

Cliffs Shaft Mine 1867-1967 (100 Years)

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SS3230

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May 8th 2002

On September 19th, 1844 William A. Burt, a deputy government surveyor, was the first to discover the great Lake Superior iron ore deposits. His survey party included Jacob Houghton, the brother of Michigan's first state Geologist Doctor Douglas Houghton. Burt and his party were surveying the east line of Section 1, Township 47 North, Range 27 West, just south of Teal Lake near today's community of Negaunee. The compass-man, Mr. Ives, began to notice fluctuation of the needle. After some investigation, some individuals came back with specimens of iron ore from nearby rock outcrops. Later, in June of 1845, Dr. Douglas Houghton and Mr. Burt also came across ore samples while in the south sections of Township 47, Range 26. This was to later be named the Cascade Range near the town of Palmer (Swineford76' p92).

The following year a Mr. Philo Marshall Everett of Jackson, Michigan, along with some of his neighbors, formed the "Jackson Mining Company". Everett and a Mr. Jed Emmons left for the North Country in search of copper. While in Sault Saint Marie they met Louis Nolan who told them of the existence of iron ore in the region. Nolan and the group made their way west to the area near Teal Lake but failed to find any ore. The Jackson group proceeded to Copper Harbor to the north. While there they meet up with the daughter of Chief Marji Gesick. She took them back to the Teal Lake region. There, with Chief Gesick they found a fallen pine

tree with a deposit of iron ore imbedded in its roots. The number one open pit mine was started near this location of the fallen tree almost immediately afterwards. The Jackson Iron Company brought an era of iron ore mining to the Marquette Range.

In The spring of 1846 The Jackson Mine's President Abram V. Berry Investigated the area surrounding the mine and noted a location to the west. After building a small cabin and taking out three hundred pounds of ore from the site, Berry proceeded to Sault Saint Marie. There he met a Doctor named J. Lang Cassels, an outstanding scientist from the community of Cleveland who was going to the Upper Peninsula to see mineral reports. Together they proceeded to the iron range and visited the site west of the Jackson lands. Berry strategy was to bring another company into sharing the development costs and facilities in mining the region. Soon after, seeing the later known "Cleveland Mountain" or "Jasper Knob" area, there was the application for a mining permit by Cassels at the Sault Ste Marie land office. With this he took possession of a square mile of land from the "Dead River Silver and Copper Company" with the property that Cassels had viewed included (Swineford76' p116). This land was the east half of Section 10 and the west half of Section 11 for Township 47 North and Range 27 East.

The articles of Association for the Cleveland Iron Company were signed on November 9th 1847. The observed time for the

company's Michigan founding was on April 2nd 1850. This occurred after being aware of the need to be recognized under the new legislation that stated that companies mining in Michigan had to be organized and follow certain regulations. A special charter to create the "Cleveland Iron Mining Company of Michigan" was asked for, and accomplished with Act number 294 from the Michigan legislation (Swineford76' p116). This Charter was soon abandoned when in April 1853 Articles of Association were filed with a Capital Stock of \$500,000 distributed with 20,000 shares. Some of the signers were John Outhwaite, Morgan L. Hewitt, Selah Chamberlain, and Samuel L. Mather.

In the winter of 1852 the Marquette Company was sold to the Cleveland Iron Mining Company and the title transferred on May 18th 1853. This finally ended the dispute of original claim on the property when Cassells left the country and Captain Samuel Moody, John H Mann and Edmund C. Rogers claimed and squatted on the property. Robert J. Graveraet with the formed "Marquette Iron Company" took possession of the property as a representative of Moody, Mann, and Rogers. The old "Marquette Iron Company" opened the "Little Mountain Mine", later known as the "Cleveland Mine", in the fall of 1849. That summer a barn, a boarding house, and other houses all of log construction were built on the site (Swineford76' p116). Ore was soon collected from the mine site. There was no need to use black powder to free the ore collected,

for the ore was accessible from the falling face of the geographical bluff. About twenty double teams of horses were employed during the winter months to haul ore to the company forge that was being built at the mouth of the Carp River, on the coast of Lake Superior. The forge was to open the following summer. The following two years openings were started on this land in Section 10 and 11.

Transportation was a concern for the company's leaders from the beginning. The matter of how to get ore from the Marquette Iron Range to market hundreds of miles away had to be solved. In December 1852, after the success of instituting them in Cleveland, Ohio and the disfavor of building a railroad, Tower Jackson, purposed that a plank road be built. Jackson was the Cleveland Company's first residential mining agent. The road would go from the "Cleveland mountain" where their mine was located to Lake Superior, about 17 miles away. This would allow the shipment of ore year round rather than waiting to move it out on sleigh in winter. Also, the plank road was thought to help boost the population of the area. The Jackson Company was also to get involved as one of the extra benefits for them was the transportation of charcoal for their furnace on the Carp River (Boyum p12). The "Plank Road" was constructed by a joint venture of the Cleveland and Jackson Companies. It was finished in 1855 and was out dated before it was even completed. The road did

however allow people to see that there could be a profitable future for these companies after some of the first successful shipments were made. The first railroad, the Iron Mountain Railroad Company was incorporated on March 14th 1855 and took control of the Plank Road. The railroad began operation on November 1st of 1857 (Boyum p39).

Soon afterwards the Cleveland Iron Company and Lake Superior Iron Company started to construct their first docks on Lake Superior shore in Marquette. After the completion of the Cleveland's level dock, the Lake Superior Company built their's adjacent to Cleveland's. Their's was a new design, twenty five feet above the water level and with pockets to hold the ore. This was the first pocket dock in the world (Boyum p40). The Cleveland Company remodeled their dock into a pocket dock in 1859.

From Lake Superior to Lake Huron there is an elevation change in the water levels, forming rapids between the two lakes. This change is at Sault Ste Marie. In order for transportation to commence through this area a modern lock system was built. The

Locks equalized elevation making it possible for the passage of ships. Completion was on April 19, 1855. Two months after opening the two-masted schooner "Columbia" passed with 120 tons of ore from the Cleveland Iron Mining Company. This was the first "major" shipment of ore from the Lake Superior Region (Swineford76' p152).

The first ore shipped from the Superior Iron Ore Range was from the Cleveland Mine. In 1852 three thousand tons of ore were made into blooms at the Marquette forge. The first shipment was six barrels consigned to B.L.Webb, an agent in Detroit, on July 7th, of that year (Boyum p42). The forge was destroyed by fire on December 15th 1853. One thousand four hundred forty nine tons of ore from the Cleveland mine was shipped to lower lake ports in 1855. From the first mining company on the range, the Jackson, four hundred and forty seven tons of wrought iron was shipped from the forge in 1856. That same year the Cleveland mine was making another shipment of 6,343 tons of ore.

The Iron Cliffs Company was formed in 1865 by the financier Samuel J. Tilden and other influential New Yorkers. Tilden became the governor of New York and eventually an unsuccessful candidate for the 1876 Presidential election. Tilden acquired the popular vote but failed to attain the one electoral vote needed to win over Rutherford B Hayes of Ohio. The Cliffs Company was the first mine in the region to use dynamite in its operation when it opened in the summer of 1867. This mine was located in the southern half of the northeast corner of Section 9 of Township 47 Range 47, a near distance from the workings of the Lake Superior Company's pits to the south. The Iron Cliffs Company named its mine the Barnum mine after the new mine president William H. Barnum. The Chicago and North Western Railway laid a branch of their track to

the property in June of 1868, with the first shipment of the mine's yearly value of 14,380 tons of ore shipped out of the Marquette harbor soon afterwards (Swineford76' p202). By 1871 the Iron Cliffs Company also owned the Tilden, Ogden, and Foster Mines. Work on the owned Excelsior, Salisbury, Rowland, and Pioneer (by lease from the Jackson Company) was added by 1876. The Iron Cliffs Furnace, located in the Tilden Township near Foster Lake was completed in the early part of 1874. The Furnace only ran part time in its early career.

The Barnum mine, had an iron ore vein of sixty feet in width, after the pit was heavily quarried before it was opened. In the center of the vein was a wall of slate sixteen feet in width. The respective halves of ore are therefore eighteen and twenty five feet thick on each side (Swineford71' p55). The mine had very suitable equipment on site. The hoist was capable of rising five hundred tons of ore in a time span of twenty-four hours with a pump in place to keep the mine bottom from flooding. From the open pit the mine developed three shafts located all along the north side of the pits opening.

By 1883, after sixteen years of operation the Barnum pit was becoming close to the end of its production. The pit was extended forty feet deeper in 1882. However the vein being followed was coming close to the property line of the Lake Superior Iron Company. The estimated time, in 1883, that the workings would have

reach the line was four years. In 1886 the reports stated that some ore was being taken out of the far west part of the mine. During winter, while the hanging wall experienced heavy freezing with frost, work was commenced on robbing the supporting pillars of their ore (Anderson p44). Even with the limited mining on the site, 20,593 tons was produced for shipment that year. Except with the years 1890, 1893, and 1894, the pit shipped every year from its first in 1868 until it finally closed in 1897. The total shipment of its first-class nonbessemer ore to market was 889,862 tons.

By the time the "Old Barnum" pit was finished the "New Barnum" seemed to have a bright future. Living in Paris, France in 1863, a French Engineer, named Jean Rodolphe Leschol invented the diamond drill (Boyum(geo) p46). With the first drill being brought and used at the Lake Superior Mine in 1870, this introduced the technology for the whole Marquette Range. The "New Barnum" started its career when the Cliff Iron Company started the Hole Number "A" in Section 10 on high ground over looking the swamp of Ishpeming, on March 15th 1877. On February 15th 1878, after going seventy-six feet through surface material and reaching a depth of 628 feet with no occurrence of ore the drilling was halted. During that time an another diamond drill test was being performed a short distance away to the west. The drill hole number "B", started on June 1st 1877. The drill proceeded to have 74 feet of surface material then continue till ore was discovered at a depth of four

hundred to four hundred sixty feet down. Number "B" was completed on July of 1878 (Boyum(geo) p46).

The building of the two shafts, noted as the "A" and "B" Shaft of the "New Barnum" Mine were started in the early 1880's in the attempt to proceed with a new approach to mining. In his written documentation of the mine in 1883, author A. P. Swineford, editor of the mining journal in Marquette quoted.

"The "new" Barnum is rapidly approaching a stage of development which gives promise of a future yield to that of its immediate neighbors, the Lake Superior, and Cleveland. The Large amount of money expended by the Company (Iron Cliffs) in the effort to reach and open up a deposit lying at a depth below the surface which in the earlier years in the history of iron mining on Lake Superior whould be considered wholly unattainable, instead of being misspent may now be regarded as the good seed which, through buried in the quick sand and planted in barren rock, is just on the eve of producing an abundant harvest - a harvest that will yield an hundred fold to shareholders in the way of profit (Swineford83' p40)."

The "A" shaft was the first of the two to be sunk to the ore, in approximately 1881. The shaft was well timbered with and internal dimension of ten by fourteen feet. This extended to a depth of 424 feet, from the collar to the ore formation. The first

forty-six feet descending where to the bedrock of the footwall, them continued further down. The workings on the main level were soon started and by the end of 1882 they had the main Gallery or drift being twenty feet high and eighteen feet wide. From here a drift headed east 140 feet, all with in the ore body that sank to the south and east on a forty-five degree incline. To the west a drift proceeded in the attempt to connect with the "B" shaft (Swineford83' p41).

To the west at a distance of 834 feet and $8^{1/2}$ inches (Anderson p44) was the "B" shaft. Though started at the same time as its sister shaft, the "B" ran into quicksand while reaching the ledge of bedrock in its progression. The sinking an iron caisson attempt failed due to the pressure of the quicksand. The second attempt also failed when the usual attempt of placing cribs in the shaft also failed. The final and successful attempt of going through the quicksand was organize and planed by an experienced Cornish miner named Thomas Buzzo. Mr. Buzzo, taking charge of the work, incorporated the "drop shaft". This method was to build cribs above one another and to sink the whole structure down the shaft. The quicksand was removed as fast as possible so that the bottom crib could proceed downward and supplementary cribs could continue to be place atop the system. When the bottom reached the ledge of the bedrock, there stood a safe and solid wooden shaft with in the quicksand, *"much to the relief of all concerned"*

(Swineford83' p44). " Also for Thomas Buzzo *"The management gives all the credit for the final accomplishment of the task* (Swineford83' p44). " After ledge the shaft had to sink three hundred fifty feet further to the main level that the "A" shaft had already reached. This was proposed to be done in the summer of 1884. at that time drifts and galleries could also be accounted for on the west side of the site.

For these two shafts the outlook was ever changing. A. P. Swineford from 1885, he was quoted in his written report as to the "New Barnum" mine.

"But the mine has proved much less valuable than was hoped. The ore deposits are broken up where regularity was looked for; there is a great deal more irregularity than it was expected to find. There were some really some rose-colored theories entertained regarding this new mine, before it was opened sufficiently to verify or discredit the conjectures that were made. Indeed, sufficient evidence was developed, through the systematic and thorough diamond drill borings that were made, to afford substantial basis for the best that was hoped for (Anderson p43)."

By this time the "A" shaft had been operating for a total of four years and the "B" shaft was operating for one. Both shafts had descended down to the main level, which became known as the "c-level". The subsequent levels followed the ore body on a

fifteen-degree slope to the southwest. The upper levels to the north were designated as the "a" and "b-level". The levels that proceeded further down into the earth were numerically coded as the 1, 2, and 3. From the collar of the shaft house to the main "c-level" were 470 feet for the "A" shaft and 420 feet for the "B" (Anderson p44).

With the "new Barnum" being so young by this time, with work only being started five years prior. A fully operational facility of surface equipment was in place. This site was *"one of the best equipped mines in the district"* (Swineford83 p42). One of the first buildings on the site was the, "T" shaped, stone engine house centered between the two shafts. In this building there was a Worthington and Cameron pump. There were also two low-pressure engines, that pumped water from Lake Bancroft into forming steam. A Rand 16X30 duplex compressor was also installed, providing air to the Rand No.3 numatic drills used in the underground workings. This was accomplished through a distance of 2000 feet of six-inch pipes placed through out the mine (Swineford83' p44).

Near the then thirty foot tall iron claded "A" shaft house was the fan house. In it was a twelve-foot exhaust fan keeping the air with in the mine from getting stale and uninhabitable. There were also two 48 inch boilers and a new 14X48 Corliss engine (Swineford83' p44). Soon however, everything was removed to transform the building into an office. The original building to

the west served as the boiler and engine house for the shaft, was converted into a storehouse. Southeast of the engine house was the machine shop. Inside this structure besides the machine shop was a storehouse and a black smith shop. It was also constructed of stone, therefore, being very architecturally similar to the engine house. Finally the new boiler house was completed before 1888 and shared its front face next to the engine house. With the stone construction, the two buildings almost seemed identical.

The "B" shaft house was originally smaller in comparison to the "A", but by 1888 that shaft too was iron claded and had a height of forty-five feet (Sanborn 1888'). Along with the "A" shaft, this shaft had a tram track that was built from the base of the shaft towards the stockpile yard, on the southern portion of the property.

The two largest mining companies in 1890, on the Marquette range, were the Cleveland Iron Mining Company and the Iron Cliffs Mining Company. An idea came that would take notice of an advantage in the consolidation of these two companies. One advantage was the cost sharing in the mining process. The leading men of these two companies were Samuel L. Mather the President of the Cleveland and Jephtha H. Wade Sr. a director and the Majority sock holder in the Iron Cliffs Company. By 1889 Wade had acquired Seventy percent of the stock in the company. He started buying stock after his retirement as the Financier, Industrialist, and

Founder of the Western Union Telegraph Company. The two men laid the plans for the joining of the two companies. Unfortunately Mather and Wade died before the merger was complete. The responsibility of the job fell to their decedents William Gwinn Mather son of Samuel and Jephtha Wade Jr. the grandson of Japtha Sr. The joining of the two companies became final on May 7th 1891, forming the "Cleveland-Cliffs Iron Company". William Mather became the first president of this new corporation and would lead its progress for several decades.

In the 1890's the mine continued to operate under its new ownership. A crusher was added in 1894 with the demand made for the ore by the furnace men (Newett p101). The new main offices for the Cleveland Cliffs Iron Mining Company were started in the 1897 just northwest of the mines "A" Shaft. Of the two structures built, one would serve as the general office and the engineering office wing would be connected with it through a small corridor.

The wooden dry at the mine burned to the ground on December 1st 1901. A "dry" is a miners name for a changing house used before and after work. Due to the continues risk of fire and the immediate need for such a facility, a new dry was soon built in the spring of 1902. This building was incorporated with brick into its construction to reduce the continuous risk of fire. This structure was similar but also very different to the referred to changing house in West Vulcan (Mennie p121). The loss of the other

dry was quite a financial loss to the company, not just the building but with the miners' property destroyed as well.

The dry's original dimensions were one hundred and thirty feet four inches by thirty feet four inches. The inner height was eleven feet from the floor to the bottom of the roof truss. The base foundation was set stones with concrete laid on top, and the walls were a set of erected bricks with an air gap in the middle to prevent sweating. A main design that gave the exterior brick walls their interesting ribbed décor was the extra course of bricks that made up the wall piers that the wooden roof trusses were perched. The trusses are 6-inch by 6-inch timbered beams that span from one side of the dry to the other. They are spaced at first for a distance of 7 feet 8 inches in the washroom, and 7 feet 11 inches in the changing room. The roof's coverings were 2-inch boards of pine with another layer of 1-inch hemlock, having a 1-inch spaced gap of air in the middle. The floor gave adequate drainage through grading and sewers, for the showers and sinks (Mennie p124).

The Change room was dimensioned to a size of 28 by 54 feet with 126 lockers that were 1-foot by 1-foot by 5-feet in size. With these lockers used for street clothe the room could serve to accommodate 252 men in a day of operations. Also within the room were drying racks, which were vented through 16-inch "star" vents on the roof of the building. To the north of this room is the 28

by 46 foot room of the washroom. Here there were three wash troughs with both hot and cold water that was piped in to be used with enamel coated iron washbasins. This system for the miners to wash up, was from the Beacon mine owned by the Champion Iron Co. Located eighteen miles to the west. Also with in the room were ten showers stalls (Mennie p124).

The three rooms to the north were a janitors closet and two 11-foot by 11-foot 6-inch rooms, One was used by the shift boss as a office and changing room and the other served as an emergency hospital room. The room to the south of the changing room served as an experimental dining room. The hope was that the changing room would stay cleaner in the process.

The heating of the building was accomplished through a Webster vacuum system that used exhaust steam brought though iron pipes to radiate from locations in the rooms. Such locations were under lockers, benches, and clothe racks.

This modern facility constructed for the miners was completed for a cost of \$6,604.26 and was situated on the shore bank of Lake Bancroft just north of the boiler house (Mennie p126).

The independent tramways for each of the shafts gave way to a single connected tramway so that both shafts could supply ore to a single pocket in the middle of the site. The first generation of this operation was built sometime between 1897 and 1904. The tracks went north of the engine house to an ore crusher that then

fed another tramway to the ore pocket. A symmetric tramway was then built to travel south and in front of the boiler and engine house to feed the ore pocket. Also around the turn of the century the official name of the mine changed from the "New Barnum Mine" to the "Cliffs Shaft Mine", but for decades to come the miners would refer to the site as the "Barnum Mine"

At the end of the second decade of the twentieth century, the ageing shaft houses of the "A" and "B" needed to be replaced. These shaft houses with their wooden construction had become unstable and unsafe due their deterioration. By this time the Cliffs Shaft mine had become a critical operation by being the largest producer of hard hematite ore on the Marquette iron range. The decision to proceed with the construction of new structures was made in the spring of 1919 and tentative plans were conceived to replace the buildings. The first was to create a similar structure to replace the older, being also of wooden construction. Another plan was to radically change the structure with the majority uses of steel in the building project. The third and final concept was the use of reinforced concrete to encapsulate the older structure in the processes of creating the new shaft house (Hayden p124).

The first purposed solution to the dilemma was soon rejected for the mine itself was foreseen to have a long future of production and another set of wooden shaft houses would eventually

need to be replaced. Another problem was that there was a greater chance of fire due to the near proximity to other facilities on the property. The second plan was also discouraged due to the high cost of steel at that time. Another factor was the time needed to deliver the steel and the interference of operations due to the construction and erection of a new facility. One observation at the time was that there was a presence of hard gravel well suited for concrete located just two hundred feet west of the "B" shaft. Also, the desire for the shafts not to lose production time was sought for. The cost of ore was high and peak production was needed to take advantage of this situation in the markets. The aspect of labor was another helpful situation as the use of unskilled workers was available to work the job of this type.

When the final decision of the method of action was presented to the then current Cleveland-Cliffs Iron Companies President William Gwinn Mather, he took a personal interest in the project. He was aware that this specific mine was located in the downtown region of Ishpeming and was a very predominate facility on the skyline. Mather, a very distinguished man, had the personal belief that the aesthetics of the structures should be as important as their functionality. Mather spent time of every summer in his Swiss chalet, which sat on top of a nearby hill and overlooked the town of Ishpeming. He was involved in many local charities and activities, and when it came to this project he wanted the

structures to be as ornate as possible and to have "architectural Beauty" (Hayden p127). Cleveland-Cliffs sent their plans to the Condron Company, structural engineers, of Chicago Illinois to formulate the project. The consulting architect for the structure was the much renowned George Washington Maher, also of Chicago. George Maher by this time had become a successful architect. In the early days Maher was a fellow draftsman like Frank Lloyd Wright, both working for the office of J. L. Silsbee in 1887. By the 1890's Maher had started his own practice. Through his career he had designed many suburban homes and community facilities. For the Cliffs Shaft, Maher submitted three designs, each being more detailed than the other. With William G Mather's persistence, the most elaborated design was chosen; even after the facts were made that there would be an ever-increasing cost to the details incorporated. The forms were obelisk shaped with Egyptian revival detail. Maher died only a few years later, after committing suicide on September 12, 1926. The shaft houses were part of his last era designs.

Even though the two shaft houses were mirrored copies of each other, they were not exactly the same. The designs called for the structure to have, at ground level, a squared inner dimension of 33 feet to rise 31 feet. The walls where then to incline inward to a squared side of 21 feet located 88 feet 9 inches above the

foundation. The walls were then topped off, at an elevation of 96 feet 9 inches, with a pyramidal roof.

All work was to be clear of the original shaft houses still operating when work was started for both the "A" and "B" shafts on July 21st 1919. These would remain unchanged in the construction giving an addition of the new shaft house one side. There was a mandatory positioning of all-internal supports poured for the new building to be with in the mandated available openings in the older assembly. The work required a total of 132 days of work for each shaft with 55 of those days pouring the concrete and 77 days building the forms. The largest amount of concrete poured in one day was a total of 52 cubic yards. Shaft house "A" was the first of the two completed when work finished on December 6th. This facility had a total of 725 cubic yards of concrete poured into its forms. Five days later on December 11th the "B" shaft was completed, with 1014 cubic yards of concrete. The work alternated between the two shafts. Concrete was poured in sections along the project. As the forms were being filled for one shaft project they were being extended for the other. The footings processes mirrored the sinking of the shafts nearly forty years before. The "A" shaft had very little conflict in the setting 25 pound rail three feet for its footings. However, the quicksand issue that the "B" shaft had gone through decades before had left a creator that was later filled in with rubble and did not leave stable ground for the new

structure. The footing for this shaft house had to go down to a maximum distance of 26 feet to gain the stability needed. The final castings of concrete were mixed with the use of kerosene blowers to a temperature of eighty degrees and a kept warm with tarps and steam radiators to proceed due to the ever-cooling temperatures. The forms were removed and the new concrete structures stood alone. They became the only concrete structures, for an iron mine, to be used as shaft houses, in the United States (Stakel p119)

The final architectural form that each building took by Maher's designs and construction process where buildings of the immense beauty that were sought for from the beginning. Elongated windows were patterned all along the four inclined exterior walls. The base had columned aches-ways situated on three of the sides with concrete molded CCI logos adorning each one. On the final fourth side of the base was an extension of the structure to form around the pocket that was originally put in 1910, this was were the ore was raised to fill the taming cars to move ore the center of the site. When the forms were finally removed and the new concrete structures stood alone forming a whole new visual image of the Cliffs Shaft Mine.

Charles Stakel became the superintendent of the Ishpeming district mines for Cleveland-Cliff on July 1st 1929. He took charge of the Cliffs Shaft, the Holmes, and the Tilden mines along with

his prior duties being at the Morris-Lloyd and Section Six mine in the North Lake district. Stakel only a few years earlier had avoided death when he went to work over at the Morris-Lloyd rather than to the Barnes-Hecker Mine, after his wife had taken the car to town one morning. On that morning of November 3rd 1926, at 11:04, the mine inspector, who Stakel was going to accompany at the mine, perished along with 50 other men. The Barnes-Hecker flooded within ten minutes from the first notion that anything was wrong. Only one man survived the tragedy of that day. This became the third worst mine disaster, not in a coal mine, in the United States.

Charles Stakel had inherited the Cliffs Shaft, which had become an older mine by this time, and made the best attempt to change it for the better. Stakel had no prior experience of the underground layout, so he spent hours studying maps of all the adits and stopes for the various levels. Lucien Eaton, superintendent from 1912 to 1929, had mentioned to Stakel that "The ore bodies were close to exhaustion and the mine would probably close within two to three years" (Stakel p119). The lump ore produced by the mine was very valuable however, and Stakel was determined to find more in the mine's workings. Lump ore was used as a lever by the sales department to dispose of their soft ore stockpiles. Also lump ore reduced the oxidation of iron in open-hearth furnaces, allowing ten percent more pig iron to be formed.

This was a selling point that could not be over looked. With the Republic mine being inactive, the Cliffs Shaft was the only producer for the Cleveland-Cliffs Company. Charles Stakel knew it was a daunting task ahead of him. As he had said years later, "I knew that it (Cliffs) was a geological puzzle of faults and cross faults" (Stakel p119). This made the simple idea of following the ore nearly impossible.

After much investigation and diamond drilling, more ore was discovered. Just north of Euclid Street and under Lake Bancroft, the Bancroft Vein was discovered. The company also opened the South-East Vain. Later there was a lease taken out on the Oliver Mining Company, formerly the Lake Superior Iron Company, with its holdings just south of Division Street. This was known as the Section 10 Lease. More ore was even found later when a long adit was made to the Cooper Lake Road area to the west, raising the extreme west ore bodies.

Charles Stakel also proceeded to hire more men and utilize more equipment such as more scrapers The skip hoisting shifts were extended for an additional shift each day. The production of the mine went from a yearly 250,000 tons to 800,000 tons. Most of the ore was shipped to the east but some ore made it as far as Texas and Alaska.

One innovation started, but not new to the old way of mining was to rob the support pillars of their valuable ore. The concern

here was that subsidence was not an acceptable issue due to the fact that the town of Ishpeming was directly above the mine. It was noticed that in the more recent areas of operation that the rooms had gotten bigger and the pillars had become smaller compared to their older counter parts. The original workings looked like a checkerboard on the maps, for the rooms and pillars had similar dimensions of twenty-five to thirty feet. After reading some technical literature which explained that other mines were mining the referred to "unavailable ore", Stakel contacted the man who could make the judgment on a similar operation at the Cliffs site.

Dr. Leonard Obert, chief of the applied physics branch of the United States Bureau of Mines, came to the Cliffs. Mr. S. R. Elliot, the then manager of the mines was not in favor of the idea for he saw that the current situation had not caused a problem in fifty years and he was not willing to disturb pillars that might develop into a problem for the population above. Elliot relented and a test was performed on certain pillars in the mine. After much calculation it was determined that the pillared columns were under no pressure and that they could be reduced in size. Mining of the "unavailable ore" was allowed but in locations to the west, away from the downtown location (Stakel p123).

Towards the middle of the century the Cliffs Shaft had become the largest mine in the Ishpeming area. The Mine had by that time

aggregated the properties of all the other encompassing mine. These mine included the "School House", The "Moro" (known as the "K" shaft in the late 1800's) and the "Cleveland Mine" also known as the "Marquette Mine". The "Cleveland Hard Ore Mine" was included with its different open pits and shafts. The "Saw Mill" and "Incline" were two of these pits. Three of the most active shafts where the number "2", "3", and "5". The "Number 3" engine house still stands today on the corner of Seventh Street and Division. It is of the same vintage as the engine house for the Cliffs Shaft, dating back before 1884. The "Hard Ore Mine's" neighbor to the north, the Cliffs, also took the "New York mine" into possession (Sanborn 1904).

Speaking to old miners who worked at the Cliffs Shaft while it operated gave insight into the life of the miner. When interviewed, Arvid Korpi stated that in case of emergency, one alternate route to leave the mine was to exit out of the "Selwood mine" (Korpi 1999). On the official record there is no such mine. During the 1870's a Joseph Selwood, from the Copper district of the Keweenaw, however had became for a short time the manager of the "Incline mine". For a time later there was a section of the Incline mine referred to the "Selwood Pit"

By the 1950's the Company of Cleveland-Cliffs knew in order to economically operate the Cliffs Shaft Mine that a new shaft

with modern facilities and equipment was needed to be designed and built.

Mr. R.J. Schaal, Chief Mechanical Engineer for Cleveland-Cliffs met with Aros Electric, Inc. from March 7th to 10th in Ishpeming. Aros Electric, Incorporated, from 16 East 71st Street New York 21, N.Y., was a United States representative of ASEA (Allmanna Svenska Elektriska Aktiebolaget) From Sweden. ASEA had started by Ludvig Fredholm establishing Elektriska Aktiebolaget in Stockholm as manufacturers of electric lighting and generators in 1883. By the 1950's ASEA was a major supplier to power, steel, mining, and transport industries.

The decided design for the new Shaft was the ASEA Friction-Drive "Koepe" Hoists. The arrangement was a single cage hoist and a pair of independent skip hoists to bring men and material to and from the surface. As with a form already utilized in Sweden, The hoists were to be placed in the head frame, vertically above the shaft. This arrangement gave practically no s-bend on the hoist ropes and the ropes would be shorter and shielded from the weather.

Friedrich Koepe originally invented the Friction-Drive "Koepe" Hoist in 1877. Koepe living from 1835-1922 applied the technology initially to a 234 meters shaft while working for the Friedrich Krupp Company. The design showed the way for the modern skyscraper elevator. The concept was that a hoisting rope passed

over the hoisting drum once with the load at one end and a counter weight suspended on the other. With the friction of the rope on the drum enough to prevent slipping one load could ascend while the other side would descend.

The plans called for hoisting capacities of 430 long tons in an hour with a depth of 1272 ft. This operation could be completed during the day shift. The man cage could hoist seventy-five men or 15,000 pounds on a single trip. The Skips were capable of hoisting 30,000 pounds from the crushing unit located at the bottom of the shaft to the surface.

The Swedish engineering firm Allmanna Betongbyggnadsbryan produced the preliminary designs for the construction of the head frame in the summer of 1952. Formal orders for the Hoists were filed by the end of that year.

The multi-rope hoists were delivered to the site in the fall of 1954. The base tower was already poured with concrete by a firm from Oshkosh Wisconsin contracted by Cleveland-Cliffs Company. During the summer of 1955 the Equipment was installed. The work was completed in October and operations started one December 2nd. The 174ft tower dwarfed every other structure in town including the structures of the "A" and "B" Shafts.

With the completion of the "C" shaft the operations with in each of the obelisk fell silent. The "A" and "B" shafts were later capped with a process of placing a concrete slab, the arrangement

of fifteen feet of gravel atop it and the pouring of another concrete slab at the surface. The facilities within the "A" shaft were scraped out and salvaged, leaving a huge shell of a building that resembled more an industrial cathedral than a mine's shaft house. The trestles works for the two shafts were removed and the large crushing plant disappeared from the mine site altogether.

With all efforts made to modernize the mine, the end was finally near. This was no ill-conceived guess either. The Cliffs Shaft had been a very productive operation, however the changing of the guard was to occur and the era of underground mining was coming to an end. The markets no longer supported the need for lump ore and new operations had arisen over the process of taconite pellet production.

On December 22nd 1967 the Cliffs Shaft mine closed. This ended the longest operation of an underground iron mine in the world. With the ground breaking of the "Old Barnum" pit in 1867 to the last hoist of a skip full of ore on a Friday afternoon in 1967, the operations for this small location in the far north of Michigan operated for a hundred years. The test shafts of "New Barnum" mine had become the expansive operations of the "Old Cliffs Shaft".

The last shipment for the mine was conducted on the 6th of October 1972. 2000 tons of ore were shipped by Lake Superior and Ishpeming railcars to the Marquette Presque Isle dock. The

occasion was noted with the traditional Christmas tree and pair of old overturned boots, to signify the end of the life of the mine. This shipment of ore, going to the Jones and Laughlin Steel Corporation in Cleveland, finished the 26,845,000 long tons that came out of the mine's "A", "B", and "C" shafts. The individuals present that day to see the final send off, where Nick Conte, Keith Ayres, and Earl Pleau, employees of LS&I. The Cleveland Cliffs Employees included sampler, Irving Korpi, chief ore grader, Max Madsen, all rail shipment clerk, Bill Reichel, and the shovel runner, Phil Marketty.

Cleveland Cliffs in 1997 celebrated their 150-year anniversary, and the still standing forms of the "A" and "B" shafts represented as symbols of this long and extraordinary history.

On September 17th 1998, after the guiding influence of Burton H. Boyum, the majority of the property of the Cliffs Shaft mine was given to the "Marquette Range Iron Mining Heritage Theme Park Inc." With this gift, the attempt would be made to preserve the site and for the visiting public, present and interoperate the unique history of the area.

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