IV.—CHEMISTRY.

Art. XLIII.—*On the Manganese Deposits of the Auckland District.*

By J. A. Pond.

[*Read before the Auckland Institute, 17th December, 1888.*]

The existence of manganese in various parts of this district has been recorded for many years, but it is only during the last ten or twelve years that any large quantity of it has been dealt with commercially. It was first mined on a large scale at Waiheke, and next at the Bay of Islands, since which considerable quantities have been sent from Whangarei. The mines at the Bay of Islands, and also at Waiheke, have been worked extensively, and have yielded a large tonnage of excellent ore while under the successive managements of Mr. Stovin, Captain Phillips, and Mr. Kersey Cooper. At the former place the chief workings were connected by a wire tram with the water, the motive-power being obtained from a stationary engine secured upon a moored punt, the manganese ore being discharged into punts, from which it was transferred to vessels for transmission to Auckland, the shallow water of the bay making it necessary to adopt this tedious method of loading. At Waiheke the ore was carted for some distance to the water's edge, where it was placed directly in the cutters and transferred to Auckland. At this port the ore was discharged into homeward-bound vessels, where it was of value in stiffening the ships which were loading home with wool, and was consequently taken at low freights, proving a valuable ballast owing to its high specific gravity.

In the mines the ore was found in bunches sometimes yielding several hundred tons of ore, which was brought to the dressing-floor and carefully picked over, as it was seldom possible to ship it direct owing to nodules of hæmatite and clay-masses, together with a good deal of siliceous gangue—the "flucan" of the miners—which tended greatly to reduce the value of the ore unless removed. Sometimes this siliceous gangue was stained black by the peroxide of manganese,

and unless great care was taken, and skilled workmen employed, a great deal of this material found its way into the parcel.

As this ore is always purchased upon its assay-value, and every effort is made to obtain a true average sample of the bulk, it will be seen how necessary it was to have the ore as free as possible from foreign material; and, owing to the soft, black, unctuous portions of the ore staining the accompanying worthless material, it was not always possible to do more than free it from a portion of the gangue.

The deposits of manganese ore hitherto worked have been located solely in the manganiferous slates, where they occur, as already mentioned, in irregular patches or bunches, sometimes having for a distance the appearance of a true lode, but seldom for any extent, the irregularity of its borders breaking off without continuance, though occasionally some more extended offset would be carried to another bunch. This peculiarity of the ore has made the mining of it a matter of great difficulty and anxiety.

As I have already mentioned, the mines hitherto worked have been solely in the slates; but this ore occurs in many other parts of the district than those already mentioned, notably at Kawau, where specimens of very fine ore have been obtained; again, at the island of Pakihi it has been mentioned as occurring in large quantities, by Professor Hutton.* I have also found it in the Mareatia district, where I have no doubt it will be found in sufficient quantities and richness to make it of commercial value. It is also known to be present in the hills to the west of Waipu, where it may be seen outcropping on the track between that village and the caves. Still further north it is found in larger and smaller quantities between Whangarei and the Bay of Islands, and, again, in the vicinity of Mongonui. There is no doubt that large deposits of this ore will be yet discovered when it becomes of sufficient value to warrant extensive prospecting.

The manganese shipped from this port is chiefly psilomelane, though some very fine specimens of pyrolusite have been obtained from Whangarei. From this part of the district—Parua Bay—some samples containing very high percentages of peroxide have been lately shipped.

The necessity of shipping nothing but high-grade ore is on account of the home market requiring nothing below 70 per cent. of peroxide when purchased for bleaching purposes, as the consumption of hydrochloric acid for the manufacture of chlorine is less the higher the percentage of peroxide present

* "Trans. N.Z. Inst.," vol. i., p. 168.

for a given quantity of chlorine; and, as it is purchased on the assay-value of peroxide present, the freight and shipping charges are proportionately less to its value. In this case, however, we are viewing the percentage of peroxide, and this alone is of value for bleaching purposes; but during the last few years an extensive demand has sprung up for manganese for the purposes of producing an alloy with iron to form spiegel, manganese bronze, &c., and in this demand the form of oxide in which the manganese is present is not of so much moment as the extent to which the metallic element itself is present is concerned. Hence the lower oxides of manganese are available for this purpose; but in this case it is required to be as free as possible from phosphorus, sulphur and earthy matter, silica, &c. Both of these elements—phosphorus and sulphur—are pernicious in the manufactured spiegel, and every effort is made to procure samples as free as possible from these objectionable materials; the objection to the silica being chiefly on account of the loss of iron in the process of fusion, by the combination of silicate of iron in the slag. Frequent inquiries reach me from England as to the presence or otherwise of cobalt in our manganese ores, while sometimes I am asked as to the presence of a payable percentage of copper. Hitherto I have not found cobalt in these ores beyond traces, though I have found it in combination with the manganese wads, a matter which I have already brought before the Institute. With regard to copper, I have not found it in combination with any of the ores examined by me, though I have made analyses of several samples brought to me and purporting to be copper-bearing.

The effort to ship only high-class ores has resulted in such samples being fairly free from gangue in some instances, though in others they reach 20 per cent., the iron-oxides present varying from 4 to 10 per cent. In a few instances I have examined these ores for phosphorus, and find it present to the extent of from 0·188 to 0·3 per cent., though it may very probably run higher in some samples.

By the advance of scientific research, and adaptation of knowledge so gained, means have been found in the manufacture of bleaching-powder, in which the great bulk of the manganese is used, to recover the spent ore, and re-utilise the material an unlimited number of times.. The cost of this recovery, however, is at present a known quantity, and this cost largely governs the market-value of the ore. In consequence of this the price of manganese has greatly receded during the last few years, and it is now not much more than one-half the value of its selling-price in the London market during 1880–82. This has naturally largely governed the output of our district, which at one time promised to

become a considerable item. The shipments for some years are as under:—

Year.	Quantity in Tons.	Value.
1878	... 2,516	... £10,416
1879	... 2,140	... 8,338
1880	... 2,611	... 10,423
1881	... 1,271	... 3,283
1882	... 2,181	... 6,963
1883	... 318	... 808
1884	... 601½	... 1,716

Another factor which will probably determine the shipment of a much smaller quantity than formerly is the carriage of goods to New Zealand by steamers, to the displacement of sailing-vessels, the latter alone requiring ballast.

In the event of other demands arising, and so causing an increase in the price of manganese ore, it is probable that an impetus will be given to its production here, in which case the reduction of the cost of producing it would become a necessity; hitherto the tools and means of dressing it being of the simplest, while the high price of labour and cost of exploitation has proved inimical to its competing with other parts of the world which also produce it in large quantity and of fair percentage—notably Spain, Russia, and Italy.

Art. XLIV.—*On the Occurrence of Tellurium in the Thames Lodes.*

By J. A. Pond, Colonial Analyst.

[*Read before the Auckland Institute, 22nd October, 1888.*]

In the year 1884 I received some rich stone from Mr. E. H. Whitaker, whose assay showed it to contain silver to the extent of 3,928oz., and gold 234oz. to the ton. This was from the Moa Claim, at Te Aroha. The suggestion to examine these specimens for tellurium was given by Sir James Hector, to whom I submitted them, and who confirmed the fact of tellurium being present on his return to Wellington. In the meantime I had determined the constituents of the ore, the analysis of which I append.* This exceptionally rich stone naturally led to further investigation of the ground, showing that it occurred in exceedingly narrow veins, occasionally widening to the width of an inch, or slightly more. In the richer portions the telluride is accompanied by anti-

* Analysis not received.—Ed.