

# TWO NOTABLE MINING INDUSTRIES OF LANCASTER COUNTY

By H. Luther Willig

While the bounteous harvests of her fair fields have made Lancaster County as the "Garden Spot of Pennsylvania" her past mining industries have added additional luster to her name through the discovery of the rare minerals, millerite at the Gap mine, and brucite at the Wood mine, discovered and operated at these points. Prof. Herbert H. Beck, in his Minerals of Lancaster County, states that these minerals have done more to bring into academic circles of the world the name of Lancaster County, Pennsylvania, than any other natural feature within her boundaries.

To record, therefore, this important phase of the past industrial activities of the county, which have in a large measure contributed to its great wealth, and which as one of its aspects stands unique in the mining history of the United States, (namely, a mine and furnace producing nickel on a large scale,) is the object of this paper.

In order to understand the circumstances which led to the discovery of nickel at the Gap mine, reference must be made to the previous mining of copper at that point.

The earliest mining operations recorded in Lancaster County, within its boundaries as now constituted, is that of the Gap Copper Mine, Bart Township, which was discovered about the year of 1718. As a comprehensive history of this mine already appears in the records of the Lancaster County Historical Society, Vol. 1 page 283 prepared by the late R. J. Houston, no further reference will be made to the mining of copper at this point except in its relation to the subsequent operations in the mining of nickel.

Sometime during the year 1849 a company was formed known as the Gap Mining Company, which reopened the Gap mine operating it as a copper proposition. That the ore body in addition to copper also contained nickel was not known at that time; although in the mining of copper large quantities of mineral the identity of which was not recognized and called by the miners "mundic", mineralogically an iron sulphide, was being mined along with the copper and thrown on the dumps as worthless. In 1852 Mr. Charles Doble a miner who afterwards became superintendent of the mine and to whose report to Persifer Frazer, Jr., State Geologist, the writer is indebted for the data here given, discovered and made known that what was called mundic and which was being discarded as worthless was not mundic but some other mineral; what it was he did not know. This discovery led to samples of the unknown substance being sent to chemists in Boston and Baltimore for analysis. The result of their analysis was however unsatisfactory, the identity of the mineral being undetermined. In the latter part of 1852 or 1853 a sample of the ore was sent to Prof. F. A. Genth of the University of Pennsylvania, an eminent chemist of his day, who made an analysis and reported it to be nickeliferous pyrite, giving the percentage of nickel as being from two to three per cent. together with a trace of cobalt.

The identity of the unknown ore having been established, the mining of copper was discontinued, the Gap Mining Co., confining their operations to the mining of nickel ore which was sold to a separate smelting company in Philadelphia. A year or two afterwards an independent company erected smelting works about three-quarters of a mile north of the mine purchasing the ore from the Gap Mining Company. This venture did not prove profitable and after several changes in ownership the Gap Mining Company, in 1859 purchased this furnace and smelted their own ore. In

1860 finding that neither the operations of mining or smelting or both could be carried on at a profit all activities were suspended.

In 1862, the property having remained idle for nearly two years, with the mine full of water, the machinery rusted and the stack and furnace in crumbling condition Mr. Joseph Wharton of Philadelphia bought of the Gap Mining Company, their entire interests consisting of the mine, smelting furnace, eleven roasting kilns together with all the machinery. He at once began repairing the machinery, rebuilt the furnace and stacks, unwatered the mine and in the following spring 1863 commenced the operations of mining, smelting and refining of nickel.

The mine was opened out on the vein by shafts and galleries, being worked to a depth of 235 feet with the galleries about 2,000 feet in length, there being six vertical shafts ranging from 100 to 235 feet in depth and several others from 60 to 80 feet deep.

The ore body was found associated with a dark colored highly crystalline hornblendic rock very hard and difficult to mine, large quantities of which had to be mined and hoisted with the ore. The ore after being mined was brought through the galleries on small cars to the shafts and hoisted to the surface where it was prepared for the smelter; the large material being crushed with sledges while the finer stuff was washed and cobbled. The ore was then hauled to the smelting furnace where it was first put through a Blake rock crusher after which it was placed in the roasting kilns and ignited to expel the sulphur. By reason of the high sulphur content it continued to burn from four to five weeks without the addition of any other fuel. After cooling it was charged into the smelting furnace where it was treated for the production of a slag which was drawn off above after the metalliferous product, technically known as nickel matte, had settled below. The matte after having been run into big moulds and cooled was then reduced to a coarse powder by means of a powerful Cornish crusher and forwarded to the American Nickel Works at Camden, N. J. owner and operated by Mr. Wharton, where it was refined. The pure nickel was worth from \$2 to \$3 a pound. In addition to pure nickel the American Nickel Works manufacturing nickel oxide, nickel alloys, nickel salts, nickel castings, metallic cobalt, cobalt oxide, cobalt salts, blue vitriol, etc. The monthly output of the mine and smelted ore was 636 tons.

The following statement of the operations giving the quantity of nickel ore taken from the Gap mine was prepared for the second Geological survey of Pennsylvania by Mr. Wharton:

1. By the Gap Mining Co., 1858 to 1860.....38,000,000 lbs.
2. By myself, 1863..... 4,500,000 lbs.
3. By myself, Jan. 1, 1864 to Dec. 1, 1874.....92,153,364 lbs.

Items 1 and 2 are not strictly accurate, as no account can be found showing the Gap Co.'s work and my operations in 1863 were tentative and irregular, but they are approximately correct. Item 3 is correct."

This important industry during the period of its greatest prosperity employed 143 workmen of whom 93 worked in and about the mine and 50 at the smelter.

In 1877 the working force was reduced one-third with a corresponding reduction in production, due to business depression, and in consequence complete cessation of activities was contemplated. Operations, however, were not entirely suspended until 1893, the suspension being directly attributable to the activities of the International Nickel Co. of America, strong competitors in the production of nickel. This company had acquired and were operating on a large scale at Sudbury, Canada, a large deposit of nickel ore discovered in 1856, but which had not been developed until about thirty years later. The Sudbury ore while identical in character with that of the

Gap mine contained a much lower nickel content, some of it containing but a very small fraction of a per cent. (Pratt U. S. Geol. Survey, 1904). This difference in percentage content was, however, offset by the lower cost of production. While the Gap mine was a deep mining proposition, that of Sudbury was an open working, operations being carried on by means of steam shovels.

This decided advantage compared with the methods as practiced at the Gap mine, together with the obsolete pumps and machinery rendered further operations unprofitable and the final closing down of the mine, the entire property being disposed of by Mr. Wharton to his competitors.

## CHROME MINES

The chrome mines of Little Britain and Fulton Townships enjoy with the Gap nickel mine the distinction of being unique, the Wood mine in Little Britain at one time being the largest source of chromium in the world. (Knopf Chrome ores in Pennsylvania and Maryland, Geol. Survey Bull. 725-B pp 81).

The various chrome mines in the county being identical in their character, the history of the Wood mine, the largest and most widely known will alone be considered in detail. However, reference to the ownership and output of the other mines will be made.

Wood mine was discovered in 1827 by Isaac Tyson a manufacturing chemist of Baltimore, Md., who was engaged in the manufacture of epsom salts, using for this purpose the mineral magnesite, or carbonate of magnesia, found in the serpentine ridge at Bare Hills, in the vicinity of Baltimore. Following up this ridge into Lancaster County in search of additional raw material he discovered a number of deposits of chrome ore of considerable commercial value, the largest deposit being located on the land of Jesse Wood, in Little Britain Township. Here he began mining on an extensive scale, and operations assuming such proportions that he was led to abandon the mining of magnesite and eventually the manufacture of chromium compounds became the principal products of his firm. Business considerations led to the endeavor to monopolize the production of chrome with the result that the Tyson Mining Co. controlled the principal chrome mines of the United States (Do. p 87). This company held the monopoly on production until about 1895.

The mine was opened by means of shafts and levels, to a depth of 720 feet, each level being sixty feet below the one preceding, the galleries being about 1,000 feet in length. The ore was hoisted by means of power obtained from a turbine located on the Octoraro Creek about 300 yards from the mouth of the pit.

About five per cent. of the ore was crushed and washed, the remainder being sufficiently free from gangue to be shipped without crushing. The average run of the ore contained 48 per cent. of chromic oxide, although ore running as high as 56 per cent was met with. (Pa. 2nd Geol. Survey Rept. C 3 p 177-1880).

The ore was hauled by teams to Rising Sun, Md. from which point it was transported by rail to Baltimore where it was treated, the resultant products being the various chromium compounds extensively used in dyeing, calico printing and the manufacture of pigments. The output of this mine was reported to have been from 400 to 500 tons a month before 1868. After the Civil War its output was reduced to from 400 to 500 tons a year. (Knopf Chrome ores in Penna. and Maryland Geol. Survey Bull. 725-P p 87).

The mine was worked continuously from the time of its discovery until 1868 when operations were suspended and in consequence the mine was flooded. Sometime in 1875 the mine was unwatered by means of a steam

pump, and operations resumed on a reduced scale. Operations were finally suspended about 1882 due either to the fact that sufficient ore was not being found to render further operations profitable or the fact that the California ore could be landed at a less cost.

The following chrome mines were operated in Fulton Township. Line Pit, so called for the reason that the Maryland and Pennsylvania State Line passed through the middle of the shaft opening, Lowe mine, Red Pit, Little Horse Shoe, Jenkins, Reynolds and Rock Springs. All of these mines are located in almost a direct line running in a northeasterly direction from Line Pit to the Rock Springs Church. As Line Pit is probably the best known its operations will be recorded from the data at present available. As Isaac Tyson had an interest in this mine it was evidently operated at a comparatively early period. Operations were carried on here in a manner similar to that of Woods mine by means of shafts and galleries, being worked to a depth of 240 feet. The total output of the mine was about 700 tons.

The following article in the Oxford Press, Chester County, dated February 9th, 1870, by Dr. C. H. Stubbs furnishes additional information relative to the status of the chrome industry in Lancaster County at that time.

"Andrew Lowe and Benjamin Gibson opened a mine of chrome near State Line and obtained a large quantity of the mineral realizing considerable wealth therefrom. The Line Pit was opened and worked by other parties with success. The Jenkins mine and all others were the surface indications were favorable fell into the hands of the Tysons and were wrought at different times with varying success. At present all the mines in Fulton Township have been abandoned.

Prof. Genth in his report to the Geological Survey of the county thus summarizes the condition of the chrome industry in Pennsylvania.

"Some of the chrome mines which have been explored to some extent look favorable for future supply, others are completely exhausted and the entire lenticular deposit has been removed but no matter what the value of the mines may be, as long as the best quantity of chrome ore can be brought from California or Siberia for less than the production of ours would cost, there is no prospect of reviving the mining operation for these ores." Quoting further he says, "From the best and most reliable information which in the absence of records, I could obtain, and, which is certainly an approximate to the truth, the following quantities of chrome ore have been mined in Pennsylvania:

"Lowes Mine or Line Pit, depth 240 feet, about 700 tons.

Red Pit, considered the best mine except Wood's.

Rock Spring Mine, over 200 feet deep, Much Birds Eye Ore, about 1,000 tons.

Little Horse Shoe Mine, 30 tons.

Woods Mine, depth 700 feet, galleries about 1,000 feet long, 120,000 tons.

Carters Mine, depth about 200 feet, 400 tons."

## On the Preceding Paper

Since 1918 it has been my good fortune to accompany many of the most eminent mining engineers in the world in surveys of these chrome lands. Without exception these authorities expressed the opinion that this is the richest known chrome deposit in America, and that instead of being exhausted the surface has only been scratched. Upon completion of a survey for the Bethlehem Steel Company, Mr. Merriweather, the chief mining engineer for that corporation, reported that in his opinion there is sufficient chrome on what is known as the Peoples' tract to last America for the next hundred years. Three of the noted mines are located on this tract, namely, the Line Pit, Red Pit and Rock Springs Pit. Practically a straight line drawn from the first to the last will pass through all three. The distance from the Line Pit to Rock Springs Pit is about a mile, the Red Pit being located half way between the two. In 1919 sixteen diamond drillings between the Red Pit and Rock Springs Pit struck chrome sixteen times, once within five feet of the surface.

Every one of the mining engineers with whom I was associated was of the opinion that eventually these deposits will be worked on a large scale. My own experience leaves no doubt in my mind that the only reason they are not in operation now is because of the adverse influence of certain of the large corporations that have been trying to get control of the mineral privileges.

When the United States entered the World War it was suddenly confronted with a metallurgical situation that in effect prohibited the manufacture of heavy ordnance and of armor plate for battleships. Chrome as an alloy with nickel is used for these purposes. For years virtually all the chrome used in the United States was imported from Rhodesia, Africa, and the supply on hand when this country entered the war was negligible. It is true that a small quantity was still coming from California mines, but this was of an extremely low grade and only fit for refractory purposes. Mr. Buck, the first vice president of the Bethlehem Steel Company, told me that the reason America borrowed its ordnance from England and France was because of the lack of chrome we could not make a cannon that was not less dangerous to the Germans than to the Americans.

Being apprised of this situation I volunteered some information regarding the local deposits. I discovered that the mineral rights were owned by the Octorara Water Company, a subsidiary of the Pennsylvania Railroad Company, and further learned that the company did not know that it owned them. In consideration for the service in recovering these properties for the Octorara Water Company I was promised the lease for the mineral rights, to be executed as soon as a fair basis for royalty could be ascertained. The Bethlehem Steel Company learning of the arrangements, entered into a gentlemen's agreement with me to the effect that if I would not let any other parties into the operations it would supply the capital and conduct the operations, with the proviso, however, that the report by Mr. Merriweather should be favorable. His report could not have been better. In the meantime officials of the Pennsylvania Railroad Company advised me that the Bethlehem Steel Company was exerting all the influence at its command to secure the lease which had been promised me, and on the day my lease was signed the Bethlehem Steel Company had one there with the expectation of having it executed.

The Bethlehem Steel Company, not being a mining company, turned its agreement with me over to the Electrical Metallurgical Company, an allied corporation with the Bethlehem company. A contract was drawn up which I refused to sign, because it did not contain what is known as the five miners'

clauses, and without these, as Mr. Merriweather had previously advised me, I would never receive a penny regardless of how great the profits of the venture should be. The discussion over the contract continued until the Bethlehem people felt sure I would lose the lease by default, when Mr. Chisholm of the Electrical Metallurgical Company told me that they now had me foul, that I would lose the lease and the Bethlehem Steel Company would get it direct; further, that a new chrome field had been discovered in Canada and they could, therefore, get all the chrome they needed independent of the Pennsylvania lands. Briefly stated the Pennsylvania Railroad officials declined to ~~cancel~~ my lease and to the present time have refused to consider the propositions from the other parties.

Two years later Mr. Chisholm came to Lancaster with the purpose of renewing negotiations, accompanied by Mr. Rascovitch, the superintendent of the chrome mines in California. Chisholm stated that they had spent \$75,000 in Canada without producing a pound of chrome. I accompanied Mr. Rascovitch on a survey of all the local chrome lands. He was even more sanguine than Mr. Merriweather over the quantity and quality of the deposit, stating that all the known fields in California were practically exhausted.