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Literature.

A True Description of Lake Superior Country; also a Minute Account of the Copper Mines.
By John R. St. John.—New York, 1846.

(Concluded from last number)

MINERAL VEINS.

[It will be necessary to keep the relation which the rocks and veins traversing them, have to each other, constantly in view.]

Veins are intersected with other veins, and sometimes with veins of other metals at both acute and right angles. Two lines approaching each other, generally have a large deposit at their confluence. It is a good sign if the branches or lodes enlarge in width or depth, but if bad they are horizontal or rising. It is a sign of a poor vein if it separates or divides into strings and sharp extremities. It is even a worse sign when a vein descends perpendicular, than when it runs horizontal. Copper will pay for working when only six inches wide, and tin when only three inches wide, in the Cornwall mines. The richest depth for copper ore, in mines which have been worked, has been found to be from 40 to 80 fathoms, (from 20 to 60 for tin,) although great quantities may be raised at 80 to 100 fathoms, yet the quality decreases, and the ore is too apt to be decayed. The veins of the Cornish mines run East and West varying some 15 degrees. The veins of Lake Superior run N.E. and S.W., with slight variations.

True Veins.—The northwesterly range of hills, commencing at the extremity of Keeweenaw Point and stretching in a S.W. direction into the interior, are more clearly of the trapose origin than either of the other ranges, and the rock of the southerly portion of this range is greenstone, while that of the northerly flank is almost invariably either an amygdaloid or a rock approaching to toadstone.

So far as the hills lying south of this northerly range are concerned, they would appear to be as a whole deficient in minerals, and the rocks are not apparently intersected by veins or dykes of any more recent date than that of the uplift of the northerly trap hills, near the Lake.

Veins of a date posterior to the uplift of the trap rock last mentioned are of frequent occurrence, and traverse a portion of the trap range, pass into the conglomerate and sometimes completely across the three sedimentary rocks, immediately above the trap, for an unbroken length of several miles, rarely varying more than 12 or 15 degrees from a right angle to the course of the sedimentary rocks, cutting across the dyke and conforming to the dip of the sedimentary rocks. These veins all belong to a single epoch and must be regarded as *True Veins*, and all carry the same mineral contents; and, from examinations, it is confidently believed that most, if not all, the metalliferous veins of the upper peninsula or Lake Superior regions belong to the epoch of those under consideration. It is true, native metals (particularly copper) are found in places in the greenstone, but the quantity is small and almost always may be traced to a connection with metalliferous veins in the vicinity.

Native copper in very thin plates was occasionally noticed as occupying the joints of

the greenstone of Isle Royale, though in small quantities, but the veins so far as examined there are less perfectly developed in their passage across the conglomerate, and very rarely contain any traces of zinc.

In speaking of the greenstone, Dr. Houghton says, "I not only include the true greenstone, but also those altered forms of gneiss and gneissoid granite which are sometimes associated with it, while the outer or northerly portion of the same range is usually composed of an amygdaloid form of trap."

IRREGULAR, FALSE VEINS.

After perusing the following chapter, the reader will have perceived that the condensations from Dr. Houghton's report ceased with the last, which treated of *Regular Veins*.

I write this chapter in the hope of inducing more thorough examination and minute investigation into *Irregular Veins*. The great bane and loss in mining operations is the vast amount expended and thrown away upon *irregular or false veins*, which proceeds from lack of power or knowledge to decide between true and false ones. This the reader may call a "conglomerate" chapter, if he will. If the suggestions it contains shall induce investigation of the subject, their object will be fulfilled, whatever may be thought of their *philosophy or orthodoxy*. Against any arraignment for either I here enter my caveat, that one possibility is just as good as another in defining the probable results of an *indemonstrable* proposition.

Where veins intersect the lake's shores, they are almost invariably marked by the appearance of the white spar covering, which in many instances are several feet wide, and may be traced by eye into the water thirty or forty feet in depth. Several of these wider ones occur between Copper and Eagle Harbours, in which, when the spar has been removed, boulders and ragged deposits of native copper have been found of various sizes. And from one on the conglomerate edge of the shore, on lease 15, belonging to the Boston Company, I saw already taken out two pieces of native copper, one weighing 800 lbs., the other some 60 lbs., which were cut off with chisels and sledge hammer from an imbedded sheet, four inches thick at the place of detachment, leaving the imagination to fix its own estimate of the quantity or extent of that portion remaining in the vein. Scientific men have heretofore contended that native copper existed only disseminated and as boulders. Here, at least, it appears in a sheet, but to what extent can only be determined by working.

In some of these veins, as at Agate Harbour, different kinds of ore, or, I think, different stages of advance from ore to native copper, are found,—such as the mother of ores, glass, green carbonate, and black sulphuret, all taken from the same vein. This vein and the one from which the native copper spoken of above was taken, are but one mile apart.

Native silver and native copper are often taken out attached to each other. Some of the veins, by the reports of analyzers, have a preponderance of silver ore. The copper from the same vein or rock.

Irregular Veins are of very frequent occurrence as well upon the surface as below it, which often present the best appearances, and afford specimens very likely to deceive the

novice in exploring and mining. There may be injections into a crevice only, which extend but a short way in depth or length; and though well filled while the cone raised by the interior pressure continued, and during which all the crevices were wide below in proportion to their depth, and would, had this great cone had its apex attitude, been well-filled veins, no doubt leading to large deposits like *true veins*; but by the subsequent action they are not; for that cone's fallen and depressed apex is now the synclinal axis of Lake Superior, to which the strata around it dip. When the gas by which it had been swelled forth found vent and escaped, it carried forth in the explosion those boulders of primitive rock and native metal found in all directions, and then, following, forth rushed the conglomerate, and found its level around the trap-hills, which, with fire above and fire beneath, were softened—then it was amygdaloid, greenstone, and trap were blended, and then was the native copper disseminated, more in some places than in others, according to the heat and supply of the ore. The apex or cone raised by distending the earth, unsupported at the escapement of the cause, gradually settled back, sinking lower and lower as the interior heat and pressure abated, and the matter in cooling contracted, closing first upon the surface, and shutting, as they descend, the seams and crevices opened by the expansion. The closing of those seams, veins, or crevices, in this way, compressed and forced down their contents as far as they closed. Failing, however, to resume their places in many instances, have left to unknown depths *true veins*, defined by the wall rocks, which, though shewing they have been rent asunder, are also smothered by the action of heat. In some instances, there is but one defined wall rock, while the other side is filled with native copper, disseminated throughout, as at the deep shaft of the Eagle River. In other cases, as in the Pittsburgh Company's drift, three miles back of Eagle River, both sides are workable, and the metal is disseminated in the general rock, showing that the rock had been so heated as to either take up the copper when coming in contact, or to smelt such portions of the ore as it might have possessed in its organization, the latter of which is rather sustained by the frequent occurrence of toadstone, showing that something has passed away as a gas. By this it will be readily seen why miners follow a vein that widens as it descends, even though no ore be immediately found, and discard a vein that contracts, or runs up, or even horizontal. Their experience has taught them the results to expect.

THE PLEASURE TOUR.

When I left Copper Harbour, on the 25th October, arrangements were making for the completion this winter of a waggon road from Copper Harbour to Eagle River. By letters received within a few days, I learn that the contemplated road is now finished between Copper and Agate Harbours, nine miles, and rapidly progressing towards Eagle River. Preparations are making to run a stage daily between Copper Harbour and Eagle River. The workmen, I also learn, are engaged in erecting public houses at Copper Harbour and Eagle River, and no doubt Eagle and Agate Harbours will be also supplied.