A Brief History of Mining in Michigan's Marquette and Menominee Iron Ranges

The Upper Peninsula of Michigan, the "U.P." as the locals call it, has been blessed with a wealth of mineral resources. The Native Americans were the earliest miners, using float copper left behind by the receding glaciers to make implements of many types. Copper trade goods eventually made their way throughout the Mississippi River watershed. Douglas Houghton visited copper deposits on his 1831-32 expedition. He became Michigan's first State Geologist in 1839. His reports on the copper deposits in 1841, made the public aware of the resource potential of the U.P. Although he did not personally visit the iron deposits, he reported their existence.

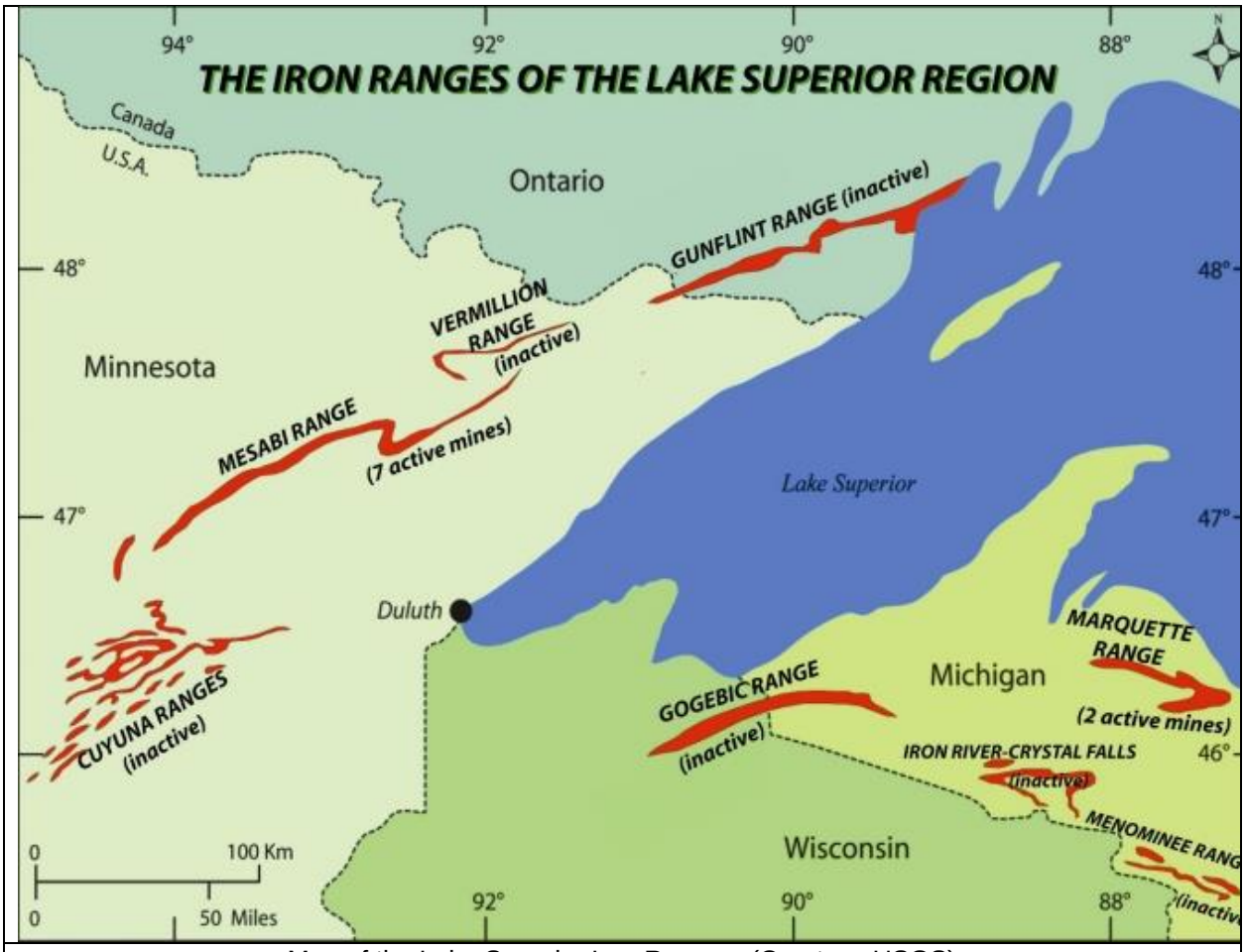
William Austin Burt, a government surveyor, is credited with the discovery of iron ore near Negaunee in 1844. This would become known as the Marquette Iron Range. In 1845, the Jackson Iron Company, with help from the Native Americans, discovered an iron deposit in another location that was to become the town of Negaunee. This deposit became the Jackson Mine. Ore was mined from an open pit. The Carp River Forge was opened in 1847 near Negaunee. It utilized ore from the Jackson Mine. The Michigan Iron Industry Museum, near the site of the forge, will be visited during the 2019 Mining History Association conference.

Other Michigan iron ore discoveries followed as prospectors gained a better understanding of the geology and pushed into unexplored territory.

Marquette Range, 1844
Eastern Menominee Range, 1845
Gogebic Range, 1848
Western Menominee Range, 1851
Gwinn District, Marquette Range, 1869

By comparison, the earliest iron ore discoveries in Minnesota occurred over 30 years later than the first discovery in Michigan.

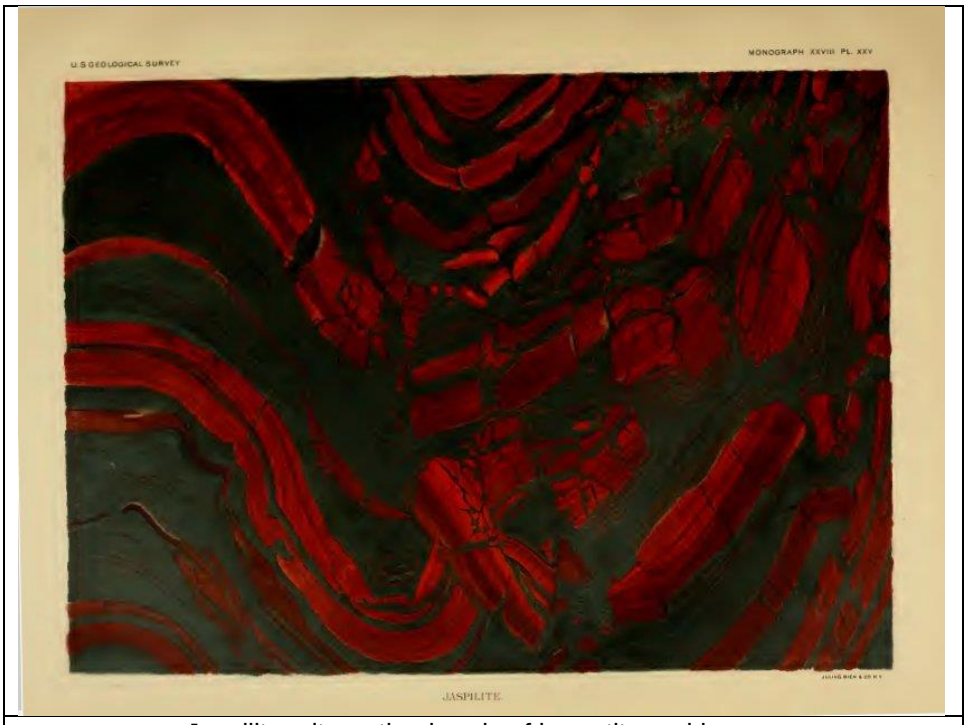
Vermillion Range, 1875
Mesabi Range, 1889
Cuyuna Range, 1903



Map of the Lake Superior Iron Ranges. (Courtesy USGS)

The 2019 Mining History Association conference in Marquette, Michigan will focus on the Marquette and Menominee Ranges. In 1997, the Mining History Association held its annual conference in Houghton, Michigan, in the heart of Michigan's Copper Country (https://www.mininghistoryassociation.org/Houghton.htm) .
In 2008, The Mining History Association visited the Mesabi and Vermillion Ranges (https://www.mininghistoryassociation.org/Chisholm.htm) during the annual conference in Chisholm, Minnesota. More information about these areas is available on the websites for these respective conferences.

The Michigan iron ores are found in very old Pre-Cambrian rocks of Huronian Sub-Group (2.2 to 2.4 billion years old). The iron formations are associated with slates and quartzites that have been metamorphosed and folded. An unknown quantity of iron formation has been removed by glacial activity leaving the formations exposed at the surface in many areas. Jasper Knob near Ishpeming provides a good look at the exposed banded iron formation called Jaspilite.



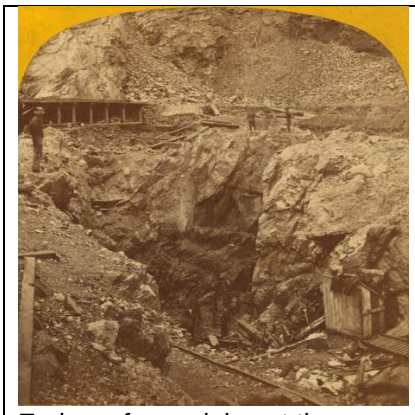
Jaspilite, alternating bands of hematite and jasper,
Negaunee Iron Formation, Ishpeming, Michigan.
(USGS, Monograph 28, 1897)

By today's standards, nearly all of the pre-World War II iron ore produced would be considered "high grade." Ore was shipped directly from the mines to the iron furnaces. From the 1880s on, an increasing number of concentrators began operation. They typically used gravity separation methods (crushing, screening, washing, and drying) to upgrade the quality some ores mainly by removing silica. So-called "hard ores" consisted of hematite and magnetite. "Soft ores" were composed of more earthy forms of iron minerals including hematite and goethite. Iron ore was priced by iron content with a dried shipping grade of 57-64% being typical. The price per ton was reduced by penalties for higher amounts of impurities such as phosphorous and sulfur which are unacceptable for Bessemer steel making.

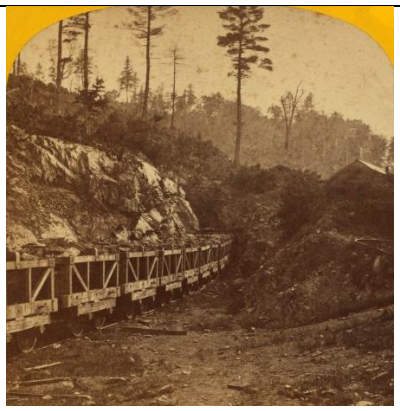
Early Development of the Marquette Range

In addition to the developments by the Jackson Mining Company mentioned above, several other companies were prospecting in the area and new discoveries were being made. The Cleveland Iron Mining Company was formed in 1847 and produced its first ore in 1848-1849 near Ishpeming. The Marquette Iron Company is credited with the founding of Marquette and construction of the first dock for lake shipping. In 1850, it opened a forge in Marquette. The Cleveland and Marquette companies merged in 1853. In 1858 the Pioneer Iron Company constructed a blast furnace at Negaunee, near the Jackson Mine. All early forges and furnaces used charcoal until 1903. The Lake

Superior Iron Company was formed in 1853 and began ore shipments in 1858. It constructed the Grace Furnace in Marquette in 1872.



Early surface mining at the Jackson Iron Mine in Negaunee.

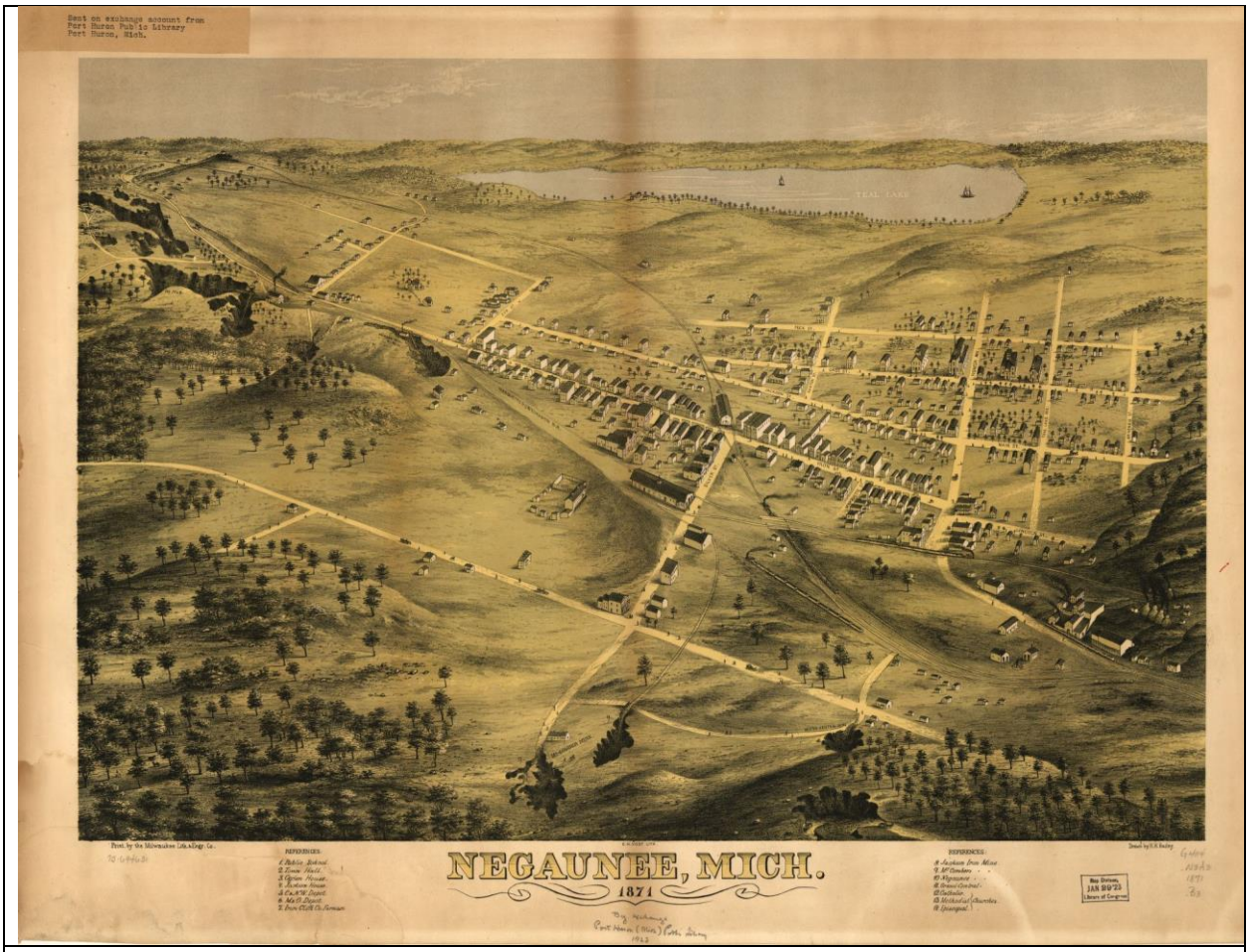


An ore train from the Jackson Mine heading to Marquette.

The ore docks and harbor at Marquette.

In 1867 the Northwestern Railway ran the Lake Superior Excursion. The Marquette Iron Range was captured in the series of stereoscopic photos from the excursion. The photos above, left to right, show the mining and rail transport of the ore to the Marquette ore docks. (Photos courtesy New York Public Library, Robert N. Dennis Collection of Stereoscopic Views)

In the 1871 pictorial map of Negaunee (below), the open pits of the Jackson Mining Company are visible in the upper left corner. The Cliffs iron furnace is in the lower right corner. By this date, the rail network used to transport ore to the docks in Marquette is well developed.

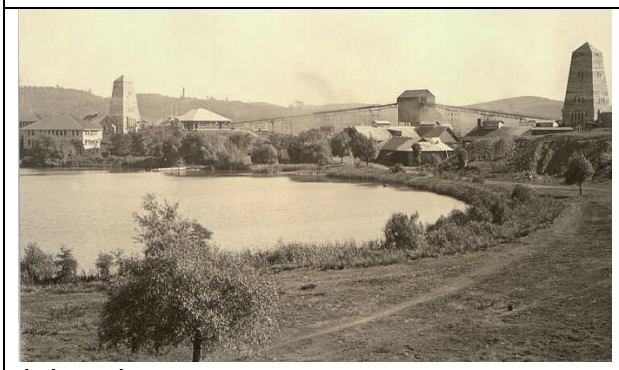


Pictorial map of Negaunee, Michigan, ca 1871. (Courtesy, Library of Congress)

The surface mines were eventually forced to go underground. Major mines on the Marquette Range include: Jackson Mine; Negaunee Mine; Cliffs Shaft Mine; Lake Superior Group; Mather Mine A and B; North Lake District - Lloyd Mine, Morris Mine, and Barnes and Hecker Mine; Humboldt Mine; Champion Mine; Michigamme Mine; Republic Mine; Gwinn District - Cheshire Mine, Princeton Mine, Austin; Gwinn, and Gardner-Mackinaw Mine; and Stephenson Mine. (Boyum, 1977)

The Negaunee Mine with trestles for stockpiling ores by different chemical analyses.

The Champion Mine showing a power shovel used for loading rail cars from the stockpile. The ore cars were destined for the ore docks in Marquette.

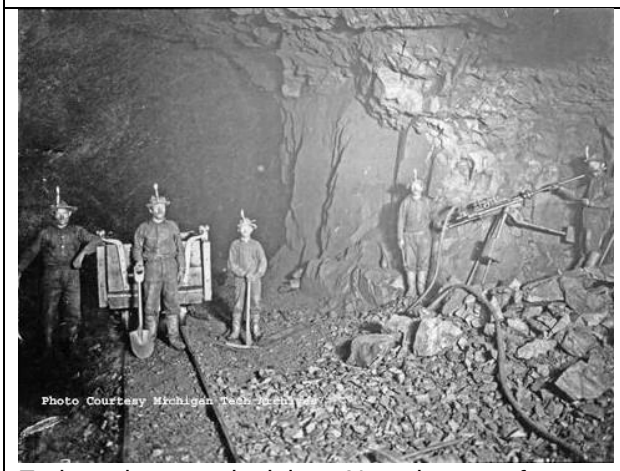


(Above) the two Cliffs Shaft Mine concrete, Egyptian Revival obelisk headframes (ca1919).

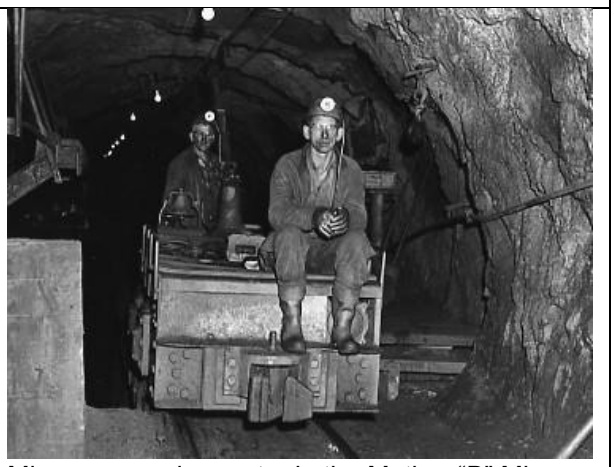
(Right) A Koepe hoist sits on top of the adjacent modern Cliffs Mine “C” shaft and headframe in Ishpeming, Michigan (ca1952).

The Mather “A” Mine in Ishpeming followed the iron formation from the Mather “B” Mine to the north.

The Mather “B” Mine in Negaunee was the last of the underground mines to operate. It closed in 1979.

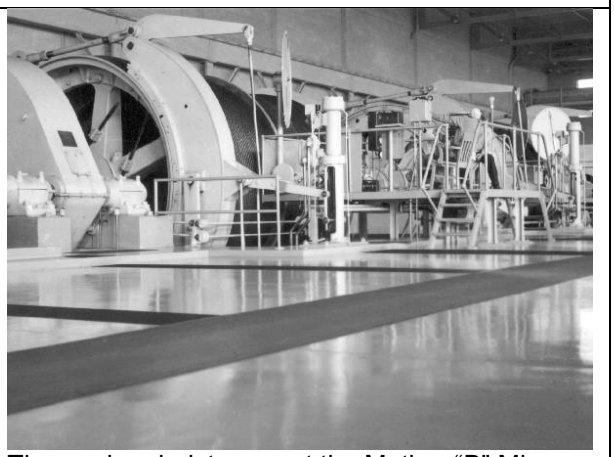


Early underground mining. Note the use of candles.



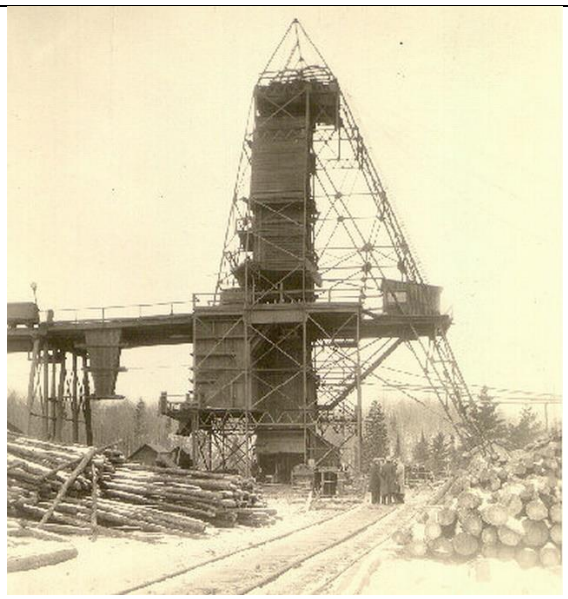
Miners on a mine motor in the Mather “B” Mine.

Miners with a loading machine in the Barnes and Hecker Mine.



The modern hoist room at the Mather “B” Mine. (USBM photo)

Highway Marker commemorating the 1926 Barnes and Hecker Mine inundation that killed 51 miners.



Headframe of the Barnes and Hecker Mine, Ishpeming, Michigan.

(Photos above courtesy Library of Congress; Michigan Tech, Department of Geological and Mining Engineering and Sciences; Michigan Tech Archives; USGS; and Wikipedia.com unless otherwise attributed)

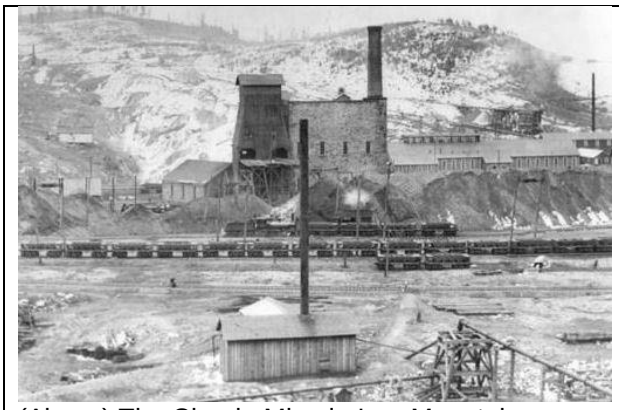
The Soo Locks

Most of the U. P. was a wilderness in the 1840s when the iron and copper discoveries was made. Getting the minerals to customers, and equipment and supplies to the mines, was a difficult and costly process. All that changed with the opening of the locks at Sault Ste. Marie, Michigan in 1855. Ore freighters still had to battle the storms in Lake Superior and avoid the shoals as they cruised along the shoreline, but they no longer had to unload their cargoes, portage them around the falls in the St. Mary's River, and then reload them into other vessels for the rest of their journey.

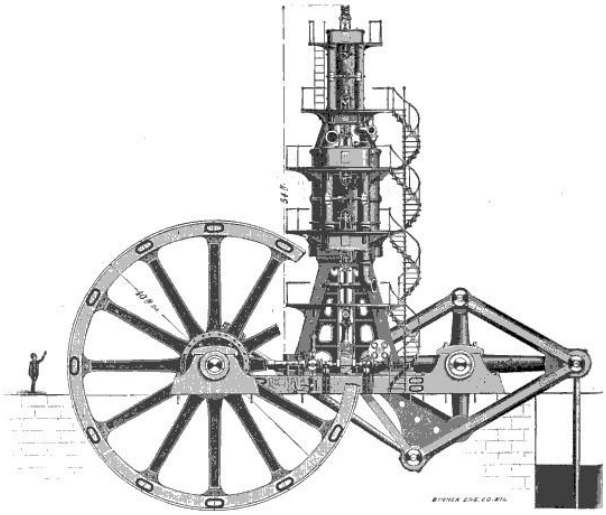
The early Soo Locks at Sault Ste. Marie, Michigan
(Courtesy USACE)

Development of the Menominee Range

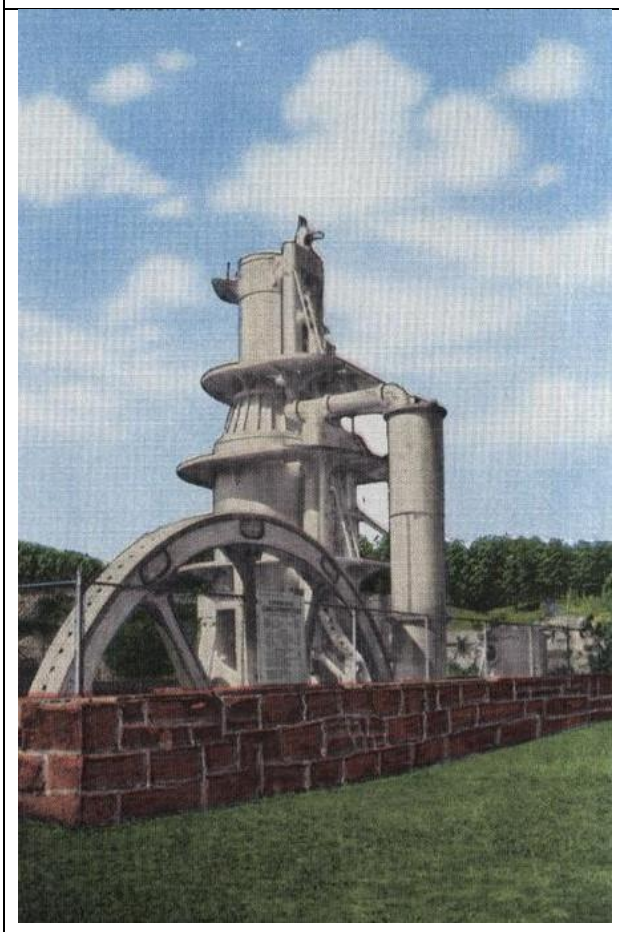
The Menominee Range is divided into two parts. The Eastern Menominee Range located near the towns of Iron Mountain, Norway, and Waucedah, Michigan was discovered in 1845. The Western Menominee Range located near the towns of Crystal Falls and Iron River, Michigan, was discovered in 1851. Unlike the mines on the Marquette Range, the steeply dipping iron formation caused most of the mines on the Menominee Range to go underground from the start. Major Mines on the Eastern Menominee Iron Ranges include: Penn Mines - Vulcan Mine; Pewabic Mines; Chapin Mine; Aragon Mine; and Groveland Mine. Major mines on the Western Menominee Range include: Riverton Group; Buck Group; Hiawatha 1 and 2 Mines; Homer-Wauseca Group; Cannon Mine (AKA Bengal Mine); and the Sherwood Mine. (after Boyum, 1977) The Menominee Range will be visited on one of the MHA tours held during the 2019 annual conference.



(Above) The Chapin Mine in Iron Mountain, Michigan used a huge pumping engine (right) to dewater the mine. It was housed in a 4-story stone, Cornish-style engine house. The engine has been preserved; however, the original engine house was demolished.

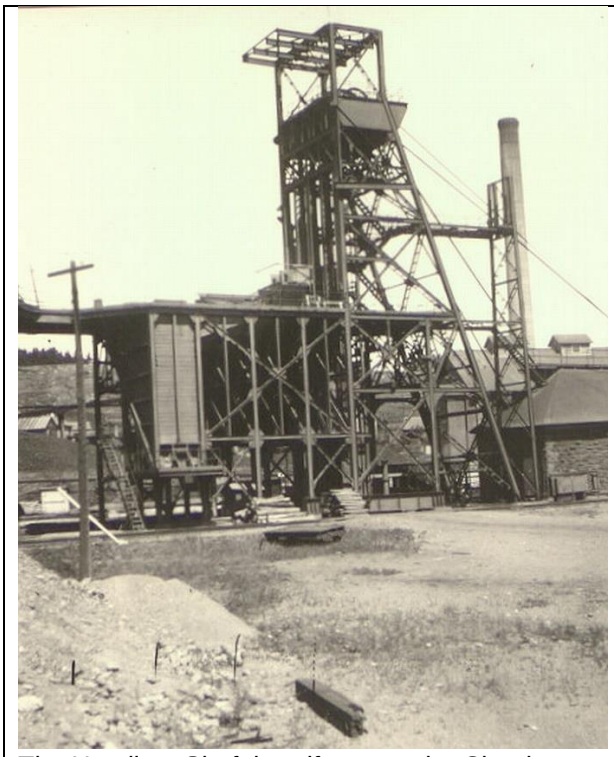


CHAPIN PUMPING ENGINE.



(Left) The engine was later moved to the Ludington Mine site where it operated until 1914. The postcard view shows the Cornish pumping engine preserved in-place after demolition of its engine house.

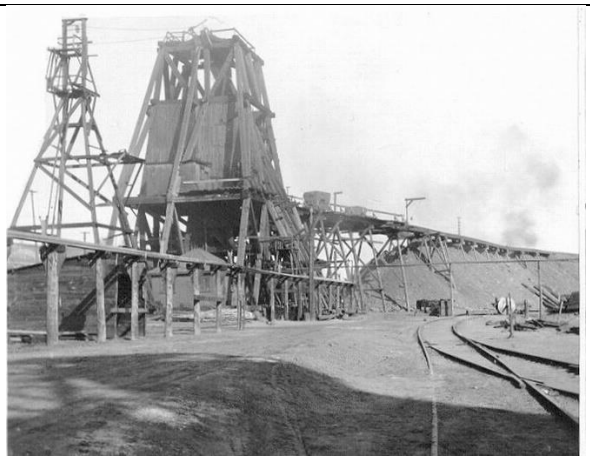
(Above) Today, the engine is protected by a modern building and on public view at the Cornish Pump Museum.



The Hamilton Shaft headframe at the Chapin Mine.

The Ludington Shaft headframe at the Chapin Mine.

The Pewabic Mine headframe in Iron Mountain. Block caving was first used at this mine.



The East Vulcan Mine headframe in Norway, Michigan.

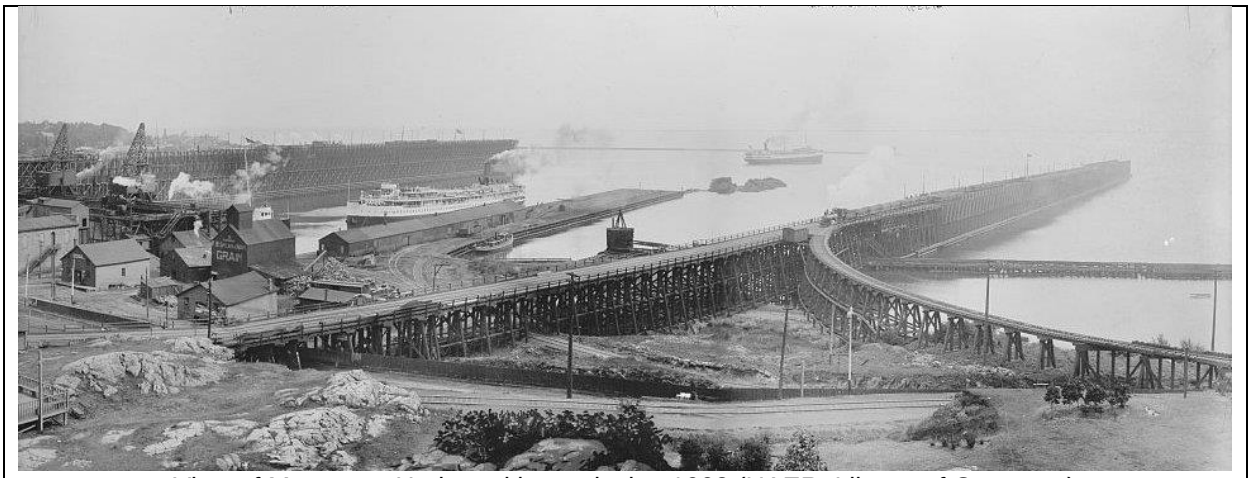
(Above) The Crystal Falls Mine was located on the Western Menominee Range at Crystal Falls, Michigan.

(Right) The Caspian Mine headframe is preserved at the Iron County Historical Museum in Iron River, Michigan. (Courtesy Iron County Historical Museum)

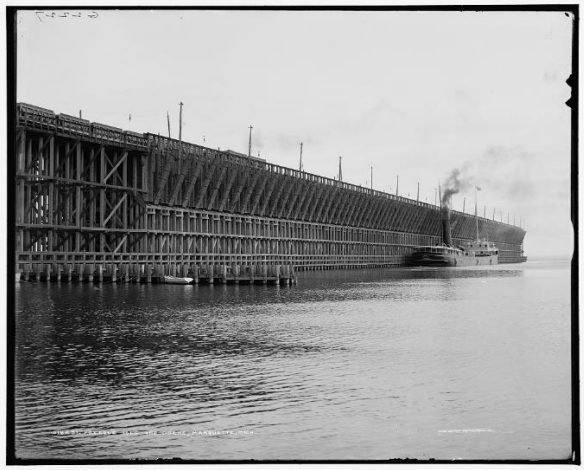
(Photos above courtesy Library of Congress; Michigan Tech, Department of Geological and Mining Engineering and Sciences; Michigan Tech Archives; and Wikipedia.com unless otherwise attributed)

Ore Docks

The ore docks in Marquette and Escanaba, Michigan, and in Ashland, Wisconsin were vital links in the iron ore transportation network. Each of the port cities eventually had several ore docks usually associated with the individual railroads serving the mines. Most of the docks were designed to allow rail cars to discharge their ore into individual hoppers. The individual rail cars were usually sampled at the mine to determine the chemical composition of the ore. When a vessel arrived for a load of ore, a chute on each ore hopper would be lowered to fill the hold. Selective loading from the hoppers could produce the desired blend of ore in the cargo. Sampling at the final destination verified the analysis of the ore. Timber construction was used in the early ore docks but later reinforced concrete docks were constructed on pilings sunk into the shoreline.



View of Marquette Harbor with ore docks, 1908 (HAER, Library of Congress)



Wooden ore dock at Presque Isle, Marquette, Michigan, 1908. (HAER, Library of Congress)

Concrete No. 6 Ore Dock, Marquette, Michigan, 1932. (HAER, Library of Congress)

Close-up of the ore chutes on the last remaining ore dock in Ashland, Wisconsin. It was built in 1916. The superstructure was demolished in 2013 so that the base can be converted to a park. (Author photo)

The last ore dock in Escanaba, Michigan was closed in 2017. It had replaced earlier conventional docks and utilized a conveyor system to load boats from a storage yard. (Google Earth 2013 image)

Over time the design of the ore docks changed to reflect the increased sizes of Great Lakes ore carriers (now up to 1000 feet in length) and replacement of natural ore by taconite pellets. Sadly, many of the older ore docks have been demolished. Marquette has preserves its last ore dock. Visitors can also observe the modern ore loading facility north of the city. It also handles the unloading of coal for the Marquette power plant.

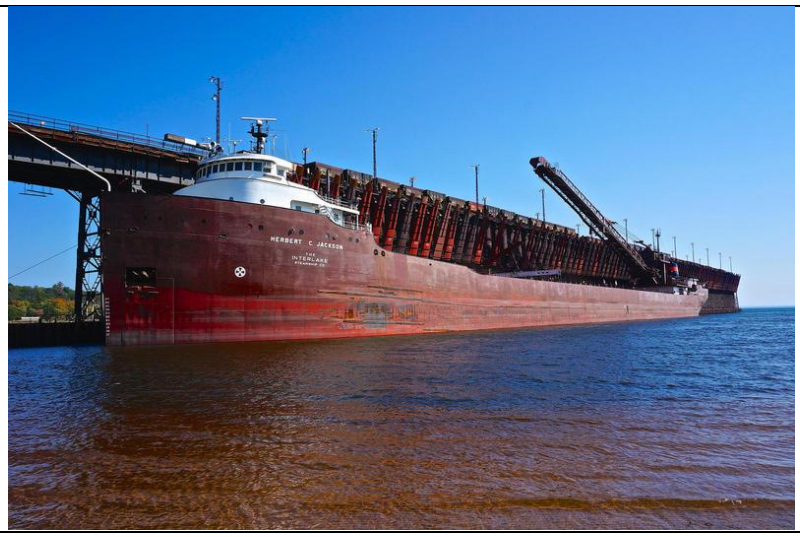
The Taconite Era

A century of mining, including supplying iron during two World Wars, had depleted the high-grade Michigan ores produced mostly from the underground mines. Researchers in Minnesota and Michigan were working on new processes that could utilize the vast tonnages of lower-grade taconite ores located in all of the Lake Superior Iron Ranges. In the early 1950s, the Mesaba Iron Company operated a plant-scale taconite concentrator in Babbitt, Minnesota to scale-up the taconite processing technology developed by Dr. Edwin W. Davis of the University of Minnesota. This led to the development of the modern taconite industry with the construction of the Reserve Mining Company concentrator and pelletizing plant in Silver Bay, Minnesota. Pellet shipments began in 1955. The mine and plant are now owned by Cliffs Natural Resources.

In Michigan similar developments were taking place in locations that had once produced higher-grade ore from underground mines. On the Marquette Iron Range, the Republic Mine started making iron pellets in 1962. It was closed in 1981. The Pioneer Pellet Plant operated on concentrates from the Mather B, the last of the Marquette Range underground mines, and its ore improvement plant until the mine closed in 1979. The Empire Mine and Tilden Mine concentrators and pelletizing plants opened in 1976. The Empire Mine was temporarily shut down in 2017. The Tilden Mine continues in operation utilizing an innovative flowsheet with flotation circuits to recover the non-magnetic hematite portion of the ore

The Groveland Mine open pit on the Eastern Menominee Range, operated by the Hanna Mining Company, started making iron pellets in 1972 and closed in 1981. The pellets were shipped through the ore dock at Escanaba.

The Tilden Mine with concentrator and pellet plant.
The Empire Mine, now closed, is in the far distance.
(Courtesy Cliffs Natural Resources)



Taconite pellets from the Marquette Range are loaded into
lake freighters at the modern ore dock located in
Presque Isle, a few miles north of Marquette.
(Courtesy Mark Langenfeld)

It's Not All about Iron in the U. P.

The complex geology of the U. P. has attracted prospectors looking for more than just copper and iron resources.

Gold was discovered at several locations north of the Marquette Iron Range. The most notable of these is the Ropes Mine which was discovered in 1881 by Julius Ropes, a chemist, assayer, and Ishpeming Postmaster. The Ropes Gold Mining Company was formed. A small stamp mill was erected in 1883 with encouraging results. Operations

expanded and the mine operated until 1897 when it was shut down because of declining ore grades as the mine got deeper.

Jumping ahead several decades, in 1975 the property was purchased by the Callahan Mining Corporation. From 1985 to 1989 the mine produced 167,000 ounces of gold and 208,000 ounces of silver, valued at over $68.4 million. On December 31, 1987, the collapse of an old stope caused a cave-in near the main shaft.

The Ropes Gold Mine in the late 1800s. (Courtesy Michigan Tech Archives)

View of the Ropes Mine collapse in 1987. (Courtesy Pasty.com)

In 2014, Lundin Mining opened the Eagle Mine to produce copper and nickel concentrates. The modern underground mine is located 27 miles northwest of Marquette. A mile-long decline tunnel allows rubber-tired mine equipment to reach the ore body. Ore from the mine is transported by truck to the refurbished Humboldt Mill at the site of the former Cleveland-Cliffs' Humboldt Iron Mine which closed in 1979. The mill processes 2,000 metric tons of ore per day. The flowsheet includes crushing, grinding, and flotation to produce the concentrate. Tailings are disposed underwater in the abandoned Humboldt iron pit, preventing any possibility of environmental damage. The initial mine life was estimated at 8 years; however, this may be increased based on additional exploration. The Humboldt Mill will be visited on one of the MHA tours held during the 2019 annual conference.

Aerial view of the Eagle Mine surface facilities (Google Earth, 2014 image)

Aerial view of the Humboldt Mill. (Courtesy Lundin Mining Company)

References

Burton H. Boyum, “The Saga of Iron Mining in Michigan’s Upper Peninsula,” John M. Longyear Research Library, Marquette, Michigan, 1977.

Robert C. Reed, “Michigan Iron Mines,” Michigan Department of Conservation, Geological Survey Division, 1957.

Charles Richard Van Hise and William Shirley Bayley with Henry Lloyd Smith, “The Marquette Iron-Bearing District of Michigan,” Monograph 28, US Geological Survey, (Washington, DC: GPO, 1897).

J. Morgan Clements and Henry Lloyd Smith, “The Crystal Falls Iron-Bearing District of Michigan,” Monograph 36, US Geological Survey, (Washington, DC: GPO, 1899).

William Shirley Bayley, “The Menominee Iron-Bearing District of Michigan,” Monograph 46, US Geological Survey, (Washington, DC: GPO, 1904).

“The Eagle Mine,” brochure from the Lundin Mining Company, 2015.

“Gold in Michigan,” Open File Report 80-1, Michigan Department of Conservation, Geological Survey Division, 1980.

L. Michael Kaas, Arlington, VA

V.2, July 12, 2018