"The Cliffs Shaft Mine, Ishpeming, Michigan: A Case Study in the History of American Iron Mining, 1844-1967,"

William H. Mulligan, Jr.
Murray State University

Presented at Third International Mining History Conference and Symposium on the Preservation of Historic Mine Sites, Golden, CO, June 6-10, 1994.

The Cliffs Shaft Mine in Ishpeming in Michigan's Upper Peninsula has an important place in the history of the Lake Superior and nationaliron mining industries and the mine site survives as the best preserved most complete, example of an underground iron mining site on theMarquette Iron Range and in the entire Upper Peninsula. It was the largest and longest-operating underground, direct-shipping, hard ore mine in the Lake Superior Region and the United States, producing nearly 29 million tons of ore from 1848 to l967. Its hard, specular hematite ore could be shipped directly for use because of its low moisture content. Other qualities were also highly desirable and for manyyears it was the bench mark against which ore prices were set - much like East Texas light crude oil in the petroleum industry.

The south shore of Lake Superior, now the Upper Peninsula of Michigan, was a remote and little explored place when Michigan was finallygranted statehood in 1837. Although first settled by the French in the seventeenth century the western two-thirds of the peninsula had not even been part of the Michigan territory until it was added to Michigan as compensation for the loss of the "Toledo Strip" when the final boundary between Michigan and Ohio was drawn. Few in the new state were enthusiastic about the distant - Detroit is closer to Washington,DC than it is to the western end of the Upper Peninsula - and little known area. One of the first orders of business in the new state was to authorize a geological survey. One of the primary aims of the survey was to determine just what was in the Upper Peninsula that might haveeconomic value; another concern was to locate salt springs which the state could set aside for itself under the statehood legislation. This survey, initially led by Douglass Houghton who lobbied it through the initial session of the state legislature, began late in 1837 and continued despite struggling with limited funding until Houghton's death in 1845. In 1844 Houghton persuaded the Commissioner of the General Land Office of the potential value of a line survey of the public lands in upper Michigan that would also gather data on the geology,flora, and topography of the region and, when Congress appropriated the necessary funds, Houghton was put in charge of the work.

Houghton had already spent several season in the field in the region and suspected there were iron deposits as well as the copper reserves hehad described in his reports for 1841 and 1842 and directed the survey parties to do magnetic readings at the compass stations as they proceeded across the peninsular.

One of those Houghton recruited for this survey was William Burt. Burt had already developed a solar compass that allowed true lines to berun without concern for fluctuations in a magnetic compass. In September 1844 Burt was leading a party surveying in Township

47 North Range 27 West, near Teal Lake, and noted in his field book constant variations in magnetic compass readings. The variations continued andwhen the fog cleared to allow a solar compass reading the magnitude of the variations strongly indicated iron. All in the party were convinced there were deposits of iron, large deposits, in the area. Both Houghton and Burt produced reports that were avidly studied by those interested in developing the wilderness and Houghton's brother Jacob, who had been part of Burt's group, published *The Mineral Region of Lake Superior*, complete with detailed maps in 1846. This and Houghton's posthumously published final report firmly established Upper Michigan as a potentially rich area for mining development.

Interest in the region grew, although the copper and silver reported to the west by Houghton attracted more attention initial-ly. By the springof 1845 Philo Everett and a number associates had formed the Jackson Mining Company, named for the lower Michigan city in which it wasorganized. Exactly what happened next is so overgrown with myth and legend that it is impossible to disassemble fact from myth. In any event it makes a good story. While heading for the Lake Superior region to look for copper lands to claim for the Jackson Mining CompanyEverett met the niece of Marji-Gesick, a Chippewa chief. She described the "iron mountain" that Burt's party had located to Everett and he decided to visit Marji-Gesick, who was at Teal Lake, on his way west. There, the chief showed him large pieces of high quality iron ore among the roots of a partially overturned tree. Promising the chief a share in the proceeds of any subsequent mining venture he and his partyexplored the area and concluded that it was "a mountain of solid ore, 150 feet high. The ore looks as bright as a bar of iron just broken." Heand his companions collected several hundred pounds of sample ore and returned to lower Michigan.

Initial tests on the ores were not encouraging. Using the charcoal techniques common to the day did not result in usable iron. Later it wouldbe clear why, the iron content was too high. In spring 1846 the Jackson Company sent out a second party, after filing mining claims on the area. The collected a second set of samples. This time using a blacksmith's forge, rather than a charcoal furnace, a bar of fine iron was hammered out of the ore and the Jackson group abandoned any interest in copper and silver and prepared to develop their iron mining claims.

Initially the Jackson Mining Company intended not only to mine the ore, but to process it and developed a forge at the Carp River, several miles east of the mine. One reason for this plan was the challenge of shipping on the lakes because of the rapids at Sault Ste. Marie. Sincethe French had first come upon Lake Superior it had been necessary to unload all but the smallest boats and carry both the boats and their cargoes around the rapids. The Sault had grown up as a settlement after 1668 in large part because of its location. It was a good place for furtrading posts and for the transfer of ownership of furs, which needed to be unloaded anyway before proceeding down the lakes. Iron ore wasa different matter. Unloading, portaging, and reloading the heavy, bulky ore was a great deal of work and a relatively large added expense.In addition the irregular shaped ore posed handling problems as well. Converting the ore into iron could solve some, if not all of these problems. The higher value per pound would also bear the costs of shipping more easily. The difficulties posed by getting the ore to areas where it could be used also kept the early operations in the Lake

Superior region small.

While making iron in upper Michigan did not last, mining it did. The Jackson group's efforts attracted a great deal of attention and many other groups began looking near Teal Lake for iron and finding it. The Jackson Mining Company went on to become very prosperous and years later lost a court case brought by the descendants of Marji-Gesick seeking his share of the mine's profits.

What became the Cliffs Shaft Mine began as a number of smaller mines to the west of Teal Lake developed by people attracted to the area by the reports of the activities of the Jackson Company. The first of these, and the second mine on the Marquette Range, was the Little Mountain Mine opened by the Cleveland Iron Company in 1848. This was an open pit mine on an outcropping of the ore body just east of present-day downtown Ishpeming. In 1868 the Iron Cliffs Company, also based in Cleveland, opened the Barnum Mine, also an open pit mine, on the same ore body. The two companies opened a number of other open pit mines - the Cleveland, Incline, Sawmill, and New York - and it became clear that they had located a very large, rich body of ore.

It had also become much easier to move large quantities of iron ore to the markets below market. In April of 1855 the first locks at the Sault opened. It was now possible to ship ore directly to the point of use. Railroads connected the Ishpeming and Negaunee mines to the harbor at Marquette and from there, through the locks, the ore moved down to Detroit, Toledo, and most importantly to Cleveland (and then to Pittsburgh). The development of the Lakes shipping industry, particularly as it relates to moving iron ore, is another story, and an important one for the development of the mining industry not only in Michigan but Minnesota and Ontario as well. Ships became larger and larger and the methods of handling ore more and more sophisticated and efficient. As the national economy expanded with its appetite for iron ore expanding even faster, there were few obstacles to increasing production.

Using the then new technique of diamond drilling, the Iron Cliffs Company determined in 1879 that the ore body it was mining continued to the west under the city of Ishpeming that had developed to serve the needs of the mines and miners. Between 1880 and 1882 they sank two shafts to the west of the city, north of the Barnum Mine. Head frames, boiler and engine houses, and a blacksmith shop were also built and mining operations focused on the new site, formally named the Cliffs Shaft Mine. The Cliffs Shaft mine was sited entirely by diamond drill testing; there was no outcrop of the ore body as was the case in most Marquette Range mines. The tests had found ore 125 feet under the surface at the site that was developed.

The use of diamond drilling shows the changing scale of the industry and its movement from a pioneer phase to a corporate phase. No longer solely an area for entrepreneurs, prospectors, or speculators, the iron industry had stockholders and investors who wanted to insure the continuation of their income and who were prepared to make investments to do so. Who were also far more comfortable making decisions based on technical information. Iron mining was becoming a technical pursuit controlled not only by geologists and engineers, but more importantly by corporate officers and boards. The initial success of the Cliffs Shaft

mine helped establish the usefulness of diamond drilling and reinforced the technical, corporate trends in the industry.

The more I think about it I think this is the main reason Michigan mining history has attracted so little national attention. While copper and iron from Michigan mines each generated more wealth than the gold in California, the lesser glamour of iron and copper compared to gold were combined with a relatively rapid appearance of a corporate mining culture which also lacked glamour and the colorful characters gave western mining a large national audience and a permanent place in our national imagination.

As the new mine workings went deeper on the ore body the earlier mines were connected underground and their ore hoisted through the Aand B shafts of the opposite ends of the Cliffs Shaft site. The earlier open pit mines to the east of the city, now being mined from below, provided natural ventilation for the mine, with fresh air entering through their workings and rising through A and B shafts.

In 1891 the Iron Cliffs Company and the Cleveland Iron Mining Company merged and formed the Cleveland-Cliffs Iron Company (CCI). After the merger the Cliffs Shaft Mine operated all of the Ishpeming properties then associated with the two companies as well as some additional leases acquired from the Lake Superior Iron Company. As the scale of mining on the range increased many of the small companies started by individuals with dreams of striking it rich were acquired and consolidated by larger companies with better financing,mostly based in Cleveland. The corporate nature of iron mining in Michigan was well established.

Eventually the Cliffs Shaft mine had fifteen levels, reaching 1250 feet below the surface. The workings of the mine extend under the City of Ishpeming but because of the strength of the rock formations are extremely stable. No timbering was used in the mine due to the competenceof its formation.

The mine's surviving A and B head frames are unusual and probably unique among such structures in the United States, both as the productof a collaboration between the engineers who usually designed them and a professional architect and for their Egyptian Revival design, which was the work of George W. Maher. They were built in 1919 to replace the earlier wooden frames and remained in use until 1955 when the first Koepe Hoist built in the Western Hemisphere replaced them. They remain, however, important landmarks not only for Ishpeming but for the United States iron i n d u s t r y .

By 1919 it was necessary to replace the aging wooden head frames over shafts A and B that had been constructed when the mine was developed in 1880. Nearly forty years of use had simply worn them out. CCI was certain the mine would have a long productive life due to its ore reserves and wanted durable frames. For that reason, the danger of fire, and the need to close down the mine during construction, wood was rejected as a possible material for the new frames. Steel, the most common material at the time, also would have required the mine to suspend production. Further, in the post war economy steel was costly and delivery was slow. Concrete, the third option, enjoyed anumber of advantages, it would not require

any disruption of mine operations, unskilled labor could be used for construction, and there wasa large bed of suitable gravel only 200 feet west of B frame.

When this was proposed to Cleveland-Cliffs president William Gwinn Mather he recommended that the design incorporate architectural beauty as much as possible because of the mine's proximity to the city of Ishpeming. The preliminary plans were submitted to the Condron Company Structural Engineers of Chicago with George W. Maher as consulting architect. Maher submitted three plans adding important window detail and ornamentation. One of these designs was used for the two frames.

The two frames are not identical, although nearly so, being right and left hand oriented (in relation to their ore pockets and the trestle for moving ore to the crusher.) [Neither the trestle nor the crusher are extant.] They are 33 feet square at the base with solid vertical walls for 31 feet, which then taper to 21 feet square at 88 feet 9 inches, with a pyramidal roof, bringing the total height to 96 feet 9 inches. There are 14 windows on each side and three doors except where there are external sheds.

Work began on July 21, 1919 and A frame was completed on December 6 and B frame on December 11. Hoisting was suspended for four hours to switch over the cables, which was the only time lost from mine operations. Construction is described in some detail in J. Ellzey Hayden and Lucien Eaton, "Building Reinforced-Concrete Shaft Houses," *Lake Superior Mining Institute Proceedings* 22 (1922). The collaboration between engineers and architects in the design of the head frames attracted attention in both professions and was discussed in articles in both *The American Architect* and the *Journal of the Western Society of Engineers*.

The concern for aesthetics in design even extended to the color of the finished concrete which was colored by the high iron content of the gravel and originally had a light brown and pink variegated color. Mather had wanted to avoid the stark gray usually associated with concrete structures. The boiler house, engine house, and blacksmith shop, all built in 1880, are of native stone. Later buildings, the miners' dry, district laboratory, and mine office are all of brick. Adjacent to the site is CCI's district office - a large, white frame building. The dry isconnected to the three head frames on the site and the boiler and engine houses by an underground tunnel.

In 1955 A and B shafts were retired from active mining when a Koepe Hoist was erected over a new C shaft. This is the first Koepe Hoist installed in the western hemisphere, using technology developed in Germany and Sweden. It allowed the mine to adopt the latest practices inmaterials handling - a field that had made many advances since 1919. It was intended to help keep the mine competitive in a rapidly changing industry. The Cliffs Shaft Mine, however, faced a number of problems as the iron industry entered a new era. Operating costs increased as the mine went deeper -lifting, pumping, and other costs are related, of course, to depth. The ore body began to decline. The mine was now 1250 feet below the surface with very extensive drifts running for miles in all directions. It was an expensive mine to operate.More important, however, were changes in the industry. Beneficiation of poor quality ores, mined in open pits, had been widely adopted in the

industry reducing the appeal and market for direct shipping ores like that of the Cliffs Shaft. Open pits had been the first iron mines on the Marquette Range. Underground mines replaced them as the best means to exploit the rich, deep ore bodies. Now the cycle had come back and open pit mines were returning and offered lower operating costs. There is some irony too in the rise of beneficiation and its impacton the Cliffs Shaft. The high iron content of Lake Superior ores had made them made them unsuitable for use in charcoal furnaces, now after more than a century dominating the market, their high iron content again made them unsuitable as more and more iron and steel millsconverted their equipment to deal with pellets.

In 1967, on December 22, the Cliffs Shaft Mine hoisted its last ore. A productive life that had spanned more than one hundred years was over. The Cliffs Shaft Mine had the longest operating life of any mine in the Lake Superior region - from 1848 when the Little Mountain Mine first produced ore until December 22, 1967 when underground mining stopped and the mine was closed. Over the years the mine produced 28,980,406 long tons of high grade hard iron ore. Nearly all of this was hoisted through shafts A, B, or C - 26,756,000 long tons -between 1881 and 1967 when mining was done as the Cliffs Shaft Mine.

Underground mining has ended on the Marquette Range, but ore from two open pit mines remains an important source of iron ore for theUnited States economy. The Cliffs Shaft site is the most complete extant example from the underground mining era and is the best link tothat important chapter in American history.

Brief Bibliography

Unpublished Material

Bentley Historical Library, University of Michigan, Ann Arbor
- Douglass Family Papers
- Douglass Houghton Papers
- Jacob Houghton Correspondence

Clarke Historical Library, Central Michigan University, Mt. Pleasant
- Field Notes of Douglass Houghton

Cleveland-Cliffs Iron Company Archives [now at Northern Michigan University]

Copper Country Historical Collections, Michigan Technological University, Houghton
- State Geologist. Report on the Value of Iron Mines and Iron Lands of Michigan, 38 vols. 1914-1919; 1921-1952. Typescript

John Longyear Research Library, Marquette County Historical Society, Marquette
Kenyon Boyer. Historical Highlights (radio broadcast scripts)
Photographic Collections
Vertical Files

William H. Mulligan, Jr. National Register of Historic Places Nomination for Cliffs Shaft Mine Site, 1991.

Published Works

Boyum, Burton H. *The Marquette Mineral District of Michigan*, second edition. (Ishpeming, MI; The Cleveland-Cliffs Iron Company, n.d.)

Boyum, Burton H. *The Saga of Iron Mining in Michigan*. (Marquette, MI: John M. Longyear Research Library, 1983).

Condren, T. L. "Shaft Houses of Imposing Architecture at the Ishpeming (Michigan) Mine of the Cleveland Cliffs Iron Company," *Journal of the Western Society of Engineers* 26 (1921), pages 22-32.

Eaton, Lucien. "Present Scraping Practices at the Cliffs Shaft Mine," *Lake Superior Mining Institute Proceedings* 24 (l926).

Eaton, Lucien. "Method and Cost of Mining Hard Specular Hematite on the Marquette Iron Range, Michigan," *Lake Superior MiningInstitute Proceedings* 27 (1929).

Hatcher, Harlan. *A Century of Iron and Men*. Indianapolis: Bobbs-Merrill, 1950.

Havighurst, Walter. *Vein of Iron: The Pickands Mather Story*. Cleveland: World Publishing Company, 1956.

Hayden, J. Ellzey and Lucien Eaton. "Building Reinforced-Concrete Shaft Houses," *Lake Superior Mining Institute Proceedings* 22 (1922).

A History of the Upper Peninsula of Michigan and its People. 2 vols. Chicago: The Lewis Publishing Company, 1891.

Hyde, Charles K. *The Upper Peninsula of Michigan: An Inventory of Historical Engineering and Industrial Sites*. Washington, DC: HAER,1978.

Mennie, John. "A New Changing House at the Cliffs Shaft Mine," *Lake Superior Mining Institute Proceedings* 9 (1903).

Mulligan, William H. Jr., editor. *Historic Resources of the Iron Range in Marquette County, Michigan, 1844-1941*. Negaunee, MI: TheEconomic Development Corporation of the County

of Marquette, 1991.

Newett, George A. "The Marquette Iron Range of Michigan," *Lake Superior Mining Institute Proceedings* 4 (1896).

Newett, George A. "The Marquette Iron Range," *Lake Superior Mining Institute Proceedings* 14 (1909).

North, Arthur T. "Engineers and Architects in Artistic Collaboration," *The American Architect*, December 15, 1920, pages 783-787, 79l.

Works published since the paper was presented have not been added.