

- The amount of employment and the attraction which this would offer to labour in the various processes of boring, refining, tinning, casing, transit, and shipping.
- The fostering and enhancing the returns of other existing Colonial industries.
- The production of a valuable commodity entering largely into ordinary consumption, for which large sums are annually expended in foreign markets, which would thereby be retained and circulated in this country.
- An addition to the exports of this Colony, largely increasing the tonnage of shipping trading with New Zealand ports, and giving an impetus to various commercial interests.
- That the successful initiation of this company would be probably followed up by the establishment of many more; the surface indications pointing to the existence of petroleum over an extensive district towards the East Cape.

Taking into consideration the liberal policy of the Government in fostering the opening up of various new industries, none of which present a greater claim to consideration than this, we would respectfully submit that similar encouragement be offered to this, by a bonus of such an amount as your honorable body shall deem fit to recommend for appropriation by Government on the production of a stated quantity of rectified oil.

We have, &c.,

The Provisional Directors of the Poverty Bay

Petroleum and Kerosene Company (Limited),

Per ANDREW GRAHAM, Chairman.

The Chairman, Colonial Industries Committee, Wellington.

No. 2.

MEMORANDUM by DR. HECTOR, relative to the Iron Ores of New Zealand.

ALMOST every known variety of iron ore has been discovered in the Colony, but none have yet been successfully worked, chiefly owing to the want of enterprise and practical acquaintance with the subject.

Until lately, the amount of iron required in the Colony has also been limited, and imported iron has been cheap; but the recent rise in price, and the demand for rails and other ironwork required in connection with the public works now in progress, are causing attention to be directed to this branch of our natural resources.

For the purpose of classification the iron ore may be divided into *Granular* and *Massive*, the former group including all the varieties of iron sand (which have always had great, and, I think, undue, prominence given to them in New Zealand); and the latter including all the ordinary ironstones, occurring either as stratified masses or as vein-stones.

I. *Granular Ores or Iron Sand*.—Iron sand, or black sand as it is usually termed, is found in every part of New Zealand, there being few soils or stream gravels that will not yield a considerable quantity when washed in a pan in the same manner that the gold diggers prospect for gold. The chief deposits are, however, to be found on the sea shore of the west coast of both Islands, the best known deposit being that at Taranaki, where the shore between tide marks is, for many miles, almost wholly formed of this black iron sand, to the depth of several feet.

Several companies have been formed, both in England and in the Colony, to manufacture steel from this iron sand, and very considerable sums have been spent, but as yet without success. Lately, a large extent (about five miles) of the beach has been leased to a new company, and they are now erecting furnaces. At the Manukau Heads, near Auckland, a similar deposit of iron sand has also been worked, but the company failed.

Before describing the processes which have been employed, and those which are adapted to this class of ore, a few words may be said on the variety of mineral compositions it presents, and the geographical distribution of those varieties, which is somewhat singular.

Samples from twenty-six different localities have been analysed, as shown in the appended Table I. The iron they contain is present as magnetite ($\text{Fe}_2\text{O}_3 \cdot \text{Fe} \cdot \text{O}$), hematite (Fe_2O_3), or as titaniferous oxide ($\text{FeO} \cdot \text{Fe}_2\text{O}_3$). The acidic rocks, such as the granite of the South Island and trachytes of the North, have been the chief source of the magnetite. The metamorphic schists afford the drifts abounding in hematites or specular ores, while the titanic oxides are derived from the diorites and basaltic rocks.

These observations give a fair indication of the formations where, in future, the different ores may be looked for in the massive form.

The various methods which have been proposed for working these iron sands were described in my evidence before the Colonial Industries Committee last year as follows:—

“Iron sand was first worked in 1842 by Mr. Horne, a steelmaker and cutler in London, who extracted 60 per cent. of malleable iron from iron sand obtained in America, and which he converted into steel. The Japanese and natives of India have also long used iron sand as ore for the production of a fine quality of malleable iron for conversion into steel. Patents were granted for producing cast steel direct from these sands in crucibles, being, in fact, an extension of the ordinary method used in the laboratory; but it was not found possible to produce uniform results on a large scale. In 1845, Heath proposed to reduce ores such as iron sand by the addition of a small proportion of charcoal, and thus produce a spongy mass of malleable iron, which was then plunged in a bath of molten cast iron, in a proper proportion to make steel of the compound. A modification of this process is now in use in Sweden, but requires the use of crucibles. In 1868, Leckie, of Montreal, proposed to mix the iron sand up into a lump with charcoal, and place it in a hearth at the back of a bath of molten cast iron in a reverberatory furnace. After the reduction, the lump was to be tipped into this bath. This was an attempt to work with a single furnace without crucibles, and by a continuous process. It does not yet, however, appear to have been a success. In 1868, Ellerschausen proposed to decarbonize pig iron