middle class of society, neither rich nor poor.

7. None of the deposits have been worked.

8. There are no special obstacles in the way of successful continuous and unencumbered mining.

9. The parties who reported or denounced the finds took no further steps in the exploring or working of the deposits, and even some of the titles to such finds are extinct, and no data exists of whether they are really worth working or not. The same has happened with other mineral products in that locality.

SANTIAGO DE CUBA.

(Mr. Consul Mason.)

1. Deposits of iron ore exist in the province of Santiago de Cuba.

2. There are many hundreds of iron claims denounced (the Spanish equivalent for locating a claim is "denunciar") in the province of Santiago de Cuba. Many of these are denounced by men who have not seen the ground, but have taken up claims on the strength of neighbouring deposits. It is almost unknown for an owner to explore his claim, and the surface showing is the only indication of value, except in one or two cases where established mining companies have explored.

By their location the mining claims may be divided into five general groups, as follows:—

Claims east of Santiago de Cuba.

Claims west of Santiago de Cuba.

Claims between Santiago de Cuba and Manzanillo.

Claims west of Baracoa.

Claims in the interior.

The first four groups are all more or less near the coast. By far the most important group at the present time is that of the mines east of Santiago de Cuba. These are located in the southern slope of the Sierra Maestra, a range of mountains parallel to the coast. They lie for the most part on the second range of foothills back from the Caribbean Sea, from $1\frac{1}{2}$ to 4 miles inland at altitudes from 200 to 1,200 feet, and form a chain of isolated deposits from 6 to 30 miles east of Santiago Bay. The western part of this group is tributary to Santiago Bay. The Juragua Iron Company, Limited, owns its own narrow gauge railroad, connecting mines of this group which it operates with the bay, where it owns an iron pier used exclusively for the shipment of its ore.

Further east, the Spanish American Iron Company operates mines connected by a standard gauge railroad $4\frac{1}{2}$ miles long, with narrow gauge branches 10 miles long, with the open roadstead of Daiquiri, where the Company's steel ore dock, with 3,000 tons storage capacity, is located. Still further east, in this group, are the abandoned mines of the Sigua Iron Company, formerly connected with an ore dock in Sigua Bay (open roadstead) by nine miles of standard gauge road.

There are more than 100 "denuncias" in this general group, which includes all the iron mines now being successfully operated in the island of Cuba. Except Santiago, and the open roadsteads of Daiquiri and Sigua, there are no shipping ports in the neighbourhood capable of admitting ocean steamers.

The group of claims west of Santiago de Cuba may be taken to extend for 40 miles west of that port, leaving all claims further west to the third group. These claims are also in the southern slope of the Sierra Maestra, varying in altitude from 150 to 2,500 feet. There are no good harbours except Chirivico, 40 miles west of Santiago, where the Cuban Steel Ore Company had an ore dock. This was connected with the now abandoned mines of the Company by six miles of standard gauge road and several narrow gauge lines.

Of the third group the principal claims are located 75 miles west of Santiago Bay, and would require some twelve miles of road to connect them with the sea, where the loading would have to be done in an open sea (which is possible), or else 12 to 15 miles more of road would have to be built to the small harbour of Portillo. The group west of Baracoa on the north coast of the island are known as the Moa mines. They are near Moa "Bay," so called because partially protected by reefs. Depth of water for large vessels is claimed, although no large vessels have ever used the "bay." Practically no work has been done here.

The inland mines are for the present inaccessible for lack of transportation.

3. The ore will not bear road transportation, and there are no canals. All transportation must be by rail. In estimating cost it must be borne in mind that a Company operating mines must build its own railroad and dock as in the case with the four Companies already cited. Cost must therefore include interest on cost and depreciation of plant. Even if ore were found near the few existing public railroads there are no public docks or piers suitable for shipping ore in any port in Cuba; and expense of loading from lighters is prohibitory. Cost of transportation varies with length of haul, in actual practice, from nine cents per ton over five miles of road with favourable grades to 60 cents per ton over 20 miles of line with some steep adverse grades, not including interest and depreciation.

4. Labour available is for the most part Spanish. The labourer from Galicia is a good pick-and-shovel man, and stands the climate well. Cubans do not take to mining work. Puerto Ricans have been tried with moderate success. Italians and negroes from Jamaica, Fortune Island and Inagua, have been tried, but are greatly inferior to the "gallego" labourer.

Wages are \$1.00 American gold per day for any labour (common). Most companies feed the men for 25 cents daily, but this is not obligatory on the men.

All mines are on side-hills, and the work is quarrying rather than mining. Cost of mining varies with the amount of waste it is necessary to handle. All of the large ore bodies carry waste, and it is necessary to handle from one to four cubic yards of waste for a cubic yard of ore mined. Costs from \$1.00 to \$1.75, including labour, tools, supplies consumed, fuel, explosives, and superintendence; but not including exploration on new constructions. To this must be added railroad freight and cost of shipping, which, with a well constructed dock, will be less than five cents per ton.

5. The following is an average analysis of nearly 500,000 tons produced in one group of mines in 1902:—

Iron	...	...	...	...	...	...	62.32
Silica	...	...	...	...	...	...	7.99
Phosphorus	...	...	...	...	...	...	.030
Sulphur	...	...	...	...	...	...	.084
Moisture	...	...	...	...	...	...	1.269

Ore of similar quality is found in some of the other groups. The bulk of the samples analysed thus far from the Moa group run 40 to 50 per cent. in iron. From the most easterly mines, east of Santiago, the ore average is 55 to 58 per cent. iron. Phosphorus is generally low, most of the ores being well within Bessemer limits. Sulphur occurs chiefly as pyrite in bunches, and in some places is absent altogether.

6. Except the companies mentioned, proprietors are generally poor, but have exorbitant ideas of the value of their claims. They are ready to sell, but have not explored their claims, and cannot show ore commensurate with prices asked.

7. Deposits have been worked as follows:—

Shipments of iron ore during the calendar year 1902—

By the Juragua Iron Company, Limited	...	221,039 tons.
By the Spanish American Iron Company	...	445,105 ,,
By the Cuban Steel Ore Company	...	33,590 ,,

Total 699,734 tons.

Total shipments by the several mining companies from time of first opening their mines down to close of year 1902 have been—

By the Juragua Iron Company, Limited	...	3,911,795 tons.
By the Sigua Iron Company	... ..	20,438 ,,
By the Spanish American Iron Company	... ..	1,777,118 ,,
By the Cuban Steel Ore Company	... ..	41,241 ,,

Total 5,750,592 tons.

8. There are no special obstacles to continuous and unencumbered mining, except the fact that the work, being carried on in the open air, is somewhat delayed in times of heavy rains.

9. The Spanish Government made special concessions to encourage mining, till now that industry is practically free from all taxes. No export tax has ever been paid, and import taxes on materials have been light, and at times nil. Nor has the man who located the mine had to pay anything beyond a moderate fee for measuring and registering, and once in his possession he has not been asked to pay any further tax, however long the mine might remain in his possession without working it.

ECUADOR.

GUAYAQUIL.

(*Mr. Consul Cartwright.*)

Deposits of iron ore, of a very high grade as regards percentage of metal, are known to exist in the Daule district, within about seventeen to twenty miles of the port of Guayaquil. I am aware, from personal knowledge, that these deposits were denounced and examined in about the years 1878-81, but from absence of fuel, and (I think) refractory character of the ore, no works were undertaken. The specimens seen had the appearance of containing nearly 60 to 80 per cent. of iron. Probably some samples could yet be obtained, if requisite, but no mention of them has been made here since 1880.

So far as I know, the mines are situated in lands belonging to "Comunes," but the Ecuadorian Mineral Laws would allow of their denouncement, and the person or company denouncing them would become the owners.

Labour could only be obtained here by great difficulty, and at heavy cost. It should be brought from outside.

The above is all the available information I can obtain, without going to the cost of special survey to report on the subject.

No other iron deposits are known in Ecuador.

FRANCE (POSSESSIONS OF).

MARTINIQUE.

(*Mr. Consul Meagher.*)

Mr. Meagher states that no deposits of this ore exist in Martinique in paying quantities.

GUADELOUPE (*see also* below).—Mr. Acting Vice-Consul Lauzainhein reports that at Guadeloupe the beach from Petit Bourg to Trois Rivières, a distance of about thirty-five kilometres, is composed of ironsand. This sand is reported to be pure, but no analysis has been forwarded. In his report for 1896 Mr. Vice-Consul Japp states that a small shipment of this sand was made in that year, but it is not stated whether the results obtained were satisfactory or not.

GUADELOUPE.

(*Mr. Vice-Consul Devaux.*)

1. Yes, iron sand.
 2. Along the beach from Goyaves to Bananiers, on the windward side of Guadeloupe proper. The nearest shipping port is Ste. Marie, capable of holding three vessels of only 14 feet draught; vessels drawing more than that can lie between Goyaves and Ste. Marie, at a distance of about one mile from shore, in seven or eight fathoms. Ste. Marie is situated on the coast where the iron sands are found.
 3. The means of transport, which exist at present, are primitive and costly; but the sands can be droghed alongside the ocean steamer. The cost of transport by droghers is about one franc per ton.
 4. No mining (or quarrying) has to be carried on. The iron sands lie along the beach, and have simply to be transported and shipped. Unskilled labour costs from one franc to one franc fifty centimes per day. Skilled labour from three francs upwards.
 5. No official analyses of the sand are obtainable, but what samples I could procure are being sent.
 6. The deposits belong to the Colony. But a long-term concession was, a few years ago, granted, by the Colonial Government, to Mr. Numa de La Roncière, merchant, in Pointe à Pitre. The "concessionnaire" is willing to sell the sands on reasonable terms.
 7. Yes. In September, 1896, an American obtained a concession for the shipment of iron sands from Ste. Marie, but owing to some difficulty about the concession, the Administration allowed only 60 tons to be shipped.
 8. See reply to No. 4.
 9. A concession for the exploitation of the iron sands of Guadeloupe has been granted to M. de La Roncière, of Pointe à Pitre.
- These sands are found at many places along the coast in vast beds. The quantity in sight and immediately available is estimated at some 200,000 tons. It is a very pure magnetic iron sand, free from impurities, and yielding about 67 per cent. of iron. This iron is said to give a superior quality of steel. Practically unlimited quantities can be furnished, and vessels can be loaded very speedily and safely. All persons interested should write to M. Numa de La Roncière, Pointe à Pitre, Guadeloupe.

A refinery could be set up on some convenient spot along the coast where water-power is plentiful.

HOLLAND (POSSESSIONS OF).

SURINAM (PARAMARIBO).

(*Mr. Consul Pigott.*)

1. Deposits of iron ore do exist in this consular district.
2. They are in the interior; the nearest port is Paramaribo, into which steamers drawing 20 to 22 feet can enter at spring tides. The deposits commence about 40 miles from the coast, in a direct line.

3. The cost of transport cannot be stated, as no roads, railways or canals exist, and the river navigation, in the upper reaches of the rivers, is difficult, and at times, owing to the lowness of the water, impossible.

4. Labour is black (creole); wages, about 2s. 1d. per day, with food.

5. No official or other analysis of the ore is available.

6. The deposits are mostly in the hands of the Colonial Government, or holders of gold mining concessions.

7. No deposits have been worked, and consequently no ore shipped.

8. The only obstacles are difficulty of transport, possible shortage of water, and malarial fever.

9. The following is a copy of a letter on the subject addressed to me by Mr. James H. Mayo, a mining engineer (American), manager of one of the principal gold placers in the Colony:—

“There is but little to be said for the iron ore of Surinam. So far as developed, its only occurrence is in the iron conglomerate cappings of most of the hills, sometimes cemented and massive, and again, disintegrated, forming beds of nodules of hematite.

“The hills carrying these cappings are generally kaolinite, or decomposed feldspathic rock, and in this occurs the quartz in masses, lenses, and ‘stringers,’ which is the source of the gold in the Colony. These quartz stringers also carry a hematite plate as foot, and hanging walls, the outer surface generally mammillary in form. In a six-inch ‘stringer’ these plates would be, say, an inch thick. I have not observed the occurrence of iron in any other form than as above in the Colony.”

HONDURAS.

PUERTO CORTES.

(*Mr. Acting Consul Bain.*)

1. A large deposit of iron ore is said to exist.

2. About 25 miles from this port, on line of railway.

3. By rail. No rate fixed.

4. There is no capable labour to be procured at present. No estimate of mining, &c., can yet be formed.

5. None so far.

6. The deposit has been “denounced,” that is to say, permission has been applied for and granted by Government to work same to an American Syndicate, but so far no work has been commenced.

7. No deposits have been worked hitherto.

8. None.

TEGUCIGALPA.

(Mr. Consul Campbell.)

1. There are various deposits of iron ore reported to exist.
2. (a) In the department of Colon, between the department of Olancho and the Caribbean Sea; nearest port, Trujillo, 50 miles distant.
(b) Near Catacamas in the department of Olancho; more than a hundred miles from Trujillo, but near Patuca River, which may be made navigable at some early date.
(c) Near Concordia and Boquin in the same department of Olancho; nearest port, Trujillo; distance, more than a hundred miles.
(d) Agalteca, twelve leagues north of Tegucigalpa; half way between ports, say 150 miles from either Puerto Cortes on the Atlantic or Amapala on the Pacific.
(e) Near Minas de Oro, perhaps 130 miles from Puerto Cortes.
(f) Near Lake Yojoa, which is situated not far from the projected Inter-oceanic Railway, and about 60 miles from Puerto Cortes.
3. Except for 57 miles of railway inland from Puerto Cortes on the north coast, all transportation is made on mule back, or in case of very heavy loads, and in places where the roads allow it, by means of ox-carts. Under the most favourable circumstances as to roads, weather, and supply of mules, &c., the price per ton of 2,000 lbs. could not be less than £4, and with unfavourable circumstances could easily be double that amount.
4. Roughly speaking, unskilled labourers receive at least 2s. per day. The estimate of cost of mining, &c., is quite out of reach.
5. The only analysis obtainable is given below (in answer to Question 9). Samples of Agalteca ores have been forwarded. It may not be possible to obtain other samples immediately.
6. The proprietors of the most important deposits, those of Agalteca, are the Government, and it is understood that they are prepared to let all or part of it for very long leases against a royalty of 5 per cent. of the product. Probably the other deposits belong to private persons rather poor than rich, who would not be likely to ask very high terms.
7. None have ever been worked to any great extent.
8. The only possible obstacles to steady mining consist in difficulties of transportation and possible scarcity of labour.
9. (a) *Department of Colon*.—Between the department of Olancho and the Caribbean Sea, at a distance of about 50 miles from the coast, brown and red hematite ores are found.
(b) *Department of Olancho*.—Near Catacamas, five leagues from Guayapa and Patuca Rivers, there are brown and red hematite ores.
Near Concordia and Boquin, two leagues from Guayape River, are found brown and red hematite ores, limestone dikes, and coal. The latter was recently discovered, within a league of the iron ore. Its appearance is good, and the coking properties are now being tested. Copper and gold mines are found in the same neighbourhood.
(c) *Department of Tegucigalpa*.—At Agalteca, about twelve leagues nearly due north of the capital, the most important iron deposits of the country are found. The district is nearly in the centre of the country, on the dividing line or ridge. So far all these deposits are reserved by the State, with the intention of having them developed by lessees paying royalty. The importance of these deposits, vouched for by the Government and many

private individuals, is said to arise from the very large quantities of ore to be found, from the facility and cheapness with which it can be produced, and from the belief that coal will be found at a distance of 30 to 50 miles, in the department of Yoro.

The quality of the ore may be judged by the following comparison with the Cuban ores, based on an analysis of both made in the laboratories of Birmingham and Bessemer, Alabama, United States of America, during the years 1896-7:—

<p>AGALTECA :—</p> <p>Metallic iron... 68 to 71 per cent.</p> <p>Sulphur ... Trace.</p> <p>Phosphorus ... 0·002 per cent.</p> <p>Titanic acid... None.</p>	<p>CUBA :—</p> <p>Metallic iron... 62 to 65 per cent.</p> <p>Sulphur ... 0·040 per cent.</p> <p>Phosphorus ... 0·026 „</p>
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Limestone dikes and manganese ore are also found near Agalteca, the latter being of great value as a flux.

(d) *Department of Comayagua*.—Large quantities of brown and red hematite ores are found near Minas de Oro, which district also abounds in copper and gold mines.

(e) Near the Lake Yojoa, not far from the line of the projected Inter-oceanic Railway, similar iron ores have also been discovered.

General Remarks.—None of the deposits mentioned have been developed or worked, but at least in the case of Agalteca, there seems to be no doubt that there exists an iron mine of an exceptional character, and it is probable that many of the other deposits would prove important on investigation.

The difficulty of utilising all the products of this country lies in the lack of adequate means of transportation, but several of the districts mentioned have projected railway lines within a reasonable distance.

It is reported that a competent person is engaged upon a statement of the mineral deposits, with a mineralogical map of Honduras, which shall be sent as soon as it can be obtained.

MEXICO.

(Mr. Consul Jerome.)

1. Yes.

2. (a) Iron mines are reported by the Department of "Fomento" to exist in the following States:—

States.	Number of Mining Properties.
Aguascalientes	1
Chiapas	1
Chihuahua	4
Coahuila	34
Colima	1
Durango	50
Guanajuato	1
Guerrero	18
Hidalgo	15
Jalisco	21
Mexico	1
Michoacan	4
Morelos	4
Nuevo Leon	19
Oaxaca	7

States.	Number of Mining Properties.
Puebla	3
Queretaro	4
San Luis, Potosi	2
Sinaloa	2
Sonora	13
Tamaulipas	1
Vera Cruz	6
Zacatecas	5
Tepic	2
Lower California	37

As regards Lower California, Mr. Vice-Consul Packard reports as follows:—

“Neighbourhood of Ensenada, San Fernando; neighbourhood of San Quintin, Cape Colnett, Rosario, San Carlos, Canoas Point, Maria Point, Lagoon Head.”

(b) Atlantic (Gulf of Mexico) coast. Tampico, port for points on Mexican Central Railway: 322 miles from Monterrey; Monterrey to Monclova 135 miles; Durango to Monterrey 396 miles.

Pacific ports. Lower California, nearest port of entry Ensenada. All the bodies of ore reported by Mr. Packard are close to open roadsteads and are reasonably safe, except in January, February and December, the distance from the coast varying from 1 to 30 miles. The ore in the State of Guerrero, near Iguala, which place is some 150 miles from Mexico City (Mexican Central Railroad), could be taken without being re-handled over the Mexican railway to Vera Cruz.

The other Pacific ports are Guaymas (Sonora Railway), Altata, Mazatlan, Manzanillo, Acapulco, all of which are ports of entry.

3. (a) Mr Thomas P. Honey, of the Zimapan Iron Mines, in the State of Hidalgo, writes: “By rail, carload lots, 10,000 kilos. minimum load, the rough average freight is 1.90c. per ton (say one halfpenny) per kilometre, less-than-cartload lots 50 per cent. higher. By cart, we credit our cart trains with 13c. (3d.) per ton per kilometre, which you will see is very low, but we have exceptionally favourable facilities in carting.”

In most cases carting would cost very much more, and, in the case of many good bodies of ore, roads would have to be built.

(b) Most of the bodies of ore are away from the railways, excepting those of the Cerro del Mercado, at the town of Durango, and connected directly with the International Railway; those of Monclova, in Coahuila, 8 miles from the same railway; those of the Cerro Carrizal, 60 miles from Monterrey, on the National Railway; the Zimapan mines, close to the Central and Hidalgo Railways; and the La Barra properties, near Iguala, on the Central.

4. (a) Native miners are usually very good. Generally they are paid by task work; in the few places where daily wages are paid, these vary between 1s. to 6s. per day, according to the proximity of gold or silver mines or scarcity of supply of labour.

Mr. Honey writes: “Our iron ores are extracted by native labourers at an average cost of 80c. per ton (20d.)”

In Lower California Mr. Packard reports: “Labour good and abundant, miners receive \$4.00 (8s.) per day, muckers \$2.00 (4s.), stevedores \$2.00 (4s.) to \$4.00 (8s.); cost of mining would depend on machinery employed. Miners receive £1 per metre for sinking, and from 15s. to £1 10s. for drifting.”

(b) Mr. Honey states that the cost of loading on railway cars is \$1.00 per ton (24d.) The trucks in use in Mexico are the American pattern flat cars, and carry from 10 to 20 tons.

5. I have found it very difficult to get any analyses of Mexican iron ores. Neither at the School of Mines nor at the department of "Fomento" (this department regulates mining matters in Mexico) could I get much information. In a letter, dated October 10th, 1903, General Gonzales Cosio, Secretary of State for "Fomento," writes: "The average result of the analyses made in the United States from 27 samples of ore taken from the Cerro del Mercado, near Durango, where the ore deposits are enormous, was:—

Black magnetic oxide of iron (Fe_3O_4)	...	...	2.071
Ferric oxide (Fe_2O_3)	...	...	77.571
Manganese oxide (MnO})	...	...	0.113
Titanium dioxide (TiO_2)	...	...	0.710
Magnesium oxide (MgO})	...	...	0.364
Sulphuric oxide (SO_3)	...	...	0.212
Phosphoric oxide (P_2O_5)	...	...	3.041
Loss	...	...	1.984
Silicic oxide (SiO_2)	...	...	7.760
Alumic oxide (Al_2O_3)	...	...	1.124
			<hr/>
			100.000

Mr. Richard Honey's mines, at Vaquerias, in the State of Hidalgo, give the following result:—

Water	...	...	16.00
Silica	...	...	8.37
Iron oxide (?) FeO}	...	...	75.72
Phosphorus and Lime	...	...	Traces
			<hr/>
			100.00

Note.—This ore is found between basalt and labradorite.

Mr. Honey's analysis of ore from Cerro de Cangando, near Zimapan (which are hæmatites, with much magnetic ore, owing to the contact of the diorite with the limestone) is as follows:—

Iron	...	...	69 per cent.
Sulphur	...	...	1 "
Phosphorus	...	...	0.1 "
Copper	...	...	Traces.

Tenexpanoya mines (State of Vera Cruz), on the Inter-oceanic Railway, give the following result:—

Silica	...	...	32.49
Sulphur	...	...	0.72
Alumina	...	...	10.20
Peroxide of iron (FeO?})	...	...	56.61
Lime	...	...	Traces
			<hr/>
			100.00

The Las Truches mines are some twelve miles from the sea, near the mouth of the Rio Balsas (Pacific Coast), in the State of Guerrero. The lode is about 400 yards by 150. The following is the average analysis:—

Iron	...	...	between 66.650 and 63.750 per cent.
Silica	...	...	4.600 " 6.260 "
Sulphur	...	...	0.046 " 0.160 "
Phosphorus	...	...	0.025 " 0.026 "
Peroxide of manganese (MnO})	...	...	2 to 4 "
Alumina	...	...	1 " 2 "
Lime and magnesia	...	...	$\frac{1}{2}$ " 2 "

N.B.—This Company is now exporting ore to San Francisco, California, U.S.A.

I have not been able to get any other analyses and, with the exception of the samples from Zimapan, it may be months before others can be obtained.

6. The owners of the Zimapan, the Monclova and Cerro de Carrizal mines are wealthy, and these mines are not likely to be in the market. Most of the other mines could be purchased, but I doubt, owing to high freights and distance from the sea, that it would be commercially feasible to buy Mexican iron mines.

7. This data is not available. In 1901 88 tons of iron ore are said to have been shipped to the States. I have not been able to get any information as to the quantity of ore extracted, which must be considerable. Mr. Honey gives the extraction of the Zimapan mines in 1902 as 6,455 metric tons.

8. In so large a country as Mexico it is very difficult to give a concise answer to a query of this kind; the chief difficulty is want of fuel, in many cases distance from any railway, high freight rates, in some parts of the country want of water, in others difficulty of getting labour, and in a few cases possible hostility of the native population.

9. Mr. Thomas Honey writes: "All our iron ores are of such high grade and good quality, we never require to treat them in any way, but simply limit ourselves to mining from different lodes and fluxing in the ordinary manner. The ore is smelted with charcoal in blast furnaces and converted into pig-iron, or ingots, which are puddled in furnaces for the purpose, hammered by steam, rolled into bars of all sizes, cut and stamped with our trade mark."

ENSENADA.

(*Mr. Vice-Consul Packard.*)

1. Yes.
2. Neighbourhood of Ensenada:—
 - Ensenada.
 - San Fernando.
 - Neighbourhood of San Quintin.
 - Cape Colnett.
 - Rosario.
 - San Carlos.
 - Canoas Point.
 - Maria Point.
 - Lagoon Head.

Nearest port of entry, Ensenada. All of the places are open roadsteads and reasonably safe, excepting in the months of December, January and February. The ore bodies are distanced from 1 to 50 miles from the coast.

3. Cost of transport would vary with distance. In nearly all instances wagon roads would have to be built to the coast. Without some method of transportation, other than by teams, the cost of hauling, in the majority of cases, would be prohibitive. Cost of railroad building would be comparatively light. There is a general incline to coast, from all points.

4. Labour is Mexican and abundant. Miners receive \$4.00, Mexican money, per day; muckers, \$2.00; stevedores, \$2.00 to \$4.00. Cost of mining depends entirely upon the machinery employed. Miners are receiving \$10.00 per metre for sinking, and \$7.50 up to \$15.00 for drifting.

5. No official analyses of the ore have been made. The ore will run from 59 per cent. to 68 per cent. metallic iron.

6. Neither the one, or the other; but as none of the proprietors are working their iron ore mines, they would be sellers, on very reasonable terms.

7. None have been worked, excepting to show up ore bodies, and very little of such work has been done.

8. None whatever.

9. The best-known mines are at San Ysidro. Probably the greatest ore bodies, however, are to be found in the neighbourhood of Canoas and Maria Points.

No working having been done on the properties, very little can be said about the tonnage in sight, excepting what is actually shown on the surface, and barely any allowance made for depth.

At San Ysidro there are probably over 200,000 tons of ore in sight, and in the whole district about 1,000,000 tons.

TAMPICO.

(*Mr. Vice-Consul Griffith.*)

REPORT on Mines and Deposits of Iron Ore in the States of San Luis Potosí, Coahuila, Nuevo Leon, and Tamaulipas, in the Republic of Mexico.

1. Yes.

2. (a) In the Carrizal mountains, near Golondrinas station, on the Mexican National Railway, in the State of Nuevo Leon, half-way between Monterey and Laredo.

(b) Near Monclova, on the Mexican International Railway, in the State of Coahuila, 150 miles distant from the frontier town of Eagle Pass.

(c) On the Hacienda (farm) of Alamitos, 33 miles from Rosillo, a station on the Monterey and Mexican Gulf branch of the Mexican Central Railway, in the State of Tamaulipas.

The nearest shipping port is Tampico, distant from (a) 392 miles; (b) 617 miles; (c) 74 miles.

3. (a) \$10.24 (17s. 6d.)
 (b) \$18.34 (£1 11s. 4d.) } by rail.
 (c) \$12 (£1 0s. 6d.) by road, \$3 (5s. 1½d.) by rail.

4. Ordinary peon labour. Cost of mining about \$1.50 (2s. 6¾d.) per ton, and of loading \$0.82 (1s. 4¾d.).

5. No. Ore has assayed:—

(a) and (b) 65 per cent. to 75 per cent. iron; from 1 per cent. to 1½ per cent. sulphur; 4 per cent. to 6 per cent. silica; and about from 1/10 per cent. to 1/8 per cent. phosphorus.

(c) [COPY.] "No. 18779. Assay Certificate of McCANN BROS. & JEFFCOCK, Mexico.

Per 1,000 Kilos.

	Silver Kilos.	Gold Kilos.	Lead.	Copper.	Indis-soluble.	Iron.	Man-ganese.	Sul-phur.	Phos-phorus.	Titanic Acid.	Lime.	Mag-nesia.
Iron Ore ...	0 0	1	—	0	5.9	69.5	0	0	0	0	0.3	0.1

MEXICO, December 31st, 1902."

6. (a), (b), (c) All proprietors would probably sell on reasonable terms.

7. (a) For a short time only, chiefly for flux ores for the lead smelters in the country.

(b) Now supplies the Monterey steel works, lately established.

(c) Is not worked. Fifteen tons were shipped as a sample to Liverpool, in the spring of 1903.

8. None whatever.

9. The cost of loading the ore on vessels at Tampico would be about 1s. 10d. per ton.

Railway cars run on to the wharves, where vessels lie in 23 ft. of water, at low-water spring tides.

VERA CRUZ.

(*Mr. Consul Leay.*)

1. There is but one deposit of iron ore reported to exist in this consular district.

2. It is in the Municipality of Las Vigas, Canton of Jalapa, and the nearest shipping port admitting ocean steamers is Vera Cruz, one hundred and twenty miles away from the ore deposit.

3. The transport of ore would cost to the port four dollars, Mexican silver, per ton, equal to about six shillings and sixpence, and the carriage would be by rail.

4. The labour obtainable is poor. The cost for mining would be about one dollar and a half, or half a crown, and for loading on railway trucks about a dollar, or one shilling and sevenpence per man per day. I estimate the cost of mining or quarrying and loading on trucks at about seventy-five cents, or one shilling and threepence per ton, but the cost in sterling depends greatly on the rate of exchange.

5. A recent analysis of the ore gives—silicon, 1.74; iron, 65.34; sulphur, 0.26; lime, 0.15; magnesia, 0.47; alumina, 0.63.

6. The proprietors of the deposits are rich. They are not likely to sell cheap.

7. This deposit has not hitherto been worked.

8. There are no special obstacles in the way of continuous and unencumbered mining in my district.

9. The owners of these mines are now building a furnace at Tepeyahualco, some thirty miles distant by rail. There are no other known deposits of iron ore in the States of Vera Cruz, Campeche, Yucatan or Tabasco.

NICARAGUA.

MANAGUA.

(Mr. Consul Nicol.)

1. No investigations for iron ore have been made. This part of the country is entirely of recent volcanic formation, but in the mining districts there may be indications of iron ore. I am writing to some mining experts on the subject.

2, 3, 4, 5 and 6 are replied to by the above.

7. Certainly no deposits have been worked.

8. Mining laws are very favourable, and there are no exceptional difficulties.

9. Freights are very high from the Pacific side, 45s. a ton being the minimum.

In a subsequent report, Mr. Consul Nicol adds the following, from Mr. Calderwood, who is the most reliable authority in this country. Mr. Calderwood says: "I am certain that iron ore has not yet been mined in this country. Iron ore exists in various places in the N.W. of the country, but, as the deposits have never been opened up, or proved, it is at present impossible to say if they are of any commercial value. Under present existing conditions, this ore could not be mined and transported at a profit, unless a large amount of capital was expended on roads and railways," and, in reply to the questions, he says:—

1. Yes. Iron ore exists in Nicaragua.

2. In north and west of the country. Amapala (Honduras), 60 to 80 miles distant.

3. At present there are no means of transport.

4. Native labour fairly intelligent, equal in ratio two to one of white labour. Wages 1s. per day, without food. Cost of mining about 4s. per ton, but would depend on circumstances.

5. No.

6. Free land.

7. No.

8. No.

9. No.

As the above information has been gathered in a very superficial way, on my travels, it would be necessary to investigate before the information could be accepted as a guide to invest capital. I have no idea of the size of the deposits.

PANAMA (*see under* COLOMBIA).

PARAGUAY.

(Mr. Acting-Consul Hankin.)

1. Yes.

2. Scattered throughout various parts of the Republic. A mine, unworked for many years, is situated near Ibicui, some thirty miles from the railroad and one hundred from Asuncion. Rosario, in the Argentine Republic, from eight hundred to one thousand miles.

3. Impossible to answer first part of this question in a general way (see following answer).

Neither roads nor canals exist in the interior of the Republic; some parts of the rivers are navigable for small craft, drawing from two to three feet of water, and about seven feet at the port of Asuncion.

4. The character of labour is that of unskilled and indifferent workmen. Cost of labour, from one shilling to three shillings per day.

To give an estimate of the cost of mining and loading in carts is impossible in a general way. Many of the ledges of iron ore are almost inaccessible, being surrounded by dense forests. From those within a reasonable distance of the one railway, ore might possibly be placed on trucks at a cost of from ten shillings to fifteen shillings per ton.

Cost of freight from Asuncion to Rosario would be a matter of arrangement with barge owners, rate of freight by passenger steamers being quite prohibitive.

5. No, though I have heard of one which gave a very poor percentage of iron.

6. Most of them are not wealthy, and it is understood that the titles to their holdings are not infrequently unsatisfactory.

7. Yes, but not to any great extent. Some cannon are still in existence made from ore extracted in 1865, by President Lopez, during the war, by forced labour.

8. Yes; the whole matter bristles with obstacles.

In many cases the deposits are miles from any settled district; roads to approach them would have to be made and cut through almost impenetrable forest. The absence of the means of internal communication is the principal cause of the lack of development of this Republic, added to which is the total indifference of the natives to money, and hence work.

Wages for any large job have to be paid for three months, if the work is to last as long, in advance, and State aid invoked to bring back deserters, stragglers and malingers.

9. The foregoing is obtained from private sources, as no official information on the subject of iron ore exists.

There is no Mining Department, and no official interest is displayed in the mineral resources of the country.

No statistics of analysis or otherwise are published or to be obtained.

PERU.

(*Mr. Consul-General St. John.*)

1. No deposits of iron exist in this consular district, but iron is known to exist in the Department of Piura. It is said that indications of the existence of that metal are also to be found in various other parts of Peru, but the information upon the subject is extremely vague.

2. The iron deposit in the Department of Piura is near Tambo Grande, within a few miles of Sullana, which is on the railway line which runs from the town of Piura to the port of Paita, one of the best harbours on the Pacific coast. The distance from Sullana to Paita is about 38 miles.

3 and 4. At present it is not possible to tell with any degree of accuracy what would be the cost of transport, as the iron deposit in question has never been worked. The cost of native labour in mining districts in the interior is about 3s. a day. Labourers who work on the coast earn about 2s. a day.

5. No official analyses have been made. Three samples of iron ores are forwarded from the following localities:—

- (1.) Tambo Grande near Sullana on the railway from Payta to Piura. Sullana is about 38 miles from Payta.
- (2.) The neighbourhood of a place called Carpancha about 60 miles from Cerro de Pasco, which is in communication with the sea by rail. The distance from Callao to Cerro de Pasco is 215 miles.
- (3.) Taya Taya, 160 miles from the sea, and only one from the railway which runs from Mollendo to Pimo.

The deposits in question are reported to be of importance.

Two samples of iron ores are also forwarded from the following localities:—

- (1.) Chacra Silva about five miles from the confluence of the Perené with the Paucartambo.
- (2.) Hacienda La Romilda, half way between La Merced and the Perené Colony.

These samples have been transmitted by Mr. Vice-Consul Furlong. He is not able to furnish any information as to the importance of the deposits.

6. The deposit at Tambo Grande is State property.

7. As far as is known, no iron deposits have ever been worked in Peru for industrial purposes.

8. No obstacles, except, perhaps, the scarcity of labour.

9. The School of Mines at Lima proposes that a Bill should be passed providing that the extraction of iron should only be permitted on a large scale. This project is based on the belief that important iron deposits will eventually be discovered in Peru.

SAN DOMINGO.

(Mr. Vice-Consul Gosling.)

1. Yes.
2. (a) Near Cotuy; nearest port Sanchez, 50 miles from mines.
(b) Near Bani; nearest port San Domingo, 40 miles from mines.
3. It is not possible to give estimate of cost of transportation, as no railroads, wagon roads, or canals pass through the immediate locality of the mines.
4. The labour available is of poor quality and scarce at 40c. to 50c. a day. It is impossible to give estimates as to cost of mining.
5. There are no analyses obtainable.
6. Poor. The mines could probably be bought cheaply.
7. No work other than prospecting has been done at the mines.
8. No obstacles exist.
9. The Cotuy mine is very extensive, and has been pronounced very rich by several mining engineers. There is a British-owned railroad from La Vega to the port of Sanchez, which passes within 40 miles of the mines. Labour can always be obtained from the neighbouring British islands, of good quality, for 50c. per day. The country is frequently in revolution, but this would in no way interfere with the working of a mine.

 SAN SALVADOR.
(Mr. Consul Coldwell.)

1 and 2. The only mines known in this Republic are those of Metapan, Department of Santa Ana. They are named "San Juan," "San Casimiro," and "El Cabano."

These have been worked since the time of the Spaniards. "El Cabano" is the nearest to the town of Metapan, and all of them are within 5 to 10 kilometres. The road is only for beasts (mules) not ox carts. Metapan is 50 kilometres from Santa Ana, by cart road, and Santa Ana is 107 kilometres from the port of Acajutla, by railroad. Acajutla is the nearest port.

3. Freight from the mines to Santa Ana is \$1 currency (say 1s. 8d.) per cwt., by mule, and from Santa Ana to Acajutla, by railway, \$1 currency, per cwt., but a reduction might be obtained.

4. Cost of quarrying is from 12 to 20 cents, silver, per 100 lbs. (quintal). No information can be obtained as to loading, but usually the cartmen or mule-drivers load at their own cost, and amount is included in cost of carriage.

5. Samples have been analysed, in the National Laboratory, of the three mines mentioned, and the result has been published in their review, No. 6, page 509, viz. :—

"His Excellency the Minister of Finance sent to this laboratory, amongst other things, three samples of iron ore from Metapan.

“The proportions of iron per cent. are as follows:—

‘San Juan’ mine	...	...	...	...	39.24
‘El Cabano’	...	...	...	...	63.75
‘San Casimiro’	...	...	...	...	68.5.”

6. These mines would be sold at reasonable prices, the owners are not wealthy men, but are fairly well-to-do.

7. These mines have been worked since the eighteenth century, and continued working actively up to about the year 1860. Since then they have hardly been touched, and their product has only been used in the country and in the neighbouring Republic of Guatemala (which is very near). The workings have all been on a small and primitive scale.

8. The great obstacle to successful working is the want of coal, as the combustible hitherto used has always been firewood, which is becoming everyday scarcer and dearer.

9. Near and in the immediate vicinity of the above-mentioned mines there are heavy waterfalls, which have already been utilized in a primitive fashion in casting the iron, and which could be well made the motive power for working machinery.

UNITED STATES.

CONSULAR DISTRICT of BALTIMORE, comprising the States of MARYLAND,
VIRGINIA, WEST VIRGINIA, and KENTUCKY.

(*Mr. Consul Fraser.*)

1. There are.

2. Maryland, Virginia, West Virginia, and Kentucky. The four ports of Baltimore, Maryland; and Norfolk, Newport News, and Richmond, Virginia; are capable of admitting ocean steamers, and their average distance from the ore deposits is 300 miles.

3. The cost per ton to either of the above named ports would be in the neighbourhood of \$1.50. Rail is the only means of transport.

4. White and negro miners are employed, and they receive from \$2 to \$2.25 per day of ten hours. Unskilled labourers, also whites and negroes, are used for quarrying ore, and they receive from \$1.10 to \$1.25 for ten hours' work. The cost of mining, or quarrying, and loading on railway trucks varies greatly per ton, from 25 cents to \$1.25.

5. A copy of the complete analyses of the ore in Kentucky, Virginia, and West Virginia, is forwarded herewith. (Printed below.) There is no complete analysis of the ore in Maryland obtainable, but partial analyses are transmitted. (Printed below.)

Complete Analyses of Iron Ores in Kentucky, Virginia, and West Virginia.

	Kentucky.		Virginia and West Virginia.	
	Natural Ore.	Dried Ore.	Natural Ore.	Dried Ore.
1. Sulphur	0·227	0·227	0·352	0·352
2. Phosphorus	0·126	0·128	0·103	0·103
3. Iron, metallic	40·61	40·85	48·47	48·50
1. Silica	14·37	14·59	21·58	21·60
2. Iron, protoxide	4·93	5·01	6·03	6·03
3. „ peroxide	53·93	54·75	62·35	62·39
4. Alumina	9·36	9·50	4·94	4·94
5. Manganese, protoxide	1·26	1·28	—	—
6. Lime	1·03	1·05	0·28	0·28
7. Magnesia	0·52	0·53	0·37	0·37
8. Iron, disulphide	0·072	0·073	0·320	0·320
9. Barium, oxide	—	—	1·18	1·18
10. Nickel, sulphide	0·25	0·25	—	—
11. Cobalt, sulphide	0·21	0·21	—	—
12. Copper, sulphide	0·03	0·03	—	—
13. Potassa	—	—	0·99	0·99
14. Soda	—	—	0·14	0·14
15. Carbonic acid	3·66	3·72	0·21	0·21
16. Sulphuric acid	0·02	0·02	0·45	0·45
17. Phosphoric acid	0·290	0·294	0·239	0·239
18. Tannic acid	—	—	0·07	0·07
19. Carbon in carbonaceous matter ...	0·15	0·15	—	—
20. Hygroscopic water	1·49	—	0·07	—
21. Water in composition	8·54	8·66	0·85	0·85
Total	100·112	100·117	100·069	100·059
Per cent. of insoluble siliceous water...	19·43	19·73	28·53	28·55

Partial Analyses of Iron Ores from 48 mines in Maryland.

Phosphorus ...	Ranging from 0·040 per cent. to 1·363 per cent. for natural ore.
Metallic iron ...	Ranging from 30·45 per cent. to 64·85 per cent. for natural ore.
Phosphorus ...	Ranging from 0·025 per cent. to 1·396 per cent. for dried ore.
Metallic iron ...	Ranging from 30·77 per cent. to 64·88 per cent. for dried ore.

6. The proprietors of the deposits are usually poor farmers, and when ore is discovered on their lands they almost invariably put such a high value on them that their purchase cannot be made at remunerative prices.

7. The deposits have been worked in Virginia to a considerable extent, and the production for the five years ending 1901 was as follows:—

State.	1897.	1898.	1899.	1900.	1901.
	Tons.	Tons.	Tons.	Tons.	Tons.
Kentucky	12,464	12,913	35,384	56,057	46,499
Maryland	11,500	5,941	3,428	26,223	21,218
Virginia and West Virginia	711,125	557,713	986,476	921,821	925,394

The exports of iron ore from these States is infinitesimal.

8. The ores in the States in this consular district are what are called pockety. There are a few continuous beds, but the deposits are uncertain in extent.

9. A general characteristic of these ores is that they are too high in phosphorus for the production of Bessemer steel. They are suited to making a foundry, forge, and basic pig iron, but not high enough in phosphorus, for the making of basic Bessemer metal.

CHARLESTON.

(*Mr. Consul de Coetlogon.*)

1. Iron ore exists, and is somewhat widely distributed in the western counties of North and South Carolina, Georgia, and also in the eastern parts of the State of Tennessee; the above named sections form parts of the Appalachian range of mountains, which extend southward into Alabama, the principal producer of iron in the Southern States.

Tennessee is the most important State in this consular district producing iron and coal. In the Georgian iron district, near Altoona, situated between Chattanooga and Atlanta, iron ore is mined and forwarded from there to the blast furnaces in Tennessee and Alabama for treatment of the ore, there being no blasting facilities in operation at present in Georgia, South Carolina and North Carolina.

During the American civil war, iron was mined for the Confederate Government in South Carolina, in the county of Spartanburg, in the Piedmont section of that State. The principal iron mine in North Carolina is situated at Cranberry, in Mitchell County, at the terminus of the Tennessee and Western North Carolina Railroad. The ore body consists of an immense lens of magnetite. The ore is in irregular masses through the gangue, and is at times intimately associated with it in bands, the extent and thickness of which are variable, ranging from a few inches to more than fifty feet. Nearly all the iron produced in North Carolina during the years 1900 and 1901 was from this mine, which, however, was shut down during the greater part of 1902. The output in 1901 was about 2,500 tons, compared with 21,000 during the previous year of 1900.

The only other mine producing iron in North Carolina in 1901 was the Potato Creek Mine, situated in the Piney Creek District, of Alleghany County, and it contains magnetic ore. There are also large iron deposits in Ashe County, North Carolina, which are reported to have been purchased by the Pennsylvania Iron Company, who are expected to begin extensive operations in the near future. The shutting down of the large blast furnace

of the Empire Steel and Iron Company, at Greensboro, North Carolina, two years ago, resulted in closing the mines in the eastern and central part of the State. This state of affairs was brought about by the competition of the Lake Superior iron ores, but it is believed this will not be permanent, as the Lake Superior district is understood to be limited, and unless other sources in the neighbourhood are found to supply the demand, the ores of more distant districts will become available, and while at the present time the iron ores of North and South Carolina and Georgia are adding comparatively little to the wealth of these States, they are, nevertheless, regarded as representing reserved sources of supply which in time will be valuable.

Some of the principal other iron localities of North Carolina for magnetite ores are in Granville, Stokes, Surry, Catawba, Ashe, and Mitchell Counties; while the limonite ores are in Chatham, Gaston, and Cherokee Counties. Geologically speaking, the magnetite and hæmatite ores are confined almost exclusively to the crystalline rocks. Some limonites are also found in these rocks and in the Ocoee formation of Madison and Cherokee Counties. The history of iron mining in North Carolina dates back to the year 1729, when small shipments of the ore were made to England, mined most likely from the bog ores near the coast.

A bulletin of the iron ores of North Carolina, together with a map showing the distribution of the ores throughout the State, issued by the North Carolina Geological Survey for 1902, is herewith enclosed; these documents give full particulars in regard to this matter, including analyses of ores, &c.

Tennessee is the most important iron producing State in this consular district, as before mentioned; there are twenty-two blast furnaces in the State, and the production of pig iron during the year 1901 was 337,139 tons, compared with 267,625 tons in 1890.

The amount of iron ore produced in 1900 was 594,171 tons, compared with 473,294 tons in 1889.

There are three varieties of iron ore found in the Tennessee iron districts, viz., brown ore, or limonite, red fossil ore, and the carbonate of iron. The brown ore is found in a belt fifty miles wide, west of Nashville, and extending from the Ohio river southward through Dickson, Hickman, and Wayne Counties, in the State of Tennessee, to Russellville in Alabama.

This ore is found in pockets, or banks, some of which are extensive and others small. The best deposits of this ore, however, so far as has been ascertained, are contiguous to the Cumberland and Mannie furnaces; it also embraces the Nunnely Banks in Hickman County, together with the Mannie Banks and Wayne Banks in Wayne County.

When properly dressed these ores will average about fifty per cent. in metallic iron, about eight per cent. in siliceous matter, and a variable quantity of phosphorus, ranging from a quarter per cent. to one per cent.; there being scarcely a trace of sulphur in any of them. It is probable that the deposits near Mannie furnace and southward through Wayne County contain as much iron ore within a limited area as any other deposits of brown ore in the south.

As much as twenty thousand tons has been mined from a single acre.

The red fossil ore is found on the eastern side of Sequatchie Valley, Tennessee, at the foot of Walden's Bridge; this ore has been mined for many years at Inman, and used in the South Pittsburg furnaces. While there appears to be an abundant quantity, the ore is low in metallic iron and very high in the carbonate of lime.

The carbonate of iron called the spathic, or black band iron ore, occurs in a stratified deposit in contact with the mountain, or Bangor limestone, forming usually a layer between that and the lower conglomerate rock. This bed of ore has been met with on Crow Creek in Franklin County, in the borings at Tracey City, and also at Beersheba Springs. It is three feet and a half thick at the head of Hubbard's Cove, in the north-western part of Grundy County, its characteristics being lightness of colour, fineness of grain, and a certain resemblance to an earth coloured limestone.

This ore is undergoing, at all exposed points, a change from the carbonate to the limonite, or the oxide of iron.

An analysis of this ore has been made by the Hon. Charles W. Hayes, United States Geologist, No. 1 being the unchanged carbonate, and No. 2 the oxydized carbonate:—

—	Number 1.	Number 2.
Metallic iron	35·19	47·21
Silica	5·55	8·00
Carbonic acid	34·29	—
Phosphorus	·14	·20

The above shows that this ore compares favourably with other carbonates of iron found elsewhere, and that it would give good results in a furnace after roasting.

2. The nearest shipping ports to the iron ore sections in this district, as above described, capable of admitting ocean steamers, are Savannah and Brunswick, in Georgia, Port Royal and Charleston in South Carolina, and Wilmington in North Carolina; each of these ports is about four hundred miles from the ore deposits.

3. The only means of transporting the ore to the shipping ports would be by railway, and the last quoted railway rates were ten to twelve shillings per ton, equal in United States currency to about two and a half to three dollars per ton.

4. Negro labour is perhaps the principal kind, the cheapest and most available for mining purposes, all things considered, in this part of the country; it is worth from a dollar to a dollar and a half per day. It might also be possible to obtain convict labour, at a cheaper rate, from the State in Georgia, Tennessee and North Carolina, by making special contracts with the authorities for the same, rates perhaps depending to some extent on the number of hands wanted and period required.

5. Official analyses of these are given herewith, in this report (in answer to Question 1) and in the Bulletin No. 1 already referred to and transmitted separately.

6. The status of the proprietors of the ore lands varies greatly, some being rich and quite independent, but many holders are persons of moderate means, who would be willing to sell on reasonable terms. Much of the undeveloped ore land could be bought cheaply by careful purchasers, who, watching their opportunities and taking advantage of forced sales, could at times secure good bargains.

Most of the leading real estate dealers in the towns of Atlanta, Georgia, Knoxville and Chattanooga, in Tennessee, and Asheville, in North Carolina, could put prospective buyers into communication with sellers of ore lands in their respective localities.

7. The deposits of iron ore in all the States of this district have been at some time worked, but the product of the Tennessee, North Carolina, and Georgia mines are used to meet local demands of the domestic American markets, practically none of it having been shipped abroad during the past five years, whilst foreign shipments of iron from Charleston (South Carolina) also from Savannah (Georgia) during this period have originated in nearly every case at Birmingham, Alabama.

8. There are no especial obstacles in the way of successful mining in this district, except the competition of the important iron manufacturing establishments around Birmingham, Alabama, and the other American competitors in Pennsylvania and elsewhere.

9. Full additional particulars with reference to the iron ore supplies will be found set forth in the enclosed map of the Tennessee iron and coal district, and in the north iron ore map and bulletin before mentioned, these documents having been prepared under the direction of the State Geologists in each case.

CHICAGO.

(*Captain W. Wyndham, Consul.*)

1. There are iron ore deposits in five States in this consular district.

2. Colorado, Wyoming, Minnesota, Missouri, and Wisconsin.

The nearest port to the Colorado and Wyoming mines is San Francisco, a distance of over 500 miles, so that this field is entirely out of any shipping sphere, and can only be used for local requirements.

The gulf ports are nearest to the Missouri field, but it is said to be too far to consider. A report from Mr. Vice-Consul Bascome, of St. Louis, is forwarded (*see page 228*).

Large lake steamers load the Lake Superior iron ore from Minnesota and Wisconsin at ports from 40 to 100 miles from the mines, but no exports of ore have been made, and only the lake ports supplied.

A map of Lake Superior region is annexed, which includes the Michigan iron ranges. It is impossible to report on this district without including the State of Michigan.

3. No estimate can be given of the cost of transportation by lake to Quebec and Montreal, as no facilities are in use at those ports for the speedy unloading of ore. The railroad freight from mines to lake ports for loading varies from 1s. 8d. to 4s. 2d. per ton. The lake freights vary from 2s. 6d. for 500 miles to 3s. 2d. for 985 miles.

4. The greater number of labourers employed in the Lake Superior mines consist of Finns, Austro-Hungarians and Italians. Many of these men own farms in the neighbourhood, and work on them in the summer when work is slack in the deep mines, or are lumbermen in the winter, working in the open pit mines during the summer season. In 1900 skilled labourers received 12s. a day, miners 8s. 7d., trammers 8s. 7d., labourers, both underground and surface, 8s. 2d.

The cost of mining varies greatly in the mines of different systems of working. Hard ores cost 6s. 2d. per ton, and hæmatites 4s. 1½d.; shaft mining in the Mesabi Range 3s. 1d., and open pit in the same district from 1s. to 1s. 3d.

5. Copies of analyses of ores are attached. (*See below.*)

In addition to the price fixed by the demand the analysis is also taken into consideration, and the following table has been used since 1897. The price of base ore is fixed by market demand, and in 1901 was 17s. 6d. per ton. The base is an ideal ore of 63 per cent. iron, .045 per cent. phosphorus, and 10 per cent. moisture. After this calculation has been made the price is still varied by per cent. of iron, silica, &c. :—

Percentage of Phosphorus.	Rate of change per price per ton according to percentage of Phosphorus.	Phosphorus value to be added to or subtracted from base ore value.	Price.		
			s.	d.	\$
·070	·0200	·3500	16	0·988	= 3·9000
·069	·0195	·3300	16	1·978	= 3·9200
·068	·0190	·3105	16	2·9436	= 3·9395
·067	·0185	·2915	16	3·844	= 3·9585
·066	·0180	·2730	16	4·8	= 3·9770
·065	·0175	·2550	16	5·690	= 3·9950
·064	·0170	·2375	16	6·555	= 4·0125
·063	·0165	·2205	16	7·396	= 4·0295
·062	·0160	·2040	16	8·214	= 4·0460
·061	·0155	·1880	16	9·006	= 4·0620
·060	·0150	·1725	16	9·772	= 4·0775
·059	·0145	·1575	16	10·514	= 4·0925
·058	·0140	·1430	16	11·268	= 4·1070
·057	·0135	·1290	16	11·925	= 4·1210
·056	·0130	·1155	17	0·592	= 4·1345
·055	·0125	·1025	17	1·286	= 4·1475
·054	·0120	·0900	17	1·855	= 4·1600
·053	·0115	·0780	17	2·449	= 4·1720
·052	·0110	·0665	17	3·018	= 4·1835
·051	·0105	·0555	17	3·562	= 4·1945
·050	·0100	·0450	17	4·082	= 4·2050
·049	·0095	·0350	17	4·576	= 4·2150
·048	·0090	·0255	17	5·047	= 4·2245
·047	·0085	·0165	17	5·602	= 4·2335
·046	·0080	·0080	17	5·912	= 4·2420
·045	·0000	·0000	17	6·308	= 4·2500
·044	·0080	·0080	17	6·704	= 4·2580
·043	·0085	·0165	17	7·125	= 4·2665
·042	·0090	·0255	17	7·447	= 4·2755
·041	·0095	·0350	17	7·916	= 4·2850
·040	·0100	·0450	17	8·547	= 4·2950

NOTE.—Exchange at \$4·85 to £.

Percentage of Phosphorus.	Rate of change per price per ton according to percentage of Phosphorus.	Phosphorus value to be added to or subtracted from base ore value.	Price.		
			s.	d.	\$
.039	.0105	.0555	17	9-055	= 4-3055
.038	.0110	.0665	17	9-600	= 4-3165
.037	.0115	.0780	17	10-044	= 4-3280
.036	.0120	.0900	17	10-761	= 4-3400
.035	.0125	.1025	17	11-380	= 4-3525
.034	.0130	.1155	17	11-800	= 4-3655
.033	.0135	.1290	18	0-692	= 4-3790
.032	.0140	.1430	18	1-384	= 4-3930
.031	.0145	.1575	18	2-102	= 4-4075
.030	.0150	.1725	18	2-845	= 4-4225
.029	.0155	.1880	18	3-612	= 4-4380
.028	.0160	.2024	18	4-401	= 4-4540
.027	.0165	.2205	18	5-260	= 4-4705
.026	.0170	.2375	18	6-061	= 4-4875
.025	.0175	.2550	18	6-927	= 4-5050
.024	.0180	.2730	18	7-813	= 4-5230
.023	.0185	.2915	18	8-783	= 4-5415
.022	.0190	.3105	18	9-673	= 4-5605
.021	.0195	.3300	18	10-638	= 4-5800
.020	.0200	.3500	18	11-628	= 4-6000
.019	.0205	.3705	19	0-643	= 4-6205
.018	.0210	.3915	19	1-682	= 4-6415
.017	.0215	.4130	19	2-745	= 4-6630
.016	.0220	.4350	19	3-884	= 4-6850
.015	.0225	.4575	19	4-947	= 4-7075
.014	.0230	.4805	19	6-088	= 4-7305
.013	.0235	.5040	19	7-249	= 4-7540
.012	.0240	.5280	19	8-436	= 4-7780
.011	.0245	.5525	19	9-649	= 4-8025
.010	.0250	.5775	19	10-886	= 4-8275
.009	.0255	.6030	20	0-148	= 4-8530
.008	.0260	.6290	20	1-434	= 4-8790
.007	.0265	.6555	20	2-746	= 4-9055
.006	.0270	.6825	20	4-082	= 4-9325
.005	.0275	.7100	20	5-443	= 4-9600

NOTE.—Exchange at \$4.85 to £.

Analyses, and Prices of Base Ore, 1895 to 1902 inclusive.

Year.	Iron.	Phosphorus.	Moisture.	Natural.	Price at Lake Erie.
1895	63.25	.045	9.00	57.56	\$ s. d. 2.90=11 11½
1896	63.00	.045	9.75	56.58	4.00=16 6
1897	63.00	.045	10.00	56.70	2.60=10 8¼
1898	63.00	.045	10.00	56.70	2.75=11 4½
1899	63.00	.045	10.00	56.70	2.95=12 2
1900	63.00	.045	10.00	56.70	5.50=22 8¼
1901	63.00	.045	10.00	56.70	4.25=17 6½
1902	63.00	.045	10.00	56.70	4.25=17 6½

Cargo Analyses of Gogebic Range Ores, 1899 and 1901.

The upper figures, analysis when dried at 212° F.; lower natural.

Name of Ore.	Year.	Iron.	Silica	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*Ashland (299,083), shaft ..	1899 {	63.00	—	.045	—	—	—	—	—	—	12.00
	1901 {	55.44	—	.0396	—	—	—	—	—	—	—
†Anvil	1899 {	61.00	6.85	.045	.240	3.23	.360	.280	.012	2.30	—
	1901 {	54.29	6.09	.040	.213	2.87	.320	.249	.010	2.047	11.00
Anvil, special (1,100) ..	1899 {	63.00	5.80	.048	.90	.97	.25	.17	.005	3.02	—
	1901 {	55.03	5.066	.0419	.786	.847	.218	.148	.004	2.637	12.65
†Ardale	1899 {	52.00	5.80	.050	10.00	.97	.25	.17	.005	3.02	—
	1901 {	45.76	5.10	.044	8.80	.85	.22	.149	.004	2.657	12.00
Atlantic	1899 {	56.99	10.459	.055	.30	4.60	.220	.100	—	2.82	—
	1901 {	51.02	9.364	.049	.268	4.118	.196	.089	—	2.524	10.469
†Aurora (234,249 tons) ..	1899 {	62.77	4.16	.043	1.04	1.11	.19	.105	.015	—	—
	1901 {	55.243	3.661	.0378	.915	.976	.167	.092	.013	—	11.99
Best	1899 {	61.88	—	.048	—	—	—	—	—	—	—
	1901 {	55.28	—	.042	—	—	—	—	—	—	10.65
†Bonnie	1899 {	61.81	5.48	.027	.43	1.11	.07	.10	.010	4.02	—
	1901 {	55.72	4.94	.024	.39	1.00	.063	.09	.009	3.62	9.86
Brotherton (105,000) ..	1899 {	62.73	4.76	.033	.37	1.88	.280	.13	—	2.90	—
	1901 {	55.23	4.19	.029	.325	1.65	.246	.114	—	2.55	11.952
†Bonnie	1899 {	55.48	13.94	.056	1.00	1.62	.35	.26	.025	3.03	—
	1901 {	48.28	12.13	.048	.87	1.40	.30	.22	.021	2.63	12.98
Brotherton (105,000) ..	1899 {	56.29	12.22	.59	.93	.98	.68	.90	.007	2.90	—
	1901 {	49.23	10.68	.516	.81	.857	.59	.787	.006	2.53	12.54
Brotherton (105,000) ..	1899 {	53.45	11.04	.027	5.11	1.40	.14	1.10	.025	3.51	—
	1901 {	47.37	9.78	.024	4.52	1.24	.12	.97	.022	3.11	11.37
Brotherton (105,000) ..	1899 {	50.23	12.57	.038	6.01	1.69	.17	.70	.019	4.58	—
	1901 {	45.207	11.31	.034	5.409	1.52	.15	.63	.017	4.12	10.00
Brotherton (105,000) ..	1899 {	63.03	7.04	.029	.405	.756	.40	.046	.009	1.150	—
	1901 {	56.27	6.292	.026	.362	.676	.358	.041	.008	1.03	10.73
Brotherton (105,000) ..	1899 {	62.50	7.35	.028	.35	1.00	.20	.04	.010	1.15	—
	1901 {	56.25	6.615	.025	.315	.90	.180	.036	.009	1.035	10.00

* Worked by Cleveland Cliffs Iron Company.

† Newport Mining Company owns Anvil and Newport, latter 4 ores, 213,588 tons in 1901.

‡ Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.

Gogebic Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Buckeye	1899	50.94	9.17	.052	.38	1.72	.12	.40	.022	2.23	12.61
	1901	58.14	10.50	.084	.43	2.02	.14	.46	.025	—	—
Cary Empire	1899	51.17	9.24	.074	.38	1.88	.12	.41	.022	—	12.00
	1901	57.79	4.54	.057	3.97	.77	.18	.10	.005	5.75	—
Colby, No. 1	1899	52.23	4.103	.051	3.588	.695	.162	.090	.004	5.196	9.62
	1901	58.46	4.75	.050	3.02	.97	.12	.14	.012	5.64	—
Colby, No. 2	1899	52.555	4.270	.053	2.715	.872	.107	.125	.0108	5.0704	10.10
	1901	57.66	3.61	.084	6.12	1.345	.34	.28	.009	6.94	—
Colby Bessemer	1899	51.89	3.25	.058	5.51	1.211	.31	.25	.0081	6.25	10.00
	1901	56.700	3.200	.066	6.820	.880	.160	.400	.006	2.200	—
Cass	1899	51.585	2.911	.060	6.204	.800	.145	.363	.005	2.201	9.020
	1901	60.37	3.74	.092	2.80	1.28	.17	.23	.006	4.60	—
Day	1899	54.94	3.40	.084	2.55	1.16	.15	.21	.005	4.19	9.00
	1901	60.600	4.000	.080	2.250	1.100	.170	.470	.008	2.150	—
Fairfax	1899	54.661	3.608	.072	2.029	.992	.153	.423	.007	1.939	9.800
	1901	64.300	2.720	.039	.260	1.020	.160	.210	.006	1.900	—
Globe	1899	57.857	2.447	.035	.233	.917	.143	.188	.005	1.709	10.020
	1901	53.65	8.14	.053	7.22	.86	.21	2.17	.019	3.13	—
Hennepin	1899	47.335	7.41	.0467	6.67	.75	.18	1.91	0.16	2.76	11.77
	1901	62.370	—	.0723	—	—	—	—	—	—	—
Iron Belt	1899	55.806	—	.0646	—	—	—	—	—	—	10.524
	1901	63.287	—	.0736	.756	—	—	—	—	—	—
*Ironton	1899	54.677	—	.0635	.6531	—	—	—	—	—	13.604
	1901	64.23	6.68	.117	.19	—	—	—	—	—	—
Jack Pot (22,000)	1899	56.522	3.878	.1029	.1672	—	—	—	—	—	12.00
	1901	59.30	10.10	.049	.36	1.23	.25	.09	.015	2.70	—
Lawrence	1899	53.42	9.099	.044	.32	1.108	.225	.081	.0135	2.43	9.91
	1901	60.66	8.35	.045	.35	1.60	.18	.13	.011	2.40	—
Lyon	1899	53.59	7.38	.040	.31	1.41	.16	.11	.010	2.12	11.66
	1901	60.50	8.75	.045	.36	1.50	.35	.39	.030	3.90	—
†Melrose	1899	53.32	7.71	.040	.32	1.32	.31	.34	.027	3.40	11.86
	1901	61.120	6.700	.051	.920	1.400	.360	.120	.004	2.900	—
Melrose, No. 2	1899	54.641	5.989	.045	.822	1.251	.321	.107	.003	2.592	10.600
	1901	52.90	—	.035	—	—	—	—	—	—	—
*Meteor (35,563 tons)	1899	46.05	—	.030	—	—	—	—	—	—	12.95
	1901	61.83	5.90	.040	.57	1.38	.15	.13	.020	3.30	—
‡Mikado (76,116)	1899	55.61	5.31	.057	.51	1.24	.13	.12	.018	2.97	10.06
	1901	62.21	4.62	.055	.30	1.34	.19	.11	.018	3.98	—
.. ..	1899	55.44	4.12	.049	.27	1.20	.17	.10	.016	3.55	10.37
	1901	58.44	—	.048	—	—	—	—	—	—	—
.. ..	1899	53.31	—	.0447	—	—	—	—	—	—	3.77
	1901	62.19	4.72	.0302	.91	.96	.16	.09	.018	3.86	—
.. ..	1899	55.025	4.17	.0267	.80	.84	.14	.07	.015	3.41	11.52
	1901	62.00	5.35	.040	.95	1.08	.17	.13	.011	3.31	—
.. ..	1899	55.40	4.78	.0357	.848	.964	.15	.116	.0098	2.957	10.65
	1901	62.00	5.15	.070	—	1.08	.17	.13	.011	3.31	—
.. ..	1899	55.40	4.60	.062	—	.964	.15	.116	.0098	2.957	10.65
	1901	60.100	8.700	.039	.560	.900	.620	.090	.004	2.260	—
.. ..	1899	53.639	7.764	.034	.499	.603	.553	.080	.003	2.017	10.750
	1901	56.35	15.05	.138	.35	1.10	.24	.17	.010	2.30	—
.. ..	1899	48.6582	12.9957	.1192	.3022	.9499	.2072	.1468	.0086	1.9861	13.65
	1901	57.29	13.90	.151	.32	1.01	.42	.18	.011	1.55	—
.. ..	1899	50.3121	12.2070	.1326	.2810	.8870	.3888	.1531	.0097	1.3612	12.18
	1901	—	—	—	—	—	—	—	—	—	—

* Corrigan, McKenney, and Company, owners, are doing large explorations.
 † Newport Mining Company owns Anvil and Newport, latter 4 ores, 213,588 tons in 1901.
 ‡ Owned by Verona Mining Company, and operated by Palkands, Mather, and Company.
 NOTE.—Ironton, Puritan, and Winona, output 19,229 tons.

Gogebic Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese	Alumina.	Lime.	Magnesia	Sulphur	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Montreal	1899	65.42	3.14	.041	.84	.71	.13	.12	.11	.016	3.07
		60.09	2.88	.038	.77	.65	.12	.11	.016	3.07	8.14
	1901	62.86	4.47	.045	.43	1.18	.20	.13	.012	—	—
		56.15	3.99	.040	.38	1.05	.18	.12	.011	—	10.68
New Davis	1901	48.00	11.02	.055	10.00	—	—	—	—	—	—
		44.16	10.14	.051	9.20	—	—	—	—	—	8.00
†New Era	1899	67.105	11.40	.0285	1.41	1.24	.19	.10	.011	5.06	—
		50.44	10.06	.0251	1.24	1.09	.16	.08	.009	4.54	10.12
	1901	58.00	10.05	.035	.90	1.23	.26	.14	.011	4.41	—
		51.27	8.883	.0309	.795	1.087	.229	.12	.0097	3.897	11.61
†New Era, No. 2	1901	58.00	10.05	.075	.90	1.23	.26	.14	.011	4.41	—
		51.27	8.88	.066	.795	1.087	.229	.12	.0097	3.897	11.61
†Newport	1899	53.702	5.63	.0392	7.66	1.12	17	.14	.009	5.06	—
		48.267	5.06	.0352	6.88	1.00	.15	.12	.008	4.54	10.12
	1901	53.23	6.24	.041	8.12	.81	.22	.18	.008	5.15	—
		47.60	5.58	.0366	7.26	.72	.196	.16	.007	4.60	10.57
*†Norrie (625,391 tons, shaft)	1899	62.597	—	.0420	—	—	—	—	—	—	—
		56.4736	—	.0376	—	—	—	—	—	—	10.298
	1901	63.425	3.994	.0405	.400	1.90	.320	.120	—	2.600	—
		56.5662	3.5620	.03612	.3567	1.694	.2853	.1070	—	2.318	10.814
*†Norrie Norden	1901	63.995	2.992	.0804	.350	1.48	.240	.090	—	3.30	—
		57.8124	2.7029	.07263	.3161	1.337	.2168	.0813	—	2.981	9.661
Nordale	1901	58.268	10.025	.0362	.310	3.43	.220	.100	—	2.66	—
		52.255	9.0147	.03243	.2780	3.076	.1972	.0896	—	2.385	10.319
North Vein	1899	62.58	5.50	.048	.41	1.20	.09	.08	.004	—	—
		56.28	4.94	.043	.37	1.08	.08	.07	.004	—	10.10
Ottawa.. .. .	1901	58.10	6.14	.067	2.72	1.58	.05	.16	.005	4.74	—
		52.00	5.50	.060	2.43	1.41	.04	.14	.004	4.24	10.50
Ottawa Manganese	1901	54.95	4.25	.074	6.29	1.01	.15	.21	.031	6.50	—
		49.18	3.80	.066	5.63	.91	.13	.18	.028	5.81	10.50
Palms	1899	61.856	5.28	.0556	.90	1.31	.17	.12	.012	3.26	—
		52.633	4.49	.047	.76	1.11	.14	.10	.010	2.77	14.91
§Puritan	1901	57.200	6.200	.038	4.020	1.400	.420	.120	.006	2.900	—
		50.679	5.493	.033	3.561	1.240	.372	.106	.005	2.599	11.400
*||Rand	1899	62.340	—	.0460	3.610	—	—	—	—	—	—
		54.7968	—	.0404	3.1731	—	—	—	—	—	12.100
	1901	63.43	2.58	.0397	1.99	1.22	.47	.35	—	2.83	—
		55.361	2.251	.0346	1.736	1.064	.410	.305	—	2.470	12.72
Rowe	1901	57.00	11.25	.040	.90	.70	.23	.19	.02	2.75	—
		49.59	9.787	.0348	.78	.609	.20	.165	.017	2.39	13.00
Sunday Lake (89,997)	1899	63.00	7.00	.030	.32	1.34	.16	.06	.006	.59	—
		53.07	6.23	.0267	.285	1.193	.143	.054	.005	.53	11.00
	1901	62.50	7.10	.028	.30	.95	.25	.05	.010	1.04	—
		56.25	8.390	.0252	.270	.855	.225	.045	.009	.936	10.00
Taylor	1899	62.00	—	.065	—	—	—	—	—	—	—
		54.56	—	.0572	—	—	—	—	—	—	12.00
	1901	58.00	8.40	.052	.230	3.52	.280	.150	.014	3.20	—
		52.20	7.56	.0468	.207	3.168	.234	.135	.0126	2.88	10.00
*||Tilden (421,316 tons)	1899	62.737	—	.0476	.784	—	—	—	—	—	—
		54.238	—	.0411	.6777	—	—	—	—	—	13.546
	1899	63.88	2.99	.0497	.77	1.29	.53	.37	—	2.68	—
		55.505	2.598	.0438	.669	1.120	.460	.321	—	2.328	13.11

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.

† Newport Mining Company owns Anvil and Newport, latter 4 ores, 213,588 tons in 1901.

‡ Ore from Norrie and East Norrie, 625,391 tons, from Pabst Mine, 177,561.

§ Corrigan, McKinney, and Company, owners, are doing large explorations.

|| All from Tilden Mine.

Gogebic Range—continued.

Name of Ore.	Year	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*†Tilden, No. 8	1899	62.358	—	.0400	1.678	—	—	—	—	—	—
		54.139	—	.0347	1.456	—	—	—	—	—	13.179
*†Tilden Norden	1901	63.82	3.00	.0756	.76	1.30	.56	.44	—	2.59	—
		55.293	2.599	.0654	.658	1.126	.485	.381	—	2.243	13.36
‡Winona	1901	57.200	8.000	.046	2.180	.900	.210	.090	.006	2.180	—
		51.036	7.152	.041	1.948	.804	.187	.080	.005	1.948	10.600
*Chicago	—	55.00	—	.075	—	—	—	—	—	—	—
*Royal (underground openings)	—	—	—	—	—	—	—	—	—	—	—
*Genevia	—	—	—	—	—	—	—	—	—	—	—
§Salisbury (181,019).. ..	1901	—	—	—	—	—	—	—	—	—	—

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.
 † All from Tilden Mine. ‡ Corrigan, M Kinney, and Company, owners, are doing large explorations.
 § Worked by Cleveland Cliffs Iron Company.

Cargo Analyses of Menominee Range Ores, 1899 and 1901.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*†Ajax	1899	52.17	11.14	.0607	.86	2.22	1.56	4.70	.022	3.94	—
		48.612	10.38	.0565	.80	2.06	1.45	4.37	.020	3.67	6.82
	1901	52.10	14.60	.0575	.4272	1.76	1.55	3.34	.005	2.70	—
		48.677	13.640	.0537	.3991	1.644	1.448	3.120	.0046	2.522	6.57
Amasa	1899	55.64	6.84	.218	.29	2.95	2.05	1.92	.015	5.30	—
		53.6982	6.6013	.2104	.2799	2.8470	1.9785	1.8530	.0145	5.1150	3.49
‡Armenia (23,983)	1901	58.700	6.950	.226	.200	1.180	2.190	1.020	.004	3.100	—
		52.653	6.234	.202	.179	1.058	1.964	.914	.003	2.780	10.300
Atfield	1901	60.58	6.18	.055	.078	2.48	.84	.62	.22	2.42	—
		54.402	5.549	.0493	.0700	2.227	.754	.556	.197	2.173	10.197
Badger	1899	59.91	4.47	.120	.22	2.52	1.20	1.97	.100	—	—
		54.39	4.06	.100	.20	2.29	1.09	1.79	.091	—	9.22
§Baltic (27,871, large body of ore)	1901	59.35	3.79	.456	.26	3.13	.39	.43	.052	5.55	—
		53.9195	3.4432	.4143	.2362	2.8436	.3543	.3907	.0472	5.0422	9.15
Bangor	1901	59.00	6.50	.46	.23	1.99	.61	.90	.050	4.15	—
		51.92	5.72	.40	.20	1.75	.536	.79	.044	3.65	12.00
Barfield	1901	58.57	8.15	.074	.129	2.68	.924	.67	.234	3.10	—
		52.363	7.286	.0661	.1153	2.396	.8260	.599	.2092	2.771	10.597
Barton	1899	59.828	—	.530	—	—	—	—	—	—	—
		56.4752	—	.5002	—	—	—	—	—	—	5.604
	1901	59.09	4.71	.416	.640	2.32	.66	.533	.035	5.50	—
		56.460	4.500	.3974	.6115	2.216	.630	.5092	.033	5.255	4.45
Basic	1901	56.880	4.140	.360	4.900	1.650	2.200	1.180	.006	2.900	—
		52.557	3.825	.332	4.527	1.524	2.032	1.090	.005	2.679	7.600
||Bristol.. ..	1899	50.00	6.10	.738	2.69	3.34	3.77	1.97	.033	7.95	—
		46.09	5.62	.680	2.48	3.08	3.48	1.82	.030	7.33	7.82
	1901	56.70	5.24	.496	.94	1.83	1.54	.50	.022	6.72	—
		52.45	4.85	.458	.87	1.69	1.42	.46	.020	6.21	7.50

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.
 † 1901 production, 927,747, Chapin Mine.
 ‡ Corrigan, M Kinney, and Company, owners, are doing large explorations.
 § Owned by Verona Mining Company, and operated by Palkands, Mather, and Company.
 || Bristol Mining Company owns the Bristol, producing two ores, Bristol and Manganate, 41,600, and Beaufort.

Menominee Range—continued.

Name of Ore.	Year.	Iron.	Silica	Phosphorus.	Manganese.	Alumina.	Lime	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Brunswick	1901	57.81	4.86	.520	.250	3.10	1.37	.853	.016	4.44	—
		50.820	4.272	.4571	.2197	2.725	1.204	7.498	.0140	3.903	12.09
Cedar	1899	52.00	10.26	.190	.30	3.95	1.75	4.87	.130	3.68	—
		47.59	9.39	.170	.27	3.61	1.60	4.46	.119	3.37	8.49
*†Chapin (shaft)	1899	58.13	6.20	.065	.54	1.41	1.235	3.565	.019	3.22	—
		54.08	5.76	.060	.485	1.31	1.145	3.31	.017	3.00	6.96
	1901	59.30	6.25	.0615	.4124	1.17	1.34	2.87	.004	2.55	—
		55.368	5.835	.0574	.3850	1.092	1.251	2.679	.0037	2.380	6.63
Clearfield	1901	59.18	6.13	.047	.067	2.37	1.48	.69	.495	3.43	—
		52.377	5.425	.0415	.0592	2.097	1.309	.610	.4380	3.035	11.495
‡Clifford (63,155, Traders' Mine)	1899	41.01	39.10	.014	.09	.97	.49	.29	.003	.45	—
		39.96	38.10	.0136	.087	.945	.48	.28	.0029	.44	2.55
	1901	41.00	39.79	.012	.12	.81	.21	.09	.010	.68	—
*Columbia, No. 1	1899	39.85	38.67	.012	.12	.79	.19	.09	.009	.66	2.82
		60.00	5.10	.52	.23	1.99	.61	.90	.050	4.15	—
*Columbia, No. 2	1899	53.28	4.52	.461	.20	1.76	.54	.79	.044	3.68	11.20
		54.48	12.15	.46	.21	1.95	1.20	.65	.049	2.56	—
Crystal Falls (232,294 tons)	1899	48.378	10.78	.408	.18	1.73	1.09	.57	.043	2.27	11.20
		58.40	4.09	.71	.31	1.40	2.62	2.02	.007	3.51	—
	1901	53.84	3.77	.655	.29	1.29	2.42	1.83	.036	3.24	7.80
		58.650	4.270	.772	.380	1.820	2.600	1.060	.006	2.200	—
Davidson (78,000, Commonwealth Mine; also own 2,000 acres near)	1899	53.806	3.902	.705	.347	1.663	2.376	.968	.005	2.010	8.600
		56.03	7.64	.180	.24	3.43	1.27	2.89	.080	5.00	—
	1901	50.78	6.92	.163	.22	3.11	1.15	2.62	.073	4.53	9.37
		56.06	7.29	.130	.35	3.76	1.08	2.85	.120	—	—
Davy	1901	49.89	6.49	.116	.31	3.35	.96	2.50	.106	—	11.00
		41.50	38.08	.021	.08	.33	.60	.85	.02	.66	—
Florence	1899	41.08	37.699	.0207	.079	.326	.59	.84	.019	.65	1.00
		56.02	4.85	.325	.38	2.83	1.70	2.50	.125	5.44	—
	1901	51.459	4.45	.298	.34	2.62	1.56	2.29	.114	4.99	8.14
		55.00	6.05	.292	.50	3.95	2.30	3.34	.11	5.23	—
*‡Granada (shaft)	1899	49.87	5.486	.264	.45	3.58	2.08	3.028	.099	4.74	9.32
		61.52	4.60	.061	.23	1.53	.36	1.63	.015	2.30	—
	1901	56.64	4.23	.056	.21	1.41	.33	1.50	.014	2.12	7.93
		60.75	5.35	.0605	.153	1.39	.98	3.17	.019	2.17	—
*Gray (Cundy Mine, 178,856 tons)	1901	56.029	4.934	.0557	.1411	1.281	.903	2.923	.0175	2.001	7.77
		43.91	23.88	.038	.53	1.91	—	—	.062	4.70	—
	1899	43.466	23.638	.0376	.524	1.890	—	—	.0613	4.652	1.01
§Great Western (108,442)	1899	60.40	5.80	.385	.61	1.21	2.24	1.65	.009	2.43	—
		55.39	5.32	.353	.56	1.11	2.05	1.51	.008	2.23	8.30
	1901	59.040	6.800	.327	.900	1.760	2.180	.960	.007	2.970	—
§Groveland, No. 1	1901	53.903	6.208	.298	.821	1.606	1.990	.876	.006	2.711	8.700
		52.030	10.870	.046	1.370	2.700	6.200	4.720	.008	3.260	—
Groveland, No. 2 (13,649)	1901	48.700	10.174	.043	1.282	2.527	5.803	4.417	.007	3.051	6.400
		51.100	19.070	.058	1.530	3.090	2.850	4.680	.018	6.300	—
	1899	47.913	17.887	.054	1.435	2.898	2.673	4.389	.016	5.909	6.200
Hemlock	1899	58.72	5.70	.272	.20	2.66	1.92	1.55	.006	2.95	—
		56.4064	5.4754	.2613	.1921	2.5552	1.8444	1.4889	.0058	2.8338	3.94
	1901	55.97	6.14	.257	.32	2.88	2.36	1.89	.012	4.50	—
		53.3450	5.8520	.2449	.3050	2.7449	2.2493	1.8014	.004	4.2890	4.69

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.

† 1901 production, 927,747, Chapin Mine.

‡ Owned by Republic Iron and Steel Company, who also have extensive properties on Mesabi and Menominee Ranges.

§ Corrigan, McKinney, and Company, owners, are doing large explorations.

|| 1901 production, 466,086, Aragon Mine Shaft.

Menominee Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Hiawatha (20,000, Victor Schlitz Mining Company)	1901	57.34	7.08	.184	.46	1.60	.328	.28	.017	—	7.00
		53.326	6.584	.1711	.42	1.488	.3020	.2604	.0158	—	7.00
*Hope (underground openings)	1901	59.00	8.00	.325	—	—	—	—	—	—	—
		51.920	7.040	.2860	—	—	—	—	—	—	12.00
Keel Ridge	1899	40.64	37.42	.046	.20	.90	1.35	1.00	.006	—	—
		39.46	36.33	.045	.19	.87	1.31	.97	.0058	—	2.90
Keel Ridge	1901	40.64	37.42	.046	.20	.90	1.35	1.00	.006	—	—
		39.46	36.33	.045	.19	.87	1.31	.97	.006	—	2.90
Kimball	1901	57.200	4.300	.660	.210	1.600	2.600	1.800	.006	3.020	—
		52.624	3.956	.607	.193	1.472	3.392	1.656	.005	2.778	8.000
Kimball	1899	58.10	4.31	.873	.35	1.25	1.92	2.34	.009	3.60	—
		53.39	3.96	.618	.32	1.15	1.76	2.15	.008	3.31	8.10
†Lamont	1901	57.600	4.150	.720	.580	1.240	2.610	1.100	.006	2.100	—
		52.704	3.797	.658	.530	1.134	2.388	1.006	.005	1.912	8.500
*Levida	1901	61.65	5.22	.0853	.131	1.36	.92	2.25	.015	2.08	—
		56.810	4.810	.0786	.1207	1.253	.847	2.073	.0138	1.916	7.85
Levida	1899	60.20	5.05	.290	.66	1.67	2.29	2.35	.010	2.95	—
		55.38	4.65	.267	.61	1.54	2.11	2.16	.0092	2.71	8.00
†Lincoln (14,976)	1901	58.800	6.900	.340	.660	1.800	1.600	1.180	.008	2.720	—
		54.037	6.341	.312	.606	1.654	1.470	1.084	.007	2.499	8.100
Lincoln	1899	57.067	13.20	.0205	.20	2.12	.32	.57	.062	1.59	—
		52.09	12.04	.0187	.18	1.93	.29	.52	.056	1.45	8.72
§Loretto	1901	59.00	11.16	.022	.17	1.71	.43	.70	.023	.79	—
		53.60	10.139	.0199	.15	1.55	.39	.636	.0208	.717	9.14
Loretto	1899	50.00	4.45	.626	4.82	2.50	2.53	2.73	.021	7.98	—
		47.70	4.24	.597	4.60	2.38	2.41	2.60	.020	7.61	4.61
Manganate	1901	51.55	6.05	.550	3.30	2.78	2.08	1.60	.042	7.34	—
		47.73	5.60	.509	3.06	2.57	1.93	1.48	.038	6.80	7.41
Michigan, No. 1 (underground openings)	1901	57.50	4.50	.225	—	—	—	—	—	—	—
		53.762	4.207	.2103	—	—	—	—	—	—	6.50
Michigan, No. 2	1901	53.50	7.50	.325	—	—	—	—	—	—	—
		48.685	6.825	.2957	—	—	—	—	—	—	9.00
Millie (12,133, Dessau Company)	1899	63.705	2.97	.0275	.12	.94	1.14	1.49	.008	2.12	—
		60.092	2.80	.0259	.11	.88	1.07	1.40	.007	1.99	5.67
Monongahela non-Bessemer (2,397, closed)	1901	52.33	15.59	.109	.23	3.84	.29	.50	.020	3.50	—
		47.25	14.08	.098	.21	3.47	.26	.45	.018	3.16	9.70
Nimick	1899	62.72	4.35	.071	.22	1.25	.65	2.24	.03	1.65	—
		57.71	4.00	.065	.20	1.15	.60	2.06	.027	1.52	7.99
†Paint River	1901	57.400	6.100	.660	.400	1.900	1.960	1.410	.008	3.600	—
		51.086	5.429	.587	.356	1.694	1.774	1.254	.007	3.204	11.000
Paint River	1899	63.21	5.48	.009	.11	1.04	.86	1.12	.003	1.20	—
		58.7853	5.0964	.0084	.1023	.9672	.7998	1.0416	.0028	1.1160	7.00
Pewabie	1901	64.37	4.75	.012	.13	.99	.57	1.22	.001	1.03	—
		59.3491	4.3795	.0110	.1199	.9128	.5225	1.1248	.0009	.9497	7.80
Pewabie	1899	45.97	32.40	.009	.09	1.30	.79	1.08	.002	1.24	—
		43.5566	30.699	.0085	.0853	1.2318	.7485	1.0233	.0019	1.1749	5.25
Pewabie Genoa	1901	43.21	30.69	.010	.10	1.62	.72	1.37	.005	1.29	—
		40.6520	28.8732	.0094	.0941	1.5241	.6774	1.2889	.0047	1.2136	5.92
†Quinneseec	1899	49.61	27.80	.028	.27	.56	.82	.48	.010	2.40	—
		48.53	27.19	.027	.26	.54	.80	.47	.010	2.35	2.18

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.
 † Corrigan, McKinney, and Company, owners, are doing large explorations.
 ‡ 1901 production, 466,086, Aragon Mine Shaft.
 § Loretto Mining Company, produces three ores, 80,000 tons
 ¶ Bristol Mining Company owns the Bristol, producing two ores, Bristol and Manganate, 41,600, and Beaufort.
 ¶ Pewabie Mining Company 597,786 tons of five grades.

Menominee Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent. 62·100	Per cent. 4·020	Per cent. ·034	Per cent. ·220	Per cent. ·600	Per cent. ·200	Per cent. ·220	Per cent. ·006	Per cent. 2·200	Per cent. —
Quinnesec, No. 1	1901	58·684	3·798	·032	·207	·567	·189	·207	·005	2·079	5·500
Quinnesec non-Bessemer	1901	62·200	4·100	·112	·210	·700	·200	·260	·006	2·180	—
		59·002	3·889	·106	·199	·664	·189	·246	·005	2·067	5·140
Quinnesec Silicious Bessemer (64,900)	1901	44·800	30·100	·032	·120	1·090	·260	·380	·004	2·720	—
		43·823	39·443	·031	·117	1·066	·254	·371	·003	2·660	2·180
†Russell	1899	54·10	10·00	·067	·32	2·15	3·02	2·65	·032	4·57	—
		50·432	9·32	·0624	·29	2·00	2·81	2·47	·029	4·26	6·78
		54·40	9·66	·061	·37	2·56	2·35	3·40	·019	3·29	—
†San Jose	1901	50·12	8·90	·056	·34	2·358	2·16	3·13	·017	2·948	7·86
		64·405	4·64	·014	·30	1·24	·19	·39	·027	·64	—
		59·072	4·25	·0128	·27	1·13	·17	·35	·024	·58	8·28
†Sheridan	1899	65·40	3·64	·014	·16	1·18	·24	·38	·013	·52	—
		59·827	3·329	·0128	·146	1·079	·219	·347	·0118	·47	8·52
†Tobin (21,957)	1899	55·48	7·37	·224	·25	4·48	·75	·59	·610	5·35	—
†Tobin (21,957)	1901	49·5880	6·5873	·2002	·2234	4·0042	·6703	·6273	·5452	4·7818	10·62
		60·180	6·400	·240	·220	1·410	1·320	·960	·004	2·920	—
‡Toledo	1899	55·004	5·849	·219	·201	1·288	1·206	·895	·003	2·668	8·600
		54·21	19·80	·010	·11	1·20	·88	1·08	·004	1·20	—
		50·9574	18·6120	·0094	·1034	1·1280	·8272	1·0152	·0038	1·1280	6·00
‡Tyronne	1901	55·01	16·44	·012	·11	1·36	·81	1·36	·004	1·31	—
		51·0548	15·2580	·0111	·1021	1·2622	·7518	1·2622	·0037	1·2158	7·19
		60·40	6·59	·088	·16	1·38	1·25	2·15	·001	2·05	—
‡Tyronne	1899	56·1720	6·1287	·0818	·1488	1·2834	1·1625	1·995	·0009	1·9065	7·00
		59·87	7·46	·073	·16	1·37	1·66	2·45	·002	2·66	—
		55·6492	6·9341	·06785	·1487	1·2734	1·5430	2·2773	·0019	2·4725	7·05
†Vivian	1901	42·00	36·42	·008	·10	1·07	·60	·99	·002	·86	—
§Walpole (1,200 feet deep)	1899	58·75	10·61	·129	·13	1·30	·79	1·96	·002	1·22	—
		55·8125	9·9845	·1140	·1235	1·2350	·7505	1·8620	·0019	1·1590	5·00
		57·61	9·82	·118	·15	2·32	·22	1·23	·003	2·05	—
*Mansfield (74,113; will be large development underground openings) ..	1901	53·9287	9·1925	·1105	·1404	2·1718	·2059	1·1514	·0028	1·9190	6·39
		60·00	—	·055	—	—	—	—	—	—	—
*Dober (59,972; large striping contracts let) ..	1901	59·00	—	·495	—	—	—	—	—	—	—
*Riverton (59,838)	1901	57·00	—	·495	—	—	—	—	—	—	—
*Gibson (underground openings)	—	—	—	—	—	—	—	—	—	—	—
†Athens .. } Verona Mine	1901	60·00	—	—	—	—	—	—	—	—	—
†Madrid .. } (14,115) ..	1901	63·00	—	·020	—	—	—	—	—	—	—
†Caspian (shaft sinking) ..	—	—	—	—	—	—	—	—	—	—	—
†Dunn (shaft sinking) ..	1901	58·00	—	—	—	—	—	—	—	—	—
Comrade Ore	—	56·00	—	·112	—	—	—	—	—	—	—

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.

† Loretto Mining Company produces three ores, 80,000 tons.

‡ Corrigan, McKinney, and Company, owners, are doing large explorations.

§ Pewabic Mining Company, 507,786 tons of five grades.

|| Owned by Verona Mining Company, and operated by Palkands, Mather, and Company.

NOTE.—Volunteer Mine being explored, formerly productive.

Cargo Analyses of Marquette Range Ores, 1899 and 1901.

Name of Ore.	Year	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*†Abbotsford ..	1899	64.22	4.42	.033	.18	1.69	.31	.17	.014	—	—
		62.653	4.3121	.0321	.1756	1.6487	.3024	.1658	.0136	—	2.44
		62.88	7.41	.030	.13	1.59	.112	.151	—	.33	—
*†Alford ..	1901	62.053	7.312	.0296	.128	1.569	.1105	.149	—	.325	1.315
		63.74	3.39	.052	.35	1.83	.31	.20	.020	—	—
		57.485	2.9509	.0452	.3046	1.5930	.2698	.1741	.0174	—	12.95
Angeline Hard ..	1901	63.70	5.86	.048	.26	1.64	.149	.169	—	1.05	—
		59.851	5.229	.0428	.232	1.463	.1329	.1508	—	.937	10.751
		66.71	2.19	.016	.11	1.47	.10	.05	.013	.66	—
Angeline Hard, No. 1B ..	1901	63.327	2.0789	.0151	.1044	1.3954	.0949	.0474	.0123	.6265	5.07
		67.41	—	.011	—	—	—	—	—	—	—
		63.65	—	.010	—	—	—	—	—	—	5.57
Angeline Hematite..	1901	67.18	—	.014	—	—	—	—	—	—	—
		64.49	—	.013	—	—	—	—	—	—	4.00
		64.40	4.05	.045	.32	1.31	.15	.09	.012	2.01	—
Angeline South ..	1899	57.7539	3.632	.0403	.2869	1.1748	.1345	.0807	.0107	1.8025	10.32
		65.13	—	.041	—	—	—	—	—	—	—
		57.85	—	.036	—	—	—	—	—	—	11.17
*Averhart (see Hartford) ..	1901	62.17	5.04	.099	.40	1.56	.18	.12	.025	3.40	—
		54.672	4.4321	.0870	.3517	1.3718	.1582	.1055	.0219	2.9899	12.06
		61.70	6.85	.079	.32	1.52	.25	.13	.022	3.67	—
Barrow ..	1901	54.94	6.10	.070	.28	1.35	.22	.12	.020	3.27	10.96
		61.47	9.97	.020	—	—	—	—	—	—	—
		59.472	9.645	.0193	—	—	—	—	—	—	3.25
†Beaufort (11,682; sold to Roger Brown and Company but still worked by Bristol Company)	1901	42.43	33.46	.040	—	—	—	—	—	—	—
		38.90	30.68	.037	—	—	—	—	—	—	8.31
		52.00	5.07	.257	.24	.98	3.42	2.63	.086	11.68	—
Bessie ..	1901	47.94	4.68	.237	.22	.90	3.15	2.43	.079	10.77	7.79
		53.47	12.07	.432	—	—	—	—	—	—	—
		51.732	11.677	.4179	—	—	—	—	—	—	3.25
*Bell (see Winthrop) ..	1899	39.985	38.27	.0332	.22	1.28	.13	.16	.028	2.29	—
		38.853	37.18	.0322	.21	1.14	.12	.15	.027	2.22	2.83
		40.00	38.25	.034	.21	1.28	.13	.16	.028	2.29	—
*†Bedford ..	1901	39.09	37.38	.033	.20	1.25	.127	.156	.027	2.288	2.26
		59.05	8.84	.122	.52	1.49	.41	.31	.027	—	—
		51.964	7.779	.1073	.4576	1.3112	.3608	.2728	.0237	—	12.00
*†Beresford ..	1901	60.16	7.80	.140	.61	1.26	.335	.519	—	3.28	—
		53.301	6.910	.1240	.540	1.116	.2968	.4598	—	2.906	11.40
		63.61	4.88	.105	.39	2.57	.43	.43	.013	—	—
*†Beresford Lump ..	1899	62.8721	4.8233	.1037	.3854	2.5401	.425	.425	.0128	—	1.16
		63.47	4.97	.106	.13	2.48	.298	.432	—	.43	—
		63.081	4.939	.1053	.129	2.464	.2961	.4293	—	.427	.612
*Bernhart (see Hartford) ..	1901	64.60	3.51	.107	.13	2.22	.335	.378	—	.40	—
		64.240	3.490	.1064	.129	2.207	.3331	.3758	—	.397	.556
		58.02	9.05	.075	—	—	—	—	—	—	—
Bigelow ..	1901	53.993	8.412	.0697	—	—	—	—	—	—	6.94
		51.00	22.04	.050	.12	2.10	.26	.12	.016	2.53	—
		46.41	20.056	.045	.109	1.91	.236	.109	.014	2.30	9.00
*§Buffalo ..	1899	60.973	—	.069	—	—	—	—	—	—	—
		53.3013	—	.0394	—	—	—	—	—	—	12.582
		61.65	5.05	.099	.309	2.74	.94	.817	.091	1.979	—
*§Buffalo ..	1901	54.202	4.439	.087	.2716	2.409	.826	.7183	.080	1.739	12.080

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.
 † Production for 1901, 680,822; Lake Superior Group, Hard Ore, Hematite, and Winthrop Mines.
 ‡ Bristol Mining Company owns the Bristol, producing two ores, Bristol and Manganate, 41,600, and Beaufort.
 § Production for 1901, 337,629.

Marquette Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
†Cambria (68,907)	1899	53.46	5.76	.050	.28	1.80	.78	.33	.0089	2.25	11.20
	1901	67.41	6.64	.053	.98	2.63	.90	.32	.010	2.71	—
Cambridge	1899	53.698	5.90	.047	.87	2.337	.80	.28	.0088	2.408	11.11
	1899	59.71	7.10	.610	.42	1.25	2.50	.52	.004	1.81	—
	1901	50.5803	6.0144	.5167	.3557	1.0588	2.1177	.4404	.0033	1.5332	15.29
*†Cameo	1899	59.50	6.03	.668	.718	1.513	1.80	.461	.010	1.97	—
	1901	50.66	5.13	.568	.611	1.288	1.53	.392	.008	1.66	14.85
	1899	58.826	—	.1162	—	—	—	—	—	—	—
*†Castleford	1899	51.3627	—	.1014	—	—	—	—	—	—	12.687
	1901	60.41	6.64	.053	.98	2.63	.90	.32	.010	2.71	—
	1899	53.698	5.90	.047	.87	2.337	.80	.28	.0088	2.408	11.11
*‡Champion, No. 1	1899	58.64	10.43	.094	.36	2.87	.40	.40	.020	—	—
	1901	58.1356	10.3403	.0931	.3569	2.8453	.3965	.3965	.0198	—	.86
	1899	56.90	13.80	.087	.13	2.75	.279	.447	—	.52	—
Champion B	1901	56.234	13.638	.0859	.128	2.717	.2757	.4417	—	.513	1.170
	1899	64.00	4.55	.060	.20	2.38	.32	.29	.013	—	—
	1901	63.44	4.51	.0594	.198	2.36	.317	.287	.0128	—	.88
Champion Hematite (99,026)	1901	64.03	4.55	.060	.20	2.38	.32	.29	.013	—	—
	1899	63.49	4.51	.0595	.198	2.36	.317	.288	.0129	—	.80
	1901	60.30	8.96	.058	.23	2.78	.38	.26	.018	—	—
*§Chatford	1901	59.73	8.87	.0574	.228	2.75	.376	.258	.0178	—	.95
	1899	52.25	9.84	.397	.28	1.67	3.16	1.81	.053	6.35	—
	1901	47.76	8.99	.363	.256	1.53	2.89	1.65	.048	5.30	8.60
*||Cliffs Shaft (274,259)	1899	50.72	17.70	.105	.78	1.25	.31	.31	.027	—	—
	1901	44.968	15.692	.0930	.6915	1.1082	.2748	.2748	.0239	—	11.34
	1899	50.96	21.10	.114	.31	1.35	.186	.169	—	3.39	—
Chester, No. 1	1901	46.750	19.357	.1045	.284	1.238	.1706	.1550	—	3.109	8.260
	1899	45.35	28.54	.061	.33	1.75	.89	.65	.009	1.78	—
	1901	41.85	26.542	.0567	.3069	1.6275	.8277	.6045	.0083	1.6554	6.95
Chester, No. 2 (22,815; one million tons in sight)	1901	40.80	36.16	.030	.478	1.422	.22	.25	.006	2.12	—
	1899	38.72	33.809	.02805	.4469	1.3296	.2057	.2338	.0056	1.982	6.50
	1901	60.90	4.030	.109	.384	2.446	1.148	.339	.025	2.710	—
||Cliffs Crushed (76,815)	1899	60.00	3.970	.107	.378	2.410	1.131	1.319	.024	2.670	1.47
	1901	61.90	4.48	.098	.24	2.19	1.28	.97	.021	.63	—
	1899	61.24	4.43	.0969	.237	2.166	1.266	.959	.0207	.623	1.06
||Cliffs Lump (468,333)	1901	63.49	3.30	.087	.25	1.88	1.23	.84	.019	.56	—
	1899	63.22	3.286	.0866	.248	1.872	1.224	.836	.0189	.557	.42
	1901	56.51	11.11	.126	.073	3.817	.27	.70	.087	2.70	—
Comrade	1899	55.89	10.99	.124	.072	3.775	.26	.69	.036	2.67	1.09
	1901	55.10	12.36	.112	.106	4.15	.561	1.98	.025	1.29	—
	1899	54.50	12.23	.1107	.1048	4.10	.555	1.96	.0247	1.275	1.09
Derhart	1901	47.01	29.91	.020	—	—	—	—	—	—	—
	1899	45.590	29.006	.0193	—	—	—	—	—	—	3.02
	1901	59.38	9.17	.043	.14	2.48	.39	.41	.017	1.77	—
East New York (31,626)	1899	52.759	8.147	.0408	.12	2.20	.346	.36	.015	1.57	11.15
	1901	52.70	12.890	.281	.161	1.004	1.027	1.218	.018	7.470	—
	1899	47.95	11.730	.255	.146	.913	.934	1.108	.016	6.797	9.00
Imperia	1901	52.44	13.49	.256	.198	1.20	1.37	1.39	.011	7.38	—
	1899	47.03	12.10	.229	.177	1.076	1.228	1.246	.009	6.62	10.32

* Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.

† Owned by Republic Iron and Steel Company, who also have extensive properties on Mesabi and Menominee Ranges.

‡ Production for 1901, 337,623.

§ Production for 1901, 680,822: Lake Superior Group, Hard Ore, Hematite, and Winthrop Mines.

|| Worked by Cleveland Cliffs Iron Company.

Marquette Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Jackson Pit 7.. .. .	1899	55.00	14.38	.076	.37	2.49	.14	.11	.022	3.73	—
		51.05	13.35	.071	.34	2.31	.13	.10	.020	3.46	7.18
Jackson South (38,721 tons taken from rock pile in 1901 not working body of ore)	1899	43.50	—	.055	.350	—	—	—	—	—	—
		40.0417	—	.0508	3.2475	—	—	—	—	—	7.50
	1901	42.50	29.60	.082	2.82	1.65	.14	.07	.018	3.50	—
Lake	1899	38.9428	27.1225	.0751	2.5840	1.5119	.1283	.0641	.0165	3.2071	8.37
		59.90	6.010	.100	.443	2.784	.408	.597	.017	3.570	—
	1901	51.61	5.178	.083	.381	2.398	.351	.514	.014	3.075	13.84
Lake Bessemer	1899	59.70	5.73	.125	.490	2.82	.50	.54	.013	3.71	—
		51.90	4.981	.1086	.425	2.451	.434	.469	.0113	3.225	13.07
	1901	63.67	5.460	.040	.295	1.447	.230	.226	.016	1.400	—
*Lillie (98,788)	1899	55.74	4.779	.035	.258	1.266	.201	.197	.014	1.225	12.46
		64.03	5.26	.040	.230	1.25	.260	.130	.011	1.50	—
	1901	56.48	4.64	.035	.203	1.10	.229	.114	.009	1.32	11.79
†Michiganme (30,996)	1899	62.55	5.14	.077	.37	2.22	.28	.09	.011	2.40	—
		55.61	4.57	.038	.33	1.97	.25	.080	.010	2.13	11.10
	1901	60.85	6.16	.085	.34	2.10	.41	.09	.013	3.34	—
‡Moore (strip)	1899	53.35	5.388	.074	.297	1.837	.358	.078	.0110	2.92	12.52
		42.793	35.37	.050	.25	.99	.21	.21	.021	1.67	—
	1901	40.251	33.26	.047	.23	.93	.19	.19	.019	1.57	5.94
‡Negaunee (269,838 tons)	1899	59.20	11.70	.104	.19	2.23	.84	1.01	.025	1.50	—
		58.45	11.54	.102	.187	2.20	.829	.997	.024	1.48	1.26
	1901	60.88	—	.156	—	—	—	—	—	—	—
Norfolk	1899	53.88	—	.188	—	—	—	—	—	—	11.50
		41.60	37.48	.019	.29	1.21	.69	.48	.035	.42	—
	1901	40.457	36.450	.0184	.282	1.176	.671	.466	.034	.408	2.747
Norfolk Bessemer crushed	1899	59.60	7.4	.062	.35	2.88	.99	.608	.067	1.98	—
		52.815	6.55	.0549	.310	2.552	.877	.5387	.0593	1.754	11.383
	1901	55.00	14.25	.055	.17	3.30	.57	.56	.032	—	—
Norfolk non-Bessemer not crushed	1899	54.50	14.12	.0544	.168	3.27	.56	.55	.0317	—	.91
		55.55	15.26	.055	.27	3.35	.38	.21	.034	.15	—
	1901	54.91	15.08	.0543	.267	3.31	.376	.208	.0336	.148	1.15
Peninsular	1899	57.17	13.91	.126	.27	3.08	.38	.21	.034	.15	—
		56.51	13.75	.1245	.267	3.04	.376	.208	.0336	.148	1.15
	1901	52.00	—	.080	—	—	—	—	—	—	—
Princeton No. 1	1899	47.84	—	.0736	—	—	—	—	—	—	8.00
		62.81	5.95	.063	.14	1.25	.80	.68	.004	1.69	—
	1901	53.6962	5.0866	.0538	.1196	1.0686	.6839	.5813	.0034	1.4447	14.51
Princeton No. 2	1899	64.40	2.30	.047	.43	1.37	1.05	.93	.021	1.60	—
		53.94	1.926	.039	.36	1.147	.879	.778	.017	1.34	16.24
	1901	61.63	8.50	.109	.24	1.21	.70	.54	.005	2.60	—
Republic special	1899	53.1065	7.3244	.0639	.2068	1.0426	.6031	.4653	.0043	2.2404	13.83
		60.27	7.70	.124	.57	1.50	.65	.518	.016	1.98	—
	1901	49.95	6.38	.102	.46	1.23	.538	.429	.013	1.64	17.12
Republic crushed	1899	67.82	1.30	.021	Trace	.63	.15	.08	.045	.60	—
		67.5148	1.2941	.0209	Trace	.6271	.1493	.0796	.0447	.5973	.45
	1901	65.50	4.00	.046	—	—	—	—	—	—	—
Republic Kingston.. .. .	1899	64.84	3.960	.0455	—	—	—	—	—	—	1.00
		63.84	6.40	.041	.16	1.08	.40	.33	.028	.19	—
	1901	63.1505	6.3308	.0405	.1582	1.0683	.3953	.3264	.0276	.1879	1.08
Republic Kingston.. .. .	1901	62.62	7.21	.045	.12	1.42	.42	.30	.027	.31	—
		61.94	7.132	.0445	.118	1.404	.415	.296	.0267	.306	1.08

* Owned by Republic Iron and Steel Company who also have extensive properties on Mesabi and Menominee Ranges.
 † Worked by Cleveland Cliffs Iron Company.
 ‡ Those marked are from mines worked by the Oliver Mining Company, the mining branch of the United States Steel Corporation.

Marquette Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Republic Specular (153,183 tons; Cambria Steel Company, Owners) ..	1899	66.77	2.70	.037	.0893	.9228	.1683	.1190	.0099	.3473	.77
	1901	67.41	2.31	.040	Trace	.747	.22	.15	.025	.23	—
Republic Magnetic (non-Bessemer) ..	1899	66.74	2.286	.0393	Trace	.7395	.217	.148	.0247	.227	1.00
	1901	69.00	3.23	.12	.147	.364	.20	.216	.021	.46	—
Richmond (54,181) ..	1899	68.6550	3.128	.1194	.1432	.3606	.1900	.2149	.0208	.4577	.50
	1901	69.00	2.50	—	.147	.664	.20	.216	.021	.46	—
Rose	1899	68.31	2.47	—	.145	.657	.198	.213	.0207	.455	1.00
	1901	44.00	35.06	.041	.15	.52	.30	.15	.006	1.50	—
*Salisbury (181,019)..	1899	43.12	34.36	.040	.15	.51	.29	.15	.006	1.47	2.00
	1901	43.600	36.200	.034	.040	.640	.490	.110	.004	2.740	—
*Salisbury Bessemer ..	1899	43.046	35.740	.033	.039	.631	.488	.108	.003	2.705	1.270
	1901	61.05	6.33	.117	.257	2.379	.42	.061	.018	2.98	—
Scotch	1899	53.66	5.56	.103	.226	2.091	.37	.054	.016	2.62	12.10
	1901	60.50	6.41	.150	.33	2.45	.50	.18	.029	2.16	—
*Salisbury Bessemer ..	1899	54.45	5.769	.135	.297	2.20	.45	.16	.023	1.94	10.00
	1901	61.87	5.570	.092	.167	1.807	.262	.147	.014	2.910	—
Sheffield	1899	52.65	4.740	.078	.137	1.537	.222	.125	.011	2.47	14.90
	1901	60.42	7.00	.112	.29	2.31	.56	.56	.012	2.22	—
*Salisbury Bessemer ..	1899	52.56	6.089	.097	.252	2.009	.487	.487	.0104	1.931	13.01
	1901	63.60	3.43	.044	.25	1.38	.13	.18	.017	4.45	—
Scotch	1899	54.11	2.91	.037	.21	1.17	.11	.15	.014	3.78	14.91
	1901	59.00	—	—	—	—	—	—	—	—	—
Sheffield	1899	58.41	—	—	—	—	—	—	—	—	1.00
	1901	58.50	10.19	.122	.105	3.92	5.86	.874	.019	.730	—
*Tilden Silica (10,643 open pit)	1899	57.92	10.08	.1207	.104	3.88	.580	.865	.0188	.722	1.00
	1901	60.45	10.69	.021	.11	1.57	.10	.09	.026	1.03	—
*Tilden Silica (10,643 open pit)	1899	59.0354	10.4398	.0205	.1074	1.5332	.0973	.0878	.0253	1.0058	2.34
	1901	59.72	—	.028	—	—	—	—	—	—	—
*Tilden Silica (10,643 open pit)	1899	57.45	—	.027	—	—	—	—	—	—	3.80
	1901	42.50	37.49	.029	.103	.908	.150	.142	.012	.800	—
†Winthrop (not operative; production provided for 112,000)	1899	41.28	36.41	.028	.100	.882	.145	.137	.011	.777	2.86
	1901	42.10	38.10	.031	.06	.63	.25	.10	.010	.27	—
†Hartford (1901 3,220. Will be big producer) ..	1901	41.35	37.42	.030	.058	.815	.24	.098	.0098	.265	1.78
Bessie (1901 output 805) ..	—	—	—	—	—	—	—	—	—	—	—
*Maas Exploration ..	—	53.47	—	.032	—	—	—	—	—	—	—
Lake Angeline and East End Mine (488,617 tons; high grade ore worked out)	—	—	—	—	—	—	—	—	—	—	—
Foxdale (4,526. Bird Iron Company)	1901	53.50	—	.068	—	—	—	—	—	—	—

* Worked by Cleveland Cliffs Iron Company.

† Those marked are from mines worked by the Oliver Mining Company, the Mining branch of the United States Steel Corporation.

Mesabi Range.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Adams	1899	63.80	3.00	.034	.41	1.17	.12	.05	.002	3.74	—
		57.30	2.69	.031	.37	1.05	.11	.04	.0018	3.36	10.19
Adams	1901	62.75	3.49	.034	.706	1.08	.148	.080	.005	4.57	—
		56.719	3.154	.0307	.6381	.976	.1337	.0723	.0587	4.130	9.61
Adams Special	1901	63.61	3.09	.032	.574	1.30	.119	.079	.047	3.87	—
		57.497	2.793	.0289	.5188	1.175	.1075	.0714	.0424	3.498	9.61
Adams No. 2	1901	59.93	4.09	.069	.662	2.29	.130	.088	.073	6.79	—
		50.940	3.476	.0586	.7627	1.946	.1105	.0748	.0620	5.771	15.00
Admiral	1899	64.20	5.04	.028	.31	.41	.35	.27	.004	2.06	—
		59.26	4.65	.026	.29	.38	.32	.25	.004	1.90	7.70
Admiral	1901	63.800	4.900	.027	.300	.620	.230	.180	.006	2.140	—
		58.823	4.517	.024	.276	.571	.212	.165	.005	1.973	7.800
Atlas	1901	60.53	5.70	.057	1.07	1.03	.20	.10	.013	4.73	—
		54.2228	5.1061	.0511	.9585	.9227	.1792	.0896	.0116	4.2371	10.42
Auburn	1899	64.10	2.86	.049	.43	1.80	.53	.27	.010	2.44	—
		56.940	2.5405	.0435	.3820	1.5989	.4708	.2398	.0089	2.1675	11.17
Audrey	1899	62.15	3.24	.058	.85	1.86	.62	.23	.007	4.00	—
		54.2383	2.8275	.0506	.7418	1.6232	.5411	.2007	.0061	3.4908	12.73
Audrey	1901	61.66	4.20	.054	.54	2.30	.38	.20	.002	4.16	—
		53.311	3.631	.0466	.466	1.988	.328	.172	.0017	3.956	13.54
Beaver	1899	62.66	3.53	.0794	.34	1.92	.20	.13	.015	3.90	—
		54.665	3.09	.0695	.29	1.68	.17	.10	.013	3.27	12.44
Beaver	1901	63.85	2.35	.078	.33	1.54	.18	.12	.011	3.95	—
		57.24	2.106	.0699	.29	1.38	.16	.107	.0098	3.54	10.35
Biwabik	1899	63.56	3.00	.038	.49	.95	.12	.07	.006	3.41	—
		58.4307	2.7579	.0349	.4504	.8733	.1103	.0643	.0055	3.1348	8.07
Biwabik	1901	63.55	3.10	.038	.45	.95	.19	.11	.009	4.13	—
		58.64	2.86	.035	.415	.876	.175	.10	.008	3.81	7.72
Butler	1901	62.59	2.52	.053	.50	1.02	.41	.28	.015	5.08	—
		56.88	2.29	.048	.454	.926	.372	.254	.013	4.61	9.12
Canton	1899	60.95	3.16	.048	.44	.84	.64	.18	Trace	7.10	—
		53.6909	2.7836	.422	.3876	.7400	.5638	.1586	Trace	6.2544	11.91
Chisholm	1901	64.30	3.36	.39	1.15	1.02	.18	.20	.006	—	—
		54.471	3.003	.0348	1.027	.911	.160	.178	.0053	—	10.62
Clark	1901	62.82	4.68	.034	1.04	.96	.23	.18	.005	—	—
		56.148	4.182	.0303	.929	.858	.205	.160	.0044	—	10.62
Commodore	1899	63.30	4.21	.038	.44	1.21	.34	.12	.007	3.39	—
		56.73	3.76	.034	.39	1.08	.30	.11	.006	3.02	10.80
Commodore	1901	63.100	4.150	.039	.200	1.210	.240	.060	.004	3.400	—
		57.231	3.764	.035	.181	1.097	.217	.054	.003	3.083	9.300
Commodore (non-Bessemer)	1899	62.70	4.21	.058	.44	1.29	.34	.12	.006	3.72	—
		55.80	3.75	.052	.39	1.15	.30	.11	.005	3.31	11.00
Columbia	1901	57.52	8.89	.066	.56	3.94	.13	.13	.016	4.58	—
		49.28	7.62	.056	.48	3.37	.11	.11	.014	3.92	14.33
Corsica	1901	61.00	—	.045	—	—	—	—	—	—	—
		54.21	—	.0400	—	—	—	—	—	—	11.10
Croxtan	1901	60.00	—	.060	—	—	—	—	—	—	—
		54.60	—	.546	—	—	—	—	—	—	.900
Dailey	1901	61.03	6.11	.038	.71	.92	.21	.18	.043	5.17	—
		51.51	5.157	.032	.599	.776	.177	.15	.036	4.36	15.59
Duluth	1899	60.19	5.12	.48	.90	1.24	.15	.08	.011	6.90	—
		52.30	4.45	.042	.78	1.07	.13	.07	.0096	6.00	13.11
Duluth	1901	59.93	5.23	.053	.883	1.62	.118	.109	.010	6.33	—
		52.492	4.580	.0464	.7734	1.418	.1083	.0954	.0087	5.544	12.41

Mesabi Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent. '170	Per cent. '84	Per cent. '039	Per cent. '93	Per cent. '89	Per cent. '10	Per cent. '17	Per cent. '010	Per cent. '520	Per cent. —
Elba	1901	55.7891	3.4721	.03526	.8409	.8047	.0904	.1537	.0090	4.7018	9.58
		63.41	3.15	.035	.63	.81	.42	.19	None	4.10	—
Fayal	1899	56.8597	2.8246	.0314	.5649	.7263	.3766	.1704	None	3.6765	10.33
		63.80	2.95	.037	.65	.75	.40	.15	.004	3.69	—
Franklin	1901	57.860	2.675	.0335	.589	.680	.362	.136	.0036	3.346	9.31
		62.78	4.85	.040	.49	1.03	.30	.46	.016	3.41	—
Genoa	1899	58.5046	4.5197	.0372	.4566	.9598	.2795	.4286	.0149	3.1777	6.81
		60.035	—	.0381	—	—	—	—	—	—	—
Hale	1901	55.558	—	.0352	—	—	—	—	—	—	7.457
		63.42	3.38	.030	.50	.86	.47	.16	Trace	3.23	—
Hartley	1899	57.3442	3.0562	.0271	.4521	.7776	.4250	.1447	Trace	2.9206	9.58
		62.88	4.62	.032	.46	.77	.44	.22	.007	3.44	—
Hibbing	1901	56.453	4.147	.0287	.412	.691	.395	.197	.0062	3.088	10.22
		60.00	5.00	.080	.55	.52	1.58	—	.016	—	—
Island	1899	54.00	4.50	.072	.495	.468	1.422	—	.017	—	10.00
		64.74	2.50	.038	.41	1.29	.18	.04	.007	3.10	—
Jordan	1901	57.77	2.23	.034	.37	1.15	.16	.035	.006	2.77	10.76
		63.45	3.65	.042	.552	1.24	1.50	.028	.008	3.50	—
Juanita	1899	57.606	3.313	.0381	.5011	1.125	1.361	.0254	.0072	3.177	9.21
		64.85	2.68	.033	.46	1.40	.14	.13	.009	2.31	—
Kanawha	1901	57.92	2.39	.029	.41	1.25	.13	.12	.008	2.06	10.69
		64.62	2.84	.033	.507	1.32	.155	.083	.007	2.56	—
Longyear (Bessemer)	1899	57.899	2.544	.0295	.4542	1.182	1.388	.0743	.0062	2.293	10.40
		61.40	3.43	.066	.56	.91	.49	.23	.013	5.96	—
Mahoning	1901	54.179	3.026	.0582	.494	.802	.432	.202	.0114	5.259	11.76
		63.600	4.200	.059	.260	1.050	.280	.180	.006	2.760	—
Mountain	1899	57.685	3.509	.053	.235	.952	.253	.163	.005	2.503	9.300
		58.971	—	.0578	.401	—	—	—	—	—	—
Morrow	1901	50.3022	—	.0493	.3420	—	—	—	—	—	14.700
		61.45	5.35	.054	.280	2.43	.115	.075	.011	3.65	—
Mountain	1899	53.305	4.640	.0468	.2428	2.107	.0997	.0650	.0095	3.166	13.254
		60.00	5.50	.067	.46	1.10	1.40	.25	.004	2.00	—
Mountain	1901	54.00	4.95	.060	.414	.99	1.26	.225	.004	1.80	10.00
		59.10	8.78	.069	.45	1.19	.95	.14	.010	2.09	—
Mountain	1899	53.0718	7.884	.0619	.4041	1.0686	.8531	.1257	.0088	1.8768	10.20
		61.00	—	.050	—	—	—	—	—	—	—
Mountain	1901	55.51	—	.0455	—	—	—	—	—	—	9.00
		60.00	6.50	.070	.49	1.21	.25	.17	.010	—	—
Mountain	1899	54.60	5.915	.0637	.4459	1.0031	.2275	.1547	.0091	—	9.00
		64.66	2.45	.047	.39	1.46	.14	.12	.008	2.97	—
Mountain	1901	57.93	2.19	.042	.349	1.308	.12	.107	.007	2.66	10.49
		62.60	4.67	.029	.46	.86	.64	.22	Trace	2.78	—
Mountain	1899	57.5795	3.7436	.0267	.4231	.7910	.5887	.2024	Trace	2.5570	8.02
		63.52	4.70	.030	.78	.63	.12	.12	.013	2.80	—
Mountain	1901	58.1526	4.3029	.02747	.7141	.5768	.1099	.1099	.0119	2.5634	8.45
		61.73	—	.032	—	—	—	—	—	—	—
Mountain	1899	60.00	5.50	.060	.47	1.32	.12	.08	.027	—	—
		54.90	5.0325	.0549	.43	1.2078	.1098	.0732	.0247	—	8.50
Mountain	1901	62.890	—	.0474	.307	—	—	—	—	—	—
		53.9640	—	.0407	.2636	—	—	—	—	—	14.111
Mountain	1899	63.78	3.95	.0415	.219	1.95	.106	.070	.014	2.35	—
		55.833	3.457	.03632	.1917	1.707	.0927	.0612	.0122	2.057	12.459

Mesabi Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Oliver	1899	61.893	—	.0496	.2996	—	—	—	—	—	13.885
		53.2991	—	.0496	.2996	—	—	—	—	—	—
	1901	62.64	4.63	.0498	.232	2.18	.096	.087	.015	3.04	—
		54.702	4.043	.04348	.2026	1.903	.0838	.0759	.0130	2.654	12.671
Pearce	1901	63.00	3.17	.035	1.10	1.01	.18	.20	.007	—	—
		56.70	2.853	.0315	.990	.909	.162	.18	.0063	—	10.00
Penobscot	1899	61.435	6.44	.0335	.46	1.43	.20	.10	.013	3.39	—
		55.878	5.64	.0293	.40	1.25	.17	.08	.011	2.97	12.30
	1901	59.82	7.22	.040	.88	1.93	.20	.14	.10	3.53	—
		53.18	6.419	.035	.78	1.71	.177	.12	.088	3.138	11.09
Pillsbury	1899	62.32	5.00	.028	.30	1.29	.11	.14	.005	3.80	—
		56.67	4.55	.025	.27	1.17	.10	.13	.0045	3.46	9.06
Pillsbury, No. 1	1901	62.07	4.28	.030	.507	1.23	.090	.171	.008	4.84	—
		56.707	3.910	.0274	.4631	1.123	.0822	.1562	.0073	4.421	8.64
Pillsbury, No. 2	1901	59.04	4.92	.055	.50	1.28	.118	.215	.010	8.23	—
		52.191	4.349	.0486	.6630	1.131	.1043	.1900	.0088	7.725	11.60
Preble	1899	59.40	—	.0840	1.345	—	—	—	—	—	—
		51.7718	—	.0732	1.1722	—	—	—	—	—	12.842
	1901	60.67	6.22	.063	.325	2.63	.116	.065	.013	3.63	—
		52.412	5.373	.0544	.2307	2.272	.1002	.0561	.0012	3.135	13.611
Roberts	1899	61.35	7.46	.028	.44	1.07	.46	.19	.008	1.97	—
		55.78	6.77	.0254	.40	.973	.418	.173	.007	1.79	9.08
	1901	60.95	7.90	.025	.45	1.13	.25	.08	.040	2.10	—
		55.525	7.196	.0227	.4099	1.0294	.2277	.0728	.0364	1.9131	8.90
Sauntry	1899	62.50	4.75	.069	.30	1.90	.19	.11	.01	—	—
		56.25	4.27	.062	.27	1.71	.17	.099	.009	—	10.00
Sauntry, No. 1	1901	61.68	5.94	.053	.50	1.88	.21	.11	.006	—	—
		56.221	5.414	.0483	.455	1.713	.191	.100	.0054	—	8.85
Sauntry, No. 2	1901	61.64	6.03	.079	.80	2.07	.29	.11	.005	—	—
		56.184	5.496	.0720	.729	1.886	.264	.102	.0045	—	8.85
Sellers	1899	63.95	3.82	.039	.46	1.29	.17	.13	.032	2.45	—
		57.72	3.45	.035	.42	1.16	.15	.12	.029	2.21	9.74
Shilling	1901	62.17	2.78	.062	.53	1.06	.22	.07	.013	6.09	—
		55.25	2.47	.055	.47	.942	.195	.06	.011	5.41	11.13
Sparta	1899	64.08	3.90	.030	.37	.84	.53	.15	.006	1.57	—
		59.0561	3.5942	.0276	.3410	.7741	.4884	.1382	.0055	1.4460	7.84
	1901	61.63	7.75	.025	.40	.69	.15	.26	.019	2.35	—
		56.3298	7.0835	.02285	.3656	.6307	.1371	.2376	.0174	2.1479	8.60
Stephens	1901	60.00	3.75	.070	—	—	—	—	—	—	—
		54.00	3.375	.0630	—	—	—	—	—	—	10.00
Steese	1901	62.64	2.48	.037	1.07	1.22	.12	.05	.007	4.87	—
		57.86	2.29	.034	.988	1.127	.11	.046	.006	4.498	7.62
Stevenson	1899	63.40	5.10	.040	.32	.62	.24	.18	.009	3.20	—
		57.06	4.59	.036	.288	.558	.216	.162	.008	2.88	10.00
	1901	64.890	3.020	.036	.310	.720	.260	.180	.005	2.720	—
		59.504	2.769	.033	.284	.660	.238	.165	.004	2.494	8.300
Thompson	1901	63.01	3.34	.036	.607	.82	.185	.113	.027	4.66	—
		55.600	2.947	.0317	.5356	.723	.1592	.0997	.0238	4.111	11.76
Top Brown	1899	61.26	4.04	.065	1.30	1.29	.55	.15	.007	4.35	—
		55.2443	3.6433	.0586	1.1723	1.1633	.4960	.1353	.0063	3.9228	9.82
	1901	60.99	5.30	.066	.88	.95	.15	.24	.018	4.43	—
		54.8788	4.7689	.05939	.7918	.8548	.1350	.2160	.0162	3.9861	10.02
Tubal	1901	61.19	4.45	.060	.938	2.37	.168	.062	.016	4.18	—
		52.953	3.851	.0519	.8117	2.224	.1453	.0536	.0138	3.617	13.46

Mesabi Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Union	1901	60.54	—	.041	—	—	—	—	—	—	—
		55.63	—	.0376	—	—	—	—	—	—	8.11
Vulcan	1899	62.55	4.27	.042	.94	—	—	—	Trace	—	—
		57.0018	3.8013	.0383	.8566	—	—	—	Trace	—	8.87
Wallace	1901	64.850	2.100	.055	.370	.900	.180	.210	.008	2.900	—
		58.559	1.896	.049	.334	.812	.162	.189	.007	2.618	9.700
Welsh	1901	61.45	3.35	.055	.61	1.07	.47	.24	.016	5.79	—
		54.432	2.927	.0487	.540	.947	.416	.212	.0141	5.128	11.42
West Drill	1899	63.84	2.51	.052	.72	—	—	—	Trace	—	—
		57.7688	2.2713	.0471	.6515	—	—	—	Trace	—	9.51

Vermilion Range.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Chandler	1899	64.43	4.20	.040	.22	2.20	.63	.14	.002	.90	—
		60.9250	3.9715	.0378	.2080	2.0802	.5957	.1324	.0019	.8510	5.54
	1901	64.42	4.21	.040	.10	1.99	.38	.20	Trace	.98	—
		61.224	4.001	.0380	.095	1.891	.361	.190	Trace	.931	4.96
Jura	1899	62.142	—	.0760	—	—	—	—	—	—	—
		57.5565	—	.0703	—	—	—	—	—	—	7.379
	1901	61.02	4.31	.078	.156	2.67	1.16	—	—	4.07	—
		56.779	4.010	.0725	.1451	2.484	1.079	—	—	3.787	6.95
Long Lake	1899	60.47	7.67	.044	.13	3.65	.86	.28	.012	1.45	—
		56.1948	7.1227	.0409	.1208	3.3919	.7992	.2602	.0112	1.3475	7.07
	1901	60.64	7.68	.043	.14	3.26	.40	35	Trace	1.43	—
		56.722	7.183	.0402	.130	3.049	.374	.327	Trace	1.337	—
Pioneer.. .. .	1899	63.506	—	.0422	—	—	—	—	—	—	—
		58.4534	—	.0388	—	—	—	—	—	—	7.956
	1901	63.11	5.66	.040	.139	2.55	.074	.017	—	1.35	—
		59.108	5.301	.0374	.1226	2.388	.0693	.0159	—	1.264	6.34
Red Lake	1899	63.72	4.68	.131	.09	2.01	1.02	.34	.022	.80	—
		61.8976	3.9633	.1273	.0874	1.9525	.9908	.3303	.0214	.7771	2.86
	1901	61.45	6.73	.122	.09	2.49	.61	.64	.019	.93	—
		59.723	6.540	.1185	.087	2.420	.592	.622	.0184	.903	2.81
Savoy	1899	63.452	—	.0479	—	—	—	—	—	—	—
		58.9887	—	.0445	—	—	—	—	—	—	7.034
	1901	63.76	3.46	.051	.080	2.38	.248	—	—	2.68	—
		59.532	3.230	.0476	.0746	2.222	.2315	—	—	2.502	6.63
Sibley	1901	64.00	4.00	.048	—	—	—	—	—	—	—
		60.160	3.760	.0451	—	—	—	—	—	—	6.00
Soudan	1901	65.65	4.05	.084	.06	.85	.52	.29	.022	.36	—
		64.803	3.997	.0829	.059	.839	.513	.286	.0217	.355	1.29
Vermilion	1899	66.22	2.55	.127	.06	1.04	.92	.30	.007	.45	—
		65.2598	2.5130	.1252	.0591	1.0249	.9067	.2957	.0069	.4435	1.45
		64.88	4.24	.136	.06	1.35	.65	.41	.015	.59	—
	1901	64.205	4.135	.1345	.059	1.325	.643	.405	.0148	.583	1.04

Vermilion Range—continued.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Vermilion special	1899	66.43	2.60	.087	.04	.85	.63	.30	Trace	.30	—
		65.3937	2.5594	.0856	.0394	.8367	.6202	.2953	Trace	.2953	1.56
Vermilion lump	1901	66.05	2.30	.156	.09	1.06	.64	.42	Trace	.51	—
		65.600	2.284	.1549	.089	1.062	.635	.417	Trace	.506	.68
	1899	64.751	—	.0403	—	—	—	—	—	—	—
Zenith		61.0378	—	.0380	—	—	—	—	—	—	5.682
	1901	65.95	3.30	.036	.108	1.53	.075	—	—	.70	—
		60.845	3.044	.0332	.0996	1.4115	.0691	—	—	.645	7.44

Michipicoten Range.

Name of Ore.	Year.	Iron.	Silica.	Phosphorus.	Manganese.	Alumina.	Lime.	Magnesia.	Sulphur.	Loss by Ignition.	Moisture.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
	1901	58.94	5.37	.112	.13	.91	.13	.09	.063	.999	—
		55.99	5.10	.106	.12	.86	.12	.08	.0598	.949	5.00

6. In Colorado practically all the mines are owned by the Colorado Iron and Fuel Company.

In the Lake Superior district it is said that the United States Steel Corporation own 60 per cent. of the mines, while at least 60 per cent. of the remainder are held by other firms interested in the iron business, and are therefore not for sale. The Mining Commissioner for Michigan says that the United States Steel Corporation has 900,000,000 tons of ore in reserve.

One man who is interested in mines in this district says that at the present time he could buy mines with 23,000,000 tons of ore in sight at 2s. 1d. per ton, and this price might be slightly reduced.

The United States Steel Corporation has no mines for sale, but is said to value the ore in the ground at 4s. 2d. per ton.

It is impossible to give a list of the mines which could be bought unless some buyer is really in the market. When enquiring about the value of the mines the first question asked is if there is a genuine buyer enquiring.

7. The outputs of mines for the five years ending 1901 are given, with total output of each mine. The estimated output of several mines for 1902 and 1903 are also given. These figures may not be exactly correct, as they differ in the reports issued from various sources.

The Oliver Mining Company, a branch of the United States Steel Corporation, the International Harvesting Company, and others are exploring for new mines.

Reference may be made to the "Miscellaneous Series" of Foreign Office Reports, No. 583 (*Iron Ore Industry of the United States*).

OUTPUT OF THE FOLLOWING MINES.

Marquette Range.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output in 46 years.	Remarks.
Albion	—	—	—	—	—	4,592	Last return, 1892.
Allen	—	—	—	—	—	9,347	
America	—	—	—	—	—	112,933	Last return, 1892.
Ames	—	—	—	—	—	6,298	Last return, 1894.
Barnum	—	—	—	—	—	801,851	Last return, 1889.
Bay State	—	—	—	—	—	16,637	Last return, 1888.
*Bessie	—	—	—	—	—	847	Last return, 1891.
Beaufort	—	—	—	1,583	4,338	96,138	
Blue	—	—	—	—	—	92,639	Last return, 1897.
Boston	—	—	—	—	—	62,532	Last return, 1896.
Buffalo	—	—	—	—	—	217,730	Last return, 1890.
Braastad	—	—	—	—	—	968,081	Last return, 1889.
†Cambria	110,648	102,623	124,930	80,432	68,907	1,367,365	
Carr	—	2,380	—	—	—	2,380	
Champion	141,728	163,190	215,074	113,743	99,026	3,815,476	
Chester	3,975	—	—	22,585	22,815	284,000	
Chicago	—	—	—	—	—	9,012	Last return, 1883
‡Cleveland Cliffs I. Co.	718,408	869,482	1,011,048	881,021	874,465	10,478,233	
Columbia	—	—	—	—	—	94,813	Last return, 1883.
Curry	—	—	—	—	—	16,671	Worked 1889.
Detroit	—	—	—	—	—	140,841	Last return, 1890
Dexter	1,154	—	—	—	—	118,512	
Dey	—	—	—	—	—	2,709	Last return, 1884.
E. Champion	—	—	—	—	—	76,002	Last return, 1889.
E. New York	—	—	—	27,987	31,696	225,926	
Edison	—	—	—	—	—	893	Last return, 1889.
Erie	—	—	—	—	—	8,136	Last return, 1883.
Etna	—	—	—	—	—	1,091	Last return, 1883.
Fitch	—	—	—	—	—	31,817	Last return, 1895.
Foster	—	—	—	—	—	171,893	Last return, 1890.
Gibson	—	—	—	—	—	16,357	Last return, 1887.
Goodrich	—	—	—	—	—	49,754	Last return, 1882.
Grand Rapids	—	—	—	—	—	110,736	Last return, 1896.
*Hartford	—	—	—	—	—	14,289	Last return, 1896.
Hortense	—	—	—	—	—	30,574	Last return, 1890.
Humboldt	—	—	—	—	—	723,961	Last return, 1896.
Iron Cliffs	—	—	—	—	—	1,700,537	Last return, 1895.
Imperial	—	—	23,235	62,321	—	149,762	

* Owned by United States Steel Corporation under name of Oliver Mining Co.

† " Republic Iron and Steel Co.

‡ " Cleveland Cliffs Iron Co.

Marquette Range-- continued.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output in 46 years.	Remarks.
Jackson	79,102	55,012	88,230	31,714	38,271	3,754,014	
*Lake Superior	376,761	686,563	682,595	709,143	635,642	10,285,094	
§Lillie	112,781	211,023	196,200	114,990	98,788	1,334,374	
Lucy (McComber)	10,033	11,846	—	—	—	516,159	
Magnetic	—	—	—	—	—	788	
Manganese	—	—	—	—	—	6,359	Last return, 1886.
Mesaba	—	—	—	—	—	16,043	Worked in 1895 and 1896.
†Michigamme... ..	—	—	—	—	—	880,362	Last return, 1895.
Miller	—	—	—	—	—	4,756	
Milwaukee	—	—	—	—	—	375,451	Last return, 1890.
*Moore	—	—	—	4,648	37,655	42,303	
National	—	—	—	—	—	150,216	Last return, 1884.
*Negaunee	182,169	191,330	195,573	126,829	234,713	1,754,436	
Negaunee Conn.	—	—	—	—	—	12,708	Last return, 1886.
New York	—	—	6,642	3,327	—	1,123,071	
New York Hematite	—	—	—	—	—	37,587	Last return, 1882.
North Republic	—	—	—	—	—	289	Worked in 1888.
North West	—	—	—	—	—	1,687	Worked in 1893.
Norwood	—	—	—	—	—	5,753	Worked in 1887 and 1888.
Norpareil	—	—	—	—	—	23,395	Worked in 1882, 1883, and 1887.
Ogden	986	—	—	—	—	986	
Palmer	—	—	—	—	—	1,041	Worked in 1896.
Pascoe	—	—	—	—	—	59,806	Last return, 1886.
Pendill	—	—	—	—	—	45,993	Last return, 1884.
Phenix	—	—	—	—	—	59,114	Last return, 1887.
Pioneer	—	—	—	—	—	15,409	Worked in 1886, 1887, and 1888.
Pittsburgh and Angeline	489,685	460,333	464,988	389,128	481,574	5,990,519	
Platt	—	—	—	—	—	73,844	Worked in 1892 and 1896.
Primrose	—	—	—	—	—	6,040	Worked in 1896.
Prince of Wales	—	—	—	—	—	32,415	Worked in 1890.
Princeton	—	25,247	55,802	75,037	67,051	440,226	
Quartz	—	—	—	—	—	491	Worked in 1899.
Queen	239,774	61,022	342,978	398,298	400,845	3,294,047	
Republic	124,342	140,312	137,085	130,126	104,604	5,014,855	
Republic Red Company	—	—	—	—	—	47,174	Worked in 1887 and 1890.
Richards	6,887	—	—	—	—	8,261	
Richmond	4,630	24,464	4,613	51,303	54,181	140,279	
Riverside	—	—	—	—	—	16,160	Worked in 1888, 1889, 1891, and 1893.
Rolling Mill	3,975	—	—	—	—	238,600	

* Owned by United States Steel Corporation under name of Oliver Mining Co.
 † " Cleveland Cliffs Iron Co.
 § " Republic Iron and Steel Co.

Marquette Range—continued.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output in 46 years.	Remarks.
Saginaw	—	—	—	—	—	451,424	Last return, 1891.
†Salisbury	—	—	—	—	—	686,411	Last return, 1890.
Sam Mitchell	—	—	—	—	—	17,780	Worked in 1886 and 1888.
Samson	—	—	—	—	—	267,805	Last return, 1892.
Section 12	—	—	—	—	—	21,887	Last return, 1882.
Schadt	—	—	—	—	—	1,261	Worked in 1895.
S. Buffalo	—	—	—	—	—	245,412	Worked in 1887 and 1890.
Spurr	—	—	—	—	—	164,244	Last return, 1886.
Star West	942	—	6,716	15,987	—	204,649	
Taylor	—	—	—	—	—	32,970	Last return, 1883.
Titan	—	—	—	—	—	90,371	Worked in 1882 and 1888.
Volunteer	1,617	—	29,983	47,578	—	1,152,349	
Webster	—	—	—	20,797	—	34,905	
W. Republic	—	—	—	—	—	133,077	Last return, 1889.
Wetmore	—	—	—	—	—	50,870	Worked in 1882 and 1889.
Wheeling	—	—	—	—	—	10,555	Worked in 1884 and 1887.
*Winthrop	106,894	122,592	171,318	148,945	109	1,710,063	
TOTAL	2,719,010	3,127,418	3,757,010	3,457,522	3,254,680	62,872,918	

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† " Cleveland Cliffe Iron Co.

Gogebic Range. (Shipping commenced 1884.)

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output since 1884.	Remarks.
Ada	—	—	7,977	25,047	—	33,024	
Anvil	—	5,037	—	—	1,101	314,586	
‡Ashland	111,625	123,208	154,615	232,961	286,399	2,898,841	
Atlantic	50,307	38,058	19,964	135,595	190,135	567,504	
*Aurora	166,122	133,076	170,369	193,111	223,747	2,990,417	
Bessemer	—	—	—	—	—	20,889	Worked in 1886 and 1887.
Blue Jacket	—	—	—	—	—	—	Worked in 1887.
Brotherton	46,186	73,198	78,858	89,804	103,109	930,665	
†Cary and Superior	37,308	43,162	62,524	125,496	179,374	984,586	
Chicago	—	—	—	633	—	1,137	504 in 1896.
Colby, E.	22,921	152,875	103,239	32,572	23,475	1,772,148	
Eureka	—	—	—	—	—	128,719	Worked from 1890 to 1896.
Federal	—	—	—	—	—	27,928	Worked in 1890 and 1891.
First National... ..	—	—	—	—	—	1,997	Worked in 1887.

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† " Pickands, Mather & Co.

‡ " Cleveland Cliffs Iron Co.

Gogebic Range—continued.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output since 1884.	Remarks.
Harmony	1,015	—	—	986	10,358	342,992	
Hennepin	—	—	—	7,728	21,475	214,131	
Imperial	—	—	—	—	—	8,515	Worked in 1892.
Iron Belt	96,763	58,418	105,934	54,664	43,883	1,013,386	
Iron Chief	—	—	—	—	—	12,199	Worked in 1886 and 1887.
Iron Chief Two	—	—	—	—	—	551	Worked in 1886.
Ironton... ..	—	—	—	—	—	58,368	Worked from 1886 to 1891.
Jack Pot	1,265	—	—	33,893	19,988	61,744	
Kakagon	—	—	—	—	—	71,904	Worked from 1886 to 1888.
Meteor	—	—	332	7,844	34,140	131,507	
†Mikado	11,397	—	10,324	1,090	91,846	119,445	
Minnewawa	—	—	1,255	—	—	1,255	
Montreal	191,106	270,776	153,307	107,524	72,945	1,439,712	
New Davis	—	—	5,029	3,569	—	57,312	
Newport	150,979	196,953	263,711	217,201	190,448	2,124,624	
Nimikon	—	—	—	—	—	28,635	Worked from 1886 to 1888.
*Norrie... ..	604,281	700,990	714,669	666,389	660,965	9,623,135	
Odanah... ..	—	—	—	—	—	77,124	Worked from 1886 to 1894.
*Pabst	220,496	223,891	263,869	239,242	198,686	2,366,583	
Palms	207,153	175,925	154,705	139,658	7,603	1,118,283	
Pence	120	—	—	—	—	40,566	
Pike	—	—	—	3,434	6,346	9,780	
Puritan... ..	—	—	—	—	21,788	108,313	Worked from 1886 to 1891.
Sec. 33	—	—	—	—	—	253,590	Worked from 1889 to 1892.
Shores	16,102	15,691	11,819	—	—	55,808	
Sparta	—	—	—	—	—	4,862	Worked in 1892 and 1895.
Sunday Lk.	45,815	—	12,526	74,097	89,997	547,508	
Superior	—	—	—	—	—	121,627	Worked from 1886 to 1893.
*Tilden... ..	276,890	287,203	500,830	481,909	446,670	3,267,861	
Trimble	—	—	—	—	—	25,931	Worked from 1886 to 1888.
Tyler's Forks	—	—	—	—	—	10,683	Worked in 1890.
Valley	—	—	—	—	—	1,878	Worked in 1886.
West Colby	—	—	—	—	12,836	12,836	
Windsor	385	—	—	488	841	148,905	
TOTAL	2,258,236	2,498,461	2,795,856	2,875,295	2,938,155	34,154,790	

* Owned by United States Steel Corporation under name of Oliver Mining Co.
† " Pickands, Mather & Co.

Menominee Range.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output in 45 years.	Remarks.
§Antoine	98,847	104,510	93,025	119,940	63,429	618,503	
Appleton	—	—	—	—	—	12,102	Worked in 1892, 1893, and 1895.
*Aragon	145,594	295,821	337,807	404,645	477,212	2,523,425	
Armenia	—	—	—	—	18,750	97,749	
†Baltic	—	—	—	—	17,326	17,326	
Beta	—	—	—	—	—	4,211	Worked in 1886, 1887, and 1891.
Breen	—	—	—	—	—	17,430	Worked in before 1882.
Brier Hill	—	—	—	—	—	14,981	Worked in 1882 and 1883.
Bristol	—	—	80,915	51,639	36,593	236,101	Worked in 1892.
Calumet	—	—	—	—	—	38,713	Worked in 1882, 1883, and 1884.
*Chapin	643,402	724,768	940,513	929,937	929,701	10,299,601	
*Columbia	24,623	14,199	126,290	97,531	19,963	728,022	
Commonwealth	98,283	250,687	117,295	53,342	77,799	2,327,194	
Cornell	—	—	—	—	—	49,302	Last return, 1887.
Crystal Falls	95,210	128,233	147,346	197,770	230,614	862,051	
Cuff	—	—	20,210	38,209	—	58,419	
*Cundy... ..	41,942	76,877	100,902	141,148	160,519	524,783	
Curry	—	—	—	—	—	416,928	Worked since 1892 as Penn Iron Co.
Cyclops... ..	—	—	—	—	—	286,093	Worked since 1892 as Penn Iron Co.
Delphic... ..	—	—	—	—	—	33,770	Last return, 1887.
Dunn	31,062	49,381	77,458	—	—	1,056,946	
Emmett	—	—	—	—	—	66,655	Last return, 1881.
Fairbank	—	—	—	—	—	8,500	Worked in 1882 and 1883.
Florence	37,594	93,663	74,235	35,756	15,395	1,384,075	
Foxdale... ..	—	—	—	—	4,647	4,647	
Great Western... ..	—	33,851	43,316	98,550	123,261	686,721	
Groveland	—	—	—	—	11,444	12,493	
Half-and-Half... ..	—	—	—	—	—	7,524	Worked in 1889, 1890, and 1891.
Hamilton	—	—	—	—	—	96,072	Worked in 1886 and 1892.
†Hemlock	96,032	69,865	110,269	72,413	149,966	706,452	
Hersel	—	—	—	—	—	955	Worked in 1890.
Hiawatha	—	—	—	11,008	20,355	34,247	
Hiltop	—	—	3,496	6,410	2,503	12,409	
Hollister	—	—	—	—	—	4,098	Worked in 1890, 1891, and 1892.
*Hope	—	—	—	—	—	17,818	Worked in 1892 and 1893.
Indiana	—	—	—	—	—	17,871	Last return, 1886.
§Keel Ridge	—	—	4,900	—	—	93,101	
Lamont... ..	—	—	67,652	31,323	—	227,884	
Lee Peck	—	—	—	—	—	2,844	Worked in 1892.
Lincoln... ..	—	—	43,622	72,959	19,727	172,897	
Loretto	54,104	68,447	64,824	61,219	54,985	455,187	

* Owned by United States Steel Corporation under name of Oliver Mining Co.
† " " Pickands. Mather & Co.
§ " " Republic Iron & Steel Co.

Menominee Range--continued.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output in 45 years.	Remarks.
Ludington ...	—	—	—	—	—	1,001,518	Last return, 1894.
Manganate ...	—	—	—	—	—	6,844	Worked in 1890.
*Mansfield ...	37,182	60,739	86,907	90,155	74,113	555,752	
Mastodon ...	—	—	—	—	—	425,708	Last return, 1896.
Metropolitan ...	—	—	—	—	—	107,027	Last return, 1888.
*Michigan Explo. Co...	—	—	—	—	—	1,869	Last return, 1895.
Millie ...	10,374	17,430	15,194	14,922	12,133	231,755	
Monongahela ...	—	—	—	—	2,397	2,397	
Nanaimo ...	—	—	—	—	—	127,566	Last return, 1891.
North Western ...	—	—	—	—	—	17,206	Worked in 1883 and 1884.
Norway ...	—	—	—	—	—	1,291,352	Worked since 1892 as Penn Iron Co.
Paint River ...	—	—	—	1,316	—	223,687	
Penn Iron Co. ...	237,886	223,713	229,651	197,606	358,126	2,173,245	
Perkins ...	—	—	—	—	—	397,225	Last return, 1895.
Perry ...	—	—	—	—	—	3,138	Worked in 1883.
Pewabic ...	279,855	305,072	530,129	374,043	507,786	3,209,549	
Quinneseec ...	—	—	11,050	25,967	66,383	387,484	
*Riverton ...	—	5,009	13,242	120,207	119,860	1,162,905	
Selden ...	—	—	—	—	—	2,092	Worked in 1886 and 1887.
Sheridan ...	146	—	31,104	8,063	—	116,299	
S. Mastodon ...	—	—	—	—	—	8,203	Worked in 1888, 1889, and 1890.
Stephenson ...	—	—	—	—	—	39,350	Last return, 1887.
Sturgeon River ...	—	—	—	—	—	18,404	Worked in 1887, 1888 and 1889.
Tobin ...	—	—	—	—	18,597	18,957	
Vulcan ...	—	—	—	—	—	1,668,654	Worked since 1892 as Penn Iron Co.
Walpole ...	—	—	—	—	—	19,089	Worked in 1887 to 1891.
Youngstown ...	661	—	—	—	—	151,425	
TOTAL ...	1,937,013	2,522,265	3,301,052	3,261,221	3,605,449	37,621,428	

* Owned by United States Steel Corporation under name of Oliver Mining Co.

Mesabi Range.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output in 10 years.	Remarks.
*Adams	170,738	390,860	720,474	777,346	829,118	3,182,239	
Aetna	—	—	—	—	—	19,368	Worked in 1893 and 1896.
Auburn	175,263	235,630	385,992	263,692	427,510	2,104,745	
Biwabik	427,464	383,180	553,836	924,868	410,074	3,104,745	
Canton	—	—	99,498	—	—	713,048	
Chisholm	—	—	—	—	34,573	34,753	
Cincinnati	32,912	—	246	—	—	134,041	
Clark	—	—	—	63,071	199,566	262,637	
Cloquet... ..	12,215	—	1,621	—	—	163,444	
Columbia	—	—	—	—	15,627	15,627	
Commodore	60,798	80,494	152,947	278,416	35,546	702,614	
†Corsica	—	—	—	—	26,838	26,838	
Day	—	18,651	1,975	—	—	20,626	
Duluth	—	112,155	165,435	128,587	150,024	593,827	
†Elba	—	564	9,547	121,707	224,630	356,448	
*Fayal	642,939	575,933	1,072,257	1,252,504	1,656,973	5,585,852	
Franklin	30,128	200,400	60,000	168,524	39,299	1,285,876	
Genoa	309,514	279,677	276,559	253,651	332,022	1,468,559	
Hale	13,728	—	18,807	32,901	30,929	225,158	
Kanawha	—	—	14,963	64,218	41,300	120,481	
L. Superior	259,912	135,404	154,326	284,023	594,761	1,554,208	
Mahoning	519,892	520,751	750,341	911,021	765,872	3,753,006	
†Malta... ..	—	—	28,615	65,346	126,299	220,260	
Minnewas	—	—	—	—	—	15,998	Worked in 1893 and 1894.
*Mountain Iron	773,538	650,955	1,137,970	1,001,324	1,058,160	5,832,745	
Norman	101,077	110,141	—	—	—	421,132	
Ohio	47,350	101,607	293,651	172,597	—	714,073	
Oliver	601,072	349,100	—	244,876	5,420	3,138,106	
Penobscot	11,933	29,652	85,619	146,641	221,080	494,925	
Pillsbury	—	99,691	106,487	101,032	120,723	427,933	
Roberts... ..	18,614	—	57,847	41,965	42,756	161,182	
Sauntry	—	—	53,004	68,560	328,739	450,303	
Sellers... ..	—	112,765	174,867	56,280	34,918	579,300	
Sharon	—	—	—	—	56,810	56,810	
†Sparta... ..	66,722	226,156	237,143	202,144	156,426	888,591	
*Spruce	—	—	—	101,675	279,515	381,190	
Stevenson	—	—	—	56,031	666,273	722,304	
Union	—	—	—	8,297	93,109	101,406	
Williams	—	—	12,357	18,238	—	44,890	
TOTAL	4,275,809	4,613,766	6,626,384	7,809,535	9,004,890	40,404,967	

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† " " Pickands, Mather & Co.

Vermilion Range.

Mine.	1897.	1898.	1899.	1900.	1901.	Total Output since 1884.	Remarks.
*Chandler	438,365	715,919	808,359	644,801	627,379	7,027,830	
Minnesota	592,196	426,040	457,732	325,020	208,284	7,178,343	
*Pioneer	207,103	123,183	339,897	450,794	678,310	2,009,300	
Savoy and Sibley ...	—	—	86,191	175,116	212,008	473,315	
Zenith	40,817	—	79,323	60,089	60,082	288,455	
TOTAL	1,278,481	1,265,142	1,771,502	1,655,820	1,786,063	16,977,243	

* Owned by United States Steel Corporation under name of Oliver Mining Co.

The following figures are taken from "The Marine Review" and "Iron Age":—

Minnesota Mines.

Mines.	1902.	1903.
*Adams	1,242,923	1,109,759
*Spruce	543,397	587,032
Troy (new)	—	10,267
Duluth	150,220	17,405
Biwabik	623,128	10,722
St. Clair (new) ...	—	6,148
*Burt	100,331	429,711
Day	106,516	111,009
Glen	23,875	171,705
*Hull	423,266	432,916
Pittsburgh	238,122	229,133
Rust	242,715	160,624
Sellers	193,428	251,631
Lincoln	87,779	279,632
Poole	—	200,029
Mesabi Mountain ...	5,131	5,866
*Mountain Iron... ..	1,430,103	1,217,156
Etna	199,473	119,212
*Fayal	—	1,460,815
*Chandler	—	460,548

All the mines marked "new" are in the Mesabi range.

* Belong to United States Steel Corporation, whose shipments of ore from Minnesota for 1903 are placed at 9,226,815 tons.

Minnesota Mines—continued.

Mine.	1903.
*Pioneer	596,780
*Norrie	700,891
*Chapin	704,114
*Aragon	522,035
*Lake Superior ..	620,000
†Leetonia	200,160
†Cyprus	122,201
†Croxtton	100,645
†Pearce	50,429
†Morrow... ..	49,409
†Kanawha	24,844
†Cass (new)	52,905
†Longyear	81,823
†La Rue (new) ...	54,000
†Agnew	108,982
†Hawkins	107,773
†Brotherton	100,000
†Sunday Lake ...	100,000
‡Corsica	34,034
‡Elba	93,630
‡Minorca	115,000
‡Sparta	40,373
‡Malta	11,675
‡Troy (new)	15,000
‡Albany (new) ...	120,000
‡Utica (new)	155,000
‡Cary	86,723
‡Mikado	112,000
‡Baltic	128,470
‡Vivian	11,878
‡Verona	49,735
‡Hemlock	79,179

All the mines marked "new" are in the Mesabi range.

* Belong to United States Steel Corporation, whose shipment of ore from Minnesota for 1903 are placed 9,226,815 tons.

† Belong to International Harvester Co.

‡ Belong to Pickands Mather & Co.

Minnesota Mines—continued.

Mine.	1903.
Chisholm	168,869
Clark	300,604
Commodore	20,436
Franklin... ..	64,026
Genoa	303,713
Grant (new)	18,928
Jordan	130,024
Kinney (new)	31,000
La Belle	48,298
Laura	97,782
Leonard (new)	7,750
Mahoning	1,010,000
Oliver	5,866
Penobscot	1,630
Pettit	62,323
Pillsbury	229,187
Sharon	48,199
Stephens (new)... ..	87,055
Stevenson	1,014,582
Union	91,496
Victoria	27,973
Winnifred (new)	31,869
Savoy	169,616
Sibley	113,595
Soudan	175,114
Zenith	161,091

All the mines marked "new" are in the Mesabi range.

8. The lakes are closed to navigation during the winter months, practically from November to May. Some of the mines operate all the year.

9. There is an estimated supply of iron ore in the Lake Superior that will, at the present rate of consumption, last about 40 years. Many Americans have invested money in iron ore land in Canada. There are four fields in Canada within reach of the lakes.

FREIGHT RATES.

Average Freight Rates on Iron Ore per gross ton from Ports named to Ohio Ports.

	Escanaba.		Marquette.		Ashland and other Ports at the head of Lake Superior.	
	Wild or daily rate.	Contract rate.	Wild or daily rate.	Contract rate.	Wild or daily rate.	Contract rate.
1882	s. d. 4 3½	s. d. 5 9¼	s. d. 5 2½	s. d. 7 2¾	—	—
1883	5 0½	4 1½	5 9¼	4 11½	—	—
1884	3 7	4 6½	4 5½	5 6¾	—	—
1885	3 2¾	3 8½	4 0½	4 4	5 2	4 9
1886	5 3½	4 4	6 2¾	4 11½	7 4¼	4 11½
1887	6 6¾	5 9¼	7 8½	6 8¾	9 2½	8 3
1888	4 4	3 8½	5 4¼	4 9	5 10¾	5 2
1889	4 2	4 1½	4 11	4 6½	5 6¼	5 2
1890	3 8	4 6½	4 5	5 2	4 10	5 6¾
1891	3 5½	2 8¼	4 2½	3 8½	4 7	4 1½
1892	3 0¾	4 1½	4 0½	4 9	4 9	5 2
1893	2 3¾	3 6	2 11¼	4 1½	2 2¼	4 1½
1894	1 11¼	2 5¾	2 5¾	3 3½	3 2¾	3 3½
1895	3 0¼	2 3¼	3 9½	3 1¼	4 8	3 3½
1896	2 1¾	2 10¾	2 8¾	3 11	3 2¼	4 4
1897	1 10¼	1 10¼	2 3¼	2 8¼	2 4¼	2 10¾
1898	2 1¼	1 10¼	2 5¾	2 5¾	2 6¾	2 5¾
1899	3 11	2 0¾	4 5¾	2 5¾	5 4¼	2 5¾
1900	2 10½	4 1½	3 2¾	4 6½	3 5¾	5 2
1901	2 7¾	2 5¾	3 3½	2 10¾	3 8	3 3½

Rate of exchange taken at \$4.85 to £.

MISSOURI (ST. LOUIS).

(*Mr. Vice-Consul Bascome.*)

While the State of Missouri possesses many iron ore deposits (280), they are distributed and broken and comparatively small, and situated where the expensive transportation has kept them out of the ore market.

The three principal and important iron regions in Missouri are:—

1. The eastern region, composed of the south-eastern limonite district and the iron mountain specular ore district; 1,000 miles by Mississippi River to tide water.

This region has its natural outlet over the iron mountain railroad,

2. The central region, containing principally specular ores, has its commercial outlet over the St. Louis, Salem and Little Rock, and the St. Louis and San Francisco Railways, and the Mississippi River to tide water.

3. The western or Osage region, with its limonites and red hematites, is too remote from present ore markets, and will have to establish local industries to develop it.

These three principal regions combined, form a broad belt, running across the State from the Mississippi to the Osage Rivers, in a direction parallel to the Missouri River, from south-east to north-west between the thirtieth and fortieth township lines. The spectacular ores occupy the middle portion of this belt, the limonites both ends of it.

The eastern ore region has been more extensively developed

The Iron Mountain district is said to be nearly worked out; the ores were all magnetic, and large quantities were shipped via the Mississippi and Ohio Rivers to Pittsburg, twenty years ago, to the Edgar Thompson Steel Company, of which Mr. Carnegie was then manager, but I have never heard of any iron ore being shipped to any foreign country from this state, the great distance and expense of transportation being a barrier, and likely to continue so for an indefinite period.

The Iron Mountain formerly had a blast furnace on the property, established for the smelting of the ore, but it has been out of blast for some time. The Pilot Knob differs in quality, its colour is steel or pearly gray, with a marked tinf of skyblue, and none of them are polaric-magnetic. There was a large body of ore in this deposit, but it gave out ten years ago, and the deposit has not since been worked. This ore was also at one time shipped to Pittsburg, but the business has long since been discontinued.

The vast ore discoveries in Northern Wisconsin and Michigan, which are so extensively worked and transported on such an economical basis, has put a quietus on the trade of the Missouri ores, which must depend for development on local establishments.

Replying to the memorandum:—

1. There are deposits of iron ores in this district.
2. The nearest ocean shipping port is New Orleans.
3. The cost of transportation has not been ascertained, because there is no trade at present, but it is known to be prohibitive.

(COPY OF LETTER forwarded by Mr. J. C. Spry to Mr. Vice-Consul Erskine, Chicago.)

Chicago, Illinois, November 24, 1903.

“In relation to the Moose Mountain Company’s iron lands, they are located about 35 miles north of Sudbury, Canada. I enclose you a map of the country. The Canadian Pacific Railroad has a line surveyed to the property from Sudbury. The new Grand Trunk and Pacific Railroad have a survey made about five miles north of the property, so that the property is now nicely located for shipping of the ore.

“I enclose you two reports that we had on the property, one by Mr. Walter Fitch, General Manager of the Champion Iron Company, of Beacon, Michigan, one of the largest mines in Michigan, and one by Mr. Seaman, who is Professor of the College of Mines at Houghton, Michigan. Both parties have visited the property and were there for some time. These speak for themselves.

“ In relation to your asking if the property is for sale, will state that I do not know. We have never made a price on it. The parties bought it with the intention of working it and building a road from the mines to Georgian Bay, a distance of about sixty miles.

“ There is very good water power close by the property that can be had for a small sum, and you could run the property by power so as to save the expense of taking coal in.

“ We think we have a very large and valuable amount of iron. The property is owned by the Moose Mountain Mining Company, head office at Chicago, Illinois Trust and Savings Bank Building, and if a party wanted a price on the property I would arrange with the *bonâ fide* people so an interview could be had, and I think a price could be obtained from Mr. John J. Mitchell or Mr. J. C. Hutchins, who are the Managing Directors of the Company. Any other information that you desire at any time, if it is in my power, I should be pleased to give it to you.”

(Enclosure No. 1 in Mr. Spry's letter to Mr. Vice-Consul Erskine.)

Champion Iron Company, Beacon, Michigan,

GENTLEMEN,

September 19, 1902.

IN accordance with my offer to you I will give you briefly my impressions of the extent and value of your discoveries of ore on the Moose mountain range, in the Nipissing district in Ontario. The outcroppings of ore on this range, to which I recently made a visit with you and Professor Seaman, of the Michigan College of Mines, consisting largely of very rich magnetic iron ores, associated with some of lesser richness, but still very valuable, were, I consider, larger than any that were ever found on the Marquette iron range, and as these ores in iron range as high as 64 per cent., and very likely above that, and are low in phosphorus, the highest being well within the Bessemer limits necessary for steel making, I therefore consider that the lands which you have secured, extending over several miles of territory, possess a very large value indeed, there being many millions of tons of ore which can be readily mined and shipped as soon as railroad facilities are provided.

In addition to the values represented in the outcroppings, which are visible without any preliminary work, I think it is safe to predict the presence of very large deposits of richer ores associated with these outcroppings, such as have characterised many deposits on the old ranges; for instance, at the Republic Mine, the company for the operation of which was organized for the purpose of mining the ore contained in the so-called Republic Mountain, which consists of a mixed ore and jasper, nothing was known of the rich ore resting at the foot of this bluff, and yet the whole of the shipments from the Republic Mine, aggregating about five million tons, have been made from a deposit unknown until after the organisation of the company and the commencement of mining operations; none having been taken from the mountain itself. Again, at the Soudan mines of the Minnesota Iron Company the operations were first commenced with the idea of mining on the smaller outcropping, nothing being known then of the deposits from which all the shipments have been made. The same thing was also true of the Champion. The company was formed with the idea of operating, and the first work was started on the so-called Parsons pit, nearly three thousand feet from the rich bodies of ore from which the mine has made its whole shipments.

In each of the above cases the drift material covered the richer deposits of ore, I think this can be considered the general condition, from the fact that the richer ores are in many cases more easily eroded, and though in the case of your Moose Mountain Range outcrops the situation is different because of the presence in those outcrops of very rich ores, this differing condition may, I think, be explained by the fact that these rich bodies of ore are associated on their sides by the lower and more silicious outcrops, thus largely protecting the rich ores from erosion.

There are many points of similarity between the situation on the Moose Mountain Range and the conditions existing on the Vermillion Range in Minnesota, and there would therefore seem to be no reason why such additional deposits of hematites similar to that in which the Chandler and Pioneer mines are now working might not be found somewhere in the less elevated parts of your holdings.

I mention these several possibilities because experience on the old ranges has shown that the initial developments on the different properties have been of much less value than the later ones. In your case you have already a showing that will insure a very large production without any additional developments. This production can, I believe, be made at a cost not to exceed one dollar per ton, unless it was decided to mine the mixed ores, associated with the richer deposits, in which case these could be easily graded at an additional cost of not to exceed fifteen cents.

I consider your holdings and the promise of this new range to exceed in value anything outside of the Mesaba Range.

Yours truly,

W. FITCH.

Enclosure No. 2.

Michigan College of Mines, Science Hall,
(Department of Geology.)

The Moose Mountain Mining Company,
Chicago, Illinois.

DEAR SIR,

October 1, 1902.

In compliance with your request that I express my opinion of the value of your Moose Mountain properties, I submit the following:—

These properties are located in the Moose Mountain region, about thirty-five miles by waggon road, in a northerly direction from Sudbury, Ontario.

The iron formation is a quartz magnetite schist, associated with amphibole schist and diorite. The formation as a whole presents many analogies to the vermilion of Minnesota, and is probably its equivalent in geological age. At four different outcrops that were visited, the iron shows a remarkable degree of concentration. No attempt was made to estimate the millions of tons of workable ore in sight.

At one outcrop the ore was somewhat mixed with epidote, but this, owing to its greenish colour, could easily be sorted from the rich magnetite ore.

I was amazed at the magnitude of the deposits, as well as at their richness. The amount and richness of the visible deposits, however, did not impress me as deeply as did the hidden possibilities, which may lie buried beneath the drift covered surface between the exposures. In my estimation it is safe to predict that the exposed bodies of ore are but a small consideration compared with what is not in sight. The surface showing is the best I have ever seen, and, the only regret is that the ore is a hard magnetite instead of a soft hematite.

I believe you have the prospect for the largest and best mine in Canada. The property certainly deserves active and extensive exploitation. The ground between outcrops should be thoroughly tested, so that permanent improvements may be wisely made.

Thanking you for your courteous treatment during my pleasant trip to your camp,

I am,

Very sincerely yours,

A. E. SEAMAN.

TEXAS.

(Mr. Consul Nugent.)

1. Yes.

2. In north-eastern Texas, occupying portions of 19 different counties and covering an area of over 1,000 square miles.

Galveston is the nearest seaport, distant some 200 miles from the centre of the iron-ore district.

3. The ore would have to be brought by rail. The cost would depend on contract made with the railroads. None has ever been brought to Galveston.

4. It is impossible to answer these questions, as there are practically no mining operations at present.

5. The following are analyses of these ores.

Analysis of limonite from Cherokee Co., Texas:—

Moisture	...	...	...	1.63	per cent.
Loss by ignition	...	...	...	11.65	„
Silica	...	...	...	10.81	„
Alumina	...	...	...	3.40	„
Metallic iron	...	...	...	48.24	„
Manganese	...	...	...	0.43	„
Lime	...	...	...	0.24	„
Magnesia	...	...	...	Trace.	
Sulphur	...	...	...	1.176	„
Phosphorus	...	...	...	0.268	„

Average of six analyses of Llano Co. hematites:—

Metallic iron	...	...	...	56.43	per cent.
Silica	...	...	...	5.59	„
Alumina	...	...	...	7.86	„
Lime	...	...	...	1.44	„
Magnesia	...	...	...	Trace.	
Phosphorus	...	...	...	0.55	„
Sulphur	...	...	...	0.091	„

6. Deposits can probably be bought on very reasonable terms.

7. No. The State of Texas is about to work the deposits near Rusk.

8. Lack of coal or other fuel is the greatest drawback.

9. Throughout north-eastern Texas we have an extensive series of iron ore deposits, occupying portions of 19 counties, and having approximately an actual ore-covered area of 1,000 square miles. The existence of this ore has long been known. The great ore belt may be described as a triangular area, bounded on the north by an irregular line drawn from the Sulphur Fork, in Cass County, extending west and south through Daingerfield, in Morris County, to a little south of Quitman, in Wood County.

The western limitations of the belt extend irregularly southward through the west side of Smith, east side of Van Zandt and Henderson, and the centre of Anderson County, a short distance west of Palestine, and in a south-westerly direction to the Brazos River, near Hearne.

The southern side is limited to a line crossing the Trinity River, near Crockett, the Neches, at Augusta, and the Sabine River, near the north-east corner of Sabine County.

The total area is approximately 10,000 square miles, of which about 1,000 square miles are covered with iron ore.

NEW MEXICO.

(Mr. Consul Nugent.)

1. Yes; large deposits, especially at Fiero, Grant County.
2. Galveston, about 1,000 miles.
3. By rail; cost would depend on contracts made.
- 4 and 5. It is impossible to obtain information on these points as the companies interested refuse utterly to answer such inquiries.
6. They are likely to be sellers on reasonable terms.
7. Yes, but the figures cannot be obtained.
8. Lack of fuel chiefly.
9. The Governor of New Mexico states:—

"I will say that several individuals own mining locations which are taken up under location similar to any other mineral deposits, that is, it is all Government land, but an individual has the right to locate mining claims upon complying with the usual assessment work, which, I believe, is \$100.00 per year or digging a ten-foot hole.

"Different mining districts have different rules and regulations, but in the main they are all the same.

"After \$500.00 worth of work has been done on the claim, application can be made to the Government for patent.

"I think there are large areas of iron properties located in the territory of New Mexico that are open for location to-day."

NEW ORLEANS.

Iron Ore Deposits in the State of Arkansas.

(Mr. Consul Vansittart.)

Iron deposits are reported to exist in two counties of the State of Arkansas, viz., Lawrence County, and Montgomery County.

An official analysis of the ore in Lawrence County gives following: Assay, 55.75 iron, 5.20 silica, .041 phosphorus, .212 sulphur, little manganese.

The analysis of the ore in Montgomery County gives assay 61 $\frac{9}{10}$ % iron, 1 $\frac{5}{10}$ % silica, .200 phosphorus, .04 manganese.

Both the above mentioned counties are traversed by railways. The St. Louis, Iron Mountain, and Southern Railway has 22 miles, and the Kansas City, Fort Scott and Memphis Railroad has 30 miles of roadbed within the limits of Lawrence County. Iron, zinc and lead have been mined to some extent in Lawrence County, and there are prospects that the mineral resources will be developed in the future.

As regards Montgomery County, some sulphur and iron exist, but little effective work has been done in developing minerals, and the county being forty miles from the nearest railroad there are no facilities for the shipment of these products.

The working of the deposits above mentioned do not amount to anything, but there do not appear to be any special obstacles in the way of mining.

NEW ORLEANS.

Iron Ore Deposits in the State of ALABAMA.

(Mr. Consul Vansittart.)

Extensive beds of iron ore are to be found throughout the mineral region of Alabama, in such proximity to coal, limestone and dolomite, that its manufacture is much cheaper than in other mineral regions of America, where these materials have to be assembled at greater cost.

The brown ore is found in pockets, and for that reason it is hard to estimate with any certainty the extent of the same. It is being mined extensively in eight counties, viz.: Cherokee, Etowah, Calhoun, Talladega, Blount, Shelby, Bibb, and Jefferson. These deposits are said to exist in a number of other counties, in which there has been no mining done up to the present time.

The principal ore supply is from the red ores, found outcropping on Red Mountain. This vein runs along this mountain for a distance of 150 miles, reaching in some places a thickness of 26 feet. There has been no deterioration in the quality of this ore, although some of the slopes have been driven down as far as 2,000 feet. The supply, therefore, might be considered practically inexhaustible.

The number of men employed in and about the ore mines is about five thousand.

The production of ore in the State, ninety per cent. of which is in the Birmingham district, was:—

In 1880	...	...	...	171,136	tons.
„ 1885	...	...	...	505,000	„
„ 1890	...	...	...	1,897,815	„
„ 1895	...	...	...	2,199,390	„
„ 1899	...	...	...	2,627,000	„
„ 1900	...	...	...	3,095,406	„
„ 1901	...	...	...	2,881,593	„

So far there has been no shipment of ore from the Birmingham district to the coast. If such a thing were undertaken, the freight rate would probably be about 75 cents per ton.

Birmingham has good railroad facilities. Five trunk lines furnish communication with the outside world, viz.: The Louisville and Nashville, four directions; Southern, two directions; the Frisco system, one direction; Central of Georgia, one direction; while the Birmingham Mineral Railroad, the Birmingham Southern and the Belt line girdle the city, and tap every main line, reaching every factory, mill, furnace and quarry and mine in the district, delivering raw materials to the factories and finished products to the trunk lines, and open up territory for development.

Since January, 1900, there has been built in the district 200 miles of main lines and spur tracks.

When the improvements now being made by the Government on the Warrior and Tombigbee Rivers are completed, they are destined to play an important part in the transportation of coal and other heavy products from the Birmingham district to tide water at Mobile.

With 24 feet of water over the bar at Mobile this route would be the means of reducing the cost of transportation to the Atlantic seaboard.

The distance from Birmingham to Mobile is 258 miles.

NEW YORK.

(Consul-General Sir Percy Sanderson.)

I beg to enclose a report which has kindly been drawn up for me by Mr. F. Hobart, Assistant Editor of the Engineering and Mining Journal, a very competent authority on this subject.

REPORT by Mr. F. HOBART, Assistant Editor of the Engineering and Mining Journal.

Iron ores are found in Connecticut, at Salisbury, and other points. In New York they are found in the Champlain region, at Port Henry, at Crown Point principally; while in New Jersey, they are mined at a number of points, the principal locations being at the Hybernia, Teabo, Mount Pleasant, and smaller mines in Morris County; at Oxford furnace and Jenny Jump in Warren County; at Hurd Mine, Ford Mine, Pochuck and other localities in Sussex County. So far as shipment is concerned, the mines in the Champlain regions, in New York, could ship by canal to the port of New York, while those in New Jersey could ship by rail, or by canal, to the same port. I do not think, however, that it is of any use going into further details, as the mines in the region named are all owned by iron companies, and their product is entirely consumed in local furnaces. The actual output of the New Jersey mines, at the present time, is about 500,000 tons yearly, and of those in New York and Connecticut about 400,000 tons. The supply which they furnish is not sufficient for the furnaces in the region, as is shown by the fact that nearly 1,000,000 tons of ore are imported yearly, principally from Cuba, for the use of those furnaces. There would be no possibility of securing any of the deposits, as none of them are for sale, and the operators have no ore to spare for sale to outside parties.

Further Information from Consul-General Sir PERCY SANDERSON.

I have to report that Mr. W. H. A. Davidson, the Manager of the Sprague Electric Company, whose offices are in the Maryland Trust Building, Baltimore, called at this Consulate-General to-day (November 20, 1903), and stated that, having seen a notice that His Majesty's Government were making enquiries respecting deposits of iron ores, he wishes to bring to their notice certain deposits of magnetic ironsand which his company possesses in Costa Rica. In the first instance the deposit is about one mile long, three hundred feet wide above high water mark and of an average depth of seven or eight feet. There is a good harbour and the largest ocean steamers can approach within three hundred feet of the shore where the deposit is situated.

Labour can be obtained at the cost of about eighty cents or three shillings and sixpence per diem, but if a system of "conveyers" were set up to carry the deposit to the steamers, very little labour would be necessary.

In the second instance, the deposit, which covers about fifty miles three hundred feet wide and seven to eight feet average depth is not so easily workable, as it would have to be conveyed by rail for shipment at Port Limon. There is at present no railway except a light line for the conveyance of fruit.

The owners are willing to treat either on the basis of a royalty of one dollar and twenty-five cents per ton or to sell the deposit outright.

A sample of the sand in its natural condition is herewith enclosed.

CONSULAR DISTRICT OF PHILADELPHIA (PENNSYLVANIA, OHIO, INDIANA
AND MICHIGAN).

(*Mr. Consul Powell.*)

1. Extensive deposits of iron ore exist in this Consular district, viz., Pennsylvania, Ohio, Indiana and Michigan.

2. Pennsylvania.—In a general way the iron ore deposits follow the line of the Allegheny Mountains, running from south-west to north-east, smaller deposits exist in a number of detached places throughout the State. In 1891 the only mine in Pennsylvania, which produced as much as 100,000 tons per annum, was the Cornwall mine, from which magnetic iron supplies were obtained. The State of Pennsylvania in 1890, made 48 per cent. of the pig-iron production in the United States, declined to 46.2 per cent. in 1900, and a further drop to 45.5 per cent. in 1902. These declines, however, were almost entirely confined to the eastern part of Pennsylvania, whilst in the western part there have been almost proportionately large advances, but lake ores were used entirely.

Many mines in Pennsylvania have been closed, either because of leanness, excessive phosphorus, or expensive exploitation, which prevents competition with cheaply-mined and transported ores of other sections of the United States, especially the ore from the lake districts. The distance of the Allegheny Mountain deposits in Pennsylvania from Philadelphia varies from 150 to 350 miles.

Ohio deposits are 450 to 600 miles from Philadelphia or Baltimore; Indiana is from 700 to 800 miles from Philadelphia or Baltimore; and Michigan from 800 to 1,000 miles from Philadelphia or Baltimore.

3. Transportation to the coast is principally by rail, but canal routes also exist. Cost of transportation by rail varies from \$1.00 to \$3.00 per ton, according to distance of mine from point of destination. Canal route prices would practically be about the same, as competition is keen. Freight rates vary so greatly, however, that it would be useless and misleading to quote them.

4. In accordance with the conditions of the labour market.

5. Official analyses of the ores from the various deposits, as well as average samples, can be obtained without difficulty from the State Assay Office.

6. The proprietors of the deposits have, where they are individuals, grown wealthy on their exploitations, or are corporations of large capitalization. The iron and steel trusts have a large influence.

7. The iron deposits of this Consular district have been extensively worked for the past 60 years, and constitute the principal source of the

United State's iron supply. The greater part of the production is consumed in the United States, and the amount produced is estimated as follows:—

Iron Ore mined and consumed in the United States.

(In tons of 2,240 lb.)

District.	1899.	1900.	1901.	1902.
Lake Superior, shipments to furnaces	18,251,804	19,095,393	20,589,237	27,571,121
Southern States, shipment to furnaces.	4,800,000	5,100,000	4,767,667	4,850,000
Other States, shipment to furnaces.	2,240,000	1,758,000	2,530,575	2,215,000
Total mined in United States	25,291,894	25,917,393	27,887,479	34,636,121
Add decrease in stocks at Lake Erie Docks.	—	—	45,207	—
Add importations	674,082	897,792	966,950	1,165,470
Total	25,965,886	25,815,185	28,899,436	35,801,591
Deduct increase in stocks at Lake Erie Docks.	750,000	690,000	—	1,214,591
Deduct exportation	40,665	51,460	64,703	88,445
Total consumption	25,175,221	26,073,725	28,834,733	34,499,555

For 1898 Lake Superior shipments to furnaces 14,024,673

For 1898 total mined 19,443,716

The following is a table of the output of iron ore by States in 1901:—

	Tons of 2,240 lbs.	Estimated value in dollars.
Minnesota	11,109,537	\$15,335,513
Michigan	9,654,067	21,735,592
Alabama	2,801,732	2,587,719
Pennsylvania	1,040,684	1,561,620
Virginia and W. Virginia	925,394	1,466,423
Tennessee	789,494	912,849
Wisconsin	738,868	1,564,173
New York	420,218	1,006,231
Colorado... ..	404,037	1,284,255
New Jersey	401,989	918,011
Montana and Nevada, New Mexico, Texas and Wyoming.	234,514	367,864
Georgia, and North and South Carolina ...	215,599	258,227
Kentucky and Iowa	46,499	48,938
Ohio	44,185	67,776
Connecticut and Massachusetts	25,214	73,487
Maryland	21,218	33,825
Missouri... ..	14,230	33,742
Total	28,887,479	\$40,256,243

From the above it will be observed that although Minnesota produces the largest amount of ore, that obtained from Michigan is by far the most valuable. It should be added that the greater portion of this ore is brought to Pennsylvania for treatment, in consequence of the large coal deposits, both anthracite and bituminous, in that State, it being advantageous to deal with the ore as near as possible to the coal mine, where the greatest number of blast furnaces are erected, thus, although Pennsylvania comes fourth on the list of ore-producing States, and Ohio the sixteenth in the same list, yet Pennsylvania stands first in the percentage of pig-iron output, with 45.5 per cent., and Ohio second with 20.4 per cent. of the total production of pig-iron in the United States.

8. There exists no obstacles in the way of successful, continuous mining in this district, and the present railway facilities have been very largely developed as a result of the iron business.

9. Considerable British capital is already invested in the iron ore mining industry in this Consular district.

DISTRICT OF PORTLAND (OREGON).

(*Mr. Consul Laidlaw.*)

This district comprises the States of Oregon, Washington and Idaho, and while iron ores are known to exist in all the States in considerable quantities, they have not generally been prospected to such an extent as to come under the category of ascertained supplies. No information is available from the State of Idaho, and Mr. Vice-Consul Pelly, of Seattle, has prepared a report on the ores of Washington, which is annexed.

1. Numerous deposits are reported to exist, those of Washington being detailed in Mr. Pelly's memorandum.

2. In Oregon, iron ores are to be found amongst the mountain ranges of the Western Counties of the State. There is a large deposit at Oswego, and another at Scappoose, Columbia County; also at Gold Hill, Jackson County. The distances of these from Portland, which is the only shipping port which can be used by ocean steamers, are respectively 7 miles, 20 miles and 313 miles.

3. The transport of ores from Oswego can be made by rail at a cost of 60 cents; and from Gold Hill at \$3.40 per ton of 2,000 lbs.

4. White labour is usually employed for mining, and varies from \$1.75 to \$2.00 per day. There is no data available as to cost of mining and loading. Mere mining at Oswego is said to have cost 75 c. per ton.

5. No official analyses are obtainable.

The Oswego ores were smelted for several years, and near the surface yielded as high as 55 per cent. metallic iron, but, as mining becomes deeper, the value of the ore became less, and latterly 30 to 32 per cent. was all obtained, with 18 per cent. silica, 6.10 per cent. alumina, and 35 per cent. phosphorus. Scappoose ores are reported low grade, and those from Gold Hill, which were practically tested years ago, assayed as follows:—

Ferric oxide	...	...	...	90.00	per cent.
Silica	...	...	...	5.00	"
Alumina	...	...	...	1.00	"
Sulphur	...	...	...	.05	"
Phosphorus	...	...	...	.04	"
Manganese	...	...	...	.02	"
Water, &c.	...	...	...	3.89	"
				<hr/> 100.00	"

and yielded 63 per cent. metallic iron. These ores are all hematites.

6. Proprietors of deposits would generally dispose of them on reasonable terms.

7. The Oswego deposit was first worked about 1867, when the ores used were bog ores; later a furnace was erected, the capacity being afterwards increased to 125 tons per day. Ores were smelted with charcoal, and the product consumed locally on the Pacific coast. The grade of the ore, after mining had been carried on for some years, became so low that work ceased in 1894. The product of pig-iron was as under for the last 5 years of operation:—

1889	...	...	...	...	...	10,000	tons.
1890	...	...	...	...	...	12,305	„
1891	...	...	...	...	...	10,000	„
1892	...	...	...	...	...	7,620	„
1893	...	...	...	...	...	4,739	„

A few trucks of Gold Hill ores were brought here from the deposit in 1882, but the freight rates were too heavy, and nothing has been done for years past.

8. The principal obstacles in the way of successful mining are low grade of ore, and, in most instances, the distance from tide-water.

9. The shipment of ores does not seem to be practicable. So far those found convenient to tide-water are too low grade, and in the absence of deposits of coking coal and the distance from which lime must be brought, are not even profitable to smelt. Other deposits of higher grade are too remote. There is a limestone deposit, also, near Gold Hill, and it is believed by the owners that the ores could be profitably smelted on the spot.

MEMORANDUM on the Iron Ore Deposits of the State of WASHINGTON.

(*Mr. Vice-Consul Pelly, of Seattle.*)

1 and 2. There are extensive deposits of bog iron, limonite, hematite and magnetite ores in the State of Washington, in the Western Counties of King, Pierce, Kitsap, Skagit, Whatcom and Jefferson; and in the Eastern Counties of Stevens and Kittitas.

The largest deposits are believed to be the beds of magnetite ore in King County, lying among the ridges of the Cascades Range, on the western slope, and in Kittitas County, on the eastern slope of the mountains near the Cle-Elum River.

Hematite and magnetite ores are found in extensive deposits near Hamilton, along the Skagit River and in Whatcom County, on the line of the Great Northern Railway, near Baring, Berlin and Money Creek. Bog ores are to be found underlying the flats on Puget Sound.

The nearest shipping ports are Seattle, Tacoma, Anacortes, Everett and New Whatcom, all of which are capable of admitting ocean steamers, and the distance from the deposits varies from 25 to 65 miles.

Distances from deposits in Stevens County are so great as to render them practically unavailable for shipment to tide-water at present.

3. The transport cost of ore from the Washington deposits to tide-water will range from \$1.80 (7s. 6d.) to \$2.50 (10s. 5d.) per ton, generally by railroad, except on the Skagit River, where it can be loaded on barges and towed to Anacortes, at the mouth of the river.

4. White labour is used, and the cost of mining and loading ranges from \$1.50 (6s. 3d.) to \$2.00 (8s. 4d.) per ton.

5. Official analyses are not obtainable.

King County ores assay, on an average, metallic iron 69.31; silica 2.46; phosphorus .034; sulphur .021. Kittitas ores assay from 50 to 63 per cent., and are variable, running in bands.

Whitcom County ores are high grade magnetic.

Hematite ores of Stevens County assay about 55 per cent.

Bog ores in Puget Sound basin have an excess of phosphorus, and yield about 42 per cent. metallic iron.

Ores generally are low in phosphorus and sulphur, and without titanium.

6. A large proportion of the ore bodies is controlled by the Seattle Iron and Steel Company, which has an authorized stock of \$6,000,000 with an authorized issue of \$2,000,000 6 per cent. bonds. It owns a furnace at Irondale, Jefferson County, with a capacity of 50 tons per day of charcoal iron, and is planning a large addition to its plant. Most of the ores used, however, are brought from Texada Island and Barclay Sound, British Columbia.

There are undoubtedly deposits which could be purchased on reasonable terms.

7. None of the ore bodies in the State have been practically worked, but most of those referred to have been prospected and more or less developed. Some quantity has been worked up in the Irondale furnace, but information is not attainable as to quantities.

8. Climatic and physical conditions are favourable for unencumbered mining all the year round.

9. Presuming that enquiries are made with the view of shipping the ores abroad in the condition in which they come from the mines, it is improbable, owing to the distance and consequently excessive freight, that this would be practicable. It should also be noted that there is a large consumption of iron and steel on this coast, and a ready sale for the products of any local furnaces. Coal and coke are abundant in the State, and convenient for shipment, and charcoal can be produced cheaply. Limestone can be delivered at \$1.00 per ton.

The estimated cost of making pig-iron on Puget Sound is as follows:—

With charcoal as fuel:—

1.6 ton of ore at \$3.00 per ton	...	...	\$4.80
140 bushels charcoal at 4½ cents	...	...	6.30
1/6 ton limestone at \$1.00	...	...	.17
Labour per ton	...	...	2.00
Repairs, supplies, &c.	...	...	.50
Total cost	...	...	<u>\$13.77</u>

With coke as fuel:—

1/6 ton ore at \$3.00 per ton	...	...	\$4.80
2,800 lbs. coke at \$3.75 per ton	...	...	5.25
.6 ton limestone at \$1.00	...	...	.60
Labour per ton	...	...	1.50
Incidentals	...	...	.50
Total cost	...	...	<u>\$12.65</u>

The presumption, therefore, is that all ores will be smelted on the spot.

STATES OF CALIFORNIA, NEVADA AND UTAH, and the TERRITORY OF ARIZONA.

(*Mr. Consul-General Bennett.*)

State of CALIFORNIA. Area, 156,203 square miles.

1. Yes.

2. Deposits have been found in Shasta, Plumas, Del Norte, Humboldt, Placer and Napa Counties to the north of the city of San Francisco, and in Fresno, San Bernardino and Madera Counties to the south. Shipments from the northern portion would be made either via Eureka or via San Francisco, and from the south from San Pedro, the port of Los Angeles.

3. A few rates only can be quoted. The following have been obtained from the Southern Pacific Railway for car load lots, minimum 15 tons, from named points in the counties to the nearest seaport.

Rates per Ton of 2,000 lbs. :—		\$	
From Delta, Shasta Co.	to San Francisco	... 3.90	per Ton.
„ Beckwith, Plumas Co.	„ „	... 6.55	„
„ Auburn, Placer Co.	„ „	... 2.60	„
„ Calistoga, Napa Co.	„ „	... 2.00	„
„ Fresno, Fresno Co.	„ „	... 3.80	„
„ Madera, Madera Co.	„ „	... 3.55	„
„ Raymond „	„ „	... 3.25	„
„ San Bernardino, San Bernardino Co.	„ Port Los Angeles	... 4.00	„

There is no rail connection for Del Norte County, but Crescent City is the principal seaport on the coast in that county. There is no rail connection for Humboldt County, but Eureka is the principal seaport in that county.

The rates might be materially reduced in many cases by the construction of light railways direct to a seaport, but at present the only means of transport is the existing railway system.

4. Labour is scarce in California and wages are high. White labour would cost about 10s. to 16s. a day; Chinese somewhat less. The deposits could be worked with steam shovels, and with lines laid from the nearest railway junction direct into the quarry, enabling ore to be loaded straight into trucks; the expense of quarrying is estimated at about 2s. a ton.

5. Only a few analyses of ore can be obtained, and are given below.

Del Norte County.—Magnetite occurs in the serpentine near Gasquet, associated with copper and iron sulphurets.

Hematite is found in the northern part of the county in such quantity and quality to make it valuable for smelting. No developments. The mountains east of Gasquet, French Hill, and the slopes of Hardscrabble Creek are covered with grains and lumps of brightly polished black hematite, which seems to have weathered out of the serpentine country rock.

Humboldt County.—Centerville. In the gray metamorphic sandstones on the beach, four miles south of Centerville, occur veins of hematite. One of them, exposed by the action of the surf, is eight feet thick. The ore is soft, of brown-red colour, and has a tendency to become scaly, like micaceous iron.

Preston Iron Mine. On James Creek, two miles north-east of Arcata. The quality of the ore seems fair—a soft red hematite—but whether it exists in sufficient quantities to make the deposit of commercial value has yet to be demonstrated.

Inyo County.—East slope of Argus Range. Iron appears in the form of bunches of varying size over an area several hundred feet in diameter.

Mountain Spring Cañon. On the south side of Mountain Spring Cañon, near its head, is a ledge of hematite iron running east and west. The float

is very abundant, but the croppings are mostly covered, so that the extent is not known. It is enclosed in granite.

Mount Gleason deposits. On the south slope of Mount Gleason, near the head of Little Tejunga Cañon, is the Padre claim. At the western base, half a mile from Ravenna Station, good magnetic iron ore is found. None of the deposits appear to be very extensive, but in each the ore is of good grade.

San Bernardino County.—West Lava Beds District. About 26 miles south-east of Daggett, in this district, are large deposits of hematite and magnetite of superior quality.

Shasta County.—Lost Confidence Company's mine. A body of hematite, covering about 40 acres, is situated near Slick Rock Creek, running parallel with the silver ore outcrop. It is very pure, and could be delivered on the cars at the bank of Sacramento River through an inclined tramway at a small expense.

Maxwell Mine. This is $1\frac{3}{4}$ miles east of the United States fishery, and comprises five claims. The ore body lies in limestone, and is extensive, containing largely magnetic iron.

Magnetic iron ore was found in Section 26, T. 34 N., R. 4 W., near junction of McCloud River with Pitt River. The deposits were quite extensive, but there has not been sufficient development to determine extent. The ore gives by analysis 69 per cent. of iron, 15 per cent. of silica, .018 per cent. of sulphur, and .025 per cent. of phosphorus. The iron deposits rest on limestone.

Sonoma County.—Fisk's Mill. Three miles inland, on the Lancaster ranch, a body of iron ore has been slightly exploited, which is a part of an ore body running west and south along the coast for miles.

Fort Ross. Six miles east of Fort Ross is a body of iron ore, mostly hematite, coursing north, of considerable extent.

Noble's. Five miles north of Noble's ranch, near the west fork of Gualala River, is a large body of hematite and silicate of iron.

Fresno County.—Deposits of hematite and magnetic iron ore, existing near the Minaret Mountains in the north-western portion of Fresno County. A Mr. Nelson, one of the interested parties, handed me (the State Mineralogist) several analyses of the ore, made by Mariner and Hoskins, of Chicago:—

	No. 1.	No. 2.	No. 3.	No. 4.
Iron	66.3	66.13	67.20	62.90
Silica	4.57	4.27	4.40	6.35
Phosphorus ... ..	.128	.454	.454	.748

The following is an analysis made of the same iron ore by Rattle and Nye, of Cleveland, for Mr. Nelson:—

Iron	66.20
Silica	4.20
Phosphorus ... ..	.249
Manganese ... ..	.37
Alumina ... ..	.54
Lime	2.04
Magnesia ... ..	.022
Sulphur ... ..	.039
Organic and volatile matter ... ..	.34
Titanic Acid	None.

6. There is hardly any doubt but that the deposits could be purchased if desired, as none of them are being worked.

7. No, practically none of them have been worked.

8. It is simply a question of "would it pay?" Water in many cases is scarce, limestone is rarely found in California, and coal is dear. Oil fuel for the generation of electricity is cheap and abundant, but a method of utilising it for quarrying purposes would be a novelty in California.

9. The whole of the pig iron and steel used in the Union Iron Works and other shipbuilding yards, as also in the various foundries, comes from either the Eastern States or the United Kingdom. No local ore is smelted. Local coal is of poor quality and unsuitable. So far it has not been found possible to use oil, the great difficulty being that the gas given off by the oil is absorbed by the ore, and the product is thereby altered.

The development of the smelting industry in the Western States is retarded by the low rates quoted in the east for delivery of structural iron, &c., in California. Steel rails can be placed here as low as \$22 a ton.

State of NEVADA. Area, 109,901 square miles.

The Governor of the State writes me, "I have the honour to state that we have no Mining Bureau, nor State Mineralogist, therefore are destitute of statistical information desired by you. We have many immense outcroppings of iron in this State, but I have no knowledge that any have been sufficiently developed to determine their value, or quality of product."

Territory of ARIZONA. Area, 113,738 square miles.

The Governor of Arizona writes as follows: "I have the honour to inform you that the mining of iron ore in this territory is not carried on. There is, however, known to be a large deposit of iron ore in the Plomosa range in Yuma County, not located, and never having been mined.

"The usual occurrence of iron ore in this territory is as a cap rock for other ores such as copper, gold and silver.

"The deposit of iron ore mentioned as in the Plomosa Range in Yuma County is near the Colorado River.

"The mining of iron ore in this territory could not be carried on successfully, and I am unable to give you the address of any person who could furnish you with more detailed information in regard to the one known deposit."

State of UTAH. Area, 82,096 square miles.

1. Yes.

2. In Iron County, at Iron Mountain, and Iron Springs district, twenty-two miles from Lund, on the Oregon Short Line Railroad.

3. See annexed report.

4. Labour conditions and price of loading in trucks about the same as for California.

5. Analyses of the Iron Mountain ore will be found in report annexed.

6. It is not believed that these mines are in the market. Still the owners would probably accept a liberal offer.
7. Yes. See report.
8. No; fuel is plentiful and so is limestone.
9. The accompanying valuable report has been drawn up for the Consul-General by Mr. A. C. Milner, of Salt Lake City, at the request of the Governor of Utah. It covers all the ground and affords a quantity of general and technical information which it is believed will be highly interesting.

General Remarks.

It is not believed locally that it would pay the British iron industry to purchase iron ore anywhere in this district for use in England. The freights, however, from San Francisco to Liverpool are so low, only 12s. 6d. a ton for wheat, and it has been as low as 10s. 6d., that it is possible that it might be a success. There is not much difference between the rates by steam vessel from Bilbao to Middlesborough, and the rate by sail from here to Liverpool. Iron ore is not a perishable cargo, and manganese ore has been shipped from San Francisco. Wheat cargoes from here must become rarer and rarer, and in a few years time no doubt will cease altogether, so that there appears little chance of freights rising. The two, wheat and ore, could be advantageously carried together.

Whether it would pay to start blast furnaces here in California is a question on which judgment must be reserved. There is a project on foot to start blast furnaces near Tacoma, where fuel and limestone are abundant.

Some time ago, however, the Steel Trust were approached by some western men with a project for blast furnaces at Seattle, where coal and other conditions are favourable. The Trust, who are always on the lookout for a good thing, sent out a couple of experts, who reported most unfavourably. In fact, they declared roundly that "there was nothing in it."

The Standard Oil Company have also spent an immense amount of money in trying to adapt oil to the generation of electricity with a view to smelting iron, but without success. It is said that they have dropped a million dollars over the experiments.

If the ore in the west is ever smelted on the spot, it will probably be by electricity, generated by water power from the Sierras.

REPORT on Iron Ore Deposits in Utah, by Mr. A. C. Milner, of Salt Lake City.

The iron properties in Iron County, South-Western Utah, are situated in Iron Mountain and Iron Springs districts, which are about 22 miles south-east of the Oregon Short Line Railroad.

The deposits cover an area 15 miles long by about three miles wide, the ore showing on the surface at three different points. The ore is principally a soft red and brown hematite, which can be handled easily by steam shovel, except where blowouts occur, which are hard and magnetic. Hundreds of acres will require only from one to three feet of stripping. Mr. R. B. Dear, of the firm of Winston Bros. and Dear, Duluth, estimated that ore can be stripped, mined and put on cars for 15 cents per short ton (2,000 lbs.).

There are apparently three separate veins, the largest being 800 feet between walls, second about 500 feet, and third 200 feet. The largest vein has been developed along the strike for about 15,000 feet, and the 500-foot vein for about 12,000 feet, and the 200-foot vein for about 5,000 feet.

The development work has been done principally by pits and shafts, there being about 1,500 of them. There are also numerous trenches and tunnels; the deepest shaft is 150 feet. About \$125,000 has been expended in this work. The ore occurs between lime and granite, foot-wall being granite and hanging wall lime.

Various iron experts who have made examination of these properties state that it is the largest surface of iron ore in the world. The tonnage in sight is so great that it is very difficult to state what it is, but the various experts have made estimates from 100,000,000 to 500,000,000 short tons. They also stated that the possibilities of the deposit were from 800,000,000 to 1,000,000,000 short tons. About 25 per cent. of this ore is Bessemer, balance being basic. By mixing the two ores, the percentage of Bessemer would be much increased.

The ore runs an average of about 60 per cent. metallic iron. The average in silica is about 7 per cent. The limestone adjacent to the iron has all proper fluxing qualifications necessary in furnace work.

The coal measures in Carbon County produce a coke which is equal to the Connelsville article, both as regards analysis and strength necessary to carry furnace burden; this coal is about 225 miles from the iron on the Rio Grande Western Railroad.

The iron fields are 273 miles from Salt Lake City and 445 miles by Clark Road Survey from San Pedro Harbour, which is the Pacific Coast terminus of the Clark Road.

This combination controls 124 claims or locations, 109 being patented and 15 unpatented. These claims cover about 2,800 acres, which take in about 85 per cent. of the iron in sight.

Experts figure that pig iron can be manufactured in Utah for \$6 per ton, and that steel rails can be made for \$13 per ton.

The Colorado Fuel and Iron Company, at Pueblo, Colorado, are the only pig iron and steel manufacturers west of the Mississippi River, and their cost per ton is high, as all their raw materials are hauled from considerable distances, Arizona, New Mexico, Wyoming, &c., to point of manufacture, which is 1,400 miles from the Pacific coast, and 900 miles further from the coast than Utah iron, and thus could not compete with an iron and steel plant in Utah for the Pacific coast and Oriental iron and steel business.

Pig iron sells at Salt Lake City at \$38 to \$42 per ton, San Francisco, \$34 to \$38; steel rails, Salt Lake, \$46, San Francisco, \$48 (not to-day). Annual consumption of steel rails on Pacific Coast is about 300,000 tons, pig iron, 480,000 tons. Consumption could be much increased if iron products could be obtained from Utah cheaper. This iron field developed will eventually control the Pacific Coast and Oriental iron and steel business, if properly manipulated. The Orient is the future great market for many of our manufactured commodities, among which iron and steel are the principals.

Any one visiting the iron mines must leave the Oregon Short Line at Lund, Iron County.

A much more elaborate description of the iron ore and its possibilities could be given. The within includes the principal facts.

Will state further that there are no other known iron deposits in the west that are of sufficient extent to be considered as the basis for developing an iron and steel enterprise.

The following is an extract from a report made by George E. Gunn, expert for the American Smelting and Refining Company:—

General Formation.—Granite, limestone, sandstone, and quartzite.

Formation of Veins or Ore Deposits.—In this respect, in describing one mine I might as well include the whole district.

A range of granite hills, having a north-east and south-east course, traverses the country for a distance of fifteen or twenty miles. The width of the granite varies, in places being several miles wide, while in other places it is contracted to much less than a mile across, this contraction probably being due to the sedimentary formations overlying the granite not being eroded away in the low places as much as where the hills are more precipitous and higher.

The iron deposits seem to follow on both sides of this granite, sometimes occurring on the contact between the lime and granite, again occurring in the limestone near the granite, while in other places they are located in the granite, and occasionally between the quartzite and lime, but in all cases, as far as present developments show, they have fairly perpendicular walls.

While all the iron ores carry some percentage of magnetic, yet in the limes and on the contacts the iron is largely hematite, while in the granite the iron is a magnetite.

The iron deposits do not hold uniform the whole length of these granite hills, in many places they being hundreds (perhaps over a thousand) of feet wide, while in other places they contract and the surface shows no iron.

Apparently these granite hills were made by either upheaval or contraction. In the disturbance, fissures were made in places in the granite, afterward filling with ore. At the same time, the ground along contact was disturbed and fissured. Water coursing along these contacts eroded the limestone, causing caves, which afterwards filled with ore. In one place, about the centre of the range, there is a break, causing a flat valley some four miles across, which is now covered with debris, and upon which no work has been done. Undoubtedly the iron bodies go across this valley, and under which there undoubtedly exist large bodies of ore.

Analysis of Milner Iron at Iron County, Utah.

Made by Lorch Bros., Analytical Chemists and Mining Engineers, of Hebing,
Minnesota.

				Feet.	Iron.	Phos.
Old Pinto Shaft sample	...	...	...	From 20-30	48.78	.047
				" 30-40	51.60	.050
				" 40-50	55.96	.144
				" 50-60	57.71	.139
Black Hawk Shaft sample	...	...	...	From 40-50	53.67	.110
				" 50-60	58.86	.128
				" 60-70	59.51	.245
				" 70-80	62.18	.126
				" 80-90	62.66	.288
				" 90-100	60.62	.213
				" 100-110	57.47	.120
				" 110-114	59.61	.063
Pinto Shaft sample	...	...	...	From 0-10	52.47	.082
				" 10-20	51.13	.056
				" 20-30	55.52	.009
				" 30-40	53.41	.026
				" 40-50	49.82	.121
				" 50-58	57.27	.590
Pinto Shaft, top of hill	...	...	...	From 60-65	56.09	.122
Mountain Lion Shaft	...	...	...	48 feet deep	58.20	.083
Mountain Lion Shaft sample	...	...	...	From 0-10	52.14	.190
				" 10-20	55.44	.110
				" 20-30	53.74	.282
				" 30-40	56.43	.297
Pinto No. 6 Shaft samples	...	...	...	" 10-20	58.73	.034
"	"	...	...	" 20-30	59.65	.043
"	"	from bottom 6 ft.	...	" 30-36	59.33	.068
Sample of outcrop around Mt. Lion	...			—	65.88	.258
Lump sample (Hard Ore)	...	...		—	66.69	.420
General sample of Blowout	...	...		—	64.04	.102
Chesapeak No. 1	...	...	...	—	66.02	.182

Analysis of Milner Iron—continued.

		Iron.	Phos.
Dear Claim	—	66·57	·287
Lerch Claim	—	65·26	·298
Black Hawk	—	62·56	·139
Chesapeak No. 2	—	68·56	·087
Milner Land S.W. of Chesapeak	—	69·50	·015
First Chance, West End	—	65·25	·062
Pot Metal	—	58·76	·098
Constalk Claim, owned by Page	—	60·27	·144
Black Magnetic	—	66·07	·094
Mountain Lion No. 1, Test Pit, N.W. Corner.	—	53·71	·169
Picked Sample from the Blowout	—	65·49	·040
First Chance Claim	—	68·03	·081
Milner Land, east of Burke No. 5	—	63·68	·349
Mountain Lion, No. 3	—	63·14	·239
" " " 3, Drift sample	Mang. 2·81	57·90	·336
" " " 1	—	64·27	·236
" " " 2	—	55·14	·119
Milner Land, west of Blowout	—	61·87	·137
Milner land between Duncan No. 1 and Burke No. 5.	—	61·87	·137
Constalk Claim	—	59·82	·030
Shining Light	—	65·17	·478
Burke No. 2... *	—	60·07	·298
" No. 3... ..	—	62·31	·196
" No. 5... ..	—	54·45	·073
Red Cloud	—	61·56	·209
Duncan No. 1.	—	61·99	·147
Mountain Lion Claim, No. 1	—	62·59	·226
" " " " 2	—	61·04	·207
" " " " 3	—	59·95	185

Copy of Analysis.

Careful Average Samples taken by John J. Jones, Iron Mountain, Michigan.

No. of Sample.	Silica.	Sulphur.	Phosphorous.	Manganese.	Metallic Iron.	Lime Cao.	Magnesia Mgo.	Copper.	
86	2.77	.080	.172	.07	67.90	.79	1.11	.005	Top of Taylor's Blow-out.
82	6.97	.077	.057	.02	60.25	1.50	1.95	.002	Milner property ; Pinto No. 6 Shaft 100 feet deep. Stock pilesample, Blue Memiatite.
81	14.27	.076	.036	.58	52.82	.91	1.61	.151	Burke No. 2 ; from drift 4 feet under limestone ; Outcrop 3 to 400 feet wide.
85-2	5.34	.067	.421	.02	61.20	2.30	1.53	.006	Pinto No. 2 Shaft 113 feet deep ; taken from Stock pile.
87	5.90	.062	.045	.11	59.26	4.59	1.95	.003	Mountain Lion Shaft ; from Stock pile.
88	7.16	.105	.245	.18	58.07	4.12	2.13	.003	Mountain Lion No. 3 ; from upper cut.
90	2.74	.055	.072	.06	66.89	.93	1.37	.002	Little Allic outcrop 200 X 200 feet.
91	11.57	.24	.257	.02	59.26	1.13	.47	.009	Armstrong outcrop alongside of Adunis outcrop ; 800 X 1,000 feet.
92	19.74	.048	.207	.02	46.78	2.71	3.06	.007	J. M. Wick ; crop cut 30 feet in ore.
83	6.54	.096	.731	.07	55.50	6.33	2.41	.010	Pinto Stock pile, sample from 112 feet shaft.
84	7.28	.127	.088	.15	55.89	6.14	1.33	.010	Pinto No. 3, trench 30 feet, shaft 75 to 80 feet deep ; Lirch property.
1	6.46	.098	.067	.02	61.64	.99	1.42	.136	"Denacan" sample, 10 feet across drift ; 3 trenches on Sich Hill ; had the appearance of Atterus ore.
93	6.72	.052	.093	.20	59.46	1.15	1.47	.012	Hematite ; Little Mormae, 8 feet in one place under lime.
94	8.73	.059	.225	.04	57.97	1.28	2.89	.010	Vermillion ; Hematite ore ; outcrop 20 feet wide.
95	6.86	.143	.029	.02	60.55	1.23	1.29	.061	McGary ; Eclipse ; Hematite ore.
96	6.29	.044	.086	.14	58.27	4.07	1.18	.006	McGary ; Twitchel.
97	8.14	.029	.534	.17	50.24	5.19	1.78	.005	McGary ; Pittsburg.
98	4.61	.094	.204	.11	60.74	4.85	3.76	.006	Smith outcrop.
99	14.79	.045	.122	.15	49.45	3.45	2.35	.008	Big Mogul ; McGary's group.
100	2.57	.040	.134	.19	67.98	.87	1.05	.005	Blair and Great Western Lorge outcrop 500 X 1,000 feet ; magnetic ore.
85-1	8.67	.117	.071	.04	59.30	2.40	1.13	.008	

PORTO RICO.

(Mr. Consul Churchward.)

Reports that iron measures are freely distributed over all the mountainous parts of the island, and that numerous concessions have been granted for the exploitation of the ore in all directions.

The more noticeable selections are considered valuable, and the deposits are estimated to be of extent and quality that should encourage serious enterprise.

Reports on these, in the form of answers to the questions supplied with the circular, are enclosed, from the Vice-Consular districts of Ponce, Arroyo, Arecibo and Humacao.

The other two divisions, San Juan and Mayaguez, have nothing to report as yet.

Ponce.

1. Yes. An important one.
2. On the banks of the river Portugues, about fourteen miles from the port of Ponce, open to ocean steamers of the largest tonnage.
3. There is a good road. Transport would be with ox-carts at the rate of about 12s. 6d. per ton.
4. There is no need of shaft or gallery. The cost of quarrying and loading into carts would be about 10d. per ton. Labour is abundant at 2s. 6d. per working day of eight hours.
5. There is no official analysis. Samples taken have been analysed in London and Halifax, N.S.

London Analysis :—

Iron	...	...	...	...	67.20	per cent.
Alumina	...	...	...	...	.25	"
Magnesia	...	...	...	...	.80	"
Silica	...	...	...	...	5.10	"
Phosphorus	...	...	...	...	.01	"
Sulphur	...	...	...	...	.02	"
Oxygen, traces of manganese, arsenic, &c.	...	...	...	...	26.62	"
					<u>100.00</u>	"

Iron equal to Sesquioxide 96 per cent.

No gold.

Fine silver. 7 dwts. 12 grains per ton of 20 cwts.

Halifax analysis :—

Iron	...	...	...	...	66.17	per cent.
Phosphorus	...	...	...	...	Nil.	
Sulphur	...	...	...	...	Trace.	
Silica	...	...	...	...	1.02	"
Loss on ignition	...	...	...	...	.45	"

Original analysis with Messrs. Fred. Barnes & Co., of 109, Fenchurch Street.

6. The deposits can be bought at a reasonable price. The owners are well off.
7. No.
8. None.
9. Technical information, details and prices are to be had from Senor Ramon Gandia Cordova, Civil Engineer, of 45, Fortaleza Street, San Juan, who represents the owners.

Arroyo.

1. There are large deposits of iron ore in the district.
2. They are to be found in the Barrio Laurel, four miles from the port of Arroyo, where ocean steamers can load.

3. It is impossible to state cost of transport as there are no roads to the mountains, only rough tracks.

4. It is impossible to state cost of labour for mining as no such work has ever been done here. Ordinary field labour is paid 50 cents., gold, per day, and is plentiful.

5. No official analysis has been made. A private one gives 67.50 per cent., but little faith can be put in this, as there is no assurance of the sample having been an impartial one.

6. They are well off, but would sell on reasonable terms.

7. No.

8. None that under present circumstances can be imagined.

Arecibo.

1. Yes.

2. In the neighbourhood of Vivi and Canovanillas, near Utuado, about twenty miles from the port of Arecibo, where ocean steamers can load.

3. Only by track. Approximate cost of putting ore from mine on ship \$6, gold, per ton.

4. Cost of labour cannot be estimated, but is plentiful.

5. Analyses have been made.

6. Mostly poor and willing to sell.

7. None.

8. None to be ascertained.

Humacao.

1. Yes.

2. In the neighbourhood of Juncos and Las Piedras. There are three ports, Humacao, Naguabo, and Ensenada Honda, where ocean steamers can load from lighters. Distance about twenty miles.

3. Impossible to estimate. No roads, only tracks.

4. Impossible to estimate. Field labour is plentiful at 50 cents, gold.

5. I can quote none.

6. The proprietors are well disposed to sell. They are in good circumstances.

7. None have been worked but for samples.

8. None.

9. It is understood that Senor Pedro Sansteban, of San Juan, is moving in the iron interest of this district.

VENEZUELA.

CIUDAD BOLIVAR.

(*Mr. Consul de Lemos.*)

1. Very extensive iron ore deposits are reported to exist in my consular district.

2. They are situated on the south side of the Orinoco River at Imataca, near the mouth of the river. There is no established shipping port, but there is a convenient shipping place with deep water where ocean steamers which can pass the Orinoco bar, 16 feet, can lay alongside. This shipping place is in close proximity of the ore deposits.

3. The cost of transport of the ore to the shipping place would therefore be small. It could be effected either by a tram line or by overhead wire rope.

4. The labour for mining, &c., would have to be imported, as none is available locally. For this purpose a supply can easily be obtained from the West Indian Islands. The wages would probably be about four shillings a day for miners and quarrymen and 25 per cent. less for common labourers.

5. No official analyses of the ore are obtainable here. Experts who have visited the mines have stated that the ore is of an exceptionally high quality, containing 70 per cent. of metallic iron, and that it is almost, if not quite, free of sulphur and phosphorus. One expert qualified it as "specular" iron ore, capable of being treated with a small quantity of fluxes.

6. Concessions on the iron ore deposit referred to have been granted to different parties, who have been negotiating for a long time to form companies. The concessionnaires are not rich, and likely to be sellers of deposits on reasonable terms. It is reported that a company has been lately formed by one of the concessionnaires, a Mr. George Turnbull, an American, but details are not known as yet.

7. Work on a small scale has been done on some of the deposits, and one or two sample cargoes were shipped a few years ago. No statistics are, however, available.

8. The only and serious obstacle in the way of successful and unencumbered mining is that these iron ore deposits are situated in a country where industries have to contend with many difficulties, owing to the existing fiscal laws,* and where revolutions are of frequent occurrence.

9. The iron ore deposits in the Imataca Range of mountains have not yet been properly explored, and it is believed that other deposits besides those already known could be discovered. So far, only outcrops in the immediate neighbourhood of the Orinoco River have received attention.

The titles and concessions already issued have given rise to several lawsuits and disputes, while difficulties have been placed in the way of vessels loading at Imataca. This has no doubt impeded the development of these mines, which certainly appear to be of great value and importance.

* *Note.*—In this connection reference may be made to the new Mining Law—see B. of T. Jr., pp. 222-3, Vol. XLVI.

ASIA.

ARABIA.

MUSCAT.

(Major Cox, Consul.)

1. Yes.
2. Fifteen miles away. Nearest port—Muscat.
3. By camel.
4. Difficult to estimate. Labour 6 annas per day per man.
5. No. Small sample sent.
6. Owner: Sultan of Muscat. Cannot be negotiated at present.
7. No.
8. Yes; tribal and political.

9. The Sultan of Muscat's territories have never been in any way exploited or geologically examined for metals and minerals. The existence of an old copper mine is known of in the interior, also of a silver mine; both have long since fallen into desuetude, and, so far as is known, would not repay resumption. Coal of good quality has been discovered in the vicinity of Soor, and a small tract of country examined for it by a geological expert of the Government of India and confidentially reported on.

The coal was found to be of excellent quality but apparently not in sufficient quantity, in the tract examined, to repay the inception of mining operations. More may exist, however, in other districts.

As regards iron, I may reiterate that the country has never been geologically examined for it, but I forward by the same mail a sample of what I believe to be iron ore obtained from a district about fifteen miles from Muscat, which is apparently ferriferous. I am endeavouring to obtain more.

Hitherto any systematic survey of Oman, either geological or trigonometrical, has been impracticable owing, primarily, to the turbulence and suspiciousness of the tribes of the interior.

CHINA.

AMOY, SOUTH CHINA.

(Mr. Consul Hausser.)

1. Deposits of iron ore are reported to exist in large quantities in several places within this Consular district, embracing the southern portion of the Fukien province.
2. There are known to be deposits:—
 - (a.) In the Leng Na Sub-Prefecture, at a distance of about 100 miles from the sea. Amoy is the nearest shipping port for ocean steamers.

- (b.) In the Chang Chiu Prefecture, in the Nan Ching and Ping Ho districts, from 60 to 100 miles distant from Amoy.
- (c.) In the Chin Chiu Prefecture, in the An Chi district, about 60 to 80 miles from Amoy.

Deposits of iron ore are also reported to exist in other districts.

3. It is impossible to give any accurate estimate of the cost of transport of ore, but it may be roughly calculated at not less than \$5 per ton. The roads are very poor, being narrow and in bad repair. There are no canals available, and river traffic is much impeded by shallows and rapids. To make any scheme of working iron mines pay, railroads would have to be built to the coast.

4. There is abundant native labour available, the average cost for ordinary labourers ranging from 30 to 50 cents per diem. The probable cost of loading would be between 20 and 40 cents per ton.

5. Official analyses show about 56 per cent. of metallic iron. Copies are not obtainable.

6. The proprietors of the deposits are generally poor, and would no doubt be sellers at reasonable rates to a company in which Chinese held shares, but they would hardly be likely to sell the mines outright to a foreign company.

7. The deposits have hitherto been worked only by the Chinese themselves, and by native primitive methods only. There is no export of ore, but certain manufactured articles are sent abroad; chiefly to Chinese in the Straits Settlements.

8. The Chinese Government is very slow to grant concessions to outside companies. Native superstitions, graves, individual ownership of land, mandarin rapacity, &c., &c., are some of the inevitable obstacles to be overcome before any mining company can be successfully floated in China, though these difficulties are greatly diminished when once the consent of the Government has been obtained.

9. Efforts have already been made by both British and Japanese syndicates to float companies for mining iron and coal in this district, but, judging by the time that has already elapsed, and money that has been spent, without any compensating return, it is obvious that there are many serious difficulties to be overcome before any practical beginning can be made.

Further professional surveys of this province would almost certainly result in the discovery of other deposits of iron and coal, hitherto unworked, or worked only very superficially.

CHINKIANG.

(*Mr. Consul Tratman.*)

1. No information is available as to deposits of iron ore within this Consular district. Natives state vaguely that "there are metals in the hills," but it does not appear that any proper survey has been made at any time, or that any "metals" have ever been taken out of the hills. Until an expert survey of the district has been made it is impossible to say whether deposits of iron ore exist or not.

2. Chinkiang is itself a shipping port capable of admitting ocean steamers.

3. The district is well served by water-ways, including the Grand Canal. There are at present no railroads.

4. Any quantity of coolie labour would be available at about seven pence a day for mining and about five pence for loading.

5. No.

6. If deposits of ore were found, the proprietors would be likely to be sellers on reasonable terms.

7. No.

8. The existing official mining regulations for the Empire are obstructive and unsatisfactory, but it is understood that the Chinese Government has promised to draw up fresh ones which shall be more in accordance with modern usage. Locally there would be no special obstacles to mining, though the officials would doubtless attempt their usual "squeezing" tactics.

FOOCHOW.

(*Mr. Consul Brady.*)

1. Iron ore is found in many districts of this province (Fuhkien), but the deposits are worked in a primitive manner and to no great extent. No foreign machinery is used and foreign methods are not followed.

2. The principal deposits in this neighbourhood are at:—

Kutien, Ku Cheng, distant from the port of Foochow	... ..	About 120 miles.
Ming Ching, east of Kutien, distant from the port of Foochow	... ..	„ 40 „
Lo Yuan, distant from the port of Foochow	... ..	„ 50 „
Chien Ning, distant from the port of Foochow	... ..	„ 160 „

and Fu Ning, a place in close proximity to the open port of Santuao.

The nearest open shipping port capable of admitting ocean steamers is Pagoda Anchorage about 9 miles distant by river from Foochow, of which it is the port.

3. It is difficult to arrive at an accurate estimate of the cost of transport of ore, but the following notes, which have been verified as far as circumstances admit, may be of some value. It should be noted, however, that there is no demand for ore amongst the Chinese, and, so far as I can ascertain, none ever leaves the mining districts, except in the form of pig iron, similar to the samples which accompany this report; were it required, the transport would be effected by coolies, who would carry it by basket loads from the inland districts where it is quarried, or rather dug from the hill sides, to the river where it could be shipped by junk to Foochow or Pagoda Anchorage. No canals, railways, or roads permitting of vehicular traffic exist in the province.

For ore, Sample II., collected in the Kutien district, the cost of conveyance overland in the manner described, to Sui Kow, which is the general place of shipment for all local produce, would come to about 80 Mexican dollar cents per picul of 100 catties = 133 lbs. avoirdupois; while the freight by junk thence to Foochow or Pagoda would amount to some 10 cents odd.

The transport of iron pigs, manufactured at Kutien, would be the same.

From Ming Ching the transport would be cheaper, while from Chien Ning it would be more, owing to the longer distance from Foochow.

4. The labour available for mining (or quarrying) and loading is coolie labour which is plentiful throughout the mining districts. Skilled labour, *i.e.*, miners capable of washing the clay containing the ore, and extracting the iron deposit, can be obtained at about 20 cents per day; unskilled hands can be had for about half that sum.

The cost of the ore at Kutien is about 15 cents per picul if taken in large quantities.

5. I enclose an analysis of a sample of Kutien pig iron kindly supplied to me by the Imperial Commissioner of the arsenal at Pagoda Anchorage, and also one of An Chi iron, a mine in the Amoy district, obtained from the late Mr. J. Farrow, whose efforts to secure a mining concession for coal and iron in that district have recently proved abortive. The latter shows 36 per cent. metallic iron.

Sample I.—A pig of iron procured from the Kutien mines. In this district, according to local custom, 85 catties are reckoned equivalent to one picul, the market price being \$2.80 on the spot, equal to about \$3.20 per 100 catties, or \$54 per ton. Purchased in Foochow the same article would cost about \$5 per 100 catties, say \$85 per ton. I learn that the Arsenal authorities are able to lay this iron down at Pagoda for \$3.10 per picul.

Sample II.—Is a specimen of Kutien iron ore (sha or dust), the only form in which it is worked apparently; it can be purchased on the spot for 15 cents per picul of 100 catties=\$2.55 per ton—practically the cost of collecting it. One hundred catties of this "sha" or ore when smelted down by native methods produces 20 odd catties of pig iron, which makes the prime cost of the latter equal to 60 odd cents per picul, or, say, about \$10 per ton. The expense of smelting, however, brings the price up to \$3.20 per picul as already stated.

Sample III.—Is a specimen of the Iron produced in the Ming Ching district, the market price for which (on the spot) is about \$3 per picul.

Sample IV.—A sample of the "sha" or dust from Ming Ching cost about 15 cents a picul.

6. The hills in which the ore is found belong either to village communities or private individuals, who would no doubt be glad to dispose of their property on reasonable terms if they were free agents; unfortunately the Chinese officials oppose all attempts of foreigners to engage in mining operations, and I see no immediate prospect of any change in this respect.

7. The iron deposits may be said to have been worked from time immemorial, but only in a primitive way and merely to meet local demands, which are extremely limited. It is not possible to give data as to the output, as no statistics exist; no ore leaves the port except perhaps coastwise by junk in small parcels.

8. The only obstacle to mining in the district is the opposition of the officials which seems to be insurmountable; the country people would gladly welcome the introduction of foreign machinery and the opening of mines, but in spite of the elaborate mining regulations that have been drawn up to this end, the authorities still withhold their permission.

9. Mining is not carried on in any systematic manner; the ore is found on the hill sides in considerable quantities, especially after the heavy summer rains, and is collected by the country people who convey it to the towns and dispose of it to the furnace owners at the equivalent of a day's wages. The fuel used for the purpose of smelting is said to be mainly charcoal, which explains in some measure the comparatively high price of the iron.

Analysis of Kutien Iron by a Manchester Expert.

I have investigated the two pieces of Chinese native iron submitted to me for analysis and have to report as follows:—

Analytical test of iron as received from Foochow:—

Iron	...	...	...	...	99.315 per cent.
Carbon	...	...	...	...	.300 "
Silicon	...	...	...	...	.140 "
Sulphur	...	...	...	...	.010 "
Phosphorus	...	...	...	...	.035 "
Manganese	...	...	...	...	.200 "

The iron was very rough and appeared to contain free silica as intermingled slag; this silica appears to have become liberated on melting as it does not appear in the finished steel.

The analysis shows the iron to be of a very good quality and to be suitable for melting by crucible process into steels for best purposes, such as turning tools for engineers' lathes, drills, planing and boring tools, punches, &c., &c.

One bar one inch square and about 28 inches long I cut in the centre and send the two halves herewith; one piece, as you will see, has been made into an engineer's turning tool, and the tool has been in daily use for four weeks in a 6-inch lathe in turning steel cranks, forgings, cast and wrought iron, besides being used for general work as is ordinarily required in an engineer's workshop. The tool has given perfect satisfaction and is fully equal to any Sheffield steel of the same character.

I have drilled the finished bar and submitted it to chemical test, the analysis coming out as under:—

Chemical Test.

Carbon	...	...	...	...	...	1.82
Silicon	...	...	...	...	...	.031
Sulphur	...	...	...	...	...	.06
Phosphorus	...	...	...	...	...	.02
Manganese	...	...	...	...	...	.20

I send herewith samples of the steel turnings cut off a steel crank by the tool made from this bar. The samples are good to have been cut in so very small a lathe. The tool worked with the greatest ease and smoothness. Carbon only has been added to the native iron. This steel could be improved by the addition of alloys, but it was considered that a better test of the quality of the iron would be arrived at by the addition of carbon alone.

1. With reference to the question of converting the iron into good tool steel, the iron is quite unsuitable for conversion in the cementing or converting furnaces as carried on in Sheffield with Swedish and other good irons.

2. As to the number of tons of charcoal required to heat one ton of steel:—

Crucible furnaces in Sheffield use selected coke for melting and about 3 tons, 6 cwts. are used for each ton of steel. Charcoal can, of course, be used instead of coke and the weight would be about 3 tons of charcoal for each ton of steel.

3. (Has reference to cost of installation of furnaces, &c.)

* * * * *

If more care were exercised in making the iron in the $\frac{1}{2}$ -inch bar in a purer state free from intermingled slag it would prove still better.

The result of an official analysis which had been made of a specimen of iron ore from the An Chi district showed that it contained 36 per cent. metallic iron; it was not considered a good sample. Report says the Kutien iron is very good.

HAINAN.

(Mr. Consul Werner.)

1. Yes; deposits are said to exist.
2. Chiefly in the central mountainous districts of Hainan. The only port at which ocean steamers call is Hoihow, the port of Kiungchow, the capital of the island; opened to foreign trade by treaty of 1858. The distance of Hoihow from the ore deposits would be from 60 to 100 miles, and would take from nine to twenty days, according to the state of the weather, &c.
3. The cost of transport of ore per ton would be a matter of bargaining with the local carriers. It would probably be about 60 cents a day per carrier, each carrier taking about 100 lbs.
The transport overland would be almost entirely by bridle-paths and across rivers. If political arrangements admitted, it would be cheaper to convey the ore to the coast and thence by sea to Hoihow.
4. The labour obtainable locally is entirely manual. The cost of a coolie for mining or loading per day would be probably not less than 50 cents, owing to their objection to engaging in mining work.
5. No analyses of ore have been made. It is said to be of poor quality.
6. The deposits are situated principally in the districts inhabited by the Loi Aborigines, who are half savage and very poor. They are said to be willing, in famine years, to grant permission to open mines, but as a rule their superstitions are an insuperable obstacle, since they maintain that the earth spirit would seek revenge for the removal of its riches.
7. No records exist of any attempt to mine iron.
8. The principal obstacles are the prejudices of the natives against opening the earth, the difficulties in the way of obtaining concessions, especially to foreigners, the unhealthiness of the central districts of the island, and the difficulties of transport. It is not improbable that the second of these may be partially removed by the regulations to be drawn up under Article IX. of the Commercial Treaty between Great Britain and China, of September 5th, 1902.
9. The interior of the island is still entirely unreclaimed, and the obstacles to be met with are those encountered in dealing with savage and superstitious people dwelling in unexplored and undeveloped districts. The deposits of copper, lead, tin, and gold are probably more extensive than those of iron.

HANKOW.

(Mr. Acting Consul-General Playfair.)

1. There are abundant iron ore deposits in the province of Hupei.
2. The mines, which are being worked, are situated at T'ieh Shan ("Iron Mountain"), in the district of Ta Yeh Hsien. The nearest shipping port is Huang Shih Kang, about ninety miles below Hankow. Large ocean steamers can reach this place from May to September, inclusive. During the winter months not more than ten feet of water is found on

certain shallows below this port, but Wuhu may be reached even in low water by ships drawing fifteen feet. The deposits are about twenty miles inland.

3. The ore is brought down to the river by rail.

4. Chinese labour is obtainable in abundance, and the cost is about two hundred cash (say sixpence) per man per day for either mining or loading work.

5. No analyses of the ore are obtainable.

6. The proprietors are the Hupei Provincial Board of Mines. They would not be likely to sell, as the mines are Government owned. There are, however, unworked deposits which might be purchasable.

7. The T'ieh Shan mines have been worked for over twelve years. The shipments go to the Hanyang Ironworks, and to Japan, Japanese steamers having a monopoly of the conveyance of the ore to that country. No statistics are obtainable.

8. The only real obstacles in the way of mining in China are the strong reluctance of the Chinese officials to grant mining privileges to foreigners, and the ignorant and superstitious prejudices of the native population against foreign enterprise.

KIANGSI.

(*Mr. Consul Clennell.*)

1. Yes.

2. I am inclined to believe that a competent geological survey would reveal the presence, in greater or less quantity, of iron ore in almost every district of the western half of Kiangsi, and in several localities in the eastern half.

It is worked in, at least, the following districts:—

Hsinfêng Hsien, in Kanchou Prefecture. These are reported to be extensive workings, supplying Kanchou city and prefecture.

Lungch'uan Hsien and Yunghsin Hsien in Chian Prefecture. The city of Nanch'ang, Capital of Kiangsi, is mainly supplied from Yunghsin district.

P'inghsiang Hsien in Yüanchou Prefecture. These deposits are very important, being in close proximity to coal and easily worked. The district is on the Hunan side of the watershed, but administratively in Kiangsi.

I think that some iron is also obtained from Wants'ai, Ich'un, and Fên-yi Hsiens, all in Yüanchou prefecture.

I have not heard of iron being worked on the other—eastern—side of the province, but coal occurs in Lop'ing Hsien, Yükan Hsien, Yiyang Hsien (very hard coal), and at a locality called Hufang, in Yüanshan Hsien.

In northern Kiangsi, there is, at least, one coal mine, near Juich'ang Hsien, about 25 miles from Kiukiang. Over the Hupei border, on the south side of the Yangtze, both coal and iron are plentiful, and extensively worked, the iron being chiefly found in the neighbourhood of Huangshih Kang, but this region pertains rather to the Hankow Consular district than to mine.

In the case of Hsinfêng and Lungch'uan, the nearest shipping ports are Canton or Swatow.

In the case of the other places named, the nearest shipping port is Kiukiang, but P'inghsiang is more easily accessible from Hankow.

In every case, distance is less important than facility of communication, and it is to be remembered that the Yangtze Ports, Hankow, and Kiukiang, though capable of admitting ocean steamers in summer, are only accessible to river steamers in winter, and that at all seasons river boats, involving transshipment at Shanghai, do the bulk of their carrying trade.

Hsinfêng.—180 miles to Canton as the crow flies, and probably 300 by road and river, but easy route.

190 miles to Swatow, as the crow flies, probably no direct route, or only a very long one, through difficult mountain country, inhabited by Hakkas, to the Kuangtung Han River, then downstream to port.

305 miles to Kiukiang, as the crow flies, and not very much more by road and water. There is, in most States of the Kan River, junk communication from Kiukiang to Kanchou, which is 30 miles direct, or 50 by road, from Hsinfêng.

Lungch'uan.—220 miles to Canton, 250 to Swatow, 260 to Kiukiang, as the crow flies. Practicable communication is with Kiukiang, by road and Kan River. With Canton more difficult, up stream to Kanchou, thence viâ Nanan and over Meiling Pass.

Yunghsin.—230 miles to Kiukiang, 250 to Canton, 290 to Swatow, as the crow flies, but much more, in each case by road and river. Direct road towards Canton would commence by crossing 80 miles of mountains covered by practically virgin forest. Easy route to Kiukiang viâ Chian. Another way viâ Yüanchou (Ichun on map).

P'inghsiang.—190 miles to Kiukiang, 205 to Hankow, as the crow flies. Practically very much further in each case, Hankow being the more accessible.

The opening of Ch'angsha, Capital of Hunan, as a Treaty Port, 75 miles as the crow flies, and perhaps 130 or so by road, rail, and river from P'inghsiang, will make Ch'angsha the port, certainly for P'inghsiang, possibly for other iron ore centres. But as Ch'angsha is not capable, at any season, of admitting ocean-going steamers, or even river-steamers of the draught and build used on the Lower Yangtze, there would always be transshipment at Hankow.

Wants'ai, 155, Ichun, 160, Fên-yi, 150 miles, respectively, from Kiukiang, as the crow flies. All are a good deal further by water, but routes are not difficult, unless from first-named, which is more usually reached over pass from Ichun.

Yükan, 85, Lop'ing, 95, Yiyang, 130, Yüanshan, 150 miles, respectively, from Kiukiang, as the crow flies. Actual routes are longer, especially in winter, when eastern basin of Poyang Lake is not navigable.

Juich'ang.—25 or 30 miles from Kiukiang, easy communication.

3. I do not know. It would differ in each case, and with the season, state of roads, water ways, &c., &c. Carriers would have to be hired for road transit, and junks for water transit. An average carrier takes a load, of 70 or 80 lbs., 20 to 25 miles a day, for about 200 to 250 cash—say 6d. to 7½d. a day. A good carrier takes up to 110 lbs., or even more, 25 to 28 miles a day, but expects 400 cash, say, 1s. a day, wages. In most localities, the supply of carriers is regulated by organised guilds or trades unions, or restricted to people of particular villages, who are extremely jealous to uphold their monopoly, and would resent introduction of other, especially of cheaper, labour.

I believe hire of junks would be cheap. Grain transport by junk from Chian to Nanch'ang costs about 110,000 cash, say, £13, for a junk of 1,200 to 1,300 piculs, carrying capacity. This would work out at about

3s. 2d. a ton. Transport from Kanchou to Kiukiang would be two or three times as much, plus charge for transshipment into a Poyang Lake junk at Nanch'ang. From this point, 115 miles to Kiukiang, towage by steam launch would become available during seasons of high water; and at most seasons from Wuchêng—50 miles to Kiukiang—with some saving of time, but additional cost. Supposing the same freights for ore as apply to grain, I think the junk hire would come to about 10s. a ton in the case of ore from Hsinfêng, the most distant of the producing centres, and proportionately less in the other cases, according to distance.

In every case Lekin barriers would have to be passed and their charges met. In this province these average 2 per cent on the value of the cargo taxed, but, as far as I know, there is no method of commuting the charges of several barriers, as there is in some provinces, so that the Lekin is cumulative. Thus, from Nanch'ang to Kiukiang, three barriers are passed, implying 6 per cent. tax on cargo conveyed, and there is another barrier on the Kan, about 20 miles above Nanch'ang. Lekin may be avoided in two ways. One, by obtaining an outward transit pass for which the Customs charge transit duty, and also require a deposit of three times the amount of export duty, this deposit being repaid on payment of export duty when the goods leave China. A bond also is required, with Consular fee of \$1.50 per pass. The other method is by employing a sort of semi-official Chinese commission agency, called Pao Shang Chü, which issues passes that are generally respected by the Lekin Administration, with which the Agency doubtless makes its own bargain. As the Lekin revenue of the province is partly hypothecated to the payment of foreign loans, this practice, though increasingly prevalent in the last two years, would appear to border upon defrauding the creditors of the Chinese Government. It has been the subject of at least one protest from the Kiukiang Customs, but, for the present appears to continue, and to be on the increase.

From P'inghsiang, there is a railway running over the Hunan border to Liling Hsien, and which is in course of being extended to the Siang River. Transport thence is by junk down the Siang and across T'ungting Lake to Yochou and the Yangtze. At high-water seasons, steamers would be met with at Changsha, and at all times at Yochou.

In all cases except P'inghsiang, transport would be for a greater or less distance by road, but principally by river.

There are no cart roads, but wheelbarrows are in fairly common use in most places. A very few rough buffalo carts are in use in flat regions for conveying reeds and agricultural produce, but the roads in general are unsuited for even the most primitive cartage by draught animals. Pack mules or asses may be found in a few places, but are not common. One camel visits Kiukiang for a few days, with a load, nearly every winter, but attracts attention as a curiosity. Practically speaking, transport is by burden carriers, and the roads, though varying greatly with the nature of the soil, and with the weather, are very rough. Where they are paved, the pavement is mostly out of repair. Where they are unpaved, they are liable to be deep in mud. Mountain crossings are by paved tracks, the stones forming rough flights of steps in steep places, and frequently carried away by torrents and landslips. Some bridges are good and well-kept, but the majority are roughly and slovenly constructed, and often destroyed by floods. Elsewhere, in the absence of stone bridges, bridges of planks and fir poles are found, mostly rotten and unsafe.

There are no canals, unless certain of the water-courses in the delta of the Kan and Fu Rivers, below Nanch'ang, and one immediately above that city, uniting these two rivers, being in part artificial, be so considered.

The river Kan is navigable by junks of small draught right up to Kanchou, and by boats, occasionally, to Nanan. Several other rivers are also in part, or at times, navigable. The tributary of the Kan which drains Yüanchou and taps Ichun and Fên-yi districts, entering the Kan at Changshu, is obstructed by rocks, but is extensively navigated by junks at seasons of high water.

4. I do not know. Mine labourers command rather higher wages than carriers, but in this case it would be usual to give the wages partly in rice or other food stuff. I think that 200 cash (say, 6d.) with rice to about the same value would be an average man's wage per day. Price of rice varies very much, from about 25 cash a quart, now, to 60 cash or so, for very poor rice, during winter of 1901-1902.

In my experience a Chinese labourer does, for one-third of the wages, one-fifth of the work that an English labourer would do. This applies to building, road making, and other out-door work, and I expect much the same rule would apply to mining. Expense of superintendence would be considerable. The rule does not apply to carrying loads, where the Chinese labourer has, by long habitude and early training, acquired a special facility. If he cannot carry as heavy a burden as an English porter, he can carry further, and handles his load with greater care and skill. As in the case of carriers, native organisations, of the nature of trades unions, guilds, or village communities with their elders and the local "gentry," would expect to be consulted in all arrangements for the supply of mine labour. To attempt, at any rate in the first instance, to use any but local men, would result in disputes, friction, and, perhaps, bloodshed. Thus, it proved wholly impossible to repair a road south of the Yangtze with refugees from the north bank of the river, owing to jealousy of farmers and gentry of villages along the road. Had the scheme been persisted in, the expense of soldiers and police needed to protect the work and men would have nearly equalled the cost in wages. Huts would have had to be erected for all the men, as none of the villagers would lodge them. Again, a plan for repairing a dyke, which crossed the border of the province, miscarried through gentry on each side insisting that they could not permit the dyke to be made in the place which those on the other side wished.

5. There are no official analyses to my knowledge.

6. I believe the P'inghsiang deposits are, to a great extent, the property of His Excellency Shêng Hsüan-huai, who, as General Administrator of Chinese Railways, and holder of many other offices, is, doubtless, a very wealthy man. But if it be true, as reported, that the Viceroy of the Hukuang Provinces intends to establish an arsenal at P'inghsiang, larger than the present Kiangnan Arsenal, it would seem possible that local iron ore deposits will be monopolised for Chinese Government purposes.

Other properties are controlled by the Kiangsi Department of Mines, K'uang Wu Chü, in Nanch'ang, but the majority are private Chinese undertakings, of whose proprietors I know nothing.

No mineral rights in China are easily acquired by foreigners. The right of mining is regulated by the Board in Peking. Local land-owners would often be willing to lease to foreigners, but I should anticipate that in every case the wealth or poverty of the owner would prove a far less important factor in determining the terms of transfer of any deposit to foreigners, than would the conditions demanded by the Chinese local or central Administration. Two foreign companies have, or lately had, coal mining interests in Kiangsi, but I have not heard of either being able to undertake successful work.

7. Unless at P'inghsiang, the deposits are only worked by native methods and for native and local purposes. As already said, Hsinfêng supplies Kanchou and district, and Yunghsin appears to be the chief source of supply for Nanch'ang. None, as far as Customs returns show, is exported abroad. Any export of iron ore, from this part of China, would be from mines near Huangshih Kang on the Yangtze, in Hupei Province, and be exported from Hankow. Total export from Hankow of iron ore in 1902 was 965,381 cwt., but I have no information where this

was mined or whither it was shipped, except that a considerable quantity went to Japan. Unmanufactured and pig iron from Hanyang also figure in the Hankow Customs returns.

8. Not more than elsewhere in China. Several foreigners have tried at various times to acquire mines or mining rights, but I know of none who have persevered to success.

9. A map of part of China is enclosed, to illustrate this report.

KUANGSI.

(*Mr. Acting Consul Fox.*)

1. Deposits of iron ore are reported at various places in this province.

2. At Chin Hsing Wei and Tung An, in the Tsang Wu district of the Wuchow prefecture; in the Ch'en Chi and Yung districts of the same prefecture; in the Pai Liu district of the Yu Lin department; in the Wu Yuan district of the Ssu-En prefecture.

The treaty port of Wuchow is the head of navigation for ocean-going steamers on the West River. It has direct and regular communication with Hong Kong (distant 220 miles), by small steamers owned, for the most part, by British companies. The ore deposits are scattered in various parts of the province. The prefectures named above will be found in the "Times Atlas." The most easily accessible, Chin Hsing Wei, is distant from Wuchow 5 miles by river, then 10 miles over land.

3. It is impossible to estimate the cost of transport of ore to the port; this would depend on the location of the mine, the supply of labour, the goodwill of the local gentry, &c., &c.; most of the deposits are situated at least 10 miles from the nearest river; transport would be by coolie back and native boat. A coolie in the Wuchow prefecture will carry a pack of 60 catties (80 lbs.) about 20 miles per diem, at the rate of \$1 per diem. Boat hire varies according to distance and value of goods to be carried; the freight on rice from Wuchow to Kueih sien (150 miles) was, this summer, \$13 per picul (133½ lbs.). There are no railways in the province and few good roads; there is, however, an excellent navigable river system.

4. The province is thinly populated and the people are very poor. Labour of the kind required would probably be cheap but scarce. The usual wage of a farm labourer is 20 cents a day, rice not included: this would average 5s. a month per man.

The Kuangsi peasant is, generally speaking, of poor physique, and has a reputation for indolence. He is frugal, not addicted to opium smoking, and, unless pressed by hunger, law abiding.

5. No; an agent of Messrs. Jardine, Matheson & Co., of Hong Kong and London, visited the Chin Hsing Wei mine about four years ago and brought away specimens of the ore, which are doubtless still in the firm's possession.

6. The deposits being for the most part in the hill sides, would probably belong to no particular owners, but grave sites would have to be bought up and the local gentry would have to be "squared." See reply to No. 8.

7. As far as can be ascertained, the only deposits that have been touched are those at Chin Hsing Wei. A Chinese syndicate was formed five years ago to mine gold there, but after importing some \$20,000 worth of machinery, the promoters discovered the ore to be iron pyrites; the machinery was subsequently sold and the mine abandoned.

There is at present no export of iron ore from this province.

8. Although the Chinese Government has, in principle, decided to encourage the exploitation of the mineral wealth of the country, with the assistance of foreign capital and science, and has actually granted concessions to foreign syndicates in various parts of the Empire, the mining regulations of this province, issued two years ago by the provincial Government, are framed in such a manner as to make profitable mining almost impossible.

By the new Commercial Treaty the Chinese Government has pledged itself to at once set about the revision of existing regulations.

Much depends on the Governor of the province; if he can be made to understand that the opening of mines will be of real benefit to this poverty-stricken province and its depleted provincial exchequer, he has it in his power to facilitate in many ways the initiation of mining enterprise. The common people are, for superstitious reasons, suspicious of any attempt to touch the mineral deposits in their hills; the local gentry are by profession strongly opposed to foreign innovations of any kind.

The merchant class, however, whose influence is steadily increasing, fully realise the importance of the Kuangsi mineral deposits, and are ready to co-operate in any respectable mining undertaking.

MANCHURIA (NEWCHWANG).

(*Mr. Consul Fulford.*)

1. Yes.
2. The principal one is at Tieh Ling. Newchwang. 200 miles.
3. About £1 10s. 0d. per ton. By cart and river, or by cart and rail.
4. Chinese coolie labour at about 6d. per day per man.
5. No official analysis of ore has been made.
6. Rich. (*See also* below, in the answer to Question 9.)
7. Yes. No shipments made, all used locally.
8. No, but old iron imported competes successfully with the native iron and limits its production.
9. Other workings are at Pên Hsi Hu, which is about 120 miles from Newchwang. Of this distance 40 miles would be over a hilly road to Liao Yang, which is 80 miles from here by railway. The cost of transport by cart in Manchuria on good roads is about 3d. per ton per mile, over mountain roads it would be more. The railway transport costs about 1½d. per ton per mile.

There are workings also at Sai Ma Chi, about 100 miles east of Liao Yang by a difficult mountain road. The cost of transport in this case would also be prohibitive.

The mines at Tieh Ling are, therefore, the most accessible by means of the Russian railway or the Liao River, both of which are within easy distance of the deposits.

It is evident from the above details that the working of iron deposits in Manchuria has been hitherto of an extremely limited and local character. The difficulties of transport alone are quite sufficient to account for this.

With regard to question 6, it may be mentioned that foreigners have no treaty right to own land or work mines in the interior of China, and that the co-operation of foreign capital in developing the mineral resources of the country is only permitted by the Chinese Government under very onerous conditions.



CHEKIANG (NINGPO).

(Mr. Consul Mortimore.)

1. Yes.

2. Iron ore is obtained from Nan Chi and Hsi Chi, in the Yung Chia district, distant from Wenchow 35 miles; from the district of T'ai Shun, distant from Wenchow 100 miles; from the districts of Yün Ho Hsien and Sung Yang Hsien, distant from Wenchow 175 miles. Also in the Jui An district. By far the largest quantity of ore comes from the Yun Ho district.

Vessels drawing 16 feet can come up to Wenchow.

3 to 8. No information is obtainable on these points.

9. The province of Chekiang is not rich in minerals, but there are no doubt other districts, besides those mentioned above, in which iron ore exists to some extent. The Chinese do not mine the iron ore, but wash out the fine grains of hæmatite from the sands of the rivers. This mineral occurs in small crevices of porphyric tufas, and it is by their decomposition that it is carried into the rivers.

PAKHOI, SOUTH CHINA.

(Mr. Consul Little.)

1. Yes.

2. At or near Shih Tou Pu. Pakhoi, distant 30 to 40 miles, is the nearest port capable of admitting ocean steamers. Chinese gunboats of several hundred tons occasionally call at Shih Tou Pu, but it is not known whether the harbour is large enough to receive ocean steamers, which, moreover, are not allowed to call there under existing regulations.

3. Transport by sea would no doubt be cheapest, but I am not able to give an estimate of the cost.

4. An abundant supply of ordinary Chinese coolies could probably be obtained at, to begin with, about \$5 to \$7 (silver) a month. I am unable to estimate the cost of mining and loading per ton.

5. No. I am informed samples were shown to a French engineer, who pronounced the ore to be of rather poor quality.

6. The proprietors of the supposed deposits are mostly poor and would no doubt sell on reasonable terms if skilfully handled.

7. No.

8. France claims preferential mining rights in this province and in Kuangsi under certain conventions concluded with China.

9. In the neighbouring country of Tonkin an iron mine is being worked in the province of Thai-nguyen,* one of iron and manganese in Phulien,† and iron is believed to have been found in Quangyen.† No detailed information concerning these mines is at present procurable, but it may be said that the general conditions for working them are probably favourable except as regards labour, which would probably have to be procured from China.

* Near Hanoi.

† In the Delta.

TIENTSIN, INCLUDING THE PROVINCES OF CHIH LI AND SHANSI.

(Mr. Consul-General Hopkins.)

1. Yes, both in Chihli and Shansi.

2. *Province of Chihli.*—There are believed to be deposits in the hills of the north-eastern part of the province, but none are worked. There is a very large deposit at Kuyeh, on the railway between Tientsin and Shanhai-kuan, but it has not been worked because of the excess of silica in the ore. The nearest port to any of these deposits would be Chinwangtao, about 70 miles by rail from the above-named deposit near Kuyeh.

Province of Shansi.—There are immense deposits of both iron ore and coal throughout this province. Shanghai is the nearest shipping port, over 600 miles distant.

3. *Province of Chihli.*—From Kuyeh, by rail, at a charge of $1\frac{3}{4}$ cents per ton per mile.

Province of Shansi.—By rail and canal, at an estimated charge of from 10 shillings to 20 shillings per ton.

4. *Province of Chihli.*—Labour is fairly abundant. The average rate of pay for coolies is 25 cents per day, for miners 30 to 35 cents per day. The rates are upwards.

Province of Shansi.—Information under this head is not available.

5. Neither analysis nor samples are procurable.

6. The Chinese Government claims the proprietorship of all minerals, and "foreign" individuals or companies cannot acquire the deposits merely from the surface owner.

7. In Chihli, they are not known to have been worked. In Shansi, the deposits have been worked by the local Chinese for probably over a thousand years, but not exported oversea.

8. The difficulties would probably be found to be of a political or quasi-political nature.

9. The following extract is from Baron von Richthoven's great work "China," and refers to the coal and iron deposits of Shansi:—

"Reviewing the main features of the geology of Southern Shansi, we have then, (1st) a rugged eastern barrier made up of ancient formations; (2nd) a general substructure of limestone in regular and little disturbed stratification; if all the superincumbent strata were removed, it would present the appearance of a nearly level plateau with more or less steep descents, varying in altitude from 2,000 to 3,000 feet, and interrupted only by (3rd) the granitic and metamorphic Hoshan Range; (4th) a system of coal-bearing strata, about 500 feet in thickness, covering the plateau of limestone, carrying bituminous coal west of the Hoshan, anthracite east of it, and everywhere a large quantity of iron ore; (5th) the post-carboniferous strata, about 3,000 feet thick, and not containing any useful minerals. If no erosion had taken place, its surface would be a nearly level plateau of about 6,000 feet altitude. But we have (6th) the marks of a considerable eroding and denuding action which has carried away the post-carboniferous from large areas, but has left it in its original position in others of still greater extent. Where it exists it forms undulating highlands, intersected by deeply cut watercourses, and where it is removed the coal formation is laid bare, and in places even this has been washed off and the limestone floor exposed; (7th) a general cover of loess spread over hills and valleys, and covering the highest plateaux as well, and borders the great plain. It is intersected by labyrinthic watercourses, most of which are cut through loess into the underlying formation. From the description of these simple features it will be seen that Shansi is one of the most remarkable coal and iron regions in the world, and some of the details which I give will make it patent that the world at the present rate of consumption of coal could be supplied for thousands of years from Shansi alone.

"Professor Dana, in comparing the proportions in which in different countries the area of the coal land is to the total area, says that the State of Pennsylvania leads the world, its area of 43,960 square miles embracing 20,000 of coal land. It is very probable that, on a closer examination, the Province of Shansi in China, with an area of about 55,000 square miles, will take the palm from Pennsylvania by a considerably more favourable proportion.

"But this is not yet all the advantage on the side of the Chinese coal fields. Another is afforded in the ease and cheapness with which coal can be extracted on a large scale.

"On the other hand, the whole of this great coal and iron region labours under two great disadvantages.

"Firstly, it is situated a distance away from the coast, and from rivers that are unfit for other navigation than by small Chinese boats; and, secondly, the whole of this coal formation rests, as it were, on a platform raised a few thousand feet above the adjoining plain. The steep ascent by the latter will not form an obstacle, but at least offers great difficulties to the construction of a railway, which will be the only means of ever bringing to account the mineral wealth of Shansi."

WUHU.

(*Mr. Consul Goffe.*)

1. Deposits of iron ore are reported to exist throughout the whole province of Anhui.

2. I am unable to indicate the position of these deposits, as the province has, so far, been very imperfectly prospected; but several districts bordering on the banks of the Yangtze River are reported to be rich in mineral wealth. The only port in the province available for steamers as yet is Wuhu, but An Ch'ing, the capital of the province, is to be opened as a treaty port as soon as Article VIII. of the recent Commercial Treaty comes into force.

3. Under present conditions the ore could only be transported to the port by road and by boat. The cost of the former method of transport would probably be prohibitive, and the latter would only be available in the summer, when the water in the river is sufficiently high to fill the creeks. Mining on any considerable scale would necessitate the construction of light railways, of which there are none at present.

4. Chinese are practically unacquainted with western methods of mining, and skilled labour for this purpose may be said to be non-existent. Unskilled labour is, however, procurable to almost any extent, the ordinary rate of wages of a Chinese coolie being about sixpence per day.

5. No official analyses of the ore are obtainable. Mr. Hespeler, of the London and China Syndicate, has very kindly furnished me with a sample of ore, extracted from deposits on their concession near Ta T'ung, some sixty miles from Wuhu, which I am forwarding to Your Lordship under separate cover.

6. To work any mines in China negotiations have to be entered into with the high provincial authorities for the grant of mining rights over stated areas. These concessions are not obtained without difficulty, and are subject to certain conditions and royalties. The land required for sinking shafts and other mining purposes can generally be purchased at a reasonable price.

7. The Chinese have worked some of these deposits according to their primitive methods, but they have only extracted such ore as came readily to hand, and that only in quantities sufficient for local requirements. No mention is made in the Foreign Customs Returns of the export of iron ore from this province.

8. After the concession has been obtained and the permit to commence operations issued, there are no serious obstacles in the way of mining, except such as arise from the lack of transport facilities.

9. The London and China Syndicate and Mr. Ede, a British merchant in Shanghai, have recently obtained mining concessions in this province, on which prospecting is now being carried out.

FRANCE (POSSESSIONS OF).

PONDICHERRY.

(*Lieutenant-Colonel A. de C. Rennick, Consul.*)

The area of the two French Colonies of Pondicherry and Karikal comprised in the consular district is about 60,000 acres, and consists principally of calcareous sandstone of a soft nature.

Numerous artesian wells have been sunk to considerable depths in both of the towns and in the neighbouring country within the last forty years. There exist also a number of quarries from which limestone has been extracted at different times, but in no instance has iron ore been met with.

The sand of the sea shore between Porto Novo and Cuddalore, some ten miles south of Pondicherry, is full of magnetic iron, judging from the smelting furnaces and large blocks of iron still extant, but that of Pondicherry is entirely devoid of it; from these facts it must be concluded that there is no iron ore to be found in this consular district.

HOLLAND (POSSESSIONS OF).

BATAVIA.

(*Mr. Consul Fraser.*)

Mr. Fraser forwards the following information kindly supplied by the Chief Engineer (Mr. W. Godefroy), head of the Mining Department in Netherlands India.

I have the honour to inform you that at no place in Netherlands India is iron ore worked. Here and there natives make iron from the ore, chiefly for the manufacture of weapons, but this so far takes place very seldom.

From the jottings to be found in our literature as to the places where iron ore has been discovered, I beg to reply so far as possible to the questions set down in the Memorandum you have handed me.

1. Iron ore deposits are found in Netherlands India, but from a technical point of view have so far proved to be of no importance.

2. In Java is found:—

(a) Morass or bog iron ore (1), in the Residencies Krawang, Batavia Bantam, in the Quaternary deposits along the north coast. In some places this ore is employed as hardening material for the roads.

(b) Magnetic iron ore (2), generally on the south coast of Java as a beach formation, *e.g.*, at Palaboean Ratoe (Wynkoops Bay), the island of Noesa Kembangan, near Tjilatjap in the Residency Banjoemas, &c.

In Sumatra is found:—

(c) Magnetic iron ore, near Paningahan, XX. Kotta's (Government of Sumatra's west coast).

(d) Iron glance or peroxide of iron (3), on the Goenoeng Bessi (Iron Hill), in the district of Tanah Datar (Government of Sumatra's west coast).

Civil Engineer Verbeek estimated the quantity of ore at this place at only 10,000 tons. (*Vide Mining Year Book. 1877, I. 39.*)

In Borneo, Residency South and East Division of Borneo:—

- (e) Chromic iron ore (4), on the south and east coast of Borneo and Poeloe Laut. The ore is found in certain localities, in great quantities, *e.g.*, near Pagattan. It is found in some places piled up in deposits a few metres broad, and half a metre or more in thickness. (*Vide* Mining Year Book, 1872, II. 201; 1874, II. 60.)
- (f) Red iron ore (5), (hematite) in different places in the district Martapoera. This is very pure ore. It is found in loose blocks of 200 cubic metres, and thus, in the opinion of the Mining Engineer Hooze, not in workable quantities. (*Vide* Mining Year Book, 1892, 410.)

Residency Western Division of Borneo:—

- (g) Iron glance or peroxide of iron is found near Pagiloe, in pieces weighing 200 to 300 kilogrammes, originating from veins. Not of importance for extraction, as the quantity is too small.

5. From a chemical investigation it appears that:—

- (1) A sample originating from the district of Meester Cornelis contains 39.23 per cent. Fe; 3.84 per cent. Mn. (*Vide* report of the Mining Department, 2nd Quart. 1901.)
- (2) A sample originating from a deposit near Tjilatjap contains 75.15 per cent. magnetic iron, 16 per cent. carbonate of lime, 2.68 per cent. oxide of iron, rock alum, and silicic acid soluble in muriatic acid, 1.03 per cent. silicic acid insoluble in muriatic acid. (*Vide* Mining Year Book, 1886, W. 177.)
- (3) Iron glance or peroxide of iron from the Goenoeng Bessi contains 90 per cent. Fe O, 6 per cent. FeO. Specific gravity, 4.7. (*Vide* Mining Year Book, 1872, I. 275.)
- (4) Chromic iron ore contains 30.434 per cent. Ca O, 63.550 per cent. Fe O, FeO, 2.287 per cent. rock alum, 9.771 per cent. sand. Specific gravity, 4.561. (*Vide* Mining Year Book, 1872, II. 201; 1874, II. 60.)
- (5) Red iron ore from Goenoeng Tambaga (Martapoera), very pure ore contains 99.69 and 98 per cent. Fe O. (*Vide* Mining Year Book, 1873.)

6. The disposal of the mineral riches of Netherlands India belongs entirely to the Netherlands Indian Government. No concessions for the working of iron ore have yet been granted.

7. No; with the exception of the exploitation on a small scale by Chinese and natives.

8. Yes; especially for iron ores, as they represent an insignificant value, and because Java is handicapped by such factors as high salaries for European staff, inexperience of workmen, who are often difficult to obtain, dear transport, and unhealthy climate, which is not suitable for hard work.

JAPAN.

KOBE.

(*Mr. Vice-Consul Griffiths.*)

Mr. Griffiths reports that, while deposits of iron ore exist in this district, they are of but small extent, and of little importance or value.

He encloses a tabulated statement of the information which has been furnished by the Chief of the Mining Inspection Bureau at Osaka.

He has not been able to obtain any official analysis or specimens of the ores, but is informed that they are of poor or moderate quality.

No iron ore is exported from this district, and the total output of the mines is of small amount. The chief obstacle to mining would appear to be the scarcity of deposits of iron ore of good workable quality.

List of Iron Ore deposits within

Name of Mine.	Situation.			Name of Proprietor.
	Prefecture.	District.	Village.	
Maketani	Fukui ...	Echizen ...	Kitusoma- yama.	Onishi Nishizalmon ...
Futatsuya	" ...	" ...	Kahira ...	Segawa Yonekichi ...
Nakazae	Nara ...	Yamato ...	Tennokawa..	Arai Fukusaburo ...
Kawaharada	Hiogo ..	Harima ...	Miketa ...	Harima Iron Mine Co....
Imori	Wakayama	Kü ...	Ōzu	Nakae Tanego
Suhara	"	" ...	Tasugawa ...	Dembo Kunikasu ...
Nagaoe	"	" ...	Miokawa ...	Nakashima Gannosuke..
Chiohozan	"	" ...	Higashitonda	Kamotani Esuke ...
Kamihageyama	Tottori ...	Hōki ...	Tari... ..	Takeuchi Tsurayoshi ...
Yao	Okayama...	Bitchiu ...	Hayashima...	Sakamoto Kinza ...
Kami Kojiro	" ...	" ...	Yakami ...	Katayama Asajiro ...
Yamakami	" ...	" ...	Iwata ...	Kusakabe Torakichi ...
Yukiya	" ...	" ...	Yukiya ...	Mitsubishi Mining Co...
"	" ...	" ...	" ...	Nagasawa Youejiro ...
Motoyama	" ...	" ...	Sakamoto ...	Nishi Genishi
Sakamoto	" ...	" ...	" ...	Ohashi Riohi
Nagao	" ...	" ...	Kami-uke ...	Nagao Tasuke
"	" ...	" ...	" ...	Tamura Kuniye
Egomi	" ...	Bizen ...	Egomi ...	Fukuda Shikazo
Yasumi-ishi	" ...	Mimasaka .	Minamiwake	Yabuki Shise
Kanahori	" ...	"	"	Fukuda Yasutaro ...
Kuki	" ...	"	Yoshioka ...	Kusakabe Torakichi ...
Yasumi-ishi	" ...	"	" ...	Ishito Yasuze
Isuya	" ...	"	Nishikawa ...	Chikusa Yasube ...
Tawara	" ...	"	Ueda ...	Kusakabe Toraji ...
Kishitane	Kioto ...	Tango ...	Ikenouchi ...	Imanishi Kanze ...
Sakatane	Shimaue...	Iwanie ...	Sawatani ...	Taniuchi Kaze
Udo	" ...	Izumo ...	Usage ...	Nagasawa Teikinosuke..
Nishi-iwase	" ...	" ...	Iwasawa ...	Takinouchi Ehachiro ...

the Consular District of Kobe.

Kind of Ore.	Amount produced in:—					
	1898.	1899.	1900.	1901.	1902.	1903.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Iron pyrites...	56	253	296	14	279	254
” ...	—	—	—	—	—	—
Magnetite ...	—	—	—	—	—	—
” ...	—	—	—	—	—	—
Iron pyrites...	3,752	2,494	5,618	6,891	8,947	7,972
Unknown ...	—	—	—	—	—	—
” ...	—	—	—	—	—	—
Iron pyrites...	—	—	—	6	—	—
Micaceous ...	—	—	—	—	—	—
Unknown ...	—	—	—	—	—	—
Iron pyrites...	247	237	243	223	211	35
Unknown ...	—	—	—	—	—	—
Iron pyrites...	—	56	12	240	—	—
Unknown ...	—	—	—	—	—	—
Iron pyrites...	1,325	1,259	1,426	1,354	1,363	1,167
” ...	—	—	—	—	1½	—
” ...	4	4	4	5	—	—
” ...	11	12	70	9	10	—
Brown iron ore	110	257	257	248	2,839	2,500
” ...	—	—	—	—	—	—
” ...	—	—	—	—	—	—
Iron pyrites...	—	1,386	2,659	3,715	3,957	2,408
” ...	—	—	—	—	—	—
Unknown ...	8	12	30	30	—	—
” ...	—	125	—	5	214	86
Magnetite ...	—	—	—	—	—	—
” ...	—	—	68	—	—	—
Unknown ...	—	163	35	73	25	105
” ...	—	—	—	43	—	—

SHIMONOSEKI.

(Mr. Vice-Consul Chalmers.)

1. Yes; deposits of iron ore do exist, but only some small iron sand deposits are worked, and the others are quite inconsiderable.

2. The chief iron sand deposits are in Hiba and Sozo Districts, Bingo Province, Hiroshima Prefecture. The nearest shipping port capable of admitting ocean steamers is Itozaki, about 50 miles from the deposits. The produce is not exported abroad, but finds a local outlet in small quantities. Details are not ascertainable.

3. Not known.

4. Labour is probably plentiful as regards miners and carriers. Wages at mines generally are about 47 to 60 sen (1s. to 1s. 2 $\frac{3}{4}$ d.) a day for men, and 24 to 30 sen (6d. to 7 $\frac{1}{2}$ d.) a day for women. Children, under 14 years of age, are paid, for boys, 17 $\frac{1}{2}$ sen (4d.), and girls, 11 $\frac{1}{2}$ sen (2 $\frac{1}{2}$ d.).

Mine workers are generally provided with lodging, medical attendance, and compensation in case of accidents.

5. No official analyses or samples of the sand deposits are obtainable.

6. Iron ore deposits owned by private individuals would probably in all cases be purchasable.

7. Yes. In Hiba and Sozo Districts, Hiroshima Ken iron sand deposits have been worked. The following figures are given for the year 1902:—

Iron Sand Deposits.

Government owned.		Privately owned.		
Iron Ore produced.	Value.	Iron Ore produced.	Iron Ore sold.	Value.
Tons.	£	Tons.	Tons.	£
852	361 or about 8s. per ton.	7,691	7,454	1,542 or about 4s. per ton.

8. There are limitations to the right of aliens to own mines. By Law No. 74 of March, 1900; however, a company registered under Japanese law as a legal person, even if it consists entirely of aliens, may work mines in this country.

Local obstacles might have to be overcome by aliens desiring to exploit mines.

9. At the best, the iron ore deposits in this Consular District seem to be of trifling importance, and no information is obtainable about any, except the sand deposits referred to.

The Imperial Japanese Government iron and steel works at Wakamatsu, about 10 miles from Moji in the island of Kiushiu, own two iron ore mines in Akadani and Kamo, respectively, province of Echigo in the Consular District of Yokohama, which furnish the principal supplies, while 50,000, or 70,000 tons of raw material are imported from the mines

of the Hang-yang iron works in China. An account of the Imperial Japanese iron works at Wakamatsu will be found in the report on the trade of this port for the year 1901.*

In Oita Ken no iron ore deposits have yet been discovered, but experimental borings are still being made in certain localities.

In Tukuoka and Yamaguchi Prefectures the small iron sand deposits that are known to exist are of no practical importance.

YOKOHAMA.

(*Mr. Acting-Consul Hampden.*)

1. Deposits of iron ore and sand occur here and there in this district, but only in quantities altogether too insignificant for mention.
2. Their location is shown on the attached map, which has, however, little more than a geological interest.
7. Some have been worked (*vide* map), but so small is the output that no figures are quoted for this district in official statistical tables of the output of Japanese mines.
9. Iron ore does not figure as a specified export from Japan in the Customs returns. On the contrary, it is largely imported.

PERSIA.

KERMAN.

(*Major Sykes, Consul.*)

Although there may possibly be iron ore in this district, it is neither worked nor workable, until the country be developed by means of railways and roads.

So far as I am aware, the defunct Persian Mining Corporation only worked at the borax mines; but the cost of transport was too costly. For all practical purposes, then, it may be considered that no iron ore is known to exist in this consular district.

SIAM.

BANGKOK.

(*Mr. Paget.*)

I have the honour to enclose copy of a letter addressed by Mr. Scott, Director of the Siamese Department of Mines, to Mr. Consul Beckett, with regard to iron ore supplies in this consular district.

Mr. Scott states that there are no "ascertained iron ore supplies," and that he cannot conceive the remotest possibility of the scattered deposits of pisolitic iron in this country ever having any industrial value, even if first-class coal were discovered in their neighbourhood.

The information on this subject being so meagre, it would appear useless to endeavour to furnish detailed replies to the tabulated questions of the memorandum.

* *Annual Series of Diplomatic and Consular Reports*, No. 2,878.

(Copy of Letter from Mr. Scott, Director of the Siamese Department of Mines, to Mr. Consul Beckett.)

“In answer to yours of yesterday, *re* the information required by the British Iron Trade Association, I should say that in Siam there are no ‘ascertained iron ore supplies,’ which are what the Association want to know about.

“Besides the occurrences you mention, I believe some iron ore is actually worked for making knives somewhere north of Pichit, and I have seen both magnetite and hematite, which, I believe, came from Supan; there is also an immense amount of pisolitic iron oxide scattered over the surface of the country in Pachim, especially between Kabin and Sisophon, but I should not describe any of these as ‘ascertained supplies.’

“I have not interested myself in the iron of this country, because I cannot conceive the remotest possibility of these deposits ever having any industrial value, even if first-class coal were discovered in their neighbourhood.

“The information available is so utterly scrappy and useless that I really think it would be absurd to answer the Association’s tabulated questions in detail.”

TURKEY IN ASIA.

ALEPPO AND ADANA.

—(Mr. Consul Barnham.)—

Iron ore is found at Beirut-Dagh, a mountain seven hours’ caravan ride from Zeitoun, in the vilayet of Aleppo, near Selefké, in the vilayet of Adana, and, generally speaking, throughout the Taurus Range, the Amanus, and the Anti-Lebanon. Unfortunately the deposits at Beirut-Dagh are of little commercial value, owing to the inaccessible nature of the country and their distance from the sea. The Government appears to attach no importance to what, in view of the excellent quality of the iron, might, in spite of these disadvantages, be made a most valuable asset, but allow the people of Zeitoun and surrounding villages to extract it freely without payment of duty, and sell it in the neighbouring towns of Marash and Aintab. If it were proposed to export the iron, the transport by camel to Alexandretta would take seven days, and cost 16s. per cantar of 200 okes, or about three shillings and three-pence per hundredweight.

It is impossible to give an idea of the extent of the deposit, as this mine has never been surveyed by experts. At Alexandretta shipments would be effected by lighters.

There are deposits of iron near Selefké at two and three hours’ distance from the sea. The nearest port of call for ocean steamers is Mersyna, which is some two days’ journey by sea from Selefké, but there is no apparent reason why steamers could not equally well call at Selefké, if necessary.

Except for the presence at Mersyna of lighters and two tugs, it has no advantage as a harbour, being merely an open roadstead. There is no road, rail or canal from the deposits to the sea, and before commencing operations it would be necessary to construct a rough cart road. The iron would be brought down to Selefké by camel.

No skilled miners could be found in the district. Native labourers, Turks, Yuruks, Armenians, &c., could be employed, working with picks, shovels, and wheel-barrows at a wage of 1s. to 1s. 6d. per day. Foreigners, such as Greeks, might be obtained at from 2s. 6d. to 3s. per day. The native labourer is lazy but sober, and easy to manage, if instructed and well treated.

These mines near Selefké have never been worked, so that it is difficult to give even an approximate estimate per ton of the cost of quarrying and loading, but with good and suitable tools, the cost should not, perhaps, exceed

two shillings per ton, if the deposits are rich. Captain Townshend, His Britannic Majesty's Vice-Consul at Adana, in reporting upon this subject, states that, with the exception of a Monsieur Penziches, a mining engineer who is now engaged in working chrome near Selefké, no one, so far as he knows, has ever applied to the Government for a permit to work iron in that district. This gentleman is very anxious to assist in any way should an English mining engineer be sent to Selefké. He is not a rich man, and Captain Townshend believes he would be glad to sell on reasonable terms any interest which he possesses in iron ore, his chief business being with Chrome. Monsieur Penziches has lived for many years in England, speaks English well, and, as he is the only authority upon this subject on the spot, he would in his own interest be glad to see the introduction of British capital to promote this industry. I would suggest that any members of the British Iron Trade Association who are disposed to take an interest in these mines should correspond directly with him.

Concessions for the working of mines in Turkey are obtained with the greatest difficulty, and should, as a rule, be applied for in the name of a wealthy Ottoman subject, who would be ready to transfer his interest to Europeans. The initial step towards obtaining a concession is to apply for a permit to survey the mine, which carries with it the right to export up to 2,000 tons of ore, after which a regular concession must be sought.

BAGDAD.

(*Mr. Consul-General Newmarch.*)

1. Yes.
2. In the Vilayet of Mosul.

(1.) In a mountain, named Kafnirk, near the villages of Ourman and Yakmala.

(2.) In a mountain, named, Yusufka, near the village of Haisi.

These two mountains are in the Nahia* of Barwari, which is part of the Kaza† of Amadia. These mountains are about 40 hours journey (about 150 miles) from Mosul.

The nearest shipping port capable of admitting ocean steamers is Basrah, and it is about 950 miles from the ore deposits, reckoning viâ the Tigris from Mosul.

There are also said to be some deposits of iron ore in the mountains of Kazadhook, which are about two days' journey from Mosul (about 50 miles), but this information is uncertain.

3. The transport of the ore to Mosul would cost about four (4) £ per ton, because it would have to be carried on mules or donkeys, there being no road or railway, and the country being hilly.

From Mosul the ore could be transported on rafts—at certain seasons of the year when the Tigris is in flood—to Basrah, viâ Bagdad, but I think the cost of this would be prohibitive, and it would take at least 20 days from Mosul to Basrah, in the most favourable time of the year.

From Bagdad to Basrah country, sailing boats could be employed, but they are more expensive than rafts, and take nearly as long to do the journey. There are steamers plying between Bagdad and Basrah, but their charges for freight are very high.

4. The character of the labour available for mining and loading would be coolie labour. The labourers in that part are strong but lazy,

* A district governed by a Mudir.

† A district governed by a Kaimmakam.

and good European supervision would be necessary. The cost of a labourer, per day of eight hours, varies from 6d. to 1s. for unskilled labour.

I am unable to give the cost of mining, because these deposits have never been worked. The cost of quarrying and loading would be from 6d. to 1s. per man per day of eight hours.

5. No official analyses of the ore are obtainable, but samples could be procured.

6. The proprietors of the sand deposits are poor, and would probably give leases or sell their rights on reasonable terms. The Turkish Government would, however, be sure to intervene, and then there would be numerous obstructions and delays, which might or might not be removed by bribery.

7. None of these deposits have been worked hitherto.

8. In my opinion, there are special obstacles in the way of successful continuous and unencumbered mining.

After the proprietors have given their consent, the permission of the Turkish Government will be necessary.

9. I have said that these deposits have never been worked, and that is practically correct. But about 50 years ago, so I am told, when iron was dear, some of the Kurds, in the neighbourhood of these deposits, smelted the ore in their very primitive way and got enough iron out of it to make the tools and implements they required. Soon afterwards, however, iron was imported in abundance from Russia and England, the price fell, and it was no longer worth the while or labour of these Kurds to make their own iron. The workings were therefore abandoned.

BROUSSA.

(*Mr. Vice-Consul Gilbertson.*)

1. Yes.

2. The district of Broussa is exceedingly rich in iron ores—hæmatite (ranging from deep red to iron black and steel grey), magnetite, limonite and spathic;—and the nearest port is Ghemlek. Ore can be shipped from this port all the year round.

The nearest deposits are situated in the Cazas of Pazar-keui and Ghemlek, and from 3 to 5 hours distance from the latter port. This distance could be reduced by about one-third if an aerial ropeway was erected, and this could be easily done as the ground not only favours such a line, which can be taken in a straight line from terminal to terminal, but the approximate difference in height being 1,500 feet, the mean grade is in favour of the loads.

3. From 30 to 40 piastres (5s. 5d. to 7s. 2d.) per ton of 800 okes. By macadamized road.

4. Native labour is plentiful; and there is an Armenian village (Seuloz) with over 6,000 inhabitants, not far from the deposits. This village alone can furnish between 500 and 600 labourers.

The actual cost of labour is paid in two ways, with and without food (the food consisting of bread, olives and native cheese); with food costing 5, and without 7 and 12 piastres—the latter being the pay of drillers—(10 $\frac{3}{4}$ d., 1s. 3d. and 2s. 2d. respectively) per diem. The labourers commence work at sunrise and leave off at 11.30 p.m. Turkish time (half an hour before sunset).

The ore would be transported by camels, donkeys, horses and mules; and likewise carted by horse, bullock and buffalo carts; and, as it is the custom for the proprietors to load their own animals and carts, loading costs nothing.

The deposits are favourably situated for being worked on a large scale, and can be attacked both as an open quarry and also by means of adits, which would thus both be drained and rendered easily accessible. The cost of extraction ought to be a mere nothing.

5. Last year three specimens of minerals from the region of Seuloz were sent, through the Foreign Office, to the Imperial Institute, and these were submitted to chemical examination in the laboratories of the Scientific Department, with the following results:—

“Specimen No. 1.—This mineral consisted of a black crystalline mass containing a number of cavities from which gas had evidently escaped while the material was in a semi-liquid condition. The result of the chemical analysis given below supports the view that this specimen is probably artificial and not a natural ore. The amount of the chief constituents has been determined as follows:—

Silica	...	...	...	26.95	per cent.
Ferrous oxide	...	...	...	59.16	”
Ferric oxide	...	...	...	3.68	”
Alumina	...	...	...	5.3	”
Manganous oxide	...	...	...	0.48	”
Lime	...	...	...	2.76	”
Magnesia	...	...	...	0.53	”

“The substance is, therefore, chiefly a silicate of iron, very similar in appearance and composition to that produced as slag in smelting operations. It would be remarkable if this substance proved to be a natural product.”

“Specimen No. 2.—This mineral consisted of rather less than a pound of a dull reddish mineral, evidently consisting chiefly of two substances. The result of the chemical analysis shows that one of these is hæmatite, or ferric oxide, and the other heavy spar, or barytes, the mixture being composed of about one-third hæmatite and two-thirds of heavy spar. It is doubtful whether this mineral would repay the cost of transport, but it would be worth while to obtain a broker's opinion on this point, for which purpose it would be necessary to send a representative sample of about 10 or 20 pounds of the ore.”

“Specimen No. 3.—This mineral consists of quartzite containing sulphides of iron, copper, zinc and lead, these sulphides being distributed uniformly in small crystals throughout the quartzite. The analytical results are as follows:—

Metallic iron	...	...	...	11.85	per cent.
Metallic zinc	...	...	...	3.72	”
Metallic copper	...	...	...	1.26	”
Metallic lead	...	...	...	1.49	”
Lime	...	...	...	4.40	”
Magnesia	...	...	...	2.77	”
Sulphur	...	...	...	13.98	”
Silica	...	...	...	42.28	”

“This sample contained no gold, and only a trace of silver.”

“Having regard to the small amount of copper contained in this ore, to the presence of the sulphides of zinc and lead, and to their mode of distribution, as well as to the fact that they occur as sulphides, and that no gold and only a trace of silver are present, it is doubtful whether the mineral is worth exporting, or even working on the spot.”

Professor Dunstan, in his letter that accompanied the above report, stated, that if this question is to be further examined, I ought to forward larger samples of between 10 and 20 pounds of each specimen.

I beg to mention here that my report on these samples was based on statements of the native who brought them to me, and I then stated that the cost of transport would be from 10 to 12 shillings per ton. In view, however, of Professor Dunstan's request, and also your instructions, I proceeded to Seuloz and personally examined these deposits, and also took fresh samples; but I found that the cost of transporting these ores to Ghemlek, by carts, &c., would only be from 5s. to 5s. 8d. per ton, and not 10s. to 12s., as previously reported. In fact, they are actually transporting chrome iron ore from Einégholl to Ghemlek, about four times the distance from Seuloz to the latter port, for 4 paras per oke, or 80 piasters (13s. 4d.) per ton (of 800 òkes).

6. According to Turkish law, landowners are not the proprietors of the minerals that may exist in their lands, and they, like any private individual, who, though not proprietor of the ground, has discovered a mine, must petition the Governor-General of the province for permission to search for minerals in their landed property. This petition must indicate the place or spot where the excavations are to be made, the limits and other details of the ground, and also the nature of the mineral they intend searching for. It must also designate the village or town, the Nahié, Caza and Sandjak within the boundaries of which the mine or mines exist. If, after enquiry, it is ascertained that the excavations will not damage the private buildings or public edifices thereabouts, the request is communicated to the Minister of Mines and Forests, who, after having inscribed the petition in the register specially kept for that purpose, and having encashed a fee of 3 to 5 Turkish liras, delivers, through the Vali, a permit, which is valid for two years.

So far, no permit has been delivered for the working of iron ore deposits in my district; but I am aware that a petition has been filed for permission to work the Seuloz mines, and I am of opinion that the applicant, who, being first petitioner, is the registered proprietor, would either sell out on reasonable terms, or come to some reasonable arrangement. He would undertake to obtain the concession for same, which, as a rule, is for 99 years.

7. No deposits of iron ore are actually worked, but from the numerous old workings and the heaps of scoria that exist about Seuloz, and in all parts of this province, I should imagine that work had been conducted there and in numerous parts of the vilayet on a large scale by the Romans, though, from the disposition of the pits and the remains of the workings, it would appear that no regular mining system was followed.

8. As to whether there are any special obstacles in the way of successful, continuous and unencumbered mining in Turkey, Art. 14 of the new chapter, published in June, 1901, denotes that applicants for a prospecting license are required to state in their petition that in the event of the license being refused, or being withdrawn by the Government after being granted, they have no right to claim any compensation beyond the "droit d'invention." This means that a prospector who discovers a valuable mine may, at any moment, until he obtains the definite firman or concession, have it taken from him, without further indemnity than the payment of his expenses.

The foreign Embassies and Legations strongly protested against this new chapter of the mining law, and the question of the withdrawal or modification of this new chapter is now under negotiation.

It is exceedingly doubtful whether the Ottoman Government would, in view of the strong protest launched by all the European Powers against the new chapter of the mining law, refuse granting permits to foreign subjects, much more withdraw licenses that had been granted to them in due form.

9. With reference to Specimen No. 1, which Professor Dunstan states is chiefly a silicate of iron and probably artificial and not a natural product, and therefore asked me to enquire further into the matter and

ascertain, if possible, the history of this deposit, I was shown the place from which the mineral had been taken, and which consisted of a heap of black crystalline massive pieces of iron ore, most of which contained a number of cavities, which would make it appear that the ore had been partly burnt; but, nevertheless, these pieces were totally devoid of that vitreous covering which, as a rule, covers fused metal, as in slag. In the same heap there were also pieces of unburnt ore of a dark iron-gray colour with metallic lustre, both of fine and coarse crystalline grain, attracted by the magnet and giving a black streak, and probably magnetite; while others had aggregations of crystals and striæ appearing on the exterior and in the cavities of the upper part of the mass, the edges and points of both being most distinctly defined.

Being aware that the crystalline structure of a mineral, where it exists, is of the greatest importance in mineralogy, not only as showing the relation between forms the most dissimilar, but as affording ready proof of its identity in circumstances where it would otherwise be extremely difficult to distinguish it, I am sending a specimen of the latter ore to Professor Dunstan, who, from the crystals and striæ of the mineral, will no doubt be able to arrive at a definite conclusion as to whether the specimen is artificial or a natural ore.

This specimen I took from a heap of ore at an altitude of 2,275 feet above sea level—and there were several such heaps round about—and at about a mile to the west of the hæmatite deposits from which Specimen No. 2 was taken, and although it was evident that this ore had been extracted not far from the heaps, for there were old diggings or openings in the hill side, but these were nearly filled up with earth, and as I had only taken a prospector's hammer and a small stone pick with me, it was impossible with such tools to clear away the debris, &c., which covered the deposits or veins from which the ore had been extracted centuries ago by the Romans.

From there I proceeded to where Specimen No. 2 had been taken, and which Professor Dunstan states consisted chiefly of two substances, and that the chemical analysis showed that the mixture was composed of about one-third hæmatite and two-thirds heavy spar or barytes. He furthermore stated that although it was doubtful whether this material would repay the cost of transport (which I had reported would cost from 10s. to 12s. per ton), it would be worth while to obtain a broker's opinion on this point, for which purpose it would be necessary to send a representative sample of about 10 to 20 pounds of the ore.

This ore was taken from the top of an outcrop or boss of red hæmatite and heavy spar, at an altitude of 1,850 feet above sea level. It is an oval-shaped hill with a superficial area of over 11,000 square feet, and having its longer axis N.E. and S.W., which measured 260 feet; the shorter axis, N.W. and S.E., measuring 130 feet.

The ore is shaly and coarse grained, the outer covering of the shales having a sub-metallic lustre, and yields, according to Professor Dunstan, 33 per cent. of iron, the rest being heavy spar. It is disseminated with minute acicular crystals of barytes, but these gradually decrease downwards, and at about 6 feet from the surface some of the ore is solid, very pure, and of an exceedingly fine texture. In fact, so much so, that even with strong lens you cannot discern the grain.

The direction of the bed is, as already stated, N.E. and S.W., and, as it descends, gradually expands on all sides. It can be traced for some distance down the hill towards the lake of Iznik, and from the formation and colouring of the ground, I am of opinion that this immense bed of mixed ore, which, I presume, will be purer deeper down, descends down to the level of the lake of Nicea, perhaps underlying it, and within a few hundred yards of the Ghemlek carriage road that runs alongside of the lake in question.

To the east, and at about 500 yards from this hæmatite and heavy spar boss, there is another hill with several small outcrops of a highly ferruginous breccia of different hues of black, blue, brown, green, red and

yellow, some parts being of a dull yellowish earthy structure, while others have a glazed and sub-metallic appearance. These outcrops appeared to me to be upheavals of volcanic or igneous matter that had cooled while in a semi-fluid state. Under the lens, fine, yellow particles can be discerned in some of the pieces of this ore, and as they present the same colour from whatever direction they are looked at, I presume it is gold.

This hill overlaps the deposits from which Specimen No. 3 was taken, and from the colouring and form of these outcrops, I presume that the principal ingredients are earthy-brown iron ore (limonite), zinc and copper, with some lead. However, that there should be no doubt in the matter, I am sending a representative sample, just as I took it from the croppings, to the Imperial Institute for analysis. This sample will be marked No. 4.

Less a small outcrop here and there, the hill is nearly level; is some hundreds of feet in length and width; runs nearly due east and west, but expands on the north and north-eastern side. It is bound on the south and south-eastern side by extensive outcrops of bluish-grey conglomerates, which appear to underlie the whole strata. The beds of banket conglomerates follow the same strike and dip as the beds in which they occur, and are of all degrees of coarseness, from fine sandstone to pebbles and large stones, all cemented together with what appears to be a mixture of lime, sand and iron.

It is to the N.N.E. of this hill, and about 300 yards below it, that Specimen No. 3 was taken, and which, according to the analysis of the Scientific Department of the Imperial Institute, consisted of quartzite containing sulphides of iron, copper, zinc and lead, these sulphides yielding, respectively, 11.85, 3.73, 1.26 and 1.49 per cent. of metallic iron, zinc, copper and lead. This sample was taken from the croppings, but I am sending another sample taken a few feet below the surface, and which, I feel certain, will give superior results. The fresh sample of this ore is marked No. 3.

These deposits are also of great extent, and could be worked as an open quarry, in steps or galleries all round.

The natives have named this hill "Kir-atch" (barren or sterile hill); and this on account of its being totally devoid of vegetation.

The four samples of ore I am sending are marked No. 1, 2, 3 and 4 (No. 1 being enclosed in No. 2), and were all taken from the northern side of the Gemiditch-Burdjim mountain chain and from the ridges to the west of Seuloz and within two miles of that village. The direction of this mountain chain is N.E. and S.W., and from the fossils and formation of the strata, it would appear to be Primary.

The general stratification of the country appears to be composed of series of, what I should call soft sandstones of different colours, with some shales, cherts, and quartzites, disturbed in places by intrusive dykes—the rocks being greatly disturbed and contorted in some places.

This part of the province is very rich in iron, zinc and other ores. The principal deposits of the ores lie in the mountains between Karsak and Pamboujak, a distance of over forty kilometres; and I am of opinion that it would be worth while sending a competent person to examine and report on the iron and other valuable ores that exist in this highly mineralised part of the country.

Being aware that lignite and brown coal exists in the hill to the west of Karsak, for I discovered large beds of these minerals some years back, the top seam of the brown coal being ten feet thick, I felt certain that coal existed in the Gemiditch-Burdjim range of mountains, and while examining a large and ancient opening in a hill to the east of Seuloz, which the villagers called a slip, and which they stated existed long before the village was built, I discovered several small seams of coal, the lowest being three-quarters of an inch thick.

The stratification of this opening was slightly synclinal. Actually, it is between 250 and 300 yards wide, from 150 to 200 feet deep; but it had evidently been worked much deeper, and the whole strata had been

extracted for some hundreds of yards. The strata was totally different to the other parts of the country I had gone over, for, had it not been bent by pressure or strain into very slight curves, the series of strata would have been parallel to one another, whereas all other parts of the country seemed to have been tilted up from their original horizontal position into numerous small hills.

From the nature of the ground and the facing of the opening, it is evident that this large breach was not due to a slip or slips, but that the whole strata had been scientifically quarried.

The strata is composed of regular stratified beds of crystalline and earthy rocks and conglomerates, the rocks being of a bluish, brown, grey (light to dark), greenish, red, reddish-brown, yellowish and yellow-ochre colour, while the conglomerates are mostly brown, due, no doubt, to iron pyrites, and all of which (rocks and conglomerates) vary in thickness from a few inches to several feet. The rocks are jointed at regular intervals of between three and four feet, the joints being right-angled, and are more or less fossiliferous, the grey and brownish rocks and the conglomerates being highly so, and contain numerous species and varieties.

I have sent samples of these rocks and some fossils I obtained from the conglomerates to Professor Dunstan, which will no doubt enable him to fix or classify the epoch of this formation.

These rocks and conglomerates are disseminated with very fine yellow particles, also grains and spangles of a silvery-white metal with a shining metallic lustre, the latter being, I presume, one of the precious minerals, for had it been silver, it would, owing to its having been exposed for centuries in the atmosphere, have oxidised. It also occurs segregated in the interstices of the rocks.

DAMASCUS.

(*Mr. Consul Richards.*)

1. Yes.

2. In the Caza of Ajlûn, about 100 miles to the south-south-west of Damascus, the ore being found at a distance of 4 to 6 miles from the Haifa-Derâa branch of the Hejaz Railway, now in the course of construction.

Meshgara, to the south-west of Damascus, 23 miles from Múallaka, the nearest station on the Beirût-Damascus Railway, which itself is 35 miles from Beirût.

Mejdelshems, about 30 miles by road to the south-west of Damascus, and the same distance by road from Sidon.

Blûdan, 30 miles to the north-west of Damascus, at a spot distant 3 miles (all down hill) from the nearest point on the Beirût-Damascus Railway, of which the station is 61 miles from Beirût—the nearest port.

Kufeir is about the same distance from Sidon as Mejdel-Shems, say 36 miles, and 33 miles from the nearest railway station at Múallaka, which itself is 35 miles from Beirût. And it is believed in many other parts of the vilayet, though nothing is known for certain.

3. Ajlûn, by road to nearest station, say a day's march for a camel carrying quarter of a ton, 13s. 4d. per ton; by rail to Haifa, the nearest port, 4s. per ton.

Meshgara to Múallaka, the nearest point on Beirût-Damascus Railway, by camel, 10s. per ton; from Múallaka to Beirût, by rail, 2s. per ton (at most).

Mejdel-Shems, by road, to Sidon, 30s. per ton.

Blûdan, by road to Zibdani, 4s. per ton; from Zibdani to Beirût, 4s. 6d. per ton.

Kufeir to Múallaka, by road, 26s. per ton; from Múallaka, by rail, 2s. per ton.

4. There are no trained miners in this Province, but the wages of such a workman may be put at 1s. 5d. per diem. As no mining is actually being carried on, it is impossible to make an estimate of its cost per ton.

5. No.

6. It is impossible to answer this query with any degree of precision, because accurate information on this point is not obtainable.

7. No; no mines have been worked hitherto.

8. It may be stated at once that concessions for the working of mines are very difficult to obtain in this country (Turkey). Then, when obtained, the means of communication with the coast are, as a rule, so deficient, that it does not pay to work any mine, however rich it may be in ore. Fortunately, this particular province is better provided in this respect than many others, and railways are being made which will open up the country considerably. The Turkish mining regulations have been altered quite recently, and are now less complicated and more suited to the actual needs and economic condition of the country than they were. The main difficulty is to obtain the concession, which, in the case of a British applicant, is no easy matter.

9. No further information is obtainable at present.

DARDANELLES.

(*Mr. Vice-Consul J. F. Jones.*)

1. Yes.

2. At Koru and Okdjilar. Birghaz Limani, on the straits, from which the deposits are twelve to fifteen miles distant, would be the nearest port for Koru. For Okdjilar the port of Tchanak (Dardanelles) itself, at distance of five miles, would be the nearest port.

3. From the port of Birghaz Limani the country carts ply for a distance of twelve miles in the direction of Koru, and a good road could be made without great difficulty to facilitate considerably the transport of the mineral to the coast.

The country carts also ply between Okdjilar and the Dardanelles.

The cost of transport of the ore from Koru to the coast (for which under present conditions camels would probably have to be employed) would be from 55 to 60 piastres (9s. 11d. to 10s. 10d.) a ton.

4. The average cost of common (unskilled) labour is 7 to 8 piastre (1s. 3d. to 1s. 5d.) a day. Miners receive from 12 to 15 piastres (2s. 2d. to 2s. 8d.) a day. The fact that no serious efforts have been made hitherto to utilise these deposits of iron ore renders it difficult to estimate the cost of mining in these districts.

5. According to the analysis made by Dr. Noad, F.R.S., of London, with regard to a specimen of the ore from Koru, the results obtained were as follows:—

Peroxide of iron	...	...	80.00	per cent.
Oxide of manganese	...	...	2.40	„
Lime	...	...	.80	„
Magnesia	...	...	.72	„
Sulphur	...	...	Nil.	
Phosphorus	...	...	Nil.	
Water	...	...	Nil.	
Silica	...	...	16.00	„
Other substances	...	...	.08	„
			<u>100.00</u>	

Another analysis made in London gave the following result:—

Iron	...	...	...	57.31	per cent.
Oxygen	...	...	...	24.48	„
Silica	...	...	...	14.65	„
Alumina	...	...	...	1.10	„
Water	...	...	...	2.46	„
Sulphur	...	...	...	Traces.	
Phosphorus	...	...	...	—	„
				<u>100.00</u>	

An analysis of the ore from Okdjilar, made at Paris, showed that the peroxide of iron formed 87 per cent. of the ore, the metallic iron being 61 per cent.

6. The proprietors of these deposits would most probably be willing to sell their land on reasonable terms.

7. At Okdjilar some slight efforts have been made to work the deposit, but there were no shipments of ore. Hitherto no attempt whatever has been made to extract the mineral at Koru.

8. As iron is regarded as a metal of inferior value, it is probable that no great difficulties would be encountered by capitalists wishful to acquire and utilise these deposits.

9. In both cases these deposits of ore could be worked by means of quarries.

ERZEROUH.

(Mr. Acting-Consul Shipley.)

1. *Erzeroum*.—Yes.

Van.—Yes.

Bitlis.—Numerous deposits reported, but impossible to obtain detailed information.

2. *Erzeroum*.—North of Baibourt, at the Agana Yoyla, “very rich.” In the Caza of Kiskim, at Teksiyan. In the Kassaba of Kighi, “very rich.”

Van.—In the district of Norduz, 50 miles south-south-east from Van. In the Caza of Shattakh, 40 miles south by west from Van.

Bitlis.—Near Tukh, at the south-west corner of the Lake of Van. At Talori, on the southern slope of the main Kurdish chain of mountains, south of the town of Moush. Ferruginous springs near the town of Bitlis point to the existence of iron there also.

Nearest port for all deposits, Trebizond. From those in Erzeroum, about 40 hours, or 180 miles; from those in Van, about 500 miles; from those in Bitlis, about 14 days, *when* roads are open.

Another route from Bitlis is to Alexandretta, viz.: To Diarbekir (eight days), Biredjik (on Euphrates, near the projected Bagdad railway line) (eight days), Alexandretta (three days).

3. Transport by road; pack animals or ox-carts. Cost: From Erzeroum, about £4; from Van, £30; from Bitlis, £6 a ton, calculating on the present rates.

4. Labour cheap, but supplied by the neighbouring villagers, and quite unskilled: 6d. to 1s. per diem.

5. No; samples are not procurable, at all events not at this time of the year.

6. Proprietors are poor, but pretentious; in Van, the Government.

7. Not to any appreciable degree. Villagers' rough tools have been made of the iron extracted. No shipments.

8. Yes. The Turkish Government and the local populations.

9. None.

HODEIDAH.

(*Mr. Vice-Consul Richardson.*)

I am not in possession of any definite information pointing to the actual existence of iron ore in this vice-consular district.

Though it is not unlikely that iron may be found in certain parts of the Yemen, there are no mining or exploring industries to locate its deposit and distribution in this extensive vilayet.

It is hardly probable, in my opinion, that the Ottoman Government would be disposed to grant concessions to foreigners in the event of discoveries being made in that direction at any future time.

JERUSALEM.

(*Mr. Consul Dickson.*)

I beg to state that there are no deposits of iron ore within this consular district, but I understand that in Jebel Akkar, in the Lebanon Range above Tripoli, abundance of the ore is to be found, although it seems that no mining or working of the same has taken place. Smaller quantities of the metal exist in other parts of the Lebanon, but in consequence of the difficulty in procuring fuel for smelting purposes, the production is only sufficient for the manufacture of horse-shoes and nails for local use.

SMYRNA,

Which comprises (1) the Vilayet of Aidin, (2) the Sandjak of Aivali (Vilayet of Hudavendighiar), (3) the Sandjak of Adalia (Vilayet of Koniah), (4) the Vilayet of the Islands of the Turkish Archipelago, (5) the Island of Samos.

(*Mr. Consul-General Cumberbatch.*)

1. There are three localities within the metalliferous areas of the district of the Smyrna Consulate-General, where deposits of iron ore are known to exist, and about which any information more or less reliable is obtainable.

2. (a) On the south-west slopes of the "Besh-Parmak" mountains (ancient Mount Latmus) in the Aidin Vilayet. The nearest seaport capable of admitting ocean steamers would be Assin, at the head of the Gulf of Mandalieh, 15 miles, as the crow flies, from the deposits, and 24 by road, which would have to be constructed. At present there are no shipping facilities at Assin.

(b) In the vicinity of Trianda, a station on the Smyrna-Aidin Railway, in the Aidin Vilayet. The nearest shipping port is Smyrna, about 27 miles by rail from the Trianda railway station, which is under two miles off from the deposits.

(c) At Tchiraly, a small seaport in the Adalia Sandjak (Koniah Vilayet). Ocean steamers could safely load in the roadstead, lighters being obtainable at Adalia or Finika. Distance of Tchiraly from deposits, two to three miles.

3. (a) 1s. 9d. per ton by rail (to be constructed), or 4s. by road (to be constructed).

(b) If charged the same as emery stone, it would be 8s. 1d. per ton by rail from Trianda to Smyrna. If the annual amount were to exceed 20,000 tons, there would probably be a reduction to 3s., and possibly the construction by the railway company of a branch line to deposits would be considered worth while.

(c) 3s. 6d. per ton by road (carts or pack animals).

4. (a) Labour is cheap and fairly good. Native (Turks), 10d. per diem. Armenians and Greeks, 1s. 8d. to 2s. 8d. per diem. Italian (skilled), 2s. 6d. to 3s. 4d. Cost of mining would be about 1s. 6d. per ton. The ore would have to be transported to the foot of the hill containing it by means of a wire rope-way. Whole cost of loading and transport to seaport has been estimated at 2s. 6d. per ton.

(b) Usually 2s. 6d. per diem for men accustomed to work in mines or quarries, and 1s. 4d. for ordinary labourers.

In some places miners are paid by piece-work on a basis of 2s. 6d. per diem. Good miners are procurable in Trianda district, and if extra hands are required they are obtainable from Greece. Ordinary labour is usually plentiful, but the islands of the Archipelago can be relied upon in case of necessity for any amount. Cost of extraction would probably be comparatively higher than at (a), as the mineral is very hard.

(c) Ordinary hand labour at wages of 1s. to 1s. 4d. per diem, employer supplying tools. Supply fairly good in winter, somewhat less in summer.

5. (a) The official analysis is considered unreliable. Assays of average samples made in England and by Mr. W. Thomas (mining engineer) gave between 60 and 62 per cent. metallic iron.

(b) Non-official analysis gives average of 60 per cent. metallic iron, but also .32 to 2.05 arsenic.

(c) No analysis, official or private, has been made.

6. (a) Proprietors are not rich, and the mines could be purchased on favourable conditions to buyers.

(b) Not worked at present, though mining rights are held on some of the properties by parties who would be willing to surrender their rights on moderate terms.

(c) The deposits are on State property, there are no private owners.

7. (a) Not worked hitherto except by villagers for local consumption, the ore being smelted on the spot in primitive furnaces. This also has been stopped.

(b) Never worked.

(c) Never worked.

8. For information on this point and on mining regulations, *vide* Parts 2 and 3 of Report on Mining Industries, &c., in Turkey, published by Foreign Office, sub No. 589, Miscellaneous Series, May, 1903 (Cd. 1387-2), which is too lengthy for reproduction in this place.

9. (a) The deposits of iron ore nearest the sea are said to be the poorest in quantity. The mass covers an area giving 1,000,000 tons for every 100 feet of depth. A rough sketch of the "Besh-Parmak" district is annexed herewith.

General Remarks.

Aidin Vilayet.—There are considerable deposits of iron ore distributed all over the Aidin Vilayet, but none present, so far as it can be ascertained, such good indications as the "Besh-Parmak" deposits (a). Certain outcrops of iron ore in the vicinity of Ayassolouk (ancient Ephesus) may be mentioned as sufficiently near the seaboard and railroad, but very little prospecting has been done in that region. A prospecting licence, covering a deposit at Sakar-Kaya, near Milas, was issued in 1897 to an Ottoman subject, but no work has been done there.

Adalia Sandjak.—Though further iron ore deposits are said to exist in the Adalia Sandjak, especially in the Alaya district, there has been little or no prospecting carried out. The only locality specially mentioned is Karagheuz, six to eight hours distant (30 to 40 miles) from Adalia.

Other parts of Consular District.—There are no known deposits of iron ore in the Sandjak of Aivali or in the Islands of the Turkish Archipelago (Rhodes, Mitylene, Scio, &c.).

Further information could be procured, if particulars are specified.

SAMOS.

(Mr. Consul Marc.)

I am informed that there exists a deposit of iron ore in this island, but whether it is in quantity sufficient to pay for mining I am not aware, as it has not been properly opened.

I hear that small sample has been analysed and found to be of very good quality.

This deposit is near the sea, about 300 metres distance, but the ore would have to be brought either to Port Vathy, or in summer time to Marathocampo, by small sailing boats, if required to be shipped in ocean steamers.

The distance from Calabactassi, where the iron ore exists, to Port Vathy is about 25 miles, and to Marathocampo about eight

UNITED STATES OF AMERICA (POSSESSIONS OF).

MANILA.

(*Mr. Consul-General Kenny.*)

1 and 2. There are extensive deposits of iron ore on the western flanks of the central mountain range of the Island of Luzon, but the working of ore is confined, at present, to one part of the range, known as the Angat region, in the province of Bulacan, where a few furnaces of a primitive kind are in operation. Prospecting is being carried on in other parts of the islands, but, so far, without resulting in the discovery of any iron ore deposits of large value.

Angat, above mentioned, is about forty miles to the north of Manila, and lies in an out of the way, mountainous district, about fifteen miles from the Manila-Dagupan Railway.

3 and 4. There is no record, so far as can be ascertained, of ore being transported from Angat to Manila, and statistics as to the cost of transport are, therefore, not obtainable. It is difficult to estimate what such cost would be under present conditions, but it is probably safe to say that, coupled with the cost of labour at the mines, labour and transport expenses would be so heavy as to render the shipping of iron ore from Manila unremunerative. The population of the Angat region is sparse, native labour is scarce, and, where available, is considered to be both expensive and inefficient, the supply of yoke-oxen for traction purposes is insufficient, and mountain paths are the only means of communication with the railroad, which, as mentioned above, is about fifteen miles distant. These factors are all drawbacks to the successful prosecution of the mining industry in the Angat region. Elsewhere throughout the islands, the absence amongst the natives of cheap, steady and willing labourers, for any purpose, is equally felt as a disadvantage, and the introduction of Chinese and Japanese contract labour, which is at present prohibited, is being advocated, in some quarters, as a means of supplying this want, and as a necessity for the development of the islands. There would appear to be no doubt that, as regards mining at least, the employment of such labour, if it could be obtained, in preference to native labour, would tend to make the industry more remunerative.

5. For official analyses of the Angat iron ores, see page 52 and the tables at the end of the accompanying "Report on a Geological Reconnaissance of the Iron Region of Angat, Bulacan," which has been issued recently from the Mining Bureau here.

6. There are nine first-class iron mining claims in the Bulacan district, covering 1,137,571 acres, the concessions for which were obtained by royal decree under the Spanish régime. The following list gives full particulars regarding these claims, including the names of the concessionaires or of their heirs:—

Names of Mines.	No. of Perts.	Area.	Place.	Subdivision.	Date of Concession.	Concessionaires, &c.
De Hizon ...	11	111-798-16	Sapang Bacal...	Angat ...	... ..	Heirs of Hizon.
Sta Lutgarda ...	1	150-000	Pinnngayan ...	Do. ...	... ..	Heirs of Anchuelo.
Constancia ...	2	300-000	Do. ...	Do. ...	Aug. 13, 1880	Dona Francisca Talag.
De Concha ...	12	125-772-93	Sapang Bacal...	Sn. Miguel de Mayumo.	June 23, 1856	Heirs of Concha.
San Pio V. ...	2	300-000	Do. ...	Do. ...	Dec. 7, 1883	Pablo Carlós.
Sapangmunti ...	1	150-000	Mantamuro ...	Angat ...	June 9, 1893	Francisco Sanches.

Under United States law, which prohibits the concession of Government mineral lands to aliens, mining claims can only be granted directly to citizens of the United States, or of the Philippine Islands. Although I have no definite knowledge, at the moment, as to the circumstances of the proprietors of these claims, or as to whether they are likely to be sellers of the deposits, I should be inclined to think, from the fact that most of the deposits are at present lying idle, that some of the proprietors might be induced to part with the deposits on what might be considered reasonable terms. A sketch of the law relating to mineral lands now in force in the Archipelago, may be of interest to the Association, so I give the following précis :—

Under Act of Congress of July 1, 1902, it is provided that in all cases public lands in the Philippine Islands, valuable for minerals, shall be reserved from sale, except as otherwise expressly directed by law, but the Act also declares that all valuable mineral deposits in public lands in the Philippine Islands, both surveyed and unsurveyed, are free and open to exploration, occupation and purchase, and the land in which they are found, to occupation and purchase by citizens of the United States, or of the Philippine Islands.

Proof of citizenship, under the clauses of this Act relating to mineral lands, may consist, in the case of an individual, of his own affidavit thereof; in the case of an association of persons unincorporated, of the affidavit of their authorized agent, made upon his own knowledge, or upon information and belief; and in the case of a corporation organized under the laws of the United States, or of any State or Territory thereof, or of the Philippine Islands, by the filing of a certified copy of their charter or certificate of incorporation.

Every person above the age of 21 years who is a citizen of the United States, or of the Philippine Islands, or who has acquired the rights of a native of the Philippine Islands, under and by virtue of the Treaty of Paris, or any association of persons severally qualified as above, shall, upon application to the proper provincial treasurer, have the right to enter any quality of vacant *coal lands* in the Philippine Islands, not otherwise appropriated or reserved by competent authority, not exceeding 160 acres, to such individual person, or 320 acres to such association upon payment to the provincial treasurer or to the Collector of Internal Revenue, as the case may be, of not less than \$10 per acre for such land, where the same shall be situated more than 15 miles from any completed railroad, or available harbour or navigable stream, and of not less than \$20 per acre for such lands as shall be within 15 miles of such road, harbour or stream : *provided* that such entries shall be taken in squares of 40 or 160 acres, in conformity with the rules and regulations governing the public lands surveys of the said Islands in plotting legal sub-divisions.

7. Deposits of iron ore are said to have been extensively worked in the Bulacan district and elsewhere, in former years, but there appear to be no records of any shipments having been made from Manila at any time. Such ore as is mined and smelted now is manufactured on the spot into crude agricultural implements and kitchen utensils, and sold in the neighbourhood or hawked to Manila. No ore reaches the latter port.

8. This question may be answered by a quotation from the accompanying report of the mining engineer of the Mining Bureau, who says :—

“It would seem that if a market could be assured for a large output of these ploughshares and other castings manufactured at Angat, or of pig-iron of high grade, if charcoal can be had at reasonable rates, or if our islands can furnish lignite of a quality to give good producer gas, if the transportation rates can be materially reduced, and if competent labour can be secured, that a large modern furnace smelting the best of these ores could operate at a handsome profit to its owners. I am inclined to think that the above conditions can be satisfactorily settled, and that there is a future for the iron industry in the Philippines.”

An extract from the report of the Taft Philippine Commission (January 24, 1901), referring to the mining industry, says:—

“It is difficult at the present time to make any accurate general statement as regards the mineral resources of the Philippine Islands. There has never been any mining, properly so called, in this archipelago up to the present time. The mining fields have never been thoroughly prospected, and even where very valuable deposits were known to exist they were worked, if at all, in a haphazard and intermittent fashion.

“Present indications are that the near future will bring a great change in the mining industry. According to the chief of the Mining Bureau, there are now some twelve hundred prospectors and practical miners scattered through the different islands of the archipelago. Of these, probably 90 per cent. are Americans. They are, for the most part, men of good character. They are pushing their way into the more inaccessible regions, furnishing their own protection, and doing prospecting of a sort, and to an extent, never before paralleled in the history of the Philippine Islands. The result is that our knowledge of the mineral resources of the group is rapidly increasing. When all due allowance is made for the prospectors' exaggerations, it is not too much to say that the work thus far done has demonstrated the existence of many valuable mineral fields.

“Extensive deposits of iron ore are known to exist, but it would seem that their development must be preceded by the development of the coal fields.”

I have already stated above that the special obstacle in the way of successful, continuous and unencumbered mining in these islands is the quality of the labour, and I now conclude with an extract from a report, just issued, by Major-General George W. Davis, Commanding the Division of the Philippines, which contains a similar opinion with regard to the character of the native labour obtainable for such comparatively light work as the construction of works and roads, &c., and which says:—

“The carrying out of any extensive plan for the construction of defensive works will require a large number of labourers in building emplacements and their accessories. The unfortunate results that have attended efforts to secure efficient labour for construction of roads has not tended to encourage the belief that it will be easy to find here suitable labour in sufficient abundance.”

9. For additional information reference is suggested to the official report forwarded herewith.

An extract from “The Philippine Islands,” by John Foreman, F.R.G.S., giving an account of the mining industry, with special reference to Angat, is appended hereto.

EXTRACT from “The Philippine Islands,” by John Foreman, F.R.G.S.

Iron mines, situated a few miles from Manila, were worked in the middle of the last century by Government, but the results being disastrous, a concession of the right of extracting the mineral was put up to public auction. A Spaniard named Francisco Salgado took up the concession, engaging to pay annually to the State \$20,500 in gold, and 125 tons of iron. The concern was an entire failure, chiefly on account of the cost and difficulty of transport to the capital. Salgado afterwards discovered an iron mine in a place called Santa Inés, near Bosoboso, in the district of Mórong, and obtained a concession to work it. The ore is said to have yielded 75 per cent. of pure metal. The greatest obstacle which Salgado had to contend with was the indolence of the natives, but eventually this was overcome by employing Chinese in their stead.

The old parish priest of Angat, Bulacan Province, once gave me the whole history of the rich iron mines existing a few miles from that village. It appears that at about the beginning of this century [nineteenth] two Englishmen made vain efforts to work these mines. They erected expensive machinery (which has since disappeared piece by piece) and engaged all the headmen around, at fixed salaries, to perform the simple duty of guaranteeing a certain number of men each to work there daily. They were very smart at receiving their pay, some of them having the audacity to ask for it in advance, yet the number of miners diminished, little by little, and no reasonable terms could induce them to resume work. The priest related that after the Englishmen had spent a fortune of about £40,000, and seeing no result, in despair they hired a canoe, telling the native in charge to paddle out to sea, where each one blew his own brains out with pistols.

Afterwards a Spaniard, who had made money during years of office as Chief Judge and Governor of the Bulacan Province, thought he could, by virtue of the influence of his late position, command the services of all the labourers he might require to work the mine. It was a vain hope; he lost all his savings, became so reduced in circumstances, that for a long time he was a pauper, accepting charity in the parish convents of the province.

The Angat iron mines undoubtedly yield a very rich ore—it is stated up to 85 per cent. of metal—which is more than that of the famous Campanil ore, found near Somorrostro, in the north of Spain.

They are still worked on a small scale. In 1885, at the foot of these ferruginous hills, I saw a rough kind of smelting furnace and foundry in a dilapidated shed, where the points of ploughshares were being made. These were delivered at a fixed minimum price to a Chinaman who went to Binondo (commercial quarter of Manila) to sell them to the Chinese ironmongers. In the village of Malolos I met one of the partners in this little business—a Spanish half-caste—who told me that it paid well in proportion to the trifling outlay of capital. If the natives chose to bring in mineral they were paid for it; when they did not arrive, the works and expenses were stopped meanwhile.

List of Consular Districts where no Deposits of Iron Ore are reported.

EUROPE.	AFRICA—cont.	AMERICA—cont.
BELGIUM :— Antwerp.	FRANCE (Possessions of) :— Réunion.	NICARAGUA. :— URUGUAY :— Monte Video.
DENMARK :— Aarhus. Copenhagen.	PORTUGAL (Possessions of) :— Beira. Cape Verde Islands. Madeira.	UNITED STATES :— Boston.
FRANCE :— Aisne and Ardennes. Amiens. Brest. Dunkirk. Nice.	SPAIN (Possessions of) :— Teneriffe.	VENEZUELA :— Caracas.
GERMANY :— Breslau. Cologne. Leipzig. Stettin.	TURKEY (Possessions of) :— Benghazy. Tripoli.	ASIA.
GREECE :— Corfu. Volo. Zante.	AMERICA.	BORNEO :— Brunei.
HOLLAND :— Rotterdam.	ARGENTINE REPUBLIC :— Rosario.	CHINA :— Canton. Shanghai.
ITALY :— Brindisi. Genoa. Palermo. Venice.	BRAZIL :— Para. Pernambuco.	COREA :— Chemulpo.
PORTUGAL :— Azores.	CHILE :— Iquique.	JAPAN :— Nagasaki. Tainan. Tamsui.
RUSSIA :— Moscow. Riga.	CUBA :— Cardenas.	PERSIA :— Bushire.
SWITZERLAND :— Geneva. Lausanne.	DENMARK (Possessions of) :— St. Thomas.	TURKEY IN ASIA :— Beirut. Bussorah. Jeddah. Trebizond.
TURKEY :— Salonica.	ECUADOR :— Quito.	ISLANDS IN THE PACIFIC.
AFRICA.	GUATEMALA :— Quezaltenango.	FRANCE (Possessions of) :— Tahiti.
EGYPT :— Alexandria. Cairo.	HAYTI.	SAMOA :— Tonga.
	HOLLAND (Possessions of) :— Curaçoa.	UNITED STATES (Possessions of) :— Hawaii.
	HONDURAS :— Amapala.	

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