

**KEWEENAW NATIONAL HISTORICAL PARK**

Historic Resource Study

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## TABLE OF CONTENTS

KEY TO ILLUSTRATIONS AND CREDITS.....	iv
ILLUSTRATIONS .....	v
LIST OF ABBREVIATIONS USED IN NOTES .....	xi
PREFACE.....	xiii
CHAPTER 1. Keweenaw Copper.....	1
CHAPTER 2. The First Two Decades of Mining .....	13
CHAPTER 3. Getting Out the Copper .....	21
CHAPTER 4. Early Settlements and Copper Works.....	37
CHAPTER 5. The Mine Locations.....	53
CHAPTER 6. The Quincy Mine.....	62
CHAPTER 7. Michigan Dominates the Copper Mining Industry.....	79
CHAPTER 8. Calumet and Hecla’s Rise to Prominence.....	94
CHAPTER 9. Calumet and Hecla’s Surface Plant.....	107
CHAPTER 10. Quincy Becomes “Old Reliable” .....	130
CHAPTER 11. Surging Ahead Yet Falling Behind.....	153
CHAPTER 12. Calumet and Hecla Starts to Struggle.....	178
CHAPTER 13. Challenges to Corporate Power .....	197
CHAPTER 14. The Strike of 1913-1914.....	221

CHAPTER 15. A Half-Century of Decline .....	239
CHAPTER 16. The Quincy Mine Winds Down.....	251
CHAPTER 17. Calumet and Hecla Plays Out its String.....	262
CHAPTER 18. Legacy.....	274
APPENDIX.....	291
BIBLIOGRAPHY.....	293

## KEY TO ILLUSTRATIONS AND CREDITS

<u>Abbreviation</u>	<u>Source of Illustration</u>
<i>HAER</i>	Historic American Engineering Record, National Park Service
<i>HCHS</i>	Houghton County Historical Society
<i>JFC</i>	Mr. John F. Campbell
<i>JPR</i>	Mr. John P. Reeder
<i>LC</i>	Library of Congress
<i>LDL</i>	Author's collection
<i>LGK</i>	Mr. Louis G. Koepel
<i>MTU</i>	Michigan Technological University Archives and Copper Country Historical Collections
<i>NE</i>	Mr. Nils Eilertsen
<i>QMC</i>	Quincy Mining Company

## ILLUSTRATIONS

1. Map of the Great Lakes, locating the Keweenaw Peninsula on Lake Superior. *HAER*
2. “Map showing Ancient Indian Pits and Early Copper Mines.” *HAER*
3. 1872 map of the Keweenaw and Isle Royale on Lake Superior. *MTU*
4. Native American copper artifacts. *MTU*
5. Line drawing of surface works at early Cliff mine. *MTU*
6. Miner standing in a stope next to a mass copper specimen. *LDL from QMC*
7. Miners hand-drilling underground by candlelight. *LDL from JPR*
8. Longitudinal sections of the Quincy mine, 1860 and 1866. *HAER*
9. Miners using sledges and chisels to clean mass copper underground of adhering rock. *QMC/HAER*
10. Trammers mucking up rock with short, D-handled shovels. *MTU*
11. Men tramping rock in the Tamarack mine. *LDL from JFC*
12. Drawing of mine shaft vehicles used at the Quincy mine. *HAER*
13. Men riding the Quincy man engine. *QMC/HAER*
14. A miner “bars down loose” from the hanging wall, to make the workplace safe. *MTU*
15. A long timber stull arrives underground at the Tamarack mines No. 3 shaft. *MTU*
16. Quincy’s line of shafts, ca. 1870, showing shafthouses and hoisthouse. *QMC/HAER*
17. Map of Quincy location, ca. 1865, showing surface plant and neighborhoods of Limerick and Hardscrabble. *HAER*
18. Franklin stamp mill, with stamp sand deposits in the foreground and deforested Quincy Hill in the background. *LDL*

19. Cornish drop or gravity stamps. *MTU*
20. An end-dumping tramcar sends its lode of stamp rock into a skip for hoisting. *MTU*
21. Looking up the Quincy stamp mill tramroad from Hancock, ca. 1880s. *LDL from QMC*
22. View across Portage Lake at Hancock and Quincy Hill, ca. 1875. *MTU*
23. S.W. Hill map of Quincy and Hancock, 1859. *LDL*
24. Miners on makeshift scaffolding running a machine rock drill at the Tamarack mine in 1911. *MTU*
25. Miners tamping home explosives on C&H's Osceola lode. *MTU*
26. Bird's-eye view of "Calumet Hecla & Red Jacket, Mich., 1881." *MTU*
27. Portrait photograph of Alexander Agassiz, president of C&H from 1871 till 1910. *MTU*
28. C&H's underground force of men pose for a picture on the surface in 1874. *MTU*
29. Square-set timbering at C&H. *MTU*
30. Log miners' houses in the foreground, a line of C&H shafthouses in the background. *MTU*
31. Workers near a forge fire in the C&H drill shop. *MTU*
32. Interior view of C&H's machine shop, largest in the district. *MTU*
33. Where the Hecla and Torch Lake Railroad first ended, at the head of the tramroad down to the C&H mills at Lake Linden. *MTU*
34. C&H mill complex at Lake Linden. *MTU*
35. Exterior view of the C&H smelter works at Hubbell. *MTU*
36. A smelter worker ladles out molten copper into ingot molds. *MTU*

37. The Superior Engine, designed by Erasmus Darwin Leavitt. *MTU*
38. Surface view of C&H rockhouse, with the Superior enginehouse in the rear. *MTU*
39. View from high above the C&H mine, overlooking Red Jacket village. *MTU*
40. Log miners' houses on Swedetown Hill, Calumet. *MTU*
41. Laborers posed in front of Quincy's early rockhouse on the southern end of the mine. *QMC/HAER*
42. Quincy's underground force of men pose at the snow shed covering the rockhouse tramroad, ca. 1875. *QMC/HAER*
43. View across Portage Lake at the original Quincy stamp mill. *LDL from JPR*
44. Quincy & Torch Lake locomotive near the water station on Quincy Hill. *LDL from QMC*
45. View from the shore of Torch Lake up at Quincy's No. 1 stamp mill. *LDL from QMC*
46. Interior view of Quincy stamp mill, showing portion of tall steam stamp. *LDL from QMC*
47. Map of the Quincy location, 1892. *HAER*
48. Map of the Quincy location, 1902. *HAER*
49. Early twentieth century view atop Quincy Hill, showing the new store and the old blacksmith shop and dryhouse. *LDL from QMC*
50. Quincy's "many gabled" shaft-rockhouse at No. 6. *LDL from QMC*
51. Interior view of a rockhouse showing a grizzly, or screen, for sorting rock by size. *MTU*
52. Men stoop to pick up rock by hand that has tailed off a grizzly. *MTU*
53. Quincy's steel frame No. 2 shaft-rockhouse, erected in 1908. *LDL from QMC*
54. Drawing of Quincy's rock-handling process at No. 2 shaft. *HAER*

55. Jaw crusher on the crusher floor of the No. 2 shaft-rockhouse at Quincy. *HAER*
56. Interior view of crusher floor of Quincy's No. 2 shaft-rockhouse, showing drop hammer on the left and steam hammer on the right. *HAER*
57. The crank end of one of Quincy's E. P. Allis hoists of the 1890s. *LGK/HAER*
58. View looking north from Quincy's No. 2 to No. 6, ca. 1920. *QMC/HAER*
59. Quincy's Jacobsville sandstone office building. *LDL from QMC*
60. A battery powered haulage locomotive pulling a train of tramcars underground. *MTU*
61. Quincy miners, tucked into a man-car and ready to go underground. *MTU*
62. Map of Quincy stamp mill site, showing tailings filling in Torch Lake, ca. 1890-1928. *HAER*
63. Drawing showing Quincy's stamp mill processing, ca. 1900. *HAER*
64. View across Portage Lake at the Quincy smelter, ca. 1900. *HCHS/HAER*
65. Site map of Quincy smelting works, ca. 1920. *HAER*
66. Ca. 1910 view of worker houses with Red Jacket shaft in the background. *MTU*
67. Calumet and Hecla underground workers pose near Red Jacket shaft. *MTU*
68. Men at Tamarack ride in a cage; C&H also used cages in its vertical Red Jacket shaft. *MTU*
69. View from Swedetown overlooking the C&H mine. *MTU*
70. View looking southward along the works atop the Calumet Conglomerate lode. *MTU*
71. Exterior view of the surface plant at Red Jacket shaft. *MTU*
72. C&H's Minong Engine, part of the Red Jacket shaft complex. *MTU*
73. Interior view of the Ahmeek mill, showing Wilfley tables. *MTU*
74. Portrait photograph of James MacNaughton. *MTU*

75. An Italian immigrant poses proudly for a photograph at Calumet, ca. 1900.  
*MTU*
76. Spectators and marchers at a Fourth of July parade in modernizing Hancock, 1894. *MTU*
77. Looking up Fifth Street from Pine Street in Calumet, complete with its street car line in the foreground. *MTU*
78. Thanks to the Progressive Era, “Safety First” measures – such as this sign started popping up at the mines. *MTU*
79. Once workers’ compensation was put into law, miners received training in underground first aid. *MTU*
80. Miners’ houses at C&H with gambrel roofs. *MTU*
81. Miners’ houses at C&H; note the uniformity, the fencing, and plantings.  
*MTU*
82. Exterior view of the facade of C&H’s library. *MTU*
83. Interior view of the reading room at the C&H library. *MTU*
84. Exterior view of the C&H bathhouse. *MTU*
85. Women and girls enjoy a swim in the bathhouse pool at C&H, while a young male life guard watches over them. *MTU*
86. Strikers in Calumet, 1913. *MTU*
87. National Guard tents pitched near Red Jacket shaft, 1913. *MTU*
88. Strikers parade in Calumet, passing the C&H office on the left and the library on the right. *MTU*
89. The Seeberville neighborhood at the Champion mine, where strikers were killed in 1913. *MTU*
90. Italian Hall, home of the worst tragedy in Copper Country history, which killed seventy-four. *MTU*
91. Map of Quincy location, ca. 1920, showing mine plant and neighborhoods.  
*HAER*

92. Quincy's clubhouse/library, shown under construction in 1917. *LDL from LGK*
93. View along a row of Quincy Sears and Roebuck houses, the last wave of houses built at the mine. *LDL from NE*
94. Looking from Quincy's No. 2 shaft-rockhouse down at the early Limerick neighborhood. *NE/HAER*
95. View from Quincy's No. 2 shaft-rockhouse looking at the Lower Pewabic neighborhood. *LDL from NE*
96. Exterior view of 1920 Quincy hoisthouse, showing cooling pond for condenser water. *LDL from QMC*
97. Interior view of 1920 Quincy hoisthouse, showing the giant Nordberg hoist. *LDL from QMC*
98. View overlooking Calumet and Hecla mill complex and Lake Linden. *MTU*
99. Erecting the Calumet and Hecla suction dredge used for reclaiming copper from the stamp sands in Torch Lake. *MTU*
100. Statue of Alexander Agassiz in Agassiz Park, Calumet. *MTU*

## LIST OF ABBREVIATIONS USED IN NOTES

AA	Alexander Agassiz
AJC	A. J. Corey
<u>A.R.</u>	<u>Annual Report</u>
ASME <u>Trans.</u>	American Society of Mechanical Engineers <u>Transactions</u>
C&H	Calumet and Hecla Mining Company
CL	Charles Lawton
CR	Copper Range Mining Company
<u>DMG</u>	<u>Daily Mining Gazette</u>
<u>E&amp;MJ</u>	<u>Engineering and Mining Journal</u>
FWD	Frederick W. Denton
HAER	Historic American Engineering Record
JLH	John L. Harris
JM	James MacNaughton
<u>LSM</u>	<u>Lake Superior Miner</u>
LSMI <u>Proc.</u>	Lake Superior Mining Institute <u>Proceedings</u>
<u>MCJ</u>	<u>Mining Congress Journal</u>
<u>MH</u>	<u>Michigan History</u>
<u>Min. Stats.</u>	<u>Annual Reports of the Commissioner of Mineral Statistics</u>
MTU	Michigan Technological University Archives and Copper Country Historical Collections

<u>NMJ</u>	<u>Northwestern Mining Journal</u>
<u>PLMG</u>	<u>Portage Lake Mining Gazette</u>
PMC	Pewabic Mining Company
QAS	Quincy S. Shaw, Jr.
QMC	Quincy Mining Company
SBH	Samuel B. Harris
TFM	Thomas Fales Mason
WAP	William A. Paine
WFM	Western Federation of Miners
WPT	William Parsons Todd
WRT	William Rogers Todd

## PREFACE

In the course of studying the history of the Copper Country for a quarter of a century, I have looked at many vastly different sources and have produced publications that differ considerably from one another. Sometimes, I have emphasized technological history, and other times, social. Sometimes I looked at the earliest pioneering days, and other times, looked at mining at its peak. Sometimes I have written about distinct individuals and personalities, and other times, I wrote about groups, such as the 1,900 unfortunate men who lost their lives in pursuit of copper beneath the ground of the Keweenaw. Sometimes I have written about companies, and other times, about communities.

This current manuscript, a historic resource study done under contract for the National Park Service, is different still again. It covers no little sweep of time. It time travels to about a billion years ago, when the Keweenaw was first being formed, then stops off about 7,000 years ago, when native peoples first began taking copper from the region. Much of the story takes place in the 1840 to 1920 era, when settlers transformed a remote wilderness into an industrialized mining district, and then took it to its peaks of employment, production, and population. After that, the story of economic growth becomes one of contraction and decline. Between 1920 and the late 1960s, the mines slowed down and then shut down, while their neighboring communities suffered economic and social losses paralleling those of the mining companies. Finally, the manuscript travels to the post-mining era, to see what has happened to the Keweenaw, and to see how and why a part of that landscape became a National Historical Park.

On the following pages, readers will encounter not just one sort of history, but historical information of many sorts, especially business, economic, social, community, technological, and landscape history. No one manuscript can document everything, so in deciding what to leave out and what to include, I aimed the text at a few select ends. In terms of time, I wanted to run the gamut from the era of geological formation right up to the early twenty-first century. Once industrialized mining was underway, I wanted to provide an overview of what happened to the entire Lake Superior copper district. At the same time, however, I wanted to focus down on two companies in particular: Calumet and Hecla and Quincy. C&H was the biggest, wealthiest, and most powerful of the local mines; it truly was in a class unto itself on the Keweenaw. Quincy, in turn, was in many ways the best of all the rest. Today, it is fitting that the Keweenaw National Historical Park contains a “Calumet Unit” and a “Quincy Unit,” in recognition both of their historical importance and their architectural and technological remains. This manuscript takes each company from its beginning to its end, and from one era to the next, tries to capture the look of each place, including its adjacent community. The manuscript tries to provide a snapshot of peoples, technologies, and fortunes – tries to provide an understanding of how intimately connected life and work were on the Keweenaw, regardless of whether the copper industry was thriving or dying.



## CHAPTER 1

### KEWEENAW COPPER

As the American economy industrialized in the nineteenth century, the new manufacturers often had the luxury of choosing their locations. They could locate near their major markets, or where they could tap into an adequate labor pool. Many were sited along railroads, rivers, canals, or other transportation routes; other firms went to cities that offered access to money and capitalists. The mining industry, of course, did not have such freedom of choice. To exploit natural resources, mining firms *had* to go out to wherever those resources were found.

In the 1840s, a new copper mining district opened up on the Keweenaw Peninsula, found on the western end of Upper Michigan and on the south shore of Lake Superior. (Fig. 1.) This region was remote, isolated, and distant from markets. No capitalists lived here – only a few hundred Native Americans. No railroads or overland roads reached up to this place. Only water routes connected it to the lower Great Lakes, and they were closed, due to winter, for nearly half of each year. No indigenous labor force lived in the region that could be put to work in mines – only a handful of voyageurs, trappers, and Methodist and Catholic missionaries. But the Keweenaw did hold copper – people were sure of that. They didn't yet understand the geology. They didn't know exactly where the copper was, or what forms might support a successful mining industry. But they migrated to the Keweenaw any way, full of hope and enthusiasm and with the desire to profit from the taking of the red metal.

The copper mining industry that started in the 1840s in a remote Lake Superior wilderness lasted for about one and a quarter centuries, and when it died in the late 1960s it left behind the cities and villages that had been built up to serve it. It left behind a population rich in ethnic heritage, because the industry had drawn workers from dozens of countries. It left behind mine sites marked by all kinds of structures: rockhouses, hoist houses, machine shops, drill shops and dry houses. It left behind thousands of dwellings built by companies to house their workers. It left behind, besides the mines, remnants of the stamp mills that had separated the copper from its host rock, and the smelters, which had melted and refined the copper mineral. On the landscape, companies left behind piles of poor rock at their mines; stamp sand beaches at their waterfront mills; and hillocks of slag beside their smelters.

The copper industry made intensive use of the Keweenaw and in doing so, resculpted much of the landscape. But just as the industry changed the place, the place had shaped the industry. The cultural geography of the peninsula was tied to its natural resources, especially water and copper. The industry's mills and smelters went mostly to the Keweenaw's margins, its shorelines, because they needed water for industrial processes or transportation. Of supreme import, the mines located in the peninsula's hinterland, because that's where the mining companies discovered the most promising copper-bearing lodes. Along this finger of land jutting out into Lake Superior, the fortunes of

mines and their surrounding communities were directly tied to geology – to the formation and distribution of rock and copper, to ancient changes in the earth going back about 1.1 billion years.

The rock underlying the Keweenaw Peninsula is some of the oldest in North America. About a billion years ago, the earth's crust in this region was thinning and trying to split. From deep in the interior of the earth, molten rock rose up, followed lines of least resistance, erupted onto the surface, spread out, cooled and then solidified. Some two to four hundred magma eruptions occurred in this region over a span of about twenty-five million years. Each eruption deposited dark basalts (also called "trap" or "trap rock") on the surface; each layer of basalt overtopped the one that had come before. Some of these eruptions were spectacularly large. One, called the Greenstone Lava Flow, is thought to be the largest anywhere on earth. It ranges across fifty miles and in places is more than one thousand feet thick. Collectively, these successive lava flows are known as the Portage Lake Volcanics.<sup>1</sup>

Between magma eruptions widely spaced in time, a second type of rock strata was laid down. Ancient streams and precipitation washed sand, rocks, and pebbles down on top of the basalts, forming a "conglomerate" layer, so-called because it contained a conglomeration of materials. A later lava flow would overtop the conglomerate, compress it, and bind it up into the Portage Lake Volcanics, which were being built up, ever so slowly, layer by layer. When the volcanic activity finally stopped, approximately twenty discernable conglomerate layers were interbedded with the several hundred lava flows.

After all this rock was put down, geological change continued. The earth's surface in this region came under compression and was squeezed. The rock faulted, and along the faults some rock slid under adjacent rock, lifting it and bending it into a bowl shape. The hollow, interior part of the bowl became part of the Lake Superior basin. Along the bowl's raised rim, the edges of rock strata that had long been underground now outcropped on the surface, both on the Keweenaw Peninsula and on Isle Royale. Rock strata that had once been beneath the surface and horizontal were now visible on the surface where they outcropped, and they dipped into the ground on steep angles. The exposed, upturned edges of many of these rock strata contained native copper – copper that existed naturally in its metallic form, unalloyed with other elements.<sup>2</sup>

This copper had not been molten, and it had not been present in the basalts or the conglomerates when first formed. Instead, it had been carried in a hot solution that had leached the copper from lower in the earth and then, under pressure, had flowed upward into the Portage Lake Volcanics. There, the solution settled in fractures, fissures and porous rock, and the copper precipitated out of the solution in its metallic form.

Because the rock was not uniformly dense and compacted, the copper-bearing solution could flow into and through parts of it. The solution entered into conglomerate rock, due to the interstices that existed among the pebbles, stones and sands that made up the rock. It entered the basalts or lava flows because that rock contained many voids or vesicles.

The lava, as it spread out, contained hot gases that migrated upward toward the atmosphere. As the lava cooled, became thicker and then solidified, it trapped the gases, and these gas bubbles became voids in the rock, especially near the top of the flow, which could have a frothy appearance. Also, after initial formation, many thick and heavy lava flows had slumped, had dropped down, creating fractures or fissures in the rock that later served as conduits for the copper-bearing solution.

Three types of underground cavities gave rise to three types of native, metallic copper. The copper that filled spaces in the sedimentary rock strata came to be called “conglomerate” copper, named after its host rock. The copper that filled the vesicles in the porous basalts was called “amygdaloid” copper. Geologists took this term from the Greek word meaning “almond,” because it described the shape of the cavities left behind by the gas bubbles. The copper found in larger fissures and fractures came to be called “mass” copper, and indeed many mass copper finds were impressive in size.

The copper did not disseminate evenly or equally across the host rock. Some very dense and impervious rock deflected the copper bearing solution, keeping much or all of it out. Other rock was so porous that the solution passed right through it, meaning that the rock was not well-charged with copper. As a consequence, the interbedded amygdaloid and conglomerate lodes running the length of the Keweenaw Peninsula differed considerably in the amount of copper they contained. One lode might be rich, while all adjacent rock strata could be poor. This variation ultimately made mining here difficult, made mining a “subterranean lottery.” When the mining firms arrived in the mid-nineteenth century, there was no telling if a given piece of ground would “pay” – yield commercial quantities of copper – except by opening it up at considerable expense. The fact that a neighboring property proved either rich or poor was not a good predictor of an adjacent property’s future.<sup>3</sup>

Long after the Portage Lake Volcanics had been formed, charged with copper, and bent into a bowl shape, a long period of glaciation took place, lasting from 1.8 million years ago until about ten thousand years ago. As heavy glaciers, as much as nine to ten thousand feet thick, moved across the region, they scoured the tops of outcropping copper lodes.<sup>4</sup> Glaciers sometimes snagged pieces of copper, separated them from their host rock, moved them, and eventually put them back down. This action left some impressive pieces of “float” copper, as it came to be called, sitting loose, right on the surface of the ground. This float copper was first discovered and used by humans about seven thousand years ago.

Relatively little is known about the native peoples who made their way to the Keweenaw, discovered the copper, and began fashioning it into artifacts. They left little behind, in terms of settlement remains. However, before modern mining and mining communities arrived to obliterate much of it, evidence once abounded on the surface that showed where much earlier peoples had dug for copper. (Fig. 2.) This evidence consisted largely of pits, often called “ancient Indian diggings,” with stone tools found nearby. These diggings – along the Keweenaw, along the Ontonagon River drainage, and on Isle Royale

– helped direct modern miners to finds of copper in these places in the mid-nineteenth century.<sup>5</sup> (Fig. 3.)

Native peoples collected float copper and dug pits to liberate additional copper from the south shore of Lake Superior from 7000 years ago (as determined by radiocarbon dating) until the seventeenth century.<sup>6</sup> Over this long span of time, settlements and native copper works on the Keweenaw were not continuous, but intermittent, and the first technologies for taking and working the copper seemed to change but little.

The aboriginal peoples picked up small pieces of float copper from the surface. If they found a large mass of float copper above ground, it typically had jagged, thin appendages that they could bash or twist off, leaving them with pieces of workable size. If they encountered an upturned edge of an amygdaloid or conglomerate lode, one having visible copper bound up in a rock matrix, they hammered at the rock to free the copper. They used hard, rounded hammerstones weighing ten to fifteen pounds to strike and break the rock. These were often wielded by hand, but some were hafted, probably with flexible thongs, so the hammerstone could be swung with greater force against the rock. The native peoples also pried pieces of copper loose from the host rock, using wood, stone, or copper wedges. Many of the pits sunk into the rock by these methods were small and shallow, but they made deeper where the rock was both relatively easy to break and well charged with copper. The first miners took at least one pit down to a depth of twenty-six feet. When this pit was discovered in the mid-nineteenth century on the property of the Minesota Mining Company, a large mass of copper sat in its bottom.<sup>7</sup> The ancient miners had been able to find it, but then had no means of cutting it up or lifting it out.

The first people on the Keweenaw and on Isle Royale had no means of smelting or casting copper. They took advantage of some of copper's properties – it was relatively soft and ductile – and hammered it into different shapes for different purposes. They used stone tools to hammer it, draw it out, and form it. These cold-working processes made the copper, over time, brittle. While the early peoples had no means of smelting copper, they did know how to use fire to anneal it – they subjected it to heat that recrystallized the copper, making it ductile once more, meaning that more work could be performed on it.

Besides hammering the copper flat, ancient artisans sometimes hammered it around or inside forms to give it shape; they also rolled it. They used sandstone, sand, and wood ashes or other natural abrasives to grind down the metal, or to polish it to a desired luster. Using these techniques, the first peoples fashioned their copper into hooks, knives, chisels, awls, axes, scrapers, beads, and other decorative items and useful tools. (Fig. 4.) Then they traded these artifacts with other groups; eventually this trade led to Keweenaw copper being diffused across much of eastern North America.<sup>8</sup>

In the seventeenth century European metals arrived on the North American continent, and cultural contact and trade with the Europeans seemingly made the continued taking of Keweenaw copper unnecessary. But while this contact and trade lessened the native people's interest in the copper, it captured the interest of the newcomers to the continent.



Figure 1

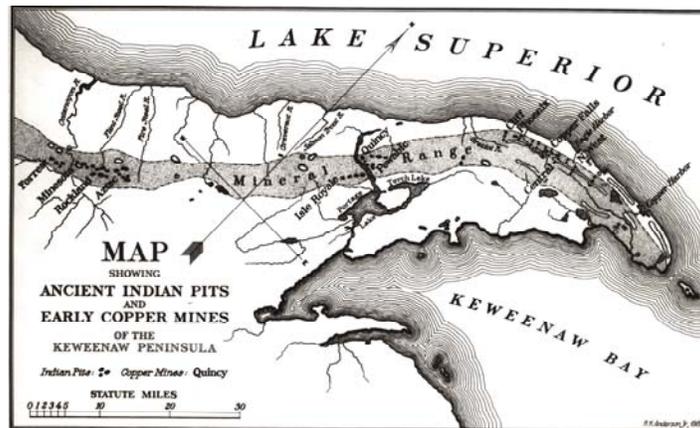
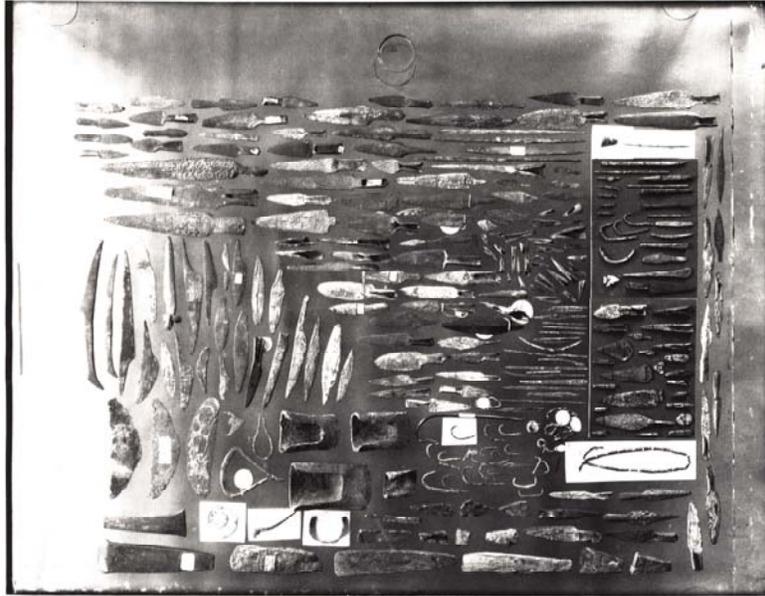


Figure 2



Figure 3



**Figure 4**

The British and French who came to the New World quickly encountered Native Americans who showed them tools and ornaments made of Keweenaw copper, and who communicated, at first in broad, general terms, the location of the deposits. Samuel de Champlain seems to have been one of the first Europeans to learn of the copper. In 1610 he encountered two Indians on the St. Lawrence River:

After conversing with them a short time about a number of things touching their wars, the Algonquin Indian, who was one of their chiefs, drew out of a sack a piece of copper a foot long, which he presented to me. It was very fine and pure. He gave me to understand that the metal was abundant where he had obtained it, which was on the bank of a river near a large lake.<sup>9</sup>

About a half century after Champlain first heard of the copper, French explorers conducted expeditions to Lake Superior in search of it. These early searches netted no significant finds. The French returned in the eighteenth century, and conducted some experimental mining along the Ontonagon River in 1737-38. The British, after gaining control over French Canada in 1763, started their own searches for Lake Superior copper. Alexander Henry led an expedition to the Ontonagon Boulder in 1766. This “boulder” was in reality a large piece of float copper that had been snagged by a glacier, ripped from its rock matrix, carried some distance, and then dropped off – alongside the west branch of the Ontonagon River. This was the most famous piece of mass copper in the region. This single specimen confirmed all the tales of native, metallic copper sitting right on the ground, and it fired the enthusiasm of those who one day hoped to mine it. Many European and early American explorers for copper, usually with the aide of Ojibwe guides, made a difficult, yet almost obligatory pilgrimage up the Ontonagon valley to see the Ontonagon Boulder. After first visiting the boulder in 1766, Henry led a small party of miners into the Ontonagon River valley in 1771-72.<sup>10</sup>

The French and British explorers and miners arrived at the site of Keweenaw copper too early to be successful. In the seventeenth and eighteenth centuries, they arrived with too few men, inadequate knowledge of the geology, and inadequate technologies and transportation. After the failure of Alexander Henry's expedition in the early 1770s, further attempts at wresting copper from the Keweenaw were delayed by the American Revolution, by disputes between the fledgling United States and Britain over the Great Lakes, and by the War of 1812. By 1820, however, a chain of events began that led directly to the opening up of a real mining industry on the Keweenaw in the early 1840s. Principally, a procession of explorations made their way to the Keweenaw, and each one resulted in more news regarding its copper, which in turn generated more enthusiasm for yet another expedition and, eventually, a rush of miners.

In 1820, Lewis Cass, governor of the Michigan Territory, worked with John C. Calhoun, the U. S. Secretary of War, to get an expedition mounted to Lake Superior.<sup>11</sup> They undertook this effort in part in the name of military security, and in part to discover what was up on Lake Superior that would help open up the west and make it more productive and appealing to future settlement. They specifically aimed at exploring the copper district and examining the legendary Ontonagon Boulder. Lewis Cass himself led the 40-man expedition party that left Detroit in May in three large canoes. Chief among his companions was Henry Rowe Schoolcraft, recruited for the journey because of his expertise in mineralogy and his interest in mining.

Just over a month after leaving Detroit, the party arrived at the mouth of the Ontonagon River. Most stayed in camp near the Lake Superior shore; only a portion of the crew made the arduous trip by canoe and foot more than twenty miles up the Ontonagon's valley to see the copper boulder. Upon their arrival, after all their effort, most of the men were disappointed. Expecting a magnificent specimen, truly a wonder of the natural world, they discovered a boulder only four feet wide, weighing between three and four thousand pounds. David Bates Douglass, a West Point engineer on the expedition, called the Ontonagon Boulder "a mere stone, a large pebble."<sup>12</sup> Yet the party's immediate disappointment did not result, later, in any dampening of public interest in the future of Lake Superior copper. In a lengthy letter to Secretary of War Calhoun, which later was published several times as his official report on the expedition, Schoolcraft admitted that the boulder was smaller than legend had made it out to be. Still, he called it "one of the largest and most remarkable bodies of native copper upon the globe." Furthermore, his published illustration of the boulder greatly exaggerated its real size; Schoolcraft made it appear to be several times larger than the six-man canoes shown drawing up to it.<sup>13</sup>

In 1830, Schoolcraft served as the Indian Agent for the upper Great Lakes and worked out of Sault Ste. Marie, about 250 miles east of the Keweenaw Peninsula. West of the Great Lakes, the Sioux and Chippewa Indians were engaged in conflict, and the War Department and Lewis Cass asked Schoolcraft to go west to try to broker a peace. Not uncommonly, this federally funded project was made to serve several purposes. Besides pacifying Indians, Schoolcraft used it as an excuse to try to find the true headwaters of the Mississippi, and as an opportunity to revisit Keweenaw copper.

Schoolcraft commanded two westward expeditions, one in 1831 and another in 1832.<sup>14</sup> Most importantly, he chose twenty-one year old Douglass Houghton to accompany him. Like Schoolcraft, Houghton was a New Yorker who had gone west to seek his fame and fortune. Also like Schoolcraft, Houghton was a man of many interests and talents. Professional science was just in its infancy at this time, and few careers had yet been built around the notion of focus and specialization. Houghton was a well-educated generalist, who a bit later in his life would be known as Michigan's foremost geologist, as a medical doctor, and as mayor of Detroit. But in 1831-32, he was just a young man getting started, who had a great opportunity to travel to a remote region rumored to be rich in copper. And while mineralogy was becoming less important in Schoolcraft's life, it would later become, thanks to Keweenaw copper, much more important in Houghton's.

In 1831, the expedition coasted down the northwestern shoreline of the Keweenaw, occasionally landing to explore the rocks and veins of green and black copper ores, sometimes blasting free specimens to take back home. While Schoolcraft eschewed another difficult passage up the Ontonagon to see the boulder, Houghton made the pilgrimage this time. As soon as Houghton returned to Detroit in the fall, local papers pressed him for encouraging words about the copper finds and ran articles on the discoveries. A bit later, in November, Houghton wrote a letter to Lewis Cass, entitled, "A Report on the Existence of Copper in the Geological Basin of Lake Superior." In the letter, later published (including as a congressional document) and widely read, Houghton wrote of the existence of native copper and of several other ores of copper, such as copper oxide and copper carbonate. His study was the best yet of Keweenaw copper and marked him as a leading expert of its characteristics and potential.<sup>15</sup>

In 1832, Schoolcraft mounted another expedition, one he hoped would travel further afield, including to the Mississippi's headwaters. Houghton went along again, this time as surgeon, to be in charge of vaccinating Indians against smallpox. He did many vaccinations, carried out some actual surgery, and explored the botany of the upper Great Lakes region and collected plants. After the headwaters had been found and the expedition's official missions accomplished, Houghton managed to revisit the Keweenaw on the way back east towards Sault Ste. Marie. He again traveled to the Ontonagon Boulder, and hacked off some of its corners to take as specimens. Coasting up the west shore of the Keweenaw towards its point, he took more specimens of native copper and green and black copper ores. Again, the overall expedition gained considerable notoriety. Schoolcraft was hailed as the discoverer of the real source of the Mississippi, and still more geological information ended up in congressional reports and in newspapers, which published letters from Houghton regarding copper discoveries. A Detroit paper, always happy to boost the prospects of the region, noted that up north, copper ore could no doubt be found in abundance, and that eventually it would "reward future exertions [explorations and mining]. It may have a mark'd influence on the coming prosperity of Lake Superior."<sup>16</sup>

After the 1831 and 1832 expeditions and trips to the Keweenaw, for a time Douglass Houghton turned away from the Keweenaw's geology and potential as a mineral range and followed other pursuits. He had considerable success as a doctor and investor. Then,

in 1837, Michigan became a state, and with statehood came the Upper Peninsula. Michigan and Ohio had disputed over which state possessed Toledo on Lake Erie and a strip of land running west from that port city. The federal government gave the disputed territory to Ohio, and in return made the Upper Peninsula a part of the new state of Michigan. Michigan's new governor, Stevens T. Mason, then made Douglass Houghton Michigan's first state geologist.

Functioning in this new role, Houghton used his scientific knowledge for practical ends. As he started exploring the geology of the state, he did not pursue additional geological knowledge just for the sake of learning it – but for the sake of using it. Using it to help develop his new state. Using it to discover what this state held in terms of mineral resources that could be exploited to produce jobs, products, and new wealth.

Houghton spent his first few years as state geologist working mostly in Michigan's Lower Peninsula and in the eastern portion of the Upper. Then, in 1840, he returned to conduct an extensive field survey of the Keweenaw and its copper deposits. The following year he reported on its minerals and economic potential to the state legislature. At this time, Houghton did not have a full understanding of the Keweenaw's geology. Houghton was not certain of what sorts of copper ores might support a mining industry, or of the extent of the mass copper deposits and their economic potential. He knew that no successful mining industry had even been based on the exploitation of native copper. So, while his report again reconfirmed and publicized the breadth of Keweenaw copper, it was at best only guardedly optimistic:

While I am fully satisfied that the mineral district of our state will prove a source of eventual and steadily increasing wealth to our people, I cannot fail to have before me the fear that it may prove the ruin of hundreds of adventurers, who will visit it with expectations never to be realized. . . . I would by no means desire to throw obstacles in the way of those who might wish to engage in the business of mining this ore. . . , but I would simply caution those persons who would engage in the business in the hope of accumulating wealth suddenly and with patient industry and capital, to look closely before the step is taken, which will most certainly end in disappointment and ruin.<sup>17</sup>

Despite the cautionary tone of Houghton's 1841 copper report, it helped accelerate the development of a mine rush up to the Keweenaw. But three other events, all in 1843, also served as catalysts: in that year, the Treaty of LaPointe went into effect; the federal government opened a mineral land agency at Copper Harbor on Keweenaw Point; and the Ontonagon Boulder, finally snatched from the Keweenaw, made a well-publicized trip to the east coast.

When it came to encouraging the start of a copper mining industry in Michigan's Upper Peninsula, the federal government did not adopt a laissez-faire attitude. Instead, it took several positive steps to aid and abet this development. For starters, it funded the Cass/Schoolcraft expedition in 1826. Following up on that, the government signed the Treaty of Fond du Lac with the Chippewa in 1826. In this treaty the Chippewa granted

the United States “the right to search for, and carry away, any metals or minerals from any part of their country.” In short, the government received mineral rights, but not property rights, to a portion of the Chippewa’s land, including the Keweenaw. In 1831-32, the federal government supported additional explorations of the copper region. Then the Treaty of LaPointe – negotiated with the Chippewa in 1842 and made effective in 1843 – ceded to the United States government all their land in Upper Michigan west of the Chocoday River.<sup>18</sup>

The U.S. government now had mineral rights and property rights to the copper lands, and in 1843 it opened up a mineral land agency in Copper Harbor. This cleared the way for speculation in copper lands to begin. Investors or prospectors in Copper Harbor and Washington, D. C. could now begin leasing the Keweenaw’s mineral lands.<sup>19</sup> In the same year, the Ontonagon Boulder engendered much additional enthusiasm for Lake Superior copper as it slowly made its way from the Keweenaw to the east.

Many early visitors to the Ontonagon Boulder had wanted to claim it as a prize, but moving the copper specimen had proved a daunting proposition. It sat more than twenty miles up from the mouth of the Ontonagon River, above three rapids totaling over seventy feet of fall, and in a steep valley surrounded by rugged, wooded terrain. In 1826, Lewis Cass, the territorial governor, sent a twenty man crew well-supplied with tools (or so they thought) to go get the boulder so it could be removed to the nation’s capitol. The work party rather quickly learned the travail of moving a copper boulder weighing over three thousand pounds from its wilderness setting, and they abandoned the effort.<sup>20</sup>

In 1843, a Detroit hardware store merchant by the name of Julius Eldred finally succeeded in removing the boulder. A work crew used a capstan or whim to lift the boulder fifty feet up to the top of the adjacent bluff. They then loaded it on a small rail car, and for a distance of four miles – from the bluff to just below the rapids – they inched their prize along. They cut a swath through the woods, laid a short stretch of rail, pushed the car to the end of the short line, picked up the rail behind the car, and laid it out front again. Once below the rapids, the boulder went on a raft; at the mouth of the Ontonagon, it went on a schooner.

Still, even once on Lake Superior, Eldred’s expedition found no smooth sailing. Eldred had, he thought, after about three tries, finally managed to obtain legal ownership of the boulder. But when the schooner landed at Copper Harbor, he was informed that the U. S. Secretary of the Treasury had instructed the Secretary of War to claim federal ownership of the copper boulder, to seize it from Eldred, and to ship it to Washington. Eventually, Eldred did surrender the specimen, and the federal government awarded him \$5,665 for his efforts.<sup>21</sup> On the way to Washington, via Detroit, Lake Erie, the Erie Canal and New York City, the Ontonagon Boulder received much public attention, and the publicity generated by the boulder’s journey was another key spark in setting off the rush to the Keweenaw in the mid-1840s.

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<sup>1</sup> For geological information on the Keweenaw, see David J. Krause, The Making of a Mining District: Keweenaw Native Copper, 1500-1870 (Detroit, 1992), 44-48; Susan R. Martin, Wonderful Power: The Story of Ancient Copper Working in the Lake Superior

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Basin (Detroit, 1999), 26-30; B. S. Butler and W. S. Burbank, The Copper Deposits of Michigan, U. S. Geological Survey Professional Paper 144 (Washington, 1929); John A. Dorr, Jr., and Donald F. Eschman, Geology of Michigan (Ann Arbor, 1977), 70-77; and T. M. Broderick and C. D. Hohl, "Geology and Exploration in the Michigan Copper district," MCJ (Oct. 1931): 478-81, 486.

<sup>2</sup> Krause, Making of a Mining District, 45-46.

<sup>3</sup> The rich Calumet Conglomerate lode was a fine example of this. C&H owned the only out-cropping part of the lode that was profitable. Just north of C&H, the Schoolcraft and Centennial mines turned no profit on the same lode; and the same was true to the south, where the Osceola mine never profited from its works on the Calumet conglomerate. See entries for Schoolcraft, Centennial and Osceola mines in Michigan Commissioner of Mineral Statistics, Min. Stats. For 1881 (Lansing, 1882), 133; Min. Stats. For 1899, 136. Also see Larry Lankton, Cradle to Grave: Life Work and Death at the Lake Superior Copper Mines (New York, 1991), 17.

<sup>4</sup> Martin, Wonderful Power, 33; Theodore J. Bornhorst and William I. Rose, "Self-Guided Geological Field Trip to the Keweenaw Peninsula, Michigan," Proceedings of the Institute on Lake Superior Geology 40, no. 2 (1994): 26.

<sup>5</sup> See "Outline Map Showing the Position of the Ancient Mine Pits of Point Keweenaw, Michigan," found in Charles C. Whittlesey, "Ancient Mining on the Shores of Lake Superior," Smithsonian Contributions to Knowledge 13, no. 4 (1863): 1-[32]. A redrawn version of this map can also be found in Larry D. Lankton and Charles K. Hyde, Old Reliable: An Illustrated History of the Quincy Mining Company (Hancock, Mi., 1982), 3.

<sup>6</sup> Martin, Wonderful Power, 143-44.

<sup>7</sup> C. Harry Benedict, Red Metal: The Calumet and Hecla Story (Ann Arbor, 1952), 22-23.

<sup>8</sup> Martin, Wonderful Power, 183-214; also see John R. Halsey, "Miskwabik – Red Metal: Lake Superior Copper and the Indians of Eastern America," MH (Sept.-Oct. 1983): 32-41.

<sup>9</sup> Krause, Making of a Mining District, 24.

<sup>10</sup> Ibid., 38-43. Also see Benedict, Red Metal, 12-17.

<sup>11</sup> Krause, Making of a Mining District, 70-77; Robert James Hybels, "The Lake Superior Copper Fever, 1841-47," MH 34 (June 1950): 100-05.

<sup>12</sup> Sydney W. Jackman and John F. Freeman, eds., American Voyager: The Journal of David Bates Douglass (Marquette, Mi., 1969), 58.

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<sup>13</sup> Henry Rowe Schoolcraft, Narrative Journal of Travels through the Northwestern Regions of the United States (Albany, 1821), 175-77.

<sup>14</sup> Krause, Making of a Mining District, 103-11.

<sup>15</sup> *Ibid.*, 105-07.

<sup>16</sup> *Ibid.*, 111.

<sup>17</sup> George N. Fuller, ed., Geological Reports of Douglass Houghton: First State Geologist of Michigan, 1837-1845 (Lansing, 1928), 557. In Houghton's "Annual Report of the State Geologist, 1841," 528-59, he gives his conservative views on the commercial value of the copper deposits.

<sup>18</sup> Krause, Making of a Mining District, 93-94, 134-35.

<sup>19</sup> Donald Chaput, The Cliff: America's First Great Copper Mine (Kalamazoo, 1971), 15, 81; Krause, Making of a Mining District, 137; Lankton, Cradle to Grave, 8.

<sup>20</sup> Krause, Making of a Mining District, 92-94.

<sup>21</sup> *Ibid.*, 136-38.

## CHAPTER 2

### THE FIRST TWO DECADES OF MINING

Starting in the mid-1840s, thousands of explorers, geologists, miners and investors discovered that transforming a remote wilderness on Lake Superior into a mining frontier was no mean feat. Douglass Houghton, the state geologist, had cautioned that mining Keweenaw copper would be a risky undertaking. Houghton himself paid the ultimate price for this quest: in 1845, on yet another geological expedition to the region, he drowned off the Superior shoreline near Eagle River when a violent storm overturned his small boat.<sup>1</sup> Just as mining was getting underway, the man thought to best understand Keweenaw copper was dead. But other geologists, explorers, and miners took his place and continued prospecting for mineral lands.

Copper Harbor, located on the northern end of the peninsula called Keweenaw Point, served as the focal point of the early mine rush. Here, the government aided exploration and settlement by opening up a land office, which first leased and later sold mineral lands to adventurers. The Army also erected Fort Wilkins, a stockaded military post meant to symbolize law and order in the region, both for rowdy explorers and Native Americans.<sup>2</sup>

Copper Harbor, which indeed had a beautiful natural harbor, was the jumping off point for the copper seekers, virtually all of whom had come by water. Large lake boats, prior to the opening of the Soo Locks in 1855, could not sail from Detroit, up Lake Huron, along the St. Mary's River and on to Lake Superior, because of the rapids at Sault St. Marie. Few large boats had been built on Superior or portaged around the rapids to be put on the big lake. As a consequence, many early arrivals at Copper Harbor came in small open craft – canoes, mackinaw boats or bateaux – that had made their way westward by coasting some 250 miles of Superior's southern shore. The explorers and settlers themselves generally were poorly equipped to lead themselves over these sometimes treacherous waters, or, once on land, to lead themselves through the Keweenaw's swamps or forests. Many turned to colorful voyageurs, who harkened back to fur trading days, as guides and transporters. These men, often French Canadian, Native American, or some mix of the two – were stereotyped as bawdy, hard-drinking men, especially when they were within the bounds of some settlement. But none were deemed better or stronger when it came to safely delivering people and cargo over water or land.<sup>3</sup>

In the mid-1840s, Copper Harbor was little more than a tent city. Many landed there in the summer, camped out near the water, and used Copper Harbor as a base of operations for striking out into the hinterland in search of copper. For most of the earliest arrivals, exploring the Keweenaw for copper was a summer activity. In summer months they endured arduous overland treks through swamps, thickets, and forests. They suffered the attacks of clouds of black flies early in the summer and then the swarming mosquitoes that followed. But few of the earliest explorers relished the idea of weathering a Keweenaw winter, cut off from supplies, living in isolation, and squatting in some ice covered tent or crude hut. Only as some truly promising copper sites were discovered,

did a more permanent population start to build up. Still, by 1850, the Keweenaw claimed only about a thousand year-round settlers.<sup>4</sup>

The first few years of the mine rush led not to sudden riches, but to general discouragement. Enthusiasm was a key part of the copper rush. The famed Ontonagon Boulder had perhaps painted too rosy a picture of copper on the Keweenaw, leading people to believe, or hope, that big pieces of mass copper could be easily found and taken here. In fact, the early scrambles over the Keweenaw landscape turned up little float copper, and nobody stumbled across an early lode or fissure vein so rich that it guaranteed success rather than failure. Prospectors moved from place to place, located some early mines, and learned from practical experience that a difficult and expensive task lay ahead. Due both to local conditions and the nature of the market for copper, the Keweenaw was not going to yield easy riches.

When explorers were first cutting trees and grubbing and burning brush to expose the forest floor to look for outcropping copper, the market for that metal was important, but not vast. The copper market followed from the physical properties of the metal itself. Copper could be easily melted and cast; it also lent itself well to being rolled into sheet stock, to being formed by presses or machined. While molten, copper could be easily alloyed with tin to form bronze, and with zinc to form brass. Copper is more corrosion resistant than many metals – including iron – because it protects itself with a bluish oxide on its skin. It is also a good conductor of heat. Importantly, copper, as well as bronze and brass, has an attractive luster, color, and patina.

Copper is also an excellent conductor of electricity. But in the 1840s, the electrical revolution – with its new and great demand for copper to be drawn into wire for motors, generators, and transmission lines – was still nearly a half-century away. Many military uses – such as the production of brass cartridges – still lay in the future, as did water piping. In the 1840s, the market for copper was much more limited than it would be in 1900. Because of its heat conductivity, manufacturers (many located in Connecticut, which had become a center of copper and brass production) employed copper in the pot and pan industry. Because of its corrosion resistance, sheet copper was used for sheathing wooden ships' hulls and for roofing and gutters. Because of the attractiveness of copper and its alloys, the metal found its way into much hardware, such as doorknobs, hinge plates, and other hardware, and into lamps, buttons, statues and other decorative items. Many of the shafts and spindles of early American machines turned in brass bearings.<sup>5</sup>

The users of copper were somewhat limited in the mid-nineteenth century, but so were its producers. Michigan copper speculators took hope in knowing that they were not having to pit their nascent industry against any well established giants. Copper mining, to this point, had been pursued in several locales, but had never been carried out on a very large scale. In the colonial period, one of the earliest copper mines had operated at Simsbury, Connecticut, and the largest producer had been the Schuyler Mine, near Newark, New Jersey. American production lagged in the late colonial and early federal periods, and American markets relied heavily on imported copper. About the time that Schoolcraft

and Houghton made their travels to the Keweenaw, American copper mining witnessed a revival of sorts. New mines opened in Vermont, Connecticut, Maryland, New Jersey, and Tennessee. All, however, were small, and no dominant producer existed.<sup>6</sup>

Michigan's native copper deposits *seemed* to promise a future well beyond that of all producers already in operation. Up on Lake Superior, however, it rapidly became apparent that a considerable investment would have to be made in the attempt to turn any property into a paying mine. For starters, copper was not a precious metal such as silver or gold. Sold by the pound, not by the ounce, copper did not bring nearly so dear a price. No individuals or organizations could take just a little copper and make any money from it. Profitability would come only from large scale production, and that production would require a sizable labor force and considerable investments in technology, housing, and other site developments. On Lake Superior, taking any wilderness site and turning it into an active, productive mine would take, usually, several years of risky development work and an expenditure of at least \$50,000 to \$200,000.<sup>7</sup>

Because of the financial risks and costs involved in opening up the Keweenaw copper mines, corporations, at the very start, became key players in the region. Indeed, many individuals and small groups participated in the mine rush and in speculative land deals. But corporations led the way in seriously trying to develop paying mines. Through stock subscriptions, a corporation raised the capital needed to sustain several years' work on a given site. Also, the corporate form was attractive to investors who wanted to limit their financial risk. Instead of putting all their money into one property, they spread their investments over several companies in several locations, in hopes that one great success might repay them for other failures.

The investors who put their money into early Michigan copper ventures came from numerous places. By the last quarter of the nineteenth century, Boston became known as the hub of investment and corporate leadership in Michigan copper. But at the start, many investors and companies came from lower Michigan and the Midwest, from the Pittsburgh area, and from the east coast in general.<sup>8</sup> Often, "families" of investors formed, typically men who shared other business interests and who combined again to invest in Michigan copper. Often these investors were friends or even related to one another, through blood or marriage. An investing family would incorporate several companies, or buy up stock in several already existing companies. Consequently, while some mines truly competed with one another, many other early mining ventures on the Keweenaw shared the same pool of capitalists, the same corporate directors, and in many cases, the same mine managers, who looked after two or more properties at once.<sup>9</sup>

At the start, prospectors and fledgling mining companies concentrated their activities on Keweenaw Point. Often using ancient Indian diggings as their signposts, they mostly went in search of deposits of mass copper found in fissure veins. The interbedded lodes charged with amygdaloid copper (in basaltic rock) and conglomerate copper (in sedimentary rock) tended to run the full length of the Keweenaw's central spine on a southwest to northeast line or strike. These lodes, in fact, held the vast majority of the peninsula's commercial copper. But initially, mass copper had the allure – it seemed so



Figure 5



Figure 6

simple. Just take the masses out in the biggest pieces possible. They were already nearly pure copper. Transport them to a smelter, melt them down, and cast the copper into ingots for sale. Mass copper required no milling or concentrating and little or no refining. So the early companies largely neglected amygdaloid and conglomerate lodes and focused their search on mass copper, the best finds of which tended to be in fissure veins running across or perpendicular to the other lodes.

The first five years or so of mining on the Keweenaw proved frustrating and often futile. The area consumed wealth without producing new wealth in return. Then, in the late 1840's, the region finally boasted a success. In 1844-45, the Pittsburgh and Boston Mining Company had first explored for copper in the Copper Harbor area. Then the company relocated most of its operations southward to a more promising site dominated by a steep cliff. (Fig. 5.) In 1849, finds primarily of mass copper at the Cliff mine, and

sales of that copper, allowed the Pittsburgh and Boston Mining Company to reward its stockholders with the first dividends ever paid out by a Lake Superior copper mine.<sup>10</sup> These dividends rekindled enthusiasm for Keweenaw mining. They proved that if a company could find the right spot, the right copper deposit, money could be made. The 1840s finally delivered an important and crucial success on the northern end of the peninsula, and in short order, in the 1850s, another major success arose on the southern end.

Like the Cliff, the Minesota mine was a mass copper mine. In 1847, the Minesota Mining Company started its works near ancient Indian diggings in the vicinity of Ontonagon, one of which was a shaft twenty-six feet deep, with a six-ton piece of mass copper on the bottom. That find soon paled in comparison with other finds of mass copper at the Minesota, one of which weighed in at an estimated five hundred tons. The Minesota Mining Company's production reached up to four million pounds per year by the late 1850s. The Cliff and the Minesota were the two most phenomenally successful mines in the era before the Civil War. Investors who had paid in \$110,000 of stock assessments at the Cliff were rewarded with dividends totaling \$2.5 million; an investment of \$366,000 at the Minesota mine returned \$1.8 million.<sup>11</sup>

On the early mining frontier, change was constant. New people came in, while others left. New mining companies started, while others went broke. While some mine locations became thriving communities of fifteen hundred or more settlers, others were abandoned and became ghost towns. Importantly, the center of mining activities moved, and at about the same time, companies started focusing their searches on a different kind of copper.

Copper mining started on the northern end, Keweenaw Point, then by the late 1840s and early 1850s much activity focused on the southern end, near the Minesota mine. The last part of the peninsula to develop as a productive, profitable district was near its middle, astride Portage Lake. Ironically, the Portage Lake district – the last to open up – proved the greatest long term success. The mineral lands from ten miles south to fifteen miles north of Portage Lake ultimately produced in excess of ninety-five percent of the native copper taken from the Keweenaw. Most of this was *not* mass copper, but amygdaloid and conglomerate copper.<sup>12</sup>

The initial mine rush had been in pursuit of mass copper. (Fig. 6.) But despite the great early successes of the Cliff and Minesota mines, mass copper did not prove to be a long term bonanza. Rich fissure veins charged with large masses of copper were few and far between. The copper, once found, was very difficult and expensive to cut up into pieces small enough to move up and out of the mine. Also, fissure veins quickly earned the reputation of being unpredictable: rich in copper one year, poor the next. They tended to peter out rapidly. Because of these problems, to grow their industry and improve their chances for success, companies started searching more intensely for lodes carrying commercial quantities of amygdaloid or conglomerate copper.

By the early 1850s the hills above Portage Lake were dotted with numerous small mines.<sup>13</sup> On the south side, above the village of Houghton, which was just developing, the Sheldon Columbian, Isle Royale, Albion, Huron, and Grand Portage mines all strove to become productive. On the north side of the lake, above Hancock, stood the Quincy, Pewabic and Franklin mines. None of these mines succeeded as quickly as the Cliff or Minesota, and many never made a profit. But in the late 1850s, after about a decade of trial-and-error development, the fortunes of this district improved. Of greatest importance, the Pewabic mine discovered a rich amygdaloid lode that ran through a portion of its section of mineral lands and on to the Quincy mine's property. Quincy started sinking shafts into the Pewabic lode in 1856 and would return dividend payments to its investors for the first time in 1862. The Pewabic lode was the kind that investors dearly sought, one that could deliver profitability year after year. Quincy mined it continuously from 1856 until 1931 and then again from 1937 to 1945. The first run of years produced a long string of annual dividends that earned Quincy the moniker of "Old Reliable."<sup>14</sup>

By the Civil War era, mining companies had explored the mineral range over a length of more than a hundred miles. The northern end had the great Cliff mine, the productive Central, the ever-promising Phoenix, and a host of others. On the southern end, the Minesota dominated, and young Ontonagon was a thriving commercial village. And in the middle, the Portage Lake district was in the early stages of a great take-off, as were the villages beside the lake, Houghton and Hancock.

Looked at on a national scale, the Lake Superior copper mines dominated American production almost as soon as they opened. In 1847, two years before any dividends were paid by the Cliff Mine, Michigan production reached 672,000 pounds – or 71 percent of the total production of all U. S. copper. The figures continued to be impressive on the national level. In 1850 the Lake mines produced 1.3 million pounds (88 percent of the national total); in 1855, 5.8 million pounds (86.4 percent); and in 1861, their peak year through the end of the Civil War, the mines produced 15 million pounds (89.5 percent of America's new copper).<sup>15</sup>

After 1861, during the remaining Civil War years copper production actually fell at the mines. This fall off generally resulted from a labor shortage problem. Men left for the Union Army, and special recruitment efforts to bring in new foreign-born workers did not make up for the shortfall. But Army enlistment was not the sole cause of the labor shortage being felt by the region's more productive mines. Because of the high demand for copper occasioned by the war, and because of inflation, the price of copper rose steeply during the war years.<sup>16</sup> High prices encouraged small scale or even defunct mines to enlarge operations or start up again. Therefore, very marginal properties syphoned off workers from more established mines. As a result, mine product declined to as low as 12.5 million pounds in 1864. Quincy's production fell from 1.3 million pounds in 1861 to a million pounds in 1865, while the number of small, less-productive mines operating in the district over that span increased from about sixteen to twenty-nine. Still, during this period of national emergency, Lake copper production accounted for as high as 90 percent, and as low as 64 percent, of total American production.<sup>17</sup>

Despite its considerable success at producing new wealth in the form of profitable mines and dividend payments, the Lake Superior copper district also created a great many financial losses. Through the Civil War, some three hundred mining ventures had been launched, including ninety-four incorporated firms. Of the incorporated companies, only eight had paid any dividends by the end of the Civil War.<sup>18</sup> Looked at in another way, fewer than one in ten mining corporations had progressed from running in the red to being in the black, and more money had been lost than had been made. Douglass Houghton, in 1841, had been correct in his fear that the pursuit of Lake copper would be the ruin of many.

<sup>1</sup> Krause, Making of a Mining District, 144, 146-48.

<sup>2</sup> For a history and description of the fort, see Thomas Friggens, "Fort Wilkins: Army Life on the Frontier, MH 61 (Fall, 1977): 221-50; and Preservation Urban Design Incorporated, Architectural Analysis: Fort Wilkins Historic Complex (Ann Arbor, 1976).

<sup>3</sup> Hybels, "The Lake Superior Copper Fever," 36-37; John H. Forster, "Life in the Copper Mines of Lake Superior," MPHS 11(1887): 177; Charles Lanman, A Summer in the Wilderness Embracing a Canoe Voyage up the Mississippi and around Lake Superior, (New York, 1847), 141-42; John R. St. John, A True Description of the Lake Superior Country (New York, 1846), 13, 15.

<sup>4</sup> William B. Gates, Michigan Copper and Boston Dollars: An Economic History of the Michigan Copper Mining Industry (Cambridge, 1951), 228. The Appendix in Gates' book contains numerous very useful tables regarding population, employment, production, dividend payments and other statistics covering the copper district through 1950.

<sup>5</sup> Charles K. Hyde, Copper for America: The United States Copper Industry from Colonial times to the 1990s (Tucson, 1998), 7-16, 21-21, 25-26.

<sup>6</sup> Hyde, Copper for America, 3-28, outlines the history of American copper mines that pre-dated Michigan.

<sup>7</sup> The various costs of opening and developing a mine are often detailed in mining company annual reports, especially those done before about 1875. Early annual reports may provide labor costs, plus expenditures made to erect mine buildings, install technologies, and build company houses.

<sup>8</sup> For the early history of investment in the region, see Charles K. Hyde, "From 'Subterranean Lotteries' to Orderly Investment: Michigan Copper and Eastern Dollars, 1841-1865," Mid-America: An Historical Review 66 (Jan. 1984): 3-20.

<sup>9</sup> Gates, Michigan Copper, 33-35; Lankton, Cradle to Grave, 20-21.

<sup>10</sup> Chaput, The Cliff, 36.

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<sup>11</sup> Hyde, “Subterranean Lotteries,” 9. For production and dividend records of early companies, also see Butler and Burbank, Copper Deposits, 64-98; and Gates, Michigan Copper, 215.

<sup>12</sup> See graph of copper production from various lodes in Butler and Burbank, Copper Deposits, 65.

<sup>13</sup> Gates, Michigan Copper, 14; Larry Lankton, “Keweenaw Copper: Mines, Mills, Smelters, and Communities,” guidebook for 26<sup>th</sup> Annual Conference of the Society for Industrial Archeology (Houghton, 1997), 29-32. The early histories or descriptions of many of these individual mines are found in Min. Stats. for 1881.

<sup>14</sup> Lankton and Hyde, Old Reliable, 18, 57, 152-53.

<sup>15</sup> See “Table 6” in Gates, Michigan Copper, 197-200. For comparative production figures, Michigan, U.S. and the world, see Hyde, Copper for America, 65-68.

<sup>16</sup> See “Table 8” in Gates, Michigan Copper, 203-06; Lankton and Hyde, Old Reliable, 152.

<sup>17</sup> Gates, Michigan Copper, 197; Hyde, Copper for America, 41; Lankton and Hyde, Old Reliable, 152.

<sup>18</sup> Hyde, Copper for America, 42; Benedict, Red Metal, 6-10.

## CHAPTER 3

### GETTING OUT THE COPPER

The numerous mines that opened between the mid-1840s and the Civil War followed very similar patterns of growth and change and employed very similar technologies. Each successful mine, on the road to profitability, passed through three stages: prospecting, development, and production. In the first stage, a small work force explored the company's mineral lands, seeking any and all outcropping lodes or fissure veins of copper. In the second stage, an enlarged force labored to open up and test the most promising finds on the property. If those finds proved disappointing – say, none bore commercial quantities of copper – the company often went out of business at that point, sold off the property, or moved to another part of the mineral range. But if a find *did* show enough copper, the company moved into real production. At that point, it brought in more people, more technologies, and invested more money, both in the underground and in surface improvements.

Getting the copper out of the ground was just the first, elemental step. Copper production entailed two additional operations. Once on the surface, much of the copper – that coming from amygdaloid or conglomerate lodes, especially – needed to be milled and concentrated. In short, the copper bound up in a rock matrix was a small fraction of the tonnage hoisted to the surface. That copper rock needed to be stamped and washed, which separated the copper from much of the waste rock and produced a copper-rich mineral concentrate. Finally, the mineral concentrate, along with finds of mass copper from the district, required smelting, which produced the ingot copper to be sold to the makers of copper, brass, and bronze products. The rise of the Michigan copper mines, then, was attended by the construction of numerous mills in close proximity to the mines and the operation of several smelters – the earliest of which were not on the Keweenaw proper, but in distant cities.

Smart mining companies conserved their capital. After leasing or purchasing mineral lands from the federal government, they typically did not send a large army of men out into the woods or swamps in search of copper. Instead, they sent out a small crew – often fewer than a dozen men – to begin the hunt. These men lived in the rudest conditions and undertook arduous labor using simple tools. Using axes, saws, and fire, they cleared timber and undergrowth from atop promising sites. Using shovels and picks they crisscrossed the property with trenches in order to find and expose the upturned edges of copper bearing lodes. They sank test pits. After removing any overburden, they employed hand-steels and black powder to blast free copper specimens and to expose the rock for better examination.

This prospecting stage could take years. Some of the earliest mineral land leases were for nine square miles of ground. In short order, this lease arrangement gave way to outright federal sales of mineral lands, and companies usually purchased a section, one square mile in size.<sup>1</sup> A dense forest, a swamp, a cliff or ravine often occupied that square mile. There was no easy way to prospect for copper on Lake Superior in the 1840s or 1850s.

Indeed, many companies looked to ancient Indian diggings as signposts for where to start their search, but these shallow pits were far from being foolproof markers. Early prospectors were not armed with a good understanding of the geology of the district, because that geology was still not well-understood, and would only be revealed as the companies succeeded here and failed there in the search for copper.<sup>2</sup> Companies could not always use a close neighbor's success or failure as a predictor – as a guide to whether and where – a good lode might occupy their property. Under these conditions, prospecting was a hit-and-miss, frustrating proposition.

Assuming that prospecting turned up a fissure vein or lode that showed at least marginal promise, a company next had to decide whether to develop it further. Looking at the copper finds in shallow pits or rudimentary shafts did little to forecast the ground's true potential worth. The ground needed to be more thoroughly tested. It had to be opened up or “developed,” and this evolutionary stage invariably cost more money than the initial prospecting.<sup>3</sup>

When a company moved into development, it typically expanded its labor force, increasing it up to fifty and then on to as high as two hundred men.<sup>4</sup> This stage had one purpose: to open up the lode or vein sufficiently to determine if it contained enough copper to pay to mine it. Miners sank two or three shafts along the strike of a lode; these shafts tested the tenor of the rock as it dipped down into the ground. To test the copper rock along the length of the mine, or from one end of the strike to the other, they drove drifts (or horizontal tunnels) from one shaft over toward the next. Sometimes they used adits or cross-cuts to test adjacent ground. Running into the base of a hillside, a tunnel-like adit could intersect a variety of lodes as it ran underground to connect with established shafts and drifts. Similarly, cross-cuts driven out perpendicularly from drifts helped determine if the mine was working the main lode, or if there was better ground beside it in either direction. The purpose, again, was to *test* the property, rather than to produce vast quantities of mass copper or copper rock and prepare it for market.

As development progressed, a mining company reached a critical juncture in its early history. Continued development consumed investors' money. If after several years' of development the lode proved too narrow or too little charged with copper, a smart company shut operations down and perhaps abandoned or sold off the property. But if the ground appeared very rich – well charged with mass, amygdaloid or conglomerate copper – the opposite naturally followed. The company accelerated work at the site and moved into full production. These decisions – either to stop work or to accelerate it – were far from simple to make. For one thing, a company was never absolutely sure of what the underground held. Many succumbed to the wishful thinking that their copper ground might turn richer, if only they went down another hundred or two hundred feet. Investors and corporate leaders did not want to abandon hope too early. Nor did they want to stay too long, and pump another \$100,000 into some barren holes in the ground. Very few copper strikes were so initially rich, right from the start, that the decision to go into full production was made with total ease and comfort. Many properties held just enough copper to tease investors, to tantalize them into sustaining their effort. Often,

these properties proved just rich enough in copper to keep their companies limping along, but too poor in copper to ever pay back the investment literally sunk into the mine.<sup>5</sup>

The decision to go into production triggered much change. Boards of directors called for investors to pay in more assessments on their stock holdings, making available the capital needed for buildings, wages, and purchases.<sup>6</sup> Employment might double again and rise to four or five hundred workers. A company started transforming its rudimentary mine camp into a mining community. Women and children and churches and schools and single-family houses arrived. While a company built up the social infrastructure of its small community, called a “mine location,” it also built up its industrial infrastructure. It acquired more complete and expensive pieces of technology, such as hoisting engines, and erected more structures, such as blacksmith and machine shops.

The first generation Lake Superior copper mines opened while the American economy was in the early stages of the industrial revolution, which ushered in many changes, not only in the workplace, but in everyday life. With industrialization came new factories, mass production, new mechanical sources of power, machine production, a greater division of labor, and the rise of a working class that toiled for wages and then used those wages to buy what they needed (instead of growing or making what they needed for themselves). Several manufacturing industries were recognized as being in the vanguard of the industrial revolution – either because of their new factories and technologies, their new products that helped transform every day life, or both. These included the textile and firearms industries and the manufacturers of machine tools, sewing machines, farm implements, and other goods. Near the mid-point of the nineteenth century, at the Crystal Palace Exhibit in London, American machines and the products they made caught the attention of the English and the Europeans, who recognized that America, once labeled as a borrower of technologies, was now an innovator to be studied.<sup>7</sup>

The American mining industry was not in the forefront of the country’s industrial revolution. It was not, in modern terms, on the “cutting edge.” True, an expanded mining industry produced more coal, more iron, and more copper to meet the increasing needs of manufacturers. But the mining industry was not so much leading the parade, as following it. It was in many ways a benefactor of industrial and technological change, rather than an initiator. For instance, the American mining industry grew in large measure due to an enhanced use of steam power. The industrial revolution has been characterized as the “Age of Steam,” when engines came to power all kinds of machinery doing work. Steam power helped transform the mining industry – but mines were the buyers of engines, not the makers, not the designers.<sup>8</sup> They used the *products* of the industrial revolution to good ends, be they engines, explosives, wire rope, or jaw crushers.

The first-generation copper mines of Michigan worked at the boundary between a pre-industrial or craft tradition of mining and a more modern industrial tradition. While engines and machines labored away on the surface, no engines and no machines toiled underground. Underground, the sweat of human labor built the industry. The muscles of men – not any newfangled machines – swung sledge hammers to drill the shot holes

for blasting rock, (Fig. 7.) used shovels to load copper rock into wheelbarrows or cars, and then pushed the rock to the shaft to be hoisted.<sup>9</sup>

Hard-rock, deep-shaft mining proceeded slowly in the pre-mechanized era; only a small advance could be made daily in sinking a shaft or driving a drift. So, when an early mine went into production, to get out much product it had to attack the lode from multiple points. To accomplish this, a mining company typically sank several shafts along the lode, spaced only two or three hundred feet apart. This provided more entry ways into the lode, more places for men to work.

The inclined copper lodes on the Keweenaw dipped into the ground on angles ranging from about thirty to eighty degrees, and a mine usually sank its shafts right through the lode, rather than sinking them in the hanging (which would be above the lode) or in the footwall (beneath the lode). The shafts gave access to the mine from the top down and served as the main thoroughfares for transporting men, tools, and copper rock.

At set distances apart, the tunnel-like drifts headed off from one shaft and ran horizontally through the lode towards adjacent shafts. During the pre-mechanized era, drifts were typically sixty feet (or ten fathoms) apart.<sup>10</sup> The intersecting drifts and shafts opened up and set off rectangular blocks of ground to be worked or “stoped” out. (Fig. 8.) Sinking shafts and driving drifts constituted development work; these openings prepared a given section of the underground to be worked. Stoping, the removal of the copper rock or mass copper from *between* two drifts, accounted for the vast majority of a mine’s product.

Miners usually stoped out the copper rock by working “overhand.” In other words, they worked from one drift up towards the next one. This method used gravity to advantage. If miners had stoped underhand, moving from one level down to the next, then after every blast the broken rock would have tumbled back down against the working face of the stope. Before men could drill and blast there again, that rock had to be lifted out of the way. But with overhand stoping, the blasted rock rolled away from the working face and down to the drift below. The next shift of miners was not slowed by any rock being in the way, and the mining companies did not have to spend money on labor needed to transport rock up and out of the stopes.

At early mines, men started stoping right next to the shaft, and as they stoped upward, they also pushed the stope out along the drift. Most lodes on the Keweenaw were quite narrow, meaning that on a given level underground, only a finite amount of ground presented itself for stoping. As a consequence, a productive mine was always on the move, taking its works down another level or two each year. After several years of operation, a mine’s underground landscape had three distinct regions. Abandoned works occupied the top of the mine. The copper there had already been removed, so the drifts and stopes were empty of men, tools, and activity. Below, one found the working levels of the mine – where stoping miners hopefully produced enough copper to make the company profitable. Most of the underground workforce labored here. Finally, at the very bottom of the mine, development continued. Men sank shafts, drove drifts, and put

in winzes (openings that ran from one level to the next and facilitated the flow of air in the mine). The development work readied the blocks of ground that stoping miners would get to in a year or two. In the three regions – stoped out ground, working levels, and development levels – one saw the past, the present, and the future of a mine.

In creating all the various mine openings – shafts, drifts, stopes, winzes, cross-cuts – miners employed the same basic technology. They drove shot holes using hand-held drill steels and sledge hammers; they charged the holes with black powder and fuse and fired them off. The number of men working alongside one another on small contract mining teams varied somewhat, depending on the size of the opening. In a large stope, three men often worked together; one held the drill steel while the other two rhythmically alternated blows with their eight pound sledge hammers. In a smaller drift, which might be as little as six feet high and five feet wide, there was no room for a third man, so a single man jacked the drill while his partner held it.<sup>11</sup>

Hand-drilling was slow and labor intensive. Part of the miners' skill rested in their ability to read the mine rock, see the lines of least resistance, and place the shot holes so that the fewest blasts brought down the most ground. Having determined the hole locations, one team member held the drill's sharpened chisel-bit against the rock face. His partners then struck the opposite end with their sledges. After each strike, the holder lifted the drill just a bit and turned it slightly, so that the next strike cut a better chip. Considerable physical skill was involved in this activity. In particular, since the angle and location of the holes differed from one to the next, the men had to have the physical dexterity and strength to accurately swing the hammer through a variety of arcs, always striking the drill head squarely, while missing the holder's hands and wrists.<sup>12</sup>

Using a succession of hand-steels of increasing length, miners drove shot holes to a depth of perhaps four feet. After drilling, as the end of the shift neared, they cleared the holes of chips and debris, set fuses and charged them with explosives. Through the Civil War period the mines all used one form or another of black powder. Powders from various manufacturers had somewhat different chemistries, but they were essentially a mixture of saltpeter, sulphur, and charcoal.<sup>13</sup> Mines stored their powder in magazines on the surface, and some mines made a practice of taking a week's worth of powder underground at a time, on a Sunday, to lessen the chances of mishandling and setting off an accidental explosion while men were at work.

Underground, mining teams drew from their own powder kegs to charge the holes. They lighted the fuses, quickly retreated to a safe place, and waited for the explosions to go off. When a burning fuse ignited a charge, the explosive detonated at a rate of about fifteen hundred feet per second. The rapidly expanding gases had a heaving effect on the rock, breaking it free. The miners counted the blasts. If they set eight charges, they wanted to hear eight explosions. If they did, they were done for the day. If not, if they suspected a missed hole – a charge that had not fired – they waited around long enough for it to be safe to go back in and try to fire that hole again. Unexploded charges were accidents waiting to happen, and needed to be dealt with.<sup>14</sup>



Figure 7

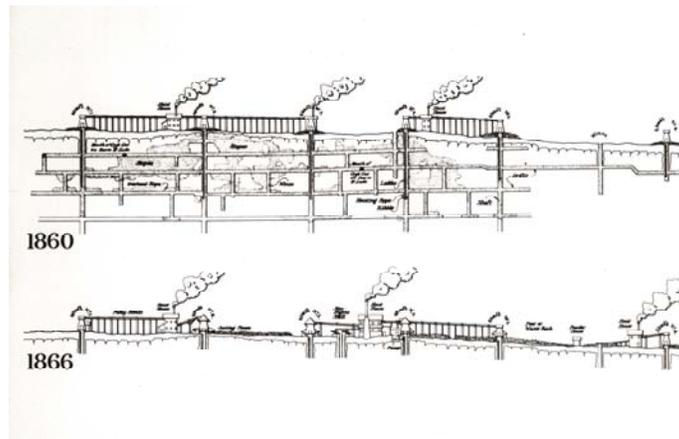


Figure 8



Figure 9



**Figure 10**



**Figure 11**





**Figure 14**



**Figure 15**

Some blasts brought down another load of copper rock, while others liberated large pieces of mass copper from the rock face. Miners sometimes tucked full twenty-five pound kegs of powder around a piece of mass copper in order to heave it out with a final large blast. Once the mass sat on the mine floor, men cut it up by hand, reducing it to pieces small enough for men to transport across and out of the mine.

Copper is a gummy, malleable metal. Explosions did not fracture it, and no machine existed in the nineteenth century to cut it up underground. Here, too, the companies resorted to manual labor, as copper cutters reduced the mass in a fashion similar to the way they drilled shot holes. (Fig. 9.) A mining captain drew lines across the mass, showing the men where to part it. One man held a chisel to the copper; others struck the chisel head with sledges. The chisel-holder walked the chisel along the cut line, and the tool produced a long chip as it moved from one side of the mass to the other. The men repeated this operation time after time. As the channel got deeper, the holder reached for

a longer chisel. Finally, the men cut through the bottom of the mass.<sup>15</sup> They then proceeded to part it again, if necessary, while others transported the removed portion to the shaft, where it was put in a sling and hoisted to the surface.

It took more than a year to cut up the largest pieces of mass copper found on the Keweenaw. Because parting the mass cost so much in terms of human labor, mass copper was not the economic bonanza companies had hoped it would be. They discovered that they could mine copper rock from an amygdaloid deposit – one that was only two percent copper – and make that pay as well or better than mining mass copper, because it was easier and faster to drill, blast, and transport.

On the Keweenaw, the tradition evolved that only the men who drilled and blasted rock underground were called “miners.” That class of men wanted to reserve the term for themselves, wanted to protect their higher status among the hierarchy of workers. The men performing other underground tasks had other titles. Those who worked at the bottom of the stopes and in the drifts to transport copper rock to the shafts for hoisting were called “trammers.”<sup>16</sup>

Trammers worked a demanding, taxing job. They mucked out broken rock, put it into a wheelbarrow or tramcar, and pushed it to the shaft. The rock blasted free by the miners came down in different sizes. Trammers picked up the smaller stuff using short D-handled shovels. (Fig. 10.) They bent over to pick up with their hands larger pieces of rock, up to a hundred pounds or so. If they couldn't easily lift the rock, they skidded or rolled it up a stout plank and into a car. If the rock was too big even for that, the trammers called in a “block-holer,” a miner who drilled a hole in the rock and charged and fired it, reducing it to pieces of manageable size.<sup>17</sup>

In the earliest years of copper production, trammers often used wheelbarrows to move rock. These had limited capacities, but their single front wheel made them maneuverable in tight spaces and small openings. When trammers used wheelbarrows, miners did not have to blast out a broad, flat floor along a drift. They could leave the floor v-shaped, good enough to accommodate the single-wheeled barrow. Before the Civil War, however, most mines replaced wheelbarrows with four-wheeled tramcars running on light rails laid along drifts.<sup>18</sup> (Fig. 11.) Tramcars carried substantially bigger loads, and the rails reduced friction, cut down on obstructions, and made the cars easier to push.

Teams of trammers moved around the mine, going to where they were needed. Miners in a given stope produced a limited amount of rock per shift, so the practice was to let it pile up, and tram it out periodically. Once they had pushed the rock to the shaft, the trammers dumped it directly into a bucket or box to be hoisted to the surface, or they dumped it on a flat floor alongside the shaft called a “trip plat.” In the early mines, hoisting, like tramming, was an intermittent thing. Just as the companies sometimes stockpiled rock at the stopes before tramming it, they also stockpiled rock alongside shafts until there was enough there to merit hoisting.

Between the opening of the mines in the 1840s and the Civil War, the most numerous and significant technological changes involved the hoisting of rock out of the mines. Initially, rock rose to the surface in wrought-iron buckets, called kibbles, which were drawn up by heavy manila hoisting ropes or by hoisting chains. In a vertical shaft, the kibble hung free in the shaft as it rose without the aid of any guides. In the more common inclined shafts, side-by-side longitudinally strung timbers formed a skid road that cradled the sides of the kibble. The kibble nestled partway down between the stringers, which served as a guide and reduced friction.<sup>19</sup>

By the early 1860s, the region's most productive mines replaced kibbles with skips, which were essentially four-wheeled, wrought-iron boxes, open on the upper end, which rolled over iron rails laid in the shaft. (Fig. 12.) The skips were raised by wire rope, instead of chain, and they carried heavier loads at faster speeds. When the heavier skips came into service, so too did more powerful means of hoisting on the surface.

Early mines typically moved through three generations of hoisting technologies as they moved from exploration, to development, and to full production. Initially, human labor raised the product of the mine; men on the surface turned windlasses or capstans by hand, winding up the rope or chain that drew up the kibble. Next, companies replaced human power with animal power – horses. Many mines operated horsewhims, which had a winding drum on a vertical axis connected to booms or sweeps near the base of the machine. Horses, harnessed to the sweeps, walked in circles, which rotated the winding drum and drew up the copper rock. Next came a very important third step – the substitution of steam power for animal power.<sup>20</sup> A reciprocating steam engine produced rotary motion at its crank, which was transmitted to a cylindrical winding drum on a horizontal axis. The winding drum typically carried wire rope by this stage, which drew up a rock skip, instead of a kibble.

In a nine or ten hour workday, two windlassmen could raise about four tons of rock from a depth of one hundred feet. A horse harnessed to its whim could raise 9 tons of rock from 150 per shift. Even the earliest steam engines could raise two to three tons of rock *per lift*, moving the skip at about five hundred feet per minute.<sup>21</sup> If a company had the capital to afford it, and enough production to justify it, steam power offered great advantages of speed and capacity.

It was no mean feat to ship an engine up to this remote wilderness in the first decade or so of mining. At Sault Ste. Marie, an engine and its attendant boiler and piping had to be taken off one boat, portaged around the rapids, and put aboard another boat plying Lake Superior. Upon arrival at the Keweenaw, the heavy equipment had to be landed at primitive docks, then put aboard heavy wagons pulled by work horses or oxen over the rudest of early roads leading to the hinterland mine site. Despite this travail, the first steam engine arrived in 1845 to work at a mine near Eagle River, and within a dozen years forty-eight engines worked at mines in the district. Twenty different companies had acquired engines by 1857. These general purpose engines could be geared up to do various types of work. Having an aggregate of some thirteen hundred horsepower, they hoisted and stamped rock and pumped water. Some engines had vertical cylinders and

walking beams – a “British style” of engine. Others were horizontal, high-pressure engines fitted up in the “American style.” A minority were small portables, which might even be used to buzz wood or grind grain at a mine site.<sup>22</sup>

Through the 1860s and even the 1870s, a company generally did not install an engine at every shaft. Instead it set the machinery up between shafts, where it could hoist rock, as needed, from two or three different ones. (Fig. 8.) In an era when engines on Lake Superior were quite scarce and dear, making each hoist engine do double or triple duty saved the company considerable capital, money that didn’t have to be expended on additional engines, winding drums, boilers, and buildings. Due to the reliance upon hand-drilling and the use of explosives of modest power, mining was a slow process at the early works. Typically a shaft carried only a single skip road (instead of two), and it did not produce enough rock to justify an engine dedicated to raising its production alone. The winding rope from an engine could be carried on pulley stands to one of several nearby shafts, to whichever shaft had the greatest stockpile of copper rock in need of hoisting.<sup>23</sup> Once the engine raised that rock, surface workers rerouted its hoisting rope to a neighboring shaft, so rock could be lifted there.

Drilling, blasting, mucking, tramming, and hoisting were the primary underground technologies; they put copper rock and mass copper up on the surface. But the mines – and their men – required a host of ancillary technologies that transported men up and down, supported the hanging wall, ventilated the mine, lighted it, or provided for underground sanitation.

Until the mid-1860s, men climbed into and out of a mine on ladders. Sometimes, in a vertical shaft they rode out of the mine on a rope sling or in a kibble. In an inclined shaft, they might hitch a ride in or on a rock skip. But wooden ladders spiked to a mine wall in a shaft remained their principal means of getting to and from work. Often a rough wooden wall separated the ladder way from the adjacent hoisting compartment. The ladders could be damp and slippery, in poor repair, and dangerous to climb; in the winter, ice often coated their upper levels, close to the frigid surface. Besides offering the risk of catastrophic falls, the ladders taxed the hearts and muscles of men who climbed down many rungs to get to work and then, at the end of nearly ten hours of arduous labor, climbed back up to get to grass. A writer in the Portage Lake Mining Gazette made clear the travail of ladder climbing:

No person, who has ever been obliged to make the ascent from the bottom of even a tolerably deep mine up to grass and sunshine but has heartily wished there were some less laborious manner of accomplishing the journey. Especially is it the case with such persons as ourself, who Nature has endowed with a light physique instead of the thews of an ox, and we have willingly imperiled our life in an old-fashioned kibble, which took us rolling along to the surface in five minutes, rather than perhaps make a thousand steps upon perhaps safer ladders in half an hour. How much more laborious must it be then to the miner who, after a hard day’s work under-ground, is compelled to climb up carrying from twenty to forty pounds of [drill] steel on his back?<sup>24</sup>

By the 1864 the Cliff mine was already one thousand feet deep, and it became the first Lake Superior copper mine to mechanically transport men up and down using a man-engine. German and Cornish mines had employed man-engines since the 1840s, and Cornishman John Rawlings designed and installed the Cliff's man-engine. Others soon followed at other mines.<sup>25</sup> (Fig. 13.) The man-engine was a mechanical ladder consisting of two side-by-side wooden rods. These rods, formed of heavy timbers twelve to fourteen inches square, bolted together end-to-end, operated in their own shaft. The rods carried small platforms about ten feet apart. A steam engine on the surface, assisted by counterweights, moved the long and heavy rods up and down. While one rod went down, the other went up. The rods briefly paused and then reversed directions. At the start of a shift, a man descended by stepping onto the platform on the rod that had just moved up. On its next short trip, the rod moved down ten feet, then stopped. During the pause, the worker stepped over to the platform on the other rod. He rode down into the mine ten feet at a time by always stepping over to the rod which, having just come up, was now poised to descend. At the end of the shift, he got to grass by doing the opposite – by always stepping over to the rod poised to go up.

With every load of copper rock, mass copper, or poor rock brought to the surface, the underground openings at a mine increased in volume, and the hanging wall – the rock “roof” of the mine perched above the stopes, drifts and shafts – increased in area. In mining, the hanging wall poses one of the greatest threats to life and limb for underground workers, because rock can break free from it and strike the men below. (Fig. 14.) In the first decades of mining copper on Lake Superior, most companies and their men came to discover that the rock here was remarkably strong – that it tended to stay in place.<sup>26</sup> As a consequence, the early mines left no regularly spaced rock pillars alongside shafts or up in the stopes to support the hanging wall. Instead, they stoped out rock rich in copper, regardless of where they found it. A large open stope might extend up and down several levels, or from one side of a shaft across to the other. The companies left some ground unmined – rock deemed too little charged with copper to merit taking – and these random poor rock pillars helped support the hanging. Besides eschewing a regular pattern of protective rock pillars, most companies also found no need to heavily timber their openings from top to bottom or end to end. Instead, they had a class of workers called “timbermen,” who propped up the hanging wall where it was loose and hazardous, using stulls, which were sections of tree trunks. (Fig. 15.)

The mines that did little to support their hanging walls also did little to ventilate their underground works. They relied on natural ventilation to move fresh air into and across the mines. This airflow scavenged the underground of dust, noxious gases, and heat as it turned direction, moved back up the mine and then exhausted into the atmosphere.

The shafts of varying depths (filled with air columns of differing heights) and the temperature gradients that existed between the surface and the underground tended to put air at the mines into motion. Certain shafts were downcast shafts. At the mouths of these shafts, a strong draught carried fresh air underground. Other shafts served as chimneys – these upcast shafts exhausted stale air and blasting gases into the atmosphere at grass.

For decades, the Lake Superior copper mines resorted but little to mechanical fans or other means of augmenting their system of natural ventilation, and all that while experts typically lauded the mines for their clean and cool air.<sup>27</sup>

Perhaps the most profound feature of the underground world was its darkness, and the way it closed in on workers. The mines used no broad, area lighting; each man carried his own. They lit the early mines with tallow candles. A man carried a shift's worth with him, using extra long wicks to tie them to his belt. He walked along a drift by the light of a single candle held to his helmet with a ball of clay. A mining team of three men drilled rock by the light of a few candles spiked to the wall or held to the rock with the clay ball taken from a helmet. The men could not focus the candlelight in any one direction or on any one thing; they worked in a dim pool of light that rapidly grew to darkness as they moved away from the source. An expansive darkness spread from one team of men over to the next. Looking over, a man saw in the distance a pin-point candle flame, but little in the way of human features.

In the early mines, from the time they left the surface until their return, underground workers typically toiled about ten hours per day. Once underground, most men stayed there for the entire shift. They ate a meal underground; one item of choice was the Cornish pasty, a kind of meat and vegetable pie wrapped in a folded over pastry crust. Men carried their victuals below in a tin pail and reheated them over a candle flame. Because their shifts were so long, men inevitably had to answer nature's call while underground. Up on the surface, many companies erected privies near major surface facilities. Such niceties did not exist underground. Men wandered away a bit from their work stations to urinate at any convenient spot. For more serious business, they squatted over an empty powder keg. For decades, underground sanitation remained as primitive as it could be. About the best the mines did was to bury offensive wastes under poor rock, perhaps after throwing some lime onto them.<sup>28</sup>

The underground environment was a world unto itself, an usual landscape, to be sure. Dark, rough, hazardous, enclosing, steeply pitched, filled with the sound of repetitive hammer blows and the smell of spent blasting powder. It was a place of work with a single purpose: to liberate copper and get it to the surface. Atop the mine, a very different world existed, one having its own characteristics.

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<sup>1</sup> Hyde, Copper for America, 33-35; Hybels, "Lake Superior Copper Fever," 234-43, 317-18.

<sup>2</sup> The best history of the quest to understand the Keweenaw's geology is Krause, The Making of a Mining District.

<sup>3</sup> Early mining company annual reports usually make it clear when a company has moved from pure exploration into development, and they typically show the requisite increase in employment and investment in physical plant.

<sup>4</sup> Data on production, technologies, and employment at early mines in their prospecting or development stages are found in J. W. Foster and J. D. Whitney, Report on the

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Geology and Topography of a Portion of the Lake Superior Land District in the State of Michigan, Part I, Copper Lands. U. S. House, Ex. Doc. 69 (31<sup>st</sup> Cong., 1<sup>st</sup> Sess.), 1850.

<sup>5</sup> Good examples of companies that tried and tried again would be the North-West/Pennsylvania/Delaware mining property on the northern end of the mineral range, and the Norwich mine on the southern end. See Lankton, Cradle to Grave, 15-17.

<sup>6</sup> See details of the stock assessment system in Hyde, Copper for America, 38; and Gates, Michigan Copper, 32-33.

<sup>7</sup> Nathan Rosenberg, Technology and American Economic Growth (New York, 1972), 59-116.

<sup>8</sup> See Louis C. Hunter, A History of Industrial Power in the United States, 1780-1930, II, Steam Power (Charlottesville, 1985), and Louis C. Hunter and Lynwood Bryant, A History of Industrial Power in the United States, 1780-1930, III, The Transmission of Power (Cambridge, 1991). Volume III has a section on “the use of Power in Nineteenth-Century Mining,” 375-512.

<sup>9</sup> For hand-drilling techniques, see George G. Andre, Rock Blasting: A Practical Treatise on the Means Employed in Blasting Rocks (London, 1878), 128-34. A good description of early technologies at the copper mines is found in Thomas Egleston, “Copper Mining on Lake Superior,” AIME Trans. 6 (1879): 275-312.

<sup>10</sup> Drifts, shafts, stopes and adits are shown in numerous longitudinal sections of mine works, often included in early mining company annual reports. For an example of a longitudinal section, see Lankton and Hyde, Old Reliable, 30. Cornish mines used the fathom (six feet) as a linear measurement, and the ten fathom spacing of drifts in Michigan is an indicator of the importance of Cornish influence at the Lake mines.

<sup>11</sup> Larry D. Lankton, “The Machine *under* the Garden: Rock Drills Arrive at the Lake Superior Copper Mines,” Technology and Culture 24:1 (Jan. 1983): 6-9. The sizes of individual teams performing different work underground is well documented in QMC, Contract Books, held at MTU.

<sup>12</sup> Lankton, Cradle to Grave, 30-31.

<sup>13</sup> Henry S. Drinker, Tunneling, Explosive Compounds and Rock Drills (New York, 1878), 56, 59.

<sup>14</sup> Andre, Rock Blasting, 124; Claude T. Rice, “Copper Mining at Lake Superior,” E&MJ 94 (17 Aug. 1912): 308; Robert E. Clarke, “Notes from the Copper Region,” Harper’s New Monthly Magazine 4 (March 1853): 448.

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<sup>15</sup> Egleston, "Copper Mining on Lake Superior," 285-87; Clarke, "Notes from the Copper Region," 4 (April 1853): 577; William P. Blake, "The Mass Copper of the Lake Superior Mines, and the Method of Mining It," AIME Trans. 4 (1875-76): 110-11.

<sup>16</sup> Extant nineteenth century Time Books and Contract Books from QMC, now at MTU, regularly make distinctions between "miners" and "trammers" -- as do most early mining company annual reports, which make it clear that a "miner" was a special class of worker.

<sup>17</sup> Rice, "Copper Mining at Lake Superior," E&MJ 94 (3 Aug. 1912): 217.

<sup>18</sup> Lankton and Hyde, Old Reliable, 25. The QMC Invoice Book, 1860-63 at MTU has an invoice dated 29 May 1860 for the purchase of forty-eight wheelbarrows.

<sup>19</sup> Lankton and Hyde, Old Reliable, 25, 109; the PLMG, 3 Dec. 1864, discusses the liabilities of kibbles and the introduction of rock skips.

<sup>20</sup> The first steam engine on the Keweenaw arrived at the Lake Superior mine near Eagle river in 1845. See LSM, 24 Jan. 1857.

<sup>21</sup> M. C. Ihlseng and Eugene B. Wilson, A Manual of Mining (New York, 1911), 127-29; Lankton and Hyde, Old Reliable, 25-26; Chaput, The Cliff, 25, 35.

<sup>22</sup> LSM of 25 Jan. 1857 lists all steam engines then used in the district. The same information is also printed in the Detroit Daily Free Press, 21 Feb. 1857 and in Mining Magazine 8 (1857): 289.

<sup>23</sup> To see an example of such a hoisting layout, see the photograph and map of the Quincy mine location in Lankton and Hyde, Old Reliable, 28-29.

<sup>24</sup> PLMG, 13 Dec. 1866.

<sup>25</sup> J. W. Rawlings, "Recollection of a Long Life," in Roy Drier, ed., Copper Country Tales I (Calumet, 1967), 115. Also, see QMC, A.R. (1866), 15; PMC, A.R. (1868), 29.

<sup>26</sup> Egleston, "Copper Mining on Lake Superior," 290.

<sup>27</sup> Lankton, Cradle to Grave, 37-39; G. E. McElroy, "Natural Ventilation of Michigan Copper Mines," U. S. Bureau of Mines Technical Paper 516 (Washington, 1932), 1.

<sup>28</sup> Arthur W. Thurner, Calumet Copper and People: A History of a Michigan Mining Community (by the author, 1974), 40.

## CHAPTER 4

### EARLY SETTLEMENTS AND COPPER WORKS

To win copper the mining companies had to do more than open up the underground. They also had to open up the remote wilderness on the surface of the Keweenaw to transportation, heavy industry, and settlement. And just as underground mining activities changed as a company moved from prospecting to development to production, so did its surface works change greatly as a mine camp evolved into a productive mining community. Companies tended to domestic and industrial needs ranging from building houses, to building roads, blacksmith shops, and stamp mills. Importantly, the mining companies were not alone in undertaking the task of planting an industrial society on Lake Superior. While they were building mines and mine towns, others established early commercial villages and erected the first hotels and stores. Mining companies and small businesses and professionals needed each other on the Keweenaw, depended on each other for support services or their livelihood, and together they changed the landscape.

Settling the Keweenaw was fraught with difficulties and uncertainties. This frontier was once described as being “beyond the boundaries appointed for the residence of man.”<sup>1</sup> Those who migrated to the Keweenaw often felt at risk, felt they were living on the edge. In the summer choking vegetation got in the way of travel and work, while successive waves of black flies and mosquitoes filled the air. These small critters exacted a toll on settlers, chasing them out of the woods and beleaguering them with nasty bites. Then came winter, which commenced by late November and lingered until April. Temperatures not uncommonly plummeted to below zero, and the exceedingly green landscape of summer became an exceptionally white landscape of deep snow during winter, thanks to the “lake effect” and its influence on the climate. Air passing over neighboring Lake Superior picked up moisture, which fell as snow over the cold Keweenaw land mass.

Often weather on the Keweenaw was glorious, the sun bright, the sky clear. But often, too, the Keweenaw presented a very hostile and threatening environment. What made winter even worse was the fact that from November to late April or even early May, it interrupted transport to and from the Copper Country. It closed off the passage of ships large and small to this land and locked its inhabitants out from the “world below.” Very few people on the mining frontier got in or out of the Keweenaw during the winter. Winter cut off the flow of food and other supplies, and residents had to make do with – and make last – whatever provisions they started the season with. Communication slowed and the sense of isolation grew as the lake boats stopped coming, and only an occasional mail delivery arrived by dogsled from Green Bay.<sup>2</sup>

For all the deprivations and risks found in this region, and for all the isolation it promised, it also promised opportunity, not only for investors and mining firms, but for all kinds of workers and small businessmen and families. Many came to work underground in the mines. Cornishmen and their families left their traditional copper and tin mining district in the extreme southwest corner of England, because that industry

at mid-century was in decline. To seek opportunity and a better future, Cornishmen booked passage on ships that carried them to many new mining districts around the globe, including Lake Superior.<sup>3</sup>

Others came to the Keweenaw not to work *in* the mines, but to work *at* the mines as managers, clerks, engineers, geologists, or doctors – while still others came to help establish commercial villages and to do some kind of business with the mines and their employees. This was especially true of the Americans who migrated to the Keweenaw. Almost no Americans came to Lake Superior, looking to work as a miner or underground laborer. The Cornish, Germans, and Irish (followed by other immigrant groups) built this industry from the bottom up, drilling, blasting, and tramping rock. Not the Americans.

The early migration of Americans to the Keweenaw was actually quite small and limited. The rich didn't come. They didn't need to. If they so desired, they could invest in a mining company and put their money to work for them on Lake Superior, while staying home in more "civilized" domains. The very poor, the infirm, and the aged generally did not come. And few came to Lake Superior who originated outside New England or New York. The New England-New York migratory path had carried many early settlers to the Lower Peninsula (including Douglass Houghton) and in the 1840s and 1850s it carried a smaller number of Americans to the Keweenaw, including such men as C. C. Douglass, Samuel W. Hill, James North Wright, and Daniel Brockway.<sup>4</sup> These transplanted Americans were instrumental in setting up early mines, or early commercial villages and businesses. The idea of opportunity drew these men to the Keweenaw. There, they could get in on the ground floor of something new, which they hoped would flourish. The migration of Americans to such a far-flung, often inhospitable or even threatening place as the Keweenaw exemplified their striving for advancement and success, a willingness to change and adapt, and to do what it took to try to forge a good life. Also, the movement to Lake Superior of Americans and immigrants alike often demonstrated the importance of kinship ties. Many did not make this risky move alone, but went there with family in tow, or with the encouragement of family already there.<sup>5</sup>

While companies put their mine villages or "locations" along the central spine of the Keweenaw – along the mineral range – the early commercial villages sprang up on the shores of Lake Superior and astride Portage Lake. The commercial villages went to shorelines and to good natural harbors, because water-borne transportation linked this mining frontier to the "world below." People and goods came in on boats, and the copper went out on boats.<sup>6</sup> The waterfront commercial villages developed where, and when, a nearby stretch of the mineral range was being opened up. The earliest important villages were Copper Harbor, Eagle Harbor and Eagle River, along the northern shoreline of Keweenaw Point. On the southern end of the mineral range, Ontonagon became an important center of commerce and trade. Then in the 1850s and early 1860s, the villages of Houghton and Hancock, on opposite sides of Portage Lake, rapidly developed as the mines on the hills above the lake went into full production. As counties were formed in the Copper Country, several of these villages also became the centers of local government. Eagle River became the county seat of Keweenaw County, while Ontonagon and Houghton became the seats of their respective counties.

Copper Harbor was the region's first settlement of note. It started out in 1843-44 as a picturesque tent city. Transient explorers pitched tents alongside the harbor as they prepared for forays into the field, or as they waited for a boat to bring in supplies or take them back to the world below. By the mid-1840s, log cabins, small shops, and the Brockway hotel brought a greater appearance of permanence to this remote outpost. Copper Harbor's importance was also bolstered by the presence of the federal government's land office to handle mining claims, by Fort Wilkins, and by a lighthouse, the first in the region, put up by the U. S. Lighthouse Establishment in 1849.<sup>7</sup>

Copper Harbor got off to a quick start, but did not continue to expand after the early years of the mine rush. Copper Harbor received one major blow when the Army decided to abandon Fort Wilkins in 1846, just two years after building it. The main blow to Copper Harbor's long-term fortunes, however, was the fact that no major mines developed on its doorstep. The biggest and best of the early mines started up away from Copper Harbor and closer to other villages, such as Eagle Harbor and Eagle River.

The Cliff, Phoenix and other neighboring mines depended on Eagle Harbor for shipping and provisioning. Edward Taylor built the first pier at Eagle Harbor in 1844. William Raley later enlarged the village's dock and warehouse facilities, and a lighthouse went up in 1851.<sup>8</sup> By the 1850s, Eagle Harbor boasted more hotels, stores, churches, and drinking establishments than any hinterland mine locations. One early general store, established initially by Foley & Smith in the 1850s, still survives. Eagle River, unlike Eagle Harbor, did not have a fine natural harbor, but nevertheless became another coastal center of commerce due to its proximity to mine locations. The land occupied by Eagle River was obtained from the federal government in 1843 by the Lake Superior Copper Company, which tried to start a paying mine a bit upstream of the river's mouth. Besides becoming a county seat, Eagle River boasted one of the early manufactories on the Keweenaw – a fuse factory. Eagle River served as a destination for residents of the mine locations seeking goods and services or entertainment. Henry Hobart, who taught school at the Cliff Mine during the Civil War era, recounted in his diary trips made to Eagle River to shop, or to have his students compete in spelling bees against Eagle River's young scholars.<sup>9</sup>

On the southern end of the mineral range, home of the famous Minesota mine and many others, Ontonagon became the key commercial village. Prior to the mine rush, Indians had camped and fished at this site located on Lake Superior at the mouth of the Ontonagon River. After the rush, some Ojibwe stayed. They caught and sold fish to settlers, loaded and unloaded lake boats, and transported people and goods up the Ontonagon River, towards the mines.

Starting in 1843, James Paul (a very rare Virginian who migrated to Lake Superior), helped found a permanent settlement at Ontonagon. The village became the jumping-off point that serviced as many as thirty mines in the hinterland. As the only major port of call on the southern end of the mineral range, and as the purveyor of goods and services to so many mines, Ontonagon thrived, particularly in the 1850s, and for a time was the

largest settlement on the Keweenaw.<sup>10</sup> Ontonagon improved its channel and docks, received a lighthouse, built hotels, welcomed druggists, erected schools and Protestant and Catholic churches, and served as the county seat. What limited the continued growth of Ontonagon was the fact that the Minnesota mine flourished for only a brief while, and although many other local mines flirted with profitability, they fell short. Mining declined on this end of the mineral range by 1870, and so did the fortunes of Ontonagon. At about the same time, the fortunes of the Cliff and other Keweenaw County mines declined, too, which capped the growth of Eagle Harbor and Eagle River.<sup>11</sup> Meanwhile, the center of mining activity and population increase shifted to the middle of the Keweenaw, which gave rise to two new centers of commerce, Hancock on the northern side of Portage Lake, and Houghton on the southern shore.

On the hill above Hancock, after a decade of futility, in the late 1850s several mines entered full production, especially the Quincy, Pewabic and Franklin mines. Hancock's rise was particularly tied to the fortunes of the Quincy mine, which originally owned much of the land that Hancock grew into as it expanded.<sup>12</sup> Houghton had several mines on its side of the lake, including the Isle Royale, Huron, and Sheldon and Columbian. Ransom Sheldon, merchant, mine developer and entrepreneur, originally acquired the land that comprised Houghton in 1852. He platted part of it for a commercial village and reserved other portions as mining lands.<sup>13</sup> In both Hancock and Houghton, the main commercial street ran parallel to the Portage, but was two or three blocks up from the shoreline. The main commercial streets – originally unpaved and having no sidewalks – started to fill with shops, stores, hotel, saloons and boarding houses. Meanwhile, the shorelines filled with docks, warehouses, shipping offices, and industrial operations, such as stamp mills, copper smelters and iron foundries.

In the first decades of mining and settlement, the region desperately needed improved water and overland transportation. The waterfront villages needed better channels or docks, and better roads connecting to mines along the mineral range. A considerable mix of peoples and institutions brought these improvements about.

The Keweenaw particularly benefited from the opening, in 1855, of the canal and locks alongside the rapids of the St. Mary's river in Sault Ste. Marie, Michigan. The St. Mary's connected Lake Superior with the lower Great Lakes, and its rocky rapids at the "Soo" kept boats from freely passing back and forth. Travelers going up to the Keweenaw from Detroit had to leave their original boat at the rapids, then get on another one that plied the higher Lake Superior. Meanwhile, dockworkers portaged their goods and freight around the rapids. The same held for all the early copper shipped out of the Keweenaw. A boat took it to the Soo, where it was unloaded, portaged, and reloaded onto a second vessel. The construction of a canal and locks at the Soo finally made it possible for any vessel on the lower Great Lakes to pass up and onto Lake Superior. Eliminating the portage made the transport of people, goods, and copper both faster and less expensive.

The copper mines started at a time when politicians disputed the federal government's role in building "internal improvements," such as canals and roads. Public works

projects were often controversial, as they stirred up constitutional debates and sectional rivalries. The locks at the Soo originally proved a hard sell in Washington, and after Michigan became a state it took a decade and half for the federal government to commit to the project.<sup>14</sup> In the end, the federal government gave a land grant to the state, and the state turned around and transferred the land to the canal's builder, as payment for the work. The builder, the St. Mary's Falls Ship Canal Company, received 750,000 acres of former federal land to sell, develop or exploit as it saw fit, and in return over a two-year span it built the vitally needed locks and canal.<sup>15</sup>

With the opening of the Soo locks, the largest lake boats could now sail up and onto Lake Superior and then another 250 miles over to the Keweenaw. They could not, however, sail directly up to the docks at Houghton and Hancock on the shores of Portage Lake. The lake boats could not navigate the shallow, meandering channel leading to the villages from Keweenaw Bay. All the early cargo going into and out of Portage Lake did so on lighters – small boats or barges. On the Keweenaw, mining companies and business firms often did not rely on government to solve transportation problems, and in 1859 locals organized to get rid of this obstruction to navigation. Mines and merchants organized the Portage River Improvement Company to remove the sand bar at Keweenaw Bay and dredge and straighten the channel to Portage Lake. When this company's work was done, any large boat on Lake Superior could sail right up to the docks at Houghton and Hancock. In a similar fashion, on the northern end of the mineral range, mining companies organized a corporation that cut a deeper shipping channel from Keweenaw Bay into Lac La Belle, making that lake a better, more useful harbor. And to the south, Ontonagon improved its harbor facilities.<sup>16</sup>

A bit later, in the 1870s, two additional improvements were made to water transport on the Keweenaw. One followed the government model, after the fashion of the Soo locks; the other the “do-it-yourself” model of the mining companies. After the “southern entry” and the channel from Keweenaw Bay to Portage Lake had been improved, it became desirable to create a “northern entry” to Portage Lake from Lake Superior by cutting a wholly new channel. Between 1868 and 1873, steam dredges ate away the ground between Lake Superior and Portage Lake, until their waters were united. Cutting the new ship canal cost about \$2.5 million; the canal company did the work in return for government land grants totaling 450,000 acres in the Upper Peninsula.<sup>17</sup> At about the time this project was being completed, Calumet and Hecla and its neighboring mines, following the do-it-yourself model, subscribed to a canal company that dredged out a new two-mile-long channel connecting Torch and Portage Lakes. This channel did for Torch Lake what other water projects had done for Portage Lake. It made the lake accessible to the biggest lake boats, and thus opened up its shoreline to full industrial and commercial development.<sup>18</sup>

Internal improvements to water transport opened up shorelines for development and made it easier for people and goods to arrive at or leave from waterfront commercial villages. Overland transportation also required vital improvements to facilitate the movement of people and goods. To get copper from mine to dock, or to get early settlers to a holiday dance at Fort Wilkins, or to get the missionary, Father Baraga, to a mine

location, or to get barrels of salt pork from Eagle Harbor to the Cliff mine – the region desperately needed roads. The earliest paths and roads ran from the shore’s commercial villages to the hinterland’s mines. Next came paths running along the Keweenaw, connecting mine to mine, village to village. Later, roads led away from the Keweenaw to connect with more distant locales, such as Marquette or Green Bay.<sup>19</sup>

Despite the tremendous need for good roads, their construction lagged in this difficult environment, which was overgrown with dense vegetation in the summer and covered with deep snow in the winter. In the 1840s and 1850s, new settlements were served and supplied by “mere trails, over which everything was carried to the mine by half-breed packers.”<sup>20</sup> Footpaths linking the settlements gave way over time to horse-paths and then wagon roads. The mining companies took charge of building the primitive roads absolutely needed to get their people and goods in and their copper out. They routed them and built them. Construction of a more extensive network of good wagon roads lagged because of a lack of public funds and because of uncertainty as to who should plan and pay for the work.

It took two decades to get government involved in the construction of good roads. Not until the 1860s did federal or state governments give a boost to road building on the Keweenaw. During the Civil War era, the Michigan legislature finally made land grants to support local road construction, and it returned to local counties revenues accruing from a tax on copper output, funds that could be applied to internal improvements. The federal government, through an act of Congress, made land grants to Michigan and Wisconsin to fund the construction of a good military wagon road running down the mineral range from Copper Harbor into Wisconsin.<sup>21</sup>

A cluster of mines on the southern end of the mineral range launched the most ambitious overland route of the pioneer era. In the early 1850s, mines using Ontonagon as their shipping port combined to build a plank road. This road, surfaced with boards laid side by side and spiked to longitudinal stringers, was smoother and faster than a common wagon road and expedited the cartage of heavy loads. The Ontonagon Plank Road, as it ran from Ontonagon to the Minesota mine, ran across or near eleven other mine locations. These mines had subscribed in the company mainly to lessen their transportation costs for copper. For one, the Toltec mine (which had invested \$12,000 in the road), the cost of shipping a barrel of mass copper to Ontonagon fell from \$1.50 to just fifty cents between 1851 and 1855. The road benefited the residents of all the mines as well, because stage coaches provided regular passenger service over the plank road.<sup>22</sup>

Ordinary roads built by the mining companies were not as well engineered and built as the Ontonagon Plank Road. To save on the cost of felling additional trees, woodsmen cut narrow road beds through forests. Builders often left old stumps and rocks right in the roadway, which rarely was adequately graded or ditched. In the spring, snowmelt and rain often turned roads into muddy, impassible quagmires. In the warmer, drier months of summer, the roads were hard, rutted, and dusty. Often, winter actually improved overland travel. Snow filled in the ruts, covered the rocks and stumps, and provided a smoother surface to glide over. Winter also froze lakes and rivers, creating natural

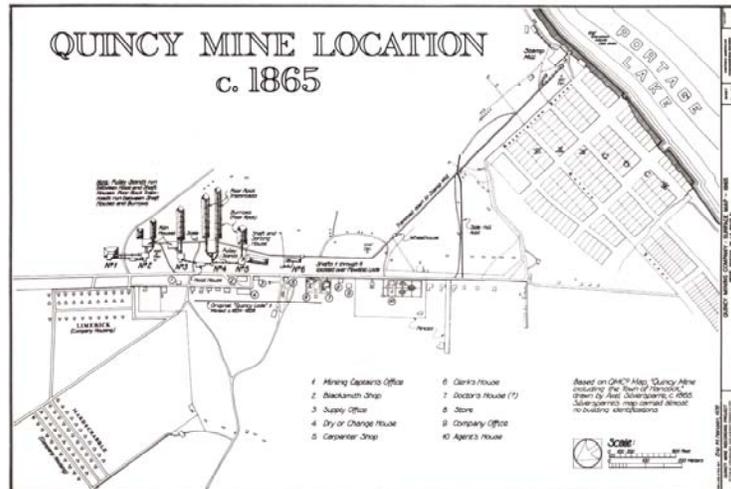
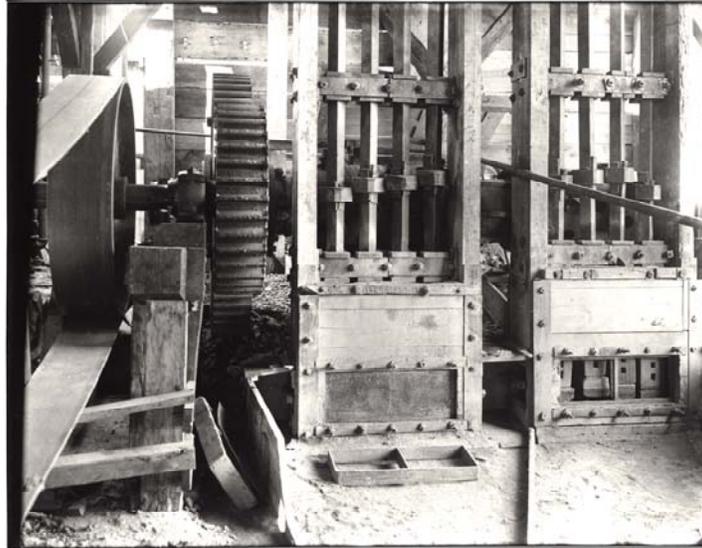


Figure 17



Figure 18



**Figure 19**

bridges and allowing for shortcuts not available during summer. Some companies stockpiled their copper at the mine during the summer and waited till winter to haul it to a shipping dock in heavy sleighs.<sup>23</sup>

The Keweenaw's primitive trails and roads ran to equally primitive and isolated mine locations, literally almost carved out of the wilderness. Typically, a mine location did not sit right next to a commercial village, not right next door to a host of stores, shops, churches, or bars. Instead, it sat out in the woods – a small island of industry in a sea of trees. Early illustrations of the mine locations invariably portrayed them as rustic, peaceful, and quaint. The industry *belonged* in the woods. It fed off nature's resources and yet lived in harmony with nature at the same time. As depicted, these idealized industrial hamlets were not home to disharmony, discord, smoke, noise, ugliness, crudeness, garbage, outhouses, blizzards, and black flies. In some illustrations, the tree stumps shown around a mine location represented the most obvious evidence of environmental change wrought by industry. But the stumps symbolized human progress, not environmental degradation. The wrecks of trees were not to be taken as ominous signs, but as evidence that at the mines, nature was being put to good use.<sup>24</sup>

The actual appearance of a mine location depended a great deal on the fortunes of the company. As a company moved from exploration, to development, to production, it added new site features, ranging from powder magazines to houses, while perhaps altering or abandoning older features. As a company passed through the successive stages of growth, its technological and domestic infrastructures both became larger, more expensive, and more complex.

The technology of prospecting involved simple hand tools needed to clear brush and trees, dig trenches and sink test pits. To perform these tasks, a small crew of men wielded picks, axes, shovels, hand steels, sledge hammers, black powder and wheelbarrows. At a mine camp holes, trenches and burrow piles of rock far outnumbered standing structures, which might include some storage sheds for tools and

copper specimens, a small powder magazine, and a rudimentary blacksmith shop, where tools such as drill steels could be forged or sharpened. The first “dwelling” on the site was often a squatter’s tent, or a hut erected out of poles cut in the woods and faced with cedar bark. The hut had a dirt floor, a circle of rocks for the fire, a hole in the roof to let smoke out, and a bed of moss and tree boughs.<sup>25</sup>

Next came boarding houses for the young, single men who worked in this primitive environment. Boarding houses sheltered from a half-dozen to twenty men, who lived together in one or one-and-a-half story structures, which might be as large as twenty-eight feet wide and thirty to forty feet long. They slept in hard, tiered bunks that ran alongside the walls and sometimes filled a loft under the roof. The earliest boardinghouses were built of logs cut and dressed at the site, but by the late 1850s, frame construction and clapboard siding became fairly common. Boardinghouses usually had wooden doors, windows, flooring, and a cast-iron stove for heat. At some camps, each boardinghouse had its own cooking and eating area; at others, the men bunked in one building and ate in another.<sup>26</sup>

While still in the prospecting stage, a company might operate but a single boarding house. If the prospectors found no copper at all, the firm abandoned the land, leaving behind a small number of modest buildings and a site pock-marked with pits and trenches. If, on the other hand, men discovered one or more promising lodes or fissure veins, then activity at the site intensified. Entering its development stage, a company opened up the underground more, by sinking more shafts and driving drifts to test its worth. But while expanding its underground works, a nascent mine’s surface plant, and rightfully so, remained quite modest.

A smart company knew that unless and until the underground proved itself of value, it should not lavish precious investment capital on surface improvements. The most rudimentary structures sufficed, most constructed of wood, perhaps a few of poor rock. Machinery remained little in evidence. Simple wooden head-frames stood over the shafts. Men or horses, not steam engines, hoisted the rock up. Burrow piles of poor rock lined the site and grew larger. More trees disappeared as they were taken for fuel, structures, or mine supports. Often but a single wagon road led to and through the mine camp, often in a meandering fashion that followed the easiest pathway and avoided the biggest obstacles.

To push development work, a company hired, sheltered, and fed upwards of a hundred men. It employed more miners. It hired blacksmiths, carpenters and cooks; surface hands to move and sort copper rock; teamsters to handle the work horses or oxen; and maybe a farmer to help raise food for men and beasts on cleared land. The men on the payroll remained mostly young and single. To board them in a cost-effective manner, a company typically just multiplied its number of boarding houses. To live communally in this rugged mine camp, barren of most amenities, a man typically paid back to his company one-quarter to one-third of his monthly earnings.<sup>27</sup>

If pioneering shafts and drifts exposed enough copper to warrant an advance into full production, a company started transforming its camp in important and expensive ways. It turned it into a mine location having a more extensive range of industrial and domestic structures. It not uncommonly sank a few more shafts (giving it a total, perhaps, of four to six) to expedite the taking of copper. At each shaft collar stood a head-frame of heavy timber construction covered by a sheathing of rough vertical planking, unpainted. No machinery operated inside a shaft-house. A pulley at the top carried the hoisting rope that ran down into the mine and then lifted the kibble or skip up. The company typically used steam power, rather than men or horses, to raise copper rock. Amidst the line of shafts stood a hoisthouse, perhaps two or three. Hoisthouses often had poor rock foundations and wooden superstructures. They contained not only the steam engine itself, but its boiler. Because of the steam boiler, a tall smoke stack marked each hoisthouse – the stack was commonly of riveted wrought iron and stood atop a tall masonry base of poor rock laid up with mortar. Near the engine house sat an impressive pile of cordwood to be burned as fuel. Because the boiler and stack posed a fire hazard to a wooden hoisthouse – which sheltered the most expensive equipment at the mine – sometimes a catwalk led up to and then along the ridge line of the building’s shingled roof. On the catwalk stood water barrels that could be dumped over the roof to help fight a blaze. (Fig. 16.)

When the hoist delivered the skip to the surface, it tipped and dumped its contents. Men put the copper rock into wheel barrows or small cars running on light rails and pushed it to a nearby sortinghouse, often attached to the shafthouse. (Fig. 17.) Men dumped the material onto the floor and hand-sorted it by quality and by size. They relegated rock carrying too little copper to merit further processing to burrow or waste piles. They tossed smaller pieces of mass copper into barrels, ready for shipment to a smelter. (Hence the term for these pieces, “barrel copper.”) Larger pieces of mass copper weren’t packed into barrels, but were warehoused for storage at the mine before being hauled away in heavy wagons or sleighs.<sup>28</sup>

Good copper rock – with a copper content of about two percent or more --could not go straight to a smelter. First, it had to be milled and concentrated -- actions that mechanically liberated the copper from the rock matrix, then separated the two materials to produce a mineral concentrate (sixty to eighty percent copper) that could be smelted. This activity took place at a company’s stamp mill, whose stamps machines could accept rock no bigger than three to four inches across. At a mine’s sortinghouses, men separated rock not only by copper content, but by size. They put pieces under four inches into cars that could go straight to a stamp mill. They put oversized rock into cars or wheelbarrows that men pushed to nearby kilnhouses, where fire – followed by sledges, picks and sweat – broke it into smaller pieces.

The kilnhouse was a common feature at Lake Superior copper mines until the Civil War era. Not until later did mechanical jaw crushers and hammers take over the work of breaking rock on the surface at the mines. At a kiln house, up to twenty-five laborers “burned and dressed” copper within a shallow, stone lined pit about seventy-five feet long that was floored with cast iron plates and covered with a roof, but not walled. The

men built a bed of timber about twenty feet square and four feet high. They then covered the wood with four to six feet of copper rock before lighting it. The heat cracked the rock; sometimes men aided this process at the end by pouring water on the rock, causing it to rapidly cool, contract, and crack. When the rock fully cooled, laborers got in the pit with hammers and picks and broke up any pieces still too large to go to the stamps. While men at one end of the kiln house waged war with hammer and pick, men in the other end prepared another load to be burned.<sup>29</sup>

The erection of a stamp mill was an important sign that a company was entering into production; it represented another major investment in building and machinery. (Fig. 18.) Stamp mills required water for their operation. Flowing water transported rock and copper from operation to operation within the mill. With the help of various machines and contrivances, water flow also served to separate the lighter rock (which would tend to be carried along by the water) from the heavier copper (which would tend to sink or settle out). Many early stamp mills were located close to the mine shafts; they were a part of the mine location. Companies supplied water to these mills by tapping water pumped from the mine itself, and/or by damming a small nearby stream to create a handy reservoir. But as mines and their product became larger, locally available water supplies often proved insufficient. Companies moved their mills to larger inland lakes, such as Portage Lake or Torch Lake, and Lake Superior, too, ultimately became a stamp mill site. The separation of mine and mill entailed the expense and construction of a transportation link between the two, and companies also had to erect housing at the mill, just like they did at the mine. But for many mines the separation was essential. The large lakes provided the vast quantities of water that mills needed, and the deeper lakes also served as convenient dumps for the waste products of milling, known as stamp sands.<sup>30</sup>

The most important machine at the stamp mill was the stamp itself. (Fig. 19.) All stamps worked in similar fashion. They all reciprocated, up and down, a cast-iron stamp shoe, carried on the bottom end of a vertical stem. The stamp crushed rock confined in a mortar box at the base of the machine. When fed into the mortar box, attended by a strong flow of water, the rock was as large as three or four inches in diameter. Each blow of a stamp shoe reduced it in size. A perforated plate formed one or two sides of the mortar box and served as a screen controlling the outflow of material from the stamp. When crushed finely enough, down to about three-sixteenths of an inch, the rock and liberated copper particles flowed out through the screen and on to devices or machines that separated the two materials.

From 1845 to 1855, the region's new mills used batteries of "drop" or "gravity stamps like those found in Cornwall's tin and copper mines. Each battery carried four or five small stamp heads working in a common mortar box. A steam engine, through belting and gearing, drove the main shaft on each battery. This shaft carried cams, one for each stamp head. As the shaft rotated, its cams sequentially lifted each of the machine's stems. As the shaft rotated further, each stem in turn fell off its cam. It dropped by gravity, and its cast iron stamp shoe struck a blow against the rock in the mortar box. By the late 1850s, some companies adopted the newer technology of steam stamps. These machines reciprocated a much heavier cast-iron stamp head in a very different way. The

vertical stamp stem was not raised up by a cam, nor did it fall only due to gravity. Instead, the stem ran up to an overhead steam cylinder at the top of the machine, passed through a steam-tight packing gland, and connected to a piston that reciprocated up and down. The pressurized steam that moved the piston up also helped propel it downwards, allowing the machine to strike a more powerful blow against the rock in the mortar box.<sup>31</sup>

Occasionally, stamp tenders stopped their machines, so they could pick out pieces of native copper that had collected in the mortar box because they were too big to flow out. Other than that, the stamps produced a constant stream of finely broken rock and liberated copper, carried out of the stamp and on to subsequent operations by a flow of water. At the earliest mills, such as the one at the Cliff mine, the stamps were about the only machines present, and men and boys accomplished the separation of rock and copper by hand using “jiggers” as well as pools, troughs, and gates laid out along the mill floor.<sup>32</sup> The jigger was a low tub with a perforated brass bottom. A boy shoveled up water, rock, and copper from a trough or pool and swished and swirled it around before setting the jigger on the floor. This action caused the heavier copper to settle at the bottom of the jig, with the rock and lighter, smaller pieces of copper above it. Using a scraper, the boy separated the two layers, collecting the copper and sending the top layer of material off for further washing and separating in troughs and “buddles,” which were like miniature rapids or waterfalls, with gates going across the water flow. In these processes, if the flow of water was just right, the copper would tend to settle out along the bottom of a trough, or behind a buddle’s gate, while the water continued to carry along the rock. The captured copper went into barrels for shipment to a smelter, while the waste tailings were dumped nearby.

Men experienced in Cornish tin and copper mining brought the knowledge and expertise needed to set up the first stamp mills and their separating technologies. These technologies rapidly changed over the first few decades, especially as more companies abandoned hopes of finding mass copper deposits. When companies started emphasizing amygdaloid and conglomerate deposits – rather than the mass copper found in fissure veins – they tied their futures to the recovery of fine pieces of copper, instead of massive ones. They needed to mill and wash great tonnages of rock, and they needed to fine-tune their milling technologies in accordance with their own particular deposits. So, a “home-grown” style of milling and concentrating rock arose on the Keweenaw.

Essential to the evolution of Lake Superior milling – the history of which is most fully told in C. Harry Benedict’s Lake Superior Milling Practice – was the design and construction of new machines that replaced steps previously done by hand or with simple troughs. Relatively soon, companies no longer hired boys to jig copper by hand. They turned to mechanical jigs powered by a steam engine. In these jigs, plungers agitated a watery suspension of copper and rock particles in a chamber with a sieve-plate bottom. When the agitation stopped, the copper settled to the bottom. At mechanical buddles, a slimy mixture of rock and copper flowed out very slowly from the center of a large, rotating disc. The heavier copper stayed on the disc. Water carried the lighter rock particles across the disc’s surface and then tailed them over its edge. With the addition of steam stamps, jigs, and rotating buddles, mechanization proceeded faster at the mills on the Keweenaw than within the mines.<sup>33</sup>

Producing marketable copper required three separate and distinct technologies: mining, milling, and smelting. Virtually all successful mining companies owned and operated their own mill. But few ever erected and operated their own smelter, because the output of a single company, unless it was very large, did not justify such an investment. In the pioneering days, on the Keweenaw and on Isle Royale, a few companies experimented with smelters, but none seem to have been successful, from an economic or a technological perspective. The Keweenaw boasted only one major smelter by the Civil War era, and that did not arrive until 1860.

Lake Superior mass copper, and the mineral concentrates from early stamp mills, first traveled to very distant smelters in Boston and Baltimore to be melted and cast into ingots. Then, smelters arose a bit closer to home, in Pittsburgh, Cleveland and Detroit.<sup>34</sup> The Waterbury and Detroit Copper Company's smelter (in Detroit) was a custom smelter – that is, it was not owned or operated by a mining company, nor did it smelt copper from just one firm. Instead, it smelted the products of many mines (and put each mine's individual trademark on all its ingot). In 1860, the Portage Lake Copper Company opened its custom smelter near Hancock.<sup>35</sup> This smelter served as a major addition to the rapidly expanding industrial landscape alongside Portage Lake. In 1867 the Detroit and Portage Lake smelting companies merged to form the Detroit and Lake Superior Copper Company, which continued to operate the smelting works both at Detroit and at Hancock.

Smelting native copper was basically a melting operation conducted in a reverberatory furnace. Due to the purity of the metal put into the furnace, the operation entailed little refining to remove undesirable elements. That purity was protected by the design of the furnace itself, which had a low bridge wall that kept the fuel (coal) in the fire-box end of the furnace separate from the mineral in the middle. Heat and flame swept over the bridge wall and reverberated along the hearth before going up and out the stack. Small doors in the masonry furnace gave furnacemen access to the melt. After the copper reached its melting point, workers skimmed or ladled off the slag of molten rock, putting it into buggies that were wheeled away and dumped. Then furnacemen splashed the copper around with a paddle called a “rabble.” Rabbling mixed air into the melt to oxidize impurities. Then they eliminated excess oxygen by plunging hardwood poles into the melt. The poles combusted immediately, agitated the melt, and produced carbon that combined with oxygen to produce a gas that left the melt and passed up the stack. Furnacemen skimmed off any remaining slag, then ladled copper into molds to produce copper ingots and cakes of different sizes and shapes for different markets. The empty furnace was then recharged with mineral and mass, through the top, to start another run.<sup>36</sup>

The mine camps along the mineral range evolved into real industrial sites as they cut back the forests and added steam engines and boilerhouses, shaft- and kilnhouses, stamp mills, blacksmith and machine shops. By 1864, the region boasted its first steam locomotive railroad, a short line built in 1864 to move copper rock back and forth across the adjacent Pewabic and Franklin mines.<sup>37</sup> While companies invested in technologies to meet their industrial needs, they tended to myriad social needs as well. The mine operators weren't utopians, seeking an ideal environment for working class families.

They were not great community planners, who went in with a well-thought out, unwavering vision of what a mine village on Lake Superior should be. But they knew that squatter's huts and boarding houses filled with single men out in the woods would not suffice. A more complete social infrastructure had to be built, and bit by bit, in a pragmatic, as-needed way, the mining companies helped shepherd the building of houses, neighborhoods, churches, and schools.

<sup>1</sup>Schoolcraft, Narrative Journal, 178.

<sup>2</sup> Larry Lankton, Beyond the Boundaries: Life and Landscape at the Lake Superior Copper Mines (New York, 1997), 12, 16, 43-44.

<sup>3</sup> See John Rowe, The Hard Rock Men: Cornish Immigrants and the North American Mining Frontier (New York, 1974), 62-95; and A. L. Rowse, The Cousin Jacks: The Cornish in America (New York, 1969), 161-95.

<sup>4</sup> LeRoy Barnett, "What the Sam Hill!" in MH (May-June 2004): 14-18; Larry Lankton, "One Family's Journey to 'Earthly Paradise'" in MH (Nov. Dec. 2001): 26-30; Lankton and Hyde, Old Reliable, 5-6, 19. Western Historical Company, History of the Upper Peninsula of Michigan (Chicago, 1883), 285-86; Alvah H. Sawyer, A History of the Northern Peninsula and Its People 2(Chicago, 1911), 1012-14.

<sup>5</sup> For instance, Ransom Sheldon, who established Houghton, married a cousin of geologist Douglass Houghton, who was also a sister of C. C. Douglass. See Lankton and Hyde, Old Reliable, 5-6. Also, Daniel D. Brockway received his job on Lake Superior courtesy of his older brother's influence: William Brockway was the head of Methodist missions on the Lake. And when Daniel migrated to Lake Superior, he brought his younger brother along with him. See Lankton, "One Family's Journey," 28-29.

<sup>6</sup> Lankton, Beyond the Boundaries, 23-36.

<sup>7</sup> Ibid., 9, 26, 33, 50-51.

<sup>8</sup> For lighthouses on the Keweenaw, see Charles K. Hyde, The Northern Lights: Lighthouses of the Upper Great Lakes (Lansing, 1986), 17, 158-84.

<sup>9</sup> Philip P. Mason, ed., Copper Country Journal: The Diary of Schoolmaster Henry Hobart, 1863-1864 (Detroit, 1991), 65, 30, 97, 99, 106-07.

<sup>10</sup> For the story of James Paul and Ontonagon, see James K. Jamison, This Ontonagon Country: The Story of An American Frontier (Calumet, 1965), 1-27.

<sup>11</sup> Gates, Michigan Copper, 43; Chaput, The Cliff, 46-56; Lankton, Cradle to Grave, 10.

<sup>12</sup> Nancy Beth Fisher, "Quincy Mining Company Housing, 1840s-1920s," unpublished master's thesis, Michigan Technological University (1997), 41-42.

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<sup>13</sup> Arthur W. Thurner, (Detroit, 1994), 76.

<sup>14</sup> Lankton, Beyond the Boundaries, 33.

<sup>15</sup> See John N. Dickinson, To Build a Canal: Sault Ste. Marie 1853-54 and After (Miami, Ohio, 1981).

<sup>16</sup> Graham Pope, "Some Early Mining Days at Portage Lake," LSMI Proc. 7 (1901): 26-28; PLMG, 2 April 1864; LSM, 14 Nov. 1857.

<sup>17</sup> Western Historical, History of the Upper Peninsula, 253; Arthur W. Thurner, Strangers and Sojourners: A History of Michigan's Keweenaw Peninsula (Detroit, 1994), 81-82.

<sup>18</sup> Gates, Michigan Copper, 61.

<sup>19</sup> Lankton, Beyond the Boundaries, 36-37.

<sup>20</sup> LSJ, 9 July 1853.

<sup>21</sup> Gates, Michigan Copper, 20-21; Orrin W. Robinson, "Recollections of Civil War Conditions in the Copper Country," MH 3 (Oct. 1919): 606-07; PLMG, 24 Sept. 1864.

<sup>22</sup> Gates, Michigan Copper, 20; Toltec Mining Company, A.R. for 1852, and A.R. for 1855, 12-14.

<sup>23</sup> Lankton, Beyond the Boundaries, 40-41.

<sup>24</sup> See, for instance, illustrations in Lankton, Beyond the Boundaries, between pp. 88-89.

<sup>25</sup> John H. Forster, "Some Incidents of Pioneer Life in the Upper Peninsula of Michigan," MPHS 17(1892): 336; Alfred P. Swineford, History and Review of the Material Resources of the South Shore of Lake Superior (Marquette, Mi., 1877), 24; George Cannon, A Narrative of One Year in the Wilderness (Ann Arbor, 1982), 54, 58-59, 63, 67.

<sup>26</sup> Pope, "Some Early Mining Days," 21; PMC, Report (March 1858), 7; Minesota Mining Co., A.R. (1858), 13; Phoenix Mining Co., Report (1865), n.p.

<sup>27</sup> Lankton, Beyond the Boundaries, 55.

<sup>28</sup> Ibid., 41, 113; Lankton, Cradle to Grave, 48.

<sup>29</sup> Clarke, "Notes from the Copper Region," 578; Robinson, "Recollections of Civil War Conditions," 598-99.

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<sup>30</sup> Lankton, Cradle to Grave, 55-56. The most thorough study of stamp milling technology is C. Harry Benedict, Lake Superior Milling Practice: A Technical History of a Century of Copper Milling (Houghton, 1955).

<sup>31</sup> John F. Blandy, "Stamp Mills of Lake Superior," AIME Trans. 2(1874): 208. Numerous companies' early annual reports document their initial use of Cornish stamps. Also see Frederick G. Coggin, "Notes on the Steam Stamp," E&MJ (20 March 1886): 210-11; (27 March 1886): 232-33; and (2 April 1886): 248-50. In Lake Superior Milling Practice, Benedict devotes a chapter to "The Steam Stamp," 55-59.

<sup>32</sup> Chaput, The Cliff, 40-41; Benedict, Lake Superior Milling Practice, 27.

<sup>33</sup> See Thomas Egleston, "Copper Dressing on Lake Superior," The Metallurgical Review 2(May 1878), 227-36; (June 1878): 285-300; and (July 1878), 389-409.

<sup>34</sup> Hyde, Copper for America, 22-25.

<sup>35</sup> Ibid., 25.

<sup>36</sup> Thomas Egleston, "Copper Refining in the United States," AIME Trans. 9(1880-81): 678-730; James B. Cooper, "Historical Sketch of Smelting and Refining Lake Copper," LSMI Proc. 7(1901): 44-49.

<sup>37</sup> See Pewabic and Franklin mining companies' annual reports for the early 1860s, which discuss their short rail line and the operations of the tramroads down to their mills.

## CHAPTER 5

### THE MINE LOCATIONS

While a company crisscrossed its land with trenches and sank test pits into every promising piece of ground, all in the name of finding copper, its small force of workers eked out a marginal existence at their mine camp. They lived without women. They bunked in a boarding house, where they ate a boring and repetitive diet of salted fish and pork, potatoes, and bread. (One company's men got a taste of "fresh" red meat only when a work ox died.)<sup>1</sup> Their shelter stood along a rude trail leading off towards some waterfront village. The immediate landscape was blighted by tree stumps and pock-marked by shallow excavations, and the air over the land too commonly hosted clouds of black flies or mosquitoes. Nothing had the look of order or the feel of comfort. Nothing had the look of permanence – this camp stood to be abandoned any day, if finds of copper proved scarce. The camp was a rough-and-tumble place of work and deprivation, a place lacking the familiar accouterments of society. The men found no bar or brothel, no hotel, no run of shops, no school, no library, no church, no physician – and no row of family dwellings. These things had to wait – and some, in fact, would never commonly be found at a mine location proper.

At successful mines, camps evolved into communities, but not into full-fledged villages or towns. The companies put select boundaries on their properties, in terms of what they let happen there – and what they didn't. And as for the "what they didn't," if the men wanted that, to get it they had to follow that road or trail off to a neighboring commercial village.

When a mining company went into production, over the next several years it faced myriad decisions not only about technologies and industrial structures, but also about the social development of the location. A company owned at least a square mile of land. It reserved a fraction of that, right near its outcropping lode, for industrial needs and purposes. It set aside some other land, when cleared of trees and brush, as pasturage or agricultural fields.<sup>2</sup> That still left considerable property to be developed as a place to live, as a community.

The historical record indicates that the mining companies served as community builders in quite a spontaneous, intuitive way, without much planning, debate or discussion. Social needs were felt and needs were met, but not in accordance with grand or delineated plans. The early mining firms left behind a considerable amount of paper: correspondence, annual reports, directors' minutes, and the like. These documents contain marvelous detail about many domestic issues. The researcher may discover exactly how many houses were built in a given year and at what cost – but discover no documents detailing who decided where they should go, what they should look like, or why only a certain number were built. A map might indicate that a mine location had only one store, or one hotel – but no accompanying documents contain evidence as to who decided what commercial activities to allow at the mine and what businesses to

exclude. Historians long for such things as a mine agent, writing to his company president, ruminating about the ruination caused by alcohol (so let us ban bars and saloons); or the edifying effects of churches (so let us encourage them); or the positive characteristics of married men, contrasted to single men (so let us build single-family dwellings and encourage families to settle). But the fact is, historical “blueprints” steering the social development of the mines, and delineating all the whys and wherefores of the decisions made, are virtually nonexistent.

Clearly, though, by the 1850s and 1860s, the mining companies had piece by piece worked out a mental template of what a mine location was supposed to be like. That mental image, that pattern, was quite consistent from one company to the next. The template guided them as they built houses, pursued agriculture, entered or stayed away from certain businesses, hired doctors, built hospitals, supported churches, and raised schools.<sup>3</sup>

According to this template, a mine location was primarily a place of life and work, and only marginally a place of commerce. The mining companies, at their locations, did not build and control complete towns, nor did they want to. They well understood they were in the business of mining copper, and that most other businesses represented undesirable complications or diversions. They recognized the need for trade, for support services, for entertainment – but they did not want to tend to every social and commercial need. They left much for others to do, and many firms encouraged the development of a town on the margin of the mine. They set aside land for town development, platted it, and then sold it.<sup>4</sup> The land sale let the companies divest themselves of property they did not need, brought in some revenue, and let them concentrate on running mines, while the towns ran themselves. The typical mine location had a store or two – but no main street. No run of shops, no bars or billiard halls, no bank, no newspaper office, no druggist or millinery.

The mine location did have houses – first boarding houses and, later, dwellings for single families. Mining companies entered the housing business because they had to, and not because of any desire to try to profit by becoming large-scale corporate landlords. In this harsh environment, it was important to put housing near the shafts and shops, convenient to work. The companies owned the prime land, and they were the ones bringing in hundreds of employees, including men with families. The mining companies needed houses, and they had the financial resources to build them, more so than the arriving immigrant population. So erecting company housing became part of the cost of doing business on this mining frontier. House construction was every bit as essential to the nascent copper industry as the sinking of shafts and importation of steam engines.

The earliest mine houses sometimes appear to have been haphazardly placed on whatever plot of ground was cleared of trees and available. They were not always set aside in a residential area, but had as neighbors piles of poor rock, or shaft and engine houses. On maps houses exist as little rectangles found here and there alongside the trail or road running through the location.<sup>5</sup> But that situation rather rapidly changed. When a company entered into production, a growing sense of orderly development took over. Near the heart of the mine, the company cut unpaved lanes or roads (calling them

“streets” would be a misleading overstatement) expressly for the purpose of creating lots for houses and neighborhoods. Along these lanes, the companies literally and symbolically pushed back the wilderness, and the houses they built represented the taking over of “civilization,” order, and control.

Single-family mining company houses communicated this message in various ways. The houses along a given lane, built at the same time, usually were identical in size and form and located on lots of the same size (which were often fenced).<sup>6</sup> The houses were oriented in the same manner towards the lane (such as all ridge lines parallel to the road) and laid out in a straight line, sharing a regular set-back.

The mining companies’ shared mental template of what mine housing was, who it was for, and what it should look like, had other select characteristics. They built single-family dwellings, rather than more large boarding houses, to send the message that they wanted to employ more married men. They sometimes gave neighborhoods names reflective of the ethnic groups at work at the time, hence the creation of a Swedetown or a Limerick. The companies recognized the existence of an occupational hierarchy at the mine. At the location, not all men were equal, nor was all housing. Cookie-cutter log cabins, having about four small rooms and a sleeping loft above, stood in rows in neighborhoods. Married, skilled workers rented them, usually at a rate of one dollar per month per room. Bosses and managers lived somewhere else on the location, in houses more expensive to construct, not identical, bigger, and sometimes with a bit of architectural style and elaboration left off workers’ houses. Meanwhile, single men or unskilled workers often had to fend for themselves in getting housing. Perhaps a company still operated a boarding house or two, but if not, the single men boarded with a family at the mine, or trudged off to the nearest village to find a place to live.<sup>7</sup>

Housing served as the cornerstone of community building at the mine, but the companies engaged in several other activities that made life on Lake Superior more comfortable and secure – or at least tolerable. Chief among these, the mines provided medical care, hired doctors and built hospitals.

In the first half of the nineteenth century, many families throughout the United States had fended for themselves when struck by illness or injury. Physicians did not have high status as medical providers, and they did not have many miracle cures or surgical arts to offer. Commonly, the first line of defense against pain, suffering and illness was the woman – the wife or mother—who knew medical recipes and served as family nurse. But things were changing at about the time the mines started. Medicine was becoming more of an accepted profession – and, thanks to the Industrial Revolution, and to the opening up of places like Lake Superior – many young unmarried men were leaving home and hearth to strike out on their own. They left behind their traditional nurses – mothers – and had no wives to take care of them. Enter the physician.<sup>8</sup> The mining companies recognized a need for doctoring on the mining frontier. As soon as a company reached an employment of two hundred or so, it hired a physician, or at least shared one with a neighboring, small mine. Companies set up medical plans, recruited doctors, treated them as important mine officials, and gave them good houses and good salaries.<sup>9</sup>

The doctors, in turn, treated the employees and their families. Single men usually paid fifty cents into the medical plan per month; married men, a dollar. (Participation was often mandatory for underground workers, but optional for surface workers – an acknowledgement of the different levels of occupational risk the two groups faced.) For this fee, men and their families received doctor's calls and all medicines and out-patient treatments for no additional charge. The mine doctors were busy men. They were wide-sweeping general practitioners who treated all ilk of medical maladies, responded to trauma cases, set fractures, amputated limbs, and delivered babies. Sometimes mines also pressed them into service as the company dentist and veterinarian. Within five to ten years of going into production, if a company was still expanding and doing well, it not uncommonly erected a dwelling-like structure to serve as its hospital. Home care remained the order of the day for patients dying of disease or giving birth, and companies largely reserved hospitalization for the treatment of traumatic injuries men had received on the job.<sup>10</sup>

Although the typical mine location lacked a full-blown commercial district, the mining companies did take select measures to help provision their employees with the stuff of life. Sometimes they built and ran a company store. Sometimes, under a contractual agreement, they allowed a merchant or two to open shop, with the understanding that they were not to gouge the men with high prices, which would only alienate them and perhaps lead to agitation for higher wages. Many early companies ran farms, which produced feed for work animals and vegetables such as potatoes for human consumption. Their other option was to lease land to a farmer who sold his produce back to the company or its men. The Cliff mine and others set aside cleared land as gardens, for employees wanting to grow some of their own food. Within a neighborhood of company houses, the sizable lots, often at least fifty feet by one hundred feet, also gave families room for modest gardens, or room for raising some fowl or a hog. And companies offered free or low cost pasturage to employees fortunate enough to be able to own a milk cow.<sup>11</sup>

As a location's population grew to include more women and children, more social needs became apparent, especially in the realms of religion and education. The histories of religion and education were somewhat intertwined at the locations, particularly at their very beginning. Sometimes the first church and the first school were one in the same building – a rather nondescript wooden structure erected by a company to serve its population. It served as a rudimentary school by day, then as a church on Bible nights or Sundays. By the 1850s, though, each institution tended to move off into its own space.<sup>12</sup>

Churchmen actually arrived on Lake Superior before the miners. The Methodists occupied their Indian mission near L'Anse on Keweenaw Bay since 1834; the Catholics arrived on the opposite side of the bay, near Baraga, in 1843. Initially, the Methodists and Catholics competed against each other, quite literally, in seeking Ojibwe converts to Christianity. Once the rough mine camps began transforming into real settlements, the head of the local Catholics, Father Frederic Baraga, and the lead Methodist, Reverend John Pitzel, began tending to the religious needs and desires of their populations.

Reverend Pitezel preached his first sermon at a mine location, the Cliff, in 1846. Cornish settlers –mostly Methodists back home and now Methodists on Lake Superior – made up his new flock. They first listened to Reverend Pitezel in the mine’s cooper shop, pushing aside the tools of barrel-making to make room for the service, but by 1848 they erected an actual church. Father Baraga made his first trips up to the mines in 1847. In private homes, or in some secular building, he preached the word of God, offered the sacraments, and no doubt encouraged the Catholics – numerous amongst the German, Irish, and French Canadians in the area – to begin planning for their own churches.<sup>13</sup>

Church building proceeded slowly in the late 1840s and early 1850s but boomed in the late 1850s, as populations rose at both at the mines and commercial villages. Because both the Methodists and Catholics had missions on Keweenaw Bay – and because most settlers belonged to one or the other of those religions – Methodist and Catholic churches were usually the first two to stand in any community. (An Episcopal church was often the third one in.)<sup>14</sup> Sometimes the Protestants got there first, sometimes the Catholics. These early churches were quite modest structures – smallish, universally built of wood using framed construction and clapboarded on the exterior – but with some refinement, such as plastered interiors and the possession of a melodeon or organ. Modest or not, at a mine location, standing as they did amidst small, squat workers’ cabins or framed houses, on land cleared of all trees, the churches and their steeples stood as prominent elements of the landscape.

When the Methodists, Catholics, or Episcopalians broached the idea of building a church at a mine location, invariably the host company responded favorably. Mining companies did not try to exclude one church in favor of another. They supported church building in general. Although they stopped far short of paying for new churches, and eschewed making large gifts to keep churches going, they often contributed to a church’s building fund and provided a building site, either freely donated or leased at nominal cost.<sup>15</sup> Once erected, a church at a location flourished only if the company did. If a company faltered and then failed, the working population left for jobs elsewhere, which robbed the church of its congregation. The fortunes of churches at commercial villages, too, often rose or fell as nearby mines grew or declined. Up and down the mineral range there was a certain ebb and flow of new church construction here and church abandonment there in early decades. By 1870, the copper district as a whole had thirty-three active churches. The Methodists and Catholics each had eleven; no other denomination had more than four.<sup>16</sup>

At the mines, churches let settlers in this remote area cling to or reclaim a bit of their past traditions. They worshipped as they had in the “old country,” hopefully while being ministered to by someone sharing their same ethnic identity and language. Churches helped immigrants self-select themselves out into smaller groups – for instance, Irish Catholics or Cornish Methodists – where they felt at home and comfortable being with like peoples. Public schools moved this largely immigrant society in the opposite direction at the same time. They brought diverse children together, where they sat with fellow scholars unlike themselves. In school they did not speak or listen to the dialect or

language of a distant homeland, but conversed and read in American English. The churches tended to perpetuate an old ethnic identity, while the schools helped forge a new one: American.

Making a new American (who could read, write, and speak English and cipher) out of the son or daughter of an immigrant family (for whom public education was often a wholly new thing) was hardly well orchestrated, well planned and funded, or rapidly achieved. In commercial villages, students got the schooling the population wanted; at the mine locations, they got the schooling the mining company wanted. Nominally, schools were public institutions, but at a location, where the company owned the land, provided the employment, paid the taxes, built the roads, erected the houses – the company also set the course for the school. At a successful, growing mine, reaching towards a population of a thousand or more, proper schooling was more likely achieved than at a struggling, declining mine, where survival was at stake and sustaining a school was a bothersome distraction. No early companies, however, even the most successful ones, funded or supported schools to the full satisfaction of teachers, administrators, or newspaper editors.<sup>17</sup>

The first instruction at the locations often occurred within houses or “borrowed” structures, rather than in dedicated school buildings – and the first teachers were volunteers from among the better educated settlers, paid tutors, priests or ministers. School buildings – maybe first shared with a church congregation, and a bit later free-standing and dedicated structures – appeared at the mines at the tip and at the base of the Keweenaw in the late 1840s and 1850s, when the mines there attracted sizable numbers of families. They generally did not appear at Houghton county mines, in the middle part of the peninsula, until the 1860s.

Starting as early as 1848, ministers or priests conducted the first schooling at the Cliff mine. By 1860 the mine had a permanent school of two rooms, supported by a two-mill tax on property in the district (mostly owned by the location’s parent company, the Pittsburgh and Boston Mining Company). To the south, in 1852, when its location boasted thirty-three dwellings and a population just over three hundred, including one hundred women and children, the Minesota mine erected “a new and comfortable building designed and regularly occupied as a church and school house.” In 1861, an early Houghton County school went up in Franklin Township, where it enrolled children from the Franklin and Pewabic locations.<sup>18</sup>

These schools were ungraded, poorly equipped and initially offered but the basics of an education. A single teacher instructed fifty to one hundred students of all ages gathered in a single large room. At best, a mine school had two rooms and two teachers: a man who directed the whole school and instructed the older students (who sometimes could be fractious and difficult to deal with, hence the need for a male teacher), and a woman, paid about half of what the man received, who taught the younger children.

Class sizes and rosters constantly varied as working families moved from mine to mine. Students stayed home during the frequent epidemics that swept through the population.

In the harshest days of winter, students didn't venture out. Also, in this culture, settlers did not universally believe in or strictly enforce the notion of compulsory attendance. Michigan's education laws were themselves quite slack; they mandated as few as twelve weeks a year of schooling, and only six had to be consecutive. As a consequence, not all children enrolled in school. (Only half of the children in Houghton County did so in the early 1860s.) And those who did enroll often came and went as they pleased.<sup>19</sup> Still, this growing, industrial society on the frontier made a start at proper education, and the mining companies played a key role in either fostering, or neglecting, public education. Besides initiating some of the earliest schools, a few mines, such as the Cliff, Pewabic and Franklin, started the region's first modest libraries (which sometimes consisted of only a bookcase or two of donated volumes).<sup>20</sup>

The first mining companies could hardly have anticipated or planned all the activities they would engage in while planting a heavy industry on the south shore of Lake Superior. They initially focused on prospecting, on finding a promising piece of property, and then on finding some copper beneath it. The more they went along, the more complicated became the task of building an industry – and an attendant society. Needs arose that had to be addressed. Mining companies built roads and docks and subscribed in other companies that dredged out waterways and improved channels. They pieced together all the technologies needed for mining and milling copper rock; they worked out arrangements for smelting.

Out of the same sort of necessity, they also engaged in a host of community building activities as they shepherded the transformation of a wilderness into a mine camp and then into a mine location. They decided what types of men they wanted, and tried to find and keep them. They operated farms, or somehow supported early agriculture to the benefit of the population. They decided which commercial activities to allow right at the mines, and which to exclude. Sometimes they helped find a new home for commercial activities that they themselves did not wish to pursue, by creating new towns adjacent to their mine works. They built houses, which not only provided shelter, but a sense of order, and even a social hierarchy. They hired doctors, built hospitals, supported churches, and set the directions – for good or bad – for many public schools.

Much of this activity surely went beyond the bounds of the mental template the companies originally had concerning what a mine was supposed to be, or include, or look like. But as locations matured, as companies found pragmatic solutions to social problems and needs, the mental template became more inclusive and clear. What the companies did at the start out of necessity (such as build houses) they continued to do out of habit. They learned in the first few decades that their mines were just that – *theirs*. They would control them in myriad ways, and at those mines, life and work would be inextricably combined in the manner in which the mining companies saw fit.

There was a word for this managerial approach and style, where a company's activities broadly affected the lives of employees and their families from cradle to grave. That word was *paternalism*.<sup>21</sup> The mining company officers and bosses never actually used

that word, paternalism, but their evolving mental template surely embraced the concept, and they practiced company paternalism for over a century on the Keweenaw.

<sup>1</sup> John H. Forster, "Early Settlement of the Copper Regions of Lake Superior," Michigan Pioneer Collections 7(1884): 191-92.

<sup>2</sup> Lankton, Beyond the Boundaries, 72. For instance, the Minesota mine contracted to have two hundred acres of land cultivated in 1855; three hundred acres in 1858; and seven hundred in 1861.

<sup>3</sup> Although mining company officials did not leave a written record of what they *thought* a mining company was supposed to do, they did leave behind all the *products* of their mental template, in terms of housing, churches, hospitals, farms, stores, and so on. The mental template did not vary much from one end of the mineral range to the other, or from ca. 1845 till 1900.

<sup>4</sup> Min. Stats. for 1880, 44-46, 58, 77, 82; Lankton and Hyde, Old Reliable, 92; Fisher, "Quincy Mining Company Housing, 1840s-1920s," 41-44.

<sup>5</sup> Lankton, Beyond the Boundaries, 57.

<sup>6</sup> Many photographs exist, taken of mine locations between the 1860s and the early 1900s that show these characteristics. In the twentieth century, virtually all the fences that once bounded nineteenth century houses were removed.

<sup>7</sup> See chapter, "Homes on the Range," in Lankton, Cradle to Grave, 142-162; Lankton, Beyond the Boundaries, 59-60; Lankton and Hyde, Old Reliable, 35.

<sup>8</sup> For a source on the evolution of the medical profession in the nineteenth century, see Paul Starr, The Social Transformation of American Medicine (New York, 1982).

<sup>9</sup> Lankton, Cradle to Grave, 181-82.

<sup>10</sup> Ibid., 182-83; Lankton, Beyond the Boundaries, 72-73.

<sup>11</sup> Lankton, Cradle to Grave, 15-16, 163-164; Lankton, Beyond the Boundaries, 72-73.

<sup>12</sup> For the interconnectedness of early churches and schools, see "Saints and Scholars" chapter in Lankton, Beyond the Boundaries, 130-44.

<sup>13</sup> Ibid., 131-34. Also see Regis M. Walling and Rev. N. Daniel Rupp, eds., The Diary of Bishop Frederic Baraga (Detroit, 1990); and Rev. John H. Pitezal, Lights and Shades of Missionary Life: Containing Travels, Sketches, Incidents and Missionary Efforts During the Nine Years Spent in the Region of Lake Superior (Cincinnati, 1882, 1st. ed., 1857).

<sup>14</sup> Lankton, Beyond the Boundaries, 131, 134.

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<sup>15</sup> Thurner, Calumet Copper and People, 21.

<sup>16</sup> Michigan, Statistics of the State of Michigan Collected for the Ninth Census of the United States, June 1, 1870 (Lansing, 1873), 636, 639, 645.

<sup>17</sup> Lankton, Cradle to Grave, 168-171; Lankton, Beyond the Boundaries, 138-39.

<sup>18</sup> Lankton, Beyond the Boundaries, 139; Lankton, Cradle to Grave, 168.

<sup>19</sup> Lankton, Beyond the Boundaries, 140-41. For a teacher's view of schooling at the Cliff Mine, see Henry Hobart's 1863-64 journal, published as Mason, ed., Copper Country Journal.

<sup>20</sup> Lankton, Beyond the Boundaries, 170. See PMC, A.R. for 1861, 19; Mason, ed., Copper Country Journal, 199; PLMG, 8 Oct. 1864.

<sup>21</sup> For a discussion of the paternalism practiced at the mines, see "Cradle to Grave" chapter in Lankton, Cradle to Grave, 163-80.

## CHAPTER 6

### THE QUINCY MINE

As a corporate player in the 1840s rush to the Keweenaw, the Quincy Mining Company was quick to form but slow to succeed. Its origins were rooted in error; its first decade of existence knew only failure. Two predecessor companies found themselves with leases to the same mineral lands. Their investors and officers, from Lower Michigan, resolved this sticky issue by closing out the first companies and rolling them into a third, the new Quincy Mining Company. Organized as an association in 1846 and legally incorporated two years later, the Quincy mine purchased its land outright in September, 1846. It acquired Section 26, Township 55 North, Range 34 West, which was near the middle of the Keweenaw and included much of the hillside and hilltop by Portage Lake.<sup>1</sup>

Small crews of men prospected at this site starting in 1846 and turned up little. Results did not improve substantially for many years to come. While the Quincy mine worked in relative obscurity because of its paucity of copper, other mines stole the spotlight. The Cliff and the Minesota, in particular, garnered fame as they found rich deposits of mass copper and provided very handsome returns on their initial investments. But, in line with all the risks and uncertainties of mining, the Cliff and Minesota mines, which profited so early, also faltered early. By the end of the Civil War era, their glory days were over. Quincy, on the other hand, headed in the opposite direction. After struggling mightily for over a decade, the company found a rich lode of amygdaloid copper and that allowed it to grow to become one of the region's most successful mines.

After its shaky start, in many ways Quincy proved an exceptional company and mine. Turmoil occasionally erupted as major stockholders, officers and directors fought for control of the company and moved its headquarters around. But overall, Quincy became known as a very well managed company.<sup>2</sup> The lode it worked – the Pewabic amygdaloid – was not always easy to follow or easy to wring profits from. It was a good lode, to be sure, one of the best. Yet it was not so fabulously rich in copper that it assured high profits and dividends. Quincy managed its works carefully on the Pewabic lode and never took success for granted. By producing a long run of dividend paying years, the firm earned its nickname, “Old Reliable.” The company paid its first dividends in 1862-64, and then none in 1865-66. But starting in 1867, Quincy rewarded investors with dividend payments for fifty-four consecutive years, running till 1920.<sup>3</sup> Quincy proved exceptional in being profitable for so many years, for mining its lode for so long (1856-1931, and then 1937-45), and for operating the deepest mine in the United States. (By the 1920s, Quincy No. 2 shaft extended to a depth of over 9,200 feet, measured along the incline.)

At the same time, Quincy was a very typical copper mine on Lake Superior. It went through the successive stages of prospecting, development, and production. For Quincy, and its neighbor, the Pewabic mine, ancient Indian diggings atop Quincy Hill served as useful signposts to help them finally find the lode. Quincy exploited its lode in typical fashion, in terms of the mine openings and systems it employed. As it moved into production, it

acquired the requisite and generally standard technologies to mine and mill rock and transport materials. It also tended to the domestic needs at its location and engaged in company house construction, doctoring and other paternalistic practices. Like many other companies, Quincy very much limited the presence of stores and trade at its location, yet it supported the growth of the commercial village of Hancock, just down the hill from the mine on the north side of Portage Lake. In its early years Quincy depended on some key American settlers to direct its fortunes on Lake Superior, yet it depended on immigrant laborers to get the hard work done. And as was the rule on Lake Superior, it relied on the contract system of mining, borrowed in modified form from the copper and tin mines of Cornwall, as a way of putting men to work and managing them.

To conserve capital, the Quincy Mining Company employed only a handful of men in the late 1840s and early 1850s. The company concentrated on exploring the hillside rising up from Portage Lake, rather than the hilltop itself. Workers dug pits and trenches, drove adits into the hillside, and sank some shafts. They found some mass copper – including one impressive specimen of 8,140 pounds – but failed to find a lode or fissure vein consistently and sufficiently rich in the red metal.<sup>4</sup> A lack of capital slowed the search, and the lack of copper finds constricted the capital flow. After several years, prospecting did shift more up toward the hilltop, where a run of Indian diggings was found. In 1854, while the directors were considering a sale of the property, up on the hilltop Quincy opened the most promising lode yet found. Dubbed the Quincy lode, it ran on a southwest to northeast line or strike and was located west of the road coming up from Hancock to the mine.

To develop this part of its property, Quincy quickly sank two or three shafts into its namesake lode. Unfortunately, a disappointing amount of copper came out. By March, 1855, the discouraged and poor company, which had sunk over \$40,000 in the property, ceased mining.<sup>5</sup> But in July, 1856, serendipity stepped in to play a role. Quincy had been looking for copper for ten years and had only losses and a bleak future to show for it. But on the mining property right next door, in 1856 the Pewabic mine discovered a promising amygdaloid deposit. That lode crossed onto Quincy property, and both firms started to open it up.

Between 1856 and 1858, two very different yet equally important events reenergized the Quincy Mining Company. First came the discovery of the Pewabic lode. Second came a new group of officers, directors and major shareholders, who took charge of the company and relocated its headquarters to New York, much closer to sources of investment capital. With investment and geology both looking up, Quincy more vigorously pursued its future. From 1856 to 1858, the company developed the Quincy and Pewabic lodes simultaneously. To its shafts on the older lode, it quickly added four new ones on the Pewabic. But after 1858, all work on the Quincy lode ceased, and the company focused on the Pewabic lode exclusively. That lode produced all the dividend paying years to come.<sup>6</sup>

Starting in 1846, Quincy prospected for 10 years on its property. Beginning in 1856, it entered its development stage on the Pewabic lode, a stage that lasted another three or four years. By 1860, Quincy finally entered into full production. During the latter years of prospecting, Quincy's employment typically ran between twenty and thirty men. In the

development stage, employment rose to 110 to 115 men in 1857-58, and to 257 in 1859. Then, with the onset of real production, employment jumped to 469 in 1860 and to 583 in 1861. In similar fashion, copper figures rose, too. Quincy produced 7 tons of copper in 1856, 61 tons in 1857, 179 tons in 1859, and then 970 and 1,283 tons in 1860 and 1861.<sup>7</sup> After a decade and a half of struggle, Quincy became a major copper producer on Lake Superior, just in time for the arrival of the Civil War. By the end of that conflict, it was a seasoned producer with a mine plant that had undergone great growth and change in five or six years.

The Pewabic lode, as it ran across Quincy's property, was about twelve feet wide near the surface. It descended at an angle or dip of fifty-four degrees from the horizontal and was sandwiched between layers of copper-poor trap rock. Quincy's shafts, too, were inclined as they followed the lode into the ground. The company sank its first shaft into the Pewabic lode in November, 1856; its second and third in October and December, 1857; a fourth in December, 1858; and its fifth and sixth shafts in July and August, 1859.<sup>8</sup> These shafts were all closely spaced – only two to four hundred feet apart – in a row that started with Shaft. No. 1, located near the Quincy-Pewabic boundary, and ran southwesterly. (Fig. 17.) Sinking so many shafts so early allowed Quincy to explore a longer run of the lode, while simultaneously boosting production. With more shafts, men could attack the lode at more places. And the six shafts aided natural ventilation at the mine. The shafts served as chimneys for the exchange of fresh air for stale air.

As the shafts went down, every sixty feet (or ten fathoms) miners created a new level, by driving a tunnel-like drift from one shaft, along the lode, over towards the next shaft. While miners sank shafts and drifted near the bottom of the mine, doing development work, other miners above them stoped out ground. Typically, they followed the advancing system; they started the stope at the shaft and advanced outwards along the drift. Underground maps show that in upper levels, Quincy's miners sometimes stoped underhand. That is, they worked from one level down towards the next. In short order, however, the company used overhand stoping almost exclusively.<sup>9</sup> Miners worked from one level up to the next, so that when they detonated their charges, the broken rock rolled down the stope and away from the working face.

Quincy, like other mines at the time in the district, took out good copper bearing rock wherever they found it. They did not leave regularly spaced rock pillars to protect the shafts from being crushed, or to hold up the mine's hanging wall in the stopes. Nor did they timber in any systematic fashion. They used stulls to prop up particularly troublesome parts of the hanging, but let the rest go. This neglect of the hanging wall ultimately caused the mine serious problems with structural stability, but in the early decades, Quincy got away with it.

As it followed the Pewabic lode into the ground, Quincy discovered that it sometimes split, that there seemed to be branch lodes in front or behind it, and that it was "bunchy" or "pockety," instead of even and regular.<sup>10</sup> They had trouble staying in good ground, and even after production was launched, underground exploration continued. Periodically miners drove crosscuts. These openings, which ran perpendicular to the drifts, tested whether there was good or better copper lying to either side of the main lode. During the Civil War years,

Quincy extended its explorations by starting to drive an adit over eleven hundred feet long. Completed in 1868, the adit ran from near the base of Quincy hill towards the Pewabic lode, where it intersected the mine at depth. The company hoped this expensive effort would pass through and uncover another lode to be worked, but it didn't.<sup>11</sup> (The completed adit did serve later, however, as a useful drain for unwatering the upper reaches of the mine.)

Going well past the Civil War era, miners employed sledge hammers, hand drills, and black powder to blast out Quincy's shafts, drifts, stopes, winzes, adits, and crosscuts. (Figs. 8-11.) Initially, after miners broke the rock, men having "wheeling" contracts mucked it out and transported it underground; later, the men performing this task were called trammers. A few Lake Superior mines used draft animals underground for tramming or haulage, but Quincy never did. Wheeling contractors probably made good use of wheelbarrows during Quincy's development stage, but by 1862 eleven tons of light-weight, narrow gauge iron rails ran along Quincy's drifts, and teams of two or three men loaded four-wheeled tramcars by hand and pushed them over the rails to the shaft.<sup>12</sup> (Figs. 12-14.)

Wheeling contractors delivered copper rock or mass copper to the plats or stations where the drift intersected the shaft. Once there, the material was ready to be hoisted. When Quincy started sinking shafts into the Pewabic lode, men with hoisting contracts (sometimes called windlass contractors) raised the rock, using hand-powered windlasses or capstans mounted at the shaft collars.<sup>13</sup> The windlasses wound up chain or heavy manila rope and pulled rock to the surface in kibbles, one in each shaft. To handle large mass copper, shaft workers removed the kibble from the hoisting rope or chain and connected a heavy manila rope that had been wrapped around the mass, forming a lifting sling.

Moving from development into production prompted Quincy to upgrade its hoisting technology. Some mines made extensive use, for a time, of horse-whims. Quincy, it seems, never made a full transition from hand windlasses to horse-whims, before switching instead to steam-powered hoists. Two credible sources, dated 1859 and 1861, mention a horse-whim on the Quincy property. The references are to a single whim, which by the latter date was said to be no longer in use.<sup>14</sup>

Quincy moved quickly from hand-power to steam, largely skipping the horse-power stage. Steam hoists arrived at the mine by the end of 1858, and by March 1859 an inventory listed two hoist houses and two portable hoisting engines. These early houses and engines were quite likely temporary and expedient measures, as Quincy erected more permanent structures and larger engines later in 1859 and in 1860.

In the summer of 1859 Quincy installed an engine built by George M. Bird & Co. of East Boston, Massachusetts, into a new hoisthouse located between Shafts 1 and 2. By August 1860, Quincy was constructing another new hoisthouse, between Shafts 3 and 4, which held a new high-pressure, horizontal engine built by J. B. Wayne & Co. of Detroit. The hoisthouses were located between the shafts, so the engines could be made to hoist from more than one, simply by rerouting the hoisting chain or rope. By the end of 1860, or shortly thereafter, Quincy's Bird engine hoisted from Shafts 1 and 2, as needed, and the Wayne engine pulled from Shafts 3, 4, and 5. By mid-1861 Quincy replaced its horse-whim at Shaft

No. 6 with an unspecified “small engine.” A few other engines were shuttled in or out of service in the early 1860s. By 1862, Quincy had used at least six different hoisting engines to begin the task of mechanizing its mine works.<sup>15</sup>

At first, the steam hoists raised rock in kibles attached to chains; these buckets were larger than the ones earlier raised by windlass contractors. They weighed a thousand or more pounds and carried about one ton of rock. With the arrival of steam power, Quincy modified its hoisting technology in several ways. Between 1861 and 1864, the company replaced all hoisting chains with a new material, wire rope, which was both lighter and less likely to fail catastrophically. And in 1863 it began replacing its kibles with wheeled skips having a capacity of two tons.<sup>16</sup> The kibles or skips were filled at one of several working levels in the mine (Fig. 20.); were dumped at the shaft-house; and all the while their motion was controlled by the hoist, located in its separate structure, one to three hundred feet from the shaft. The smoothness of the operation depended on the interaction of three men – the “filler” underground, the “lander” in the shafthouse, and the “engineer” in the hoisthouse – men who could neither see nor speak to one another. To communicate and signal starts, stops, and the like, they pulled ropes that rang bells in code.

If a man looking for work walked from Hancock up to the Quincy mine in 1865, he discovered most of the company’s major buildings standing beside the road at the top of the hill. Double-pitched roofs surmounted six board-and-batten shafthouses with unpainted plank walls. Three wood-frame hoisthouses stood over masonry foundations laid up of poor rock. (Fig. 16.) By each hoisthouse a tall iron smokestack emitted wood smoke from the steam boiler inside. Nearby, large stacks of cordwood for feeding the boilers sat at the ready. Pulley stands supported on timber stilts connected hoisthouses to shafthouses, and carried the wire hoisting ropes from one to the other. Men sorted rock inside simple and rough sortinghouses attached to several of the shafthouses. Nearby, other men burned or calcined copper rock in a couple of smoky kilnhouses. Still others wheeled rock over light-rail tramroads from sortinghouse to kilnhouse, or from sortinghouse to waste rock piles.<sup>17</sup>

The industrial landscape was rough hewn and showed plain, utilitarian, unadorned, mostly unpainted buildings, surrounded by stockpiled tools, stulls, and planking. In the vicinity of the shafts, virtually no vegetation grew. Rock made up the landscape floor. Across the road from the shafts, large outcroppings of rock, fringed with weeds, occupied the high ground. On this side of the road, blacksmiths toiled in a masonry smithy, laid up of poor rock, while carpenters worked in their simple, wooden shop. After coming up from the underground, miners crossed over to this side of the road to wash up and change clothes in Quincy’s dry house, yet another rough, grey-black building made of poor rock from the mine.

The southern end of the mine by Shafts 5 and 6 (and an abortive, shallow No. 7), didn’t look as busy as the other end – because it wasn’t. The company had done quite well working its northernmost stretch of the Pewabic lode, but its southernmost shafts proved disappointing, so the company had shut them down. Past these closed shafts ran a tramroad that carried carload after carload of copper rock from the richer end of the mine to the head of the stamp mill incline on the southern end. Connecting Quincy’s hilltop mine and its mill on Portage

Lake, this double-tracked tramway or incline descended five hundred feet while traversing twenty-two hundred feet of hillside.<sup>18</sup> (Fig. 21.)

During its exploratory and developmental eras, Quincy possibly acquired some drop stamps, to see how well they worked its local rock, and to discover how much copper that rock yielded. But Quincy built no complete mill until 1859-60. As part of its move into full production, it erected a timbered, clapboarded mill on the north shore of Portage Lake, below the mine. (Fig. 22.) Gravity delivered copper rock from mine to mill; the loaded cars travelling down the incline pulled the empties back up. Portage Lake provided ample water for running the mill, and it also served as a dump for stamp sands or tailings, which were washed out of the mill and into the lake using a wooden trough or “launder.”

The stamp mill represented one of Quincy’s most expensive surface improvements. The main building measured about 180 by 100 feet and originally contained boiler and steam-power facilities and sixteen stamp batteries – with each battery containing four stamp heads, for a total of 64. A steam engine, through gearing, shafts, belts and pulleys, powered the Cornish-style rise-and-fall drop stamps, while a steam pump sent Portage Lake water into each stamp battery’s mortar box. In choosing Cornish drop stamps, Quincy ran counter to the new technological trend on the Keweenaw of installing more powerful steam stamps, such as the Ball stamp. Quincy argued for decades that steam stamps abraded amygdaloid copper too much, and produced particles too fine to be captured by the rest of the mill’s machinery. So Quincy stuck with Cornish stamps. The mixture of water, copper, and rock that flowed from their mortar boxes passed to classifiers, Collum jigs, Evans Patent Rotating Slime Buddles, and other sorting and washing apparatus.<sup>19</sup> As the waste tailings washed out into Portage Lake, the captured mineral went into barrels, which lake boats delivered to the downstate Waterbury and Detroit Copper Company for smelting.

On top of Quincy Hill, by the mid-1860s the domestic side of the mining industry was also very evident, especially in terms of company housing. In the mid 1850s, Quincy had built some dwellings for its modest labor force: a boarding house and several smaller houses. These did not constitute an orderly developed neighborhood. Instead, they housed employees in scattered locations on the pockmarked hillside, riddled with tree stumps, holes, and piles of rock. Quincy was prospecting on the hillside, and it put its workers in the midst of it all. Between 1859 and 1861, as the company’s works on the Pewabic lode began to take off and its employment climbed, Quincy built about a hundred wood-frame dwellings for \$30,000. Mostly single-family units, but including some boarding houses, these, too, stood mostly on the hillside or near the base of the hill, in what would become Hancock (land Quincy owned).<sup>20</sup> Mining companies were loath to put housing on any land near the heart of the mine, unless they were certain that land was not needed for industrial development. By the mid-1860s, Quincy felt more confident about just what land it needed for its industrial growth, and it developed other parcels of land near the mine for domestic purposes, such as housing. By 1865, numerous dwellings stood atop Quincy Hill across the road from the mine proper, where they were arranged into neighborhoods.

In the 1860s, the dirt wagon road running to and through the Quincy location served as a dividing line. Going up and along the road, one found the mine works on the right side of the



**Figure 16**



**Figure 20**



**Figure 21**



**Figure 22**

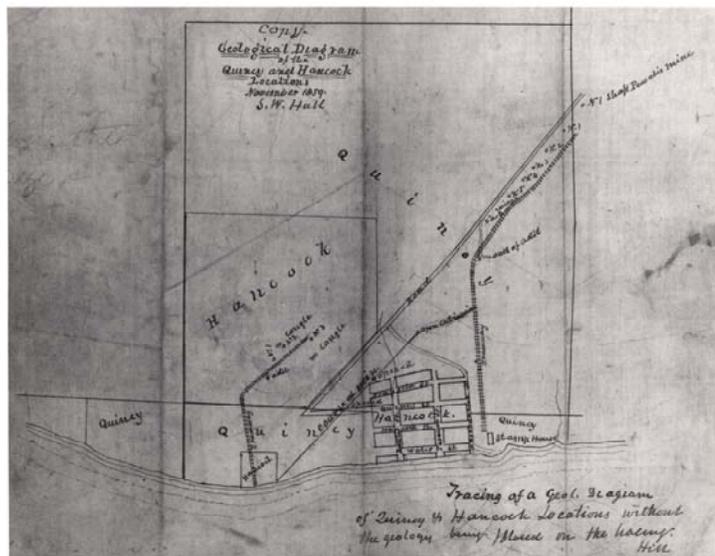


Figure 23

road – shafts, hoists, boilers, kilnhouses, and poor rock piles. On the left side stood some industrial structures that supported the mine (blacksmith and carpenter shops and a supply office), some “managerial” structures (company office and mining captain’s office), a lone commercial structure (company store), some boarding houses, and some houses erected in a size and style suitable for key personnel (special houses for the company agent, clerk, and doctor). A bit off the road, stood two new neighborhoods, dubbed Limerick and Hardscrabble.<sup>21</sup>

Sixty-eight wood frame houses, erected in 1864, lined the lanes in the new neighborhoods. (Fig. 17.) These small houses had a T-shape plan, with the top of the T paralleling the lane and carrying a centrally located door. The front of the house stood two stories tall, with two rooms on each floor; the single-story rear served as a kitchen. While some of Quincy’s earliest dwellings might have been founded on cedar posts, or on wooden sills laid right on the ground, these houses seem to have been erected on low, poor rock foundation walls. Plain, without ornamentation or pleasantries, such as a front porch, these houses rented at first not even for a dollar per room per month (as would later become standard), but for just a dollar per house per month.<sup>22</sup>

Besides putting up Hardscrabble and Limerick, in 1864, at a considerable distance from the mine proper, Quincy created another new neighborhood called Swedetown. This was part of a generally unsuccessful attempt on the part of the company to bring in a new breed of workers during the labor-short days of the Civil War. The housing there was substandard: Quincy went back to small log houses whose sills sat right on the dirt. Relatively few imported men came to work at the mine or to live in Swedetown’s thirty-seven log houses, and this neighborhood soon became a more or less forgotten part of the company’s operation and history.<sup>23</sup> Failure or not, Swedetown, along with the long-term neighborhoods of Limerick and Hardscrabble, represented how a company’s housing efforts intensified as copper production progressed.

Like other companies, Quincy went beyond house construction and engaged in several other paternalistic, community building practices as it matured as a copper producer. After sharing a physician with other nearby mines in the early 1850s, in 1859 Quincy hired its first physician, Dr. J. W. Robbins, to tend to the needs of its employees exclusively, and that same year it started operating a hospital, which had a capacity of thirty-five patients by 1862.<sup>24</sup> It deeded over lands for the site of a new Congregational church in 1862 and for a Catholic church in 1865. In 1864, during the high inflationary times of the Civil War, it opened a store at the mine, where it made provisions available to workers at less cost than other merchants on Portage Lake. It rented garden plots to workers for a nominal fee of three or four dollars a year, so they could produce some of their own food. It set up rules forbidding the sale of alcoholic beverages on company land.<sup>25</sup> And in 1867, the mining company's office hosted a meeting to organize School District No. 1 in Quincy Township. Quincy's company agent, clerk, and doctor became the school district's first board members.<sup>26</sup>

The southernmost stretches of Quincy's Section 26 reached down the hillside towards Portage Lake. This land, not needed strictly for mining, became an important part of the company's community building efforts. In following the region-wide, corporate mental template of what should and shouldn't be part of the mine location proper, Quincy made no attempt to build and control a full-scale town on top of Quincy Hill. Up there, right at the shafts, it did not want to house, provision, entertain, or provide a full range of services for everybody. Still, its labor force needed or wanted a wide range of goods and services. Recognizing that, Quincy helped develop a more complete town on the margin of its mine. This, too, was part of its plan to become a long-term, expanding copper producer.

In 1859, Quincy, on its southern land, platted ground that became the village of Hancock; it laid out an orderly street grid that was originally three blocks by four blocks, with single and double lots marked off. (Fig. 23.) The growth of the Quincy mine and the growth of Hancock became inextricably intertwined. Hancock became home to most of the churches that Quincy employees worshipped in; these structures stood on building sites donated by the company. Many who worked at the mine lived not at the hilltop location, but down the hill in Hancock. By 1862, some forty-one employees had built their own dwellings there, on ground leased from the company. Many others, especially single men, lived in one of numerous boarding establishments which had been erected in Hancock.<sup>27</sup>

As time went on, Quincy maintained great control over what happened up at the mine, but lessened its control over the destiny of Hancock. The village took on a life of its own. By 1870, Hancock had several general stores; retailers of books, carriages, clothing, jewelry, hardware, liquor, and millinery. It had a bakery, a druggist, a couple of butchers, three barbers, several licensed hucksters, and many saloon keepers. It had a newspaper, several churches, and fraternal organizations. The growing village and the growing mine were separated from each other by a steep hill and by nearly a mile, but they were still very much connected by the needs and activities of the people who moved back and forth from one to the other.<sup>28</sup>

Those people, as at the other pioneering mines and commercial villages, were largely immigrants, but with a smattering of Americans. Quincy's early leadership reflected the

importance of the westward migration of Americans out of New England/New York and into Michigan, and also the importance of kinship ties. Columbus Christopher Douglass served as Quincy's agent, the top man in charge of the mine, from 1856 till 1858. Douglass was born in Chautauqua County, New York. His interest in Lake Superior copper came naturally; he was the cousin of explorer-geologist, Douglass Houghton. Ransom Sheldon, who was instrumental in establishing Houghton on the south side of Portage Lake, also put the first store on Quincy's property on the other side of the lake in 1852. Sheldon hailed from Essex County, New York and was married to C. C. Douglass's sister. Samuel Worth Hill, Quincy's agent from 1858 till 1860 (and the man who platted Hancock), came from Starksboro, Vermont. Samuel S. Robinson, who succeeded Hill and served from 1860 until 1866, was born in Cornish, New Hampshire. James North Wright, who became Quincy's chief company clerk in 1863, and who later served as agent for Quincy and then Calumet and Hecla, was born in Haddam, Connecticut.<sup>29</sup>

Americans snagged many of the best managerial and professional positions on the Keweenaw. But the mining industry itself was borne on the backs of immigrant workers, the men who did the drilling and blasting, tramming, and other hard, blue-collar jobs. Quincy was no exception to this rule.

Through the Civil War era, the principal immigrant groups to arrive on the Keweenaw were the Cornish, Germans, Irish, and French Canadians, along with a smattering of Scandinavians, plus "other" Englishmen (aside from the Cornishmen) and some Scots.

Of the four main groups, the Cornish, Germans and Irish worked across a wide range of mining occupations, including those who toiled in the underground, while the French Canadians tended to work at surface jobs, whether in the forests or at some of the early stamp mills. Quincy acknowledged its ethnic groups when it gave names to neighborhoods at the location such as "Limerick" and "Swedetown." The company perhaps initially intended for select blocks of houses to be occupied by members of a particular ethnic group, but such company-sponsored ethnic enclaves, in housing, did not last long. The ebb and flow of groups into and out of the employment rolls meant that neighborhoods came to have mixed populations. One could discern ethnic *occupational* enclaves at the mines, however, because bosses, in filling job slots, often hired people like themselves.<sup>30</sup>

The U. S. Census of 1870 demonstrates how just a few groups dominated the ranks of miners in Houghton County. Of over eleven hundred men who self-identified themselves as miners (as opposed to trammers, stamp mill hands, or other occupations), the Irish made up forty-one percent of the total; Englishmen (mostly Cornish), forty percent; and Germans, eight percent. Just over six percent were Scandinavians, and about a third of those resided near the Quincy mine in Quincy Township.<sup>31</sup>

Looking more specifically at Quincy, in mid-1865 the company's labor force included 208 miners: 137 were Cornish or English; 58 Irish; and 13, German. Among the total labor force of 594 men, 318 (54 percent) were Cornish or English; 138 (23 percent) were Germans; and 130 (22 percent), Irish. Blue-collar occupations did not divide sharply and clearly along ethnic lines, at least over any long run of years. This was also true for managerial positions,

where select immigrants moved into the top levels of the mine's hierarchy. In 1867, for instance, the agent at Quincy, George Hardie, was a Scot; the chief clerk, James North Wright, an American; the head mine captain, John Cliff, a Cornishman; the surface superintendent, John Duncan, a Scot; the master mechanic, Fred Labram, an Englishman; and the mill superintendent, Philip Scheuermann, a German.<sup>32</sup>

Hiring and firing at Quincy, as at other early mines, was decentralized. The men in charge of select parts of the operation largely acted with autonomy when selecting employees, and they tended to look after their own. In 1853, when still largely in the prospecting stage, Quincy hired William Worminghaus, a German, as its first mine captain. For a while thereafter, the mining force was largely German.<sup>33</sup> In September, 1863, an Irishman by the name of John McCormick got a place on a contract team paid to receive and sort all of Quincy's mine product at the shafts. At first, Germans surrounded McCormick, and Henry Obenhoff, German himself, headed the contract team. But McCormick somehow got control of this operation, and by the end of the year, Irishmen the likes of Cuddihey, O'Brien and O'Neil filled his crew.<sup>34</sup> The Germans were out; the Irish were in. But while the sortinghouses became an Irish stronghold, Germans still reigned supreme down at the stamp mill, where Phillip Scheuermann served as superintendent, and where Jegel, Offenbacher, Holzbauer, and Wiedenhofer all labored. Ethnic alignments were also found underground among Quincy's many contract mining teams. The men selected their own teams (usually of four or six men, half working each shift), and they formed many that were all Cornish, Irish, German, or Scandinavian.<sup>35</sup>

The contract system of mining used by Quincy and all mines on the Keweenaw, merits special attention, because it defined relations between miners and managers, and between miners and other laborers. The system originated in Cornwall, starting about 1700, and had been carried to Lake Superior by immigrant Cornish miners.<sup>36</sup> Significantly, contract miners did not see themselves as "wage slaves." They did not just sell their time, or work for a daily wage. They did not work under the close supervision of some boss. Instead, the men worked under mining contracts that were more performance based. On Lake Superior, a mining team entered a contract to drift or stope. If drifting, they received so much per lineal foot of advance; if stoping, they received so much per cubic fathom (six feet by six feet by six feet) removed from the lode over the length of the contract, which was usually a month.

Under the contract system, the mining captain, the boss, didn't put together teams or assign coworkers. Instead, the men picked their own teams. Under the contract system, the boss didn't tell the mining teams where to work, or just what work to do. Instead, the men could bid or negotiate a contract to work in a part of the mine of their choosing, and they had more say in whether they wanted to drift, stope, shaft-sink, or whatever. They worked under little direct supervision and set the pace of work. Another feature of the contract system, that made men feel more independent, was that their employer did not provide all their tools and supplies to the men – at least not free. Contract miners paid for the drill steels they used up, for their powder, their candles, ladders, and whatever else they needed. The company kept track of the supplies drawn by each team and deducted supply charges from earnings.

Companies liked the contract system because it seemed an incentive system. Men had to work to earn anything; they couldn't just put in their time. Time spent underground didn't count. What counted was not the clock, but the work completed: the number of feet drifted, the number of cubic fathoms stoped. Quincy and other companies hired mine captains and assistant mine captains to decide what underground work needed doing, to organize contracts and to measure the work completed – but they didn't have to hire foremen or petty bosses to check on the miners all the time. The miners liked the share of independence the contract system gave them: the freedom to have a say in picking team members, to set the pace of work, to decide what kind of work to do. They also liked the *status* of working under contract; it was higher than the status of those working for daily wages, under a boss, on a crew picked by somebody else.<sup>37</sup>

Early in its production stage, Quincy put all kinds of workers under contracts. At a time when production was small or intermittent, the use of contracts protected the company from paying out too much in wages when there perhaps was little to do. It protected the company from paying men to stand around. So wheeling contractors trammed rock from the stopes to the shafts; windlass contractors then lifted the rock out of the mine; a large contract team sorted the mine's product. Others contracted to burn and dress the rock at the kilnhouse, and down at the stamp mill, a man, under contract, received so much for every car of rock he pushed from the foot of the stamp mill incline to the storage bins serving the stamps.<sup>38</sup>

Over time, as production grew larger and more regular, Quincy eliminated many types of contracts and put more workers on daily wages and under the direct control of bosses who directed and watched them. Wheeling contractors evolved into trammers, who worked where they were told, and with whom they were told, for a daily wage. Technology was a factor, too. Steam hoists put windlass contracts to rest, and rock crushers, in the 1870s at Quincy, put to rest the contractors who had burned and dressed copper at the kilnhouses. Ultimately, most unskilled labor jobs underground and on the surface became jobs performed for a daily wage. Quincy and the other companies, though, kept the contract system for their skilled miners, and that contract system protected their status within the organization and set them apart from other workers.

After a long and frustrating decade or so of futile prospecting on Section 26, Quincy finally opened up the Pewabic lode on its property. In the late 1850s and early 1860s it started going into production, acquiring technologies, erecting a physical plant, building houses, hiring doctors, and platting a new village, Hancock. All this was just in time for the Civil War, which also proved frustrating for the company. The Civil War promised to be an economic boon, for sure. The demand for copper ran high and so did prices paid for the metal. Copper jumped from nineteen cents per pound in 1861, to a war-time high of forty-six cents in 1864. Between 1861 and 1865, the Lake mines produced a low of 64.2 percent of the nation's new copper, and a high of 89.5 percent. But that high came in the first year of the war, 1861, when the mines produced fifteen million pounds. In 1864, the mines produced only 12.5 million pounds. Quincy's specific case was similar. It produced 2.6 million pounds in 1861, but only 2.1 million pounds in 1865. The mines suffered through a strange phenomenon during the Civil War: prices went up, but production went down.<sup>39</sup>

A local labor shortage caused the production decline. Part of this shortage, but only a part, could be attributed to men leaving to serve in the Union Army. During the war, Houghton County sent 460 men off to serve; Keweenaw County, 119; and Ontonagon County, 254. But another, perhaps more important factor, was that the high war-time prices being paid for copper encouraged new mines to start up, or shuttered mines to reopen. In 1860, about twenty-three companies actively mined. Only a few were major producers. One had a production of two to three million pounds; four a production of one to two million; two produced one-half to one million pounds; and no fewer than sixteen mines managed less than a half-million pounds each.<sup>40</sup> By 1865, the number of small producers (less than a half-million pounds) had risen to twenty-nine. Intensifying work at marginal properties robbed good properties of the men they needed to step up – or even maintain – their pre-war production levels.

Some companies, individually and collectively, took measures to import men to increase the size of the labor pool during the war. Quincy, among other things, arranged for a Swede by the name of Axel Silversparre to serve as an employment agent for the company. Silversparre hunted for fellow Swedes willing to relocate to Lake Superior. He succeeded in recruiting some 140 Swedes from Canada who came to the Keweenaw in 1864 (many to Quincy, where the new Swedetown neighborhood had been built to receive them).<sup>41</sup> But most of the Swedes did not stick. They had little ameliorative effect on the labor shortage during the war, and by the 1870s Swedetown was largely abandoned by the company.

The Civil War brought some other problems, too. In these labor-short years, Quincy and other companies had to pay higher contract rates and wages. Due to inflation, the costs of supplies rose. The population had to weather a shortage in the food supply, then pay more for what they got. And civil order seemed threatened, too, by inordinate drunkenness, street brawls, and crime. Quincy's paternalistic, community-building activities briefly acquired a new war-time twist: the company received an arsenal of fifty muskets from the state of Michigan, and in the spring of 1864 established and drilled a volunteer militia company for the purpose of enforcing order, if necessary.<sup>42</sup>

Quincy had many difficulties on the road to profitable production, which it got to just as the Civil War began. The war brought with it a wholly new set of problems and challenges. Still, at the end of the war, Quincy was poised to be a very successful mine, perhaps the best on Lake Superior. But two things got in the way of that. The first was the onset of a long and severe post-war depression in the copper industry. And the second was the rise of Calumet and Hecla, a new mine about ten miles north of Quincy. Calumet and Hecla soon grew to be the region's giant, and throughout the rest of the nineteenth century, all other mines, Quincy included, lived in its shadow.

<sup>1</sup> Lankton and Hyde, Old Reliable, 4-5.

<sup>2</sup> Quincy, in its early history, was headquartered in Marshall, MI and then Detroit. When a new slate of company directors came in, company headquarters moved to Philadelphia, where they stayed from 1851-56. Then the company moved back to Detroit, again following the election of a new board of directors. In 1858, when Quincy's largest stockholder, Thomas F. Mason, was elected president, he moved the corporate headquarters to New York

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City, where he resided. See Lankton and Hyde, Old Reliable, 5, 7, 18-19, 151. The last page cited lists all Quincy Mining Company officials from the 1840s through 1980.

<sup>3</sup> Dividends were reported in QMC's annual reports; for a table of dividends, see Lankton and Hyde, Old Reliable, 152-53.

<sup>4</sup> Lankton and Hyde, Old Reliable, 6, 8, 10.

<sup>5</sup> *Ibid.*, 10-11.

<sup>6</sup> *Ibid.*, 15-16, 20-21.

<sup>7</sup> *Ibid.*, 152.

<sup>8</sup> Work on the early Pewabic lode shafts is documented in QMC, Contract Book, 1856-60; and QMC, Return of Labor, 1857-64, QMC coll., MTU.

<sup>9</sup> Over and underhand stopes are shown on early longitudinal sections of the Quincy mine. See Lankton and Hyde, Old Reliable, 30.

<sup>10</sup> QMC, A.R. (1872), 18; A.R. (1877), 15; and A.R. (1878), 2.

<sup>11</sup> QMC, A.R. (1864), 5; A.R. (1865), 5-6; A.R. (1866), 4; A.R. (1867), 11; A.R. (1868), 14.

<sup>12</sup> QMC, Invoice Book, 1860-63, invoice for forty-eight wheelbarrows, 29 May, 160; for rails, QMC, "Inventory," 1 Jan. 1862. The QMC Contract Book, 1856-60 carries entries not only for miners, but for men with "wheeling contracts."

<sup>13</sup> See windlass contracts in QMC, Contract Book, 1856-60.

<sup>14</sup> QMC, "Inventory of Buildings, 1 March 1859," and letter, S. S. Robinson to TFM, 14 May 1861.

<sup>15</sup> Larry Lankton, "Technological Change at the Quincy Mine, c. 1846-1931," unpublished HAER report, (1978), 289-90.

<sup>16</sup> Numerous entries for purchases of hoisting chain and then wire rope are found in QMC, Invoice Books, 1860-63 and 1864-73. Hoisting chain weighed 5.7 to 6.6 pounds per foot; wire rope, only 3.6 to 3.8 pounds. The QMC Invoice Book for 1860-63, entries for June-Sept. 1863, document Quincy's first purchases of rock skips. Purchases of "bell wire rope" are found in QMC, Day Book, 1859-66, 324, 346-47, 586.

<sup>17</sup> Lankton and Hyde, Old Reliable, 29. QMC Contract Book, 1856-60 and Kiln-House Time Books, 1861-62 and 1862-66 document much of this labor.

<sup>18</sup> Min. Stats. for 1881, 110.

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<sup>19</sup> Min. Stats. for 1880, 26; Blandy, “Stamp Mills of Lake Superior,” 208-15; Gates, Michigan Copper, 26-27. See Benedict, Lake Superior Milling Practice, for a full description of stamping, washing and separating machinery; for particular details on Quincy’s mills, see Charles F. O’Connell, Jr., Quincy Mining Company: Stamp Mills and Milling Technologies, ca. 1860-1931,” unpublished HAER report (1978).

<sup>20</sup> Lankton and Hyde, Old Reliable, 16, 35.

<sup>21</sup> See ca. 1865 map of Quincy location in Lankton and Hyde, Old Reliable, 29.

<sup>22</sup> Fisher, “Quincy Mining Company Housing,” 62-62, 69-74; Sarah McNear, “Quincy Mining Company: Housing and Community Services, c. 1860-1931,” unpublished HAER report (1978), 519-21.

<sup>23</sup> Fisher, “Quincy Mining Company Housing,” 62-63, 73, 75; Efstathios I. Pappas, “Swedetown Location: Hope and Failure in a Company Neighborhood,” unpublished master’s thesis, MTU (2002), 5-58.

<sup>24</sup> Lankton and Hyde, Old Reliable, 36; A. F. Fischer, “Medical Reminiscence,” MH 7(Jan-April 1923), 27-33. Also see McNear, “Quincy Mining Company,” section of medical service, 539-46.

<sup>25</sup> Lankton and Hyde, Old Reliable, 36-38.

<sup>26</sup> Lankton, Beyond the Boundaries, 138; School District No. 1, Quincy Township, Minutes of Meetings, 1867-, QMC coll., MTU.

<sup>27</sup> Fisher, “Quincy Mining Company Housing,” 41-44, 49; Lankton and Hyde, Old Reliable, 35.

<sup>28</sup> The list of Hancock businesses and trades was compiled from many sources: newspaper stories and advertisements, QMC invoices from Hancock firms, and from census records listing occupation.

<sup>29</sup> Lankton and Hyde, Old Reliable, 5, 6, 19; Robert L. Root, Jr., “Time by Moments Steals Away”: The 1848 Journal of Ruth Douglass (Detroit, 1998), 22-25.

<sup>30</sup> Lankton, Beyond the Boundaries, 116-18.

<sup>31</sup> To see how ethnicity at Quincy in 1870 compared to all of Houghton County, see Lankton and Hyde, Old Reliable, 39.

<sup>32</sup> Hyde, “Economic and Business History of Quincy,” 83-84; Lankton and Hyde, Old Reliable, 20, 151.

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<sup>33</sup> German workers' names are found in QMC, Time Book, 1851-55, entries for July 1851, July 1852, and February 1855.

<sup>34</sup> See contracts to sort and break rock, QMC, Contract Book, 1861-63, entries for Sept.-Nov. 1863.

<sup>35</sup> See names of German workers at the stamp mill in QMC, Time Book, 1872; see ethnically aligned mining teams in Quincy's Contract Book covering 1872.

<sup>36</sup> For discussions of the Cornish contract system, see Roger Burt, ed., Cornish Mining: Essays on the Organization of Cornish Mines and the Cornish Mining Economy (Newton Abbot, 1969).

<sup>37</sup> Burt, ed., intro. to Cornish Mining, 10-11; Lankton, Cradle to Grave, 63-64.

<sup>38</sup> Quincy's many extant Contract Books at MTU document its extensive use of contract labor at one time.

<sup>39</sup> Gates, Michigan Copper, 197, 203; Lankton and Hyde, Old Reliable, 152.

<sup>40</sup> Lankton, Beyond the Boundaries, 195; Gates, Michigan Copper, 207.

<sup>41</sup> Pappas, "Swedetown Location," 20-58; Hyde and Lankton, Old Reliable, 17.

<sup>42</sup> Lankton, Beyond the Boundaries, 187; Lankton and Hyde, Old Reliable, 41-42.

## CHAPTER 7

## MICHIGAN DOMINATES THE COPPER MINING INDUSTRY

At the end of the Civil War, Michigan reigned as the leading copper producing district in the United States, and it maintained that leadership role until the late 1880s, when the mines of Butte, Montana, surpassed Lake Superior production for the first time. This era was not without economic problems, such as in the immediate post-war period, when a severe depression hurt the Michigan mines. And over the 1865 to 1890 period, the general trend was for copper prices to fall, a fact which sometimes challenged and limited the mines' profitability. But on the whole, this period was one of great growth and change, a time when the best of the mines and their attendant communities matured and took on the trappings of permanent, rather than pioneer, settlements.

Keweenaw copper mining was always in a state of flux. Truth be told, this industry never enjoyed only expansion and growth along the full length of the mineral range. While new mines came on line at one place, older companies struggled or failed somewhere else. This certainly proved true in the quarter century after the Civil War. This era witnessed the decline of the richest pioneer producers, the Cliff and Minesota mines, and a general decline on both ends of the copper range: the northern end in Keweenaw County, and the southern end in Ontonagon County. But while mines faltered and failed on the ends of the range, a great surge of production came out of the *middle* of the Keweenaw in Houghton County. The Portage Lake mines, especially Quincy, became much larger producers. (Quincy's production increased from one million pounds of copper in 1865 to four million pounds in 1890.) And most importantly, the new Calumet and Hecla mine, established in the late 1860s about twelve miles north of the Portage, quickly became one of the largest and richest mines in the world. By 1890, C&H alone employed nearly 3,500 men (more than a fourth of the district's total force of mine workers), and produced 60 million pounds of copper (which was 60 percent of the region's total production).<sup>1</sup>

This era established Houghton County as home of the richest, longest lived native copper mines on Lake Superior. The Houghton County mines, especially C&H, sustained the district's domination over the U.S. copper market into the 1880s. In Houghton County, one found not only the largest mines, but the biggest mills and smelters, as well as the largest mine locations and commercial villages. Commercial villages on the tip and base of the Keweenaw, such as Copper Harbor, Eagle River, Eagle Harbor, and Ontonagon, were eclipsed by the rise of Houghton and Hancock alongside Portage Lake, and by the rapid growth of the village of Red Jacket, adjacent to Calumet and Hecla. In 1865, when total Keweenaw population ran a bit shy of 20,000 inhabitants, 8,500 (or 42 percent) resided in Houghton County. The Keweenaw's population doubled to 40,000 by 1890, when 35,400 residents (or 88 percent) lived in Houghton County.<sup>2</sup>

At the end of the Civil War, some thirty-six copper mines operated on Lake Superior. That number dropped to twenty-four mines in 1870, and to only fifteen in 1890. Although the number of producers declined, copper production increased dramatically. In

1865, the mines produced 14 million pounds of copper; in 1890, they produced over seven times as much: 101 million pounds. Fewer mines produced far more copper, because during this era, they became larger, more mechanized, and more productive than during the pioneer era.

While copper production over this quarter-century increased by some seven times, total mine employment only doubled: from about six thousand workers in 1865 to about twelve thousand in 1890. Technological change and productivity increases allowed each worker in the industry, over time, to account for greater production. In 1865, copper production per man year ran 2,300 pounds; by 1890, each man on the payroll accounted for nearly 15,000 pounds of copper produced.<sup>3</sup> This increased productivity allowed companies to maintain profitability in the face of generally declining copper prices.

From a peak of thirty-six cents per pound in 1865 (a price reflective of Civil War inflation), copper fell to only twenty cents per pound in 1870 (a price reflective of the post-war recession). Copper prices rebounded to another high point of about thirty-three cents per pound in 1872, and in subsequent years relatively steadily fell off to just fifteen cents per pound in 1890. During the Civil War, the mines' dividend payments hit a then-record annual high of \$1,150,000 in 1864. During the post-war recession, when copper prices fell precipitously, altogether the firms paid out only \$100,000 to \$210,000 annually in dividends. Profitability recovered in the 1870s and 1880s, in part due to substantial productivity increases that counter-acted the negative effects of declining prices. A few peak dividend paying years were 1872 and 1890, both of which saw more than \$3,000,000 in dividends returned to investors.<sup>4</sup>

This post-Civil War era, not only for Lake Superior copper but for other districts as well, marked the true industrialization of mining. When first opened, the copper mines still exhibited many characteristics of a craft industry. Production and employment had not reached vast proportions; individual skill and knowledge on the part of blue collar workers still counted a great deal; the production of copper rock at many individual shafts was often small and even intermittent; and much of the labor of winning the metal, from drilling shot holes underground to ladling molten copper into molds at the smelter, was still done by hand. Clearly, the three technological changes most important to the industrialization of mining between 1865 and 1890 were the introduction of power rock drills and high explosives underground, and the enhanced use of steam power and mechanization on the surface.

Drilling shot holes with sledge hammers and hand-held drill steels was a slow, laborious task with high labor costs. Miners could not drill many holes per shift. This put a premium on the miners' skill. They had to locate and angle the holes so that the fewest blasts brought down the largest possible amount of copper rock. At mid-century, interest grew in developing power rock drills that could drill faster than hand-drills and drive more and deeper shot holes per shift. Such a machine promised to be of benefit not just in mining, but quarrying, tunneling, and even general construction. But despite its general appeal to several industries, the mechanization of shot hole drilling did not come easily.

Producing a machine that could stand up to the rigors of drilling rock – without breaking or requiring constant maintenance – severely tested the engineering design and metallurgical skills of the time. Several early machine drills failed their tests. Finally, in the mid-1860s, the Burleigh Rock Drill Company of Fitchburg, Massachusetts, manufactured a machine that won acclaim for helping drive the Hoosac Tunnel, twenty-five thousand feet long, through the Green Mountains. In 1868, with hopes it would reduce costs, the Lake Superior copper mines may have been the first in the country to try to apply the Burleigh drill to underground mining.<sup>5</sup>

The Lake mines soon discovered that changing from hand drills to machine drills was no simple swap of one tool for another. For starters, the Burleigh drill was more than a mere tool; it was more of a technological system. The Burleigh drill used compressed air to reciprocate a piston inside a cast iron cylinder, and the piston drove the machine's drill back and forth. To operate the Burleigh drill underground, the mines burned wood in boilers up on the surface to produce steam. They piped the steam to nearby air compressors, only recently purchased and installed. The steam under pressure drove power pistons within the compressors, which in turn reciprocated other pistons that worked to compress the atmosphere in a second set of cylinders. Cast iron pipes and flexible hoses then carried the compressed air underground to work stations where miners operated their Burleigh drills.

The mines expected the Burleigh machine to drill faster and cut costs. Between 1868 and 1873, at least ten companies (starting with the Pewabic and Franklin mines) extensively tested and used the new technology. It failed. Once in place and when properly running, the Burleigh indeed drilled shot holes at a rapid rate. But the machine was too cumbersome and heavy. It had worked well in the flat Hoosac railroad tunnel, twenty-four feet wide, but proved too difficult to set up and maneuver in a mine's smaller and inclined spaces. Besides being too time consuming to set up, it also proved prone to breakage and was too complicated for ordinary miners – who had never run machines before – to operate. All the mines that tried Burleigh drills shelved them by the mid-1870s.<sup>6</sup> (Fortunately, one of these early machines survives today at the Quincy mine site.)

The mines gave up on the Burleigh, but not on the idea of machine drilling. They tested several other drills, and in the late 1870s and early 1880s hit upon the machine produced by the Rand Drill Company of New York. In contrast to the Burleigh, the Rand was simpler. For instance, it lacked an automatic forward feed. It also proved more reliable and needed less maintenance, in large measure because all its valve gear was protected inside the machine's casing or shell. The Burleigh's valve gear was outside the shell, and prone to breakage or misalignment if roughly handled. Most importantly, though, the Rand drill was much lighter and had a simplified mounting system. Two men could carry this drilling machine, plus its mounting clamp and post, almost anywhere in a mine and rapidly set it up. The Rand drill rapidly proved a grand success. The mines switched from hand-drilling to machine-drilling and the change brought large productivity increases. The Rand drill allowed fewer miners to produce more copper rock. By 1882, with Rand drills Calumet and Hecla produced twenty percent more copper with twenty

percent fewer miners. At Quincy, the gains looked even bigger, as the company soon produced fifty percent more copper while employing half as many miners.<sup>7</sup>

The introduction of machine rock drills was the single most important technological change in underground mining in the nineteenth century. (Fig. 24.) Second in importance was the introduction of high explosives. At the copper mines, machine drills and high explosives had interconnected histories. They came into the mines at about the same time, and just as the first rock drilling machines failed to earn a place among the mines' technologies, so did the first high explosives. (Fig. 25.)

The high explosives that replaced black powder burned much faster. Their blasts were said to have a shattering, rather than a heaving, effect on the rock. High explosives brought down more rock per charge, and in smaller pieces. The copper mines' initial flirtations with a high explosive followed the work of Alfred Nobel, who in the late 1850s in Sweden developed liquid nitroglycerine – initially just a scientific curiosity – into a commercial explosive. The first shipments of nitroglycerin blasting oil reached the U.S. in 1865 and reached the Lake Superior copper mines just two years later.<sup>8</sup> But by 1867, something else had also reached the mines – tragic tales of how dangerous nitroglycerine oil was, of how it had accidentally and unexpectedly detonated in various places, sometimes claiming many lives. Many miners – and mine managers – feared the new explosive. Some companies eschewed trying it. The mines' early experimentation with nitroglycerine blasting oil ended quite literally with a bang at the Huron mine in 1870. Huron miners wanted to stop the testing of the explosive in their mine, and they surely didn't want the company to convert over to nitroglycerine oil. So they used some of their tried-and-true black powder to blow up all the blasting oil sitting in storage on the surface.<sup>9</sup>

Between 1870 and 1880, while the mines experimented with different rock drills, they also experimented with new powders and high explosives. Occasionally a tragic accident occurred. In 1874, a trial of a new high explosive called Dualin ended at the Phoenix mine when the powder exploded in a mining captain's office and killed six men.<sup>10</sup> While the Lake mines shied away from adopting high explosives, other mining districts turned more willingly towards them, especially to Nobel's nitroglycerine dynamite. Nobel in 1867 had combined liquid nitroglycerine oil with an inert absorbent that held the explosive in a more stable form. Sticks of this nitroglycerine dynamite – which were detonated by blasting caps – proved safer to transport and handle.

Although far more powerful than black powder, nitroglycerine dynamite earned a reputation as being more reliable – meaning that it was less likely to explode when miners weren't ready for it, and more likely to fire on cue when it was supposed to. Just as the Lake mines were discovering and adopting Rand drills, in the late 1870s and early 1880s they also adopted various kinds of nitroglycerine dynamites, such as Hercules powder and Excelsior powder.<sup>11</sup> The two new innovations worked together well. The Rand drills produced more and deeper shot holes, and dynamite brought down more copper rock per charge.

During this era, the mines did not substantially alter their mucking and tramming technologies. Men still loaded cars and pushed them along light rails to a shaft for hoisting. At the shaft, some notable changes occurred, particularly after the advent of drilling machines and high explosives. In the slower hand drilling days, to get out much production companies had to exploit a lode through numerous shafts, which allowed for the opening up of more stopes and drifts. With Rand drills and dynamite, workers could make fewer working faces produce more copper rock. As a consequence, mines no longer needed to operate as many shafts, spaced only two to four hundred feet apart. They hoisted from fewer shafts, but thanks to new drilling and blasting technologies, each shaft produced more rock per day.

Many shafts now carried two skip tracks. Instead of hoisting rock in one skip, the shaft hoisted in balance: while one skip went down, another went up. The weight of the descending skip helped counterbalance and lift the ascending skip. Also, several companies introduced a new means of transporting men up and down. Instead of relying on ladders or a man-engine, they introduced man-cars. At the beginning and end of a shift, men in the shafthouse removed a rock skip from the hoisting rope and replaced it with a man-car, a longer, specialized “skip” having a tier of bench seats. About thirty men at a time rode a man-car into the mine. In contrast to the single man-engine that most mines used, the new man-cars, running in multiple shafts, took more men underground faster and delivered them closer to their work.<sup>12</sup>

In the decades after the Civil War, the underground saw both change and continuity. The biggest changes involved machine rock drills and high explosives. Another change, of less consequence, was the increased use of another machine – the diamond drill – for underground prospecting. Instead of driving large, expensive crosscuts underground to test for copper next to established lodes, companies relied more on diamond drills and on reading the core samples that they cut.<sup>13</sup> In terms of continuity, many underground technologies, besides mucking and tramming, remained relatively unchanged. Candles still lighted most work spaces; the mines relied almost exclusively on natural ventilation; and underground sanitation remained primitive. In only a few mines, especially those working the Calumet Conglomerate lode, did companies heavily timber an unstable hanging wall, using stulls or square-set timbers.<sup>14</sup> Most mines still timbered sparingly, and trusted their hanging walls to support themselves.

On the surface, the most significant technological changes involved hoisting, breaking, and transporting copper rock, all accomplished with the much augmented use of steam power. As steam engines proliferated on the Keweenaw, one fundamental change in the industry involved fuel. In early decades, the mining companies harvested local forests to fuel the boilers that produced the steam that drove the engines. Companies consumed the timber right at their locations in short order, then many purchased substantial woodlands as close to their mine as they could get. Woodsmen produced the thousands of cords of wood that companies stockpiled and then burned, both at mines and at stamp mills. But cutting, splitting, transporting, and stacking local wood was not inexpensive, and it became more costly when the companies had to go farther out to obtain their

supply. By the 1880s companies were generally abandoning wood as a fuel and adopting coal, shipped up from the lower Great Lakes.<sup>15</sup>

As the mines reached down another level or two each year, hoisting drums became larger to accommodate longer lengths of hoisting rope, and the scale of hoisting engines also increased. It became common during this era to have two engines drive a winding drum, instead of just one. In these duplex engines, typically the engines sat side by side in the engine house, with the hoisting drum mounted between them. Both engines' cranks connected to the drum's main shaft or axle and helped turn it. Some engines were by now specially designed to serve as hoists, but many others remained typical "American" style, general purpose engines – engines with horizontal cylinders that ran on high pressure steam. These engines could have been used to power any number of mechanical things in industry, but just happened to be used to provide rotary motion to hoisting drums.

Many steam engines on Lake Superior served long lives and performed, over time, multiple functions. Companies often took advantage of the versatility of common steam engines and moved them around as needed, from mine to mill, or from shaft to shaft.<sup>16</sup> Companies applied steam engines to numerous tasks at the mine, such as driving machine shop equipment, powering air compressors, and especially, breaking and transporting rock on the surface.

During the course of the industrialization in the American economy in the nineteenth century, different industries often encountered similar technological problems. When one industry developed a new machine that solved its problem, other industries often discovered that the same technology worked for them. The power rock drill, for instance, first developed for tunneling, found its way into quarrying, mining, and road- and harbor-building. Similarly, a machine developed in Connecticut to crush rock for surfacing roads wrought great changes, starting in the 1860s and 1870s, in how the Lake Superior copper companies dressed rock at the mine before shipping it to their mills.

Eli Whitney Blake developed the jaw crusher for breaking rock in the early 1850s and patented it in 1858.<sup>17</sup> Powered by a steam engine, the Blake crusher carried two heavy, cast-iron jaws, one stationary and one moveable. The moveable jaw alternately closed in on the other jaw, then backed off, then closed in again. The two jaws sat in nearly upright positions, but were wider apart at the top than at the bottom. Rock put in at the top was squeezed between and broken by the jaws as they moved closer together. Then, when the moveable jaw backed off, the rock dropped down farther into the machine, and was crushed again. After several breaks, the rock was small enough to drop out of the bottom of the crusher, meaning it was small enough to ship to the stamp mill.

The Blake jaw crusher allowed companies to abandon their old kilnhouses and the technology of calcining rock, which had been attended by high fuel and labor costs. By 1865, several mines had acquired crushers, and most remaining mines followed suit within the next decade. This new technology called for fewer unskilled laborers to be employed in rock breaking on the surface, and it also changed the mine's landscape. Now inoperative, a mine's kilnhouse pits stopped filling the sky with wood smoke, and



Figure 24



Figure 25



Figure 26

companies filled them in with poor rock. Meanwhile, a new major structure – the rockhouse – came to stand at the end of a company’s line of shafts. Typically, a tracked, endless-rope tramroad ran across the mine site, picked up the product from all shafts, and delivered the copper rock to the rockhouse for sorting and breaking.<sup>18</sup>

The new rockhouses were some of the most expensive mine structures erected at the time. They included steam boilers and engines for powering machinery and for driving the endless rope tramroad. In addition to jaw crushers, the rockhouses commonly included two other sorts of machinery for handling mine product: drop hammers and steam hammers. A large drop hammer, with a head weighing in excess of one thousand pounds, was mechanically lifted up and then dropped onto the largest pieces of copper rock. After this first, coarse break, the rock now fitted into the jaw crushers. Many rockhouses also contained a steam hammer, whose smallish reciprocating head cleaned pieces of mass copper of adhering rock.

From the rockhouse, mass and barrel copper travelled directly to a smelter, while conglomerate or amygdaloid copper rock passed to a stamp mill. In the earliest decades, companies moved their product via wagons or sleighs drawn by work horses or oxen. In some instances, when mine and mill were closely situated, they used a tramroad. In the quarter century after the Civil War, many mines and mills were now five to fifteen miles apart, and steam locomotives and railroads transported most mine product. The Pewabic and Franklin mines, followed by the new Hecla mine, pioneered in the use of steam locomotives in the mid-to-late 1860s. By the 1880s, an expansive network of narrow-gauge, standard-gauge, and dual-gauge railroad lines connected mines, mills and smelters up and down the Keweenaw.<sup>19</sup> Some were independent lines; several were owned and operated by their parent mining companies. By the end of the 1880s, a railroad bridge passed over Portage Lake, and Keweenaw rail service connected with lines running off to distant cities such as Chicago.

The mine of 1890 looked very different from the mine of the Civil War era. Locations, especially those that had been around for three or four decades, looked less raw and yet

more industrial. Tree stumps no longer littered the ground, because the land had been cleared so long before, and the forest line on the margin of the mine had been pushed way back as the mine consumed all nearby wood resources. A poor rock carpet obliterated natural ground covers and obscured original terrain. The ground by the shafts was poor rock from end to end. Poor rock filled ravines or low areas in some places, and at others rose from the landscape as big burrow piles. Far fewer animals and wagons traversed the ground, because tram and rail lines now crossed the site, sometimes elevated on wooden trestles. Activity – and production – at the modern mine was more continuous. Mines typically operated from fewer shafts, spread further apart, but each shaft accounted for larger tonnages than before. Each shaft by now had its own dedicated hoisting engine, often with its own boiler house and stack. Twin wire ropes ran from the hoists to the head sheaves in the shaft houses; they hummed throughout the day and even the night as they crossed over wooden pulley stands, then down into the mine, where they did the work of raising and lowering skips.

Shafthouses still had virtually no machinery in them. They largely served to keep the head frame, skip tracks and skip dumps out of the weather, and their size and appearance had changed little. But kiln-houses were gone, replaced by rock-houses. Air compressors, which powered the underground rock drills, represented a new and important class of machinery on the surface. As production increased and the mines mechanized more, they often build larger and improved machine, blacksmith, and drill sharpening shops to perform essential maintenance and fabricating operations. The look of these and other mine buildings changed somewhat during this period, not only because they were often larger than in pioneer days – but because they were also less likely constructed of wood. Wood had certain advantages. It was relatively inexpensive, it was locally available, and surface bosses and mine carpenters could design and fabricate in wood, without the help of outside experts. Wooden structures lacked the cachet of permanence, however, and were susceptible to fire. Although structures of wood and poor rock still dominated many a mine's landscape, by the end of this era more firms started turning to brick and dressed stone for construction, and within another ten to fifteen years, they would use more concrete and steel.

Wooden structures, which generally included shafthouses, rockhouses, and carpenter shops, mining captain offices and some supply structures, stood atop foundations laid up of poor rock from the mine. Masons also laid up poor rock to form the walls of numerous structures, such as hoist and boiler houses, drill, blacksmith and machine shops, powder magazines, and dry houses. Most of these buildings exhibited a rugged, utilitarian appearance, with broad mortar joints binding the irregularly shaped rock. About the only “refinement” one might find at a poor rock structure at the Quincy mine, or even at the richest of the mines, Calumet and Hecla, might be the use of red brick for window lintels and sills, and close to 1890, a limited use of red, locally quarried Portage Entry sandstone as quoins on building corners and the masonry bases of chimney stacks. Indeed, Calumet and Hecla had a few more monumental and better finished masonry structures, such as its gear house and Superior engine house, but they were the exceptions during this time frame, not the rule.

Even if individual buildings changed in their details, the mining landscape did not change in its overall configuration. Both the older mines from the pioneer era, and the newer mines developed after the Civil War, exhibited a sustained pattern. The companies erected the technological component of their operations in a nearly linear fashion, aligned along their row of shafts. Very near the shafts, but on land definitely not needed for mining purposes, they erected company housing, and they perhaps made select lots available for such things as a store or two, a church or two, and a school. But they did not erect a full-fledged commercial district or full-fledged company town on company property. This general pattern, developed in the 1840s and 1850s, held throughout the nineteenth century and into the twentieth.

By 1890, a profitable company commonly had several neighborhoods of company houses adjacent to the mine. The houses in these neighborhoods had much in common. Virtually all were constructed of wood and stood on poor rock foundations. They still occupied sizable lots, commonly fenced, that space for keeping an animal or fowl or for planting a garden, as well as room for an outhouse and maybe a small barn outbuilding. At this date, company houses still lacked utilities, such as water, sewage, gas, electric, and telephone. The houses often shared some common characteristics from neighborhood to neighborhood, and from mine to mine, but by no means were the houses all identical. Two things encouraged housing diversity: the passage of time, and the mine's occupational hierarchies.

The companies did not engage in house construction as a constant, on-going activity. As needed, they engaged in short bursts of construction, and each new burst resulted in another neighborhood or two of houses. Within each new neighborhood of worker housing, the structures often were identical. But the houses, in their elevations, plans, and sometimes construction, tended to vary from one lane to the next, one neighborhood to the next. Generally, as the nineteenth century progressed, working class families expected and wanted more from their housing: more rooms, more space and headroom, more windows, more stoves, and the like. Company housing at the mines exhibited this trait: later waves of housing were often better and more desirable than earlier houses. New houses at the mines did not replace old houses; they joined them. So at a mine in 1890, some still lived in log structures of three or four rooms, with no cellars and a low sleeping loft, while others resided in a neighborhood of five or six room frame houses, clap-boarded, having a cellar and a more commodious upper floor, as well as perhaps a second stove and more windows. Usually, newer houses were detached, single units, but occasionally a company built double-houses.

Rank and status also created housing diversity. On the Keweenaw frontier, a certain egalitarianism often had been visible at the mine locations and in the commercial villages. At first, there was a lesser gap between the well-to-do and the ordinary working class family, or between bosses and the men they bossed. But one sign of the passing of the frontier era was a widening gulf between classes, evidenced by their lifestyles, dress, and housing. By 1890, more of a contrast existed between workers' and managers' houses. Workers' housing carried no architectural embellishments, no "gingerbread," no porches, and were repetitive in their design. Meanwhile, mine agents, captains, doctors

and other key personnel lived in larger houses of individual design, with more amenities, that were spatially set apart from standard workers' housing. The Quincy Mining Company, consciously or not, made a strong statement about status and role within its organization in 1880-81. At a time when it expended only several hundred dollars to build a miner's house, it spent \$25,000 to erect and furnish a fine house for its agent, done up in the Italianate style.<sup>20</sup>

As the mine locations grew and matured, so did the adjacent commercial villages that served them. Houghton, Hancock, and Red Jacket (now called "Calumet") included more extensive main streets and downtowns replete with railroad stations, hotels, restaurants, general stores, saloons, specialty shops (such as millineries, drug stores and tobacconists), plus service businesses, professionals, and some manufactories. A snapshot of Hancock in 1890 shows that it was home, among other things, to some three banks, six churches, five hotels, five doctors, three dentists, three bakeries, three carriage dealers, six confectioners, four druggists, three drygoods merchants, nine general merchants, nine grocers, six hardware retailers, four meat markets, three millineries, eight tobacconists, four barbers, three laundries, two jewelers, one florist, one photographer, and numerous saloons and billiard halls.<sup>21</sup> Down in Hancock, principally along Quincy, Hancock, Reservation, and Tezcuco Streets, workers at the nearby mines atop Quincy Hill found the goods, services, and entertainments that they could not find at the mine locations proper.

Red Jacket village, which was not even launched until the late-1860s, when the Calumet and Hecla mines started up, exhibited a similar diversity of businesses, trades, services, and professionals by the late 1880s. (Fig. 26.) These were mainly aligned along Fifth Street, with additional commercial development on Sixth, Scott, Oak, Elm, and Pine streets. The village counted amongst its human and commercial assets some four churches, three hotels, four liverys, four tailors, two harness makers, one bowling alley and one coffin retailer, nine clothing stores, five dry goods merchants, nine general stores, eight confectioners, three druggists, eight groceries, seven meat markets, three jewelers, three millineries, five barbers, and thirty-five saloons.<sup>22</sup> Additional churches and other institutions occupied parts of Calumet Township, right next to the village. But Red Jacket village served as the primary retailing, services, and entertainment center for the northern end of Houghton County, and especially for employees and families from the adjacent Calumet and Hecla, Tamarack, and Osceola mines.

In the pioneer era, companies had stepped into the breach to accelerate the taming of a remote wilderness. The developing region needed almost everything, and the mining companies, acting out of paternalism as well as purely business interests, helped fulfill a host of social needs. They built roads, improved waterways, and sometimes operated as keepers of law and order. They cleared land and operated farms; many started at least a store or two; they helped form and staff school boards and built schools; they hired doctors, erected the region's first hospitals; and built a considerable number of the region's first houses. By platting and selling off land, they also helped launch new villages on the margins of the mines.

After the Civil War, when the region's population, businesses and institutions became more diverse, the mining companies withdrew from some of their earlier activities. Due to the presence of sheriffs, courts and jails, they no longer had to concern themselves too directly with keeping law and order. Government rightfully conducted some of the public works jobs that the mines had once assumed. With better transportation links to the "world below," and with a multitude of shops and stores in the villages, the mining companies concerned themselves far less with provisioning employees and their families. For the most part, they moved out of agricultural and commercial pursuits.

By no means, however, did the companies retreat from all of paternalism. They continued to build houses and run medical programs. Within their townships, they encouraged managers to remain active in politics, which meant they retained considerable say in the building, staffing, and operations of schools, the setting of tax rates, and so forth. Although the mining companies did not seek to be all things to all people, they did seek to shape, define, and maintain control over their workforce in many ways. In this, they were successful during this era, and the mines earned a reputation for having generally harmonious labor management relations.

By 1890, new immigrant groups from northern, southern, and eastern Europe were appearing up on Lake Superior in large numbers, especially Finns and Italians. But through the 1870s and 1880s, immigrants from the British Isles, Western Europe, and Canada still made up most of the workforce. As conditions in the copper industry fluctuated, the mining companies profited better in some years than in others. They raised or lowered wages accordingly, and wages proved to be the one issue (as opposed to other potential issues, such as working conditions or length of workday) that most often created tension between companies and workers. When workers were plentiful, or when faced with a poor copper market, companies typically offered lower wages and resisted pressures to raise them. But when the mines boomed and workers were in short supply, laborers often seized that time to press for an increase. Sometimes workers won these confrontations, but overall, they manifested little collective power when standing up against the companies.<sup>23</sup>

Workers flirted with unionism during this era, but no labor organization proved effective or lasted long. In the early 1870s, the International Workingmen's Union had a role in prompting a three week long strike at the Portage Lake mines and at Calumet and Hecla. This strike in 1872 resulted in workers achieving increased wages – but at a tremendous price. The strike so alienated the new president of C&H, Alexander Agassiz, that it engendered in him a staunch anti-unionism that he took to his grave in 1910. In the intervening years, Agassiz, as leader of the dominant mining company in the region, effectively quashed unionism and other forms of worker unrest in and around his mine, even as unionism was gaining a foothold in many other industries around the Great Lakes.<sup>24</sup>

In the 1880s, the Knights of Labor, whose national membership peaked at 750,000 in 1886, arrived on the Keweenaw. 1886 was known as the "Great Upheaval," because of the great number of strikes (1,432) and lockouts (140) that took place that year. The

rapidly industrializing, rapidly urbanizing American economy spawned deteriorating labor-management relations, and some of the worst outbreaks occurred in midwestern cities such as Chicago and Milwaukee. Under Agassiz's tutelage, C&H was careful not to import workers from places known for strident unions; careful not to hire any Knights of Labor members; and if any men on the payroll subsequently joined that union, they were to be discharged. Much of C&H's anti-unionism, during this era at least, was quietly conducted. Calumet and Hecla did not fire men for being union members, an act which might have made them labor martyrs or fueled a labor backlash. Instead, the company fired them for some other reason or infraction of company rules. The copper companies, with C&H leading the way, succeeded in neutralizing unions such as the Knights of Labor, in part by using guile, vigilance, and the steadfast resolve that they would not share their power with organized labor.<sup>25</sup> Paternalism played into their overall strategy here. By providing services such as housing and doctoring, they hoped to cement worker loyalty, while controlling their workers' cost of living. A lower cost of living, companies believed, would lessen demands for higher wages.

People within and without the Lake Superior mining district, in observing society there, often expressed the view that this was a special place, where a harmonious relationship existed between employer and worker. In 1882 a *Harper's* magazine writer expressed the view that "two 'Molly Maguires' from the coal regions would make more noise than the two thousand employees of Calumet." Calumet, he wrote, was a mine village without peer, an exemplar of "the straightforward manly development of American civilization." It was a place where immigrants were "quietly and harmoniously developing into self-respecting American citizens." James North Wright was a long-time insider, an American who had come from the east to Lake Superior and had served as the agent, or superintendent, of both the Quincy and Calumet and Hecla mines. In 1899 he wrote, "From an experience of thirty years . . . , I can truthfully say that I know of no mining region where the relations between the companies and their employees have been more friendly and pleasant."<sup>26</sup>

During this era, whether extolling the progress made by local society, praising company paternalism, describing the underground, or detailing the large and impressive facilities on the surface, most observers paid particular attention, and often a kind of homage, to Calumet & Hecla. It was not an early mine on the Lake, but after the Civil War it quickly became the best, the richest, and the most dominant. During this era, C&H was never just another mine, never just a typical operation. Instead, it was in a league of its own.

<sup>1</sup> Gates, Michigan Copper, 209, 230; Lankton and Hyde, Old Reliable, 152.

<sup>2</sup> Gates, Michigan Copper, 228.

<sup>3</sup> *Ibid.*, 212.

<sup>4</sup> *Ibid.*, 39-63, 203-04, 216-18; Lankton and Hyde, Old Reliable, 152. Also see Hyde, Copper for America, 49-67.

<sup>5</sup> Lankton, "The Machine *under* the Garden," 9.

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<sup>6</sup> Ibid., 10-17.

<sup>7</sup> Ibid., 17-23.

<sup>8</sup> Lankton, Cradle to Grave, 94.

<sup>9</sup> PLMG, 5 Aug. 1869 and 24 April 1870; Hyde, Copper for America, 62-63. Also, for nitro accidents, see Arthur Pine Van Gelder and Hugo Schlatter, History of the Explosives Industry in America (New York, 1972, reprint of 1927 ed.), 325-26.

<sup>10</sup> NMJ, 18 Feb. 1874.

<sup>11</sup> Lankton, Cradle to Grave, 96-97.

<sup>12</sup> Ibid., 35, 47.

<sup>13</sup> Lankton and Hyde, Old Reliable, 58.

<sup>14</sup> Lankton, Cradle to Grave, 30-37.

<sup>15</sup> Photographs of mine locations taken through the early 1880s sometimes show large stockpiles of cordwood located near engine houses. In addition to burning wood in boilers at their mines and mills, the companies cut wood for mine supports, kilnhouse fuel, and lumber. Lankton, Cradle to Grave, 42-42, 80-81.

<sup>16</sup> Mining companies could set up a standard horizontal steam engine to perform myriad tasks over time, as needed. At the crank-end of the engine, the drive shaft produced rotary motion. By affixing to that shaft a belt pulley, spur gear, or a friction drive, power could be transmitted to some piece of machinery in need of a prime mover.

<sup>17</sup> W. P. Blake, "The Blake Stone- and Ore-Breaker: Its Invention, Forms and Modifications, and Its Importance in Engineering Industries," AIME Trans. 33(1902): 988-1031.

<sup>18</sup> Lankton, Cradle to Grave, 49-50.

<sup>19</sup> Benedict, Red Metal, 67; Gates, Michigan Copper, 60-63; Willis Dunbar, All Aboard! A History of the Railroads in Michigan (Grand Rapids, 1969); Lankton, Cradle to Grave, 54.

<sup>20</sup> Lankton and Hyde, Old Reliable, 85-89; Lankton, Cradle to Grave, 151-53; Fisher, "Quincy Mining Company Housing," 47-179; McNear, "Quincy Mining Company," 521-24.

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<sup>21</sup> Information on Hancock establishments was collected by MTU students William Gruhlke, David Kari, and Deanna Koryczan; they did this work as a class project for L. Lankton. Some of their main sources were 1887-88 Handbook and Guide to Hancock, Michigan; vertical file photos of downtown Hancock (MTU); and Sanborn maps of Hancock (MTU).

<sup>22</sup> Michigan Tech students Kathleen Dravillas, Eric Durkee, Keri Ellis and Kim Wilmers collected data on Calumet establishments as a class research project done for L. Lankton. Their two main sources of information, both at MTU, were Polk's City Directory, 1895-96, and Sanborn Fire Insurance maps, 1888.

<sup>23</sup> Lankton, Beyond the Boundaries, 120-21; Lankton, Cradle to Grave, 204.

<sup>24</sup> Lankton, Cradle to Grave, 203-04; Gates, Michigan Copper, 113-14.

<sup>25</sup> Lankton, Cradle to Grave, 205-06; Gates, Michigan Copper, 114.

<sup>26</sup> "The Upper Peninsula of Michigan," Harper's New Monthly Magazine (May 1882): 898-99; James North Wright, "The Development of the Copper Industry of Northern Michigan," Michigan Political Science Association 3(Jan. 1899): 139-40.

## CHAPTER 8

## CALUMET AND HECLA'S RISE TO PROMINENCE

Calumet and Hecla got a late start because early prospectors missed finding its particular lode of copper. But once mining commenced on the Calumet Conglomerate lode in the late 1860s, Calumet and Hecla quickly became the premier copper mine on Lake Superior. It produced the most copper, paid the greatest dividends, employed the biggest work force, and built the largest, most impressive physical plant. Calumet and Hecla, through much of the late nineteenth century, dwarfed not only its neighboring Michigan mines, but all other copper mines in the world.

In his Report for 1899, Michigan's Commissioner of Mineral Statistics wrote of Calumet and Hecla that, "It sprang, fully panoplied, like Minerva from the head of Jove, to a commanding position among the wondrous treasure vaults of man."<sup>1</sup> In choosing the word "sprang," the Commissioner made the rise of C&H seem almost too rapid and easy. Even Calumet and Hecla encountered snags on its way to great success and profitability. The discoverer of the Calumet Conglomerate lode, Edwin J. Hulbert, ran afoul of the Boston capitalists who invested in the property, and the early corporate history of the company was rife with controversy and animosity. The first attempt to develop the lode, led by Hulbert himself, left the mine in shambles and impeded subsequent work. The leader erred in thinking that the Calumet Conglomerate's rock was so rich that it could be smelted directly, without milling or concentrating it. Then, when the need for milling became obvious, the company wasted capital in investing in the novel (and unsuccessful) technology of crushing rock with rollers, instead of using tried and true stamps.<sup>2</sup>

For a brief period, nothing seemed to go right. It proved embarrassing, to say the least, when the mining company discovered that its newly built railroad did not match the gauge of its just arrived steam locomotives. But following its fitful beginning, Calumet and Hecla soon became the dominant mine in the region. Its lode proved so rich that once mining commenced in earnest, the company could hardly fail to profit. Two major credit ranking firms reported that both the Calumet and the Hecla mines (which started as two separate, but related companies, and joined into one in 1871) were "A No. 1" and the "best on the Lake." By the mid-1870s, the combined Calumet and Hecla was reported as "the largest and best copper mine in the world."<sup>3</sup>

C&H originated with Hulbert, a surveyor with considerable knowledge of geology and an interest in discovering new copper deposits. To say he discovered the Calumet Conglomerate lode by accident, or by just stumbling over it, would be inaccurate. His discovery resulted from careful observations. In the late 1850s, the Michigan legislature provided funds to survey a road along the Keweenaw. Hulbert received the contract to survey the line of the road from Copper Harbor south, for a distance of about sixty miles. Running a good line for a wagon road in this country was not simple, and Hulbert made more than one pass at it, trying to avoid steep grades and swamps. In the course of his survey, Hulbert kept a sharp lookout for copper-bearing rock. In 1858, in the forest

between Portage Lake and the Cliff mine, he found promising geological specimens, as well as an interesting pit. He explored the pit, expecting to find evidence that it was an old Indian mine-works situated on a promising lode that was right underfoot. But he found no hammerstones or other tools suggestive of ancient mining. Hulbert left the area “puzzled” by the pit he’d discovered. He kept it a secret and planned to return sometime for another look.<sup>4</sup>

Early in September, 1859, Hulbert finally had a chance to explore his secret area more thoroughly. He packed up tent, blanket, compass, tripod and hatchet, and set off on foot from Eagle River, the site of his office. As he tramped on, he carefully masked his intent and his true direction of travel from any observers. Whenever he saw anyone coming, he sat down till they passed, so they would not know which way he was heading towards or coming from. At his destination, he camped out and began to explore the geology and the pit, which he later called his “Sphinx of the Forest.” To maintain secrecy, he carefully recorded his field observations in cipher. Following this examination and subsequent ones, Hulbert determined that a great copper deposit indeed existed here. In 1860 he began purchasing mineral lands in the area and started seeking outside investment capital needed for development work. The coming of the Civil War interrupted Hulbert’s efforts, and serious work to uncover the Calumet Conglomerate lode waited till 1864. Ironically, the mysterious ancient pit indeed sat right atop the lode, but did not go deep enough to expose it. The pit that fascinated Hulbert and riveted his attention proved not to be ancient Indian diggings where they had taken copper, but a cache where Indians had hidden copper taken from other locations.<sup>5</sup>

Three companies became involved in testing and developing the lode that Hulbert discovered beneath a virgin forest. The Hulbert Mining Company came first. Boston capitalists joined Hulbert in starting this firm. His key associates were Horatio Bigelow, James A. Dupee, James Beck, Henry Sayles, E. D. Brigham, Charles D. Head, T. H. Perkins, and J. W. Clarke. The Hulbert Mining Company obtained mineral land parcels all along the Keweenaw, including the site of the Calumet Conglomerate lode in Sections 13 and 14, Township 56, Range 33 – land previously owned by the Metalline Land Company of Philadelphia and the St. Mary’s Canal Mineral Land Company. To develop this particular site, in 1866 the Hulbert company spun off a new company, the Calumet Mining Company. Later that same year, the Calumet Mining Company created yet another company controlled by the same investors: the Hecla Mining Company. The Hecla Company acquired Section 23, Township 56, Range 33, which was adjacent to the Calumet property. The two companies shared a boundary, had the same stockholders, the same administrative heads – and the same lode. The Calumet Mine developed the Calumet Conglomerate lode in the southeast quarter of Section 14; the Hecla Mine developed the same lode where it traversed the northeast quarter of Section 23.<sup>6</sup>

After purchasing their respective properties in 1866, the Calumet and Hecla companies had little money left to pay for developing the mines. So later that year, the fledgling Calumet Mining Company entered an agreement with Hulbert to have him work its lands under tribute, a method that preserved the company’s limited capital. Hulbert would take most of the risk and bear the expense of opening the lode. In return he and his associates

would receive seven-eighths of the ingot copper yielded by the property. The Calumet Mining Company – which provided the mineral lands but avoided development costs – received the remaining eighth of the product.

Under this tribute contract Hulbert began losing his grip on the lode he had discovered. In 1866, tributor Hulbert and his associates chose first to develop the Calumet property, rather than the Hecla – but it would be the Hecla end of the lode that ultimately turned out to be wider and richer at grass-roots, and less covered by overburden. On the Calumet end of the lode, instead of quickly settling atop it and exploiting it through standard shafts, Hulbert proceeded to mine it through large open pits that filled with water and suffered collapses of the pit walls. Hulbert continued to send glowing reports back to Boston on the richness of the Calumet Conglomerate lode, but his crew's development work proved slower than expected in yielding marketable copper.<sup>7</sup>

Other reports went to Boston by the hand of Henry D'Aligny, a French engineer who served as resident agent of the St. Mary's Canal Mineral Land Company, which owned a great deal of property on the Keweenaw. D'Aligny held Calumet Mining Company stock and knew many of the company's major investors. While Hulbert wrote optimistic reports, D'Aligny wrote letters "full of doubt and misgiving." The discouragement spread by D'Aligny caused some original Calumet Mining Company investors to pull out. One man who had more faith in Hulbert's reports the Bostonian investor, Quincy A. Shaw. Shaw and a group of investment friends bought up much of the Calumet stock and began directing operations out in Michigan.<sup>8</sup>

Shaw sent his brother-in-law, Alexander Agassiz, to the Keweenaw to assess the situation and Hulbert's performance. On this trip, and on others to follow, Agassiz became a believer in the property, if not in the person. Hulbert's slow progress in developing the mine appalled Agassiz. Yet in February, 1867, he could write: "The value of the mines, both Calumet and Hecla, is beyond the wildest dreams of copper men, but with the kind of management many of the mines have had, then even if the pits were full of gold, it would be of no use."<sup>9</sup>

Under Shaw's leadership, the new Hecla Mining Company was set up, and the Calumet company halted its arrangement with Hulbert to work its land on tribute. Shaw made his first trip to the Keweenaw in June 1867 and became further convinced of the value of the properties. Both companies levied new assessments on their stock to fund development work, which in March of that year the companies' directors had entrusted not to Hulbert, but to Alexander Agassiz. Agassiz moved to Lake Superior to serve briefly as resident agent of the Calumet and Hecla mines until they were well underway. Thus in 1866-67 the Shaw-Agassiz team wrested control of the endeavor away from Hulbert, who from 1867 onward felt nothing but bitterness toward the Boston pair. In that year, Quincy Shaw wrote to Theodore Lyman:

I have the prospect of a general lawsuit with Mr. E. J. Hulbert, former Supt., who is confident that he is defrauded by me of all his property and that I have been

scheming for his destruction, while he was slaving in that desolate region deprived of all social advantages to make me rich.<sup>10</sup>

The Shaw-Agassiz team made mistakes of their own in guiding the Calumet and Hecla mines, yet the properties rapidly and greatly improved under their leadership. They transformed wilderness mine sites into profitable operations in short order. In 1867, the combined production of the Calumet and Hecla mines amounted to 1.35 million pounds of ingot copper, a figure representing 7 per cent of the Lake mines' total production. In 1868, the two companies totaled 5.10 million pounds, already nearly a quarter of regional production. By 1870, production hit just over fourteen million pounds of ingot copper, and the Calumet Conglomerate lode's dominance was clearly established. Michigan in 1870 accounted for eighty-seven percent of the entire nation's copper ingot, and the Calumet and Hecla mines provided fifty-seven percent of Michigan's product (and a whisker under half the nation's). The Hecla Mining Company paid its first dividend in 1869; the Calumet mine in 1870. Once underway, the mines proved rich enough to pay for their own development. Copper sales, rather than numerous stock assessments, paid for their physical plants.<sup>11</sup>

In the spring of 1871, the two companies consolidated, forming the single Calumet and Hecla Mining Company, which Quincy A. Shaw briefly presided over until Alexander Agassiz became president on August 1, 1871. Agassiz did not surrender that post until his death in 1910, so Calumet and Hecla prospered under consistent, predictable leadership for a great many years. (Fig. 27.) The Shaw-Agassiz team put an indelible mark on their company and its behavior, on its technologies, its buildings, and its relations with workers. And Calumet and Hecla put an indelible mark on the Lake Superior copper district, which it dominated, thanks to the richness of its lode.

The Calumet Conglomerate lode outcropped on the top of the broad plateau that forms the spine of the Keweenaw Peninsula and stands about 640 feet above Lake Superior. The strike of the lode ran on a line thirty-nine degrees to the northeast; it dipped into the ground on an angle of thirty-eight degrees from the horizontal. C&H was exceedingly fortunate to own its particular portion of this lode. The Calumet Conglomerate can be traced for long distances along the Keweenaw, but over most of its extent it exists as a thin sandstone or shale, in places only a few inches thick. In Sections 14 and 23, however, the lode opens to a width of six to twenty feet, and the rock becomes much coarser and is filled with pebbles and boulders. Here the lode's porosity allowed the inflow of copper-bearing solutions – and any outflow was checked by impermeable margins of shale that closed in against the Conglomerate lode's bed. Copper concentrated in the Calumet Conglomerate to a degree not found in any other lode in the Lake Superior district. When opened up on C&H property, the lode yielded from 3 to 15 per cent copper, with an average yield of 4.5 per cent. By comparison, this was over twice the yield of Quincy's Pewabic (amygdaloid) lode, ten or twelve miles south of C&H.<sup>12</sup>

Calumet and Hecla had no way of knowing it at the start, but this lode's richness ran to great depths. In addition, C&H owned the only stretch of the Calumet Conglomerate –

where it outcropped on the surface – that could be made to pay. The company's boundaries nearly coincided with the lode's copper-rich portion. While C&H returned fabulous profits, competing investors failed to develop the same lode just to the north and the south. In 1881, a 4,200-foot-long stretch of the lode was considered prime; C&H owned all this stretch. To the north of C&H, the Schoolcraft and then the Centennial mines could turn no profit on the Conglomerate. The Centennial extensively worked the lode over twenty-nine years. It sank seven inclined shafts, one extending down thirty-two hundred feet, but did not find commercial mineralization. To the south, the Osceola mine failed just the same. These companies survived only by abandoning the Calumet Conglomerate and working amygdaloid deposits on their properties.<sup>13</sup>

Once C&H got underway, the richness of its lode meant it did not have to be very cost conscious. It was certainly less cost conscious than the Atlantic mine south of Portage Lake, which managed to squeeze profits from a lode charged with less than one-fourth the copper value of the Calumet Conglomerate. This is not to say, however, that all was perfect or ideal at C&H. Across its property, the Calumet Conglomerate definitely ran richer in some locations than others. There were barren spots. And while C&H had the richest copper rock, it also had the hardest. The conglomerate was a much harder, tougher and more expensive rock both to mine and to mill than amygdaloid deposits. It initially offered great resistance to miners drilling shot holes by hand and to stamping or crushing machinery on the surface. Also, the "roof" or hanging wall over the conglomerate was far less stable than that found in other Lake Superior mines. In most mines, when the lode was taken out the rock over the stopes tended to stay put and required little support. At C&H, the hanging demanded great attention from the surface down, causing a major part of the company's mining expense to be charged to timbering. The company buried "a forest" of timbers in its underground levels each year. The timbers rendered C&H more secure from rock falls, but more susceptible to underground fires.<sup>14</sup>

Because Calumet and Hecla developed twenty years after the start of the copper boom, it did not have to invent its own business practices, technologies, or social and paternalistic activities. The earlier mines adopted, and adapted, many practices from the tin and copper mines of Cornwall, England, practices which C&H in turn picked up. Calumet and Hecla innovated in certain ways, to be sure. But what set it apart from other Lake mines was not so much what it did – but the way it did it, on a vaster scale.

Trying to reconstruct in detail the rise of Calumet and Hecla in the nineteenth century is difficult. Extensive manuscript business records survive, but do not present great coverage of the early years.<sup>15</sup> Unlike virtually all other productive Michigan copper mining companies, C&H published no annual reports until the 1890s, and those were hardly fact filled. Quincy Shaw and Alexander Agassiz put their mark on the company and one trait C&H long exhibited was this: it did not open itself up for close scrutiny by outsiders. It largely kept economic, production, and employment data to itself. C&H volunteered little information and seemingly dismissed outsiders' inquiries, whether they were made by Michigan's Commissioner of Mineral Statistics or by representatives of Dun and Bradstreet. C&H, the dominant mining company, exhibited a singular style: it



*A. Ayassiu*

**Figure 27**



DAY AND NIGHT SHIFT OF C. & H. MINE, 1874, CAPT. THOS. HOATSON, SUPT.

**Figure 28**



**Figure 29**

was also the most aloof, independent, and arrogant mining company. The company's attitude did not endear it to outsiders, and a trace of pique and censure can be discerned in the Commissioner of Mineral Statistics Report for 1899, after C&H finally had begun publishing annual reports:

The company does not give detailed figures to its stock-holders, but contents itself with an annual report of exceeding brevity. . . . The statements given shareholders are remarkably meager, but as the dividends are phenomenally large, the stockholders content themselves with a minimum of information regarding their property, and the maximum of profits derived therefrom.<sup>16</sup>

The stockholders derived their “maximum of profits” thanks to the Calumet Conglomerate lode, which traversed the Calumet and Hecla properties over a total distance of about ten thousand feet. The early Shaw-Agassiz regime abandoned Hulbert's attempt to sink pits over the lode and conducted more extensive explorations to determine where best to attack the lode using traditional shafts. Generally, the further north the lode ran (especially on the original Calumet Mining Company's property), the less promising it appeared. C&H chose not to push ahead, at first, with the northern end. But this still left a long run of the lode to be opened, and the Calumet and Hecla companies did so by following the common practice of sinking a line of shafts that, by later standards, were closely spaced and as little as four hundred feet apart. By 1871, when the Calumet and Hecla companies combined into one, plans called for sinking sixteen inclined shafts into the lode, far more shafts than any other mine had on its property. Only four of these were on the northern side of the old boundary line between the original two companies, ground now called the company's “Calumet Branch.” Twelve penetrated the richer southern ground of the “Hecla Branch.”<sup>17</sup>

Not all of C&H's first shafts became permanent fixtures. Companies often altered their underground works in response to changing conditions, copper values, and technologies, and C&H was no exception. At least five of C&H's first sixteen shafts remained in service for many decades and reached down to the mine's eighty-first level. (C&H's

levels started out ten fathoms, or sixty feet apart, but by the 1880s were ninety to one hundred feet apart.) The No. 4 and 5 shafts of the Hecla Branch, on the other hand, never extended beneath the tenth level. Similarly, the company did not sink Calumet shafts Nos. 1 and 3 and Hecla shaft No. 1 below the twentieth level, because all three had received severe fire damage in the late 1880s. They'd be too costly to rebuild, and really were no longer essential. Closing several shafts did not mean that C&H was declining or diminishing; it meant the company smartly adjusted its plant to changing conditions. Not all adjustments in the nineteenth century were closures; Calumet and Hecla also opened several new shafts as time went along. With the cessation of some and the opening of others, C&H still had twelve shafts operating along the Conglomerate lode in the late 1890s.<sup>18</sup>

Calumet and Hecla first worked its lode on the advancing system, using open, overhand stopes. Stopping started at the shaft and proceeded out along the drift; miners worked from one level up towards the next; and the stopes were "open," meaning that broken rock was drawn from the stopes rather continuously. The company did not stockpile copper rock in the stopes, filling them up, and then drawing down the rock later, all at once.

Whether miners sank shafts, drifted or stoped, they discovered that the Conglomerate lode was very hard and difficult to drill – especially when hand-drilling with sledge hammers. According to one source, some of C&H's early contracts paid miners on the basis of how many *inches* they had driven shot-holes, rather than feet, because the rock was so hard.<sup>19</sup> The hardness of its rock prompted Calumet and Hecla to become one of the Lake mines most interested in finding a machine that could outperform hand drills. In the early 1870s, C&H ran more Burleigh rock drills than any other mine in the region, before giving the bulky machines up. Then, like other Lake mines, in the late 1870s C&H discovered the Rand "Little Giant" rock drill, and with that machine in hand, it succeeded in mechanizing its shot-hole drilling. By 1882, Calumet and Hecla ran 65 Rand drills underground, and together the Rand drills and dynamite significantly increased the mine's productivity.<sup>20</sup>

Given the production and employment data that survive, the best available measure of productivity is the number of tons of stamp rock produced per underground employee. From 1871 to 1875, C&H employed a low of 824 men underground, and a high of 1,114. (Fig. 28.) During these years, miners drilled both by hand and with the Burleigh drill. Output per underground worker (including miners, trammers, timbermen and others), varied from a low of 188 tons per man in 1873 to a high of 224 tons in 1874 and 1875. This output rose dramatically, and more than doubled, after Rand drills and dynamite appeared on the Keweenaw. Between 1880 and 1885, C&H employed a low of 692 and a high of 1,004 men underground. The underground work force produced a low of 407 tons per man in 1880 and a high of 564 tons in 1885.<sup>21</sup>

Taking advantage of the fact that machine drills and dynamite allowed miners to bring down more rock, C&H made several changes in how it exploited its lode. Since each shaft could produce more copper rock, fewer hoisting shafts were needed to get out the

desired amount of production. Because a greater amount of shaft-sinking, drifting, and stoping could be done in a year, the company saved on development costs by spacing its levels further apart. And the reduced costs of drilling and blasting encouraged C&H to do more. At Calumet and Hecla, stoping miners did not work hard on the heels of shaft-sinkers and drifters. Instead, men sank shafts and drove drifts far beneath the levels then being stoped out. By 1880, the shafts and drifts already opened at C&H could support five years of stoping. By the early 1890s, C&H had sunk a total of 2 miles of shafts and driven 13.6 miles of drifts beneath its working levels. C&H's ground was then opened ten to eleven years in advance of stoping, while most mines were opened only a year or two in advance. C&H's position enabled it to assess its future stoping ground better and to plan for its exploitation.<sup>22</sup>

Where the Conglomerate lode carried commercial quantities of copper, its dip and strike were remarkably uniform, so drifts running through it were very regular. They did not have to turn or twist much to follow the lode. Also, the lode was richly charged in copper from the footwall to the hanging, so stoping miners took the entire lode down. The problem became, at the same time, keeping the hanging wall up.

At the start, the forest of trees that Calumet and Hecla planted underground each year to help hold up the hanging took the form of large, round, stulls – essentially tree trunks – cut to the needed length. In the 1870s, woodsmen cut much of this timber from near the shores of Torch Lake. It was stockpiled at the lake near the stamp mills, hauled up an incline, and put aboard cars on the Hecla and Torch Lake Railroad. The railroad carried the timber to the mine, where special skips operating in the hoisting shafts lowered it underground.

Underground, timbermen struggled to handle the massive stulls, moving them along drifts, up stopes, and then putting them into place. By the mid-1880s, C&H moved to more easily handled square-set timbers that could be erected underground to form a crib-work supporting the hanging. (Fig. 29.) The company milled 12x12s, 14x14s, and 6x12s that, with mortise and tenon connections, could be interlocked underground to help support the hanging in stopes.<sup>23</sup> Sometimes, C&H used both square-sets and stulls at the same time, using large stulls to serve as barricades to protect the more fragile square-sets from rolling rock. Because of its need for timbering, C&H purchased a great deal of forested land along the Keweenaw. By 1885, the company owned an estimated eighty million feet of standing pine. By 1895, along with its three thousand acres of mineral lands, it owned twenty thousand acres of timberland in Houghton, Ontonagon, and Keweenaw counties.<sup>24</sup>

The timbering guarded against rock falls, yet at the same time exposed the company and its workers to the grave hazard of fire. Michigan's Commissioner of Mineral Statistics noted in his Report of 1887 that "The mine is a network of fine timber; millions of feet of dry pine; the best fuel for a great conflagration, and to such a calamity there is, inevitably, constant danger."<sup>25</sup> Indeed, fires broke out in 1887 and 1888 at Calumet and Hecla that did great damage to the underground, caused lengthy shutdowns and production losses, and took a toll in lives. On August 4, 1887, a fire broke out along the

16<sup>th</sup> level near the No. 2 Hecla shaft. The mine closed for several weeks while fighting the fire with water, steam, and carbonic acid gas. C&H managed to reopen, but just a short time later, on November 20, fire broke out again. The company sealed its shafts as tightly as possible to smother the blaze and again manufactured and injected carbonic acid gas into the mine. Despite vigilance and constant effort, C&H could not fully reopen the interconnected Calumet and Hecla branches of the mine until June, 1888. These two fires cost C&H a production loss of about ten million pounds of copper. What saved the company from a total shut-down was the fact that by this time it had three branches: the Calumet, the Hecla, and the South Hecla. The newest South Hecla branch, fortunately, did not connect through drifts or stopes to the original two branches. So the South Hecla branch stayed in operation while the rest of the mine smoldered.<sup>26</sup>

Calumet and Hecla's woes did not end with the two fires that originated in 1887. On November 29, 1888, yet another fire broke out, this one in the No. 3 Calumet shaft. Eight men died due to this conflagration, which again closed the Calumet and Hecla branches, but left the South Hecla open. The company thought its attempts to smother the blaze had succeeded and started to reopen the mine in February, 1889. But when fresh air poured into the mine, the blaze erupted again. Not until May 1, 1889, did the Hecla and Calumet branches reopen.<sup>27</sup>

The fires caused a number of changes at C&H. The company abandoned some extensively damaged parts of the mine, rather than rebuild them. It closed two shafts on the Calumet branch and one on the Hecla. This left the company with three shafts on the Calumet branch (Nos. 2, 4, and 5); four shafts on the Hecla branch (Nos. 2, 3, 6 and 7); and five shafts along the South Hecla branch (designated as shafts Nos. 8 through 12). The fires also encouraged C&H, in the 1890s, to open and equip a wholly new and very expensive part of the mine, the Red Jacket shaft, which was another measure taken to assure that part of the mine could remain in production, even while others burned.<sup>28</sup>

The unstable hanging wall forced C&H to put a vast amount of timber underground. It also caused the company to leave copper-rich rock underground to help hold up the hanging. The company sought to protect itself from any collapses that might crush a shaft and shut down hoisting. Even at shallow depths, C&H began leaving rock pillars twenty-five feet wide alongside its shafts. In other words, no stoping took place within twenty-five feet of a shaft, in either direction, no matter how rich in copper the rock might have been. As the mine went deeper, the company enlarged these pillars. By 1886, C&H left a fifty foot pillar on each side of every shaft, and by 1895 to 1900, a seventy-five foot pillar.<sup>29</sup> Along each level of the mine, then, a fair run of the Conglomerate lode remained intact. This rock was not a total loss to the company, however. C&H knew that the shaft pillars constituted "a neat little mine" to be exploited later, when the mine neared its end. Someday it could "rob" the pillars of their copper, starting at the bottom of the mine and working back up.

The Rand rock drill surely was the most important machine taken underground at C&H prior to 1890. Generally, underground mechanization proceeded slowly to that date. For underground prospecting, as early as 1871 the company did use a diamond drill to take

core samples, and around 1880, C&H initiated some mechanical ventilation to assist natural ventilation in moving air into, through, and out of the mine. This fan – thirty feet in diameter and turning fifty revolutions per minute – affected underground conditions, but was probably mounted on the surface, at the collar of an abandoned shaft. The exhaust fan ran only during hot weather, when increased air temperature on the surface upset the flow of air into and out of the mine.<sup>30</sup>

Mucking rock into cars and pushing them to the shaft remained labor-intensive tasks done by hand. By the time C&H started up, the wheelbarrow era was over, and men pushed four-wheeled tramcars (with capacities of about two tons) over light rails with about a four foot gauge. They dumped the cars' contents directly into a skips at the shaft. C&H's early shafts carried but a single car or skip-road, and the skips' capacity was about the same as that of the tram cars. Steam hoists raised the skips to the surface.

C&H briefly relied on ladders to transport men up and down, but by the early 1870s the company adopted the man-engine, already used in many mines in the district. While most mines operated a single man-engine, Calumet and Hecla operated two: one on the Calumet Branch, and one on the Hecla. By 1880, the C&H man-engine rods extended seventeen hundred feet into the mine; by 1885 they reached the mine's twenty-eighth level – and could get a man there in twenty minutes.<sup>31</sup>

The man-engines met their demise during the fires of the late 1880s. Instead of rebuilding them, in 1889 or 1890, C&H introduced man-cars that carried up to twenty-eight men at a time. These man-cars ran up and down the same skip roads used for hoisting rock; within the shafthouses, laborers lifted them onto and then off the skip road as required. One notable feature of C&H's man-car system was this: the man-cars did not go on the ends of the hoisting ropes used for rock skips, nor were they raised by the same large engines that lifted rock. Instead, they had their own ropes and their own hoists, which were smaller, slower, and therefore safer to use in raising men.<sup>32</sup> Only the wealthiest mine in the district built this level of safety into its man-cars. And only the wealthiest mine in the district could build and operate the very capital intensive surface works that miners walked through everyday after they rode the man-engine or man-car to the surface and headed to the dry.

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<sup>1</sup> Min. Stats for 1899, 147.

<sup>2</sup> Edwin J. Hulbert, "Calumet Conglomerate," an Exploration and Discovery Made by Edwin J. Hulbert, 1854 to 1864 (Ontonagon, MI, 1893), 25; C. Harry Benedict, Red Metal, 40-59.

<sup>3</sup> Credit Ledger, Michigan – Houghton County, I, 266Q, 274a, and 327. R. B. Dun & Co. coll., Baker Library.

<sup>4</sup> Hulbert, "Calumet Conglomerate," 105-06.

<sup>5</sup> Ibid., 25, 49, 108-120.

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<sup>6</sup> Boston Sunday Globe, 13 Sept. 1885; Hulbert, "Calumet Conglomerate," 28; Benedict, Red Metal, 69-70; Min. Stats. for 1882, 99.

<sup>7</sup> Benedict, Red Metal, 46, 50, 52-53, 60, 66.

<sup>8</sup> Boston Sunday Globe, 13 Sept. 1885; Benedict, Red Metal, 45-60.

<sup>9</sup> Benedict, Red Metal, 59.

<sup>10</sup> Ibid., 58.

<sup>11</sup> Gates, Michigan Copper, 197, 217, 230; Benedict, Red Metal, 69; Wright, "The Development of the Copper Industry," 131.

<sup>12</sup> Broderick and Hohl, "Geology," 479; Min. Stats. for 1895, 120.

<sup>13</sup> Min. Stats. for 1881, 120, 13, 136; Harry Vivian, "Mining Methods used on the Calumet Conglomerate Lode," MCIJ 17:10(Oct. 1931): 496.

<sup>14</sup> Min. Stats. for 1882, 96; Min. Stats for 1895, 121.

<sup>15</sup> Records that passed from C&H to Universal Oil Products are now held at MTU.

<sup>16</sup> Min. Stats. for 1899, 266. Also see R. G. Dun & Co., Credit Ledger, 327.

<sup>17</sup> Benedict, Red Metal, 66, 81.

<sup>18</sup> Vivian, "Mining Methods," 497; Benedict, Red Metal, 81; Min. Stats. for 1897, 177-78.

<sup>19</sup> Benedict, Red Metal, 83.

<sup>20</sup> Lankton, "Machine *under* the Garden," 20; PLMG, 7 March and 4 April 1872; Min. Stats. for 1882, 97.

<sup>21</sup> Employment figures from Gates, Michigan Copper, 208; stamp rock tonnages from Benedict, Red Metal, 80.

<sup>22</sup> Min. Stats. for 1880, 148; C&H, A.R. for 1892-93, 15; Benedict, Red Metal, 104.

<sup>23</sup> Min. Stats. for 1883, 98-99; Min. Stats. for 1886, 217; Min. Stats. for 1895, 122; Min. Stats. for 1897, 179.

<sup>24</sup> Min. Stats. for 1885, 238; Min. Stats. for 1895, 126; C&H, A.R. for 1892-93, 9.

<sup>25</sup> Min. Stats. for 1887, 199.

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<sup>26</sup> Ibid., 199-200; Min. Stats. for 1888, 67-68; Benedict, Red Metal, 87.

<sup>27</sup> Min. Stats. for 1888, 67-68.

<sup>28</sup> C&H, A.R. for 1891-92, n.p.

<sup>29</sup> Min. Stats. for 1886, 217; Min. Stats. for 1895, 122; Min. Stats. for 1896, 123-24; Min. Stats. for 1899, 271.

<sup>30</sup> PLMG, 6 July 1871; Min. Stats. for 1880, 149.

<sup>31</sup> Min. Stats. for 1880, 149; Min. Stats. for 1885, 237.

<sup>32</sup> C&H, A.R. for 1890-91; A.R. for 1891-92; A.R. for 1892-93, 12-13; Min. Stats for 1895, 121-22.

## CHAPTER 9

### CALUMET AND HECLA'S SURFACE PLANT

The Calumet Conglomerate lode lay hidden underground, but its richness was very evident on the surface. As the underground works expanded, so did the village of Red Jacket, platted on the margin of the mine. So did the neighborhoods of company housing, ringing the mine. The mine's great surface plant stood right atop the lode and included dozens of buildings and a large array of machinery. The company's total physical plant included some far reaching elements as well: a railroad, two impressive stamp mills on Torch Lake, and, a bit later, a smelter on Torch Lake and another smelter near Buffalo, New York. In 1880, Michigan's Commissioner of Mineral Statistics opined that Calumet and Hecla's surface plant was "superior, it is believed to that possessed by any other mine in the world."<sup>1</sup> That plant only grew larger in following years.

C&H made no attempt to hide its wealth when erecting buildings and machinery. Any observer touring its facilities could easily tell that among the copper mines on Lake Superior, C&H clearly was king. C&H had the same basic structures and technologies as other Lake Superior copper mines, but it erected more expensive and bigger facilities than any other company. In large measure, this followed directly from the simple fact that C&H had the richest lode, the most shafts, the largest production, and the highest profitability in the region. But something else was at work, too. C&H developed a company style that incorporated the words "big" and "powerful" as key elements of its presentation of self to others. Two men in particular set this style: Alexander Agassiz, president, and Erasmus Darwin Leavitt, consulting engineer. The former conjured up the image of a company richer, bigger, and more powerful than any other, and the latter helped execute that image in iron and steel.

In 1880, if visitors wanted to get at the heart of things in the vicinity of the Calumet and Hecla mine and Red Jacket village, they didn't walk down a Main Street; instead, they strolled down Mine Street. There, surrounded by a population of about 7,500 people, the C&H mine stretched out along the lode. Near the mid-point of the linear mine plant, Red Jacket Road intersected Mine Street and ran westerly only a few short blocks over to the adjacent village. South of the intersection of Mine Street and Red Jacket Road stood most of the mine's Hecla branch; its Calumet branch occupied the land north of Red Jacket Road. Save for some open land the company reserved between its Calumet Branch and Red Jacket village (fenced fields used for pasturage and sports, such as baseball), this was no tranquil environment, but one of great motion, noise, and activity.

A dozen or so tall shafthouses with battered sides dominated the landscape. (Fig. 30.) Elevated tramroads standing on wooden trestles ran down the line of shafts. Cars received their loads of rock at the shafthouses, and were then drawn to one of two large rockhouses, one for the Hecla branch, one the Calumet, where the rock was sorted and, if necessary, run through crushers. Next to the rockhouses ran rail lines. Hecla and Torch

Lake Railroad locomotives pulled up with trains of rock cars, which constantly shuttled between the mine and the Lake Linden stamp mills, pulling full cars in the one direction and hauling empties back in the other.

By 1880, each branch of the mine had its own large engine house, replete with magnificent steam powered machinery and attended by massive boilers. Tucked in along the line of shafts were dryhouses, a railroad roundhouse, pumphouses for unwatering the mine, a compressor building (for powering new air drills), a couple of blacksmith shops, a machine shop, warehouses, man-engine houses, a carpenter shop, numerous tall smokestacks, and a bit to the north, the Calumet and Hecla waterworks. The surface plant was fully equipped with the facilities needed for receiving copper rock, giving it a preliminary break, and then shipping it to the stamp mill. In addition, its host of shops gave C&H the ability to do a vast amount of maintenance, repair, and fabrication work (Fig. 31.), as well as forge and sharpen drill steels. (Fig. 32.) In terms of their materials, the structures evidenced a kind of evolution at C&H. Many of the earliest buildings were framed and clad in wood; then followed a generation of buildings laid up of poor rock from the mine; more recently, dressed stone and brick gave shape to the company's more important structures.

By 1880, C&H had two large stamp mills at Lake Linden, a small industrial village on the shore of Torch Lake, about five miles from the mine. The lake provided the water needed for the milling process; the lake bottom provided a place to dump the mills' tailings. In the late 1860s, the then still separate Calumet and Hecla mines had faltered in launching their first generation mills. There was some question as to whether milling the rich Calumet Conglomerate copper rock was needed at all – followed later by questions about which machines to use, and where to site the mills. When these issues were resolved, impressive mills went up alongside Torch Lake.

The Calumet mine initially tried smelting the richest portion of its copper rock without milling and concentrating it. In 1866, the Calumet company sent this rock – containing about fifteen percent copper by weight – to the smelter on Portage Lake. At the time, the poorest mineral being smelted successfully was 40 percent copper, and the attempt to smelt the Conglomerate rock in a cupola furnace failed completely.<sup>2</sup> Thereafter all conglomerate copper was milled before smelting. When it came to erecting the first mills in 1866-67, the Hecla company bettered the Calumet company by a large margin.

The first steps in the milling process were the sorting, sizing, and crushing of rock near the shaft collars. At C&H, the richness and uniformity of the Conglomerate lode largely eliminated the need to sort out poor rock from copper rock at the surface. By 1880 C&H relegated only two percent of hoisted rock to poor-rock or burrow piles, while other mines rejected up to twenty-five percent.<sup>3</sup> Calumet and Hecla still had to size its rock, however, and break the pieces that were too large to go directly to a mill. Here, the nature of the Calumet Conglomerate rock handicapped C&H in two ways. First, the exceptionally tough rock included pebbles having the hardness of flint. Neither breaking it by hand (calcining), nor machine (crushers), proved easy. Secondly, little rock hoisted from the Conglomerate was fine enough to go directly to a stamp mill. Most had to be

broken at the mine first, either at the kilnhouses C&H initially used, or at later rockhouses armed with mechanical crushers.

By the time Calumet and Hecla got underway, rock breaking machinery was already superseding the process of calcining. Still, through the early 1870s the Calumet mine made limited use of fire, human muscles, sledges, and picks to break up the largest rock received at the surface in kilnhouses. By the late 1860s, though, most of the Calumet mine's rock received a mechanical break, using steam hammers and two jaw crushers used in series.<sup>4</sup> (Rock passed through a large Blake jaw crusher, receiving a preliminary break, and then went through a second, smaller crusher for a final break.) With rock breaking technology in place at the mine, the next step was to build a mill. In building and equipping the first mill for the Calumet mine, Edwin Hulbert opened himself up to criticism from investors by selecting novel – and unsuccessful – rock crushing machinery. Compounding his troubles, Hulbert also poorly sited the first Calumet mill, putting it just north of the mine proper along a small, dammed creek. The site provided too little water and too little room for the disposal of tailings.

Hulbert had once served as agent of the Huron mine above Houghton, where an earlier agent, John Collum, had introduced large, corrugated iron rollers to crush and mill rock. In the mid-1860s, for a brief time these rollers seemed an attractive alternative to stamps, because they promised higher capacity. Their rotary motion was continuous (as parallel rollers rotated towards each other, they drew rock into the space between them and crushed it). Stamps were straight-line, reciprocating machines. They stamped rock only on the downward stroke and did no work while the stamp rose up prior to next blow. Hulbert decided to equip the Calumet mine's new mill with rollers, and to save on transport costs he located the mill close to the mine.<sup>5</sup>

Hulbert's faith in the new crusher-roller technology temporarily spread to Alexander Agassiz in 1866 and early 1867. Agassiz supported the idea of using rollers and ordered machines from the nearby Portage Lake Foundry, which manufactured equipment for many of the mines. By the end of April, 1867, however, Agassiz realized that the rollers, plagued by mechanical failures, were poorly matched when put up against the Calumet Conglomerate lode's rock. He searched for a replacement, choosing between Cornish gravity stamps or steam stamps.<sup>6</sup> Agassiz opted not to use Cornish stamps because they did not yield great force or have high capacity, and in 1867-1868 he obtained two Ball steam stamps for the Calumet mill and two more for the first Hecla mill. This stamp, an adaptation of the Nasmyth steam hammer, was patented by William Ball of Chicopee, Massachusetts, in 1856. The Ames Manufacturing Company, also of Chicopee, a premier American machinery builder, built the first Ball stamps for a South Carolina mine, and shortly thereafter, several of the Lake copper mines turned to this technology.

Like gravity machines, the Ball stamps crushed rock in a mortar box at the base of the machine. But while a battery of gravity stamps contained four or five small stamp shoes on vertical steams, the Ball stamp carried a single, much larger shoe. A steam cylinder and piston atop the machine not only lifted the stamp up, but propelled it downward into the rock. The Ball machine struck heavier blows and stamped greater tonnages per unit.

The first few Ball stamps in the Calumet and Hecla mills did about the same work as twenty to twenty-five batteries of Cornish gravity stamps.<sup>7</sup>

At the first C&H mills, pairs of Ball stamps were erected side-by-side, so they could share common mechanical devices, such as valve gearing. Timber framed the early machines. At the base, under the mortar box, sat an iron anvil weighing about eight tons. The replaceable shoe on the vertical steam weighed about three-hundred pounds. The stamp stem rose up to connect directly to the piston rod entering the vertical steam cylinder. Within the cylinder, steam at about eighty pounds per square inch reciprocated a double-acting piston that alternately pulled up and then drove down the stamp shoe, making about seventy-five strokes per minute. Stamp tenders shoveled rock from storage bins into the machines' mortar boxes, and water and stamped rock constantly flowed outward through screens and passed to the next steps in the milling process. The early Ball stamps at the Calumet and Hecla mills treated about eighty tons of rock per day each; improvements in their design and construction ultimately raised that figure to one hundred or one-hundred-twenty tons of Conglomerate rock daily.<sup>8</sup>

Besides changing from rollers to stamps, Agassiz changed mill locations. He knew the original Calumet Mining Company mill was poorly sited, so when locating the first Hecla mill, Agassiz turned to the shores of Torch Lake, about five miles from the mine. He could not have made a finer selection. Room existed here for decades of expansion. The deep lake provided the abundance of water needed for milling; treating a ton of rock required up to thirty tons of water. The lake bottom also provided space for receiving enormous tonnages of stamp sands. The lake was not land-locked, but connected with Portage Lake, which in turn connected with Keweenaw Bay and Lake Superior. C&H dredged the Torch Lake-Portage Lake connection and kept it clear. This allowed the largest freighters on the Great Lakes to deliver and receive shipments at company docks on Torch Lake.

The Hecla mill began treating mine product at Torch Lake in 1868; a second Calumet mill, replacing the one near the mine, followed in 1871. The Hecla and Torch Lake Railroad, initially wholly owned by the Hecla Mining Company, connected the mines and mills. Built in 1867, the railroad's four-and-three-quarter-mile-long, four-foot gauge main line stopped about one-half mile from the mills. It terminated at the top of a hill running down to Torch Lake that was too steep for the narrow gauge locomotives to handle. (Fig. 33.) Rock trained to the hilltop rode an incline down to the mills, where it was dumped into storage bins above the Ball stamps.<sup>9</sup> (Fig. 34.)

After the Ball machines stamped the copper rock, water carried it to the machines designed to separate the copper and gangue by gravity methods. The principle involved was rather simple: heavier copper sank faster and flowed more slowly than the rock. Copper has a specific gravity of about 9; the specific gravity of Calumet Conglomerate rock ran from 2.67 to 3.25. This difference was great enough to allow the copper to be recovered with considerable efficiency, but this recovery was never complete.<sup>10</sup>

In addition to the Ball stamps, the most important machines in the early Calumet and Hecla mills were jigs and Ellenbecker tables. At the jigs, plungers agitated the mixture of copper, rock and water in a box over a sieve plate. Within the box, the copper settled to the bottom first, with the lighter rock above it. The Ellenbecker tables treated “slimes” – or the watery mixture of extremely fine particles of rock and copper. The slimes flowed out onto an inclined shaking table. The heavier copper flowed off one end of the table, while the lighter rock tailed off the other.<sup>11</sup>

The technology of gravity separation was by no means perfect. The coarsest copper caused problems because when subjected to the flow of water, it did not move. It sat in the bottom of the stamp’s mortar box, for example, and periodically had to be picked out by hand. The finest copper presented the opposite problem. When traveling with water and rock, it could not be stopped. If not stopped, instead of becoming part of the captured mineral that was shipped off for smelting, it flowed out the mill as waste and ended up in the stamp sands deposited in Torch Lake.

The stamp rock from the Calumet Conglomerate lode contained a higher proportion of fine copper particles than did neighboring amygdaloid lodes. In 1879-80, C&H determined that sixty-seven percent of its copper took the form of flat scales or leaves less than a millimeter (one-twenty-fifth of an inch) in size. By comparison, only forty-two percent of the Atlantic mine’s, and only ten percent of Quincy’s copper was so small. This small copper presented C&H with two problems. First, the fine particles, if liberated from the rock, were hard to capture or separate out. Secondly, the smallness of the particles meant that much of the copper never was liberated from the rock in the first place, but remained bound up within individual grains of stamp sand. Only grinding or crushing the rock more finely would have liberated that copper. But that extra, costly step would only have produced more of the finest copper that the rest of the mill failed to capture.<sup>12</sup>

The losses of fine copper freed from the gangue – and of fine copper still included in sands or tailings – were considerable. The rock milled in the late 1860s and 1870s yielded four to five percent copper, extremely high percentages (for the district) that supported C&H’s high profitability. Yet at the same time the company’s mills were *failing* to recover twenty-five to thirty per cent of all the copper hoisted out of the mine. Assays done in 1879-80 showed that 1,000 tons of rock delivered to C&H’s mills contained 130,848 pounds of copper. Of that amount, the mill recovered only ninety thousand pounds. The other 40,848 pounds of copper flowed out with the tailings into Torch Lake.<sup>13</sup> The company fretted over these losses, but profits nevertheless were high, and no technology then existed to reduce the losses. So year after year, tailings rich in copper passed out of the mills and into Torch Lake. Only decades later, armed with new reclamation technologies, could C&H reclaim the copper once lost.

While waiting several decades to achieve major improvements in its separation processes, C&H did substantially alter other facets of its milling operations. As the mine’s output grew, the company put about ten Hecla and Torch Lake locomotives into service and used hundreds of rail cars to deliver rock from mine to mill. A rerouting of the rail line in

the mid-1880s did away with the old stamp mill incline, and rock cars thereafter deposited their loads directly into rock bins at the backs of the two mills. C&H also elevated these bins, so that gravity delivered rock into the stamps' mortar boxes; men no longer had to shovel it all in. The rock slid out of the bin and along a shaking tray that fed the stamps. A stamp tender, freed of heavy shovel work, stood alongside the tray, regulated the flow of rock, and picked out any oversized rock or pieces of mass copper.<sup>14</sup>

Through 1890, the biggest changes at the C&H mills involved the stamps. By circa 1880, its Ball stamps were driven by fifteen-inch pistons (increased from twelve inches), reciprocated at ninety strokes per minute. Each stamp crushed one hundred to one-hundred-fifty tons of conglomerate rock per day. Then in the early 1880s, the company changed over to stamps engineered by Erasmus Darwin Leavitt, one of the foremost machinery designers in the United States, the second president of the Society of Mechanical Engineers, and C&H's primary engineering consultant. The first Leavitt steam stamp showed a twenty-five percent gain in capacity over the Ball and a ten percent gain in fuel economy. The second Leavitt machine, with modified pistons, achieved a fifty percent increase in tonnage, and a thirty-five to forty percent savings in fuel. (Ultimately, C&H claimed a capacity of 325 tons per day for each Leavitt machine.)<sup>15</sup>

One feature of the Leavitt stamp that allowed for greater capacity was its mortar box, which had discharge screens on all four sides, instead of the usual two. The machine's most novel and important component was its "differential" steam cylinder. The Ball machine had one double-acting piston used to propel the stamp downward and to lift it back up. It was on the upstroke that the machine wasted much steam. The Leavitt stamp, by contrast, had two pistons atop the machine, which were mounted on a common rod and yet worked in cylinders of different size.

The upper cylinder had a large diameter of 21.5 inches. High pressure steam acting on the top surface only of this cylinder's piston drove the stamp downward through a power stroke of twenty-four inches. The lower cylinder's piston measured a small fourteen inches. A uniform steam pressure constantly maintained against the bottom of this piston powered the machine on its upstroke, while a vacuum was maintained in the area between the large and small piston head. One cycle of the stamp went like this – the intake valve on the upper, larger cylinder opened, allowing high pressure steam to enter. This caused both pistons, their common rod, and the stamp head to descend. When the intake valve closed on the top and the exhaust valve opened, the constant steam pressure on the lower, smaller piston caused the machine to reverse its stroke. Thus the Leavitt stamp applied greater force than the Ball on its downward stroke, allowing it to do more work, while it consumed less steam on the essential, yet unproductive, upward stroke. C&H put the new Leavitt machines in both mills. By 1886, the Calumet mill ran seven, and the Hecla mill, five. As mine production further increased, so did the size of the mills and the number of Leavitt stamps. By the mid-1890s, eleven large Leavitt stamps worked in each of the two mills.<sup>16</sup>

For two decades, Calumet and Hecla shipped mineral from its stamp mills at Lake Linden to the Detroit and Lake Superior Copper Company's smelter on Portage Lake. This custom smelter kept C&H's mineral separate from that of other clients; C&H copper smelted in reverberatory furnaces was ladled out into special, marked moulds and did not lose its identity. By 1885, the production at C&H was great enough that the company thought it could do its own smelting at less cost than that being charged by the Detroit and Lake Superior firm. At the mine, C&H ran two divisions: the Hecla and Calumet branches; at Lake Linden, it operated two mills. C&H was known for perhaps overbuilding its physical plant and for duplicating facilities in order to avoid accidental shutdowns and production snags. So it was not too surprising that when C&H decided to build a smelter, it built two. It put the first (opened in 1887) on Torch Lake at Hubbell, less than a mile from its mills; it spread its empire out by siting the second smelter (opened 1891-92) on the Niagara River at Black Rock, New York, near Buffalo.

C&H's smelting contract with Detroit and Lake Superior was due to expire in 1887. The mining company in 1885 entered into an agreement with E.D. Peters to design a new company smelter that could be finished by the contract's expiration date. This agreement with Peters was never finished or fulfilled, but its creation signaled to Detroit and Lake Superior that C&H was truly intent upon building its own smelter. Not wanting to lose its biggest and best customer altogether, near the end of 1885 Detroit and Lake Superior entered an agreement with C&H that gave it a share of the new works. The custom smelter company and the mining company put up equal capital and jointly formed the Calumet and Hecla Smelting Corporation to build and operate the facilities at Hubbell. The agreement stipulated smelting charges – and also gave the mining company the option of buying out Detroit and Lake Superior's interest in the smelter after five years of operation. In 1892, five years after the Calumet and Hecla Smelting Corporation commenced operations, C&H exercised its option, bought out Detroit and Lake Superior, dissolved the separate smelting corporation, and ran the works under the banner of the Calumet and Hecla Mining Company.<sup>17</sup> (Fig. 35.)

The Calumet and Hecla smelting plant at Hubbell, connected by rail with the nearby mills, occupied thirty acres and originally contained four stone reverberatory furnace buildings. As was common in the region, each building sheltered four furnaces, one in each corner. Numerous access doors for mineral and coal pierced the walls, and above each of the four furnaces stood a tall brick chimney, surmounted by a large damper plate. The site also housed a cupola furnace building (for recovering copper from slag), a blister furnace, and numerous ancillary structures: cooper, blacksmith, and carpenter shops, an office, and storage buildings for mineral, coal, and other supplies.<sup>18</sup>

Technologically, the plant was not at all novel, except in size. It embodied standard smelting practices (such as charging, rabbling, poling) that had changed but little on Lake Superior since 1860. The sixteen furnaces at the C&H smelter were larger, though, than earlier ones, and could refine a thirty thousand pound batch of copper per melt, up from the original sixteen thousand pounds.<sup>19</sup> After refining the metal, furnacemen cast it into molds of different sizes and shapes: flat, square cakes for copper rolling mills; notched ingots for brass founders; and bars for wire-drawing firms. (Fig. 36.) Men dipped fifteen

to twenty pounds of copper out of the furnace in iron ladles, carried the copper across the floor to moulds and poured it. If pouring a large copper cake of one-hundred-fifty to three hundred pounds, as many as four to eight men ladled at a time. Later, to allow for faster casting and a reduction of labor, C&H installed larger ladles, which a man handled with the mechanical aid of an overhead trolley.

To smelt copper near Buffalo, C&H first shipped its mineral across Lake Superior, through the Soo Locks, down Lake Huron, and then across Lake Erie. This mineral still contained considerable fine sands of waste rock, so C&H paid to ship to Buffalo not only its valuable metal, but rock that would become a waste byproduct, slag. At first glance, it might seem this arrangement burdened Calumet and Hecla with higher production costs due to increased transportation costs. But this was not the case. To reduce shipping charges, C&H sent its higher grade mineral to Buffalo and smelted lower grades at Hubbell. On the debit side, C&H paid higher costs to ship mineral south, instead of pure copper ingot – but on its credit side it saved greatly on the cost of shipping coal – furnace fuel – north to Lake Superior. At Buffalo, the company expected to pay reduced prices not only for coal, but for virtually all supplies. The economics of smelting in Buffalo soon proved to work in the company's favor. By the mid 1890s it smelted much more product at far-away Buffalo (fifty-one million pounds annually) than it did just a half dozen miles from the mine at Hubbell (about thirty-five million pounds).<sup>20</sup>

In its first few years of operation, Calumet and Hecla perhaps distinguished itself from other mines mostly by its size. It was a bigger company. But from the mid-1870s onward, C&H also distinguished itself by its corporate style. This style embodied the company's philosophy of nearly duplicating everything, so that fires, accidents, or mechanical failures could not force a total shutdown and loss of production. Another notable feature of C&H's late nineteenth century plant was this: the company built facilities to serve its needs over the long run, not the short. Calumet and Hecla knew, because of its underground development work, that it had a long and rich future working the Calumet Conglomerate lode. Instead of building a plant that met just short term needs – which was what other companies tended to do – C&H overbuilt to assure that facilities served for decades.

Michigan's Commissioner of Mineral Statistics in the 1880s repeatedly made the point that C&H had a one-of-a-kind physical plant on Lake Superior. In 1881 he noted that, "It is claimed that the machinery at the Calumet and Hecla excels that found at any other mine in the world, particularly the Hecla and Calumet [steam] engines." The following year, the Commissioner even implied that C&H's plant was too lavish: "It may be with companies as with individuals, [that] an immense and assured income begets a seeming extravagance." In 1885, the Commissioner sent out another similar message: "Nowhere else on this continent, if indeed in the world, is there so much powerful and costly machinery employed in mining work."<sup>21</sup>

The chief architect of C&H's corporate and technological style was Alexander Agassiz, a rare individual and very atypical mining company president. Agassiz, born in Neuchatel, Switzerland, in 1835, grew up in a remarkable family. His father, Louis, was extremely



**Figure 30**



**Figure 31**

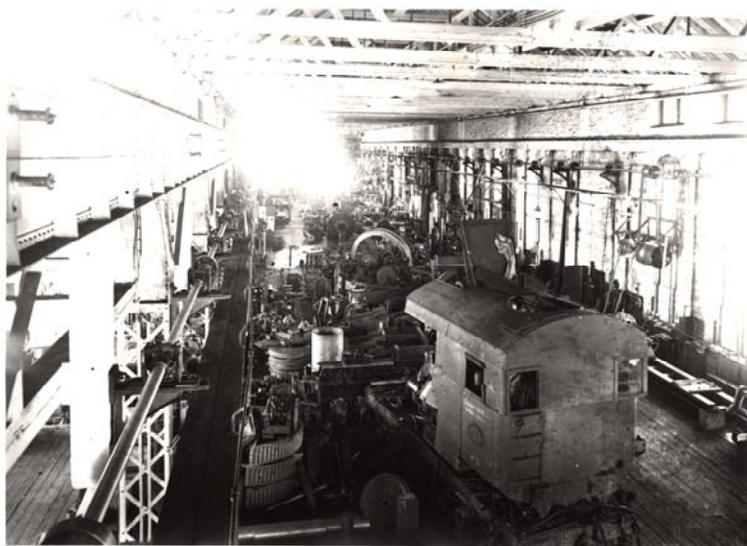


Figure 32



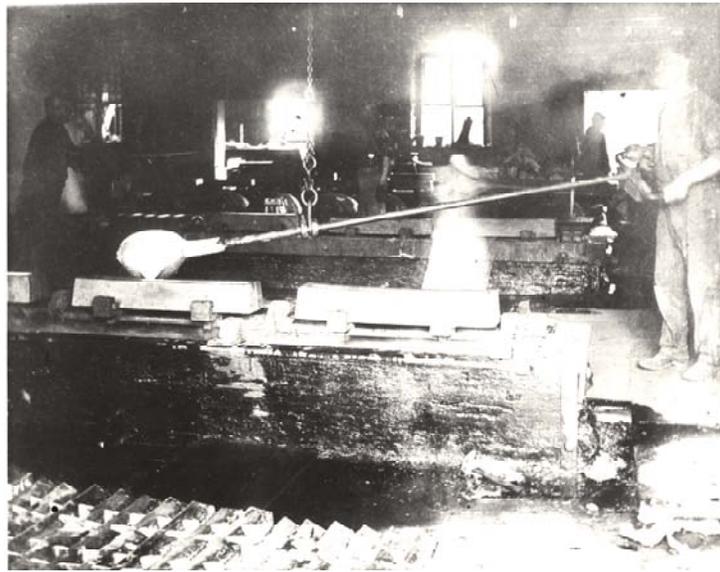
Figure 33



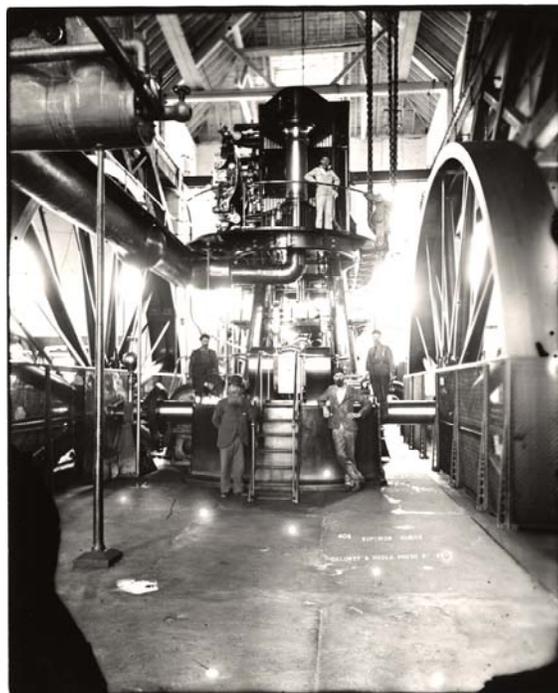
**Figure 34**



**Figure 35**



**Figure 36**



**Figure 37**



**Figure 38**



**Figure 39**



**Figure 40**

well educated as a naturalist in Europe, and he became very well known for his work in ichthyology, geology, and paleontology – and for being one of the great popularizers of science. His mother, Cecile, was a fine artist and illustrator. He had some notable uncles, too: the botanist, Alexander Braun, and Maximilian Braun, a mining engineer.

Alexander Agassiz emigrated to America with his family in 1849 and settled in Cambridge, Massachusetts, where his father enjoyed a professorship at Harvard. Like father, like son: Alexander moved into scientific studies himself and pursued several different fields. Harvard awarded him a Bachelor of Arts degree in 1855; he received a Bachelor of Science degree in engineering from the Lawrence Scientific School in 1857, and Lawrence awarded him another degree, this one in zoology, in 1862. Some of his early positions were as diverse as his education. Agassiz taught at a school for girls; worked on the U. S. Coast Survey, which allowed him to travel up and down the Pacific coast of the Americas; worked some in Pennsylvania coal mining; and wrote and illustrated scientific articles. He was a very well-educated and well-traveled man of thirty-one years of age when his brother-in-law, Quincy Shaw, sent him out to the Keweenaw Peninsula in 1866 to check on two fledgling and struggling mines just starting to work the Calumet Conglomerate lode.<sup>22</sup>

From his very first visit to the mines, Agassiz became convinced that this lode was one of the world's great mineral deposits. As that lode took off, so did Agassiz's career as an industrialist. From his mid-thirties till his death in his mid-seventies, Alexander Agassiz juggled the demands of two very different worlds. Residing most of the time in Cambridge, he served as a prominent Harvard professor and eminent zoologist. At the same time, for nearly forty years he presided over Calumet and Hecla.

As a mining company president, Agassiz developed a certain technological style – a very expensive one that only a rich mine could afford. Agassiz unquestionably believed that this great lode merited a superlative company that would do things its own way, and do them in grand style. One hallmark of this style would be the acquisition of some truly monumental steam engines. These engines not only did much industrial work; they also

symbolized the power that was C&H. Clearly, Agassiz liked large pieces of technology that impressed. Instead of installing small steam engines all over the mining landscape, each powering one finite, specialized task, he preferred very large engines that sometimes drove multiple kinds of machinery. Agassiz also believed in planning and foresight, in identifying potential problems that might interrupt production, and in using money and engineering to keep them at bay. It was under Agassiz's leadership that C&H became known for building to meet tomorrow's needs, not just today's.

If Agassiz, figuratively speaking, was the chief architect of C&H's technological style, Erasmus Darwin Leavitt was, quite literally, its engineer. These two men, who did so much together to shape Calumet and Hecla's style and its technologies, could hardly have come from more different backgrounds. They were nearly the same age (Leavitt was born in 1836, just a year after Agassiz), but age aside, their differences predominated. Agassiz was European, well bred, and well educated, formally, at universities. After coming to America as a child, he came of age in Cambridge, Massachusetts, alongside Harvard. Leavitt was born and came of age only twenty-five miles away from Cambridge and Harvard, but in a very different place and culture: Lowell, Massachusetts. When Leavitt was born there, Lowell was one of the premier industrial cities in America, a city dedicated to textile production. Agassiz grew up with academies, science, and the elite. Leavitt grew up with textile mills, water-power canals, and machines.<sup>23</sup>

Agassiz went to college (more than once), but Leavitt, despite the high acclaim and status he earned as an engineer, never attended college. Instead of going to one of America's early engineering schools, Leavitt graduated from the "shop culture" school of engineering. In short, he learned his engineering on the job, in the shops, as an apprentice or employee. He worked his way up by gaining more responsibilities at work, until he had become knowledgeable and skilled enough to begin doing his own design work. He became so successful as a machinery designer and consulting engineer that the university world, which he'd never attended, sometimes asked him to teach there and paid him respect: in 1884 he received the first honorary doctorate in engineering awarded by the Stevens Institute of Technology. Just a year earlier, he had become only the second president of the premier professional organization in his field, the American Society of Mechanical Engineers. No small measure of the accolades and recognition given to Leavitt followed from his work done for Calumet and Hecla over a thirty year span, starting in the 1870s. Leavitt engineered not only novel and powerful stamps for the mills, but also massive water pumps and engines.

A future "shop culture" engineer could hardly have picked a place better than Lowell, Massachusetts to be born. Some ten major cotton textile companies practiced new-style factory production, and the Lowell Machine Shop built not only textile machinery but other industrial hardware, including steam locomotives and water turbines. At age sixteen, Leavitt apprenticed as a machinist in Lowell, staying in his first shop for three years. At age nineteen, he started moving from place to place, shop to shop, advancing himself with every change.

Leavitt moved from Lowell to the Corliss and Nightengale firm in Providence, Rhode Island, where he worked with steam engine valving. Then he went to the City Point Works in South Boston, where he helped construct engines for the *USS Hartford*. Next he served as chief draftsman for Gardner & Company of Providence, and then he entered the Navy as an assistant engineer during the Civil War. He served on a gunboat, and then worked in the Navy yards in Baltimore, Boston, and Brooklyn. In 1865, the Navy detailed him to Annapolis as an instructor in engineering. Two years later he left the Naval Academy to strike off on his own as a consulting mechanical engineer, with a particular specialty in steam engines and steam power. He achieved considerable success and recognition early, thanks to his successful execution of large steam-powered pumping engines for both Lynn and Lawrence, Massachusetts. It turned out that in the mid-1870s, Calumet and Hecla needed large steam pumps, too, not for a municipal water supply, but for its stamp mills. Upon the recommendation of James B. Francis, famed hydraulic engineer for the Locks and Canals Company in Lowell, Massachusetts, C&H turned to Erasmus Darwin Leavitt.<sup>24</sup>

Leavitt's first job for Calumet and Hecla, in 1874, was a stamp-mill water pumping engine. His second job, in 1876, was another pump for the mills, this one twice the capacity of the first.<sup>25</sup> Leavitt designs came to dominate much of the mills' "big ticket" engineering. Besides the pumps, he engineered his novel steam stamps for Calumet and Hecla. He also designed, in the mid 1880s, large sand wheels for the mills, which were fifty feet in diameter.<sup>26</sup> By then, stamp sands washed out of the mills in launders or troughs already filled the lake bottom close to the mills, creating a new shoreline and a broad, flat beach. To make the waste launders more effective, and allow them to deposit additional tailings farther from shore, the tailings had to flow out of the mills on launders that started higher up and had a steeper pitch. Leavitt's rotating sand wheels worked rather like water wheels running in reverse. As they rotated, buckets at the bottom picked up water and waste sands from the lower level of the mill, which they carried up fifty feet and then discharged. The water and waste sands flowed into an elevated launder that dumped them well beyond the shoreline.

Leavitt's work at the mills was impressive, but the most visible and celebrated machines he designed for Calumet and Hecla stood at the mine. The predilection he and Agassiz shared for large, centralized prime movers resulted in C&H operating what might well have been the most impressive array of steam engines found at any one American company in the last quarter of the nineteenth century. During that time, many Lake copper mines, including Quincy, started to acquire large engines specially designed for mine hoisting. Typically, these engines were installed right near the shaft they served – and all they did was hoist rock. One thing that set some of Leavitt's engines apart was their capability not only power hoists, but other machinery at the same time. Some of this machinery sat right alongside the driving engine, in its engine house. Other machines, located a considerable distance away, were connected to the driving engine via a power transmission system.

C&H's first Leavitt engine went into service at the mine in 1877. He designed his engines to serve specified purposes and each carried its own name. The 1877 engine, the

“Hecla,” was a compound engine; it used the same steam first in high and then in low pressure cylinders. The engine produced about one thousand horsepower. It drove four hoisting drums twenty-four feet in diameter, each of which served a different shaft. The “Hecla” also powered new air compressors for the Hecla branch of the mine, plus rock breakers and other machinery.<sup>27</sup>

In 1879, C&H contracted with Leavitt to design an even bigger engine. This engine, aptly named the “Superior,” stood in a large brick engine house along Mine Street on the Calumet branch of the mine, where it was flanked by impressive new boiler facilities. (Figs. 37-38.) The “Superior” became a signature piece for Leavitt, as well as a symbol of this mining company’s power and wealth. The engineering press and profession paid considerable attention to the acclaimed “Superior” engine. Taken together, this engine and its engine house were, arguably, the single best-known features ever erected at the mine. The “Superior” came at a time, after all, when monumental engines were important cultural symbols. The centerpiece of America’s Centennial Exposition in Philadelphia’s Fairmount Park had been the massive Corliss engine there. The “Superior,” although working in a far grittier environment, functioned similarly as the centerpiece of the Calumet and Hecla mine.

When started up in the early 1880s, the “Superior” was said to be “the largest stationary engine in the world.” I. P. Morris, a very well established engine firm from Philadelphia, built the engine to Leavitt’s plans. The compound engine weighed nearly three-quarters of a million pounds. It was capable of producing forty-seven hundred horsepower, although its regular working load was about twenty-seven hundred. The engine drove winding drums that hoisted from four separate shafts: Nos. 2, 4, and 5 on the Calumet branch, and Hecla No. 3. The winding drums, twenty and a half feet in diameter, could raise rock from depths of over four thousand feet. (The mine was not that deep when the “Superior” was installed, but it was engineered to last for decades.) Running at fifty to sixty r.p.m., the engine turned two forty-five-ton flywheels, whose outer surfaces served as belt pulleys. Thirty-inch wide leather belts took power from these wheels for myriad purposes. Using belts, gears, and/or a wire-rope power transmission system, the “Superior” engine drove two large air compressors, two mine pumps, two man-engines, and the rockhouse tramroad. The wire ropes transmitted power as far as two thousand feet from the engine before that power was applied.<sup>28</sup>

As C&H grew and new technologies such as power rock drills and high explosives allowed for higher production levels, the company added more Leavitt engines. In the 1880s and through the early 1890s, C&H added the “Baraga” and “Rockland” engines to the Calumet branch; the “Frontenac,” “Gratiot,” “Houghton,” and “Seneca” engines (all about two thousand horsepower) to the Hecla branch; and the “Hancock,” “Pewabic,” “Detroit,” and “Onota” engines to its newer South Hecla branch. These engines typically could reach depths of four thousand to fifty-five hundred feet and hoist five- or six-ton skips at one thousand feet per minute. More and even larger engines followed. By the end of the 1890s, C&H had some fifty steam engines in service at the mine, plus more at its mills and smelters. The engines produced an aggregate of about fifty thousand

horsepower, or about as much power as was then being used by a typical manufacturing city of two hundred thousand people.<sup>29</sup>

The vast majority of C&H's horsepower drove industrial machinery and did not serve the domestic needs and wants of employees and their families. Nowhere near two hundred thousand people resided at or around Calumet and Hecla, yet by 1890 within the immediate vicinity of the mine lived the greatest concentration of population in the Copper Country. This population lived and worked amidst a landscape that differed from other mine locations, even though C&H had followed the same basic model of settlements established by earlier companies.

C&H did not build and control a full company town. It built its mine, and on the margins of the mine, it built neighborhoods of company housing. On company property, it fostered or allowed only very little mercantile development, because company president Alexander Agassiz did not want a full downtown as part of C&H's large domain. In the formative years of C&H, only two general stores (one each near the mine's Hecla and Calumet branches), plus a bank, meat market, and hardware store stood on company-owned ground.<sup>30</sup> Like other companies, C&H fostered the growth and development of a separate commercial village (Red Jacket) independent of direct company control. But at this place, the model resulted in a landscape having a distinctly different look.

The landscape formed by the combination of C&H and Red Jacket village, for instance, differed greatly from the one found in the vicinity of the Quincy mine and Hancock. While the Quincy mine took shape, it promoted the concurrent development of Hancock as its attending village. That place rounded out local society by providing entertainment, housing options, all kinds of goods and services, plus culture and churches. Quincy sat atop its hill as a mine location, relatively isolated and unto itself. Hancock was not that far away, but it was downhill from the mine and out of sight. Quincy and Hancock, though closely related both socially and economically, were two very different places, with two separate and even segregated purposes. One was the mine; one was the town.

That was not the case up by Calumet and Hecla, standing on a level plateau of ground. The mine and the attendant Red Jacket community were sited close together; they were within view of one another. (Fig. 39.) Over time, as the C&H mine grew, and as other nearby mines such as Tamarack and Osceola grew, so did the village of Red Jacket and another neighboring village, Laurium. This assemblage of mines, mine locations, and villages became unique in the copper district. More than anyplace else on the Keweenaw, this landscape had the appearance of an urbanized *mine town*, akin to the manufacturing cities found elsewhere in the country near the end of the nineteenth century.

Other mine location landscapes on the Keweenaw differed, because none of them had as much town next to their mine as did C&H. Similarly, villages the likes of Houghton or Hancock or Ontonagon, or earlier ones, such as Copper Harbor or Eagle River, never had as much mine right next door as did Red Jacket. Up around Calumet and Hecla, to be sure one could find clearly identifiable zones of commerce, transportation, housing and

heavy-industry – but these zones were more or less contiguous and integrated. True, various governmental boundaries divided this space up (this village is here, that village is there, and the township is everything else). But in a real sense, separate governmental units existed only on maps. Out on the land itself, this was one place, a populous community built around an industrial mining core, a place where life and work were hardly separated at all, where the spires of churches competed for attention with smokestacks, where railroad lines intersected streets, and where a school might have boiler- and engine-houses for neighbors.

Edwin Hulbert, the man who discovered the Calumet conglomerate lode, who formed companies to mine it, and who then mismanaged and lost control of the whole endeavor, was responsible for establishing the look and location of Red Jacket village, which he platted. His 1868 plat set up an L-shaped piece of land encompassing ninety acres that were set off into twenty-six rectangular blocks by a grid of streets that ran north-south and east west.<sup>31</sup> After the separate and small Calumet and Hecla companies combined in 1871 to form the soon-to-be-mighty C&H, president Agassiz and other company leaders did not try to launch their own rival commercial village. Instead, they encouraged the growth and development of Hulbert's Red Jacket plan, even though he and company officials were estranged from one another. Indeed, C&H literally bought into the Red Jacket plan, by purchasing property there it later sold off at a profit for select uses that met with company approval.

Some structures stood in what would become Red Jacket village even before it was platted. Then, fire destroyed the earliest part of the town, or most of it, in 1870.<sup>32</sup> This was not an uncommon occurrence on the mining frontier; other villages, including Hancock, also suffered catastrophic fires. As they rebuilt and expanded Red Jacket village, small commercial buildings constructed of wood remained the norm for about two decades. By 1890 Red Jacket's Fifth Street was established as the village's principal commercial district. One and two story storefronts – still built largely of wood – lined this then unpaved street.

Red Jacket's streets also contained commercial and private residences, but commerce, culture, and entertainment – rather than housing – seemed the village's major role. Far more people lived in surrounding Calumet Township than in Red Jacket village. In 1890, the village was home to 3,073 residents, while 12,529 lived in the township.<sup>33</sup> Within the township, C&H owned much of the land and housing, and exercised its will in determining the run of streets, rail lines, and the location of neighborhoods. In some portions of this overall landscape, the knitting together of village and township appeared quite seamless, despite the fact that the village was a mix of commercial and residential development, while the township was a very different mix of industrial and residential. The border between these two governmental units was particularly difficult to discern in those places where the village's north-south and east-west streets continued their same course when crossing into the township, and when the streets in both village and township were lined with residences.

In addition to building types, a few other major features of the landscape set the mine and village off from one another somewhat, even though they were in close proximity. South of the village (between the village and mine) Calumet and Hecla owned a sizeable tract of land that it had chosen not to build on, or was holding for possible future development. This field served as pasturage, or could serve as a place for recreation or the outside storage of materials. This field created an open, visual break in the landscape. Notably, this field, when combined with the orientation of the Calumet conglomerate lode – which ran on a southwest to northeast line or strike – set the village off from part of the mine and some of its early neighborhoods of company housing.

Unlike the village's streets, which were aligned by compass direction, many streets at C&H within Calumet Township were aligned with the copper; they ran either parallel or perpendicular to the strike of the Calumet Conglomerates lode. As a consequence, the village had its street grid, which in places extended out into the township, but the mine proper and some of its neighborhoods had their own separate street grid. Thanks to the open field that C&H left as a wedge between these two grids, the company did not have to cope with a host of streets running up to and through the mine from the village. C&H probably wanted to avoid that, because regular street traffic would have inconvenienced, bothered, or interrupted mine traffic near the shafts and shops. The main connector between village and the heart of the industrial sector was curving Red Jacket road, an extension of Fifth Street that led away from the village to intersect Mine Street.

Along its streets, C&H erected its earliest waves of houses in a manner consistent with what other mines did in the region. Initially, it erected a number of boarding houses. Then, as it moved into production, it moved away from that form towards single-family dwellings. It started by erecting log houses, then switched to frame, which were typically one-and-a-half stories tall.<sup>34</sup> (Fig. 40.) It tended to batch build houses, as needed, creating new blocks or even new neighborhoods of worker housing. Like some other firms, the company gave its neighborhoods names, starting with the likes of Albion location, then over the years adding many others, such as Blue Jacket, Yellow Jacket, Hecla, Newtown, Raymbaultown, Swedetown, Red Jacket Shaft, and Waterworks locations.<sup>35</sup>

In some of these locations or neighborhoods, entire blocks were erected and owned by the company. Along other streets, one found that C& H had been successful in encouraging a sizeable number of its employees to build their own houses on company lands. C&H was not alone in allowing or even encouraging workers to build on company property, on ground leased for a nominal annual fee.<sup>36</sup> Other companies had done it. For the companies, it meant that they had to build and maintain fewer houses themselves, and this practice, so they thought, helped to cement worker loyalty. Putting a house on company property was about the greatest expression of loyalty to his company that a worker could make. This act more or less locked in a family's future with that of his employer. C&H boasted more worker-built houses on company land than any other mine on Lake Superior. That was not surprising, because Calumet and Hecla was, after all, the biggest and wealthiest of companies, with an assured future that no other company

could match, including Quincy, which was a distant second to C&H in nearly every aspect of the business.

<sup>1</sup> Min. Stats. for 1880, 147.

<sup>2</sup> Min. Stats. for 1885, 237.

<sup>3</sup> Min. Stats. for 1880, 148.

<sup>4</sup> Benedict, Red Metal, 43, 84.

<sup>5</sup> *Ibid.*, 41-42, 5, 63.

<sup>6</sup> *Ibid.*, 65, 69; Coggin, “Notes on the Steam Stamp,” 210; Blandy, “Stamp Mills of Lake Superior,” E&MJ (27 June 1874): 401.

<sup>7</sup> Benedict, Red Metal, 65.

<sup>8</sup> *Ibid.*, 69, 83; Blandy, “Stamp Mills,” 401.

<sup>9</sup> Benedict, Red Metal, 67, 83; Min. Stats. for 1880, 149; Frank G. Haller, “Transportation System and Coal Dock,” MCIJ, 13:10(Oct. 1931): 515; C&H, A.R. for 1892-93, 17.

<sup>10</sup> Benedict, Lake Superior Milling Practice, 1.

<sup>11</sup> H. S. Munroe, “The Losses in Copper Dressing at Lake Superior,” AIME Trans. 8(1879-80): 410-11.

<sup>12</sup> Benedict, Red Metal, 85-86; Munroe, “Losses in Copper Dressing,” 410-11.

<sup>13</sup> Benedict, Red Metal, 60; Munroe, “Losses in Copper Dressing,” 422-23.

<sup>14</sup> Min. Stats. for 1885, 238; Min. Stats. for 1895, 125; Min. Stats. for 1896, 126; C&H, A.R. for 1892-93, 15; Haller, “Transportation System,” 516; F.F. Sharpless, “Ore Dressing on Lake Superior,” LSMI Proc. 2(1894): 99; Benedict, Red Metal, 84.

<sup>15</sup> Coggins, “Notes on the Steam Stamp,” 210, 232; Benedict, Red Metal, 83.

<sup>16</sup> Sharpless, “Ore Dressing,” 100; Coggings, “Notes on the Steam Stamp,” 232; Min. Stats. for 1886, 216; Min. Stats. for 1895, 125; Min. Stats. For 1896, 126; C&H, A.R. for 1892-93, 15-16.

<sup>17</sup> Benedict, Red Metal, 98-99.

<sup>18</sup> Min. Stats. for 1895, 126; C&H, A.R. for 1892-93, 18.

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<sup>19</sup> H. D. Conant, "The Historical Development of Smelting and Refining Native Copper," MCJ 17(Oct. 1931): 531; James MacNaughton, "History of the Calumet and Hecla Since 1900," MCJ, 17(Oct. 1931): 474.

<sup>20</sup> Benedict, Red Metal, 94; C&H, A.R. for 1891-92; Min. Stats. for 1891, 24; Min. Stats for 1896, 126; Min. Stats. for 1899, 275.

<sup>21</sup> Min. Stats. for 1881, 132; Min. Stats. for 1885, 237.

<sup>22</sup> Lankton, Cradle to Grave, 19-20; Benedict, Red Metal, 40-41, 46-50, 52, 54-57, 59-60, 62-65, 67-69.

<sup>23</sup> This summary of Leavitt's life and career is based largely on his obituary, ASME Trans. 38(1916): 1347-49. Engineering drawing for much of his machinery designed for C&H can be found in the C&H coll., MTU, and in the Leavitt coll., National Museum of American History, Smithsonian.

<sup>24</sup> J.B. Francis to AA, 19 Jan 1874, C&H coll., MTU.

<sup>25</sup> Min. Stats. for 1880, 148.

<sup>26</sup> Min. Stats. for 1899, 275; also see an illustration of one of these wheels in Scientific American, "Giant Lifting Wheel for the Copper Mines," 50:10(new series).

<sup>27</sup> Erasmus Leavitt, "The Superior," ASME Trans. 2(1881), 107; Min. Stats. for 1880, 148.

<sup>28</sup> Min. Stats. for 1881, 131, 133; Leavitt, "The Superior," 106-12; Min. Stats. for 1882, 97; C&H, A.R. for 1892-93, 10.

<sup>29</sup> Min. Stats. for 1895, 124; Min. Stats. for 1899, 271-72; C&H, A.R. for 1892-93, 10-12.

<sup>30</sup> Thurner, Calumet Copper and People, 8.

<sup>31</sup> Lynn Bjorkman, "Calumet Village, Laurium Village, Calumet Township: Historic and Architectural Survey: Phase I," Western Upper Peninsula Planning and Development Regional Commission report (31 August 1995), 30, 33.

<sup>32</sup> Thurner, Calumet Copper and People, 9-10; Bjorkman, "Calumet Village," 34.

<sup>33</sup> Thurner, Calumet Copper and People, 106.

<sup>34</sup> Ibid., 9-10.

<sup>35</sup> Based on a 1919 map, the Keweenaw National Historical Park generated a series of maps of individual neighborhoods or locations. These maps indicate if houses were

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company or privately owned, and whether they were single-family or double or triple houses.

<sup>36</sup> Lankton, Cradle to Grave, 149-50, 158-59.

## CHAPTER 10

## QUINCY BECOMES “OLD RELIABLE”

Calumet and Hecla, because of the richness of its lode, did not have to struggle to make a profit, did not have to skimp or exercise frugality when erecting its physical plant at mine, mill, or smelter. But Calumet & Hecla was alone in this regard. Other Lake Superior copper mines – the typical ones – had to be more cost conscious and conservative in order to squeeze profits out of more modest deposits. Of these companies, Quincy was perhaps the best at making the most of what it had, as noted by Michigan’s Commissioner of Mineral Statistics, in his Report for 1881:

Taken all in all the Quincy has, perhaps, the best record of any copper mine on Lake Superior....It has a very valuable history; a suggestive one to other companies. If any one mine were to be selected as an example from which to derive important lessons, undoubtedly the Quincy deserves the preference. Its management may be characterized as, on the whole, a fortunate medium between the conservative and progressive; it has ever held to that which has stood the test of experience, and availed itself of whatever was new that proved to be of value.<sup>1</sup>

In the quarter century after the Civil War Quincy earned the moniker of “Old Reliable” because it so regularly turned an annual profit and paid dividends. Over this period Quincy invested considerably in new technologies that raised worker productivity and total copper production. At the same time, however, in some important ways the size of the company did not increase. Quincy did not grow on the ground. It did not expand its mineral lands, but continued to exploit its original stretch of the Pewabic lode. The company did relatively little community building over this span, and erected few new houses for workers. Quincy did not need to invest in a larger settlement at the mine, because over these years, employment shrank, rather than grew. As it applied machine rock drills, high explosives, and other new technologies, Quincy produced more copper with fewer people. While technological change was a hallmark of the era, social change at Quincy was less dramatic, in terms of worker housing and the domestic landscape. Overall, Quincy did not look like a booming company, busily making itself over, reinvesting capital at every turn. Instead, it looked like a workaday company, living within its means, changing whatever needed changing the most, while leaving other things be.

Quincy made an important change in 1866, when it constructed a man-engine to transport men up and down. In 1864 the Cliff mine installed the first man-engine in the district; the Pewabic mine, just north of Quincy, followed suit in 1865. Man-engines were expensive to erect, maintain, and extend to deeper levels, but companies felt their benefits clearly outweighed their costs. Men traveled to and from work faster than when climbing ladders, meaning that a lesser part of the workday was spent in just moving men and a greater part of the shift was spent on productive work such as drilling or tramming. Also, men could work more vigorously right till the end of their shift, and not save up energy for a long ladder climb. A man-engine also allowed a deeper mine to compete for

laborers with a newer, shallower mine; without this device, Cliff or Quincy (about five to six hundred feet deep in the mid-1860s) could lose workers to mines that were easier and quicker to climb up and down. Finally, the mining companies recognized that relieving their men of arduous ladder climbs of five hundred to a thousand feet was simply the right thing to do.<sup>2</sup>

Quincy installed its 1866 man-engine at an initial cost of about \$17,500. It functioned in the same manner as the one erected a year earlier by the Pewabic mine:

[The man-engine] consists of two lines of heavy timbers bolted together continuously . . . , resting on a steep incline on rollers, with steps at certain distances the entire length. When the propelling power at the top starts, one of these timbers moves up the incline and the other down, measured and equal distance, until the steps come opposite each other, when both halt for a second, and then move in reverse directions – up and down, up and down, continuously. The mining captain takes his position on a step, which comes up to a level with the floor . . . . As the timbers move on their measured tread, and the step on which the leader stands moves down to a vacant step on the opposite timber, he changes from one to the other, and gives the word of command, “Step over,” and all the party do the same, and are carried down gradually in this way, until the bottom of the moving timbers are reached.<sup>3</sup>

As the mine kept going deeper, Quincy periodically sank its man-engine shaft another level and extended the length of the man-engine rods. Quincy relied on this technology for lowering and raising men for nearly thirty years, into the mid-1890s. Throughout this period, the man-engine shaft delivered workers underground to a point between the No. 2 and No. 4 shafts, and they then walked north or south along a drift to get to their work stations. Up through 1890, the men continued to move and work by the light of candles, and they breathed air still circulated by natural, not mechanical, ventilation.

At the ends of drifts, bottoms of shafts, and up in the stopes, teams of contract miners continued to do Quincy’s drilling and blasting. During this period, virtually all other underground workers, and men on the surface, too, worked not under contracts, but for daily wages. Compared to other manual laborers, contract miners still enjoyed higher pay, higher status, and greater perquisites, such as access to company housing and other favors. They even worked a slightly shorter work week than trammers or timbermen, because at Quincy miners worked a shorter shift on Saturday than did others.<sup>4</sup>

The social and economic organization of contract mining changed little in the two or three decades after the Civil War, but the way the men won ground changed a great deal. In the mid-1860s, Quincy’s miners used sledge hammers, hand-held drills, and black powder to drive shot holes and blast rock. But in the late-1860s, the portent of great changes arrived at the Lake Superior mines in the form of the new Burleigh rock drill and the new explosive – nitroglycerine oil. Quincy joined other Lake mines in seeking to modernize and mechanize by adopting power drills and high explosives. These transitions, as noted earlier, did not come easily or rapidly, at Quincy or elsewhere. The

business records left behind by the Quincy Mining Company (and now housed at the Michigan Technological University Archives and Copper Country Historical Collections) present a detailed picture of the company's struggle to innovate: a picture of just how and why it failed with the Burleigh drill and later succeeded with the Rand drill; of how and why it avoided nitroglycerine oil and finally introduced, considerably later, nitroglycerine dynamite. Very rarely can the introductions of major nineteenth century technologies be traced in such detail, as is possible with the Quincy mine.

The Portage Lake Mining Gazette, the copper district's major newspaper, chronicled the initial burst of enthusiasm for the Burleigh drills, which had proved so successful driving the long tunnel at Hoosac Mountain. The Mining Gazette was a great booster of the surrounding mines and a voice that often advanced the cause of technological change. In 1870 the paper noted that the Burleigh drill "promises to be a great success in our mines, and that, for certain work, it is a mere matter of time as to its general introduction."<sup>5</sup>

The Quincy mine certainly moved toward machine drilling in a most positive manner, as if it entertained no doubts whether the Burleigh would be a success. In the company's 1871 Annual Report, the president and agent urged the procurement of "suitable machinery . . . for the introduction of power drills into use in the mine." In April 1872, stockholders appropriated \$100,000 for improvements to the mine's plant, and by the end of that year, Quincy's air compressor and drill account amounted to \$25,093, making it one of the largest investments in a new technology that the company had ever made. It purchased an air compressor, installed the requisite pipes, and ordered five drilling machines from Burleigh: three "tunnel" and two "mining" drills, plus an assortment of spare parts, mounting clamps, and two mining carriages, or low, wheeled trucks having vertical screw posts to carry the drills. By October 1872 the company had two machines driving drifts twelve hundred feet underground.<sup>6</sup>

These first two drills, whether of the tunnel or mining variety, were large. The tunnel drill could cut holes up to 2.5 inches in diameter. Using a rifle bar and a ratchet and pawl mechanism, it rotated the drill steel a partial turn prior to each forward stroke. It also had an automatic advance or feed. The tunnel drill could automatically advance a hole thirty-six inches before miners had to back the machine off and insert a longer drill steel. This machine, without any clamps or mounts, weighed 550 pounds and was 67 inches long. Burleigh's mining drill, a foot shorter and weighing 475 pounds, could drill up to a two-inch hole.

Sheer size was the dominant feature of the Burleigh drills. In drifting with them, Quincy had to increase the cross-section area of those openings more than threefold, just to give the drills room to be worked. It operated its Burleighs in drifts that were ten feet by ten, instead of just five feet by six. While Quincy pushed the larger, machine-drilled openings a little faster than the smaller, hand-drilled drifts, it cost the company "considerably more than it would have [if] done by hand-power." Quincy's agent, A. J. Corey, noted that "we cannot afford to carry a 10 x 10 drift through poor ground."<sup>7</sup> Indeed, when the first two machine-driven drifts ran into long stretches of barren ground, Quincy stopped using the Burleighs for a time.

Quincy's Burleighs worked well and drilled fast after being set up – but that was the problem. They took too long to set up. They proved too cumbersome and difficult to handle. After it stopped drifting with Burleighs, Quincy tried them in shaft sinking and stoping, but with little success. In mid-1873 the company received two smaller Burleigh “stopping” drills, which were 38 inches long and weighed 206 pounds. These promised to be easier to move around, set up, and reposition as one hole was finished and another started. The company was initially sanguine regarding the stoping drill's performance, but soon found itself in a dilemma. The first Burleighs were too big, overpowered, and too hard to maneuver; the new, smaller machines were easier to set up, but underpowered. They did not break “as much ground” as had been hoped. After expending \$26,557 on rock drills in 1872-73, Quincy reluctantly acknowledged that “our success with them has not been such as to warrant their general introduction into the mine.” The company deactivated its compressor near the end of 1873 and shelved its Burleighs. That same year, the Engineering and Mining Journal reported that, at the Michigan copper mines, “The introduction of drilling machinery is at a stand-still.”<sup>8</sup>

Quincy and neighboring mines were not so disenchanted with the Burleighs that they shunned new rock drills altogether. Between 1866 and 1880, numerous manufacturers entered the rock-drill market, and the United States issued at least 160 patents for drills and their constituent parts. Still, the copper mines, more cautious this time around, did not rush to purchase different drills in any great number. While his mine was still trying the Burleighs in 1873, Quincy's agent and head mining captain visited the nearby Isle Royale mine to examine the compact, two hundred pound Wood drill. A month later, Quincy borrowed the Wood drill for a test, only to dismiss it as being “liable to trifling accidents.” The mines also found fault with drills made by Winchester, Ingersoll, Horton, Brown, and Duncan. Then they discovered the Rand “Little Giant” drills.<sup>9</sup>

Like most drills of the period, the Rand was similar to the Burleigh, but simpler, lighter, more reliable, and easier to set up. Quincy acquired one Rand in mid-1879, five in 1880, twelve in 1881, and four more in 1882, bringing its total up to twenty-two, the most it would run up through 1885. During this time, Quincy bought no other manufacturer's machines. The Rand drill proved a phenomenon in this mining district. In the early 1880s, seventeen to twenty mines operated, and some fifteen of them turn to Rand drills by 1883, including all major producers.

The machine brought Quincy immediate, sharp increases in output, profits, and worker productivity. The introduction of the drills coincided with the mine's jump in production between 1880 and 1881 of nearly 50 percent – from 3.7 to 5.5 million pounds of ingot copper. At the same time, Quincy's running expenses increased by only 3.5 percent, and the number of contract miners declined from 192 to 167. In 1882, production reached 5.7 million pounds, a figure attained by only 90 contract miners – 60 working Rand drills and 30 who still drilled by hand.<sup>10</sup>

Despite the fact that the drilling machines altered traditional work habits, the companies introduced them without incurring any recorded strikes or labor unrest, due to good

planning and fortunate circumstance. The Quincy mine's surviving records make it clear just how the company used discretion in fitting the machines into its labor force; how managers quickly recognized the need to offer incentives to encourage miners to accept the machine; and how, in fact, the machine benefited the miners in important ways.

In 1879 and 1880, Quincy's first Rand drills went to volunteers who came from the ranks of regular contract miners, and those men, after becoming proficient with the machine themselves, went on to teach other contract miners how to use it. Quincy did not import new men to run the drills, nor did the company try to dismantle the established contract system by putting them in the hands of men earning daily wages. Quincy did, however, encourage contract miners to try the drills by temporarily abandoning the usual manner of settling contracts. Machine-drillers entered contracts and worked on teams, but, since they were unaccustomed to the drills and uncertain as to how much work they would perform, their contracts guaranteed a monthly payment higher than the average earnings of hand-drill miners. For instance, in July 1881 Quincy ran four Rand drills. It paid one team \$57 per man for twenty-six days worked; one team, \$55; and the two other teams, \$52. During this same month, hand-drilling contract miners earned an average of \$47.92. As Quincy's miners became more proficient with the machines, their settlements reverted to the old form; they were paid once again on the basis of the number of feet driven, or the number of fathoms stoped. Rand contractors received less per foot or fathom than hand drillers, but the speed of the machine allowed them to break more ground and earn more money. In 1878 and 1879, Quincy contract miners averaged monthly earnings of \$40.80 and \$38.34, respectively. In 1880 and then 1881, the figures stood at \$49.14 and \$47.63. In 1882 and 1883, when the Rands came more heavily into play, average monthly earnings rose to \$53.15 and \$50.10. An increase in earnings of twenty-five percent attended the introduction of the machine drill, a fact that certainly made the Rands more acceptable to the labor force.<sup>11</sup>

To take full advantage of the Rand drill as a labor-saving device, Quincy made an important change to its contract system. A traditional stoping team consisted of six hand-drilling miners, three working each shift. Quincy sought to run the Rand drill with four-man stoping teams, or only two men per shift, and the company instituted this change throughout the mine in February 1881. In 1882, both Quincy and C&H started a new practice indicative of some problems with the two-man per machine rule. The two-man teams needed some help, so both companies put extra hands underground. In Quincy's case, twenty-five new workers headed underground. They were not men, but "drill boys."

Prior to the introduction of the Rand drill, few boys worked underground. The 1880 U. S. Census reported only twenty boys working underground in the entire Michigan copper district. Quincy and C&H did not plan at the start to use more child labor in conjunction with the new machines; the idea arose as they experimented with means of maximizing the machines' economic benefits by keeping them more constantly in use.

The Rand drill with its post and mounting clamp weighed about six hundred pounds. Because the weight was distributed across three pieces, only two men were needed to

move, set up, and run the drill. Yet two miners could not run the machine full-time while attending to other chores, such as obtaining supplies, such as bundles of resharpened drills. The machines dulled a great many drill steels that had to be taken to the shafts for hoisting to the surface, where blacksmiths applied new edges. Then the resharpened drills, transported underground, had to be returned to the contract teams. The drill boys ran such errands. They ran not only for drill steels but for water, tamping clay, and other supplies, while the men stayed at their machines. The boys provided the miners with extra help and the companies with cheap labor. In 1882, Quincy's drill boys usually received \$1.00 per day, or about half what an adult miner earned. The Mining Gazette faulted parents for pulling their young lads from school and putting them to work, but the voice of protest largely fell on deaf ears among mining families, who were happy to receive the extra income that drill boys provided.<sup>12</sup>

Unlike hand-drilling miners, the Rand drill did not tire or require frequent breaks. That machine altered the pace or tempo of the miners' workday – and certainly the companies, including Quincy, expected their men to keep the machines more constantly at work, and the men were to take fewer breaks and enjoy fewer prideful of tobacco up in the stopes. Still, Quincy did not add any shift bosses, foremen, or assistant captains to its ranks, suggesting that the Rand drill miners worked under no more scrutiny, pressure, or control than before. If Rand drill teams kept busier, their work nevertheless was easier than swinging sledge hammers. With machine drilling, the hardest jobs were moving the drilling equipment and setting it up. While the machine was running, one man at the ready fed the drill steel forward with a hand crank. Meanwhile, the second man stood at the front of the machine, ready to rap the drill steel with a sledge if it stuck in a hole. He also squirted water in the holes drilled downward (to clear chips for faster cutting and to keep the dust down), and he chucked new drills into the machine when necessary.

In the copper mines, the introduction of the machine rock drill did not raise any issue of occupational health and safety. On the contrary, the drills were credited with improving the miners' work environment by improving underground ventilation. The technology had the side effect of carrying more air into the mines. Miners could open compressed-air valves as soon as they reached their work stations. This helped blow out dust or noxious gases lingering from the shift before. Once the drill was under way, the compressed air powered the machine and then exhausted into the mine. Also, companies ran compressed air underground between shifts to augment natural ventilation.<sup>13</sup>

At Quincy and C&H, the Rand drill definitely displaced many hand-drilling miners. Although men lost their jobs, it seems unlikely that they were unemployed for long, or that the machines had only a negative effect on employment in the region. If that had been the case, one would have expected protests from the labor force – but there were none. The Quincy Mining Company more than halved its number of contract miners between 1880 and 1882, dropping to 90 men from 192.<sup>14</sup> But its total employment declined by only fifty-three men, or eleven percent. For the copper district as a whole, employment actually rose as the drills were introduced, from five thousand men in 1880 to sixty-three hundred in 1884. True, the drills meant fewer jobs for miners at some mines, but at others they protected jobs. The drills helped sustain the Atlantic mine,

which worked, at a profit, a lode charged with less than one percent copper. And in one very important case, the drills created jobs by making possible the opening of the Tamarack mine, which became an important producer. To reach and begin working the Calumet Conglomerate lode, located far beneath the surface of its property, the Tamarack mine first had to sink a shaft 2,270 deep through poor rock. Using Rand drills exclusively, Tamarack accomplished the feat between February 1881 and June 1885. It was “the most rapid sinking in hard rock, that has anywhere been done,” and without the machine drill, it probably would not have been tried.<sup>15</sup>

Finally, men at Quincy, C&H, and elsewhere accepted the machines because of their size, because of the fact that it took two men to set up and run one. This preserved the social nature of contract work and the tradition of men working together on teams. Every miner still had his “buddy” to share the work with, and nobody had to work alone in the dangerous underground.

In the Quincy Mining Company’s Annual Report for 1879, agent A. J. Corey wrote: “It is becoming more and more evident that for the future cheapening of our mining costs, we must place more reliance upon the use of power drills and high explosives.” Quincy and the other Lake Superior copper mines definitely linked these two innovations, drilling machines and dynamite. They arrived together. Quincy, however, only cautiously and rather slowly turned to high explosives.

The men running the mine out in Michigan knew that for their miners, the choice of powder was an important, personal one. In the 1860s and 1870s, blasting accidents accounted for fully a third of all mining deaths in the district.<sup>16</sup> The profit-driven company might have wanted an explosive that was more powerful, or cheaper – but the men who handled it were more interested in its predictability. They did not want to be blinded, or lose an arm, or be killed by a premature blast while they were charging a hole. They did not want misfires or hanging fires. When the charges they set went off, they wanted them *all* to go off. They did not want to have to go back to check on a misfire, only to have a late blast send them to their grave. They didn’t want a powder that was rendered unpredictable by temperature changes, dampness, or its age. They preferred an explosive whose chemical reaction did not produce overly noxious gases that burned their eyes, seared their lungs, or caused headaches.

Quincy, unlike the Huron mine and a few others, never flirted with the idea of using nitroglycerine oil. That explosive, for most mines in the district, simply seemed too dangerous, and therefore too contentious. But even after Nobel produced a more stable explosive, nitroglycerine dynamite, Quincy still shied away from it and other high explosives and retained black powder in the late 1860s and the 1870s. In 1874, when a hundred pounds of the explosive Dualin exploded in the mining captain’s office at the Phoenix mine, Quincy’s agent, A. J. Corey, chalked it up as “Six more victims to the little understood, possibly unknown, properties of Dualin.”<sup>17</sup> Quincy for a while wanted nothing to do with suspicious high explosives. This did not mean, however, that Quincy remained free of controversy regarding its powder choices. Even in the traditional black

powder era, company officers in the East, the mine managers in Michigan, and the miners in the stopes, drifts and shafts squabbled over powder selection.

In 1874, William Rogers Todd, stockholder and company treasurer in New York City took the liberty of ordering, on trial, fifty kegs of powder from the Oriental Powder Mills of Boston. Todd did this on his own, then informed agent A. J. Corey of the purchase. The powder Todd purchased was a soda-powder. Instead of having a saltpeter of potassium nitrate as one of its main ingredients, this powder contained the less expensive sodium nitrate. Todd looked to find a cheaper explosive, and in ordering the soda-powder, he touched a nerve. Powder selection was a sensitive issue, and one that sometimes caught the mine's agent in the middle. A. J. Corey had to answer to the miners on his doorstep, concerned about safety and predictability, and to company officers like Todd in New York, who were more concerned with bottom-line costs.

In this instance, Corey objected to the purchase of any soda powder. He wrote back that the mine had tried and condemned it years before. It did "good work while fresh," but no soda powder had stood "the test of time and climate." Corey put his faith in Dupont saltpeter powder: "The Dupont has proved without exception the best powder in use on the Lake and gives universal satisfaction among the men, and by actual test breaks from 25 to 33 percent more ground than any soda powder."<sup>18</sup>

Corey was obliged to give the Oriental soda-powder a trial, but he found it lacking. In 1878, his powder of choice still remained Dupont's powder, and Quincy purchased at least a thousand twenty-five-pound kegs of it that year. At the same time, however, Quincy made its first, albeit small, purchase of a high explosive for trial: four hundred pounds of No. 2 "Hercules Powder" from the California Powder Works. By this time, other mining districts used high explosives extensively, including the Marquette iron range, a hundred miles east of the copper mines. Dynamite did not seem as threatening or frightful as before, and over the next several years, Quincy tested to see what high explosive to phase in while it phasing out its traditional black powder.

By 1880, when Quincy ordered 2,517 kegs of saltpeter powder, its purchases of Hercules Powder had risen to 21,750 pounds. In 1881, Quincy continued to buy saltpeter, but instead of purchasing more Hercules, it switched to 540 boxes of "No. 2 Excelsior" powder, purchased through John Senter of Eagle River. In 1882, Quincy mixed its purchases even more: 140 kegs of black powder; 1,944 boxes of No. 2 Excelsior; and 8,250 pounds of "Diamond J" powder from J. H. King in California. So the years 1878 to 1882 – just when Quincy firmly converted over to machine rock drilling – were experimental ones, in terms of powder. Black powder remained in use, but Quincy tried several high explosives. By 1884, in an average month Quincy consumed 26 kegs of black powder and 9,933 pounds of dynamite.<sup>19</sup> Mine agent S. B. Harris then noted that, "The high explosive used in the Quincy for some time past is the No. 2 "Excelsior," manufactured at Marquette. . . . The grade used here is 50 percent [nitroglycerine], price 31 cents per pound. They [the miners] like this powder here better than any other they have used."<sup>20</sup> In later decades Quincy would have a wider range of high explosives to select from – active base dynamites, ammonia powders, and gelatine dynamite, to name

some. Always, however, a challenge to change might erupt, whenever Quincy thought about switching powders.

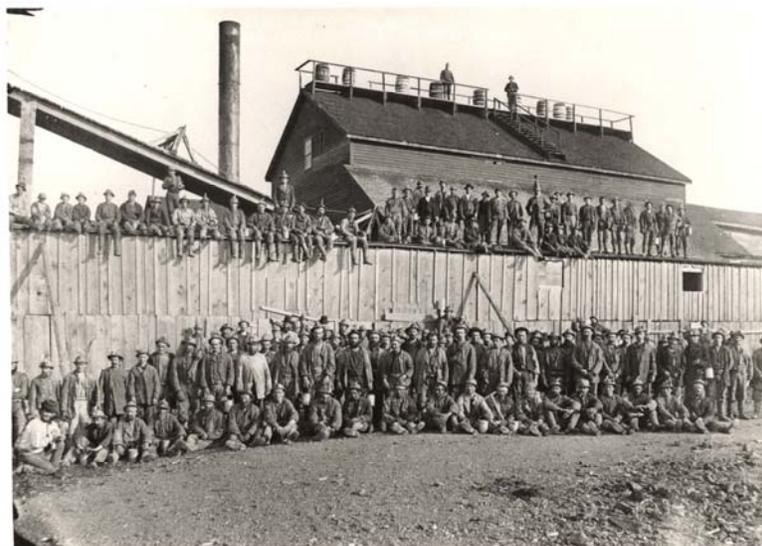
Typically, not all parts of a mine's operation changed at once. While a company revolutionized its technologies over here, it hewed to the tried and true, traditional way of doing things over there. So while Quincy made great changes in drilling and blasting in the twenty five years after the Civil War, other parts of its operations largely stood pat. Underground sanitation remained unchanged. The company still timbered sparingly and not in any systematic way. Importantly, the very basic technology of tramping continued as before, untouched by mechanization. Men still mucked up rock by hand, loaded the rock into four-wheeled, end-dumping tram cars, and then pushed the cars from stope to shaft along light industrial rails laid down in the drift. At the shafts, the trammers tipped the cars to spill their loads into waiting rock skips, raised to the surface by steam-powered hoists. The skips, traveling about five hundred feet per minute, lifted about three tons of rock per trip.

Operations at the shafts, like work done in the drifts, changed little over this period. The filler underground, working at the junction of shaft and drift, still used pull cords and a system of bells to signal or communicate with the lander on the surface. Until 1890, a Quincy shaft still carried but a single skip track, because one skip per shaft provided all the copper rock that the company's stamp mill on Portage Lake could handle. That mill had become a bottleneck to the mine's production, limiting it in the 1880s to some six million pounds of copper ingot per year. In 1890, when Quincy opened up a higher capacity mill on Torch Lake using steam stamps, then it was the right time to widen its shafts and put in a second track.<sup>21</sup> Two skips operated at the same time, with one going up while the other returned underground. This allowed almost twice as much rock per day to be hoisted from each shaft. Hoisting in balance also saved on energy costs, because the weight of the empty, descending skip helped lift the loaded skip going up.) Quincy sank its shafts to much deeper levels during this period. In 1865, they dipped down six to seven hundred feet, or to the mine's tenth or eleventh level; by 1890, the shafts reached down forty levels, or some twenty-four hundred feet deep, measured along the incline. To save on mining and operating costs, Quincy trimmed the number of shafts it operated during this time period. It abandoned four or five early hoisting shafts atop the Pewabic lode, and for most of this era brought up its entire mine product through just two shafts less than six hundred feet apart, Nos. 2 and 4.<sup>22</sup>

Some of the surface facilities associated with the No. 2 and No. 4 shafts changed a great deal; others did not. Wooden shafthouses deteriorated due to wear and the region's harsh environment, and sometimes due to the very moist air exiting the mine and entering the structures standing over upcast shafts. Quincy's No. 4 shaft had a bit of a dog-leg in it at upper levels, and when the company straightened the shaft out in 1877, it put up a new shafthouse at No. 4, about eleven feet south of the one it replaced. Quincy put a new structure over No. 2 in 1881. Then in 1890, when it double-tracked the two shafts, the company modified the interiors of its shafthouses, putting a second skip road and skip dump into each one. The shafthouses, through 1890, remained simple and still contained



**Figure 41**



**Figure 42**



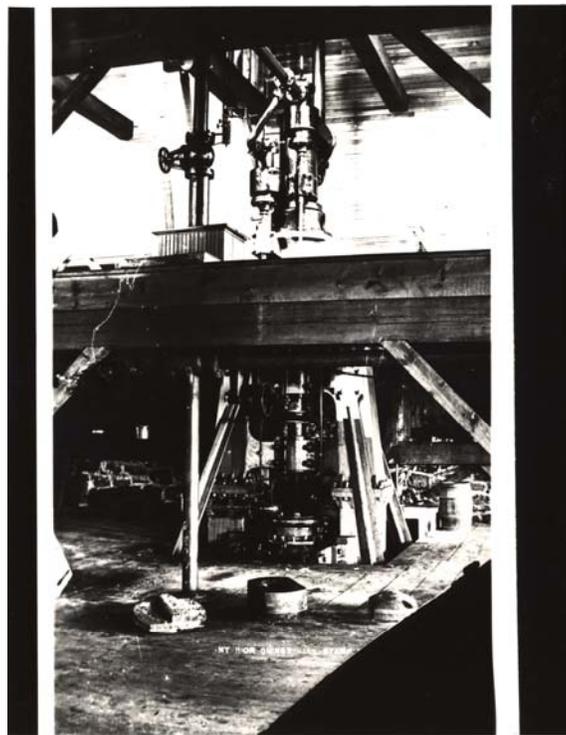
Figure 43



Figure 44



**Figure 45**



**Figure 46**

facilities only for receiving and dumping rock; all sorting and breaking operations took place elsewhere.<sup>23</sup>

Up the road about ten or twelve miles, Calumet and Hecla lavished money on its surface plant, and especially upon many monumental steam engines designed by Erasmus Darwin Leavitt. When it came to steam hoisting technology, Quincy cut quite a contrast to the dominant C&H. For many years at its No. 2 and No. 4 shafts, it made do with simple engines, deemed reliable and easy to repair, if not fully modern or very impressive.

Quincy's No. 2 and No. 4 hoists underwent change between 1870 and 1890, but the changes were not nearly as far reaching as they might have been. Prior to the 1890s, the mining company, instead of buying new and fully modern equipment, squeezed every bit of usefulness from engines already on hand. The used, upright Hodge and Christie engine that Quincy traded for in 1867 hoisted from the No. 2 shaft until 1894. As the shaft went deeper, Quincy periodically "lagged" its winding drum (built up its diameter) or replaced it with a larger one, so the hoist could carry a longer length of rope and reach greater depths.<sup>24</sup>

Quincy's hoisthouses originally sat between shafts, where they could serve more than one. By the 1880s, the first wooden hoisthouses were dilapidated, and with only two shafts left in operation, there was no reason to maintain their original positions. In 1882 Quincy erected a new engine house out of poor rock on the east side of No. 2. Quincy moved the old Hodge and Christie engine into the new hoisthouse and installed a new friction gear and cylindrical drum, which was fourteen feet in diameter and could carry four thousand feet of wire rope. The new hoist house was laid out in a manner that allowed a second drum to be added in 1890-91, when the mine double-tracked the shaft and converted to balanced hoisting.<sup>25</sup> The poor rock walls of the hoisthouse were typical of Quincy construction at the time. In replacing first-generation wooden structures, it often turned to masonry construction – usually grey-black poor rock, perhaps with a few brick details – because it offered greater permanence and protection from fire.

The mine agent noted in Quincy's 1871 Annual Report that, "We need a new hoisting engine of greater capacity for the No. 4 shaft." In December 1872 company mechanics installed a horizontal Jackson & Wiley engine at No. 4 that cost \$8,000 and had a twenty-six inch bore and a five foot stroke. To demonstrate its frugality when it came to engines, Quincy took the old No. 4 hoist engine and set it up to run the mine pump and man-engine; it took the old engine from the pump and put it to work powering new rock-breaking machinery.<sup>26</sup>

The Jackson & Wiley engine installed at No. 4 in 1871 continued to hoist there until 1909, when that shaft finally closed. In 1884, agent S. B. Harris contemplated a replacement, largely because of recommendations made by Nathan Daniels, an eastern stockholder and unofficial steam expert. In January 1884 Daniels wrote Harris to complain of the "dilapidated condition of the hoisting apparatus" at No. 4. "You want," he wrote, "a modern engine with a variable cut off and dispense with the old slide valve

you now have – and new Drum and all that goes with it.” Over the next half year, Daniels continued to chide Harris and press for a new engine. In May he wrote, “The power required at the shafts and the stamp mill is large, and the engines at each place, would not in our Eastern mills be allowed to remain in place longer than the time required to replace them with others of modern construction.”<sup>27</sup>

“Modern construction,” for Daniels, meant an engine with Corliss valves and a variable cut off, which shut off steam flow into the cylinder as soon as possible in the piston’s stroke – which saved on steam and thus on fuel. Harris argued back that “the old is equal to the requirements for years to come.” Daniels agreed that the Jackson & Wiley engine at No. 4 was “big” enough, but size was not the issue:

The real question is not whether the old slide valve Engine now there is big enough . . . , but rather can the corporation afford to literally throw away the extra fuel required to furnish steam, and hold on to an old-fashioned engine, entirely behind the requirements or economics of the present age.<sup>28</sup>

Daniels shopped around for a new engine at No. 4 and found one that could be had for \$6,900; he also suggested that the mine investigate the Reynolds-Corliss engines built by the E. P. Allis Company in Wisconsin. In the next decade, Quincy would do just that. But in the 1880s, S. B. Harris dug in his heels. The Jackson & Wiley engine could limp along, he said, for another year or two. At the No. 4 shaft, that year or two stretched out to be twenty-five years.

In 1885-86 Quincy built a new poor-rock hoisthouse to shelter the Jackson & Wiley engine and to serve the No. 4 shaft. The engine drove a new sixty-ton cylindrical drum, eighteen feet in diameter. Now both the No. 2 and No. 4 hoists could reach to a depth of four thousand feet. Nathan Daniels had wanted a hoist of thoroughly “modern construction.” S. B. Harris happily settled for one more to his liking that was “plain, strong, easily operated and durable.”<sup>29</sup>

Prior to the 1890s, largely to avoid the expense of new equipment, Quincy chose not to purchase more efficient steam hoists. In other ways, however, the company paid more attention to energy consumption and generation. In Quincy’s 1881 Annual Report, the agent wrote that, “No time should be lost in giving our steam equipment full consideration.” A number of Quincy boilers were over twenty years old and required frequent repairs. They not only were “far from economical”; they also offered up the threat of explosions.

A shortage of steam, the danger of explosion and fire, and the inefficiency of old steam plants spread across the mine site prompted Quincy to build a more central boilerhouse east of the No. 4 shaft in 1882. The stone structure contained eight new tubular boilers and all necessary feed-water pumps and connections. This single plant provided steam – through cast iron pipes laid in insulated trenches – to the No. 2 and No. 4 hoists, to the mine pump, the machine shop, and the air compressors.<sup>30</sup>

Maintaining sufficient boiler capacity was one problem; maintaining an adequate supply of boiler feed water was another. Sitting on the plateau almost six hundred feet above Portage Lake, Quincy was not endowed with an abundance of water for steam generation. During some winters it even melted snow to augment the water collected and stored in cisterns near the boiler plants, cisterns that provided not only boiler water, but water for fire fighting. Starting in 1872, Quincy pumped water from its abandoned shafts on the Quincy lode to its cisterns. This arrangement did not work as well as had been hoped. In 1881 the company constructed a pump works at the mill on Portage Lake and sent water four-fifths of a mile uphill to the mine. Quincy continued to rely on Portage Lake water until the mine closed.<sup>31</sup>

Quincy changed its water source; it also changed its fuel. Originally, wood harvested near the mine fired all of Quincy's boilers. In 1862, "to provide against the gradually increasing costs of timber and fuel," the company purchased surface rights to Sections 15 and 22, adjoining the mine, which it used for woodlots. These properties fueled the mine for a quarter-century, before Quincy started converting over to coal.<sup>32</sup> The switch started around 1886, when the Mineral Range Railroad Company built a branch line to Quincy's central boilerhouse near No. 4. The Mineral Range line made it more convenient and cheaper to transport coal and other freight to the mine.

Freighters carried coal north from ports on the lower Great Lakes. In switching to coal, Quincy became dependent on far away coal mines, brokers and shippers. The mine sometimes had problems getting the coal it wanted and when it wanted it. The winter environment, and the closing of navigation, exacerbated these problems. By November Quincy needed a full stockpile of coal to carry it through till spring. The mine never failed to gather an adequate supply, but in more than one year it cut it close, securing coal on some of the last lake freighters of the season.

Coal, like blasting powder, sometimes spurred controversy between the Michigan and New York ends of the company. In 1887 agent S. B. Harris experimented with at least three kinds of coal. "Mansfield" coal proved itself superior, at least to Harris, who deemed it twenty percent more efficient than the others. For the next several years, the mine used Mansfield coal, and Harris happily stuck with it. But the New York officers, as in the case of explosives, sometimes felt that the mine bosses in Michigan were too complacent, too ready to stick with the "tried and true" instead of shopping around for something better, or at least cheaper. The officers saw it as their duty to help make wise choices when selecting supplies that were consumed in large quantities. So, they occasionally ordered a shipment of new coal that the agent didn't want, and he would stubbornly have to defend his choice of one coal over another.<sup>33</sup>

During this era, rock drills were clearly the most important machines introduced underground. On the surface of the mine, Blake jaw crushers represented the greatest advance in the mechanization of work. Quincy thought about substituting mechanical crushers for kilnhouse work and calcining as early as 1863. But the Civil War with its high prices and busy machine shops and foundries delayed the mine's trial of rock crushers. After the war, dismal economic conditions and a depressed copper market

caused Quincy to again hold off on the acquisition of crushers. But by 1871, the demand for copper had risen temporarily, along with its price, and James North Wright, then Quincy's agent, foresaw an era of higher wages beginning for laborers in the district. To counter such a trend, to reduce labor costs at the sorting and kilnhouses, Wright recommended "that a rock house be built near the head of [the stamp mill's] tramway incline, to be furnished with a full set of Blake's rock-breakers, and connected by a railway with the working shafts of the mine. . . ." <sup>34</sup> (Fig. 41.)

The heavy timbered rockhouse, completed in 1873, was the most expensive structure Quincy had ever erected at the mine, when the cost of its machinery was counted in. Quincy spent about \$40,000 on the rockhouse, its breakers, and other equipment, and another \$18,000 on the "railway" or tramroad that ran south to the rockhouse from the No. 2 and No. 4 shafts. (Fig. 42.) The rockhouse contained boilers and two steam engines. One engine powered the endless-rope tramroad that pulled full cars from the shafts to the rockhouse, and then returned them empty. Sitting on the southern end of the mine, the rockhouse was a bit downhill from the shafts. The tramroad, in its final approach, ran on an elevated trestle. The cars dumped their contents into the upper level of the rockhouse, so gravity feeds could be used to move and sort the rock.

A second steam engine drove six major pieces of equipment. The Blake Crusher Company of New Haven, Connecticut, provided five crushers (one large and four small) that squeezed rock between heavy iron jaws to break it. The sixth equipment item driven by the engine was a heavy drop hammer. The hammer's head (weighing slightly over a ton) could be raised vertically in guides and then released to fall free. Initially the rockhouse also contained a second, smaller hammer, whose head was moved up and down by its own steam piston atop the machine.

This machinery sat in the midst of a series of iron screens (called "grizzlies"), slides, hoppers, and bins that sorted, moved, or stored material. The machinery replaced the arduous hand labor conducted at the old kilnhouses, but by no means eliminated such labor altogether. Men still had to push, drag, carry, or pick over a great deal of rock and mass and barrel copper by hand. When rock passed down the structure, gravity moved it; but when it moved across the rockhouse, men moved it.

Within the rockhouse, firemen and engineers controlled the boilers and engines and brakemen operated the tramroad. Laborers segregated the mass copper, barrel copper and stamp rock, and discarded the poor rock. The free-falling head of the large drop hammer cleaned mass copper of adhering rock; the small steam hammer cleaned the barrel work. Coarse screens or grizzlies sorted the stamp rock by size, and over-sized pieces went to the crushers.

Upon arrival at the upper level of the rockhouse, the stamp rock tipped out onto the inclined grizzly. The rock small enough (three inches or less) to fall through the grizzly's iron bars was small enough to enter the Cornish drop stamps at Quincy's mill. Needing no further reduction, this material fell into a storage bin, and from there laborers chuted it into cars for transporting to the stamp-mill tramroad.

The over-sized rock slid the length of the grizzly and was drawn out onto a heavy floor, where men sorted it by hand. They sent rock less than about ten inches in diameter to one of the small crushers; the bigger pieces went first to the large crusher for an initial break, and then on to a smaller crusher for a final break. Laborers probably fed the crushers by hand, while keeping an eye out for barrel copper, which they picked out to assure that gummy pieces of copper did not jam the machine's jaws. Once material passed the crushers, it chuted to storage bins, and later moved on to the mill.<sup>35</sup>

The basic components of Quincy's rockhouse – steam engines; an elevated dump and receiver; grizzlies; large and small jaw crushers; a drop hammer; a steam hammer; and slides, chutes and storage bins – there was also the components of the last Quincy rockhouse, built in 1908. The tools remained basically the same, but the arrangement of the hardware underwent numerous changes. These changes were aimed at achieving the same goals: to increase the rock-handling and storage capacities of the rockhouse, or to reduce the number of times laborers handled the rock, thus reducing the number of laborers needed.

In starting up its first rockhouse, Quincy encountered some problems. Its “automatic road” or tramway balked, and then the crushers failed when some castings fractured. But by November 1873 agent A. J. Corey could write that, “the new rock house is in full blast and works like a charm.” In the 1873 Annual Report Corey noted that, “the rock house is large and conveniently arranged, enabling us to handle with dispatch, all the rock we can hoist, and at much less cost than by the old method of calcining, and breaking by hand.”<sup>36</sup>

The cost reduction was substantial. In 1872, the last year in which kilnhouses treated all the over-sized mine output, the mine sorted and handled 60,628 tons of rock (38,058 tons needed calcining) for \$29,399, or 48 cents per ton. In 1874 and 1875, using the rockhouse alone, Quincy handled 67,112 and then 71,441 tons of rock. The costs, respectively, were \$25,218 and \$21,495, or 37 and then 30 cents per ton. The rockhouse's expenses for fuel and other supplies ran higher than those of the kilnhouses, but its labor costs were far less. In 1872, kilnhouse labor amounted to \$26,735; in 1874, rockhouse labor amounted to \$16,450.<sup>37</sup>

Quincy's rockhouse handled all the product of No. 2 and No. 4 until fire destroyed it on the last day of 1879. Quincy rebuilt on the same spot, and started up its second rockhouse on March 10, 1880. Lightning struck that structure June 7, 1887, when it, too, burned down. By mid-November, Quincy had a new tramroad leading to its third rockhouse, which was quite different in appearance from the first two and located several hundred feet closer to the shafts. The internal changes made to these rockhouses, particularly when they were totally rebuilt, cannot be documented in detail. But small changes and adjustments seem to have occurred with some frequency. In 1884, for example, Quincy adjusted the grizzlies for screening rock at least three times, until fourteen men (eight on the day shift and six and night) could do the work that previously required twenty-two.<sup>38</sup>

Good copper rock sorted and crushed in the rockhouse traveled in cars down the gravity incline to Quincy's stamp mill beside Portage Lake. (Fig. 43.) With the mill, Quincy again showed its propensity for sometimes holding on to the older way of doing things, while other companies more rapidly adopted the new. Through the 1870s and 1880s, Quincy eschewed adopting the larger and more powerful Ball or Leavitt steam stamps that other companies had long used. Instead, Quincy stayed with its batteries of smaller, less powerful gravity or Cornish stamps.<sup>39</sup> The company claimed that bigger, more powerful steam stamps would have abraded its copper too much while liberating it from the amygdaloid rock – would have produced particles of copper so small that the mill's buddles and jigs could not stop or capture them. This fine copper, Quincy said, would wash right out of the mill and into the lake. So it stayed with its original Cornish stamps until it finally built an entirely new stamp mill.

That time came in the late 1880s. Looking into the future, Quincy saw an expansion of its underground works coming, as it was planning to purchase and exploit a longer length of the Pewabic lode. The old stamp mill was already a bottleneck to production, because of the limited tonnage it could handle. To significantly increase its production, Quincy needed a new mill. Also, Quincy and other companies running stamp mills on Torch Lake were coming under pressure from the federal government to stop depositing tailings into that navigable channel. In short, using the lake as a tailings dump conflicted with its use as a transportation channel. So in the late 1880s Quincy decided to erect a new mill on a three hundred acre site at Torch Lake, about seven miles from the mine.<sup>40</sup> Torch Lake offered an abundance of water and a deep bottom, where Quincy could deposit tailings for decades. The start up of a new facility at Torch Lake led Quincy to complete three important and distinct building projects: it laid down a new railroad from mine to mill; put up the mill itself, starting in 1888; and also built two clusters of housing for stamp mill employees and bosses.

Quincy tried to negotiate good railroad freight rates to deliver its stamp rock to its new mill site, but could not come to terms with the Mineral Range or the Hancock and Calumet railroads. So it created its own line, the Quincy & Torch Lake Railroad, and proceeded to lay track, erect support structures, and obtain rolling stock. (Fig. 44.) Again turning to poor rock from the mine as a construction material, Quincy in 1889 built a locomotive engine house on the southern end of the mine, attended by a turn-table and covered water tower. (The engine house originally had two engine stalls; later, the company added a third stall and attached a small machine shop.)<sup>41</sup> Quincy in the same year obtained its first narrow gauge steam locomotives from the Brooks Locomotive Works of Dunkirk, New York and laid three-foot-gauge track across the mine site, along the brow of Quincy Hill, and on to the new mill on Torch Lake.

Quincy's new mill, which opened in 1890, followed the step-down design common in the Copper Country. (Fig. 45.) The highest part of the structure, abutting a hillside, held the stamp rock storage bins, which were supplied directly from the Quincy and Torch Lake Railroad's rock cars. The rock then gravity fed into the stamps, and water and gravity carried the discharge of the stamps off to other milling machinery located lower in the structure. Quincy's old mill on the Portage contained 80 head of Cornish drop stamps

and had a maximum capacity of 118,000 tons of rock per year, or a daily capacity of about 400 tons. The new mill contained just three E. P. Allis steam stamps, but each stamp could treat six to eight hundred tons of rock daily, giving the mill, as originally constructed, a daily capacity of up to eighteen to twenty-four hundred tons.<sup>42</sup> (Fig. 46.)

Off to one side of the mill Quincy built a cluster of six or seven new single-family dwellings for mill bosses or managers, in a tract it called “Bunker Hill.” The houses here were generally L-shaped, with a total of nine rooms on two floors. These houses had a covered porch and another nice amenity – an enclosed walkway to the privy out back. Also, these houses stood along their own lane, which curved off from the more trafficked main road running along the industrialized shoreline of Torch Lake.

On the opposite side of the stamp mill, Quincy erected small houses for ordinary mill hands that were not unlike houses built earlier at the mine. These thirty-five to forty houses stood in rows, in a small settlement dubbed “Mason,” after the company’s long-standing president, Thomas Fales Mason. No quiet settlement was this. Between the rows of houses ran Torch Lake’s main wagon road, as well as a busy rail line, and two other rail lines ran nearby. The T-shaped houses carried no porches, and no covered walkways to the privies. They typically had four rooms on the first floor and two or three bedrooms on the second. Although similar in their number of rooms to the managers’ houses, these worker houses were not similar in size. In Bunker Hill, the first floor footprint of the managers’ houses covered 1,468 square feet; the worker houses in Mason had a much smaller footprint, only 596 square feet.<sup>43</sup>

At 1890, Quincy was on the verge of making itself new, on the verge of expanding its mineral lands, opening new shafts, hiring more workers. It had a new stamp mill; it had its own railroad. But, as the company sat poised on the edge of a new era, it also remained traditional in many ways. It still lacked its own smelter, for instance. And up at the mine, landscape, population, and company organization and management remained much the same since the Civil War.

At the mine location, the industrial sector changed in appearance and function with the advent of new masonry hoist houses, the installation of a compressor, the abandonment of kilnhouses and the erection of a rockhouse, and with the introduction of tramways and rail lines, including the company’s own Quincy & Torch Lake Railroad. The domestic side of the location did not witness such important changes, in large measure because the mine’s labor force remained relatively about the same size over this time span. The company generally abandoned one of its neighborhoods – Swedetown, whose twenty-six houses had been built during the Civil War era, about a mile-and-a-quarter from the mine.<sup>44</sup> Closer in to the mine, the company erected approximately eighteen to thirty dwellings over this span, with some going up in the early 1870s and others in the late 1880s. Most were single units, but Quincy also erected some double houses at the mine. Also, the company bought up a small number of residences that employees had earlier built on lots leased from the company.<sup>45</sup>

On the whole, Quincy continued to have three discernible neighborhoods atop the Hill (Hardscrabble, Limerick, and Frenchtown), as well as numerous houses on the side-hill, running down towards Hancock and Portage Lake. The grandest house in this mix, by far, was the agent's house, done up in the Italianate style, located on the southern end of the mine, near the company's office. Here, in 1880-81 the company lavished some \$25,000 on a house that it provided rent-free and well furnished to its agent.<sup>46</sup> In large measure, Quincy did this not only to help it attract the best agents it could get, but also to help keep them. Quincy had lost some of its top men to Calumet & Hecla, which had lured James North Wright and others away with higher salaries, more perquisites, and the bump in status that attended managing the greatest mine in the district. Quincy hoped its new agent's house would slow or stop its loss of key personnel to its giant neighbor to the north.

Quincy's overall labor force, besides remaining quite steady in terms of numbers over this time, also remained relatively constant in terms of its ethnic mix. Most of the early-to-arrive ethnic groups from the Civil War era still remained at Quincy in the mid to late 1880s, and the tremendous influx of new immigrant groups, a hallmark of the post-1890 period, had not yet happened. 1865, the three largest ethnic groups working for Quincy were the Cornish, the German, and the Irish, with English/Scottish a distant fourth. In 1885, the top three ethnic groups remained the same, but the Finns – almost as an indicator of the many new people soon to come – had grown to be the fourth largest group.<sup>47</sup>

By 1890, Michigan was no longer the dominant copper producing state in the nation. That distinction, in the late 1880s, had passed to Montana, thanks to the mines of Butte. But the fact that they were surpassed in production did not mean that the Michigan mines were in decline, or even that they had peaked. Tremendous growth lay ahead. At Quincy, the technologies and plans were there. Quincy had double-skip tracks in its shafts, a new stamp mill, and a new railroad. Soon, once some issues were settled in court, Quincy planned to take over more mineral lands on the Pewabic lode, north of its original works. Adding fuel to the optimistic fire of expansion, growth and change was the rise of the electrical industry, which in the 1890s would create a tremendous boom for American copper producers.

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<sup>1</sup> Min. Stats. For 1881, 107.

<sup>2</sup> Lankton, Cradle to Grave, 33-35; J. W. Rawlings, "Recollections of a Long Life," in Roy Drier, ed., Copper Country Tales I (Calumet, 1967), 115.

<sup>3</sup> PLMG, 22 July 1869; QMC, A.R. (1866), 15.

<sup>4</sup> Lankton, Cradle to Grave, 70.

<sup>5</sup> PLMG, 18 Aug. 1870. For a fuller account on the introduction of machine rock drills, see Lankton, "Machine *under* the Garden," 1-37.

<sup>6</sup> QMC, A.R. (1871), 7, 18; A.R. (1873), 8; A.R. (1872), 16.

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<sup>7</sup> AJC to Burleigh Rock Drill Co., 7 Dec. 1872, QMC coll., MTU.

<sup>8</sup> QMC, A.R. (1872), 16; A.R. (1873), 15, 20; E&MJ 16(12 Aug. 1873), 107. No Burleigh drill contracts for miners can be found in the QMC Contract Books after 1873, and no compressor runners show up in the QMC Time Books.

<sup>9</sup> Henry S. Drinker, A Treatise on Explosive Compounds, Machine Rock Drills and Blasting (New York, 1883), 260-74; AJC to WRT, 3 March, 10 April and 12 August 1873, QMC coll., MTU.

<sup>10</sup> Lankton, "Machine *under* the Garden," 20-23.

<sup>11</sup> *Ibid.*, 24-26.

<sup>12</sup> *Ibid.*, 26-28.

<sup>13</sup> *Ibid.*, 29-31.

<sup>14</sup> *Ibid.*, 33-34.

<sup>15</sup> Min. Stats. for 1885, 241-42.

<sup>16</sup> Larry D. Lankton and Jack K. Martin, "Technological Advance, Organizational Structure, and Underground Fatalities in the Upper Michigan Copper Mines, 1860-1929," Technology and Culture 28:1(Jan. 1987), 48-49.

<sup>17</sup> AJC to WRT, 15 Feb 1874; NMJ, 18 Feb.1874.

<sup>18</sup> AJC to WRT, 15 Feb and 21 April 1874; AJC to Austin, 1 April 1874, QMC coll., MTU.

<sup>19</sup> Quantities of the various explosives were calculated by summing the invoices for these materials found in QMC Invoice Books, 1879-81 and 1881-82. Also, see SBH to TFM, 16 Feb 1884.

<sup>20</sup> SBH to TFM, 16 Feb 1884.

<sup>21</sup> QMC, A.R. (1889), 11; A.R. (1890), 11. Also, SBH to TFM, 24 Oct., 1889 and 9 Aug. 1890; and SBH to WRT, 3 July 1890, QMC coll., MTU.

<sup>22</sup> Quincy's annual reports throughout this period tell which shafts are in operation, their depths and production.

<sup>23</sup> QMC, A.R. (1876), 20; A.R. (1877), 14; A.R. (1873), 20.

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- <sup>24</sup> AJC to WRT, 12 March 1873; QMC, A.R. (1873), 20.
- <sup>25</sup> QMC, A.R. (1882), 12; Weekly Mining Journal (21 July 1883), 4.
- <sup>26</sup> QMC, A.R. (1870), 14; A.R. (1871), 18; A.R. (1872), 16; A.R. (1873), 20. Also, Jackson & Wiley invoice, 29 June 1872, in QMC Invoice Book, 1863-73. And AJC to WRT, 10 April 1873.
- <sup>27</sup> Daniels to SBH, 28 Jan. and 22 May 1884.
- <sup>28</sup> Daniels to SBH, 22 May 1884.
- <sup>29</sup> SBH to TFM, 16 May 1884 and 13 Aug. 1885; QMC, A.R. (1885), 12.
- <sup>30</sup> QMC, A.R. (1881), 12; A.R. (1882), 11.
- <sup>31</sup> QMC, A.R. (1872), 21; A.R. (1875), 22; A.R. (1881), 7, 12.
- <sup>32</sup> QMC, A.R. (1862), n.p.; A.R. (1886), 12; SBH to TFM, 19 Jan. 1885.
- <sup>33</sup> SBH to WRT, 11 June 1891 and 5 April 1892; WRT to SBH, 15 June 1891.
- <sup>34</sup> QMC, A.R. (1863), 14; A.R. (1864), 13; A.R. (1871), 18.
- <sup>35</sup> QMC, A.R. (1872), 16; A.R. (1873), 15. Also see QMC, Invoice Book, 1872-73, invoices from Portage Lake Foundry and Blake Crusher Co. for rockhouse machinery. Records of rockhouse labor are found in QMC, Time and Day Book, 1873-77, entries for Jan. 1874.
- <sup>36</sup> AJC to H. Bigelow, 6 and 25 Oct. 1873; AJC to WRT, 4 Nov. 1873. QMC, A.R. (1873), 21; QMC, Invoice Book, 1872-74, invoice from Portage Lake Foundry, 1 May 1873.
- <sup>37</sup> All data were taken from QMC annual reports, 1871-75.
- <sup>38</sup> QMC, A.R. (1879), 3; A.R. (1880), 3; A.R. (1887), 11-12. Also, SBH to TFM, 23 Feb. and 16 May 1884; and SBH to N. Daniels, 24 Aug. and 6 Oct. 1884.
- <sup>39</sup> QMC annual reports, ca. 1865-1890; besides documenting operations and production at the mine, these reports also record machinery used, operations, and production at the stamp mill on Portage Lake. QMC, A.R. (1884), 13, discusses the company's retention of drop stamps. Also see O'Connell, "Quincy Mining Company: Stamp Mills," 572-601.
- <sup>40</sup> SBH to TFM, 7 Feb. 1885, 16 and 23 May, 13 June and 3 Aug. 1887; TFM to SBH 14 May 1886.

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<sup>41</sup> Lankton and Hyde, Old Reliable, 77; Charles F. O'Connell, Jr., "A History of the Quincy and Torch Lake Railroad Company, 1888-1927," unpublished HAER report (1978), 649-88.

<sup>42</sup> H. G. Wright, "The Quincy Amygdaloid Mills," E&MJ (22 July 1911): 166; T. A. Rickard, The Copper Mines of Lake Superior (New York, 1905), 122, 129; O'Connell, "Quincy Mining Company: Stamp Mills," 601ff.

<sup>43</sup> Fisher, "Quincy Mining Company Housing," 141, 143-48; McNear, "Quincy Mining Company: Housing and Community Services," 524.

<sup>44</sup> Pappas, "Swedetown Location," 54ff.

<sup>45</sup> McNear, "Quincy Mining Company: Housing and Community Services," 521, 523; Fisher, "Quincy Mining Company Housing," 115-19, 138-39.

<sup>46</sup> Lankton and Hyde, Old Reliable, 89; QMC, A.R. (1880), 3; for costs associated with this house, see QMC, Journals, 1879-82, 303, 413; and 1882-87, 32. In a letter to SBH, TFM called this dwelling, "our extravagantly large house."

<sup>47</sup> Hyde, "Economic and Business History of the Quincy Mining Company," 83, 133.

## CHAPTER 11

## SURGING AHEAD, YET FALLING BEHIND

The twenty or so years after 1890 presented the copper mines on Lake Superior with both great opportunities and great challenges. In a sense, the mines moved in two directions at once. On the one hand, they surged ahead with tremendous expansion, which could be measured in many ways: in terms of product, employment, or dividends. Yet at the same time, the mines kept sliding backwards in terms of their share of total U.S. production of new copper.

Although plumbing and other uses contributed to the expansion of copper production in the late nineteenth and early twentieth centuries, the rise of the electrical industry proved key to encouraging growth. Copper went into the windings of generators and motors, into transmission lines, and into the wiring of factories, shops, and homes. As the nation turned from steam engines and gas and kerosene to electric power and electric light, the demand for copper rose, and its production expanded tremendously. American mines produced 260 million pounds of the red metal in 1890, and the figure shot up steeply from there: 380 million pounds in 1895; 606 million in 1900; 889 million in 1905; and a billion pounds of copper in 1910.<sup>1</sup>

The Michigan mines contributed to this growth. In 1880, they produced fifty million pounds of copper. That figure doubled to 101 million pounds in 1890. In 1895, 1900, and 1905, Michigan's production again rose considerably, from 129, to 145, to 230 million pounds annually, before dipping a bit to 221 million pounds in 1910.<sup>2</sup> What was true for the Lake Superior mines as a whole was true for Calumet and Hecla and Quincy mines. In five year intervals, starting in 1890 and running through 1910, C&H produced sixty, seventy-seven, seventy-eight, ninety-five, and then seventy-two million pounds of copper. Quincy, over the same run, produced eight, sixteen, fourteen, nineteen, and then nearly twenty-three million pounds. Production occasionally dipped from year to year, but the overall picture was clear: the Lake Superior copper industry was a lot bigger after 1890.<sup>3</sup>

The rise in Michigan's total production was due, in part, to some new mines that opened during this period, especially those owned in whole or in part by the Copper Range Mining Company. These mines – especially the Champion, Baltic and Trimountain – worked the Baltic lode about ten miles south of Portage Lake. They made up a new “South Range” within the district, and the South Range represented the last important part of the native copper mineral range to be opened. The well-capitalized Copper Range mines developed rapidly at the turn of the century. They produced 10.5 million pounds of copper by 1902, and then jumped to 40.6 and 42.5 million pounds in 1905 and 1910.<sup>4</sup>

Despite the rise of the Copper Range mines, during this period of expansion there was no dramatic increase in the number of active mines in the district. Fifteen mines operated in 1890. That number fell to twelve in 1895 and recovered to fourteen in 1900. In 1905 and

1910, eighteen and then nineteen mines recorded production. The mines did not become much more numerous, but they did become bigger. Older, smaller companies either grew, or died. From 1870 to 1885, fifteen to twenty of the mines then operating always remained small and produced less than a half-million pounds of copper per year. In 1885, only four companies (including Quincy and C&H, of course) produced three million pounds or more. Between 1890 and 1910, the number of mines producing less than a half-million pounds per year fell to just one, two or three. And by 1910, fully a dozen companies produced at least three million pounds per year. Of these, eight made more than seven million pounds annually.<sup>5</sup>

Employment figures mirrored the growth in production. The number of mine, mill, and smelter workers at Quincy rose from 484 in 1890, to 1,366 in 1900, and to 2,019 in 1910. Calumet and Hecla's force, which had been at 1,576 in 1880, stood at 3,496 in 1890; 5,000 in 1900; and dipped a bit to 4,940 in 1910. Houghton County's total mine, mill, and smelter employment, which was something less than 5,000 in 1880, reached 7,310 in 1890; 13,971, in 1900; and peaked at 17,974 in 1909.<sup>6</sup>

During this era the district saw some lean years in terms of profits, but also some very rich ones. The mines' fortunes quite literally rose and fell with the price of copper. In the early 1890s, the whole American economy suffered poor years, and so did the copper market. Prices declined from 15.8 cents per pound in 1890 to 9.6 cents in 1894, which was the lowest price ever paid for Michigan copper. Prices rebounded strongly, however, near the turn of the century, hitting 16.6 to 17.6 cents per pound in 1899-1901. Prices then declined to 15.7 cents in 1905 and just 13 cents in 1910. Dividends, not surprisingly, tended to rise and fall along with copper prices. The district as a whole paid out about \$3.3 or \$3.4 million in dividends annually in the early 1890s. With the price spike at the turn of the century, the mines enjoyed their most profitable years to date, hitting over \$12 million in dividends in a single year, with Quincy and C&H accounting for most of this. With the drop of copper prices to just 13 cents per pound by 1910, dividends fell to \$6.9 million.<sup>7</sup>

Despite all the surging ahead in terms of production, employment, and dividends paid, the mines in some important ways fell behind. They did not expand as rapidly or as much as the overall American copper industry. Michigan had once absolutely dominated that industry, but it had lost its mantle to Butte, Montana, "the richest hill on earth," in the late 1880s. Michigan produced eighty-four percent of the nation's new copper in 1880, when no other state produced more than five percent, and Montana produced only two percent. But by 1890, Butte accounted for forty-two percent of America's production, and Lake Superior dropped to thirty-eight percent. That percentage continued to fall with each passing decade: by 1900, twenty-four percent; by 1910, only twenty. In 1910, Michigan was only the third largest production state, trailing not only Montana, but also Arizona. Other states accounting for at least five percent of the nation's production by 1910 included Utah and Nevada, with California just missing that mark.<sup>8</sup>

While the Lake mines fell back vis-à-vis western producers, some of the Lake's major established mines – principally Calumet and Hecla and Quincy – fell back within their own region, due to the rise of the Copper Range mines. In the mid-1880s, C&H accounted for nearly two-thirds of Michigan's copper all by itself; Copper Range helped cut that fraction to only one-third of the district's copper by 1910. Between 1890 and 1910 Quincy's share of Michigan production ran in the range of eight to ten percent annually.<sup>9</sup> But after the turn of the century, thanks to Copper Range, it had been demoted from second largest and second most important company on the Lake, down to third largest and most important.

Besides the outside challenges presented by Western U.S. producers, the Lake mines faced many internal challenges. They were among the oldest mines in the United States, and they were perhaps too set in their ways and unwilling or slow to change, either technologically or organizationally. They were the deepest mines in the United States. Many of their lodes were pinching down – narrowing at depth – while becoming harder to drill, and also yielding reduced copper content. The Michigan mines, while approaching their peak years in terms of production and employment, faced serious problems: they basically had the industry's highest production costs; their workers' productivity in terms of output per man lagged far behind Western mines; and they worked the industry's lowest grade copper deposits.<sup>10</sup> While many indicators of industrial well-being had been going up after 1890, other signs, especially the closer one got to 1910, pointed towards troubling times ahead and eventual contraction, rather than continued expansion.

As companies such as Calumet & Hecla and Quincy moved through this era, they exhibited some important similarities. In order to increase production, they sought out additional mineral lands to be worked, either along their original lodes, or along newly acquired ones. They operated out of both old and newly opened shafts, and this invariably led to the erection of larger and more elaborate and expensive physical plants. To keep going deeper, the mines acquired larger and more modern hoisting engines, and they also redefined some of their mining methods and practices. Importantly, shortly after the turn of the century, all three of the premier mines in the district – C&H, Quincy, and Copper Range – operated under a top agent or superintendent who was college educated. “Practically” trained men – who had worked their way up the ranks to become top managers, had had their day; now the day belonged to academically trained engineers.

To cope with problems such as high production costs and low productivity per man, the mines sought out new technologies. They wanted to eliminate many trammers and reduce tramming costs by mechanizing that activity. On the surface, they wanted to streamline the sorting and breaking of rock. And, most importantly, by the end of this period, they wanted to eliminate half the miners' jobs in the district by switching from the two-man drills they had been using for thirty years to new drills that one man could operate. Some of these changes did not come easily, and the change to one-man drills proved especially difficult and contentious.

\* \* \* \* \*

In 1890, Quincy was poised to expand, ready to make itself over – and it did just that. It had put double skip-tracks in its shafts, had just erected a new stamp mill at Mason on Torch Lake, and had connected mine and mill with the Quincy & Torch Lake Railroad. Quincy could now hoist more tonnage, its old mill was no longer a bottleneck to production, and with the rise of the electrical industry encouraging expansion, Quincy did just that.

Quincy acquired the neighboring Pewabic mine, just to its north, in 1891, and also acquired mineral rights to land lying in the pathways of its No. 2 and No. 4 shafts. (Fig. 47.) This acquisition allowed both of those shafts to go still deeper for years to come. In 1896, Quincy purchased property to the northeast along the strike of the Pewabic lode, land on the far side of the Franklin mine that had once belonged to the Pontiac and Mesnard mines. Where five mines (Quincy, Pewabic, Franklin, Mesnard and Pontiac) had once stood along the Pewabic lode above Portage Lake, now there were only two – Quincy and Franklin. Quincy's land purchases hemmed in the smaller Franklin mine, throttled its growth and forced a sale to Quincy in 1909 – so now one company, Quincy, held the property once worked by five.<sup>11</sup> (Fig. 48.)

From the 1870s to 1891, Quincy hoisted from only two shafts, Nos. 2 and 4, which stood only six hundred feet apart. By 1900, Quincy pulled copper rock from five shafts. It opened a new No. 7 shaft on the southern end of its old works. It now hoisted from a rehabilitated Pewabic mine shaft, called Quincy No. 6, and from a No. 8 shaft on the old Mesnard property. The distance between Quincy's southernmost shaft, No. 7, and its northernmost, No. 8, was 7,500 feet. In 1909, Quincy finally closed the No. 4 shaft, one of its earliest, because the ground tributary to that shaft could be exploited by neighboring shafts. At the same time, Quincy opened a No. 9 shaft to the north, beyond the No. 8 shaft, on the site of the old Pontiac mine. No. 9 never proved a major asset to the company, but it did extend its works along the Pewabic lode to ten thousand feet – nearly two miles.<sup>12</sup>

Through the 1880s, Quincy remained cautious and frugal when it came to making large capital improvements to its surface plant. It typically made do with modest structures and equipment, squeezing every bit of utility out of them before replacing them with new construction or new technology. (Fig. 49.) In 1890, Quincy had a surface plant that was serviceable, but none too impressive. All this changed, however, in the next few decades, as it upgraded existing shafts and outfitted its new ones, Nos. 6, 7, and 8. Of particular import, Quincy erected a new generation of shaft-rockhouses, which became landmark structures in the Copper Country, and it installed an impressive array of new steam hoists. When Quincy added support facilities such as new machine and blacksmith shops, the mine took on an entirely new appearance and wore all the trappings of a successful and growing company.

When Quincy hoisted all its copper rock from just two shafts – each working just a single rock skip – the company needed only one rockhouse at the southern end of the mine. Its grizzlies, steam hammer, drop hammer, and jaw crushers, received via tramroad the

entire product of the mine and readied it for shipment to the stamp mill. When Quincy double-tracked its shafts and increased them to five in number, one rockhouse no longer sufficed. Quincy needed much more sorting and breaking capacity, so it started placing the required machinery right at the shaft. It grafted a rockhouse onto a shafthouse, creating a new hybrid structure at the mine: a shaft-rockhouse. (Fig. 50.) Quincy was not the first to do this; several other Lake mines had made the combination earlier. But from 1891-92 onward, after Quincy erected its first shaft-rockhouse at No. 6, the firm never lagged again in developing new and more efficient means of arranging rock-handling and crushing equipment at its shafts.

Under the old system, the shafthouse contained no machinery. It stood over the shaft collar and merely received the mine product, which was dumped into cars and trammed to the rockhouse, where it was sorted, cleaned, and broken. Under the new system, copper rock was hoisted to the top of a taller shaft-rockhouse, so that it could be gravity fed downward. When dumped from the skips it went directly to screens and then rock-crushers or hammers – all within a single building. The building also contained storage bins, elevated over railroad lines. Rock small enough to go to the mill fell into the bins, and from the bins chutes sent the rock into railcars. The new system eliminated the old tramroad run to the rockhouse and reduced the number of times the rock had to be handled. Each shaft (except for old No. 4, which continued to use the old rockhouse) now treated all its own product, just as soon as it was hoisted to the surface.

The most notable shaft-rockhouses that Quincy ever built stood over the No. 2 and No. 6 shafts. Standing tall atop Quincy Hill, these structures dominated the landscape at the Quincy mine and could be seen for miles from the opposite side of Portage Lake. The first shaft-rockhouses at No. 2 (built 1894) and No. 6 (1891-92) were wood framed and sheathed, and because of their myriad rooflines, were known as the “many gabled” shaft-rockhouses.<sup>13</sup> The two structures shared the same technologies and general appearance – but they were mirror images of one another, with left and right reversed from one to the next. In 1908 Quincy replaced the many-gabled wooden structure at No. 2 with an even taller shaft-rockhouse that differed considerable from its predecessors in form (no double-pitched roofs), materials (steel frame with sheet-metal cladding), and arrangement (which eliminated labor and stream-lined materials handling).

At Quincy’s many-gabled shaft-rockhouses, skips laden with six tons of rock rode to near the top of the structure on the double skip tracks, then were dumped. The rock fell onto a cast iron grates raised only slightly at first from the horizontal. (Fig.51.) Because the grizzly had a slight slope, men had to tend it, to pull rock along and free any jams. (A later improvement more sharply inclined the grates, so that rock slid more freely along them.)

Rock small enough to pass through the grizzly was small enough to go into the new steam stamps at the Torch Lake mill, so it fell directly from the top of the building into a stamp-rock storage bin, elevated over a rail line. Rock more than three inches in diameter was too large for the stamps, and too large to fall through the grate, so it tailed off the grizzly and fell onto an upper level floor. (Fig. 52.) Here, men still picked over

and moved the material by hand. They dropped the rock bigger than three inches but smaller than sixteen inches into one of two small jaw crushers standing nearby. Once crushed, this rock, too, fell into the bin. Bigger pieces of copper rock received a blow from the drop hammer, making it small enough to now pass through the crushers. The drop hammer also cleaned large pieces of mass copper of adhering rock, and a small steam hammer cleaned smaller barrel copper of rock. While the stamp rock chuted directly from its bin into a rail car destined for the mill, the mass and barrel copper went off to be smelted.<sup>14</sup>

The rock-handling system used in the many-gabled shaft-rockhouses of the 1890s was not perfect. Improvements were to come, principally to increase the sorting capabilities of the grizzlies; to enlarge bin capacities so that scheduling rail service to the structures was less critical; and to eliminate the manual labor involved in picking up rock and feeding it into crushers. The pieces of Quincy's rock-handling, cleaning and breaking technology did not change much from the 1870s into the twentieth century, but their arrangement or spatial organization did. In the new century, Quincy committed to enlarging production, stream-lining processes, eliminating labor, and increasing worker productivity. The company made those commitments evident in the partial reconstructions or additions it made to extant shaft-rockhouses standing over Nos. 6, 7, and 8. It best embodied those commitments, however, in the design of the totally new shaft-rockhouse erected at No. 2 in 1908.<sup>15</sup> (Fig. 53.) That structure represented one of the company's finest pieces of engineering. Today, still standing, the No. 2 shaft-rockhouse remains an essential, dominant part – indeed, an iconographic part – of the historic mining landscape.

The American Bridge Company erected the nearly 150-foot-tall No. 2 shaft-rockhouse. Its double skip-road led up almost to the head sheaves (pulleys carrying the hoist ropes) mounted at the structure's top. Along the way, the side-by-side skip roads had dumps (rather like railway sidings or switches) at three levels. These three dumps, plus the landing station right at the shaft collar, facilitated the handling of all the different things arriving at the surface from underground. Underground workers got off the man-car at the station at the collar. At the first elevated dump, a rock skip could be dipped to discharge extremely large pieces of mass copper or, more frequently, tools, such as bundles of dull drill steels, or drilling machines in need of repair. These materials would slide down a rail-clad ramp to a platform just above ground level, where men loaded them onto flat-bed rail cars pulled into the building.

If the rock skip contained poor rock – rock having too little copper content to merit further processing – the lander switched it off the skip road at the second dump. The car tipped, the rock fell into a storage bin, again elevated over a rail line. The bin chuted the poor rock into rail cars to be carried away and disposed of. But, if Quincy needed railroad ballast or concrete aggregate, the poor rock could first be routed through a poor-rocker crusher before going into the bin or railroad rock car.

The skips coming from underground now carried eight tons of rock per lift, instead of the earlier six. When loaded with copper-bearing stamp rock, the skips carried their lodes

nearly to the top of the shaft-rockhouse, and then tipped. (Fig. 54.) The rock spilled out onto an inclined double grizzly – one that had two screens, one over the other. The uppermost grizzly was made up of six-inch round steel bars set twenty inches apart, edge to edge. Rock larger than 20 inches couldn't pass through, so it slid off the end of the grizzly and into a bin with one side opening up to an adjacent three thousand pound drop hammer. Rock smaller than twenty inches fell through the first screen and onto the second, which had bars 2.75 inches apart. Rock passing through those bars was ready for the mill. It fell through the grizzly and into the main stamp rock storage bin, which held up to 2,000 tons of rock, awaiting rail shipment to the mill. The oversized rock tailed off the 2.75 inch grizzly and fell into a separate, high bin. This bin fed the rock down inclined chutes into one of two jaw crushers. (Fig. 55.) On this, the main crusher floor, the drop hammer, a steam hammer, and the crushers all worked in close proximity. (Fig. 56.) The rock fed into the crushers, once broken, fell into the main stamp rock bin. After being cleaned, pieces of mass copper went down the outside of the building, lowered by a crane installed just for that purpose. Men tossed pieces of barrel copper down a chute into a mass copper tube, which, when filled, could be emptied into a rail car bound for the smelter. All products of the mine had a place to be worked, and a place to go, and men had to pick up very little of the shaft's product by hand to move it or process it. In this structure, just three men working on the crusher floor treated upwards of a thousand tons of rock in twelve hours. All the material ended up in elevated bins standing over rail lines that ran under or alongside the shaft-rockhouse. Rock spilling from the structure's bins filled a car bound for the stamp mill in only ten seconds.<sup>16</sup>

Besides being well-engineered for handling copper rock, mass copper, poor rock, men, and tools, the shaft-rockhouse's lower level contained overhead cranes for holding and switching the various cars used in the shaft – the man-car, water-bailing skips, rock cars, and others designed for tools or explosives. Shaft workers using the cranes switched from one shaft vehicle to the next. For instance, at the start of the shift they took a rock skip off the end of the hoist rope and replaced it with a man-car. Then, when the full shift of men had been sent underground, off came the man-car and back on went the rock skip. Men made these switches in a matter of minutes. All in all, in terms of its efficiency and labor-saving, the No. 2 shaft-rockhouse represented a far better design than earlier Quincy rockhouses.

The “new” Quincy mine of the 1890s and beyond boasted a new generation of hoisthouses to go along with its tall and distinctive shaft-rockhouses. In the 1870s and 1880s the mine had relied on old engines that were not fuel efficient, but were powerful enough, steady performers, and easy to maintain and operate. In the 1890s, things changed dramatically as Quincy turned to much larger and more efficient steam-powered hoists, usually provided by the renowned engine builder, E. P. Allis of Milwaukee, and specifically engineered to meet Quincy's needs. (Fig. 57.) Only the old No. 4 shaft kept its long-time hoist; all the others got new ones.

When considering the installation of several modern hoists, Quincy entered an age when it became more dependent on the knowledge and skills of outside manufacturing experts. Large hoists were not “off-the-shelf” items. While a manufacturer's engines and drums

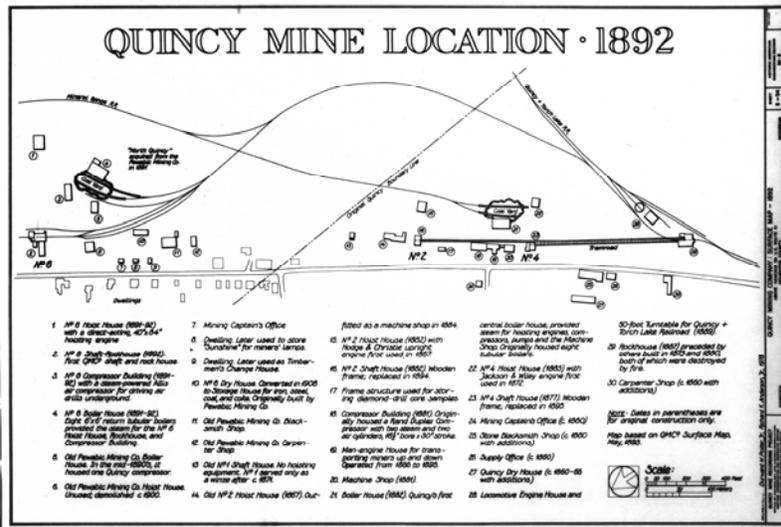


Figure 47

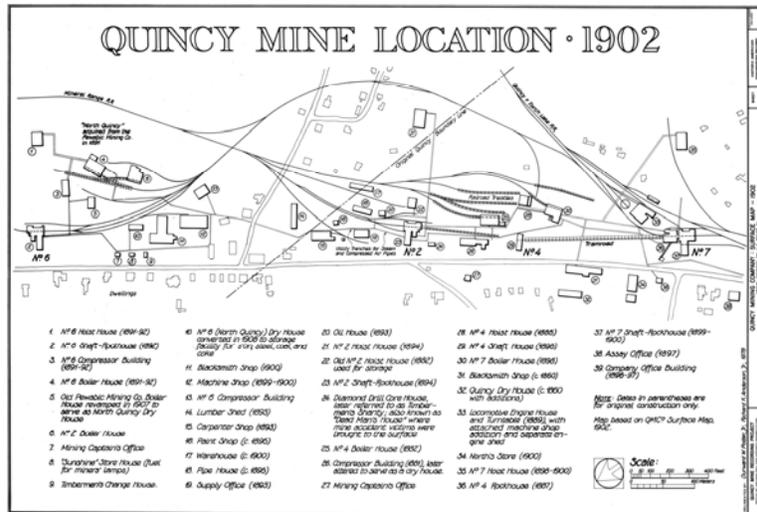


Figure 48



**Figure 49**



**Figure 50**



**Figure 51**



**Figure 52**



Figure 53

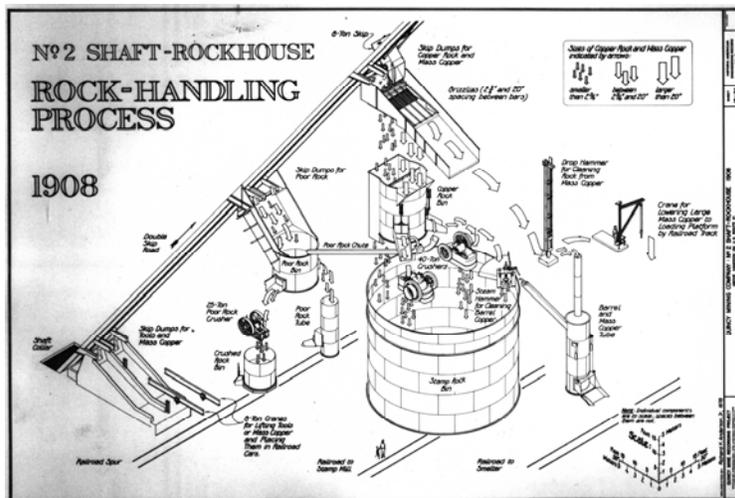
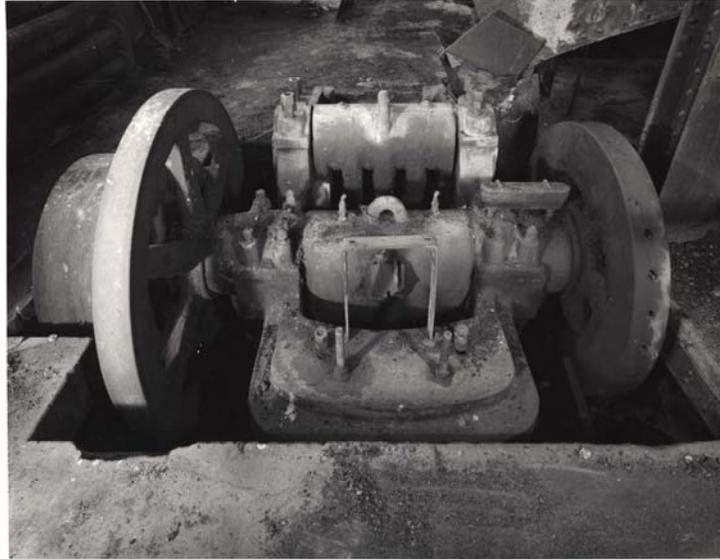


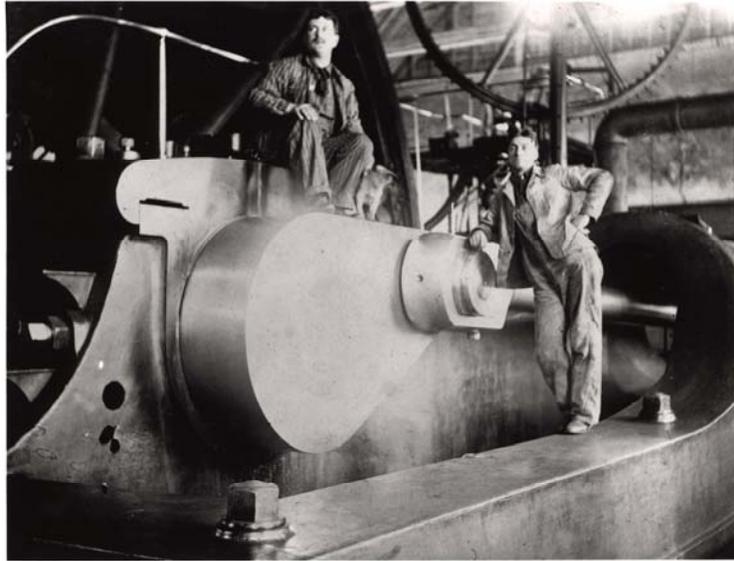
Figure 54



**Figure 55**



**Figure 56**



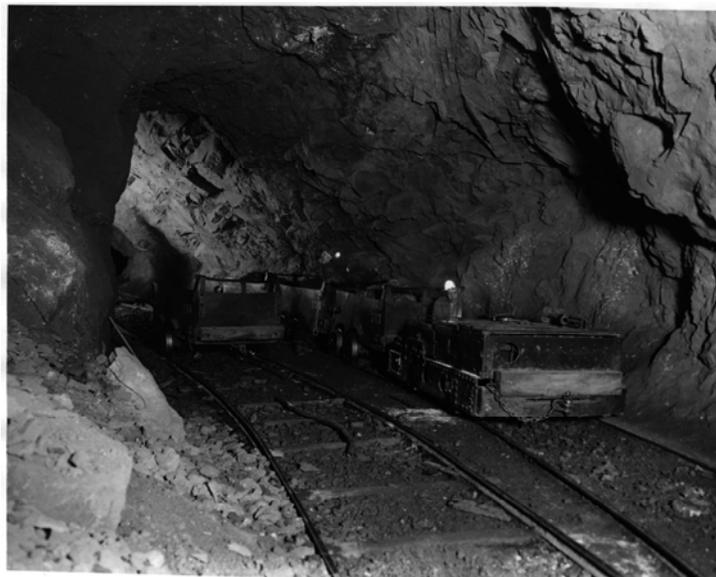
**Figure 57**



**Figure 58**



**Figure 59**



**Figure 60**



Figure 61

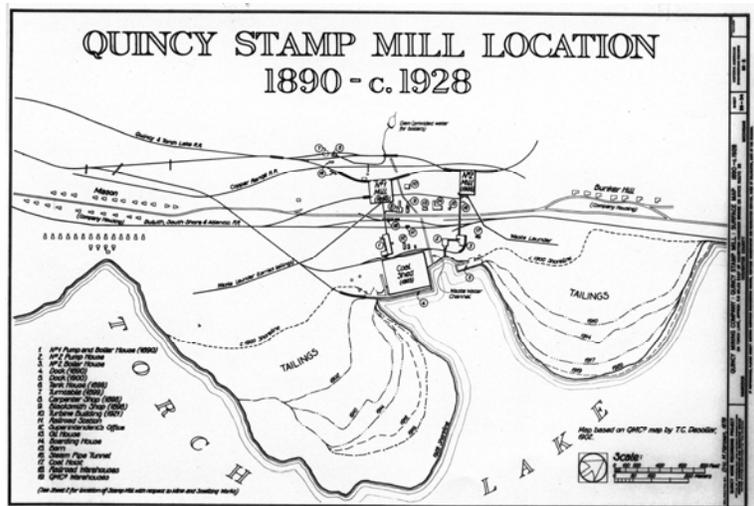


Figure 62

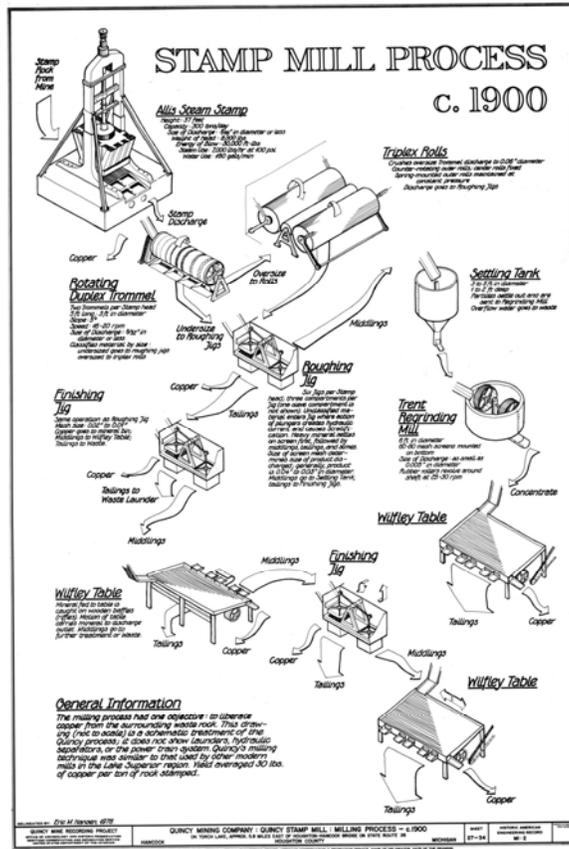


Figure 63



Figure 64

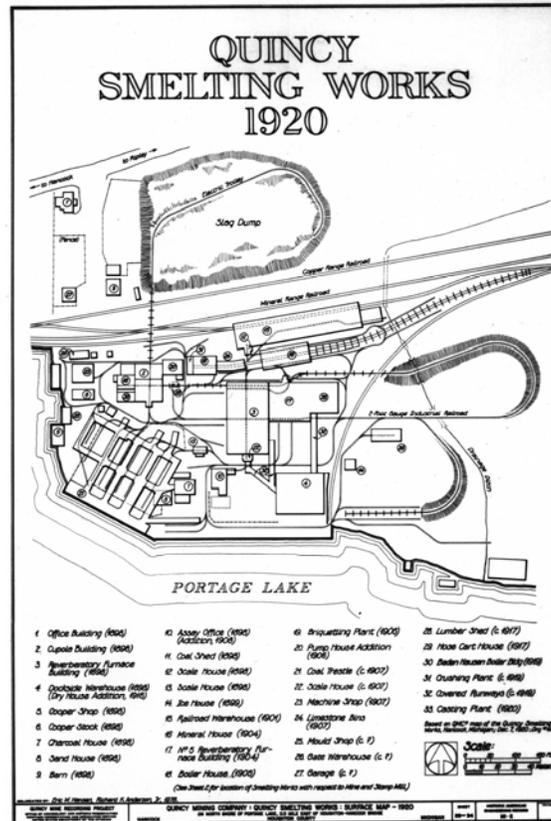


Figure 65

shared certain design features from one to the next, each large engine was in part custom designed and built to meet the requirements of the purchasing mine. Quincy did not draw up its requirements on its own, but told bidding engine building firms what it wanted in general. The manufacturers then decided most of the details and submitted their bids. At one time, the mines had simply purchased general purpose steam engines, which they connected to drums via friction drives or gearing to serve as mine hoists. But now the design and construction of hoisting engines had become a specialty, a technological realm in which Quincy was no longer expert and where solutions were no longer simple.

Quincy tapped the expertise of E. P. Allis for its first generation of modern hoists, starting at No. 6 in 1892.<sup>17</sup> Unlike earlier Quincy hoists, this \$43,000 piece of equipment was direct-acting, meaning that the drum shaft was rotated by the engines' cranks, with no intermediary drive or gearing. The hoist's single cylindrical drum, twenty-one feet in diameter and twelve feet across the face, sat between two horizontal engines, each having a forty inch bore and an eighty-four inch stroke. The hoist was more fuel efficient than Quincy's old engines, because its steam cylinders had Corliss valves with automatic steam cut-offs, rather than old-fashioned slide valves. These valves meant that the engine consumed no more steam than it really had to, to do its job. Running on eighty pounds per square inch of steam, the duplex hoist lifted six-ton skips in balance at two thousand feet per minute.

The E. P. Allis Company erected another large duplex hoist for Quincy in 1894.<sup>18</sup> This 2,500 horsepower hoist at No. 2 was the largest that Allis had ever built. The \$60,000 hoist, on its straight drum, could carry 7,500 feet of hoisting rope. The two horizontal engines on either side of the drum each had a forty-eight inch bore and an eighty-four inch stroke. The drum, twenty-six feet in diameter and just over twelve feet across the face, raised skips in balance at a rate of as high as three thousand feet per minute.

In 1900 Quincy erected another \$60,000 E. P. Allis duplex hoist at its new No. 7 shaft.<sup>19</sup> This one was larger again than the one at No. 2. Each engine had a bore of fifty-two inches and an eighty-four inch stroke. The twenty-eight-foot in diameter straight drum mounted between the engines carried up to eight thousand feet of inch-and-a-half wire rope and lifted at three thousand feet per minute.

In 1905 Quincy acquired yet another new hoist, one that was novel in several regards. The No. 8 hoist was smaller than those at Nos. 6, 2, and 7 and cost less, about \$30,000. This hoist did not come not from E. P. Allis, but from the Nordberg Manufacturing Company, also of Wisconsin.<sup>20</sup> The No. 8 hoist could reach a depth of 5,000 feet and lift skips now rated at 8-ton capacity. Each of the horizontal duplex engines had a thirty-two inch bore and seventy-two inch stroke. For the first time at Quincy, this hoist did not have a straight or cylindrical drum. Instead, to give it a mechanical advantage when initiating a lift, it had a conical section on each end, making it a “cylindro-conical” drum, 18.5 feet in diameter across the middle, and 12.5 feet in diameter at each end.

Quincy’s wholesale transformation of its surface plant did not end with the shaft-rockhouses and hoist houses, although they were the most expensive, significant, and visible alterations. During the company’s greatest building era ever, it erected a host of other structures. (Fig. 58.) It erected new compressor houses, holding some of “the finest air compressing machines ever built,” and new boiler facilities to power its new engines. Quincy better equipped itself to fabricate and/or maintain its works and machinery by erecting a new carpenter shop (1893), blacksmith and drill shop (1900), and machine shop (1900). It erected other storage or work buildings: a paint shop (1895), supply office (1893), warehouse (1900), pipe house (1895), oil house for lubricants (1893), and assay office, (1897). Under an agreement with Quincy, the Norths operated a new store at the mine by 1900 – and the company managers took care of themselves, too. In 1896-97, Quincy erected a new company office building just up the road a piece from the agent’s house.<sup>21</sup> (Fig. 59.)

Quincy looked bigger, because it was bigger. It also looked more modern, permanent, and well-to-do. Its new generation of buildings cut quite a contrast with the old, both in design and especially in materials. Up till 1890, Quincy constructed most of its structures of wood or poor rock. The company definitely upgraded its look during this construction boom. True, the firm still erected some structures of wood, especially its shaft-rockhouses through 1900, and some other buildings, such as (fittingly enough), its new carpenter shop. But more and more Quincy put up masonry buildings using red sandstone quarried locally, called Portage Entry or Jacobsville sandstone. Masons laid up numerous buildings, large and small, of this attractive material: the new hoisthouses, the

blacksmith shop, the supply and oil houses, North's store, and the main office building. The new machine shop was done in brick, with a steel truss roof – materials little used before. And the 1908 No. 2 shaft-rockhouse, with its concrete work and steel-frame superstructure, represented a definite design and materials transformation from the nineteenth century Quincy mine to the twentieth.

Expansion and change underground paralleled all the modifications on the surface. Quincy acquired new properties, sank new shafts, and mined a greater length of the Pewabic lode. And with double skip-tracks, larger skips, new hoists, new shaft-rockhouses and a new stamp mill, Quincy achieved a much larger production. During this era, the firm's exploitation of the Pewabic lode changed in a profound way. Not only did it exploit the lode in many new places – it also took out lower grade rock that prior to 1890 it would have passed over. Now, because it could handle, move, and process far greater tonnages, Quincy instructed its miners to drill and blast rock charged with smaller percentages of copper. And still, as agent S. B. Harris noted, the company profited: "We now, both from choice and necessity, mine larger quantities of 'low grade rock' and thus make money in many ways too numerous to mention."<sup>22</sup>

Moving through this era, Quincy's underground, as it got deeper, got a bit hotter. As it approached 80 degrees, the work environment became somewhat less hospitable. The company still relied on natural ventilation and upcast and downcast shafts to take fresh air into the mine and exhaust stale air, laden with rock dust and gases produced by explosives. Sanitation facilities remained primitive. Men still illuminated their work using lighting devices they carried with them. By the late 1890s, instead of candles they now used sunshine lamps that burned paraffin based fuels. At the very end of this era, 1912, they started switching to calcium carbide lamps.<sup>23</sup> Burning acetylene gas, and equipped with reflectors, the carbide lamps produced more light, and aimed that light in the direction a man was looking.

Quincy's contract miners continued to drill shot-holes using large, two-man machines. Beginning as early as 1906, Charles Lawton, the company's new mine agent, began experimenting with new and different drills. Some were like jackhammers, but mounted on posts; some were smaller versions of the piston drills Quincy had been using for nearly thirty years. The goal was to find, ultimately, a machine that could achieve as much hole-drilling in one shift as the current machines, and yet require only half as many men – one per machine – to operate. Lawton through 1912 remained frustrated in this quest.<sup>24</sup> The drills they experimented with weren't always to his liking, and the miners weren't enthusiastic at all about making this change. They did not want to break up contract teams; they did not want to work alone; and they did not want to see half of their fellow miners lose their jobs. Lawton and other mine bosses in the region looked for a new drilling machine that cut costs and greatly enhanced worker productivity. The men, in their turn, wanted tradition and security and a buddy to work with. Through 1912, the men were winning. The older, heavier two man drill remained the standard. When smaller new drills were introduced, curiously enough the men helped the mine bosses discover that the new machines couldn't drill holes as fast as they were supposed to, and they suffered reliability problems, too, and often broke. A little sabotage and soldiering

on the part of miners kept the new technology at bay and created an uneasy stand-off between miners and managers regarding the drills.<sup>25</sup>

At Quincy, the choice of powders to be used in charging and firing shot holes also created a bit of a stir now and then. Miners still charged and fired the shot holes with high explosives, and nitroglycerine dynamite remained Quincy's powder of choice during most of this era. But company officers in the East seemed bent on finding cheaper alternatives, so they sometimes purchased ammonia and gelatine powders, which had different chemistries.<sup>26</sup> Interestingly, with all the changes swirling about the mine, Quincy's agent was often quite content not to change explosives, but to stick with established powders that miners had long used and liked. If the men liked a given powder, then he deemed it was worth keeping.

The work-a-day world of the miner, in terms of the tools of the job and its organization, changed little during this era. The trammer, however, saw some significant changes at the turn of the century, when Quincy became the first mine in the district to mechanize part of his work.

In the 1890s, tramping not only remained the most arduous task underground; in some ways it had gotten worse. As Quincy extended its mine along the Pewabic lode, some tramping runs, from the stopes to the shafts, grew longer. After filling a tram car, men had to push it a greater distance before dumping its load into a skip at the shaft. In 1896, Quincy's trammers struck to ease their burden. To resolve the strike, the company (temporarily, at least) increased the size of trammer teams from two men to three. For the men, this seemed a victory; it lessened the burden on each man to fill and push cars throughout a nine hour shift.<sup>27</sup> Managers, however, saw this as an unwanted burden being shifted on to the company. They had long felt that tramping was too labor intensive, too costly in terms of labor charges. With three men per car, things seemed worse. To better the cost sheet, Quincy's managers sought a means to reduce tramping costs and, at the same time, to reduce the ranks of troublesome trammers in its employ.

Mines had failed in the attempt to change tramping before, either through the use of animals or some kind of mechanized system, operated like cable cars. In 1901, Quincy became the first local mine to make a notable improvement in underground haulage. In that year, working with General Electric, it began putting electric haulage locomotives underground. By the end of 1903, Quincy operated fifteen G.E. locomotives.<sup>28</sup> The power to drive the locomotives came from the local utility, the Peninsula Electric Light and Power Company. Its alternating current, taken underground, powered a motor-generator set; the direct current generator produced the power that the locomotives picked up from overhead trolley wires, much like the way street cars operated. Minimal use had been made of electricity underground prior to this – a bit used for lighting or driving pumps. Quincy's G.E. locomotives represented a large step forward into the electrical age.

Quincy used the locomotives on long haulage runs of two to three thousand feet. (Fig. 60.) Each fifty-five hundred pound locomotive had nine cars in its "stable." While three

three-ton cars were being transported along a drift at six to eight miles per hour, three others were being filled and the other three, dumped. The electric locomotives considerably reduced the cost of tramping by reducing the number of men required for this essential work. In 1902, Quincy's agent, J. L. Harris, figured that with a locomotive, seven men (four loaders, two dumpers, and one motorman) could transport 132 tons of rock across the longest level in a single shift. To move the same amount by hand required twelve men.<sup>29</sup> Quincy's tramping became more efficient and less labor-intensive because trammers now had to do less. They still filled their cars with rock, but they no longer had to push them, because the electric haulage locomotives pulled them. And they no longer had to accompany the tramcars to the shaft in order to dump their contents directly into a skip, once one finally arrived at their level. Quincy cut underground storage bins of five-hundred ton capacity over the shafts. Locomotives pulled tramcars by the mouths of these bins, and brand new "automatic side-dumping" cars discharged their rock into the bins without ever stopping. Later, a filler chuted that rock into a skip. Thanks to all these new devices, in 1903, Harris figured the cost of electric tramping at twelve to thirteen cents per ton; the cost of hand tramping, about twenty cents. The number of trammers employed declined, and Quincy even attempted to trim back their wages, arguing that their jobs were now easier, thanks to the new technology. Meanwhile, the number of locomotives went up, reaching twenty in service by 1910.

By the mid-1890s, new vehicles rode up and down the skip tracks at Quincy. Quincy's man-engine, located between the No. 2 and No. 4 shafts, had taken men to and from the underground for nearly thirty years but was finally put out of service in 1895. Starting with the opening of No. 6 in 1892-93, Quincy switched to man-cars at each shaft.<sup>30</sup> (Fig. 61.) These carried thirty men per trip, up and down. Man-cars rode the regular skip tracks and were moved under the control of the hoist engineers. After 1895, the same engineers also, upon occasion, controlled the passage into and out of the mine of water bailing skips, which collected up to thirteen hundred gallons of mine water per trip at an underground sump cut in the mine rock, and then hoisted it to surface.

With the mine reconfigured, both below and above ground, Quincy took up major modifications of the next two steps: milling and smelting. In 1890 it put a brand new stamp mill on Torch Lake, but that facility did not remain as originally built for long. Quincy enlarged it as the mine expanded its number of shafts and their output. In 1892, as Quincy equipped its new No. 6 shaft, concurrently it added two more Allis steam stamps to the mill built just two years before, bringing it up to a complement of five. In 1900, Quincy added a second and separate mill, containing an additional three stamps, to its Torch Lake complex. (Fig. 62.) By 1905, the two Torch Lake mills stamped 1.1 million tons of rock per year – about ten times the greatest annual production achieved by Quincy's old Cornish stamps on Portage Lake.<sup>31</sup> (Fig. 63.)

From its inception, the Quincy Mining Company had mined and milled its own rock but had not smelted its own product. It had always sent its mineral and mass off to a custom smelter, such as the Lake Superior Smelting Company, believing that its product was simply not great enough to justify the capital expense of building a smelter of its own.

That condition changed, however, in the late 1890s, due to mine and mill expansions. Quincy finally opted to build its own smelter in 1898, on the northern shore of Portage Lake. (Fig. 64.) The new smelter stood on sands at the site of the defunct Pewabic stamp mill, property Quincy acquired in 1891 when it took over the old Pewabic mine. The site was not far from the mine, and was connected by rail to the company's mills, which supplied it with mineral. (Quincy would also accept mineral from other local mines, and smelt their product, too.) The waterfront location facilitated the shipping out of ingot copper to market, as well as the receipt of water-borne supplies, such as metallurgical coal for firing the furnaces.<sup>32</sup> (Fig. 65.)

The two most important buildings at the smelter, both erected of Jacobsville sandstone, were the reverberatory furnace building and the cupola furnace building. Mineral that had traveled six miles via rail from Torch Lake went to the reverberatory building, which had four furnaces in it, one in each corner. Smelting continued at this time to be a batch process, rather than a continuous one. Each furnace was charged, fired, tapped – and then the process repeated itself. Furnacemen still did much of the work of tending the furnaces by hand. They still rabbled it, poled it, ladled the molten copper into molds, and pushed molten slag out of the building in slag buggies. The slag was not pure waste; it included some copper that had not been separated out. Recapturing that copper was the purpose of the cupola building, which stood close to reverberatory building.

Workers charged the cupola furnace, a vertical blast furnace, from the top with hard coal, slag, and limestone flux. The charges passed down the stack into the combustion zone, where the slag melted. The remelted copper from within the slag settled to the bottom of the furnace's hearth and was tapped out. The molten slag was then transported by a narrow-gauge industrial rail line out to a slag pile and dumped. It solidified, and made the slag pile a key element of the smelter landscape. With the continued expansion of production into the twentieth century, Quincy added several new structures to the smelter in the 1900-06 period, including a No. 5 reverberatory building, which provided an additional furnace.

After 1890 the Quincy Mining Company literally made itself over. It changed or added numerous machines, technologies, and buildings in order to increase production, eliminate bottlenecks, reduce its payroll, or otherwise save on production costs. But after 1906, the company faced making some changes underground out of fear and a desire to preserve the mine, which had suddenly become far less stable.

While Quincy strove to get out more product at the bottom of the mine, structural problems in stoped out, older parts of the mine started to plague it. Quincy had been hollowing out the Pewabic lode since 1856, without ever systematically supporting the hanging wall. It had always timbered sparingly; it had not left regularly spaced rock pillars as supports. Instead, random pillars of poor rock left in place supported the hanging wall over the foot wall. Finally, rock pressures grew great enough to shatter the poor rock pillars, causing stoped out portions of the mine to collapse. When portions of the mine fell, the collapsing rock compressed nearby air and shot it through the mine. Hence the local term for the rock bursts: "air blasts." They were known after their effect,

not their cause. These collapses could often be felt on the surface, too, and when they rumbled houses on Quincy Hill or down in Hancock, they earned monikers like “old rousers” or “radiator rockers.”<sup>33</sup>

The rock bursts in abandoned stopes would have been of small consequence, if their damage had stopped there. But the collapses sometimes extended to the shafts. In 1906, as the air blasts were beginning, rock falls commencing at the mine’s fortieth level crushed stretches of the No. 2, 6, and 7 shafts, putting them out of business for up to ten days. Besides interrupting production, burying shafts, and shattering compressed air lines, the air blasts offered the potential of a real disaster. Large numbers of men sometimes occupied the shafts, particularly at the beginning and end of a shift, and a collapse at the wrong time might kill many. Or maybe, instead of being localized, a rock burst might bring down a huge section of the mine at once, jeopardizing an entire shift of workers. These blasts did not occur just infrequently. No count exists for the first years of this troublesome and frightening phenomenon, but between 1914 and 1920, Quincy recorded over 400 separate rock bursts.<sup>34</sup> Starting in 1906 and for many years afterwards, the air blasts frightened the mine’s new agent, Charles Lawton, as well as the men who went into the ground every work day.

Quincy, over a several year period, studied means of protecting life and property from air blasts, looking for a solution that was both technologically and economically feasible. The mine flirted with switching from its established advancing system to a retreating system. Following the established advancing system, miners started at a shaft and stoped outwards along the drift, thus moving away from the shaft. Under the proposed retreating system, miners would first drive a long drift to the end of the ground tributary to a shaft. Then other miners would begin stoping at the end of the drift, and retreat back toward the shaft. This was deemed safer, because under the retreating system, miners and trammers did not have to regularly pass through stoped out ground that might collapse. But the system was also expensive to initiate, because it called for a host of new long drifts to be driven, while much stoping was suspended. So Quincy through 1910 or 1912 experimented with the new system, without broadly adopting it. Instead, it started leaving regularly spaced rock pillars alongside each shaft, unmined, to provide for a more secure hanging wall. And it also had laborers now lay up rib-packs or rib-walls of poor rock.<sup>35</sup> As stoping progressed along a level, a rib-wall was put in running alongside the drift, in order to help support the hanging.

The air blasts rather forcefully reminded the Quincy Mining Company that even though it had made itself over on the surface, and even though it was reaching new levels of employment and production, it was, in fact, an old and deep mine. In many ways, it was fragile.

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<sup>1</sup> Gates, Michigan Copper, 198.

<sup>2</sup> *Ibid.*, 198.

<sup>3</sup> *Ibid.*, 198; Lankton and Hyde, Old Reliable, 152.

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- <sup>4</sup> Richard A. Fields, Range of Opportunity: A Historic Study of the Copper Range Company (Hancock, Mi., 1997), 114.
- <sup>5</sup> Gates, Michigan Copper, 207.
- <sup>6</sup> *Ibid.*, 208-09; Lankton and Hyde, Old Reliable, 152.
- <sup>7</sup> Gates, Michigan Copper, 204, 218-19; Lankton and Hyde, Old Reliable, 152
- <sup>8</sup> Hyde, Copper for America, 81; Gates, Michigan Copper, 198.
- <sup>9</sup> Percentages calculated from production figures given in Lankton and Hyde, Old Reliable, 152 and Gates, Michigan Copper, 198.
- <sup>10</sup> Hyde, Copper for America, 92-94.
- <sup>11</sup> Lankton and Hyde, Old Reliable, 52, 54, 101, and map, 102.
- <sup>12</sup> Lankton, "Technological Change at the Quincy Mine," 360, 370, 376-77, 441-45.
- <sup>13</sup> Lankton and Hyde, Old Reliable, 68, 70-72; Lankton, "Technological Change at the Quincy Mine, 363-65, 371-72.
- <sup>14</sup> Sharpless, "Ore Dressing on Lake Superior," 98.
- <sup>15</sup> Lankton and Hyde, Old Reliable, 113-14, 116-19.
- <sup>16</sup> L. Hall Goodwin, "Shaft-Rockhouse Practice in the Copper Country – IV," E&MJ (10 July 1915): 53-56; T.C. DeSollar, "Rockhouse Practice of the Quincy Mining Company," LSMI Proc. 13 (1912): 217-18.
- <sup>17</sup> Lankton, "Technological Change at the Quincy Mine," 366-67; Lankton and Hyde, Old Reliable, 63-64.
- <sup>18</sup> Lankton, "Technological Change at the Quincy Mine," 372-73; QMC, A.R. (1894), 14; Engineering News (18 April 1895), 255; Lankton and Hyde, Old Reliable, 64.
- <sup>19</sup> Lankton, "Technological Change at the Quincy Mine," 376.
- <sup>20</sup> *Ibid.*, 379-80.
- <sup>21</sup> Lankton and Hyde, Old Reliable, 57, 74-76, 93; McNear, "Quincy Mining Company: Housing and Community Services," 552-54; also, see QMC's annual reports for 1890-190-0 and the entry for the Quincy Mine in Steven's Copper Handbook 1(1900).
- <sup>22</sup> SBH to W. Hart Smith, 18 Feb. 1893, QMC coll., MTU.

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- <sup>23</sup> Lankton and Hyde, Old Reliable, 62, 108, 113.
- <sup>24</sup> Lankton, Cradle to Grave, 104-06.
- <sup>25</sup> Ibid., 107-08.
- <sup>26</sup> Ibid., 97-99.
- <sup>27</sup> SBH to TFM, 29 April 1896.
- <sup>28</sup> Lankton, "Technological Change at the Quincy Mine," 386-88; Steven's Copper Handbook 2 (1902), 242; the company's progress in installing electric haulage is also covered in its annual reports for 1901-03.
- <sup>29</sup> JLH to J. H. Wilson, 26 Dec. 1903 and to WRT, 19 June 1902. Also see Lankton, Cradle to Grave, 102-03.
- <sup>30</sup> QMC, A.R. (1893), 14; A.R. (1895), 14; Steven's Copper Handbook 2(1902), 244.
- <sup>31</sup> QMC, A.R. (1891), 13; A.R. (1900), 12; A.R. (1905), 9; Lankton and Hyde, Old Reliable, 78-80, 83.
- <sup>32</sup> Lankton and Hyde, Old Reliable, 80, 82, 84, 128.
- <sup>33</sup> Ibid., 106-08; Lankton, "Technological Change at the Quincy Mine," 405-11.
- <sup>34</sup> QMC table, "Air Blast Data from March, 1914 to April, 1920," QMC coll., MTU.
- <sup>35</sup> Lankton, "Technological Change at the Quincy Mine," 411-13.

## CHAPTER 12

## CALUMET AND HECLA: NEARING THE END OF EASY TIMES, EASY MONEY

By the 1890s, the mighty C&H company and mine had more problems to resolve than in earlier decades. The hanging wall of the Calumet Conglomerate lode needed to be supported more systematically. The great underground fire hazard posed by C&H's labyrinth of timbering had to be reduced. By the 1890s, mine managers and the company president, Alexander Agassiz, were clearly vexed by new immigrant workers, especially trammers, who seemed bent on causing trouble. And by the early 1900s, the copper value or copper yield per ton of rock hoisted from the Calumet Conglomerate lode was rapidly declining.

To protect its future and remain a dominant company, C&H had to address all these problems. To protect itself from large collapses of the hanging wall, it left rock pillars next to its shafts and adopted the retreating system of mining. To guard against catastrophic fires that might close the mine for lengthy periods (as had happened in 1887 and 1888), it opened a whole new branch of the mine, reached by an engineering marvel: Red Jacket shaft. To get rid of fractious trammers, the company tried to mechanize tramming, so that fewer men would be needed. On the surface, C&H continued to improve its extant works along the Conglomerate lode. The company's great past rested on the richness of that copper deposit. But the Calumet Conglomerate lode wasn't what it once had been, and it wouldn't last forever. C&H recognized that to secure its future, it had to seek out other sources of copper.

Through 1910, in terms of underground technologies, C&H did not achieve as much technological change as it would have liked. After their introduction about 1880, large two-man drilling machines remained the norm at C&H, just as they did at Quincy and throughout the district. The switch to smaller, lighter one-man machines was in the works, for sure, but not happening very fast, or very easily. In moving rock from stope to shaft, C&H continued to rely on hand-tramming, much to its own dismay. It tried, but failed, to find a mechanized method that would cut mining costs and simultaneously reduce the company's reliance on new immigrant workers.

By the 1890s, the ethnic mix began to change rather dramatically, as new immigrant groups, especially Finns, but also Italians and eastern Europeans, arrived in large numbers. These men typically started work as trammers. In its 1891 Annual Report, C&H noted that "it is becoming more difficult, from the number of men who do not speak English, to deal directly with our employees." The gulf between employer and employee widened at C&H in May, 1893, when the trammers working the Calumet branch of the mine refused to go down for their night shift on Sunday. By Tuesday, nearly all of C&H's trammers had joined the strike. They tried to keep other men from going to work and briefly seized control of the Superior engine-house. C&H called in the County Sheriff, and he and a large force of deputies helped break the strike. In its Annual Report for 1893, the company noted that, "It was a great disappointment to find that there were among the employees of the Company so many men ready to forget the

friendly relations which had always existed between the men and the officers of the company.”

If the men were the first to forget “friendly relations,” the mine bosses were the second, and in short order. By the end of 1893, Agassiz wrote to his mine superintendent that “We must be prepared to do our tramping in some other way than man power very soon, for the men, judging from scraps in the paper, are beginning to talk about the use of men as beasts of burden.” Agassiz, never a man forgiving of transgressors, then made his views of trammers clear: “I shall be very glad not to have any of them.”<sup>1</sup>

In truth, there was no way for C&H to eliminate all trammers; that was just wishful thinking on Agassiz’s part. But to save on labor costs and to reduce the ranks of fractious trammers, in 1894-95 C&H began experimenting with mechanized underground haulage.<sup>2</sup> The company turned to a cable-car kind of system, with motive power provided by engines driven by compressed air. The drums connected to these engines wound and unwound wire ropes or cables that ran past the shafts and down along drifts to the stopes. Men still loaded and unloaded the two-and-a-half ton tramcars, but they no longer pushed them. They were pulled full to the shaft and returned empty along the drift by the endless cable.

The cable-car haulage system did not prove an unqualified success. C&H never put it into place throughout the underground. Next, the company sought to mechanize haulage and eliminate trammers by means of electric locomotives, such as those used at Quincy after 1901. But the great mine failed to figure out how to deploy electric haulage locomotives in a manner that saved money. Cables or locomotives moved cars, but men still filled and emptied them – meaning that the new technology did not substantially reduce labor costs. When quizzed once on why C&H hadn’t succeeded in mechanizing tramping, James MacNaughton replied, “It had been sort of an impossibility.”<sup>3</sup> In trying to revolutionize underground work at his mine through 1910-12, MacNaughton was twice stymied. Both drilling and tramping continued on much as they had thirty years before, with no new break-through machines serving to cut labor costs while raising productivity.

The continuing instability of the mine’s hanging wall prompted the company to alter its general method of mining. By 1895 C&H used the retreating system. Miners now drifted out to the end of ground served by a given shaft. Then stoping miners started taking copper from the end of the drift, and as they progressed, retreated back towards the shaft. The object was always “to have solid ground between the miners and the shaft.”<sup>4</sup> They could not be trapped, and the drifts could not be closed, by any falls of the hanging wall in stoped out ground.

C&H also evidenced growing concern over the protection of shafts from any collapses of the hanging. A crushed shaft would shut down active mining in its vicinity for a lengthy period, until men recovered the shaft by removing the rock and rebuilding timbers, skip tracks, compressed air lines, and the like. C&H had done a better job than Quincy of protecting its shafts. It had started leaving modest shaft pillars in place even at shallow depths. By 1895 to 1900, these pillars extended 75 feet on both sides of a shaft. Use of

the retreating system and shaft pillars did not eliminate C&H's heavy use of timbering. Supports remained necessary to secure the hanging walls until stoping in a given area was completed. By 1900, C&H installed thirteen million board feet of square-set timbers underground per year and twelve million feet of stulls.<sup>5</sup>

The timbering guarded against rock falls, but presented the grave danger of fire. After the catastrophic fires of 1887 and 1888, C&H had made many changes to its established works. It closed down three of fifteen hoisting shafts (because they were deemed too expensive to recover), abandoned its old, damaged man-engine and pump-rod shafts, and adopted man-cars and electric pumps. C&H took numerous steps to try to prevent, contain, or fight future fires. The company started treating underground timbers with zinc chloride and whitewash to make them more fire resistant. Men now regularly sprinkled shaft timbers with water. Once a level was stoped out, laborers built walls of rock to close it off from the shaft. To respond faster to a fire, the company installed an electric fire alarm system underground and a telephone system. It also installed water pipes, hydrants, hoses, and chemical extinguishers.<sup>6</sup>

The disastrous fires of the 1880s also encouraged C&H to sink a major new shaft into the Conglomerate lode. During the fires, while two interconnected branches of the mine were closed and sealed off at the surface, the separate third branch, South Hecla, remained in service. C&H wanted to extend its ability to mine significant product, even if hit by additional fires. So in 1889 miners started sinking the Red Jacket shaft, located a considerable distance north and west of its main works. (Fig. 66.) Red Jacket shaft was highly unusual in this district. It was not inclined, nor did it follow the lode down. Instead, it went straight into the ground, driven through poor rock. The shaft sinkers at Red Jacket intersected the dipping Conglomerate lode 3,260 feet below the surface, then they continued on, bottoming out at 4,900 feet in 1896. At this depth, Red Jacket shaft was reportedly the deepest mine shaft in the world.<sup>7</sup>

Calumet and Hecla outfitted Red Jacket shaft in a manner unlike all others. (Fig. 67.) The company published no cost figures for this work, in part no doubt to avoid controversy and criticism over whether the investment was worth it. Surely sinking and equipping a shaft, measuring 15.5 feet by 25 feet, to a depth of 4,900 feet was immensely expensive. C&H divided this extremely large shaft into six compartments. It reserved two for hoisting men, who rode in double-decker, elevator-like "cages." (Fig. 68) The remaining four shaft compartments hoisted rock. The rock skips in the compartments did not operate independently. They were paired, and each pair operated in balance, one going down, one going up.

Because the shaft was vertical, and intersected the lode at only one point, it also required the driving of numerous crosscuts from the shaft over to the lode, where drifting and stoping would follow. On top of all that, literally, the company built an impressive surface plant replete with a new steel-frame shaft-house, engines, boilers and other support buildings.<sup>8</sup> Even president Agassiz entertained serious doubts, during the economic hard times of the early 1890s, about the efficacy of the whole endeavor.<sup>9</sup> The fires had forced this action. Agassiz and C&H believed the Red Jacket shaft was

essential for mining the northern end of the Conglomerate lode to great depths – and being independent of the other mine branches, it could stay in full-bore operation even if they went up in flames again – or so it was thought. Originally, the Red Jacket shaft was not supposed to connect underground to the other works. But a safety issue was raised – could they have only one way out of that part of the mine, through the one vertical Red Jacket shaft? Also, C&H encountered a ventilation and air temperature problem at Red Jacket. Rock temperatures at its bottom hit eighty-seven degrees. To offer a second way out, lower temperatures, and improve ventilation, C&H holed through openings at Red Jacket with ground tributary to the Calumet branch's No. 4 shaft, and where they met, installed fire doors.<sup>10</sup>

Ultimately, Red Jacket shaft proved its worth and became the company's major production unit on the Calumet Conglomerate lode. But this had not happened by the end of the 1890s, and in 1900 the shaft failed the test for which it had been created. In May, workers discovered a fire near Hecla shaft No. 3. They were unable to douse it with water or chemicals. Other men ran to close fire doors along the various branches – including fire doors where the Red Jacket works had been connected to the rest of the mine. The doors kept the fire from spreading towards Red Jacket shaft – but they did not seal off that ground from the fire's smoke and gases. The gases sank to the bottom of the older works, then infiltrated the Red Jacket openings, fire doors or not, and drove workers out. The Red Jacket works suffered no damage, but like the rest of the mine, it had to be closed for three weeks while the fire died out. During those weeks, again the South Hecla branch alone remained in production while a fire stubbornly carried on.<sup>11</sup>

Up above the mine, C&H's surface plant in the 1890s, even before the works at the Red Jacket shaft were completed, was second to none in the United States. (Figs. 69-70.) It is doubtful that a more impressive array of stationary steam engines and machinery existed anywhere else in the country. President Alexander Agassiz's penchant for large systems, and for building big to meet tomorrow's needs – coupled with Erasmus Darwin Leavitt's engineering acumen – had resulted by the early 1890s in a plant that could handle great production levels. Unlike Quincy, when the rise of the electrical industry stimulated a much greater demand for copper, C&H did not have to make itself over from one end of the mine to the other to augment production. Many extant engines and shafts simply upped their capacities, which had never been fully reached in earlier times. Still, the company did make some very significant changes in its physical plant at the mine as it moved from “big” to “even bigger.” Some of these mirrored what Quincy was doing at the same time. C&H, too, streamlined its sorting and breaking of rock on the surface by becoming less dependent on just a few rockhouses, which received their rock via tramroad from several shafts. These structures now represented bottlenecks in the production flow. In the early 1890s, C&H put sorting and crushing equipment right over the collars of many, erecting eight combined shaft-rockhouses along the Conglomerate lode in 1891-93.<sup>12</sup> Later it added more.

C&H itself moved further into the electrical age in the 1890s. As early as 1878 the company lighted its stamp mills with arc lamps, and by 1881 a Brush arc-light dynamo helped illuminate the mine's surface plant. After 1891, C&H began using electric power

on a broader scale, using it to drive machinery. Fittingly, as a symbol of its movement from mechanical towards electrical power, C&H put its enlarged electrical generating facilities at the mine in its old “gearhouse.”<sup>13</sup> This structure had been part of C&H’s earlier, cumbersome system of transmitting mechanical power along the mine using ropes and reciprocating rods.

The 1891 electrical generating station housed a 400 horsepower Porter-Allen steam engine and a compound Westinghouse engine of 740 horsepower. The engines drove two electric light dynamos, each sufficient to light a thousand lamps of sixteen candle-power; three arc-light dynamos of seventy-four lights; and five Brush generators. From the gear house, reborn as a modern powerhouse, a line of electric poles ran the full length of the surface plant, and in 1892 electric lines for the first time ran underground to power the mine’s new motor-driven pumps.

While starting to broaden its uses of electrical power, C&H in the 1890s remained very much in the steam age as well. To an already impressive complement of engines, in the mid-1890s C&H added the “Mackinac” engine, a triple expansion “steel giant” of seven thousand horsepower, to its Calumet branch.<sup>14</sup> Even more important and monumental were the new facilities at Red Jacket shaft.

To equip the Red Jacket shaft for production, besides building an immense shafthouse, C&H installed ten new boilers of a thousand horsepower each. It built a 220-foot by 70-foot engine house, which sheltered steam-engines producing about 8,000 horsepower. (Fig. 71.) Like so many of the company’s engines, Red Jacket’s “Minong” and “Siscowit,” engines were designed by Leavitt and built by I. P. Morris. (Fig. 72.) These vertical, triple expansion, beam-type engines ran with condensers to make them more fuel efficient. The twin engines had a six-foot stroke and cylinder bores of twenty, thirty-two and fifty inches. The engine house, as originally configured, also contained the secondary engines, “Mesnard” and “Pontiac.” Leavitt initially intended for the Minong and Siscowit engines to hoist ten-ton skips at sixty feet per second, or thirty-six hundred feet per minute. In actual use, raising 7.5 ton skips at 2,700 feet per minute, the two engines had the capacity of lifting 2,000 tons of rock per day over two eight-hour shifts.<sup>15</sup>

Red Jacket’s hoisting machinery was notable not just for its size, but for its mode of operation. The engines were not directly connected to any large straight-faced or conical drums. The engines did not provide 4,900 feet of hoist rope for each skip in Red Jacket shaft, nor did they wind hoisting rope on an individual drum for each skip. The Red Jacket hoists used the endless rope or “Whiting” hoisting system, designed by C&H’s general superintendent at the time, S. B. Whiting.

The “Whiting” system machinery occupied a 412-foot by 32-foot “tailhouse” near the engine house. Using this system, each pair of skips required about 6,500 feet of hoisting rope. A rope connected to one skip came out of the ground at the shafthouse and ran to the hoist house. There it made only a few turns around a hoist drum before leaving the enginehouse and running to the long tailhouse. The rope passed around a head sheave (pulley) mounted on a tension carriage that moved over rails. The rope, after going

around the sheave, returned to the shaft, where it connected to the second skip. To further enhance the operation of these two skips in balance, C&H equipped them with tail ropes in their vertical hoisting compartments. A wire rope connected to the bottom of one skip ran down to and around a sheave mounted at the bottom of the shaft. It then passed up to connect with the second skip. Thus a long length of rope always hung beneath an empty skip at the surface, and that rope's weight helped lift the heavier weight of the paired, loaded skip, when its lift started.<sup>16</sup>

With all the machinery in place along its Hecla, Calumet, South Hecla and Red Jacket branches by 1900, Calumet and Hecla was virtually set for life. The extant works basically handled the output of the Calumet Conglomerate lode for as long as it remained in production. Right at the turn of the century, with major capital investments in new machinery at the mine completed, and with copper prices at recent highs, Calumet and Hecla enjoyed its three most profitable years ever. But the Conglomerate's diminishing yields at depth clouded the company's future. One way or another, the company thought it needed to acquire additional sources of copper.

In the October, 1931 issue of the Mining Congress Journal, which was devoted to the past, present and future of Calumet and Hecla, James MacNaughton wrote an article that set forth some of his company's problems and opportunities in the twentieth century. Of particular importance, as a problem, was the fact that in 1874 the Conglomerate lode yielded a high of 96.8 pounds of copper per ton of stamp rock. In 1900, the rock yielded only 52.15 pounds per ton. The lode had increased in thickness at depth, but the concentration of copper fell off. By 1907, the yield had declined still further, to about forty pounds of copper per ton of rock hoisted. In the face of such decline, as MacNaughton wrote, "an expansion of the company's scale of operations seemed desirable."<sup>17</sup> So the company undertook several measures to continue to provide for a high production of ingot copper. Some measures worked; others, not so well. Never, however, did C&H find another copper source as great as the one that had launched the company in the late 1860s.

C&H looked for more copper on the mineral lands it already owned in the vicinity of Red Jacket and Laurium. Calumet and Hecla went on the eastern side of its once-great Calumet Conglomerate lode to open works on two amygdaloid lodes on its property. This activity began in the last years of the nineteenth century, when C&H began sinking shafts into the Osceola lode. C&H's No. 13 shaft opened there in 1897, followed shortly thereafter by Nos. 14 and 15. The company continued to expand on the Osceola, adding shafts No. 16 and No. 17 in 1899, and a No. 18 shaft, added in 1906.<sup>18</sup> Some of these shafts were more exploratory than productive, and C&H sometimes suspended operations on the Osceola when copper prices dipped. Still, the company now had a eleven-hundred-foot-long-run of the Osceola amygdaloid ready for possible exploitation, whose rock had yielded as much as twenty-two pounds of copper per ton of rock. If and when copper prices ran high enough, that yield could be made to pay.

In similar fashion, but in a less intensive way, in 1903 C&H opened yet another mine, east of the Osceola lode, on the Kearsarge lode. The company did not push this particular



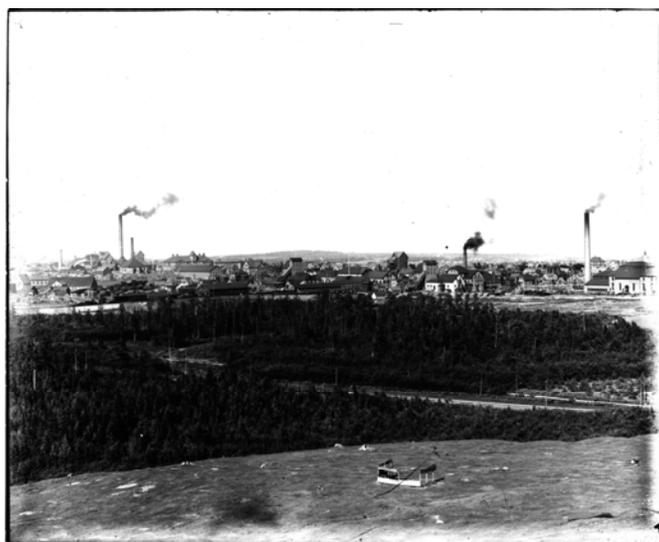
**Figure 66**



**Figure 67**



**Figure 68**



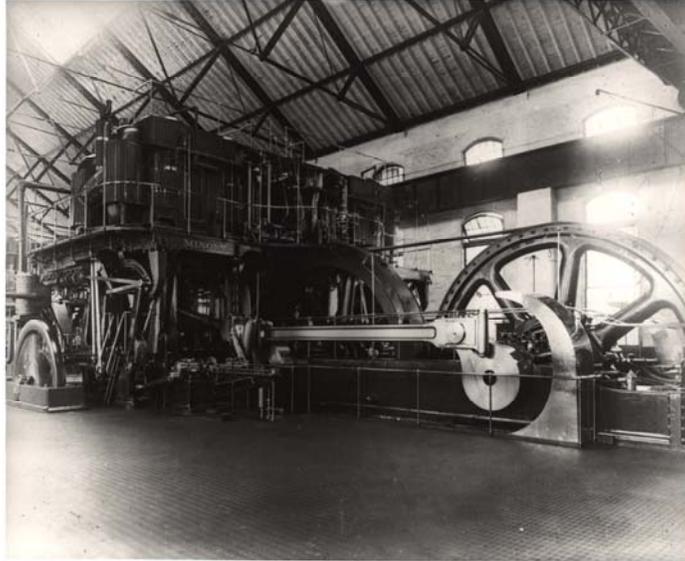
**Figure 69**



**Figure 70**



**Figure 71**



**Figure 72**



**Figure 73**



**Figure 74**

development with great vigor, but by 1906 it did lay down three shafts (Nos. 19, 20 and 21), sinking two of them down to the sixth level. These works on the Kearsarge represented a test, an exploration undertaken by a company in search of more sources of copper. Not showing a rich yield, this ground at the time did support full-fledged production.<sup>19</sup>

C&H also hoped to find new copper well beyond its established works. In hopes of finding new ore bodies, it purchased large tracts of land in Keweenaw County. But two or three years trenching, digging test pits and diamond drilling failed to turn up anything of value. By about 1906, C&H tried another approach. Besides looking on its established property for more sources of copper, and besides buying additional land it only hoped contained copper, it also started buying up stock in other copper mining companies. In a 1910 letter "To the Stockholders," C&H management explained the move:

When this company acquired holdings of stock in various companies owning properties and, in some cases, operating mines in the vicinity of the mines of this company, it was with the purpose of assuring the continuance of the life of this company and the profitable use of its very valuable plant after the exhaustion of its own mineral deposits.<sup>20</sup>

Under a new state constitution and new state laws in Michigan, one mining company could now organize and own new companies under its control, and it could also buy up

stock in established mining companies. C&H looked for opportunities up and down the Keweenaw to connect its interests with those of other companies and properties. Some mines that interested C&H were active, known producers. Others were struggling – they had property, perhaps, but lacked the capital to explore it, develop it, or put it into production. C&H had developed a run of the Kearsarge lode on its property, and it decided to acquire interests (at a cost of more than \$7 million) in the Osceola, Allouez, and Centennial mining companies, which owned their own parts of the Kearsarge lode. It purchased controlling or major interests in many other companies, including the Isle Royale, Tamarack, and Ahmeek mines. It organized new companies both on the northern and southern ends of the mineral range, such as the White Pine Copper Co., located at the Nonesuch lode in Ontonagon County. C&H's empire, once concentrated at one spot, now reached along much of the copper range.<sup>21</sup>

C&H leadership took over the management of all these various operations, but they continued to operate with their own separate identities, as individual companies.. By 1910-11, Calumet & Hecla wanted to go a step beyond that, and consolidate many companies, but not all, into one. (Those companies to be included were C&H, Ahmeek, Allouez, Centennial, Osceola, Tamarack, Seneca, Laurium, LaSalle, and Superior.) In his piece in the Mining Congress Journal of 1931, MacNaughton gave the prime reasons:

For a time the identity of the several companies was maintained, and the mines were operated as separate units; but it soon became apparent, because of the contiguity of all but one of these mines, that greater economies could be secured by a consolidation into one company, by abandoning intervening boundary lines, making common use of more favorably located plants, operating fewer shafts, centralizing management, accounting, purchasing, milling, smelting; and many other minor operations.<sup>22</sup>

The consolidation, in short, promised to assure a large supply of copper, but reduce its production cost by eliminating redundant or unproductive shafts; trimming the number of railroads needed to transport materials; reducing the number of mills and smelter furnaces in operation, while running the surviving units to full capacity. That became C&H's dream of the future. But the future did not come in 1911, when the consolidation was proposed to take place, because a lawsuit filed by non-C&H stockholders in one of the other companies stopped it. (The consolidation would eventually come, but not until the 1920s.)

In the middle part of the 1890s, nine to eleven steam locomotives and some four hundred rock cars on the Hecla and Torch Lake Railroad delivered massive tonnages of stamp rock every working day to C&H's two mills on Torch Lake. The mills, like the mine, were bastions of impressive steam power. Inside them, split equally between the mills, twenty-two large Leavitt steam stamps pounded away, and some of the largest pumps in the nation, having a combined capacity of over 110 million gallons, delivered the water needed to process the copper and rock. By 1899, the mills poured out five thousand tons of stamp sand wastes daily. The C&H mills used five sand wheels, with diameters of forty, fifty, or sixty feet, to lift the sands and water from the base of the mills up to an

elevated position. Discharged at the top of the wheels into launders, the sands then flowed down these troughs and finally dumped into the lake.<sup>23</sup>

Another way for C&H to find more copper was to improve its milling technology, to capture more of the copper liberated from the rock, and to wash less of it – the finest particles of it – out with the tailings. Fortunately for C&H, while the yield of copper per ton of rock declined around the turn of the century at the mine, the recovery of copper at its stamp mill improved. Early milling technologies employed at the C&H mill had captured only three-fourths of the copper included in the rock. A fourth of C&H's copper never became an ingot, or a pan bottom, pipe, roof, or power line. That copper – over 400 million pounds of it – was in the 120-foot-deep deposit of waste sands outside C&H's mills in Torch Lake. At the turn of the century, C&H's mills still sent out with their waste sands more than twenty-two million pounds of copper annually.<sup>24</sup> The company looked to reduce this on-going loss of copper. By 1912 it was also planning to recover copper lost once already, by reclaiming it from the lake bottom stamp sands.

Starting in the late 1890s, over the next fifteen to sixteen years C&H improved its milling technology so that instead of capturing only seventy-five percent of the copper in its rock, it captured ninety percent. This was no insignificant difference. C&H took a major step forward in 1898, when it became the first Lake mine to put Wilfley tables in its mills. This was not a home-grown technology, but one first developed in Colorado by Arthur R. Wilfley. (Fig. 73.)

The Wilfley tables captured finer particles of copper. These tables, with their slightly inclined tops, were surfaced with linoleum. They carried parallel rows of low riffles across part of the surface. Water mixed with small particles of copper and rock flowed out onto the table, which was given a vibrating or shaking motion. The water and rock tended to flow down, across and over the riffles, while the copper collected behind them. The table's back and forth motion moved the copper along the riffles, until it reached the end of the table, flowed off, and was collected. Because Wilfley tables captured fine copper, C&H started grinding its mineral to a smaller size, using Chilean mills. Set upright on their edges, these rotating wheels, about six feet in diameter, broke and abraded the rock against a die at the base of the machine. This grinding liberated more copper. Before, that copper had remained bound up inside coarser grains of sand, which had flowed through the mill and out into the lake. Now, C&H captured that copper.<sup>25</sup>

With these and other new milling technologies in hand, C&H was encouraged, for the first time in thirty years, to effect a wholesale change in its milling operations. Over a multi-year period ending in 1906, the company employed the Wisconsin Bridge and Iron Company to phase out its two original wood-frame mills, while replacing them with thoroughly modern steel and concrete mills, clad in corrugated metal, that had a total of twenty-eight steam stamps and all new washing and separating machinery, mostly driven by electric motors.<sup>26</sup> C&H built the mills to win a higher percentage of the copper passing through and to increase its milling capacity, so it could treat the rock coming from new properties, and not just the Calumet Conglomerate lode.

The improved milling technologies that captured more copper coming from the mine could also be applied to the waste sands in Torch Lake. Those sands, retrieved, could be ground more finely and treated to capture the copper missed the first time around. Starting as early as 1901, not just C&H, but several companies on the Lake (including the Quincy Mining Company) started experimenting with the idea of reclamation, of pumping submerged stamp sands back to shore, and retreating them to get out their copper. C&H in 1901 had an agreement with a related firm, called the Metals Recovery Company, to investigate milling improvements that might lend themselves to a profitable means of reclamation, and in 1904 it ran a limited test of reclamation itself. It took to a mill some sand deposited in Torch Lake in 1866-70, whose included copper had originated at the Calumet branch of the mine. This test indicated that reclamation might well pay, and pay for the cost of erecting a special plant to do the work. In 1912, C&H initiated engineering plans for a new reclamation plant at Torch Lake, which would begin retreating tailings in 1915.<sup>27</sup>

Near the turn of the century, C&H also launched some substantial changes in its refining and smelting of copper. Early in the 1890s, the company followed the standard practice of having men refine and smelt copper in relatively small reverberatory furnaces that produced one batch of ingot copper at a time. Sixteen furnaces sat in four separate buildings at Hubbell, and a second smelter embodying traditional technology operated in distant Buffalo, New York. By the end of the 1890s, however, C&H introduced some major technological changes, changes that were in full swing by the early 1900s. These involved new furnaces for smelting, new casting techniques, and C&H's first use of electrolytic refining.

C&H was not always the innovator. It watched other mining companies try something new, and if it proved successful, C&H adopted the change for its own purposes. In 1888 the Tamarack and Osceola mining companies jointly built a smelter at Dollar Bay on the Keweenaw that followed established designs and practices. But in 1898 the Dollar Bay smelter introduced a new furnace concept that C&H rapidly borrowed for itself. They abandoned the small furnaces that did both melting and refining and replaced them with a larger reverberatory furnace where the copper was melted. Then at intervals they drew the molten copper from this furnace and sent it to other furnaces for refining.<sup>28</sup> This idea of melting and refining in separate furnaces, coupled with an increase in furnace size, was an important innovation that saved on labor and fuel costs.

C&H built its first large, specialized melting and refining furnaces after the Dollar Bay model at Buffalo. By 1900, its Buffalo furnaces had a capacity raised from thirty thousand to one hundred thousand pounds. C&H eliminated much human shoveling, and reduced labor costs, by loading the melting furnace with a motorized conveyer, and mechanization also reached the casting end of the operation. At Buffalo, a circular, rotating Walker casting machine stood at the tapping end of a refining furnace. Men still ladled the copper out, using trolley ladles of 100-150 pound capacity, but they didn't walk over to the molds. They stood still more, and the casting machine continuously brought empty molds by their positions. After the filled molds passed the ladlers, a water spray helped cool and solidify the copper faster. Then the machine automatically

dumped the ingots into a water bath for further cooling, and a conveyor carried them away. The Walker machine reportedly allowed men to pour a furnace charge in less than one-fourth the time required by the old method of ladling. In January 1911 C&H started rebuilding its smelting plant at Hubbell. There, it erected a new steel-frame smelter containing two 150-ton “Jumbo” reverberatory funaces.<sup>29</sup>

Even before changing its furnace designs, C&H experimented with a wholly different means of refining some of its copper, rather than just rabbling and poling it in a furnace. In 1894-95, it built an experimental electrolytic refining plant at Buffalo, and in 1899-1900 it built a full-scale production plant there. This plant made use of the principle of electrolysis, discovered by Michael Faraday in 1835: metals can be separated and then selectively deposited using a continuous electric current. A Newark, New Jersey, smelting works first practically applied electrolysis to copper refining on a commercial scale in 1881. In the 1890s, this technology rapidly evolved, and between 1892 and 1902, the production of electrolytic copper rose from 25,000 to 250,000 tons. By early in the new century, the bulk of the world’s copper was electrolytically refined to remove impurities that lowered its workability or electrical conductivity.<sup>30</sup>

The copper companies in the Western U. S. had led the way in the large-scale adoption of electrolytic refining. C&H became the first Lake mine to use the process. In its case, C&H wanted to reduce the level of two impurities: arsenic and silver. As C&H mined deeper levels, more arsenic turned up in its copper, which hurt its workability. By removing or at least reducing that element, more of the company’s product could go into wire for the electrical industry. And if traces of silver could be removed and recovered, the value of this precious metal would help pay for the construction and operation of the electrolytic refining plant.

The plant consisted principally of a dynamo to provide continuous current; large tanks filled with a current-carrying (thus, electrolytic) solution; and racks submerged in the solution which held copper anodes and copper cathodes. C&H cast its copper anodes from molten copper made from mineral assayed higher in silver content. These copper anodes were the ones broken down by the electrical current. Copper migrated from the anodes, through the solution, and across to the cathode plates, where it was deposited. By manipulating the electrical current and the electrolyte, C&H adjusted the process to see that only copper reached the cathodes. Silver and other impurities, once liberated from the anodes, precipitated out as sludge on the bottom of the tank. By remelting the high-purity cathodes with its richer grades of mill concentrates, C&H produced a more desirable, lower-arsenic copper of higher electrical conductivity. And by collecting, drying, and smelting the tank sludge, it recovered valuable silver.<sup>31</sup>

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The Calumet and Hecla Mining Company of 1910 differed greatly from the company of 1890. It had substantially expanded its physical plant at its original mine site, at its mills, and at its two smelters in Hubbell and Buffalo. It no longer mined the Calumet conglomerate exclusively, but also mined amygdaloid deposits. It had expanded

territorially, acquiring new property up and down the Keweenaw that it explored in hopes of tapping into a heretofore undiscovered major lode. It had created new mining ventures and purchased large and usually controlling interests in other extant companies, which it now managed. It had adopted important new technologies at its mills to capture more copper per ton of rock stamped and was primed to launch a new reclamation plant to reprocess tailings and thus “mine” over four hundred million pounds of copper sitting at the bottom of Torch Lake. New technologies at the smelters cut production costs there, while allowing C&H to put a more desirable product out on the market.

Calumet and Hecla created new opportunities for itself during this era, because its old source of easy money, the once fabulously copper-rich Calumet Conglomerate lode, was letting the company down. Standing pat would have meant certain contraction and, ultimately, corporate suicide. The 1910-11 edition of Horace Stevens, The Copper Handbook, went on for page after page describing the vast industrial empire that C&H had built for itself, much of it new, but also put that growth and change in the context of the single greatest problem that C&H had been confronting:

The conglomerate mine, which, until a few years ago, was the entire Calumet & Hecla, has a life, at the present rate of production, of between 10 and 15 years, followed by 5 to 10 years of scrambling [robbing pillars, searching abandoned stopes for over-looked copper], with greatly decreased output. The conglomerate is deteriorating rapidly in average copper contents with depth.<sup>32</sup>

The second great challenge facing C&H, Quincy, and all the other Michigan companies, had been their declining position vis-à-vis the burgeoning mines of the American West.<sup>33</sup> They could make themselves new on the surface, but could not readily do the same underground, where they were old, deep, and high cost producers.

The top men at the Lake mines facing these challenges in the early twentieth century represented a new breed of agent, general manager, or superintendent. At Calumet and Hecla, that man was James MacNaughton, hired in 1901 by the company patriarch, Alexander Agassiz. (Fig. 74.) When Agassiz died in 1910, MacNaughton became the key man for setting directions at C&H for decades. In 1902, John L. Harris succeeded his father, Samuel B., as Quincy’s agent. John lasted only three years, before surrendering his post in 1905 to Charles Lawton, who then led Quincy until 1946. Beginning in 1905, Frederick W. Denton took charge of Copper Range’s mines.

MacNaughton, John L. Harris, Lawton, and Denton had something important in common: they were all college graduates, all engineers. The man before MacNaughton at C&H was deemed an engineer, S. B. Whiting – but he was from the old “shop culture” school of engineering. He had learned engineering on the job, not at a university. MacNaughton, on the other hand, had a degree in civil engineering from the University of Michigan. At Quincy, the long time agent, Samuel B. Harris, was a man who moved from the miners’ ranks right up to being the top boss. Next came his son, John L., who had been in the first graduating class of the Michigan College of Mines in Houghton, and who had also studied at M.I.T. After the younger Harris, Lawton took Quincy’s reins; he

had received a degree from the Mechanical Department of the Michigan Agricultural College (now Michigan State University). Meanwhile, the man who moved into the superintendent's office at Copper Range, Denton, had a similar background. He had graduated from the Columbia School of Mines, and had taught after 1890 at the mining school in Houghton.<sup>34</sup>

The new leaders weren't the old practical men of earlier eras. They were modern practitioners of mining, and when they looked underground at their mines, they believed that to remain competitive, some traditional practices and technologies had to be overturned and new methods substituted. They believed in cost-accounting, efficiency, and in the essential need to increase worker productivity within their domains. One of their mutual goals was to trim labor costs by somehow streamlining tramming – and especially, to cut the number of miners employed. Their desire to eliminate miners drove them to champion the one-man drilling machine, and, in short order, championing that machine generated a hornet's nest of labor unrest.

<sup>1</sup> AA to SBW, 28 Dec. 1893, quoted in Benedict, Red Metal, 93; and AA to J. P. Channing, 21 Feb 1894 and to SBW, 2 April 1894, C&H coll., MTU

<sup>2</sup> Min. Stats. for 1895, 122.

<sup>3</sup> U. S. House, Committee on Mines and Mining, Conditions in Copper Mines of Michigan (63<sup>rd</sup> Cong., 2<sup>nd</sup> sess., 1914), 1423.

<sup>4</sup> Min. Stats. for 1895, 122.

<sup>5</sup> Min. Stats. for 1897, 179; Min. Stats. for 1899, 265.

<sup>6</sup> C&H, A.R. for 1890-91; Min. Stats for 1891, 23; Min. Stats. for 1895, 122; Min. Stats. for 1899, 273.

<sup>7</sup> Benedict, Red Metal, 90-91; Min. Stats. for 1895, 123.

<sup>8</sup> Thomas P. Soddy and Allan Cameron, "Hoisting Equipment and Methods," MCI 13:10(Oct.1931), 509; Min. Stats. for 1891, 23; Min. Stats for 1895, 124; Min. Stats. for 1896, 124-25; Benedict, Red Metal, 89-90.

<sup>9</sup> Benedict, Red Metal, 92.

<sup>10</sup> Steven's Copper Handbook, 10(Houghton, 1911), 527.

<sup>11</sup> Min. Stats. for 1899, 273-74; C&H, A.R. for 1900-01.

<sup>12</sup> See C&H annual reports for these years; also, Benedict, Red Metal, 93.

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- <sup>13</sup> Benedict, Red Metal, 88; Min. Stats. for 1881, 132; Min. Stats. for 1891, 22; C&H A.R. for 1892-93, 13; A.R. for 1893-93; Carl L. Fichtel, "Underground Power Distribution and Haulage," MCIJ, 17:10(Oct. 1931): 503.
- <sup>14</sup> Min. Stats. for 1899, 271.
- <sup>15</sup> Min. Stats. for 1891, 23; Min. Stats. for 1894, 124; Min. Stats. for 1896, 124-25; Min. Stats. for 1899, 269.
- <sup>16</sup> Soddy and Cameron, "Hoisting Equipment," 509.
- <sup>17</sup> MacNaughton, "History of the Calumet and Hecla," 474-77.
- <sup>18</sup> Benedict, Red Metal, 122-23. Also see C&H, annual reports for years 1896-1905, and Min. Stats. for 1896, 125-26.
- <sup>19</sup> Benedict, Red Metal, 123.
- <sup>20</sup> Calumet and Hecla, "To the Stockholders of the Calumet and Hecla Mining Company," (Dec., 1910), 1.
- <sup>21</sup> MacNaughton, "History of the Calumet and Hecla," 474-77; Benedict, Red Metal, 125-32; also, C&H annual reports, 1905-11.
- <sup>22</sup> MacNaughton, "History of the Calumet and Hecla," 475; Benedict, Red Metal, 132-36.
- <sup>23</sup> C&H, A.R. for 1892-93, 15-16; Min. Stats. for 1895, 125; Min. Stats. for 1896, 126; Min. Stats. for 1899, 274-75.
- <sup>24</sup> Benedict, Red Metal, 80, 87.
- <sup>25</sup> Benedict, Lake Superior Milling Practice, 43, 49, 51; Lankton, Cradle to Grave, 248-49.
- <sup>26</sup> Benedict, Lake Superior Milling Practice, 118-19; Steven's Copper Handbook 10(1911), 532.
- <sup>27</sup> Benedict, Lake Superior Milling Practice, 79-82.
- <sup>28</sup> Conant, "Historical Development of Smelting," 532.
- <sup>29</sup> C&H, A.R. for 1899-1900; Conant, "Historical Development of Smelting," 532.
- <sup>30</sup> C&H, Annual Report for 1894-95; A.R. for 1899-1900; Steven's Copper Handbook, 3(1903), 61-64; Steven's Copper Handbook, 7(1907), 107-115.

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<sup>31</sup> E&MJ (31 March 1900): 373; Conant, “Historical Development of Smelting,” 532; Min. Stats. for 1899, 276.

<sup>32</sup> Steven’s Copper Handbook, 10(1911), 525.

<sup>33</sup> For concise histories of Western U. S. copper mining districts, see Hyde, Copper for America.

<sup>34</sup> Lankton, Cradle to Grave, 72-73.

## CHAPTER 13

### CHALLENGES TO CORPORATE POWER

During the pioneer era, ambitious mining companies arrived on the Keweenaw in search of copper, and via the copper, wealth. They did not come with a grand view regarding social engineering, nor were they steadfastly intent upon creating a society in some certain way. Just as the companies felt their way along, incrementally, bit by bit, learning about the geology of the region and about how to mine, mill and smelt their copper, so did they feel their way along in the social sphere. The companies, out of virtual necessity, became community builders and paternal employers. They cleared ground and grew crops; put up early stores; built roads and docks; dredged channels; erected houses at their mine locations; imported doctors and operated hospitals; supported churches and schools; created cemeteries; and helped launch additional settlements on the margins of the mines by platting and selling off ground.

The mining companies never wanted to do everything for everybody on the Keweenaw. As local society grew more mature, as commercial settlements and governments rooted in, the mining companies were content (and perhaps even relieved) to divest themselves of some social responsibilities they had once had. Most stopped doing any serious agriculture; they got out of the business of provisioning settlers by either farming or running their own stores. They turned over to government such tasks as keeping the peace and road building. They let county Superintendents of the Poor assume primary responsibility for local indigents. And because they did not want to house all their own workers, let alone everybody else in the region, they turned over to house builders and boarding house operators the tasks of sheltering many of the men, women and children who migrated to Lake Superior.

Still, the mining companies remained keenly interested in all manner of social developments, not only at the mine locations proper, but in nearby communities. They believed they had a large stake in the orderly development of the adjacent society that attended their industry. The companies, without question, saw themselves as the primary institutions of life and work on the Keweenaw. They were willing to let "life go on," as long as it proceeded in a manner that did not jeopardize, challenge, or otherwise threaten their interests. But when things didn't seem to go their way, the companies sought in many ways, at many times, to wield influence, if not absolute control, over that society. Sometimes they merely sought to curtail an individual's behavior, or nip a problem with alcohol in the bud; sometimes they chased away a prostitute; in the Civil War era, with street crime and lawlessness on the rise, they established and drilled a short-lived militia group to help reestablish order.

In the quarter century or so after 1890, the companies often felt that change threatened their hegemony and preeminence in the region. They had already lost, in the late 1880s, their leadership role in the U. S. copper industry, and their share of that industry declined thereafter, decade by decade, even while Michigan's copper production dramatically

went up. Importantly, the mining companies at the same time also sensed an erosion of their leadership role in Keweenaw society. They sensed new threats, new challenges to their authority and preeminence. For decades, much had gone right. Industry and society had gone along in tandem, matured together, while the Keweenaw had earned for itself the reputation of having the most harmonious labor-management relations in the American metals industry.<sup>1</sup> But by the late 1880s, there was the growing suspicion, amidst much social change, that some things were going wrong.

One early sign of trouble came at Calumet and Hecla. This great mine, unlike most Lake mines, was timbered from the top down and represented a giant tinderbox. A very destructive underground fire shut C&H down in 1887 and then, the very next year, another catastrophic fire occurred. The fires struck just when organizers for the union, the Knights of Labor, were active in the region. Also, C&H and the other local mines were very cognizant of the fact that social discord, unionism, and industrial violence were on the rise in America. In 1886, the year of the Great Upheaval, 600,000 workers were involved in nearly 1,500 strikes and 140 lockouts. Some of the worst violence occurred not that far from Lake Superior. In Chicago the Haymarket Riot involved molders at McCormick Harvester; near Milwaukee, immigrant iron workers and the state militia clashed.<sup>2</sup> Against this background, and having been hit by two major fires in two years, Calumet and Hecla grew very suspicious. It thought there might be some disloyal employee amongst its ranks, an arsonist, who wanted to harm the company, not work for it. The company put up a \$10,000 reward to help snare the perpetrator. The reward went unclaimed. C&H discovered no arsonist. The tendered reward, though, surely symbolized a new era of suspicion and mistrust.<sup>3</sup>

The mining companies found it easier to dominate the Keweenaw when its population remained small. Only about one thousand resided on the entire Keweenaw in 1850; about twenty thousand lived there by the early 1870s. When the mining companies boomed in the late nineteenth and early twentieth centuries, so did the population. By 1890, the population of Houghton County alone reached thirty-eight thousand. That figure climbed steeply to sixty-six thousand in 1900 and attained eighty-eight thousand by 1910.<sup>4</sup> As local society became much larger, it became more difficult for the mining companies to herd. The issue of social, political, and economic control involved more than just population size. Of more importance, perhaps, was the make-up of that population. From the last decades of the nineteenth century on into the twentieth, the immigrant groups who fueled the population growth distinctly differed from earlier ones, in terms of point of origin, language and customs, and work experience.

To a considerable degree, the immigrant groups that arrived on Lake Superior were the same ones coming to the United States as a whole. When immigrants from England (including Cornwall), Scotland, Ireland and Western Europe (especially Germany) were the most frequent arrivals to the United States, they were also frequent arrivals at the mines. But by the late nineteenth century, the immigrant flow from these regions had slowed. In the place of the English, the Germans and Irish now came the southern Europeans, especially the Italians, and the eastern Europeans, such as the Croatians or Slovenians. (Fig. 75.) These eastern Europeans, from their end of the Austro-Hungarian

Empire, were often lumped together as “Austrians,” by Americans lacking either the ability or the desire to differentiate among them. The Finns of northern Europe comprised another group that started to arrive in sizable numbers in the United States and on Lake Superior.<sup>5</sup>

These new immigrant groups, unlike the old, were more likely to come from non-mining traditions; more likely to come from rural areas or small villages; and more likely to be farmhands. They were less likely to be attuned to the world of industrial work and less likely to be skilled workers. So as the mining companies expanded tremendously in the 1890s and beyond, and as they sought greater efficiency and productivity, the men coming for all the new jobs at the mines were not well suited for them, in terms of experience and skill. The men found themselves toiling in old, deep mines, in an environment that literally was most foreign to them and threatening. Consequently, many objected not only to the arduousness of the work, but to its hazards and the underground place where it was done.

The mining companies believed that some of these new ethnic groups (especially, but not only, the Finns) embraced ideas and social and political movements that the companies found an anathema, especially unionism and socialism.<sup>6</sup> These new groups seemed less willing to try to get ahead by getting along in their new country. They seemed more prone to challenging whatever working and living conditions they found themselves in. They seemed more clannish, distant, and different. They seemed to have a bothersome solidarity as they set themselves off, establishing their own churches, newspapers, clubs, and other organizations.

On the industrial side of things, the turn of the century mining companies had no problem with issues of modernity. In fact, to stay alive and thrive economically they embraced modernity. They hired engineering graduates as key managers, pushed new cost accounting measures, and embraced notions of efficiency, productivity, and scientific management. The mining companies did not want to be running nineteenth century operations in a twentieth century world. But on the social side of things, the same mining companies saw modernization as a mounting challenge, as a source of tension and pressure, as a set of social changes that might cost them money, rather than make them money.

Pedestrians walking the streets of the copper district’s major villages saw modernization all around. They saw it in the architecture and buildings. Before 1890, some downtown structures had been constructed of poor rock or other masonry, but most had been framed in wood and stood only two stories tall. Often a false front on the gable end tried to make a structure appear grander than it really was. In the two decades after 1890, the most important towns and the centers of population made themselves over, especially Houghton, Hancock, and Calumet. (Figs. 76-77.) Out near Portage Entry, or Jacobsville, quarries opened up that produced a handsome red sandstone. As the towns modernized and reconstructed themselves, Portage Entry sandstone – along with brick – became a building material of choice.<sup>7</sup> Shoppers, worshippers, tradesmen and miners encountered impressive masonry structures along their local streets.

In a period of economic expansion, banks, hotels, shops and restaurants went up. At Calumet at the turn of the century, within a year of one another, the grand publicly-owned Calumet Theatre, done up in brick in the Renaissance Revival style, went up on one end of town, while the tall, Gothic Revival, red sandstone St. Anne's Church, supported by its French Canadian congregation, went up on the other end of town. Together, they served like bookends for the modern Red Jacket (or Calumet) village, and in between stood all kinds of commercial structures, including the Vertin Brothers department store, representing the modern, expanded version of the general store of the nineteenth century. In Houghton and Hancock, as well as in smaller towns like Lake Linden, similar transformations occurred.

The local streetscape changed in many ways as modernity progressed. Sidewalks were added, getting citizens' shoes out of the dust, dirt or mud. The street surfaces themselves changed, as more came to be paved with brick, asphalt or concrete by early in the twentieth century. By 1910, nascent auto dealerships occupied storefronts for the first time, and automobiles rambled down the streets, often alarming animals and pedestrians and eliciting the wrath of constables. Starting in 1900, streetcars, too, started taking up their part of the street, and eventually they connected the major villages in the center of Houghton County.<sup>8</sup>

Some of the most important harbingers of modern life were not found at street level, but below or above it. Beneath the streets and walks, especially after the 1890s, ran new water lines and sewer lines, and sometimes gas lines. Above the streets, atop poles, ran wires – telephone and power lines. Improvements in communications and power were a hallmark of modernization. In the villages near the mines, these improvements often got off to a small start in the late 1870s (for telephones) and 1880s (for electrical power). But not until the late 1890s and early years of the twentieth century did telephones and electrical lines become commonplace and serve ordinary homes, as opposed to public or commercial spaces.<sup>9</sup>

As part of modernization, people wanted more and expected more out of life. As they walked through expanded downtowns they shopped more for goods, services, and entertainments. With the expansion of commerce and advertising, residents desired to become more active consumers. They were in a mood to buy things, rather than making things or making do without them, and being a bigger and better consumer required a larger income. Members of the working class hoped to see a rise in their standard of living, which included living in a larger house, with more rooms, and more amenities and privacy. Many in the Copper Country still crowded into modest dwellings, where boarders often took up much of the space, intruded into family life, and made privacy a luxury. But those same boarders at least provided the family with income, and that income helped fuel the dream of someday soon acquiring more possessions and moving into a bigger and better house.<sup>10</sup> Many families also had fewer children now – the average number of children dropped from about seven in 1800 to about four by 1900.<sup>11</sup> Fewer children meant that parents had to spread their income over fewer dependents. They might be able to spend more money on each child they did have – or they might

spend it in some other manner. Maybe, someday, they might purchase their own home, or even manage to acquire one of those new automobiles.

With the advent of modern utilities, the attainment of greater comfort and convenience became an important cultural goal of the early twentieth century. The house was to be a place transformed, as was the life lived within it. Electricity provided cleaner light that was safer and needed far less tending to, when compared to kerosene lamps. Gas, too, was cleaner and required less work than wood fires used to heat the stove and the house. Inside plumbing and sewer hook-ups meant far less work, particularly for women, who no longer had to haul water both in and out of the house in buckets. Toilets were much desired, as they eliminated the chamber pot indoors and the nasty privy outdoors – and the walk out to the privy, too. Water lines, sewers, and toilets improved public sanitation and health and led to higher standards of personal hygiene and cleanliness.<sup>12</sup> People expected to be healthier, and as part of that they wanted to benefit from more professional doctors, often armed with a specialist's knowledge and more medical science than earlier doctors ever had.

Standards of education, too, went up. Society came to see children as more of a protected, special class. Parents more and more shunned the idea putting children out to work at a young age, and more and more embraced the idea of prolonged schooling. Enhanced education was a tool that all could use, hopefully, to get ahead.

All these changes, to residents, fell under the heading of progress. For the mining companies, these same changes came under the heading of headaches and problems. Around 1910, operating companies rented out approximately three thousand company houses, in which many thousands of men, women, and children lived. They had built the vast majority of these dwellings in an era of no utilities and few amenities. So thousands of employees now expected and requested upgrades; they wanted new systems retrofitted into their older company houses. And the men, women and children living in those houses, in myriad ways, expected life to be better than it had been just a decade or two before. As a consequence, modernization became a troublesome burden at times to the mining companies, the largest landlords on the Keweenaw.

The mining companies were by no means alone in facing the pressures of modernization, or in coping with the challenges posed by rising standards of life. In a sense, the whole nation coped with these issues at the same time. By the end of the nineteenth century, the nation as a whole needed to address quality of life issues. Growth and economic and social change had been very beneficial to some, especially to the four thousand or so millionaires who already resided in the United States. But to others, including many among the great wave of immigrants who had recently arrived, the United States seemed not to be living up to its promises.

The country had undergone rapid industrialization and urbanization, and in the wake of these changes problems of inequality, political corruption, squalor, poverty, urban crime, unsanitary living conditions, pestilence and disease, and business excesses and social irresponsibility had become both legion and legendary. Muckrakers, in their newspapers,

magazines and books, had sensationalized and exposed the seamier and sadder aspects of American life. Turning towards their problems, rather than away from them, many Americans believed that wrongs needed to be addressed and remedied, that all Americans deserved a better life and better treatment. Others acted out of fear – fear that socialism and rebellion might rear up, unless the needs of the indigent, of working class men, women and children were better served. Out of these concerns arose the social and political reform movement known as the Progressivism.<sup>13</sup> This movement – one of the great reform movements in American history – played out between the last years of the nineteenth century and America’s entrance into the First World War. Politicians were not the only Progressives. As a major part of this movement, scientists, technologists, and other well-educated professionals and experts applied their knowledge to identify and correct social problems. Central to Progressivism was the belief that life could and should be made better for all.

The Progressive movement had local roots. In many places, it started at the city level, in response to city problems. Then it moved to the state level and finally on to the national level. Eventually, on all these levels Progressivism entailed new social programs and institutions, and new ordinances or laws. In Michigan, for example, Progressivism led to legislation restricting child labor, shortening the work day, and in establishing workers’ compensation. On the national level, it led in 1910 to the creation of the U. S. Bureau of Mines, and in 1913 to the creation of the cabinet level Department of Labor and the United States Commission on Industrial Relations. As society and politics moved into the Progressive spirit, the mining companies along Lake Superior, like other big businesses elsewhere, sensed that their autonomy was eroding. No longer would they be able to do things just their way. They would be more carefully observed and scrutinized; they would be held more accountable for their behavior; they would have to adapt to new political and social realities. Unfettered big business had had its day.

The copper mining companies most keenly felt reform era zeal – and an overturning of their “old time rules” – in the realm of mine safety.<sup>14</sup> The pressure to change came from local courts, attorneys and juries; from the Michigan state house; and from the U.S. Congress. This pressure surfaced as early as 1887 and wrought a near revolution, smashing the old time rules by 1912. Changes were afoot that the mining companies were powerless to stop.

Serious accidents and fatal injuries accompanied the rise of the mining industry. Indeed, fatal mine accidents were a macabre measure of economic growth. In short, the more men working underground, the more men who died. For decades the annual death rate remained about five per thousand. For every thousand men working underground for a year, five would die, and a third – more than three hundred – would suffer some injury severe enough to have to take time off from work. In the 1850s, at least twelve men died underground and fifty-four died in the 1860s. That death toll nearly doubled to 106 underground fatalities in the 1870s, and it nearly doubled again in the 1880s, when the mines suffered 195 losses of life. In the 1890s, as the expansion of the industry accelerated due to the rise of the electrical industry, the death rate also escalated and claimed 284 men. Early into the new century, as the industry climbed toward peak

production and employment, it also set new fatality records. Between 1900 and 1909, 511 men died in the copper industry. From 1905 through 1911, the mines killed an average of sixty-one men per year, or more than one per week. At the end of this unfortunate run, one out of every ten men killed in the entire U.S. metal mining industry died on the Keweenaw Peninsula.<sup>15</sup>

Charles Lawton served as agent at the Quincy mine through these deadliest years. Under what Lawton called the “old time rules,” mine fatalities were indeed unfortunate, even tragic. But while accidents devastated men and their families and friends, these work-related deaths left the mining companies unscathed. Under the old time rules, society did not pay particular attention to the deaths of men at work, because death was commonplace in society, and the men deserved no special mourning or attention. Death claimed many young women during childbirth (that was their “occupational” hazard), and year after year various communicable diseases swept away numerous young children. (In the early 1880s, about seventy-five percent of all recorded deaths in Houghton County were children under the age of five.)<sup>16</sup>

Under the old time rules, there was no escaping the fact that mining was hazardous. Everybody realized that men died in pursuit of copper. Workers took precautions. They were responsible for their own safety and the safety of fellow workers. Still, unforeseeable and unavoidable accidents happened, and men died. Under the old time rules, people believed in accidents, and not so much in finding fault or laying blame. When a man died, often it was simply a case of being at the wrong place at the wrong time – when a powder charge went off prematurely, or when a piece of the hanging came down. If anyone could be blamed, usually it was the victim himself. He did something in a careless or stupid manner and paid the ultimate price. A key tenet of the old time rules was that familiarity bred contempt. Men, after working long in a mine, stopped worrying about hazards that had not hurt them yet. When they treated a hazard with contempt, and ignored it – that’s when it killed them. Finally, it naturally followed that if the mining company was not responsible for accidents, it was not obliged to pay for them. If it awarded funds to accident victims or their survivors, these monies were to be seen as charity, not as settlements.<sup>17</sup>

As personal injury law, or the law of torts, evolved in the nineteenth century, the courts tended to codify and reinforce the informal old time rules. Three legal doctrines made it very difficult for accident victims or their survivors successfully to sue an employing company. These were the doctrines of assumption of risk, of contributory negligence, and the fellow servant rule. The doctrine of assumption of risk said that a worker, when accepting employment, accepted all the risks and hazards associated with that employment. If you assumed the occupation of miner, you assumed the risks and hazards of falling rock or blasting accidents. Under contributory negligence, if a victim could be shown to have been negligent on the job, even in the slightest way, then the victim, and nobody else, was responsible for the accident. And under the fellow servant rule, if the unsafe behavior of one worker, even a boss, caused the death of another worker – then the fellow servant, not the employer, was to blame. Under such doctrines, plaintiffs

found it difficult to beat a mining company or other employer in court. As a consequence, few even tried.<sup>18</sup>

This all started to change in the late 1880s, and over the course of twenty-five years the changes proved dramatic. One early chipping away of the old time rules occurred in Michigan in 1887, when the state legislature considered some liberal measures to make workplaces better and safer. The legislature debated passing a bill that had provisions for limiting child labor, shortening the workday to eight hours, and creating a system of county mine inspectors. The child labor and eight-hour-day sections were scrubbed, but the passed legislation did create the mine inspectors, who were to be appointed by county Boards of Supervisors. A mine inspector was legally required to inspect each mine at least once annually, and he had the power to “condemn all such places where he shall find that the employees are in danger from any cause, whether resulting from careless mining or defective machinery or appliance of any nature.” The inspector was to provide an annual report of relevant activities, including a record of “the number of mine accidents occurring during the preceding year causing either death or injury to persons.” The mine inspector was also required to make a judgement call and classify the accidents as to whether they occurred “through the fault or negligence of employers” or “through the fault or negligence of employees.”<sup>19</sup>

By no means did the newly appointed mine inspectors on the Keweenaw dramatically overturn the old time rules regarding mine accidents, fault, and liability. For starters, these men were appointed by county supervisors, supervisors who themselves were often prominent managers of local mines, or else the friends and allies of same. The appointed inspectors, such as Josiah Hall in Houghton County, were older, experienced mining men who had spent their entire careers working under and believing in the old time rules. Hall had been a mine captain and even a mine superintendent. Not surprisingly, Hall rarely found a company to blame. He almost always found that fatalities were unavoidable accidents, or were caused by careless victims.<sup>20</sup>

The mine inspectors for years never wielded as much power or influence as they could have, or should have, at the copper mines. They were not pro-active, but reactive. They did not seek out safety; instead, they investigated deaths. They totally ignored one provision of the state law. They investigated fatalities, but although being charged to do so, they never recorded or investigated less-than-fatal injuries. So their reports never painted a full picture of the costs workers paid for being in this industry. But their reports did serve an important function. The inspectors rarely missed or passed over a fatal accident. So their reports, despite all their failings, for the first time in this society gave an accurate count of how many men were dying, who they were, how old they were, where they came from, how they died and what they were doing. Until those reports were made, many men had perished underground, and their deaths had hardly been noted. Local newspapers generally gave scant treatment to victims, and half of them in the nineteenth century never even had their names recorded in the local county death records.<sup>21</sup>



**Figure 75**



**Figure 76**



Figure 77



Figure 78



**Figure 79**



**Figure 80**



**Figure 81**



**Figure 82**



**Figure 83**



**Figure 84**



**Figure 85**

The acceptance of fatal accidents – or the neglect of same – was in no small measure due to the fact that most accidents claimed only one or two victims at a time. Only a handful of accidents in the copper mines ever killed five or more men simultaneously. Instead, the deaths trickled in, one here, one there. An individual miner perished under a localized fall of rock, or was blasted, or was run over by a skip in a shaft – or else maybe he just tripped and fell, then went careening several hundred feet down into the mine. American society has long proved quite forgiving of such accidents – those that kill one or a few at a time, even if over the years, the death toll from such accidents can climb to staggering numbers. Society directs more attention, scrutiny, and criticism at bigger accidents, the spectacular ones, that might occur less frequently, yet kill far more people at once. So it was within the mining industry in the late nineteenth and early twentieth centuries. Some spectacular accidents, killing many, caused both local Copper Country society, and American society as a whole, to become more critical of the industry and its practices, and less accepting of the old time rules.

On Lake Superior, the region's worst fatal accident occurred in 1895, when thirty men and boys perished underground due to smoke inhalation at a fire in the Osceola mine. Since most mines, including Osceola, did little timbering, companies and workers did not consider fire a prominent hazard. That belief led to the Osceola catastrophe. A shaft caught fire, and while some went to fight it, others, not fearful of the fire spreading, sat down to eat their lunch. But the fire did spread along the shaft, and by the time the workers became alarmed and tried to escape the mine through a neighboring shaft, it was too late. Smoke rose up the mine in the shaft on fire, then drifted across the upper levels of stoped out ground, and went down the adjacent shaft that the men thought was a safe exit. Instead, they died there.<sup>22</sup>

The Osceola mine fire, that claimed three times as many victims as the second most tragic mine accident on the Keweenaw, focused local attention on the issue of mine

safety. Nationally, around the turn of the century some very large mine accidents occurred, especially at coal mines, that helped move worker safety into the public consciousness and on to the political agenda. In Utah, 201 died in a single incident; in Pennsylvania, 239; and in West Virginia, 361. Such accidents, occurring as they did in the Progressive Era, prompted calls for reform in the mining industry and the creation in 1910 of the U.S. Bureau of Mines.<sup>23</sup> This new bureau collected data, applied scientific and technological expertise to the study of mine safety, and trained and educated companies and their workers in safe practices. While the Bureau of Mines did not regulate the mining industry, the copper mine managers on Lake Superior clearly recognized that this new federal presence entailed more scrutiny of their operations.

The companies came under greater scrutiny as well on the state level. In 1911 Michigan significantly altered its system of county mine inspectors. No longer were they appointed by county boards of supervisors, which were often dominated by mining personnel or their allies. Instead, each county was to select its mine inspector by popular election. The mine inspector in his findings and decisions was now more answerable to the general public, than to the mining companies. And instead of being required to visit a mine a minimum of just once per year, a mine inspector by law checked on each operating company every sixty days.<sup>24</sup>

It was in turn-of-the-century courts, however, that one found the greatest challenge to the old time rules of mine safety, and to the doctrines of assumption of risk, contributory negligence, and the fellow servant rule. Society – nationally and locally – came to believe that rapid industrialization had been unfair, in the sense that it burdened the working class with too many of the negative costs of that industrialization. Too many workers gave up their lives, or their health and wholeness – and too few received any recompense. Now, more injured or maimed employees, or the heirs of killed workers, took companies to court – and more and more often, as juries became more liberal, the plaintiffs won damages.

The Keweenaw reflected this national trend and became home to a key champion of the injured or killed miner: attorney Patrick O'Brien. O'Brien was a local boy who had gone through the Calumet schools and then attended law school in Indiana. While he was there, his father died while at work in the Calumet & Hecla mine. O'Brien came out of school and started to specialize in personal injury lawsuits, first in another mining region around Superior, Wisconsin. Then, in 1899, he returned to the Copper Country, took up residence in Laurium, and started suing the mining companies. His business did well enough that he added a partner, Edward LeGendre, in 1910.<sup>25</sup>

For decades, the old time rules of mine safety held strong, and the law of torts one-sidedly favored the interests of employers. In the Progressive Era, all this changed. Companies not only found themselves going to court more often – they also lost more often and sometimes paid out large sums. The whole issue of liability and compensation was in a period of change, flux, and uncertainty. Yet the pendulum was clearly swinging away from the mining companies and over toward the workers.

The mine companies and their attorneys tried to hold the line against the growing number of lawsuits. As more and more cases came up, the companies adopted a harder stance. They stopped offering charity to accident victims, because some interpreted charity as an admission of responsibility, blame, or guilt. They stopped initiating out-of-court settlements, too, because they started to believe that every time a worker got a dime out of them, it encouraged another worker to threaten his own suit. They fought every case in court that they thought they had a chance to win and went toe-to-toe with plaintiffs' attorneys, especially O'Brien and LeGendre. But over time, social and legal changes wore the companies down. By about 1910 they believed that every injury or death was going to lead to a bitter trial or difficult negotiation, and all the litigation, turmoil, legal fees, and monetary damages encouraged the companies to find a new way out.<sup>26</sup>

The way out was workers' compensation, enacted by Michigan in 1912. The new law returned predictability and regularity to the issue of corporate responsibility, accidents, victims, and their claims and needs. The new law was a compromise that gave something to both workers and companies. Workers gained a greater measure of security in their lives. If injured, they were now entitled to payments without having to pray for charity or going to court. The law buffered workers and their families from financial calamity in the wake of a fatal or serious accident. For the first time, the companies were now responsible for providing monetary awards to the dependents of all fatal accident victims (a death benefit, for example, of \$2,700) and awards to the injured and maimed (such as \$4,000 spread over five hundred weeks to a permanently disabled miner). The mining companies, in turn, avoided endless lawsuits and gained a cap on the amount an employee or his dependents could receive for a given type of injury or upon death.<sup>27</sup>

Only five years before, the mining companies would have bitterly fought any legislation that made their money available to all accident victims. In 1912, however, they more than acquiesced in workers' compensation; they supported it. When the stark fact hit home that they were now responsible for workers' compensation coverage or insurance, the companies finally abandoned one last vestige of their old time rules, namely the tenet that accidents were unavoidable. Now that they had to pay for accidents, they finally believed that many accidents could be prevented. So starting in 1912-13, for the first time ever they rushed into print booklets such as "Rules and Regulations for the Protection of Employees." This safety literature gave lists of things to do and not do to be safe at work, and it also tried to convince workers that they, and their employers, needed to work cooperatively to improve safety conditions. The companies emphasized mutual interest and espoused a deep concern for workers' welfare. Within a short time, Safety First programs were the norm up and down the mineral range. (Fig. 78.) Companies initiated first aid training, put emergency medical supplies around the workplace, tapped the U. S. Bureau of Mines for safety training, and added "safety engineers" to their payroll.<sup>28</sup> (Fig. 79.)

In a sense, as the mining companies operated in the last years of the nineteenth and early years of the twentieth centuries, they were on the wrong side of history. They were content in many ways with the "pre-modern" world, with the status quo, with their traditional hegemony, and with the old time rules. But during this time, new peoples,

new ideas, and the Progressive Era challenged them in many ways. As the mine managers saw their right to rule the district being nibbled at from several different directions, they responded in several different ways. Some changes they fought; some they acquiesced in.

The mining companies continued to practice paternalism as a major way of keeping the peace with many of their workers; they still saw paternalism as a way of instilling loyalty among that class of skilled workers that the companies most wanted to keep. C&H even expanded its paternal programs – or augmented some existing ones – during this era. For instance, in the last three years of the nineteenth century, C&H profited at a very high rate. While enjoying some of its best years ever, the company suspended workers' payments into the company's aid fund and its medical program. Temporarily, at least, the company carried all the costs of those programs, and spared its working class families some \$54 of fees annually (representing about three-fourths of a month's pay).<sup>29</sup> While exercising this largesse, however, (which no doubt many working families greatly appreciated), the company still reserved for itself the discriminatory power to decide who received benefit aid, who entered the hospital, and so on.

The company in 1904 also instituted its first retirement plan that awarded pensions. But true to its usual mode of operation, C&H managers kept this plan firmly in their grasp as they wielded discriminatory control. For starters, they ran this pension plan in secret, so they could control the demand for this benefit. Men over sixty who had worked for Calumet and Hecla for at least 20 years were eligible for consideration for a pension, but not automatically entitled to one. The company did not publicize this program. General manager James MacNaughton decided how much money the company was willing to expend on pensions annually, and decided who would receive one, and who would not.<sup>30</sup>

Because the companies were paternal landlords, they could not escape modernization and the fact that workers expected to enjoy a higher standard of living than prior generations. Besides owning over three thousand houses, the companies, as paternal landlords, owned the land under a large number of houses that workers had erected on company property. They also had established the tradition of politically controlling their locations and of running them as they saw fit. Under these circumstances, modernization inevitably applied pressure upon the companies to enhance the workers' standard of living at the mine locations. The mining companies had to address these pressures, but they were not about to rush headlong into giving workers everything they might have wanted.

In this era of economic expansion and growth, the mining companies continued to build many new houses, in order to accommodate more workers. In many instances, these houses were decidedly better and bigger than the houses built through the 1880s. (Figs. 80-81.) But in some of their newest houses, and certainly with their oldest ones, the companies generally dragged their feet when it came to outfitting, or retrofitting, them with modern utilities, such as running water, toilets and sanitary sewers, electric light or gas.

The companies offered “stop-gap measures” that made some modern amenities available to workers and their families, even if not at the house. Between the mid-1890s and 1920, for instance, the three largest companies on the range – C&H, Copper Range, and Quincy – all built libraries for workers. (Figs. 82-83.) Curiously, attached to each library was a bath house, where workers and their families, for a nominal charge, could bathe.<sup>31</sup> The existence of the bath houses took some of the pressure – and expense – off the company to connect all existing houses to water lines. (Figs. 84-85.)

When companies entered into utility upgrades, they sometimes did it in an odd and seemingly inefficient manner – yet one that saved them expense and also made evident, again, their discriminatory power. C&H at the turn of the century owned over seven hundred houses and was not about to radically upgrade them all at once, or all at company expense. If the occupant of a company house wanted a phone, fine. But the worker had to pay all installation charges, and when the worker left, the phone line remained. For a while, C&H started to wire its houses for electrical service. But then it backed off, and shifted much of the economic burden over to the occupants. If an employee wanted such service, the employee had to contract with a local electrician for the work. When the employee left the company house, he could take with him any light fixtures he had invested in, but the wiring had to stay. In the case of water and sewer lines, and inside plumbing, tubs, and toilets, C&H made all these things available over time – but not necessarily to everyone, everywhere. When it ran new water and sewer lines down a street of company houses, it did not automatically connect them with each house, and install a host of sinks, tubs, and toilets. Instead, it often made people ask individually for such amenities. That way, C&H clearly remained the boss; you got your first indoor toilet, typically set in a basement corner, if you asked for one and the company decided it was time for you to get one.<sup>32</sup>

While C&H dragged its feet on utility upgrades, it still did better than most companies in modernizing their housing stock. By 1913, all of its 764 frame company houses had water faucets in the house, and 325 had sewerage connections. Across the district as a whole, only about half the company houses had running water by 1913, and far fewer than that had toilets and sewer connections. Of the 607 houses owned by Copper Range, all had running water, but none had sewer connections. The 179 company houses at the Mohawk mine universally lacked both amenities. At Quincy, while mine agent Charles Lawton fretted over matters of housing and utilities, but resisted doing much about it, only manager’s houses had water and electricity by 1913, while about 440 worker houses still had neither.<sup>33</sup>

An important test of wills – and of social control in the region – occurred when another symbol of modernization arrived at the turn of the century: an electric streetcar line that ultimately ran from Houghton, through Hancock, up to Laurium and Red Jacket village, and beyond to Mohawk and over to Lake Linden. C&H keenly felt that the proposed street car line challenged its hegemony in its own back yard. Society as a whole – shoppers, church-goers, merchants, seekers of entertainment – wanted streetcars that would move them more easily from one end of a community to the other, or between communities. But C&H’s president, Alexander Agassiz decidedly did not want streetcar

lines running in and about the vicinity of his mine. For one thing, he did not want passing street cars to interfere with the free passage of C&H rock and coal cars on its own railroad. And also, he did not want streetcars to make it too easy for people to congregate in large groups – such as a group of men who might be engaged in union or other anti-company activities. If they wanted a meeting, make them walk to it! Agassiz mustered his company troops to try to head off the streetcars, and at one time pitted society's desire for one manner of modernization against another. C&H pumped and sold water to both Red Jacket village and to Laurium. C&H hinted to both villages that the company might cut off their water supply over this issue. Laurium also wanted to run a new sewer line that in part crossed over C&H property. Agassiz told his mine agent, S.B. Whiting to tell Laurium that, "they can have a sewer or R.R. [railroad] but not both."<sup>34</sup>

Agassiz lost the contest; the streetcar line was built. This political tempest, albeit short-lived, was significant. For Agassiz, the incident represented an eroding away of mining company power, and an eroding away of local society's belief in the idea that whatever the company said was good for them, was good for them. From 1900 to his death in 1910, Agassiz and his company took some new measures to prop up their dominance in the region and to show more corporate resolve and fight in the face of discontented employees and unwanted social changes. Other companies followed C&H's lead.

The companies had escaped much of the labor violence and union battles that had beset other mining districts in the late nineteenth and early twentieth centuries, and they had traditionally seen union organizers and supporters as more bothersome than seriously threatening. The companies generally chose not to overreact publicly to unionization attempts, including those undertaken in 1903-04 and again in 1908-10 when the Western Federation of Miners set up local unions in the district.<sup>35</sup> The WFM had been a major foe of mining interests elsewhere, and over time its leadership had grown more radical, more socialist. Rather than trying to stamp out unionism and socialism in a speedy, direct, and confrontational manner, the mining companies headed off these threats in more covert ways, which they still hoped to be highly effective.

The mining companies engaged in a range of interrelated activities meant to minimize the threat posed by radical, to them, ideas or persons. The Quincy mine, and probably several other companies, hired company spies, whose secretive services they acquired through detective agencies. Spies worked alongside men, both underground and on the surface; they frequented the same bars and hangouts. Then they told tales about them in letters sent to the detective company. The detective company typed the letters up and mailed them off to the mine agent, who read them as a glimpse into the working class culture that he suspected harbored ill-will and bad politics.<sup>36</sup>

At C&H, if they suspected a man of unionism, they did not want to make him a cause celebre, so they did not emphatically march him out of the mine. The company would, however, seek out some sort of reason – other than unionism – for terminating his employment, and then do it. C&H headed off unionism in other ways. It would not hire men coming to Lake Superior from other mining regions known to be on strike; it definitely did not want to mistakenly hire any union men who might have been deported

from the likes of Colorado or Idaho. Calumet and Hecla was also loath to hire men, such as foundry workers, who came from any established industrial center (such as Milwaukee), where unionism and labor-management turmoil ran deep.<sup>37</sup>

In the face of unionism and socialism, the mining companies – especially Calumet and Hecla – thought they could thwart unwanted ideas and actions by eliminating select people – people they thought most likely to preach or to succumb to such ideas. So, they practiced ethnic discrimination. By early in the twentieth century, mine managers all across the upper Great Lakes – at copper and iron mines both – increasingly blamed Finns for any labor problems they had. C&H began purging many Finns from its payroll, replacing them with southern and especially eastern Europeans deemed more tractable. By 1913, Finns comprised the largest foreign-born ethnic group in Houghton Country. But if you looked at the population of 2,200 underground workers at the Calumet and Hecla mine, Finns (both foreign and native born) were only the fourth largest ethnic group represented there. Their employment trailed that of the Austrians, Italians, and Cornish.<sup>38</sup>

These mines were far from equal opportunity employers. They practiced ethnic discrimination in many ways: in hiring and firing, in the level of jobs awarded, and in the number and type of company houses given out to members of different ethnic groups. At C&H, superintendent James MacNaughton was not the least ashamed or questioning of discriminatory practices; instead, to him they represented a smart way of doing business. To avoid having to hire the “riff-raff” off the streets of America’s larger cities, he knew he needed thousands of Europeans. But, as he was happy to inform the new U.S. Department of Labor, or the Immigration Service, he wanted some and didn’t want others, for various reasons ranging from stature to politics to work experience. He most preferred Swedes, Germans, Northern Italians, and the eastern Europeans who on Lake Superior were called “Austrians.” He did not want “fruit-peddlers and the like,” persons of small stature and soft hands, characteristics he associated with Mediterraneans.<sup>39</sup>

But as he spelled out to federal officials involved with immigration and labor, the group he most did not want was the Finns. “We do not want Finlanders,” he wrote. Besides discouraging their migration to the region, limiting their employment opportunities, and firing many Finns, the mining companies also sought to help control this particular group by covertly having a financial interest in a more conservative Finnish newspaper. Leery of most of the Finnish local press, which they saw as more than tinged by radicalism, the mine managers wanted to assure that the region’s Finnish population had access to a paper more favorable to companies, capitalism, and assimilation. So they secretly helped underwrite the publication of such a paper, Paivalehti.<sup>40</sup>

Overall, in the two decades after 1890, as the mining companies expanded dramatically in terms of production and employment, they nevertheless understood that not all was well. They no longer dominated the copper market. They worked deep mines with high production costs. And they operated in a social setting where the interests of the mining companies, and the interests of society as a whole, were more separate and at odds than before. It was more difficult for the mining companies to work their will on Lake

Superior. It became more difficult, and sometimes impossible, for them to keep out modern streetcars or escape the costs of upgrading their housing. Much vigilance seemed needed to keep union men and socialists off payrolls and local streets. And companies found that because they had not been able to dodge expensive liability cases in the courts, or side-step Progressive Era reforms, they had been pushed into things like workers' compensation and a Safety First movement.

By 1900 to 1912, the mining companies lived in a world of new conditions, one they felt less comfortable in, and one that caused them discontent. Soon, another big challenge to their authority would arise in 1913 – the region's greatest labor strike. The strike became a test of wills that the mining companies decided they would not, and could not, lose. By prosecuting it with vigor and determination, they would once again establish themselves as dominant within the region.

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<sup>1</sup> See, for instance, "The Upper Peninsula of Michigan," Harper's (May 1882), 892-902; Wright, "Development of the Copper Industry of Northern Michigan," 135, 139-40; Rice, "Mining Copper at Lake Superior," 217.

<sup>2</sup> Melvyn Dubofsky, Industrialism and the American Worker, 1865-1920 (Arlington Heights, Il., 1975), 34, 41-44.

<sup>3</sup> PLMG, 6 Dec. 1888; Torch Lake Times, 11 Dec. 1888; Min. Stats. for 1888, 67-68.

<sup>4</sup> Gates, Michigan Copper, 228-29.

<sup>5</sup> For a treatment of ethnicity on the Keweenaw, see Thurner's chapter, "Ethnicity and Singularity," in Strangers and Sojourners, 123-57.

<sup>6</sup> Arthur Edwin Puotinen, "Finnish Radicals and Religion in Midwestern Mining Towns, 1865-1914," unpublished Ph. D. diss., University of Chicago (1973), 20-33, 63, 88, 178-79; Al Gedicks, "The Social Origins of Radicalism Among Finnish Immigrants in Midwestern Mining Communities," Review of Radical Political Economics 8 (Fall 1976): 2-5, 12-19. Also see Gedicks, "Ethnicity, Class Solidarity, and Labor Radicalism Among Finnish Immigrants in Michigan's Copper Country," Politics and Society 7:2 (1977): 127-56; and essays by Timo Orta, A. William Høglund, Matti Kaups and Arthur Puotinen in Michael G. Karni et al., ed., The Finnish Experience in the Western Great Lakes Region (Tortu, Finland, 1975).

<sup>7</sup> For the uses of sandstone in the Copper Country generally, and for information on sandstone buildings in Calumet, Hancock, and Houghton, see Kathryn Bishop Eckert, The Sandstone Architecture of the Lake Superior Region (Detroit, 2000), 137-79, 243-47.

<sup>8</sup> R. L. Polk & Co.'s Directories from the mid-1890s and early 1900s, covering Houghton, Hancock, Calumet, and Laurium, capture many of the commercial changes made to these towns, as do the Sanborn fire insurance maps at MTU. For Calumet, also see Bjorkman, "Calumet Village," 34-55; and Thurner, Calumet Copper and People, 66-88.

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<sup>9</sup> Articles announcing new communication services and utilities such as water, sewer, gas and electricity are to be found in local newspapers from the 1870s on, such as the Portage Lake Mining Gazette, the Copper Country Evening News, the Evening Journal and others. For instance, on the introduction of the telephone, see PLMG, 21 March, 18 April and 2 May 1878; for electric lighting, see PLMG, 17 and 31 March, 14 April, 21 and 28 July, 11 Aug. and 1 Sept. 1887.

<sup>10</sup> Alison K. Hoagland, "The Boardinghouse Murders: Housing and American Ideals In Michigan's Copper Country in 1913," Perspectives in Vernacular Architecture: The Journal of the Vernacular Architecture Forum 11(2004), 12-14.

<sup>11</sup> James Reed, From Private Vice to Public Virtue: The Birth Control Movement and American Society Since 1830 (New York, 1978), 4.

<sup>12</sup> See Ruth Schwartz Cowan, More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave (New York, 1983), chapter 4, "Twentieth-Century Changes in Household Technology," 69-101; Thomas J. Schlereth, Victorian America: Transformations in Everyday Life (New York, 1991), especially chapter 3, "Housing," 87-139, and chapter 4, "Consuming," 141-67. Also, see Susan Strasser, Never Done: A History of American Housework (New York, 1982), and Suellen Hoy, Chasing Dirt: The American Pursuit of Cleanliness (New York, 1995).

<sup>13</sup> For a brief treatment of the Progressive Era, accompanied by a bibliographical essay, see Arthur S. Link and Richard L. McCormick, Progressivism (Arlington Heights, Il., 1983).

<sup>14</sup> Lankton, Cradle to Grave, 130-32.

<sup>15</sup> *Ibid.*, 110, 124-25. The data are drawn from Mine Inspector Reports and from Albert H. Fay, comp., Metal-Mine Accidents in the United States during the Calendar Year 1911, U. S. Bureau of Mines Technical Paper 40 (Washington, 1913), 21. Also see Lankton and Martin, "Technological Advance, Organizational Structure, and Underground Fatalities," 45 ff. A total of 1,900 men are known to have died underground at the mines, half of them between 1900 and 1920.

<sup>16</sup> See entries for Houghton County in Michigan, Annual Reports of the Secretary of State on the Registration of Births and Deaths, Marriages and Divorces in Michigan (Lansing). Also, Houghton, Keweenaw and Ontonagon counties maintain local Death Records at their courthouses.

<sup>17</sup> Lankton, Cradle to Grave, 131-33, 135.

<sup>18</sup> Lawrence M. Friedman, A History of American Law (New York, 1973), 409, 412-13. Also, "Labor Law and the Michigan Supreme Court, 1890-1930," unpublished master's thesis, Wayne State University (June 1980), 23-31.

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- <sup>19</sup> Michigan, Public Acts, 1887 (No. 213), 252-54.
- <sup>20</sup> Lankton, Cradle to Grave, 133-34.
- <sup>21</sup> *Ibid.*, 131.
- <sup>22</sup> *Ibid.*, 122-24; Mine Inspector's Report for Houghton County for 1895, 13-16, 18.
- <sup>23</sup> William Graeber, Coal-Mining Safety in the Progressive Period (Lexington, 1976), 1-3.
- <sup>24</sup> Michigan, Public Acts, 1911 (No. 163), 263-67; also, Public Acts, 1897 (No. 123), 140-41.
- <sup>25</sup> Lankton, Cradle to Grave, 135-37.
- <sup>26</sup> *Ibid.*, 136-38.
- <sup>27</sup> *Ibid.*, 138-39; Michigan, Public Acts, 1912, 25-26.
- <sup>28</sup> Lankton, Cradle to Grave, 139-40.
- <sup>29</sup> *Ibid.*, 188-90; Min. Stats. for 1899, 277. Also see C&H's annual reports for 1898-1901.
- <sup>30</sup> Lankton, Cradle to Grave, 194-95.
- <sup>31</sup> *Ibid.*, 172-73.
- <sup>32</sup> *Ibid.*, 157-58.
- <sup>33</sup> U. S. Bureau of Labor Statistics, Michigan Copper District Strike, Bulletin No. 139 (Washington, 1914), 114-15.
- <sup>34</sup> Lankton, Cradle to Grave, 210, 216-17.
- <sup>35</sup> Arthur W. Thurner, Rebels on the Range: The Michigan Copper Miners' Strike of 1913-14 (Lake Linden, Mi., 1984), 28-35; Lankton, Cradle to Grave, 205, 206-08, 219-20.
- <sup>36</sup> Charles K. Hyde, "Undercover and Underground: Labor Spies and Mine Management in the Early Twentieth Century," Business History Review 60 (Spring, 1986): 1-27.
- <sup>37</sup> Lankton, Cradle to Grave, 206, 208-09.

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<sup>38</sup> Ibid., 213-14.

<sup>39</sup> Ibid., 211-12.

<sup>40</sup> Ibid., 214-16.

## CHAPTER 14

## THE STRIKE OF 1913-14

Compared to other metal mining districts, the Lake Superior copper district over its history had witnessed few major battles between companies and their workers. That is not to say that harmony always ruled. More accurately, often an uneasy peace existed between the controlling companies and their workers. Labor shortages, labor surpluses, falling copper prices, rising copper prices, industrial contraction, and industrial expansion – these things often tested this peace, because they tended to separate workers and managers. What was good for the interests of one, usually worked against the interests of the other. Consequently, strikes and attempts to unionize occasionally disrupted or threatened operations at the mines.

The International Workingmen's Association actively organized in the region in the early 1870s. At the same time, the Portage Lake mines and Calumet and Hecla weathered strikes in 1872 and again in 1874. During the turbulent 1880s, a decade of many major labor revolts elsewhere, the Knights of Labor spawned a labor movement at the mines. The region was hit by a trammer revolt in 1893, and Quincy had another one at the turn of the century, when it tried to cut trammers' wages after introducing electric haulage locomotives underground. In 1903-04, the Western Federation of Miners initiated its first unionization attempts in the Copper Country. Shortly thereafter, walkouts plagued Quincy in 1904 and 1905, and a three week strike erupted there in 1906. That same year, Finnish trammers struck the Michigan mine in Ontonagon County. They hoped to achieve higher wages and force the hiring of some Finnish trammer bosses. Instead, they ran into sheriff's deputies, a riot ensued, and two Finnish trammers ended up dead.<sup>1</sup>

Without doubt, labor problems and worker dissatisfaction were on the rise after 1900, but still the region had not witnessed any sustained labor rebellion on a broad front. The Finnish trammer strike of 1906 resulted, admittedly, in two deaths, but that conflict had been short lived, isolated, and occurred at a small producer. Not until mid-1913 did the Copper Country experience its first epic labor battle, which would be its greatest test of wills. It is always called the "strike of 1913-14." But in truth, it was much more than a strike, much more than a head-butting of management and labor. It was a major social upheaval on Lake Superior, and during its run, at times nothing close to "normal" life was lived there, by anybody.<sup>2</sup>

The mining companies had felt themselves under pressure, under attack, on several fronts. Local society, state and federal legislatures, and courts – all seemed bent on overturning all the old time rules that the companies had once lived and thrived by. The companies felt vulnerable, and didn't like the feeling. They needed to take action. They needed to become more competitive, economically, by reducing their production costs. They were the deepest mines in the country, working the lowest grade copper deposits. Many lodes were pinching down, and their copper values were falling off. In the face of all this, the companies deemed it essential to reassert themselves, to have their engineers

wield the tools of modern management. They needed efficiency and higher productivity. They needed scientific management, cost accounting, and new technologies.

Workers – especially underground workers – felt just as vulnerable on their own side of the equation. They worked now for larger, more impersonal companies, whose employees numbered in the thousands. Everything they saw, everything they heard, told the newer arrivals from Europe – the Finns, the southern and eastern Europeans – that their bosses at best merely tolerated them, because they had desperately needed new workers from new places as the mines expanded after 1890. But the men knew they were often scorned, denigrated and held in low esteem by their bosses, because they weren't skilled enough, weren't steeped in mining traditions, weren't fully assimilated into the industrial culture they had migrated to.

Some of the men chafed at the unequal distribution of paternal benefits doled out by the companies. They groused about having lower pay and longer hours than miners in Butte, Montana. They believed the modern gospel of efficiency, for them, spelt only trouble, because it meant tighter inspection and work speed-ups. They felt that the underground, warmer now, maybe in the 80's, was an uncomfortable place to work – and certainly an unsafe place to work. At Quincy, “man-made earthquakes” or air-blasts happened all the time, it seemed, making a large labor force nervous and fearful. And in the county of Houghton as a whole, like clockwork, about a man a week died on the job.

The gulf between labor and management widened at a faster pace in the early twentieth century. Still, a state of uneasy peace might have continued for years, except for one thing: the one-man drill. The mining companies thought they had to have it, even if they had to force it into place; the workers thought they had to resist this new technology at all costs. The one-man drill brought conflict to a head, because the math was simple. If this new machine could really do the work of a two-man machine, then the mines would need half as many miners as before. Besides promising to devastate the ranks of already-employed miners, the one-man drill promised to devastate *future* miners – such as trammers, those who hoped to one day advance and become a miner. Miners and trammers had long operated as different classes of workmen at the mines, classes that much of the time had little truck with one another. Miners were the superior ones, and the companies treated them as such. But now, they felt more akin to trammers than ever before, because they felt they were being *mistreated* by the companies. This new technology was aimed at *them*. The threat of this new machine forged a bond between two groups that had long labored apart, but that now shared strongly-felt grievances.<sup>3</sup>

The one-man drill wasn't the sole cause of the strike of 1913-14, but it was the strike's trigger. The Western Federation of Miners pulled the trigger, fired the first shot, and aggressively launched the strike. The mining companies in turn fired right back with a total commitment to win this confrontation. Once the union had started it, the companies were bent on finishing it. This was their chance to reassert their control in the region and show everyone who was boss. The strike, by far the worst episode ever of labor and social conflict in the region, began on July 23, 1913 and did not end until April 12, 1914. In between, all hell broke loose on the copper range.

Until early in 1913 the Western Federation of Miners achieved only modest success in establishing strong local unions at the copper mines. WFM membership lagged. But it became apparent during the winter of 1912 that the mining companies were ready to replace two-man drills with one man machines in the near future. As was usually the case on Lake Superior, with its long and harsh winters, labor unrest lay fallow during the cold months, only to emerge during the warm months. Early in the spring and summer of 1913, membership in the WFM on the Keweenaw mushroomed from a thousand to maybe seven to nine thousand over just a few months. The one man drill galvanized the men. Virtually all these members came from the ranks of underground workers – workers at the surface shops, mills, smelters, and railroads stayed out of the fray. Into the fray went Finnish, Croatian, Slovenian and Italian trammers, not unexpectedly, since they were long deemed the fractious ones. But into the fray too, went the miners, including many Cornishmen not accustomed at all to such rebellion.<sup>4</sup>

The WFM had a proud tradition of radical and staunch unionism. That tradition got them into this fight, kept them in this fight, and made them pay too great a price for inevitably losing this fight. The WFM leadership, out in Colorado, had won and lost many battles (the union had won in Butte, Montana, for instance) and the union wanted to organize in Michigan. But signing new members into nascent locals – and calling for a broad strike against old and entrenched mining firms – those were two entirely different things. The executive board of the WFM, led by Charles Moyer, knew that it had less than \$25,000 in the bank, knew that many members on the Keweenaw were inexperienced and not hard-core union men, and knew that the likes of Calumet and Hecla, Copper Range, and Quincy would be hard to beat in any showdown. The executive directors of the WFM out in Colorado did not initiate the strike of 1913-14, nor did it want it at that time.<sup>5</sup> They feared it. This strike came about because the WFM locals on the copper range got out in front of the union's national leadership. The Keweenaw men wanted to head off the drills *now*. They had to strike *in the summer*. So the locals held a membership referendum early in July – should we ask to meet with the companies to press our grievances? Should we strike if the mines refuse to meet with us or concede our grievances? Backed by a majority of “yes” votes to both questions on the referendum, the leaders of the local WFM contingent sent letters, not approved by the national WFM, to all the mining companies. The letters stated some grievances. The letters also warned the companies. Should they “follow the example given by some of the most stupid and unfair mine owners in the past,” and refuse to meet with WFM representatives, then they would waste the opportunity “to have the matters settled peacefully,” and they could expect a major strike.<sup>6</sup>

The mining companies did not respond to their letters. A response would have been tantamount to recognizing the existence of the WFM, and they were not about to do that. The course was already set. The locals had thrown down the gauntlet, the companies ignored the locals, and the national leadership of the WFM was loath to rein them in, or stall the promised strike. This strident union could not take back any of its threats, and still save face, so the men took to the streets to shut the mines down.

The WFM locals had specific goals in mind. First and foremost, they needed to force the companies to recognize the WFM as the collective bargaining agent for the workers. No longer would the companies be able to set wages and hours and benefits at their own discretion; they would have to negotiate these things with their men and enter into labor agreements. Beyond that, the WFM's most important specific aims were to receive a minimum wage of \$3 for all underground workers (miners, trammers, timbermen), an 8-hour workday (down from the current 9), and two men on all drills.<sup>7</sup>

To help win these objectives, the WFM hoped to muster popular support for their cause. They wanted to be seen as the down trodden; they wanted their demands to be seen as warranted and just. At the same time, however, they knew the mining companies would not give ground unless forced to do so. So their principal tactic was to shut the mines down, stop their production, inflict economic pain upon their employers, and force negotiation. At the negotiating table, the companies would have to bow to union demands in order to get the men back to work, and the mines up and running.

The companies, of course, had a contrary set of goals and tactics. For starters, they stood united and did go off in separate ways to battle the WFM. Calumet and Hecla and its managers and attorneys called the shots. "Big Jim" MacNaughton, C&H's general manager, led the way, set the course, and other companies fell in behind. The companies' goal was to lose nothing important over the strike, and to gain even greater control over the region. They had recently seen their hegemony challenged in many ways, and for several years they had been treading gingerly on the issue of adopting one-man drills. Their goal was to kick the WFM out and put the one-man drill in. While waging the battle, they would present themselves as beleaguered companies, as good corporate citizens with a long history of paternalistic, labor-management peace. They were good corporate citizens who were now being unfairly hounded by outside labor agitators, socialists, and anarchists, who were ruining a good thing for all the hardworking men in the district who just wanted a decent wage for doing a decent job. As the strike wore on, it became apparent that the managerial goal was not just to win the strike, not just to beat the WFM, but to crush this flirtation with unionism. The companies would rout the union, whip it as badly as possible, and kill the threat of unionism on the Keweenaw for a couple of decades, at least. Early in the strike, Big Jim MacNaughton had written to his company's president, Quincy A. Shaw, Jr., that the mines were "all of one opinion, namely, that the Union must be killed at all costs." Late in the strike, MacNaughton pressed for a dramatic kill: "If we want to be insured against a repetition of this thing within the next 15 or 20 years we have got to rub it into them now that we have them down."<sup>8</sup>

Over many months, the mine managers followed some simple and clear cut tactics. Foremost, they never gave the union hope of a settlement. They absolutely refused to mediate the situation. They never recognized or sat down with the Western Federation of Miners. All pleas for negotiation fell on deaf ears, regardless of their point of origin. Pleas to negotiate that emanated from Michigan's governor, the federal labor bureaucracy, or the U. S. Congress all came to naught. The mining companies adopted the demeanor of imperial arrogance. They were using this strike to take back control of

their region. Governor Woodbridge Ferris gave up hope of brokering some sort of negotiation: “When James MacNaughton says that he will let grass grow in the streets before he will ever treat with the Western Federation of Miners or its representatives, I believe what he says.” A U.S. Congressman, during an investigation held on the Keweenaw early in 1914, asked the same MacNaughton about letting some “high authority,” some “disinterested power” arbitrate the dispute. Would he not listen to the Governor, or even the President? In response, MacNaughton reached into his pocket and brandished its contents at the Congressman: “This is my pocketbook. I won’t arbitrate with you as to whose pocketbook this is. It is mine. Now, it would be foolish to arbitrate that question. I have decided it in my own mind.”<sup>9</sup>

While forever refusing to negotiate, the companies did acquiesce in a short shut-down, forced upon them by the union. The companies knew they could weather a loss of income far better than their employees. They knew that by comparison, they were wealthy, while the WFM was poor. The WFM as a national union had less than \$25,000 to its name. On the opposite side, Calumet and Hecla’s president, Quincy Shaw, advised superintendent MacNaughton not to worry a bit about the cost of the strike. C&H had sixteen million pounds of copper ingot to sell and an additional twelve to thirteen million pounds of mineral that, when smelted, would yield another eight million pounds of salable copper.<sup>10</sup> The company had \$1 million in cash and another \$1.27 million due in bills receivable. So the mining companies welcomed a shut-down. It would lay on some hurt to the men causing it; it would aggravate any loyal non-striking underground workers suddenly shut out from their work. It would increase their anti-union sentiment. Then, the mines would reopen, albeit on a limited scale, using imported men or “scabs” brought into the district on guarded, armed trains. Loyal workers would join the scabs in restarting production. As the strike dragged on, more disenchanting strikers would abandon the union, and come back to work. Finally, the union would just have to quit. At that time, the companies would cull out the worst of the trouble makers and never take them back. But they would take back the rank-and-file strikers, those who had learned their lesson about organized labor the hard way and were ready to swear off allegiance to or membership in the WFM.

This prolonged labor battle was about power and control, most assuredly, but it was also a contest for high moral ground. It was about who the victim was, and who the villain was. It was about public sentiment, and emotions, and values. Over the run of the strike, many of its key moments evolved the contest over high moral ground: who had just taken it, and who had just lost it.

The striking WFM lost high moral ground right at the start. Since the companies would not talk or negotiate with them, the union felt it essential to shut the mines down – and there was no polite way for them to accomplish that. So on July 23, the strike started up at the C&H mine with street skirmishes and violence.<sup>11</sup> Striking miners used fisticuffs, brickbats, clubs and hurled insults to chase away the men coming off one shift. There was no gun play and no fatalities, but some battered heads and bodies. The union got what it wanted – the violence at the end of one shift caused Big Jim MacNaughton to call off the next shift. The mine had been closed. But the companies got what they wanted,

too. The rebellious men roaming the streets had resorted to violence to work their will. It looked like the companies and its loyalists were the victims; the strikers, the villains. At C&H, MacNaughton could not have scripted a better opening scene, in terms of public relations.

In the night after the strike, concerned over the safety of men and C&H's physical plant, MacNaughton (who happened to head the Houghton County Board of Supervisors), met with Sheriff Jim Cruse, a man MacNaughton believed would handle this strike in whatever manner the companies asked of him. Having just won high moral ground, MacNaughton wanted to avoid, for the time being, the arming of hundreds of quickly deputized men to protect men and property. The best solution, as worked out by the Sheriff and C&H's superintendent, was to appeal to the Democratic governor, Woodbridge Ferris, to send the Michigan National Guard up to the Copper Country. Ferris obliged and on July 24 detailed virtually the entire National Guard, some 2,765 men, up to the mines.<sup>12</sup> Soon the major mines looked like military encampments. (Figs. 87-88.) Men bivouacked in tents pitched around the C&H mine and atop Quincy hill and elsewhere. Foot soldiers stood watch and drilled; mounted cavalry rode the streets.

With the coming of the National Guard, an uneasy calm held around the mines over the next few weeks. The mining companies acquiesced in the temporary closure of operations. Some men got up and left the district. Some, after briefly flirting with the WFM, already started to defect, while others held firm. But during this time, hostile confrontations were infrequent, thanks to the presence of the National Guard. But Governor Ferris couldn't keep the whole guard up there for too long. He was worried about costs, surely, but he was more worried, perhaps, about the Guard being seen not as peacekeepers, but as strikebreakers. The Guard started to withdraw half of its forces from the mines starting in mid-August, three weeks into the strike.

The mining companies, in anticipation of the withdrawal, went ahead with the deputizing of six hundred local men loyal to their employers' cause. They also hired some fifty men – the companies called them guards, the WFM called them thugs or goons – from the Waddell-Mahon Corporation in New York City<sup>13</sup>. Companies then announced that they would start reopening their mines in mid-August, just when the National Guardsmen were starting to go home. In short, as the stabilizing effect of the presence of hundreds of Guardsmen was being removed, the mining companies chose to reopen. This poorly timed initiative raised tensions and excited confrontations, which in this instance worked against the companies.

The mines said they would reopen using men who'd never joined the union ranks, as well as men ready to defect from the WFM. The reopening of the mines was more an attempt to break the union, than an attempt to begin serious production. The companies would take back any man who swore he was not an active member of the WFM, who promised not to become a member, and who surrendered any membership book that he had.

The Copper Range Company's Champion mine was slated to reopen on August 14, and within the next few days, both Calumet and Hecla and Quincy were to follow suit. Not unpredictably, the reopening of the Champion mine was attended by a violent episode.

On August 14, strikers John Kalan and John Stimac left a bar in South Range and walked a trek of several miles back toward the company house where they boarded in Seeberville, one of the Champion mine's neighborhoods. Nearing home, they took a familiar path across Champion property, but that property was deemed off-limits to strikers and deputies guarded it. No doubt, the two parties exchanged some verbal insults, but the strikers kept on their way. The guards then informed a Waddell man, Thomas Raleigh, of the strikers' belligerence and trespass. Raleigh gathered up three more Waddell men, plus two local deputies, and marched his squad over to Seeberville, intent on arresting Kalan and Stimac.

When the men refused arrest, a fight broke out. The fight led to gunshots, all coming from the company men. They fired round after round into the crowded boardinghouse. Bullets struck four men, all Croatians: Steve Putrich, Alis Tijan, Stanko Stepic, and John Stimac. Tijan died instantly, and Putrich the next day.<sup>14</sup> (Fig. 89.)

With these two killings, high moral ground shifted to the WFM and its men, who now claimed their first martyrs. The companies had decried the outside trouble makers leading the strike, but their outside thugs had perpetrated gun violence. About five thousand mourners showed up at the funeral for Tijan and Putrich, and their deaths reenergized the strike, strengthened the union's resolve, and intensified the conflict.

While many men left the union's ranks within the first month of the strike, those remaining tended to be staunchly resolved to see it through. This resolve stiffened following the Seeberville killings, aided and abetted by the WFM's national leadership, who honored the union's promise to pay strike benefits. The money to be received was not great – \$3 per week for a single man, up to \$7 weekly for a married man with five or more children, and a maximum, in case of emergency, of up to \$9 per week. To raise this money, the union levied assessments of up to \$2 per month on all its members outside Michigan, plus it borrowed money from other unions and set up a defense fund and accepted contributions. With martyrs and a promise of soon-to-be-received benefits, the strikers gained confidence and promised to stay the course.<sup>15</sup>

Ironically, by mid to late August, the mining companies had gained confidence, too. After all, they had seen hundreds leave the union and want to return to work. Most importantly, the companies had managed to reopen their mines, albeit on a modest scale. The union was doomed, they thought. Part of the strike movement had already collapsed by mid-August. More of it would surely collapse when summer gave way to fall and as winter loomed on the horizon. Surely the men would capitulate by then. In the meantime, the companies would increase the pressure upon strikers by importing replacement workers, or scabs, which would allow them to augment underground operations.



Figure 86



Figure 87



Figure 88



SCENE OF RIOT - COPPER STRIKE  
MICHIGAN - 1913

Figure 89



**Figure 90**

It turned out, rather tragically, that the union and the companies were both wrong in their perceptions regarding the future course of the strike. But the union was more wrong than the companies. In effect, this strike was over in mid-August, as soon as the three major companies, C&H, Copper Range, and Quincy, had resumed mining operations. There was virtually nothing the union could do after that to force the recalcitrant companies to the bargaining table. They weren't going to do that, period. Instead, they would continue to take back disaffected union men, bring in more replacements, and slowly built up their production levels. Basically, with the deaths of the Seeberville men, the visit of union president Charles Moyer to the Copper Country shortly thereafter, and the providing of strike benefits, the union raised the stakes of the strike and prolonged it. But the mines had already reopened, meaning the strike was basically hopeless and futile. Reinforcing the strike, rather than winding it down, cost the union and its members dearly.

For their part, the mine managers were right in recognizing the tactical importance of reopening the mines – but they were wrong in underestimating the amount of fight left in the WFM membership, whose holdouts were predominantly Finns, Hungarians, and Croatians. The companies expected the strike to collapse much sooner than it did. The dragging on of the conflict, however, cost the union far more dearly than it cost their employers.

In September the labor struggle intensified. More replacement workers came into the district, and the union stepped up its actions. The WFM did more parading, more picketing, and more taunting of the men going underground. Striking men were not the only ones taking to the streets – their women were there too, mothers, wives, sisters, and even daughters. They hurled insults, and sometimes bucketsful of human excrement, drawn up from privies, at the scabs.<sup>16</sup> The women and the men were arrested in considerable numbers at times, and the National Guardsmen still in place failed to keep the peace as easily as had been done earlier. Indeed, the Guardsmen sometimes exacerbated the conflict. “Big Annie” Clemenc, a local, became a labor hero when a Guardsman raked her wrist with a bayonet while she marched draped in an American flag. Up at Kearsarge, north of Calumet, Guardsmen fired their weapons when confronted by two hundred marchers protesting the use of scabs. One bullet resulted in a serious head wound to a fourteen year old girl, Margaret Fazekas. To many, the Guardsmen, too, had lost high moral ground, and too closely resembled the deputies and thugs hired by the mining companies.<sup>17</sup>

While disregarding all requests to arbitrate or negotiate, the mining companies continued to import more new workers in September and October, putting them up in hastily built bunkhouses near the shafts and protecting them with deputies. By October, the National Guard force had fallen off to only a couple hundred men, but Sheriff Cruse had deputized twelve hundred men. C&H alone had four hundred “Deputies and Hotel Men” to protect life and property. High atop its 150-foot-tall No. 2 shaft-rockhouse, the Quincy mine erected an observation station so guards could watch over the entire mine site.<sup>18</sup>

The companies sought to maintain control of the explosive situation through displays of force and numbers, and through the courts. Seventeen mining companies were being struck, and through a covert arrangement their legal battles during the strike were handled by C&H’s principal attorneys, the firm of Rees, Robinson & Petermann. When the strikers picked up their street actions, which coincided with the importation of more men, the attorneys sought an injunction to prohibit picketing and the harassment of men going to work. This request for an injunction went to Judge Patrick O’Brien – the same man, who, as a lawyer in practice, had often sued and beaten the companies in personal injury lawsuits.

O’Brien’s politics clearly put him in the camp of the workers, but as a judge he wanted to reinforce respect for the law and protect law and order. On the one hand, he wanted to honor the strikers’ rights to assembly and to free speech; on the other, he wanted to avoid ugly, dangerous confrontations in the streets. As a consequence, his actions as judge wavered and tilted, first one way, then the other. Initially, on Sept. 20, he granted the companies their injunction, but then he lifted it nine days later. Rees, Robinson & Petermann requested a second injunction, and this time O’Brien denied it. The companies’ attorneys then appealed to the Michigan Supreme Court, and on Oct. 8 the high court reinstated the injunction.

Shortly thereafter, picketing and taunting led to sporadic street violence and O’Brien ordered the injunction enforced. Local officials were happy to oblige, and in two

instances they arrested 141 strikers at Allouez and another 68 at Mohawk.<sup>19</sup> When those arrested appeared before Judge O'Brien, he seemed to tilt again, back towards the men. Instead of throwing the book at them, he reminded them to obey the law and opined that circumstances surrounding the strike had goaded them into violating it. In short, if they had been treated better, they would have behaved better. Instead of immediately prosecuting the men, O'Brien released them on their own recognizance. Companies and their allies now faulted O'Brien as coddling agitators, and many citizens were growing tired of the turmoil in and around the mines, which O'Brien seemed reluctant to quash.

Others, too, were tiring of the battle. By the end of October, the WFM leadership, privately, at least, admitted they were whipped. They had raised money to sustain the battle; they had helped intensify it in the weeks and months after the Seeberville killings; they had given locals the gate to prosecute the strike with vigor in the streets. But instead of trying to still win the strike, they looked for a face-saving way of losing it. Union officials turned to a supposed ally, Judge O'Brien, to see if he might help them broker a deal to end the strike. They would end the strike, they said, and give up their demands, if the companies would just agree to take men back without requiring them to withdraw from the union. O'Brien met with Jim MacNaughton to discuss the deal. MacNaughton, knowing that victory was certain, was in no hurry to end the strike with any conciliatory move. He nixed the deal.<sup>20</sup>

The companies at nearly the same time gained an important new ally in an organization called the Citizens Alliance. Covertly, the mining companies and their attorneys had helped form and fund this organization and its activities and its publication, called the *Truth*, which very much sought to counter and refute the WFM's publication, the *Miners' Bulletin*. The public face of the Citizens Alliance, however, wore the mask of a grassroots movement of Copper Country residents who simply wanted to restore peace and tranquility to the region. Of course, the Citizens Alliance had no doubt as to who had destroyed peace and tranquility in the first place: the union. Its "poisonous propaganda of destructive socialism, violence, intimidation, and disregard of law and order" had menaced the Copper Country long enough: "The Western Federation of Miners must go."<sup>21</sup>

The Citizens Alliance turned up the heat on the strikers with its first issue of *Truth*, paid for by the mining companies, which was distributed free of charge throughout the district on Nov. 27. The organization claimed 5,236 members who all condemned the union and wanted it gone. Enough was enough; let us see the union leave this place! A day later, the mining companies did their part to undercut the union. They voluntarily announced that beginning December 1, they would introduce an eight hour work day and new grievance procedures for men who felt they had been wronged in any way.<sup>22</sup> The mining companies, not long before, had fought against an eight hour day. But they knew it was going to be forced on them shortly anyway, as a part of Progressive Era reforms, so they chose to surrender it in the midst of the strike. They surrendered it, so they said, *Not because of the pressure applied by the WFM*, but because the companies felt it was the right and just thing to do. In short, while the Citizens Alliance denied that the violent, disruptive strikers had any right to high moral ground whatsoever, the companies

protected their own claim to high moral ground by benevolently presenting the men with a shorter workday and new ways to address wrongs. The companies thought their moves would encourage remaining strikers to bolt the union and return to work before hard winter set in. Surely, the union would now collapse. But it didn't happen. Instead, the worst month of the strike lay just ahead: December of 1913.

On December 5, Judge O'Brien held the final hearing for 139 persons arrested in late October for harassing company workers at the Allouez street car station. Their actions had violated the court's injunction, and O'Brien found them all guilty. Then, he sought justice for the strikers in his own way: he suspended all their sentences. Going beyond that, O'Brien opined that the men were not criminals, but "were engaged in a heroic struggle for the mere right to retain their membership in a labor organization."<sup>23</sup> The mining companies had incited these men, by doing everything possible to "increase their bitterness and hostility."

Judge O'Brien awarded high moral ground to the strikers. A day later, the Citizens Alliance condemned O'Brien for virtually inviting the strikers to follow a violent and lawless path. The next day, on December 7, strikers perpetrated an act of violence that set off a firestorm of ill-will and condemnation and sent the district reeling.

Arthur and Harry Jane, brothers, were men in their twenties who left the district early in the strike. They removed themselves from the region's troubles. But then they chose to return. They came back to the Champion mine to go to work on December 6, and boarded with a fellow Cornishman, Thomas Dally. At 2:00 a.m. on December 7, bullets ripped into houses at Champion, including Dally's. The Jane brothers, both hit, died immediately. Thomas Dally died of a head wound the next day. In a neighboring house, a rifle shot wounded a thirteen year old girl. The men doing the shooting, trying to scare off scabs and returning workers, were two rank-and-file union men, Hjalmer Jallonen and John Juuntunen, plus John Huhta, once the secretary of the South Range WFM local, and Nick Verbanac, a paid WFM organizer.<sup>24</sup>

The shooters' identities were not known at the time, but the Citizens' Alliance responded to the murders with alacrity and decisiveness. Their fears had been realized. O'Brien's liberal treatment of the WFM had virtually sanctioned their violence and lawlessness. As a consequence, good Cornish workers lay dead at the Champion mine, while the WFM's "murder inciting mercenaries" ran free. The anti-union sentiment boiled over, the fire fanned by the English language press and by the Alliance. On December 8, the Mining Gazette in Houghton shouted, "FOREIGN AGITATORS MUST BE DRIVEN FROM THE DISTRICT AT ONCE." Fearing anarchy, the Citizens' Alliance nearly endorsed vigilantism. The Alliance quickly organized large rallies in Calumet and Houghton on December 10. They put on special trains to bring the crowds in. The companies not only paid for the trains; they also let their employees off work so they could attend the rallies and hear staunch good citizens condemn the WFM's "poisonous slime" and its "reign of terror."<sup>25</sup>

In the weeks that followed, the last of the die-hard union men and their families were put under more pressure than ever before, endured more ostracism and condemnation. Sheriff's deputies and Alliance members harassed them; many WFM houses and enclaves were raided; some serious but nonfatal shootings occurred. Still, the union locals did not collapse.

Even Big Jim MacNaughton at mighty Calumet and Hecla begrudgingly tipped his hat to the tenacity and steadfastness of the strikers. The workers had hung tough longer than he thought they could, or would. He and other mine managers were ready, a week before Christmas, to try another tactic to kill the union and its strike. They announced that all men who did not return to work immediately would lose their jobs permanently. Then, during this troubled Christmas season, local merchants appealed to MacNaughton to stay this plan. Make the deadline for returning to work after Christmas, they asked. Make it after the first of the year. MacNaughton agreed.<sup>26</sup> He, too, was tired and worn down from the long strike, and this delay promised a bit of respite over the holiday. But it was not to be.

On Christmas Eve, 1913, strikers and their families, mostly Finns, plus many Croatians and Slovenians and some Italians, enjoyed a Christmas party on the second floor of the Italian Hall in Calumet. It was meant as a moment of celebration in a time of trouble. Adults and children gathered early in the afternoon, and by 2 o'clock, some 175 adults and 500 children partied upstairs in the hall. They heard some speeches, sang some carols. Children got to visit Santa Claus and each received a rare treat and enjoyed it, however modest it was. The party had started to break up, and many had left, thankfully. Because about 4:30, all hell broke loose. People – adults and children – stampeded for the stairs, but in their rush, panic, and commotion, they failed to get out the doors below. The first ones down became buried under the next to come down, who got buried by still others coming down. The result of the panic was all too clear: seventy-three people died in the stairwell late that afternoon, and another died the next day. The dead included fifty Finns, twenty Croatians, and about three Italians. Sixty of the dead were children, from two to sixteen years old.<sup>27</sup>

If the end result was all too graphic and tragically clear, the cause was not. The exact sequence of events, from the start of the panic, through the screams and cries and death moans, until the dead fell silent, cannot be reconstructed with any certainty. In the midst of such panic, who is the calm and collected one, the careful observer, who witnesses the event from start to finish and then recalls and relays the information? Probably no one. And in the hyper-charged political and contentious era that was the strike, who in the Copper Country could tell the story of Italian Hall without having it colored by other inflammatory incidents of the past several months? Possibly no one.

Usually, the Italian Hall disaster is laid at the feet of a cry of "Fire!" which triggered the mass hysteria. There was no fire, but surely something triggered the stampede. Among the stories recounted, some said a man came upstairs wearing a Citizens' Alliance button on his coat, and he had yelled "fire!" to ruin the party and set off an alarm. Another story had it that Citizens' Alliance men held the doors shut at the foot of the stairs, so that no

one could escape the building. Various conspiracy theories immediately surfaced, which in a twisted way intermingled with everyone's grief and shock. Italian Hall claimed far more lives than any mine accident, or any other catastrophe ever on the Keweenaw.

Copper Country residents immediately set up a relief fund ear-marked for the families of the dead. Many of the contributions came from mine officials, merchants, and supporters of the companies. By noon, the day after Christmas, \$25,000 of charity had been collected. The president of the WFM, Charles Moyer happened to be in town, and he offered up a huge and hurtful snub. On behalf of the strikers and their families, living and now dead, he rejected any aid or charity. Moyer made it clear that "No aid will be accepted from any of these citizens who a short time ago denounced these people as undesirable citizens."<sup>28</sup> The managerial class had always refused to recognize the WFM; now the WFM refused the right of that class to share in the grief and tragedy of Italian Hall. Going beyond that, the union and socialist leaders publicly charged the Citizens' Alliance for instigating the tragedy.

The denial of their grief, the refusal of their charity, and the charges leveled at the Citizens' Alliance terribly angered many anti-union residents and called forth a harsh and decisive reaction. On the evening of December 26, a gang of men went to Charles Moyer's room at the Scott Hotel in Hancock. In the scuffle and man-handling that ensued, Moyer suffered a gunshot wound to the back. The men then hauled him outside and delivered him to a mob that dragged him over the bridge to Houghton and tossed him on a train bound for Chicago.<sup>29</sup>

The Italian Hall tragedy caused many from outside the region to look inside it to try to figure out what was going on in this remote part of Michigan. The U. S. Congress came and held an investigation.<sup>30</sup> But outsiders, aside from the national leaders of the WFM, had little effect on the course of things after the tragedy and Moyer's violent deportation. The companies weren't budging an inch in their determination. And, remarkably, many members of the WFM locals weren't budging either. They wanted to continue the fight into the spring of 1914. But Moyer and other WFM leaders knew that the strike was not only hopeless – it had severely hurt their union on a national level. The WFM had spent \$800,000 already on the strike, including almost \$400,000 of mandatory assessments paid in by WFM members elsewhere. The union found itself basically bankrupt and with an angry membership. Still, Moyer would not simply tell the locals in Michigan to quit; he couldn't allow himself to do that. Instead, the union's executive board decided to cut benefit payments to the strikers, a move they announced to the Michigan locals. In response to this, the 2,500 or so continuing strikers voted to call it off. The strike, which for all intents and purposes was lost by the WFM in mid-August, 1913, when the mines reopened, finally ended on Easter Sunday, 1914.<sup>31</sup>

It may have been justified in many ways, yet the strike of 1913-14 was hardly a fair fight. The WFM did not stand a chance against the well entrenched, well financed mining companies, which acted with unwavering resolve to hand the WFM a decisive defeat. And in the end, the companies got what they wanted and the workers got what they

feared: the one-man drill became the new standard; half the miners lost their jobs; production did not suffer, and productivity increased.<sup>32</sup>

Still, the region and the mining companies paid a steep price to see this battle of wills all too slowly conclude. They suffered nearly nine months of social upheaval, where tensions ran high, and sometimes lives were lost. The incident left bitter divisions in society, created wounds that would not heal. The district lost its reputation as a mining region with surprisingly good labor-management relations. The companies won their favored drilling machine, but they lost many good men who beat a path out of the district rather than weather the strike. And most surely, the replacement workers or scabs they brought into the district were not as good or as experienced as the men who left, or the men the companies wouldn't take back, because they had been too actively involved with the WFM to be "forgiven." Just after Italian Hall, the deportation of Charles Moyer, and in the midst of congressional investigations and a criminal trial involving the strike in January, 1914, down in Highland Park, Michigan, Henry Ford announced his \$5 per day wage and bonus plan. So, a man could toil up on Lake Superior in deep mine, in a hostile social environment and a dangerous work environment for something under \$3 a day – or he could get on a train and trek to Detroit, where he could work in the most modern auto plants and make more money.<sup>33</sup> A more or less permanent exodus of workers had started. From the strike on, rather than staying in the mines, many workers gave them up and headed to the auto plants of Detroit to make Fords, or Buicks, or a bit later, Chryslers.

For the companies, especially Jim MacNaughton and Calumet and Hecla, which had called all the important shots in the strike, the labor rebellion was seen as their big chance to show who was the boss. For two decades their power and control had been nibbled at from all sides, it seemed. Sometimes they had to swallow their pride; sometimes they had to change their course to adapt to the new world in which they worked. The strike gave the companies an opportunity to reassert themselves in a dramatic and forceful way, to define for themselves just how they were going to act in order to unleash a harsh blow against unionism.

The companies asserted themselves and won the day, but in truth, they truly weren't as strong and all-controlling as they once felt themselves to be in the nineteenth century. All the force and muscle they brought to bear against the WFM could not protect them from changes to come, some of which briefly floated the mines to their highest levels of operation, but most of which tossed them about. Continuing change offered the mines a host of challenges and soon put them into a long period of decline – which all the resolve and arrogance in the world could not head off.

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<sup>1</sup> Hyde, "Undercover and Underground," 11-14; Puotinen, "Finnish Radicals," 203.

<sup>2</sup> The most detailed account of the long strike is Thurner's Rebels on the Range. Thurner narrates the history of the strike from its origins to its aftermath, from the perspective of one who thinks that the strike was a tragic mistake, perpetrated by a minority of workers in the district. For a treatment of the strike from a different perspective, one more

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sympathetic to the side of labor, see Lankton's chapter, "Showdown: The Strike of 1913-14," in Cradle to Grave, 219-43.

<sup>3</sup> Lankton, Cradle to Grave, 221.

<sup>4</sup> *Ibid.*, 219-21, 229; Thurner, Rebels on the Range, 35-39.

<sup>5</sup> Bureau of Labor Stats., Copper District Strike, 38; Thurner, Rebels on the Range, 63.

<sup>6</sup> Bureau of Labor Stats., Copper District Strike, 39; Dan Sullivan and C.E. Hietal to JM, 14 July 1913, C&H coll., MTU.

<sup>7</sup> Miners' Bulletin, 9 Aug. 1913.

<sup>8</sup> JM to QAS, 6 Aug. 1913 and 18 March 1914.

<sup>9</sup> Thurner, Rebels on the Range, 83; U. S. House, Committee on Mines and Mining, Conditions in Copper Mines of Michigan, Hearings before subcommittee pursuant to House Resolution 387, 63<sup>rd</sup> Cong., 2<sup>nd</sup> sess., 7 pts. (Washington, 1914), 1482.

<sup>10</sup> JM to QAS, 10 Aug. 1913; QAS to JM, 13 Au. 1913; Thurner, Rebels on the Range, 63.

<sup>11</sup> Thurner, Rebels on the Range, 1-10.

<sup>12</sup> *Ibid.*, 7-8.

<sup>13</sup> *Ibid.*, 47-48; Lankton, Cradle to Grave, 228.

<sup>14</sup> Thurner, Rebels on the Range, 68-73; Bureau of Labor Stats., Copper District Strike, 69; Hoagland, "The Boardinghouse Murders," 1-3.

<sup>15</sup> WFM, Michigan Defense Fund Ledger I (Aug. – Dec. 1913), WFM coll., Western Historical Collection, Univ. of Colorado.

<sup>16</sup> JM to QAS, 2 and 12 Sept. 1913. Also see Thurner, Rebels on the Range, 53, 88-89.

<sup>17</sup> Clarence A. Andrews, "'Big Annie' and the 1913 Michigan Copper Strike," MH 57(1973): 53-68; Bureau of Labor Stats., Copper District Strike, 70.

<sup>18</sup> Lankton, Cradle to Grave, 232-33; Thurner, Rebels on the Range, 112-14; C&H, Employment Ledger, 1894-1918, entries for "Deputies and Hotel Men," 1913, C&H coll., MTU.

<sup>19</sup> Lankton, Cradle to Grave, 231-32.

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- <sup>20</sup> Thurner, Rebels on the Range, 101-02.
- <sup>21</sup> Citizens' Alliance, "Membership Pledge," (1913); also see JM to QAS, 9 Nov. 1913.
- <sup>22</sup> Lankton, Cradle to Grave, 233.
- <sup>23</sup> Thurner, Rebels on the Range, 118-19.
- <sup>24</sup> *Ibid.*, 120-21, 245-47.
- <sup>25</sup> FWD to WAP, 9 Dec. 1913, Van Pelt coll., MTU; A. F. Rees to WRT, 18 Oct. 1915, C&H coll., MTU; Thurner, Rebels on the Range, 127-28.
- <sup>26</sup> Lankton, Cradle to Grave, 236.
- <sup>27</sup> *Ibid.*, 236-37; Thurner, Rebels on the Range, 138-53.
- <sup>28</sup> DMG, 25 Dec. 1913; Thurner, Rebels on the Range, 155.
- <sup>29</sup> Thurner, Rebels on the Range, 159-61.
- <sup>30</sup> The investigation started on 9 Feb. 1914. See Thurner, Rebels on the Range, 191-207. For the official record on the investigation, See U. S. House, Conditions in Copper Mines of Michigan (1914).
- <sup>31</sup> WFM, Executive Board Minutes, meeting of 3 April 1914, WFM coll.; Thurner, Rebels on the Range, 229, 255-56.
- <sup>32</sup> Lankton, Cradle to Grave, 241.
- <sup>33</sup> *Ibid.*, 240-41; U. S. House, Conditions in the Copper Mines, 11.

## CHAPTER 15

## A HALF-CENTURY OF DECLINE

The strike of 1913-14 was over. The mines and their attendant communities had just lived through their most intense, tumultuous period ever. But there would be no “return to normalcy” for this mining district. The mines and their men did not reassume old ways, quickly mend fences, and pick up where they left off. The companies won the strike handily, but they still couldn’t control their fate. After the strike came an unsettling period of six or seven years, one marked by both highs and lows. At the end of that period – by the early 1920s – the Lake Superior copper industry was in permanent economic decline. After seventy-five years of growth, the mines entered a period of nearly fifty years of winding down and, ultimately, of closing down.

The mining companies had little time to celebrate their victory over the WFM before international events dealt them a blow. The post-strike mines had hardly hit their full productive stride when the First World War broke out in Europe. The war immediately interrupted trade and commerce, which negatively affected the copper market and copper prices. In 1914, the price of copper fell two cents from the previous year’s level, and stood at only 13.6 cents per pound. This drop forced cut-backs upon the Lake mines, and some even suspended operations. Then, as the war continued on for several years and grew larger, world markets adjusted to it, transportation adjusted to it, and copper, used in munitions, proved a valuable commodity in high demand.

Copper prices climbed to 17.3 cents per pound in 1915, and then shot up to 28.2 and 29.2 cents in 1916 and 1917. Recognizing the economic bonanza being offered to them, the Michigan mines pushed their production to all time highs. They had produced 166 million pounds of copper in 1914. They produced 258, then 267, and then 256 million pounds of copper annually in 1915, 1916, and 1917. These years, in terms of annual production, represented the absolute peak for the mines. These years also represented their peak in terms of profitability. The mines had paid out a mere \$1.6 million in dividends in 1914 (their lowest total since 1887), but dividends soared to \$18.7 million in 1916 and then to the all-time high of \$23.9 million in 1917.<sup>1</sup>

The mining companies knew these glory years were a brief war-time bubble that wouldn’t last. Before war’s end, prices retreated to the 18 cent per pound range – and then, between 1920 and 1921, the price dropped precipitously from 17.5 to only 12.5 cents per pound. During the war, copper had been over-produced and stockpiled. After the war, holders of unneeded copper dumped it on the market, glutting it. At only 12.5 cents per pound, the Michigan mines couldn’t make money. Many closed or severely restricted operations in the early 1920s, and in 1921, for the very first time since 1849, not a single company paid out as much as a dollar in dividends.<sup>2</sup> Throughout most of the 1920s, the price never climbed back above 14.6 cents per pound – and the Michigan mines were in trouble over the long run. They sought to recover themselves, and in many ways, over the coming decades, they succeeded. But situations beyond their control,

such as the Great Depression of the 1930s, knocked them back down, and no short lived bonanza, like the tremendous price and profit spike of the First World War, ever lifted them way up again. After 1920-21, never would the mines be as large, as profitable, or as important as they once had been. Instead of managing growth, they now managed decline. They sought to maximize their final returns on their investments made in mine, mill, and smelter plants, before closing them down.

This industrial decline declared itself in myriad ways. Michigan had produced about eighty percent of the nation's copper in 1880; forty percent in 1890; twenty-five percent in 1900; and twenty percent in 1910. This drop-off continued. In 1916, the Lake mines hit their all-time high production of nearly 267 million pounds, but that represented only 13.3% of the nation's new copper. During the late 1920s, the mines accounted for about ten percent of national production, and by the Second World War era, only about five.<sup>3</sup>

Production fell off in similar fashion, from the 1916 high of 257 million pounds to 161 million in 1920, and only 92 million in 1921, which represented the copper district's smallest annual production since 1899. Production recovered somewhat through the 1920s to reach 186 million pounds in 1929, but then came the Great Depression. In 1933 the mines sent to market only forty-seven million pounds, their lowest production in fifty-four years. Again, the mines fought back against the Depression's economic hardships and recovered somewhat, but the production level they reached by the late 1930s and into the Second World War era was only about half the level of 1929 – only about ninety million pounds – and that figure fell off sharply to only sixty-one and then forty-three million pounds in 1945 and 1946.<sup>4</sup>

Dividend payments presented a similar picture – the long term trend was decline, with just a few good years in the mix, and some very bad ones. After the disastrous year of 1921, when no dividends were paid out, the industry managed to attain dividend levels of \$4 to \$5 million per year in 1925 to 1927. Then they paid out \$7 million in 1928 and \$11 million in 1929, when copper brought a high price for the decade of 18 cents per pound. Then came the Great Depression and crashing prices: only 8 cents in 1931, 5.6 cents in 1932, and 7 cents in 1933. Some dividend lows were just \$112,000 in 1931, \$392,000 in 1934, and no dividends, again, in 1935. By the late 1930s and through the Second World War era, a “good” year had come to be redefined as one with dividend payments in the range of \$2 to \$2.5 million.<sup>5</sup>

The companies had wanted to shrink their employment ranks between the 1890s and 1913. They aimed new technologies such as electric haulage locomotives and one-man drills at the goal of enhancing productivity, and they hoped the new technologies would allow them to run a leaner work-force. It had worked. Total copper industry employment stood at about eighteen thousand in 1910, and at fifteen thousand by 1915. Thereafter, national and international economies, and their faltering fortunes, did the companies' labor trimming for them. Mines closed; others shrank. The industry employed about twelve thousand in 1920; nine thousand in 1925; seventy-five hundred in 1930; forty-five hundred in 1935; thirty-five hundred in 1940; and only three thousand in 1945. Yes, the industry lived on for decades after entering into permanent decline in the

early 1920s, but on a vastly reduced scale. The mines were only shadows of their former selves.<sup>6</sup>

Up on the great lake, Superior, the fortunes of industry and society had been inextricably linked since the 1840s. Where and when the industry had grown, mine locations and nearby villages had grown. Where and when the industry faltered, declined, or closed, a pall fell on neighboring settlements. The Copper Country had created backwaters of development, and ghost towns, all along. While the industry boomed here, it went bust there. Towns such as Copper Harbor, Eagle Harbor, Eagle River, and Ontonagon had withered – or at least lost all growth potential – when nearby mines in the hinterland struggled or completely failed. Mine locations, all up and down the range, had done the same. While a Cliff or Minnesota mine flourished, so did its location. Houses went up, and schools and churches. A thousand or more people moved in. When the host mine closed, a thousand or more people left, and the schools, churches, and houses mostly went vacant, and over time, finally went down.

Meanwhile, other places such as Hancock, Calumet and Laurium flourished because their adjacent mines continued in operation for decades, and multiplied many times over in terms of their production and employment. But after 1920, even these communities suffered. No settlement, no part of the economy, no social institution went unaffected by the onset of decline in the mining industry. People, out of work, or tired of dangerous, low-paying jobs, got up and left (many going to the auto plants), taking their families with them. The population loss was precipitous, especially between the peak of 1910 and 1950, and did not start to stabilize (at much lower levels, however) until the 1960s and beyond.

Houghton County, long the center of the mining industry, had also been the Copper Country's center of population. Houghton County had a population of eighty-eight thousand in 1910. It lost sixteen thousand residents by 1920, and another nineteen thousand residents by 1930, when its population stood at about fifty-three thousand. The county's population dipped still further to forty-eight thousand in 1940 and only forty-thousand in 1950. In the 1960s and 1970s, it stabilized at about thirty-five thousand inhabitants, meaning that it lost sixty percent of its population over fifty years.

The smaller population units within Houghton County evidenced the same decline. In the vicinity of the Quincy mine, Hancock's population dropped from nine thousand in 1910; to seventy-five hundred in 1920; and fifty-eight hundred in 1930. Above Hancock, on Quincy Hill where many mine workers lived in two adjacent townships, Quincy Township's population declined from 1,500 in 1910 to 734 in 1930, while Franklin Township declined from 5,700 residents in 1910 to 2,600 in 1930. In 1910, Hancock, plus Quincy and Franklin Townships had a total population of 16,200; by 1950, they were down to only 7,300. Large population losses also were suffered on the margins of the Calumet and Hecla mine. The village of Calumet (or Red Jacket) declined from 4,200 in 1910; to 2,400 in 1920; and to 1,560 in 1930. Over those same decade breaks, the village of Laurium declined from 8,540 to 6,700, to 4,900, while Calumet Township (home to most company-owned housing) fell from 32,850 to 22,370, to 16,050.<sup>7</sup>

The social decline harnessed to industrial decline could be seen in the old lanes at many mine locations. Sometimes, along those lanes, company housing stood all boarded up. Sometimes the houses were gone, entire neighborhoods were gone and only cellar holes remained. Decline could be measured in values – such as the assessed valuation of all personal and real property. In 1910, the equalized assessed valuation of such property in Houghton County was \$93.4 million; by the dark year of 1921, it had plummeted to \$64 million; by the mid-1930s, it fell to only \$17 to \$19 million; and by 1946, it stood at only \$14 million.<sup>8</sup> Institutions eroded as the population declined. At the peak of the mines' operations around 1910, when they employed workers from dozens of ethnic groups or nationalities, the Copper Country boasted some eighteen daily or weekly newspapers (including religious ones), printed in the English, Finnish, Swedish, Italian, and Slavic languages. Thirteen papers survived till 1931; ten till 1941; and nine till 1951. But finally the bottom dropped out – and all the foreign language papers dropped out, leaving only three English language papers by 1960, and only two by 1970 – the Daily Mining Gazette of Houghton and the Native Copper Times of Lake Linden.<sup>9</sup>

Along the streets of Calumet and Hancock, on the margins of some of the best and most important mines in the district, traffic to the shops and stores slowed after 1920 as the economy contracted. Great growth had been the hallmark of 1890 to 1910. Towns had rebuilt themselves; new construction of shops and stores and banks and hotels had been prevalent; and communities erected numerous new churches and schools as well. But after 1920, new construction proved novel, proved rare. As the population declined, so did the economy, which necessarily shrank. Closings, rather than openings, became the norm.

While many left the area to find better futures elsewhere, those who remained in the Copper Country's communities fought to keep what they had, such as their local newspapers, in their own language. Although all but two of eighteen papers died out by 1970 – the sixteen that died did not end quickly with the onset of industrial, economic, and social decline, even though the decline was clearly irreversible. Instead, many of them fought on, lingered on for years, even if they never thrived. Much of local society was like that after 1920, into the Great Depression, through the Second World War years and beyond. Local society tried to conserve and keep; it did not suffer losses easily. So for decades the population held on to and supported myriad churches, even though their congregations had shrunk, and myriad schools, even though their enrollments had steeply declined. In some ways, local society did not reach an equilibrium – where its reduced number of down-sized institutions finally matched its down-sized population – until 1960 and after.<sup>10</sup>

While society coped with broad based, general decline, so did the surviving mining companies. They, too, did not capitulate, did not quit easily. They owned thousands of houses, many deep shafts extending between one and nearly two miles underground, tremendously expensive surface plants at the mines, numerous railroads, massive stamp mills and several large smelters. All of these things still had economic value, still had life left in them, as long as the companies managed to stay afloat. The companies coped all

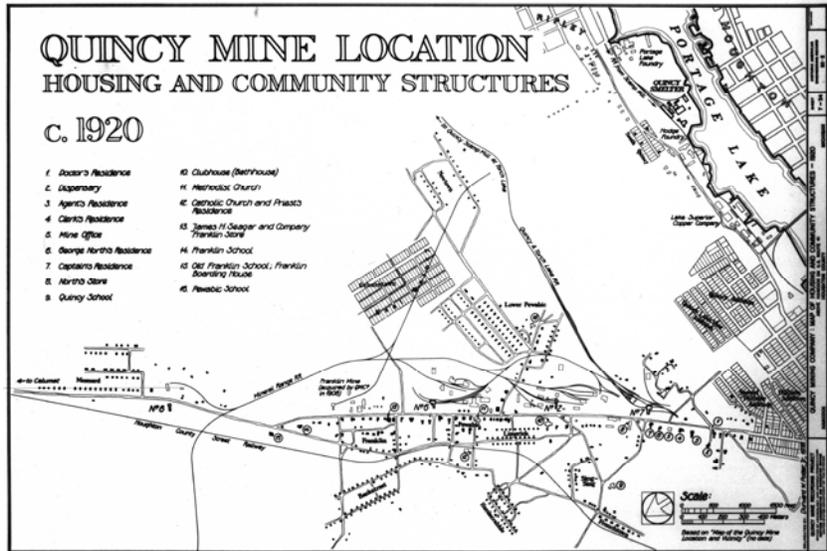


Figure 91



Figure 92



Figure 93



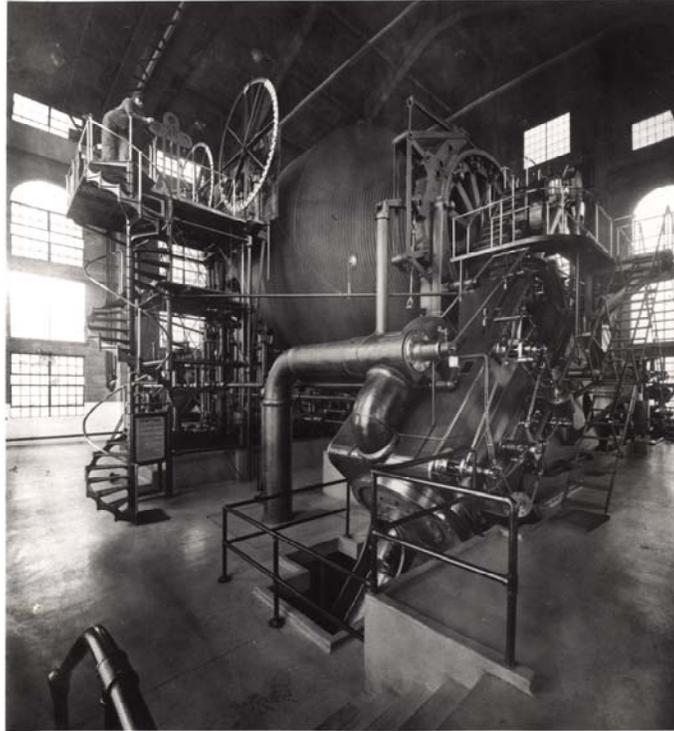
Figure 94



**Figure 95**



**Figure 96**



**Figure 97**

the time with the economic problems of mining at great depths, with falling yields, high production costs, stiff competition from other copper districts, and an eroding base of skilled laborers. They coped with whatever calamities the national or world economy threw their way, especially the steep recession after the First World War, followed a decade later by the Great Depression. And each individual company coped with its own particular circumstances. At Calumet and Hecla, for instance, that meant dealing with the end of mining on the Calumet Conglomerate lode, while at Quincy, that meant dealing with the structural instability of its hanging wall, and its confounded air-blasts.

To extend their working lives as long as possible, the mines operating after 1920 tended to follow some general strategies. This was no time to lavish money on physical plants or new technologies, but the companies spent money judiciously if they thought it would help them make money and extend their lives. They did not strictly just play out the old; they also added some new.

Underground, they sought productivity increases and costs savings in the blasting of rock by experimenting with new types of one-man drilling machines and new explosives and detonators. Companies also sought a greater level of mechanization in the mucking and tramming of rock. In mines whose lodes were of lesser pitch – where broken rock did not roll freely down to the drift – men had climbed up into the stopes to shovel or push the rock down. To perform this work, companies turned to stope scrapers, attached to cables and moved by small compressed-air powered engines, called “tuggers.” The cable, by

winding or unwinding on a drum, pulled the scraper up to the top of the stope, and then dragged it down the footwall, where it collected the broken rock in its way. Similarly, in drifts at the bottoms of stopes, mines used scrapers to drag rock up a ramp and into tramcars. In some places, companies turned to small power shovels underground – that resembled small steam shovels – to fill tramcars. Electric haulage locomotives became more widely used to deliver these tramcars to the shafts. The newer haulage locomotives, instead of being of the trolley-type, were now often battery powered.<sup>11</sup>

In hard times, companies tended to work their best, and forget the rest. At one time, during their boom years, in order to maximize production they took out ground having marginal copper content. No more. The companies needed to be more selective and concentrate on breaking rock that would earn them money, not lose them money, after tramping, hoisting, milling, and smelting it. That often meant trimming operations underground, leaving more poor grade rock behind, and even closing shafts that threatened profitability, instead of contributing to it.<sup>12</sup>

In hard times, companies also tended to work their men harder, to supervise them more carefully, and to seek out additional means of boosting productivity. They put more bosses underground. They set higher work quotas – a man had to drill a greater footage of shot-holes per shift, or load more tramcars per shift. Sometimes they flirted with bonuses. Whenever a man exceeded the work expected of him, he received additional pay for the extra holes he drilled, or for the extra rock he trammed.

On the surface, like in the underground, companies followed the tact of trimming operations. Because of their diminished production levels, they no longer required much of the equipment erected during their turn-of-the-century boom. Operating too many shafts, or too many steam stamps, or too many mills made no economic sense, so companies winnowed down. They closed shafts and moth-balled hoists and boilers – and when convinced that that machinery had no future use, they sold it off or scrapped it. They closed mills. They moth-balled neighborhoods, too, emptying some out while concentrating workers in other parts of the location.

This practice of consolidation was applied not only by individual mines, which winnowed down their discrete facilities; it was also applied by groups of mines, especially those which had been come under the management of Calumet and Hecla, and which were legally consolidated in 1923.<sup>13</sup> Under a legal consolidation of mostly contiguous companies, the stoping ground once worked by one company could now be worked through its neighbor's shafts. Fewer shafts needed to be sunk to deeper levels; fewer trammers and haulage locomotives were needed underground; fewer hoists and rockhouses were required on the surface. Trimming operations meant a savings in development and operating costs. Similarly, the larger consolidated firm did not need all those railroads or stamp mills built earlier to serve just one smaller company. Numerous underutilized resources closed; those that survived – whether shafts, railroads, mills or smelters – worked closer to capacity and achieved greater economies of scale.

Sometimes, the companies found it wisest to shut down altogether, whether for a short period or an extended time. Some, indeed, quit for good, but companies like Calumet and Hecla, Quincy, and Copper Range, when they found it too expensive and unprofitable to sustain production, retreated from it, but not permanently. They did not close for good; auction off all their equipment; sell off their lands; or lay off every last worker. But they did freeze operations, or put them into a kind of suspended animation. Maybe they kept only a skeletal crew to do maintenance and repair, to do the work necessary to preserve equipment so it could be used again. Maybe they kept the pumps running. Maybe, so as not to lose all their workers, they split up whatever few jobs they had, particularly in the worst of times (the early 1920s and the early to mid-1930s), and gave them to the married men they most wanted to keep.<sup>14</sup> Maybe they opened up new ground, not for mining – but for farming or gardening – and encouraged their idled men to try to be as self-sufficient as possible in hard times. In the depths of the Depression, in mid-1933 the ranks of the unemployed in Houghton County swelled to eighty-eight hundred men, in part because as a survival strategy, the Quincy mine had closed altogether, as had the Isle Royale mine, and Copper Range and Calumet and Hecla had closed many of their operations, too.<sup>15</sup>

Not many new mines opened during this era, but it was not for the lack of trying. Calumet and Hecla pinned hopes for its future on the finding of new mineral lands. Besides acquiring large tracts of property, it staffed a geology department. By 1919 and going into the 1920s, C&H had five or six geologists on staff, working under the guidance of a Harvard consultant, geologist L. C. Graton. The geologists not only conducted field surveys, they also spearheaded a thorough research project into the history of the district – where companies had been, what lodes they had found, how much copper they had taken out, and why they closed.<sup>16</sup> C&H's work formed the basis of an important publication, the United States Geological Survey's Professional Paper 144, The Copper Deposits of Michigan, published in 1929.

Unfortunately for the company, Calumet and Hecla's geological work did not result in any new, grand, and highly profitable mines. C&H's chief rival, the Copper Range Consolidated Mining Company, also hunted for new and profitable ground – and Copper Range found some. It opened the only truly significant new mine during the long period of general decline – the White Pine mine, located in Ontonagon County, some seventy-five miles south of the heart of the traditional copper range.<sup>17</sup>

In the general absence of freshly discovered, or rediscovered, native copper deposits to work, a few companies, with Calumet and Hecla in the lead, benefited by opening new “mines” at the lake bottoms just outside their stamp mills.<sup>18</sup> Instead of looking to get more copper from new mines, or from old mines six to nine thousand feet deep, they looked for copper a hundred feet beneath the surface of the water. They reclaimed the copper once lost in milling by sucking up the underwater stamp sands, pumping them to a new reclamation plant, regrinding them, and then capturing the copper using a combination of gravity and chemical processes. The copper from reclaimed sands cost considerably less to produce than the copper from deep mines, so reclamation was a welcome technology in hard economic times.

Throughout most of their history, the mines had rarely gone beyond the mining, milling, and smelting of copper. They made it; they sold it. They hadn't entered into the production of much else, either on or off the Keweenaw Peninsula. But desperate times called forth some desperate – or at least innovative – measures. The companies started to diversify, to enter into new ventures. If they stopped making new copper, they might smelt copper scrap. If they gave up on land ever being needed for mineral or for wood, they might sell it off as vacation property, either to city people or to local residents who wanted camps. If a closed shaft filled with water, start a water company and sell it to local communities. Open or acquire a company that used copper to manufacture tubing, pipes, or ferrules. Reuse part of your closed plant at the mine as a production facility for chemicals.<sup>19</sup>

The companies had sensed looming economic problems shortly after the turn of the century. They knew their fortunes were in decline by 1910, and they absorbed the 1913-14 strike in part because they felt they had to: they had to get the new drills in place; they had to reassert their authority and control in the face of competitive challenges. But as soon as the strike ended, the firms, all of them, got on a roller coaster ride. They went down at the start of the First World War; they went up to the very peak in the middle of that war; they swooped downward during the recession following the war; they climbed back up throughout the 'twenties, and then they dipped lower than ever during the Great Depression. Any time they climbed up after 1920, the rises were short and the peaks were low. During the worst of times, faltering companies got off the ride, leaving in production, by the Second World War era, only the Isle Royale and Quincy mines, and select operations of Calumet and Hecla and of Copper Range.

<sup>1</sup> Gates, Michigan Copper, 199, 205, 219.

<sup>2</sup> *Ibid.*, 216-20; Lankton, Cradle to Grave, 244-45.

<sup>3</sup> Gates, Michigan Copper, 198-99; Hyde, Copper for America, 81.

<sup>4</sup> Production statistics from Gates, Michigan Copper, 199-200; also see his chapter 6, "Michigan Copper Mining in Decline, 1919-1938," 143-169.

<sup>5</sup> *Ibid.*, 205, 220-21.

<sup>6</sup> *Ibid.*, 209-10.

<sup>7</sup> *Ibid.*, 229; Thurner, Calumet Copper and People, 67; in addition, U. S. Census records for Houghton County.

<sup>8</sup> Gates, Michigan Copper, 232.

<sup>9</sup> Michigan, Michigan Manual (Red Book): Official Directory and Legislative Manual (Lansing), for years 1901, 1911, 1921, 1931, 1941, 1951-52, 1959-60 and 1969-70.

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<sup>10</sup> For instance, in the vicinity of Calumet it appears that approximately twenty-seven churches held regular services in 1910. Using Polk Directories, telephone books, and local newspapers as sources, that number declined to about 24 in 1920; then stood at 26 and 25 in 1930 and 1940. It still stood at 22 in 1950, falling to about 19 by 1960 and to 14 by 1970.

<sup>11</sup> Lankton, Cradle to Grave, 248.

<sup>12</sup> *Ibid.*, 247, 250-51.

<sup>13</sup> Benedict, Red Metal, 137-41; Gates, Michigan Copper, 151-52.

<sup>14</sup> Lankton, Cradle to Grave, 253-55.

<sup>15</sup> *Ibid.*, 255; Lankton and Hyde, Old Reliable, 141-42; Thurner, Strangers and Sojourners, chapter 8, "The Truly Great Depression," 226-57.

<sup>16</sup> Butler and Burbank, Copper Deposits of Michigan, 1.

<sup>17</sup> Fields, Range of Opportunity, 69-70; Richard F. Moe, "White Pine Mine Development," Mining Engineering 6(April 1954): 381-86; Harold B. Ewoldt, "Mining and Milling at White Pine," MCJ (March 1955): 25; "White Pine Uses New Methods and Equipment for Mine Development," Mining World 16(April 1954): 35-38; "Constructing \$70 Million Michigan Copper Mine," Excavating Engineer 48(Jan. 1954): 16-23.

<sup>18</sup> Benedict, Lake Superior Milling Practice, 79-97.

<sup>19</sup> Lankton, Cradle to Grave, 258-59.

## CHAPTER 16

## THE QUINCY MINE WINDS DOWN

The Quincy mine came close to not surviving the 1920s. On top of the general economic woes suffered by the Lake mines, Quincy had its own unique, perplexing and expensive problem: its rock bursts or “air blasts,” that had started in 1906 and continued for more than twenty years. With over four hundred counted between 1914 and 1920, and with more severe ones yet to come in the 1920s, air blasts posed a serious problem that Quincy could not ignore. At the same time, company officers were never sure, or in agreement, as to how to solve or fix the air blast problem. Nor was the company ever sure it could actually *afford* to fix the problem. The air blasts, even before 1920, cost Quincy several millions of dollars, frightened workers, rattled dishes in Hancock, and taxed the problem-solving abilities of mine managers, captains, and engineers. They also strained relations between the agent at the mine, Charles Lawton, and company officers, especially William Parsons Todd, who served as vice-president from 1912 until 1924, when he became president.<sup>1</sup>

Air blasts occasionally awakened Lawton in the middle of the night when they shook his agent’s house on Quincy Hill. The air blasts frightened engineer and manager Lawton, especially when he had to go underground right after one to inspect damage. Another part of Lawton’s job, in going underground, was to rally the troops and convince the underground workers that all was well – but he wasn’t convinced of that himself. Lawton wanted to affect a technological solution to his mine’s structural problem. W. Parsons Todd, on the other hand, never seemed convinced that a true or affordable solution existed. Lawton, if he could, wanted to prevent the next air blast. Todd, on the other hand, hoped the next one might solve their problem. Someday, all the rock that was ready to fall *would* fall, and that would bring the mine into equilibrium again, making it once again secure.<sup>2</sup>

While Lawton and Todd debated the merits of various courses of action, such as the filling of abandoned stopes with sand to help hold up the hanging (something that Lawton argued for, and that Todd nixed), the company did go ahead with some other “fixes” to its problem. To protect shafts as they went deeper, Quincy started leaving fifty-foot-wide rock pillars alongside its shafts in 1906. The company increased them to 200 feet by 1913 and to 225 feet by 1920. Along shafts in the mine’s mid-region, where they passed through stoped out ground and were unprotected by pillars, Quincy built heavy timber cribwork, filled with poor rock, to guard against crushing.<sup>3</sup>

After the air blasts started, laborers began laying poor rock into ten-foot-wide rib-walls at the bottoms of stopes. By 1924 these rib-walls, increased to twenty feet wide, ran along the tops of stopes, too. To more systematically protect the hanging wall in the stopes, Quincy began leaving regularly spaced rock pillars, similar to the ones it left alongside its shafts. As stoping miners advanced away from the shaft, at regular distances they jumped past rock – no matter how rich in copper it was – in order to leave a support for

the hanging. While this measure provided more security in the stopes, it also left much copper unmined. So Quincy in the late 'teens adopted an advance-and-then-retreat mining system. As the miners worked out along the drift, they left regular stone pillars. Once they had finished stoping to the end of the drift, they then pared down the size of the pillars, "robbing" them of copper, while retreating back towards the shaft. While the men were stoping and moving outward along a level, the pillars remained large; by the time they finished retreating back to the shaft, the pillars were small.<sup>4</sup>

During its period of greatest growth, 1890 through about 1905, Quincy vastly expanded its underground works and increased its number of operating shafts. But shortly thereafter, it closed some of them – first the old No. 4 shaft, and then, during the strike year of 1913, both the No. 7 shaft on the southern end of the mine and short lived No. 9 on the northern end.<sup>5</sup> Quincy went into the 1920s with only three hoisting shafts – Nos. 2, 6, and 8. The reduced number of shafts made Quincy even more vulnerable to air blasts – if one took out a shaft, it could inflict a substantial loss of copper production. The air blasts did not abate. In 1922 a series of air blasts (which more technically might be called "rock bursts") crushed the No. 6 shaft for a run of twenty levels, and it took three and a half months to recover it. That same year, as a cost-conserving measure, Quincy had moth-balled its No. 8 shaft, so No. 6 was critically important. An air blast crushed it again along nearly ten levels in 1924, this time stopping hoisting for six weeks. In the interim, Quincy hoisted only out of No. 2.<sup>6</sup>

The worst was yet to come. In July, 1927, the No. 2 shaft caught on fire at the fifty-third level. Quincy's men couldn't extinguish it; a more experienced fire crew from Calumet and Hecla descended into Quincy with breathing apparatus, and they couldn't extinguish it. To smother the fire, albeit slowly, Lawton ordered fire doors at all openings to the mine shut and sealed. All mining ceased. The U.S. Bureau of Mines fire experts arrived on the scene from Duluth, and backed Lawton's move to seal off and shut down the mine. After some false starts – attempts to reopen the mine before the fire was totally out – the fire was finally smothered and on August 15, men went underground to begin the recovery of twenty-five-hundred feet of shaft, from the fifty-third level up to the eighteenth.

Late in October, while men still labored to repair the damage from one calamity – fire – a second calamity hit, an air blast. The hanging in the shaft came down, killing seven men beneath it. It was the worst fatal accident in the history of the mine. A series of less destructive air blasts rumbled on, impeding the full recovery of No. 2, which was closed for all of 1928.<sup>7</sup> At a time when some other Lake mines became more profitable again and got back on their feet, Quincy struggled desperately. It had to put No. 8 back in service while No. 2 remained down – and more importantly, the deadly air blast finally forced the company to switch over fully to the retreating system of mining—go all the way to the ends of long drifts, start stoping there, while working back to the shaft.<sup>8</sup> Stoping and copper rock production virtually ceased, while Quincy miners did all the development work – shaft-sinking and drifting – needed to ready new levels for the retreating system. In 1928, Quincy's production plummeted to just 1.2 million pounds of copper. The last time its production had been that low, the calendar had read 1859.<sup>9</sup>

All that happened at the Quincy mine from the strike through the 1930s, and even beyond, had to be seen against the backdrop of the frightening, sporadic air blasts, and the company's problem of how to stabilize its works while getting out substantial production. Compared to the way Quincy confronted these challenges, all other changes at the mine were, relatively speaking, of lesser importance. Changes affected parts of the mine or its operations, but none of them reversed the company's declining fortunes.

The one-man rock drills did hard service and periodically needed replacement. When that time came, Quincy evaluated current machines against others on the market. Coming out of the strike, it relied on the No. 26 Leyner-Ingersoll drill. By the early 1920s, the company sought a replacement and experimented with Cleveland drills. The Cleveland Drill Company's machines out-performed the Leyners, but in very hard times, Quincy decided to defer a wholesale, expensive change. In 1924-27, however, Quincy did replace its drills in use, purchasing at least 150 higher powered machines from both Chicago Pneumatic and Ingersoll Rand.<sup>10</sup>

Underground, in the late 'teens Quincy finally mechanized the task of cutting up mass copper underground. Although an amygdaloid mine, Quincy encountered masses of copper with some frequency, which were still cut up with hand held chisels and sledgehammers for almost two decades into the 20 century. It is not clear if Quincy's "copper cutters" were pneumatic chisels or air-operated twist drills. The drills were the region's copper cutting tool of choice by the 1920s. The operator drilled a series of holes in a line across the mass, putting them as close together as possible. Then he charged each hole with a stick of high explosives and blasted the mass apart.<sup>11</sup>

Quincy's Pewabic lode flattened out at depth, making it more difficult to get rock to roll from the top of a stope down to the drifts below for tramping. In 1918, Quincy started using air-operated stope scrapers to pull the rock down, and at the bottom of stopes, it experimented with small power shovels to muck up the rock and dump it into cars. When the power shovels failed, Quincy turned to air-operated scrapers in its drifts, dubbed "level scrapers," which pulled rock up and into tramcars. In 1930, for the first time it used underground conveyor belts to fill tramcars to be pulled by battery-powered locomotives.<sup>12</sup>

Electricity still did little to help light the underground, as men through 1930 used the carbide lamps first introduced in 1912-14. Electrical power did aid Quincy in conducting two support technologies underground, unwatering and ventilating the mine. Quincy had been unwatering the mine with bailing skips for some time; in 1916 it turned much of this work over to electric pumps and pipes, which had the advantage of not interrupting the hoisting of rock in any shafts. Also, by the mid-1920s Quincy used about a dozen, electrically-powered fans underground to send fresh air through flexible tubing and into hot, stuffy parts of the mine not well served by natural ventilation.<sup>13</sup>

On the surface, relatively little new construction took place after the strike of 1913-14. Generally, as the mine closed several shafts and its production slumped, the company

found itself with a surplus of buildings and facilities. Electric haulage had made it possible to close some shafts, such as No. 4, whose rock could now readily be trammed to more distant hoisting shafts. No. 7 had proved a disappointment in terms of the production coming from it, plus underground workers definitely disliked that shaft because of its poor ventilation and frequent rock falls. Most importantly, though, No. 7, at a depth of 6,497 feet (all attained during the short period of 1900 to 1911) had bottomed out at the edge of Quincy's property. It could go no further without trespassing onto (or under) ground belonging to the Hancock mine. So after stoping out all its levels, Quincy closed No. 7. To the north, the No. 9 shaft never really proved itself as a producer. It had been more of an exploratory venture, and it closed, too.<sup>14</sup> With fewer shafts and fewer men and machines working underground, the expansive physical plant Quincy had erected near the turn of the century was decidedly underutilized by 1920. (Fig. 91.)

Quincy did, however, make three important and visible additions to the mine location – two on the domestic or social side, one on the technological. All came about during or due to the First World War, when profits were readily made. In 1917, across from No. 2, Quincy built a clubhouse for workers, a two-story brick and sandstone edifice providing for different needs. (Fig. 92.) The first floor, split into men's and women's departments, had bathing facilities for both with tubs, showers, and toilets. The plumbing in the club house substituted for the indoor plumbing not found in Quincy's company houses. The second floor held a reading room, lecture hall, and by 1918, a library. Quincy lagged behind the larger Calumet and Hecla and Copper Range companies in providing such facilities for its men. Now, in a war year when it paid out its largest annual dividend ever (nearly \$2 million), Quincy thought it a good time to build.<sup>15</sup>

Quincy also erected its last wave of company houses during the war-time boom. It built some new story-and-a-half saltbox houses at its mill town, Mason. At the mine, it erected its largest worker houses ever, both single and double-houses, built to plans purchased from Sears, Roebuck & Company. The single Sears houses, a full two stories tall, had three rooms on the first floor and four on the second. (Figs. 93-95.) Both sets of new houses were seen by the company as necessary upgrades in its housing stock; they were needed because the company was having trouble keeping the skilled, married workers it wanted on its payroll.<sup>16</sup>

The new hoisting plant erected for the No. 2 shaft proved the most visible and significant technological addition to the mine after the strike years. In 1917, Quincy was highly profitable, and the No. 2 shaft, 7,289 feet deep, had about reached the maximum depth attainable with the E. P. Allis hoist there. Quincy, throughout its history, had shown a proclivity for squeezing every last bit of utility, every last foot of depth out of an old hoist before replacing it. Not this time. After receiving a design and cost proposal from the Nordberg Manufacturing Company late in 1916, Quincy wasted little time ordering the hoist early in 1917, because it promised to raise a higher tonnage of more rock per lift, raise it faster, and at less cost.



**Figure 98**



**Figure 99**



**Figure 100**

Nordberg was supposed to deliver the hoist in 14 months, but restrictions on the production of heavy machinery during the First World War delayed receipt of the engine until late 1919. While waiting for the hoist, Quincy erected a new hoisthouse to receive it, which in itself was quite a show piece and a distinctive bit of industrial architecture in the Copper Country. (Fig. 96.) The fire-proof building's structure was constructed almost entirely of reinforced concrete, with red brick veneer and arched windows on the walls, and a green tile roof. The hoisthouse cut a distinct contrast to earlier ones on the site, built of wood, then poor rock, then Jacobsville sandstone. The building included large doorways and a heavy overhead crane to facilitate the erection of the massive hoist, which took nearly a year to assemble. Erecting crews started on the hoist in December 1919, and it did not lift its first rock until November 1920.<sup>17</sup>

Quincy's No. 2 Nordberg hoist represented the region's last hurrah for massive steam-powered equipment, and Quincy's last hurrah in terms of a very large capital improvement at the mine. The hoist itself cost \$180,000, and the total cost to erect the engine, hoisthouse and all auxiliary facilities ran to \$370,000. The Nordberg hoist had a grooved, cylindro-conical drum, thirty feet in diameter at the center. The drum could carry ten thousand feet of one-and-five-eighths inch wire rope in one layer on the cylindrical portion and one conical end. This cross-compound hoist was actually four engines in one. (Fig. 97.) It had two high pressure cylinders on one side of the drum (mounted on an inverted-V frame, so that each engine served as a leg for the hoist to stand on). These cylinders had a bore and stroke of 32 x 66 inches and ran on 160 p.s.i. of steam. Two low-pressure cylinders on the opposite side of the hoist had a bore and stroke of 60 x 66 inches. The fuel efficient engine reduced hoisting costs in two key ways. First, it was a compound engine that used its steam twice. Steam at high pressure drove the smaller pistons on one side of the hoist. Then, when that steam was exhausted

at a lesser pressure, instead of being wasted and entering the atmosphere, it was piped across to the second side of the hoist, where it drove the larger pistons there back and forth. The low-pressure side of the engine also ran with a condenser, meaning that steam on a power stroke was pushing against a vacuum on the opposite side of the piston, so it was capable of more work.

The double-acting pistons provided eight power strokes per revolution of the drum. The drum, turning thirty-four revolutions per minute, hoisted skips enlarged to ten-ton capacity at thirty-two hundred feet per minute, or thirty-six miles per hour. Altogether, the engine and its house represented a grand investment in technology that had been made during some very profitable war years – but Quincy never fully reaped the rewards of that investment, because air blasts, shaft collapses, and economic hard times limited the hoist's use and cut short its working life.

The First World War boom that encouraged Quincy to invest in its mine plant also encouraged investments at the mill and smelter. Since its Torch Lake mills had been built, Quincy's Allis steam stamps had remained permanent fixtures, but the company kept up with technological change, in terms of getting new equipment for the fine grinding and washing of copper rock. It installed, for instance, Wilfley tables to capture a higher percentage of fine copper. These worked well, and the First World War's high copper prices led Quincy to plan for expansions at both mills, in order to house more Wilfleys. These additions were set to go on-line in 1920, but the copper market collapsed. Instead of expanding at its mills, Quincy contracted them. To save on operating costs, and to better match its mill facilities with the amount of copper being mined, Quincy closed its No. 2 mill, housing three Allis stamps, in January 1920.<sup>18</sup> It mothballed the equipment there, waiting for a time when it would be needed again. That time never came.

After the difficult 1920-21 era passed, Quincy again started to invest in its future. At the mine, for instance, after deferring for a while, it purchased new rock drills. At the mill, in 1923 it invested in a new electrical power plant. Quincy relied more on electrical power now, and believed it could produce electricity at a cost less than what a local utility was charging. So at Torch Lake, alongside the mills, it built a power house for a General Electric two thousand kW steam turbine. What made this endeavor cost effective was the fact that the turbine did not require its own boiler; the steam that powered the turbine was the exhaust steam coming from the Allis stamps.<sup>19</sup> By the late 1920s, Quincy made an additional improvement at its sole operating mill on Torch Lake. For the first time, it used something other than gravity separation to capture its fine copper. In 1927, A. W. Fahrenwald of the U. S. Bureau of Mines published work on a new oil flotation process for recovering copper. This process agitated fine copper and rock particles in a tank filled with water and an oily frothing agent. The agitation created bubbles, which rose to the top of the tank. These oily bubbles had an affinity for fine copper, captured it, and carried it to the top of the tank. Quincy quickly adopted oil flotation, and the process allowed the company to capture an additional three pounds of mineral concentrate per ton of rock stamped.<sup>20</sup>

In 1920 Quincy made substantial improvements at the smelter – again, just in time for a major down-turn in its fortunes. Quincy had always smelted relatively small batches of copper in four or five reverberatory furnaces, where all the melting, refining, tapping and pouring was done. In 1920 the company put up two large, specialized furnaces. One melted the charge, which was tapped into the second furnace, where it was rabbled and poled. When the refining furnace was tapped, furnacemen no longer ladled the copper out and into molds by hand. Instead, the molten copper flowed out to a revolving Walker semi-automatic casting machine. An operator controlled the copper flow out of the furnace and the rotation of the molds going by it.<sup>21</sup>

After the fact, the men who ran Quincy no doubt second-guessed many of the expenses they had incurred, many of the decisions they had made, from the strike years through the 1920s. The First World War boom, in particular, encouraged them to spend in ways that afterwards looked suspect. But the company did not have the luxury of forecasting the future. It did what it thought was best at the time, and Quincy continued to believe it needed to invest in new technologies, even in a new clubhouse and in company houses, to sustain itself and profitability. The company did not manage decline and shrinkage by retreating from its problems; it invested in its industrial and social infrastructure to try to secure a more predictable and stable future. But in many ways, the plan simply didn't work, especially once the Great Depression arrived.

On September 22, 1931, the Quincy Mining Company closed its works on the Pewabic lode, which it had been mining virtually without stop since the late 1850s. The company also ceased all milling and smelting. The Great Depression had driven prices down to a level that forced Quincy to halt mining. Its production costs were running a high 11 cents per pound of copper, while copper prices were at a low of only 7.5 cents per pound. In 1931, over the entire year, the mine's expenses were about twice the amount of its sales, which stood at only \$585,000. The mine couldn't go on, not until copper prices substantially recovered – and that meant the Quincy mine sat idle from September 1931 till June 1937.<sup>22</sup>

Over the difficult interim, the Quincy Mining Company reorganized itself financially in order to garner needed capital to keep the idled mine in decent condition and, later, to prepare it for reopening. Quincy lost some lands on the Keweenaw for failure to pay taxes; some of its stock was forfeited for nonpayment of the assessments called in to help care-take the mine. While poor and struggling to survive, the company nevertheless tended to the needs of families at the mine location, the families of men now without jobs. Quincy let many former employees stay in their company house rent free; it plowed fields so residents of Quincy Hill could plant crops; it let others, not even on the company payroll, occupy a Quincy house that otherwise would have been vacant. Indeed, during the dark years of the Depression many houses on Quincy Hill did stand vacant, boarded up, and abandoned.<sup>23</sup>

When copper prices improved in 1936, Quincy's officers started making plans for reinstating production. They called in an assessment on each share of stock to finance the purchase of supplies, the unwatering of the mine, and the repair of underground and

surface works at the mine and mill – but not at the smelter. The smelter remained idle, and Quincy arranged for C&H's smelter to take its mineral. The "Resumption Expenses" to put mine and mill back into service amounted to over \$313,000.<sup>24</sup> This investment seemed merited because copper had climbed back into the price range of fourteen cents per pound. Still, as it turned out, copper prices did not go high enough in the next few years to cover the mine's costs. The company called in another assessment on the stock to help it get by. Then, with the start up of the Second World War in Europe came government price controls and intervention in the market. Copper was an important commodity during the war, especially after the U. S. entered the conflict. The Metals Reserve Company, set up by the federal government, contracted to buy all Quincy's copper, paying as much as twenty cents per pound by 1945. Under price controls, Quincy hardly thrived, but neither did it go under.<sup>25</sup>

The Metals Reserve Company played an important role in Quincy's future in another important way. In 1942 Quincy received a loan from the agency, amounting to about \$1.2 million, to help fund construction of a reclamation plant at Torch Lake, near Mason and Quincy's No. 1 mill. Calumet and Hecla had been the leader in reclaiming stamp sands and had been doing it for years. C&H designed and built Quincy's plant for a fee of eight percent of its cost. Almost as soon as it opened, the reclamation plant proved far better than the old mine at making money for Quincy.<sup>26</sup>

The Metals Reserve Company's contract to buy all Quincy's copper expired on August 31, 1945. Thereafter, Quincy's copper brought a reduced price, one that would not cover operating costs at the mine. So on September 1, 1945, the Quincy Mining Company closed its mine.<sup>27</sup> For all intents and purposes, the mine was closed for good. Some exploration work went forth on Quincy Hill, jointly undertaken by Quincy and the Homestake Copper Company. This venture resulted in the taking of a bit of rock occasionally, especially in the vicinity of the No. 8 shaft.<sup>28</sup> But after 1945, although the Quincy Mining Company survived, its mine – as a viable copper producer – was dead.

Quincy's reclamation plant carried the company in the post-war years, and even let the old firm pay a very modest dividend of twenty-five cents per share in 1948, the first time Quincy had paid a dividend since 1920. In this year of renewed dividend payments, the company also renewed operations at its smelter at Ripley on Torch Lake, which had been idled for seventeen years. The smelter handled the mineral product from the reclamation plant, and also started smelting scrap copper, just to help it keep going. Once finally back in the black, the company continued to pay modest dividends for many years thereafter, as it "mined" its tailings, sucking them up with a dredge, piping them to the reclamation plant, regrinding them, capturing the copper, and then smelting the mineral. The reclamation plant operated with few interruptions from the end of 1943 till mid-1967, when it finally exhausted its supply of untreated stamp sands. Over that run, the reclamation plant produced about one hundred million pounds of copper.<sup>29</sup>

The Quincy Mining Company held investments in other metals companies; it owned real estate in Michigan and on Manhattan. It kept up with its leases for all its company houses that were still occupied. But after the late 1960s, after 120 years of corporate

existence, it had only a very small handful of employees, a quiet mine, defunct mills, a played out reclamation plant, and a cold smelter. Entire neighborhoods of company houses had disappeared up on the hill, replaced by mere cellar holes. “Old Reliable” was through as an active mine. Soon the same could be said for Copper Range’s Champion mine, for Calumet and Hecla, and for the entire native copper mining industry.

<sup>1</sup> Lawton estimated that the company’s losses through 1920 due to air blasts amounted to \$4.5 million. See “Air Blast Repairs and Expenses,” table included in CL to WRT, 11 May 1921, QMC coll., MTU.

<sup>2</sup> For much more detail on the long debate between Lawton and Todd regarding how to combat air blasts, see Lankton, “Technological Change at the Quincy Mine,” 408 ff.

<sup>3</sup> QMC report, “Cost of Producing Copper . . . Should be Less Regardless of . . . Increasing Depth,” ca. 1921, QMC coll.

<sup>4</sup> QMC, A.R. (1906), 13; A.R. (1914), 14; A.R. (1915), 14; CL to WRT, 28 Oct. 1919.

<sup>5</sup> Lankton, “Technological Change at the Quincy Mine,” 475.

<sup>6</sup> QMC, A.R. (1922), 13; A.R. (1924), 11-12.

<sup>7</sup> DMG, 22 July and 1 and 2 Nov. 1927; QMC, A.R. (1927), 12-13; Mine Inspector’s Report for Houghton County (1927-28), 5-7.

<sup>8</sup> QMC, A.R. (1927), 13-14; A.R. (1928), 6.

<sup>9</sup> Lankton and Hyde, Old Reliable, 152.

<sup>10</sup> Lankton, “Technological Change at the Quincy Mine,” 495-96.

<sup>11</sup> W. R. Crane, Mining Methods and Practices in the Michigan Copper Mines, U. S. Bureau of Mines Bulletin 306 (Washington, 1929), 130-31; Arthur C. Vivian, “Cutting Mass Copper,” E&MJ 98(7 Nov. 1914): 825.

<sup>12</sup> QMC, A.R. (1918), 15-16; A.R. (1925), 13; A.R. (1930), 13.

<sup>13</sup> QMC, A.R. (1916), 14; A.R. (1926), 6, 12.

<sup>14</sup> Lankton, “Technological Change at the Quincy Mine,” 445-49.

<sup>15</sup> McNear, “Quincy Mining Company: Housing and Community Services,” 562-66; QMC, A.R. (1916), 16; A.R. (1918), 18; Lankton and Hyde, Old Reliable, 135-36.

<sup>16</sup> Lankton and Hyde, Old Reliable, 132; Fisher, “Quincy Mining Company Housing,” 253-68.

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<sup>17</sup> For the hoist, see Thomas Wilson, "Quincy Hoist – Largest in World," Power (18 Jan. 1921): 90-95; "The World's Largest Compound Steam Hoisting Engine," LSMI Proc. 27(1929): 18-20; Ray W. Armstrong, "Compound Steam Hoist Installation of the Quincy Mining Company," LSMI Proc. 22(1922): 39-41; "Nordberg Compound Steam Hoisting Engine, Quincy Mining Company, No. 2 Shaft, Hancock, Michigan," LSMI Proc. 22(1922): 192-94; "The Quincy Hoist," E&MJ (11 Dec. 1920): 11, 126.

<sup>18</sup> Lankton and Hyde, Old Reliable, 125.

<sup>19</sup> QMC, A.R. (1923), 15-16; A.R. (1924), 13-14.

<sup>20</sup> QMC, A.R. (1928), 7, 13-14; Benedict, Red Metal, 176-77.

<sup>21</sup> Lankton and Hyde, Old Reliable, 127; QMC, A.R. (1919), 17-18.

<sup>22</sup> Lankton and Hyde, Old Reliable, 99, 106, 141, 143.

<sup>23</sup> Ibid., 142.

<sup>24</sup> Ibid., 143.

<sup>25</sup> See QMC's annual reports for 1943-45.

<sup>26</sup> Lankton and Hyde, Old Reliable, 144-46; QMC, A.R. (1966), 5; Benedict, Lake Superior Milling Practice, 90-94.

<sup>27</sup> QMC, A.R. (1945), 4.

<sup>28</sup> Lankton and Hyde, Old Reliable, 147.

<sup>29</sup> QMC, A.R. (1948), 10; A.R. (1966), 5.

## CHAPTER 17

## CALUMET AND HECLA PLAYS OUT ITS STRING

At Calumet and Hecla, Quincy, and Copper Range, the men who guided these companies through the strike of 1913-14, who were there at their peaks of production and profitability during the First World War era – were also there when they went into permanent decline and struggled to make it through the 1920s and 1930s. At Copper Range, that man was engineer William Schact, who put in thirty-seven years with his company, including fourteen as president, before dying in 1944. At Quincy, that man was Charles Lawton, mine manager from 1905 till 1946, when he died. At C&H, that man was James MacNaughton, who put in a total of forty years with the company (1901-1941) as general manager and, ultimately, president. The mines had stable leadership, even in the most unstable of times.<sup>1</sup>

The mining company that James MacNaughton started to superintend in 1901 was vastly different from the mining company it became during his tenure. For decades, it had sat adjacent the village of Red Jacket, working just the great Calumet Conglomerate lode. When that lode started to falter seriously – at about the same time MacNaughton arrived – MacNaughton helped direct the company in its quests for new fortunes, for new sources of copper. Before 1915, the company opened works on the Osceola and Kearsarge amygdaloid lodes, which paralleled its established mine; it bought up substantial shares, usually a controlling interest, in numerous mining companies that owned large tracts of mineral lands; and it planned for a reclamation plant, to reclaim copper from the stamp sands washed out of its mills and into Torch Lake. (Fig. 98.) Many of C&H's efforts at expansion did not pay off. In some ways, mining remained just as much a “subterranean lottery” in the twentieth century as it had been in the nineteenth. For every hit, there were many misses. Still, from the First World War era into the very troubled 1920s and 1930s, C&H's survival benefited tremendously from a few of its newer endeavors. While the old works at Calumet played out, C&H reclaimed hundreds of millions of pounds of copper – at low production costs – from tailings at the bottom of Torch Lake. (Fig. 99.) C&H also discovered that much of its future resided to the north. Mines there, like Ahmeek, had once been totally independent operations. Then C&H bought up stock in them and started to manage them. Finally, C&H legally consolidated with them. Out of many separate companies came a larger new company, the Calumet and Hecla Consolidated Mining Company.<sup>2</sup> This consolidation made C&H the premier producer in Michigan again (a rank it had lost for a while to Copper Range) and enabled the company to live longer and cope better with economic decline.

At Torch Lake, about one-fourth of all the copper ever hoisted from the Calumet Conglomerate lode resided in a huge deposit of tailings that filled in much of the lake, creating a new shoreline and a sterile beach. The tailings ran 120 feet deep and covered 152 acres. C. Harry Benedict served as C&H's master mill metallurgist, the man responsible capturing as much copper as possible from the mine's stamp rock, and for reclaiming as much copper as possible from the stamp sands. Several companies

considered the prospects of reclaiming stamp sands for years. Under Benedict's leadership, C&H put the region's first full-scale reclamation plant into operation in 1915.<sup>3</sup>

Initially, after regrinding the stamp sands, C&H's reclamation plant recovered the liberated, fine copper using improved gravity separation machinery, such as Wilfley tables. But a year after opening, the plant began treating the copper chemically, too. Benedict introduced the leaching process. Leaching took place in a large, new facility built alongside Torch Lake that was 508 feet long, 125 feet wide under the main roof trusses, and had a full-length attached wing offering another 49 feet of width. Inside, sixteen large, covered tanks, fifty-four feet in diameter and twelve feet deep, each held a batch of up to a thousand tons of sands. An ammonium solution flowed into the tanks and proceeded to dissolve only one mineral in the sands – the copper. The copper-rich solution next went to another closed vessel heated by steam pipes. When heated in the distillation vessel, the ammonium boiled off as a vapor, which the plant captured, condensed, and then reused in the leaching tanks. Meanwhile, the dissolved copper combined with oxygen and precipitated out of solution as a black solid: copper oxide. C&H sold some copper oxide directly to chemical companies who used it in their products; the bulk of it went to the C&H smelter to be made into ingot copper.<sup>4</sup>

C&H continued to seek other means to capture the very fine copper liberated in its mills and reclamation plant. The flotation process – using special oils or agents to cause a heavy mineral to float, rather than sink – had first been successfully applied in the treatment of zinc sulfides in Australia in 1911. At C&H, Benedict recognized flotation as the beginning of a whole new era in mill dressing. He saw flotation as the biggest technological development in about fifteen years, or since the invention of the Wilfley table.<sup>5</sup>

Over time, many different mining districts used flotation to recover different metals. Each application called for research into what would work, or not work, with a given mineral. Critical technical details to be resolved included such things as the proper oil(s) to be used, and the mesh-size of the copper particles to be floated. Some early tests on conglomerate copper in 1914, done by an outside lab, suggested it could *not* be floated. Shortly thereafter, however, newly developed flotation oils offered the company promise. In 1917 – a good time for experimentation, given the boom times of the First World War – C&H built an experimental flotation unit at its Hecla mill. That proved successful, so the company in 1919-1920 phased in a full-scale flotation plant that treated slimes (fine copper, rock, and water) from the milling of mine rock, plus very fine copper coming from the reclamation plant's regrinding units. Thereafter, flotation served as an important auxiliary to gravity separation. It accounted for something less than ten percent of the copper captured in the milling of mine rock, and for something more than ten percent of the copper reclaimed from stamp sands.<sup>6</sup>

At Calumet and Hecla, and at Quincy, too, over their run of troubled times technological changes in the recovery of copper at mills and reclamation plants proved more significant and beneficial than any technological changes in mining. Another change of great benefit

to C&H was an organizational one – the creation of the Calumet and Hecla Consolidated Mining Company in 1923. In 1911, lawsuits had blocked C&H's earlier attempt to effect consolidation. But in 1923, what had been separate mines – all of C&H's various works, plus the Ahmeek, Allouez, Centennial, and Osceola mines, started operating legally as one. From 1915 into the very difficult early 1920s, C&H accounted annually for only about thirty percent of the region's copper, because the Copper Range mines surpassed its production. From 1923 through the end of the Second World War, C&H Consolidated accounted for at least half of Michigan's production and in some years, for as much as seventy or eighty percent.<sup>7</sup>

Improved milling and reclamation technologies and corporate consolidation buffered C&H from the serious economic problems that confronted all the mines in the 1920s and 1930s, but by no means did they offer absolute protection. Like other companies, C&H virtually shutdown in 1921 and then struggled to get back on its feet, stabilize, and restore profitability over the remainder of the decade. Here, reclamation proved key. Besides running its original reclamation plant on Torch Lake, C&H opened a second one in 1925. Eight years earlier, during the First World War boom years, C&H bought up all the properties of the Tamarack mine, including its Calumet Conglomerate lode tailings in Torch Lake. C&H struggled to reduce mining costs, so it could profit from milling and smelting mine rock, despite low copper prices of twelve to fourteen cents per pound. The reclamation plants, at the same time, proved to be bonanzas, because it cost C&H only five to seven cents per pound to make copper from stamp sands. At that rate, reclaimed copper accounted for sixty percent of C&H's dividends paid out in the 1920s.<sup>8</sup>

In the 1920s, C&H sought to increase productivity among its reduced force of miners, while it also battled to hold on to its labor force at a time when many workers migrated out of the district. C&H still maintained the charade of using “contract miners,” but the system differed from earlier days. A miner worked alone, and he really worked for a daily wage, not any kind of contract settlement. But he also worked under a bonus system. On the Osceola lode, for instance, a man was expected, for his daily wage, to drill fifty feet of holes per shift. That was the standard. But if he pushed himself and drilled beyond that standard, he received an additional 10 cents per foot.<sup>9</sup>

In the 1920s, despite the fact that so many jobs had been lost by contraction in poor economic times, the industry was labor short – it had too few good men for the jobs it still offered. Many unemployed or underemployed men did not linger around Red Jacket and the other mine towns. Instead, they got on trains and left the district to go elsewhere. This became a perpetual problem at the mines: they had both fewer jobs, and fewer men to take them. C&H, Quincy, and Copper Range started recruitment programs to bring in workers from Cornwall, Germany, Canada, and even Mexico, but met with marginal success.<sup>10</sup> The companies often deceived their recruits. They promised men miners' jobs, but when the recruits arrived on Lake Superior, companies often pushed them down into unskilled, lesser paying jobs, such as tramping.

Meanwhile, in the slowest of times, the companies did what they could to keep experienced men around. Calumet and Hecla, for instance, at its peak of profitability in

the First World War, had employed just over 6,000 men, including nearly 2,800 underground workers. In 1921, the bleakest year after the war, the mine averaged only 794 on its payroll, including just 113 underground workers.<sup>11</sup> To keep a modest number of men from bolting the area, C&H put them to work at various tasks around the mine. Some of these men worked on the surface to create a civic improvement: a park built in honor of Alexander Agassiz, who headed the company from 1871 till his death in 1910. This was a “make work” project in one sense: it gave men something to do. From that perspective, the new park mirrored the company’s recent decline. Simultaneously, however, it celebrated the firm’s long, paternal past.

Agassiz Park occupied the wedge of land between the northern end of the mine and Red Jacket village. Since the 1860s, this land had been used as pasturage, as athletic fields, as open storage for timber and other mining material, and during the strike of 1913-14, as a bivouac for National Guardsmen. In 1916, C&H dressed up the twenty-five acres, making them a suitable place to stage much of the corporate and community celebration of C&H’s fifty years of operation. Over the decades, C&H had used this parcel of land in myriad ways, while nevertheless holding it in reserve. It was there to be used more intensively, if the company needed it. By the late ’teens, the company knew that growth along the old Calumet Conglomerate works was highly unlikely, so the land became available for a park.

This park was something new, at a time when few new things went up at the mine or its adjacent village. It not only honored the most important man in the history of Calumet and Hecla, it symbolized C&H’s way of doing things. The company decided to build a park; the company decided what to include or not include within it; and the company decided to do it right. It turned to Warren H. Manning, a nationally renowned landscape architect, to design the gardens, tree colonnades, paths, plantings, playgrounds, amphitheater and other facilities. Corporate support for the creation of Agassiz Park grew out of the company’s fiftieth year anniversary celebration, and also out of the highly profitable First World War era. But during that era, men were needed to maximize copper production, so park construction stalled. In the post-war economic recession, the opposite happened. The production of copper stalled – and C&H put some needy men (men it wanted to keep around) to work on creating and landscaping Agassiz Park.<sup>12</sup> (Fig. 100.) By the time the park opened in 1923, C&H had weathered the worst years of the post-war recession; it had accomplished its consolidation; and while things did not look particularly bright, they certainly looked better.

From about eight hundred employees in 1921, C&H rebounded to employ twenty-six to twenty-eight hundred in 1922-23. After the consolidation of 1923, counting employees at Ahmeek and the other mines now incorporated into the C&H fold, the company’s employment climbed to as high as forty-eight or forty-nine hundred men in 1928-29.<sup>13</sup> Then the stock market crashed and the Great Depression arrived. C&H’s total employment slipped to forty-three hundred in 1930 and to four thousand in 1931. Employment would have – and probably should have – fallen off further and faster, but C&H hoped to ride out the Depression. It tried to keep producing copper as long as possible and ate up over \$7.4 million of cash reserves to do so. The gambit did not work,

because the Great Depression outlasted C&H's financial resources.<sup>14</sup> The company had to reign in spending, and employment dropped precipitously as C&H trimmed and closed operations.

In 1932, C&H closed its reclamation plants, halted all mining on the Osceola lode and at the Allouez, Centennial, and North Kearsarge mines, and a little later (1933), at the Ahmeek mine, too. In 1932, company employment dropped by over two thousand men and fell to seventeen-hundred. Many of these men worked part time, or shared jobs with one another. That way, C&H spread out the benefits of its reduced payroll to more families. In 1933, employment fell further to only thirteen hundred men. During those two years, copper bottomed out during the Great Depression and sold for only 5.6 and 7 cents per pound. C&H recovered a bit after that, especially in 1937, when copper prices hit a Depression era high of 13.2 cents per pound. The price rebound encouraged C&H to reopen its reclamation plant and the Ahmeek. Still, in the late 1930s employment stayed around fourteen to eighteen hundred men, and only hit two thousand once prior to the Second World War. Even during the war, it never went over 2,250.<sup>15</sup>

The Great Depression signaled the end of C&H's works on the once fabulously rich Calumet Conglomerate lode. For years, the company left broad pillars alongside its shafts, to protect them from being crushed as they went deeper into the ground. These pillars often ran rich in copper rock, and during the Depression C&H started robbing these pillars. The copper from the pillars was cheaply had, because all the development costs to reach them had long since been paid for. Pumps unwatering the works on the Calumet Conglomerate lode stopped in 1933, and miners started robbing pillars at the bottom of the mine and worked up. As the men retreated towards the surface, the water grew deeper in the worked out mine. In October, 1939, men closed operations and capped off the No. 12 shaft, the last one working on the Conglomerate lode. After producing 3.275 billion pounds of copper, the old, original part of the Calumet and Hecla mine was done.<sup>16</sup>

The timing of this closure could not have been much worse, from the standpoint of the preservation of many of the showcase buildings and machines that once stood along Mine Street, or along the Calumet, Hecla, South Hecla, and Red Jacket shaft branches of the mine. The Second World War accelerated the scrapping out or selling of some of the most impressive mining machinery built in the United States in the last four decades of the 19th century.<sup>17</sup> On 20 Aug. 1943, the Daily Mining Gazette reported about C&H's works over the Calumet Conglomerate Lode:

All that remains [are] a few surface structures from which all the machinery and equipment has been scrapped and turned into war weapons, but eventually the buildings that housed them, along with the 250-foot smokestacks that stood as silent sentinels over what for many years was the world's richest copper mine, will be razed.

Many old ways passed in the late 1930s and early 1940s. The Calumet Conglomerate lode shut down. Old leadership left, namely Big Jim MacNaughton, who retired in 1941

after four decades of service. A bit more than a quarter-century after the copper companies had delivered a crushing blow to the Western Federation of Miners, a successful unionization drive occurred on the Keweenaw. And, as the Depression ebbed, another challenge emerged, as peace-time gave way to the Second World War.

Calumet and Hecla and the Lake Superior mines had risen to their peaks over a long era dominated by “big business” within the American economy. The Great Depression of the 1930s, with the more liberal New Deal administration of Franklin D. Roosevelt, saw the rise of two counter-balancing forces in the economy – “big government” and “big labor.” Roosevelt’s New Deal made the federal government a more active player in economic issues, and legislation passed under his administration, such as the Wagner Act, put the weight of the government behind a push for greater recognition of unions and collective bargaining. Calumet and Hecla had a long corporate history of vigilance in the face of labor problems, of anti-unionism, and of using guile, power, and money to win or head off labor disputes. But in the years on either side of 1940, the surviving Copper Country mining companies – Copper Range, Isle Royale, Quincy, and even the mighty C&H Consolidated – finally succumbed to the unionization of their labor ranks.

At this time, union drives succeeded in many industries across the country, including in Michigan’s auto industry. In the late 1930s, wages at the down-sized copper mines were decidedly lower than in Great Lakes iron mining districts – about one-third lower. Given these conditions, it was not surprising that organizers once again returned to the Copper Country. Led by men such as Gene Saari, the CIO started enrolling workers in locals of the International Union of Mine, Mill, and Smelter Workers – CIO (IUMMSW). Local 494 formed at South Range, covering workers of the Copper Range Company, in 1939. By early 1941, Local 515 operated at Isle Royale mine, and Local 523 at Quincy.<sup>18</sup> These three locals turned three of the four operating companies into union shops which collectively bargained with their men. That left only C&H out of the union fold – but not for long.

By 1942, the IUMMSW had attracted a sufficient number of C&H employees to its ranks to call for a union election at that grand old company under eye of the National Labor Relations Board. To help win that vote and forestall this union’s arrival, C&H granted some wages increases, provided vacations with pay, and promoted an in-house organization – the Independent Copper Workers Union – to serve as an alternative to the IUMMSW. Also, C&H strongly implied that should the union drive succeed, C&H would take back some paternal benefits long offered, such as low rents for company houses, coupled with low energy and utility costs.<sup>19</sup>

C&H escaped unionization in the spring of 1942 by a vote of 656 in favor of the IUMMSW and 736 against. But the company could not buck the nation-wide and local upsurge in unionization for long. (In the late 1930s and early 1940s, not only had the other mines on the Keweenaw been organized, but so had many of the smaller industries and firms operating on their margins.) In November, 1942, C&H workers voted again, and this time the IUMMSW-CIO won the election.<sup>20</sup> Now, all the mines faced collective bargaining whenever they moved from the conclusion of one union contract to the start of

the next. The bargaining dealt not only with wage issues, but with broad conditions of employment, including benefits, hours, seniority, work rules, and grievance procedures. It was hardly surprising that C&H, the largest, the most paternal of the companies, and the most vigilant in combating unions, was the last to be pushed into collective bargaining. It bargained first with the IUMMSW during the Second World War years. After 1950, when the men switched their affiliation over to another union, it bargained with the United Steel Workers.<sup>21</sup>

With the Calumet Conglomerate lode shut down, and with the reclamation of its conglomerate tailings at Lake Linden nearing an end, C&H was in no position to experience a real boom during the Second World War. In 1941, C&H claimed sixty-five percent of Michigan's total production (thirty-five percent attributable to its reclamation work, and only thirty percent from its mines). But Michigan's total production was now only five per cent of the nation's production of new copper. Still, even though the Michigan mines were marginal producers, in a period of war, with copper being an important metal, the government supported them so they might sustain or exceed their pre-war levels of production. During the war, the War Production Board and the Office of Price Administration established a Premium Price Plan intended to set copper prices and rates high enough to encourage domestic production, while not triggering excess profit-taking. The government-sponsored Metals Reserve Company entered into a "special contracts" program with smaller producers (including Quincy, Isle Royale, and Copper Range) to assure them the best rates for their copper, so they could produce as much as possible during the war. As a result of war-time economic programs and controls, the Michigan mines remained in production and could pay out modest dividends, even while paying higher wages to their now-unionized employees.<sup>22</sup>

When the war and price programs ended, the industry shortly thereafter contracted. Quincy closed its mine immediately; the Isle Royale, within a few years. Copper Range shut down its mines, too, for about 4 years right after the war. During the war, C&H Consolidated relied on its Ahmeek mine for much of its production, and it also put additional shafts into service. It unwatered old shafts at its Seneca, Kearsarge and Centennial properties and reopened them; it sank new shafts on properties over the Iroquois and Houghton lodes. But well before the war ended, Calumet and Hecla, looking ahead at an uncertain future, decided to branch out, to diversify in order to sustain itself better in the post-war future.

Diversification was indeed a wise plan, given what was to come. During the war, a peak of 1,517 men worked underground at the Houghton County mines. From 1946 until the late 1960s, the mines of Houghton County employed only 250-500 men at any time. Although C&H operated as many as seven shafts in Houghton and Keweenaw counties in the post-war era, mining native copper became a relatively minor part of its overall operations, due to its branching out into new endeavors. C&H's diversification began in the early war years and continued after the war.

Throughout their history, the copper mining companies had largely stayed out of copper manufacturing businesses. They had mined, milled, and smelted copper – which they

sold to other firms that drew it into wire or made it into hardware or munitions. For C&H Consolidated, that changed in mid-1942 when it acquired Detroit's Wolverine Tube Company. Wolverine, employing about a thousand persons, made various kinds of copper tubing for plumbing, refrigerators, air conditioners, and automotive and aircraft use. A year after the war ended, C&H expanded Wolverine by building a new manufacturing facility in Decatur, Alabama.<sup>23</sup>

Besides going into the tube business, C&H used its underutilized shops in and around Calumet to produce new products. It started manufacturing detachable drill bits for the mining industry, while it opened up its company foundry to produce castings for outside customers. It created a small firm to manufacture buffing compounds from stamp sands. In 1944, using its knowledge of leaching and other copper recovery technologies, C&H established a copper scrap recovery program (to reclaim copper from shell casings and the like); within a few years, its copper recovery works produced more copper for the company to sell than did its mines. While the price of scrap was up during the war, C&H also scrapped out obsolete or surplus machinery to the tune of twenty-five thousand tons of iron and steel. In 1945, it organized the Lake Chemical Company, which produced a variety of copper-based chemicals for industrial and agricultural uses.<sup>24</sup>

After the war, C&H expanded its mining operations beyond copper and beyond Michigan. It developed fledgling mining ventures in search of zinc/lead or uranium in Wisconsin, Illinois, and Nevada. Finally, C&H generated additional income from its large surface holdings. By the late 1930s, it had already started selling off surplus company houses on its property. While this continued, the company also sold off timber resources from its lands and began leasing or selling lakefront property to vacationers or to locals wanting a "camp."

The last two surviving mining companies on the Keweenaw – C&H and Copper Range Consolidated – followed many similar strategies from the Depression through Second World War and into the 1950s. During the Depression, Copper Range, like C&H, had closed unprofitable properties, principally the Trimountain and Baltic mines, in order to better continue operations at its Champion and Globe properties. Copper Range, too, diversified. In the early 1930s, it erected a hydroelectric power plant forty miles south of Painesdale on the Ontonagon River. It transmitted power to its own facilities, and sold surplus power to other companies. In 1936 Copper Range merged with C. G. Hussey and Company of Pittsburgh, a copper fabricating firm that produced rolled, sheet and strip copper. Copper Range tapped into an underground source of pure water in part of the Champion mine. It pumped this water up and piped it to communities as far away as Houghton and Hancock, which bought it. It owned and operated a bus company and a railroad. It consistently profited in the 1950s from the sale of timber off company land.<sup>25</sup>

Most importantly, of course, while its operations on the Baltic lode of native copper at Painesdale dwindled, Copper Range opened up a new and very different kind of mine about seventy miles from Painesdale at White Pine in Ontonagon County. The deposit there was neither inclined, nor native copper. Rather, it was a massive, flat, three-hundred-million ton ore body, a shale charged with chalcocite, or copper sulphide. Copper Range

opened the White Pine mine due to the Korean War era demand for domestic copper, a \$57 million government construction loan, and a Defense Materials Procurement Agency contract to purchase 243,750 tons of the new mine's copper. In its very first year of operation, 1955, White Pine produced sixty million pounds of copper, while Houghton and Keweenaw counties managed to produce just 35 million pounds of native copper.<sup>26</sup>

No one thrived as the mining of native copper limped along at C&H and Copper Range. The companies played out their string, eking out modest profits when possible from continued mining. As soon as White Pine came on line, Copper Range's surviving Champion mine, struggling from year to year, became less and less significant to the company. The same was true of the shafts still operating as part of Calumet and Hecla. The firm closed some, then reopened others, as times and copper prices permitted. During the Korean War, for instance, C&H reopened its works on the Osceola lode. But, seen as part of the big picture, C&H's remaining mines were marginal and becoming less and less important to the firm. All its operations on the Keweenaw in and around Calumet were becoming less important. This could be witnessed in new, highly symbolic ways. In 1952, C&H shortened its corporate name, took out the word "mining," and became "Calumet and Hecla, Inc." Three years later, the company moved farther away from its traditional copper mining heritage by moving its headquarters from Calumet to Chicago.<sup>27</sup>

Laborers had switched allegiance from the International Union of Mine, Mill and Smelter Workers over to the United Steel Workers union in 1950. As the native copper industry wound down at Calumet and Hecla and at Copper Range, the collective bargaining of three-year labor contracts between the mines and the United Steel Workers increasingly became contentious. In short, the men wanted more money, while the companies felt they had none to give. While its men still belonged to the IUMMSW, in 1949 C&H closed its mines throughout the summer season; this act succeeded in getting workers to accept a wage cut. Three years later, in 1952 the United Steel Workers struck Calumet and Hecla for two months. In 1955, workers struck early in May and did not return till near the end of August. To bring the men back to work on its terms, C&H announced it was going to close its mines and sell off its properties. C&H halted its move to liquidate, once the union men agreed to company terms and returned to work. The threat of closure apparently made the men more fearful of engaging in strikes, because labor relations calmed for a period, going into the mid-1960s.<sup>28</sup>

While occasionally brandishing the threat of closure, C&H continued the chase for new copper. For a time in the early 1960s, it appeared that new works on the Kingston conglomerate lode would help carry the company's Michigan mining operations along, but that did not prove to be the case. Like so many other lodes C&H had tested and tried over the decades, the Kingston did not develop into a bonanza. In 1965, labor troubles arrived again, as union workers went out on a ten week strike over wages and select work rules.<sup>29</sup> In 1968, labor and management butted heads again – and for the last time.

By 1968, Calumet and Hecla did not even exist anymore as a separate, independent company. Universal Oil Products (UOP) out of Chicago had bought up all of C&H's

properties and products. UOP was a conglomerate engaged in numerous, disparate activities. Its largest source of revenue was the petroleum and petrochemical processing market. UOP marketed itself as an advanced scientific and engineering research company. It dealt with materials science, minerals processing, catalytic converters, and plastics. It also fabricated metal parts and manufactured parts for truck suspensions and the airline industry.<sup>30</sup>

UOP, typical of a conglomerate, entered into new fields by acquiring companies already engaged in those fields. Wanting to avoid a take-over itself – wanting to avoid being swallowed up by a larger conglomerate – UOP sought in the mid-1960s to become bigger itself. C&H caught UOP's attention. It, too, was headquartered near Chicago. C&H's Wolverine Tube Works and its markets fitted in nicely with UOP's interests in energy and metals fabrication. At the end of April 1968, UOP acquired C&H through an exchange of stock. Each share of C&H stock was traded for .6 shares of UOP common stock; the UOP stock traded to acquire C&H was valued at about \$100 million. UOP then incorporated a new Calumet and Hecla Corporation as one of its wholly-owned subsidiaries.

In August 1968, only months after UOP assumed control of C&H, their last labor contract concluded with C&H and the United Steel Workers went on strike. The strike halted mining and the production, on the Keweenaw, of copper, copper alloys and chemicals, and castings. Some four hundred miles south of the Keweenaw, UOP leadership did not budge in negotiations. That leadership had no history or tradition connecting it to the 1,200 C&H workers living in the vicinity of Calumet, who were now idled. It had only economic ties, and they were marginal. The deadlock continued over all the long winter of 1968-69, and any discussions tended to be acrimonious. Bitter feelings abounded. In the spring, renewed negotiations failed. The Copper Range company had closed its last native copper mining works on the Keweenaw in 1968, and C&H (or UOP) was now about to do the same. On April 9, 1969, UOP announced to strikers that their employment was terminated. They had no jobs to wait for, no jobs to return to.<sup>31</sup>

The workers living in the small communities located around C&H had been threatened with closure before, and they were not certain if this was the real deal, or only the newest threat of closure, intended to get the union to back down on expectations and demands. UOP's April 9 announcement was surely ominous. Church bells tolled in Calumet; many thought it was a death knell. Surely, if the closure in fact happened, the loss of over a thousand jobs in the local economy, the loss of a \$9 million annual payroll, would have a devastating effect on local governments, workers, families, businesses, and institutions of all sorts.<sup>32</sup> Calumet village and Calumet Township had already withered a great deal since the peak of mining, when just over thirty-seven thousand persons, combined, lived in those two places. They had seen people leave as the copper mining economy had declined. The remaining population of about 10,500 people desperately needed to hold on to those jobs now threatened by UOP.

Civic and religious leaders attempted to broker a settlement to the strike, to forge a new contract between UOP and the Steel Workers. But last ditch negotiations between Local 4312 and UOP failed; attempts to find new ownership for the mining and industrial plant failed; and more months passed with no resolution. Finally the mine pumps halted; UOP let the last operating shafts fill with water; and by the last months of 1970, the end was at hand. UOP liquidated the Calumet division's mining and manufacturing works, scrapping out or selling off its machinery and equipment.

The mine had been there first. It had struggled at the start, but had then flourished to become the great C&H, one of the richest mines in the world. The mine had given rise to adjacent communities, filled with shops, stores, churches, schools, fraternal organizations, houses and families. The communities and the host mine had fed off each other for a full century – about a half-century of exciting growth and expansion, followed by a more painful half-century of contraction and decline. With the industrial base gone, the communities faced hard times and a very uncertain future.

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<sup>1</sup> Lankton, Cradle to Grave, 257.

<sup>2</sup> Gates, Michigan Copper, 251-52.

<sup>3</sup> Benedict, Lake Superior Milling Practice, 82 ff.; Benedict, Red Metal, 188-93.

<sup>4</sup> Benedict, Lake Superior Milling Practice, 111 ff.

<sup>5</sup> *Ibid.*, 98.

<sup>6</sup> *Ibid.*, 99-102.

<sup>7</sup> Gates, Michigan Copper, 230.

<sup>8</sup> Lankton, Cradle to Grave, 250; Gates, Michigan Copper, 145-46; Benedict, Lake Superior Milling Practice, 89-90.

<sup>9</sup> Ocha Potter and Samuel Richards, "Osceola Lode Operations," MCIJ 17(Oct. 1931): 490.

<sup>10</sup> Suomi College Oral History coll., transcript of Heritage Line broadcast, "Quincy No. 2," 4518; "Statement of German Importation Costs," n.d., Copper Range coll., MTU; Schact to WAP, 27 Dec. 1923, Van Pelt coll., MTU.

<sup>11</sup> Gates, Michigan Copper, 210.

<sup>12</sup> Arnold R. Alanen and Lynn Bjorkman, "Plats, Parks, Playgrounds, and Plants: Warren G. Manning's Landscape Designs for the Mining Districts of Michigan's Upper Peninsula," IA: The Journal of the Society for Industrial Archeology 24:1(1998): 49-50.

<sup>13</sup> Gates, Michigan Copper, 210.

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<sup>14</sup> Ibid., 161.

<sup>15</sup> C&H, “Operations – Past, Present and Future (25 Nov. 1950), 2-3, C&H coll., MTU; C&H Consolidated, A.R. for 1931, 7; Lankton, Cradle to Grave, 254; Gates, Michigan Copper, 210.

<sup>16</sup> C&H Consolidated, A.R. for 1939, 4-5.

<sup>17</sup> “Scrap Recovery Campaign in Michigan Iron and Copper Country a Model,” Mining and Metallurgy 24(July 1943): 317.

<sup>18</sup> Gates, Michigan Copper, 171-72; Thurner, Strangers and Sojourners, 261-64.

<sup>19</sup> Thurner, Strangers and Sojourners, 263-64.

<sup>20</sup> C&H Consolidated, A.R. for 1942, 5.

<sup>21</sup> Thurner, Strangers and Sojourners, 277-78.

<sup>22</sup> Gates, Michigan Copper, 177-80.

<sup>23</sup> Lankton, Cradle to Grave, 258; C&H Consolidated, A.R. for 1942, 3; A.R. for 1943, 3; Benedict, Red Metal, 239-42.

<sup>24</sup> C&H, “Operations – Past Present and Future,” 3-4; Benedict, Red Metal, 236-38.

<sup>25</sup> Lankton, Cradle to Grave, 255-56.

<sup>26</sup> Ibid., 259-60.

<sup>27</sup> Ibid., 261.

<sup>28</sup> Ibid., 261-62; Thurner, Strangers and Sojourners, 279-81.

<sup>29</sup> Thurner, Strangers and Sojourners, 287.

<sup>30</sup> Universal Oil Products, A.R. for 1968, 5.

<sup>31</sup> DMG, 9 April 1969; Universal Oil Products, A.R. for 1969, 4.

<sup>32</sup> Lankton, Cradle to Grave, 263.

## CHAPTER 18

## LEGACY

In the summer of 1820, Henry Rowe Schoolcraft and a band of explorers made a difficult trek up the Ontonagon River valley at the base of the Keweenaw Peninsula to visit the Ontonagon Boulder. This specimen of native copper, sitting alongside the river, had grown to almost mythical status since America's colonial period, since Europeans had learned of its existence from Native Americans in the early 1600s. After paddling and hiking their way into the hinterland and visiting the boulder, Schoolcraft wrote in his journal:

One cannot help fancying that he has gone to the ends of the earth, and beyond the boundaries appointed for the residence of man. Every object tells us that it is a region alike unfavorable to the productiveness of the animal and vegetable kingdom; and we shudder in casting our eyes over the frightful wreck of trees, and the confused groups of falling-in banks and shattered stones. . . . Such is the frightful region through which, for a distance of twenty miles, we followed our Indian guides to reach this unfrequented spot, in which there is nothing to compensate the toil of the journey but its geological character, and mineral production.<sup>1</sup>

Schoolcraft's journal entry made it clear that he thought this Keweenaw land was a special, highly distinctive place, albeit not a hospitable one. When he and other geologists and explorers first visited it, the Keweenaw was an extremely remote wilderness. Starting in the 1840s, that wilderness began undergoing a long series of transformations. It became a frontier to be settled and, after a fashion, tamed. Then it became home to a growing industrial society. Along the mineral range, Schoolcraft's "frightful wreck of trees" receded. Companies carved mines out the woods, while commercial settlements sprang up nearby that fed off the mines, and in turn provided companies and their workers with much needed services and supplies. Soon this region dominated American copper production. Companies grew larger; the population multiplied. To be sure, some parts of the Keweenaw still remained largely in a wilderness state, but in a growing number of mine locations stood neighborhoods of company houses, the steeples of churches, and the stacks of steam boilers. And in the towns, businessmen and a very small smattering of businesswomen set up millineries, drug stores, hotels, hardware stores, general stores, newspapers, bakeries, shoemaker shops, law offices, bars and brothels. The population ate ice cream in the summer and ice skated in the winter. They played baseball on the Fourth of July, hunted shorelines for agates and the margins of woods for wild berries.

Over here, the solitude of the forest still existed, but over there, there was no forest, but a landscape occupied now by houses, shops, stores, boilerhouses, hoists, and machine and blacksmith shops. The quiet suffered with the introduction of rock breakers, steam stamps, and steam locomotives, and – underground – the use of explosives. The air

suffered. Once filled with clouds, snow, rain, water fowl and passenger pigeons, it now received the wood or coal smoke from mines, mills, smelters, and houses. The native forest floor became a graveyard of tree stumps, or was perhaps buried under thousands of tons of poor rock from the mine. Pristine shorelines and lakes still existed, to be sure, but industry and docks redefined others, and many lakes – extolled by the earliest settlers for their natural beauty – became industrial dumps and received the waste sands spewed from the mine’s stamp mills. Alfred Swineford captured this environmental transformation in two very contrasting descriptions of Portage Lake. He wrote of how the place looked in 1846, before mining had taken off and before Houghton and Hancock had taken root:

The scenery bordering the lake was exceedingly beautiful. . . . Our cheerful Canadian boatmen, singing as they rowed, would often rest upon their oars in order to enjoy the quiet, brilliant panorama. The native forests in primitive grandeur, starting at the water’s edge, slope up precipitously toward the sky, presenting a great variety of pleasing shades and colors.

After nearly three decades of human activity, of industrialization along this waterway, Swineford offered up a very contrasting image:

Today – 1875 – the reverse of this picture is presented. . . . The busy, picturesquely situated villages of Houghton and Hancock. . . ; the giant stamp mills, which make the earth tremble with the heavy thud of ponderous hammers; the air dark with smoke, and the water discolored with rejected sand and slime . . . ; the fiery furnaces of the copper smelting works. . . ; the numerous manufactories, with their noisy rattling and banging; the fleet of steam and sail vessels. . . ; and latest innovation of all, there goes rushing up the hill-side a locomotive with a train of cars – all of these things . . . go to make up a picture characteristic of this age of progress.<sup>2</sup>

One tenet of the age of progress was that nature was there to be used, not merely to be admired, or to be protected or preserved. The natural environment deteriorated in many ways – air, land, and water – while the industrial society on the Keweenaw rose to dominate American copper production until the late 1880s, and then continued to grow in production, employment, profitability, and population until reaching its peak between 1910 and 1920. After that time, however, local society felt the downside of transformational forces. The age of progress slid into a half-century long age of industrial decline, and as the mines went down, so did local communities. Not long before, they had embraced modernization, added paved streets, sidewalks, street cars, utilities, and many new houses, as well as impressive new edifices such as banks, theatres, stores, schools, churches, and fire stations, often done in brick or Jacobsville sandstone. Now, the building boom ended. Buildings – such as abandoned neighborhoods of company houses – went down, not up. More than half the population got up and left. By the late 1960s, the last of the native copper mines shut down. The region had run the course from wilderness to rust belt. The historic Copper Country, now

a country without copper after 125 years, struggled to redefine its economy and way of life.

While passing through its many transformations, the Keweenaw produced a total of ten to eleven billion pounds of native copper. It blazed many trails, hit many milestones, and followed many trends and currents along the way. Observers from the start had noted that this land, with its distinctive natural environment, mines, communities, and people, was special, different, and unlike the “world below.” In many ways, the Keweenaw did seem a highly notable place unto itself, operating in its own ways – a place with a singular history and even prehistory.

Geologically, the peninsula was a very old part of the earth, laid up of many rock strata, including one of the thickest lava flows to be found anywhere. Within the rock, along the mineral range, existed a highly unusual deposit of native copper, very rare in the world of metals, which was extensive, deep, and capable of supporting commercial mining for one and a quarter centuries. Starting at least 7,000 years ago, Native Americans found, used, and traded that copper extensively across North America. These peoples did not have the ability to smelt copper ores. This fact made the Keweenaw an important source of American Indian metal, because they did not have to smelt its native, metallic copper. They could gather it, work it, anneal it, work it some more, shape and polish it into tools and ornaments.

In terms of American mining history, the Keweenaw served as the destination of the country’s first real mine rush. True, mines already existed in numerous locales in the Eastern United States, but those mines were almost never as isolated or as distant from established settlements as the Keweenaw. The Keweenaw, again, was *beyond the boundaries appointed for the residence of man*. It was out there, way out there. Almost nobody was going to be landing on the tip of Keweenaw Point in the 1840s except for one thing: copper. The idea of finding masses of almost pure copper lying on or near the surface of the ground excited investors and prospectors. Carried along by an enthusiastic “copper fever,” adventurers rushed beyond the boundaries to arrive at this place in search of mineral wealth.

The adventurers landing on the Keweenaw established a new type of American frontier. The Keweenaw was not on any frontier line; it was beyond any such line. It was a node of settlement surrounded by hundreds of miles of wilderness and by water. It had extremely harsh winters that closed navigation to the region for nearly half the year, making it even more isolated and remote, making it even more “on the edge.” The surrounding wilderness, the separation, and the harsh environment made settling this place so daunting and success here so impressive.

Copper mines operated in several states other than Michigan prior to the 1840s, but the Lake mines were the first major copper mines in the country. The Lake Superior copper district was also one of the earliest extractive industries to be dominated not by individual owners or partnerships, but by incorporated mining companies. Development costs at these mines ran high, and so did the risk of failure. Incorporated firms helped deal with

both challenges. A company gathered substantial investment capital from numerous individuals and spread risk across all those same investors. No one investor put up all the money, and then took all the loss, if a property failed to produce copper in profitable quantities.

These mines started in a pre-mechanized era, when human or animal labor did almost all the work. But they remained important players over the decades of the late nineteenth century when mining became less of a craft, and more an industry, when the work was done not so much just by men, but by monster steam engines, machine rock drills, and jaw crushers. These mines also led the way in this country in developing deep-shaft, hard-rock mining techniques. Because their lodes were narrow and steeply inclined, the companies never stayed on one level for long, but went deeper and deeper each year. Soon they were the deepest mines in the country, a distinction that some of their shafts held until they finally closed.

These mines became some of the longest lived in the U. S. – not just because they sat atop high-quality deposits, but because of their leadership. True, many mining companies quickly went by the wayside. They died while prospecting; they died while trying to develop a lode that just never panned out; or they died after a few years of production. But the many, many failures here – the dozens of companies that didn't make it, or made it only briefly – never defined the district as a whole. What defined the district were the mines that allowed the industry, overall, to run in the black, not the red – the mines such as Quincy, or C&H, or Copper Range, or Tamarack, which carried on for decades. These tended not to be fly-by-night operations. They tended not to be run for the sake of achieving quick and easy profits, and then departing. These mines, after achieving their early success, looked to the longer term. They sought to be permanent fixtures on the landscape, not temporary ones. Their leadership, too, often put on a mantle of permanence, as the key companies often carried on for long periods with the same major investors, the same officers in the boardroom, and the same key personnel supervising operations out on Lake Superior.

These mines also became especially known in the American mining industry for their paternalism. They were by no means the first paternal employers in the American economy, nor would they be the last. But the mining companies' paternalism surely contributed strongly to the sense that the Keweenaw was a special place, because here the companies did so much to shape and control society, over so many decades. Company paternalism, in the form of housing, medical service, or charity for accident victims, served as a buffer against the hazards of living in a harsh environment and working in a dangerous industry. Company paternalism sped up the transformation of this land from wilderness to industrial society. It helped define relations between managers and workers and between one class of workers and another. It helped define the whole look of the place, with all those rows of company houses standing along all those lanes at the mine locations. And observers credited company paternalism, even into the twentieth century, for maintaining more labor harmony here than in any other major metal-mining district in America.

While seeming to be so different and special, this rugged peninsula sticking out into Lake Superior still remained attached to the rest of the United States, its society and economy. So some of the trends the Keweenaw followed – or tried to buck – were not idiosyncratic ones, but national in scope. Local and national history cannot ever fully remain separate, because they are made up of each other.

Any settler who took the Erie Canal or a railroad or a lake steamer to get out to Michigan did so courtesy of America's transportation revolution. Thanks to a burgeoning market economy, people at the mines enjoyed a more varied diet. They cut open tins of oysters from Chesapeake Bay, spread store butter over bread, drank fresh-squeezed lemonade on the Fourth of July, and ate salt pork from Cincinnati. The industrial revolution, with its multiplying producers and many new products, gave women the bolts of cloth they examined in the stores of Ontonagon or Eagle River, gave single men their store-bought pants, gave families patent medicines lining drug store shelves, and gave the mines their new hoisting ropes, dynamites, and sunshine and calcium carbide lamps and fuels. The drive to mechanize work and save labor – coupled with the rise of mechanical engineering – wrought dramatic changes throughout all the mining companies. Engineers, inventors, foundries and shops from across the country gave them the steam engines, pumps, compressors, steam stamps, rock drills, and rock crushers that did much of the industry's hard work. Thanks to the likes of Thomas Edison and George Westinghouse and others, electrification and the rise of the electrical industry in the late nineteenth and early twentieth centuries gave the local mines a great new market for copper wire to be used in motor and generator windings and transmission lines; in response, the mines and surrounding communities expanded several times over.

American wars marked the history of the copper mines. War generally brought about high demand and high prices, because copper was a critical war materiel, whether it went into cannon, munitions, canteens, or buttons and buckles. Each major war ushered in its own set of circumstances and changes, its own unintended consequences. The Civil War brought inflationary prices in shops and stores on the Keweenaw, demands for higher wages, and a temporary breakdown in civil order at the mines. War-time arrests went up as social disturbances in the streets went up. The First World War stimulated profit-taking, and the mines enjoyed their highest production and profit levels ever. The Second World War proved no bonanza to the mines, which were deep into decline by then. Still, demand for the metal led directly to price supports that helped the companies profit even in a time of higher wages, and led to the building of Quincy's reclamation plant, which helped carry that company through later decades. Similarly, the Korean War led directly to federal support of Copper Range's development of the White Pine mine. That new mine quickly out-stripped the production of the old, native copper mines, and it remained in production after all of them had shut down.

The nation's immigration policy made the sustained growth of the copper mines possible. When the mines first started, and whenever they later expanded, they depended on thousands of arrivals coming from the British Isles or continental Europe. The nation let them in; the Copper Country took them in. These mines, in the second half of the nineteenth century and through the First World War, were carried on the backs of steam

engines – which quite literally did much of the heavy lifting – and immigrant workers. Through 1880, foreign-born men accounted for over ninety percent of all deaths in the Lake mines; even after 1900, the mines' worst era in terms of deaths per year, they still accounted for eighty percent of all deaths (and the remaining twenty percent were likely the American sons, born on the Keweenaw, of immigrant parents). Very few native-born Americans ever came from other parts of the United States to work in the mines.

The mines needed the open immigration policy that brought millions of workers to this country, and they took in whoever was migrating to the U. S. during a given era. When the immigration stream came largely from the British Isles and Western Europe, Cornish, English, Irish, German, and a smattering of Scottish and Swedish workers filled the mines' employment rosters. Later in the nineteenth century and into the twentieth, when the original immigration stream slowed to a trickle, the mines turned to new immigrant groups coming largely from Southern Europe, principally Italians; from Eastern Europe, such as Croatians; and Northern Europe, especially the Finns. Those coming to the Copper Country in particular and those coming to America in general, were largely the same peoples. What did set the Keweenaw apart, however, was the disproportionate number of immigrants coming here from Cornwall and Finland.

Broad social and political movements, nation-wide in scope, touched the Copper Country. The mines could not protect their "old time rules" from the reform fervor of Progressivism early in the twentieth century, so they faced and lost more challenges in the courts, and ultimately, they had to accept as a part of their business environment workers' compensation, child labor laws, a shorter work day, and the U. S. Bureau of Mines. Cultural ideals of progress and modernization broadly afoot in America brought about not only newly paved streets and electric poles, but people – including members of the working class – who internalized these ideals. They translated them into rising expectations, enhanced consumerism, and a desire for a higher standard of living – better hygiene, more education, more privacy, more goods, more money, and more freedom.

The dominant mining companies managed to hold at bay for quite some time a growing labor movement in America. Labor riots, successful union drives, and strikes happened someplace else, but not here. They happened in urban, industrial areas, such as Chicago or Milwaukee; they happened in western mining districts, such as Coeur d'Alene, Idaho, or the Comstock lode in Nevada, or in Butte, Montana, but not here. But the Keweenaw became home to growing labor unrest by the late 1890s; home to a bitter labor strike in 1913-14; and finally, near the start of the Second World War, home to a successful union drive that finally ushered in collective bargaining.

From 1920 until the late 1960s, as many mines closed and a few limped on, the Keweenaw went through the phenomenon of deindustrialization. As industrial jobs became scarcer, more workers, especially Finns, tried to eke out a better existence by farming. Local governments lost tax revenues. Businesses lost their customers, churches their parishioners, and many families their children – because sons and daughters moved away to find a better life in places where the economy was more varied and vibrant than in the old copper towns and villages. Perhaps only the natural environment evidenced

any obvious benefit from this long era of economic decline. Mine and mill boilers and smelter stacks discharged less and less industrial smoke into the air; mills and reclamation plants tailed less and less in the way of chemicals and waste sands into area lakes; and forests regenerated themselves in places where they once had been clear-cut to provide for fuel, mine supports, or building material. The steep slope running from Portage Lake up to the top of Quincy Hill had been barren of trees for about seventy-five years; with the slow-down and then shut-down of mining, milling and smelting at its base and top, it grew green again.

No economic activity on the Keweenaw stepped in to take the core role once played by mining industry, but select sectors of the economy did improve while the mines were in decline and after they closed. In the 1960s, as Calumet and Hecla and Copper Range's Champion mine played out, right in between them, in Houghton, Michigan Technological University expanded at a time when the post-war "baby boomers" headed off to college. Michigan Tech was a key legacy of the copper mining industry. This state supported school started in the 1885 as the Michigan College of Mines. The school believed in providing a practical and technical education, at first geared towards the local copper mines, the regional iron mines of the upper Great Lakes, and other mining districts at greater distance. But the college had to change, had to go through a metamorphosis or two to remain relevant and to succeed as the mining industry, education, and the economy changed. In 1927 it became the Michigan College of Mining and Technology. By the early 1960s, there were fewer than fifty mining engineering students enrolled, and the school dropped the word "Mining" from its name. Armed with a new name, with a broader ranging curriculum in engineering and science, and with an enlarged, more modern campus, Michigan Tech in relatively short order expanded from an enrollment of a couple thousand in the early 1960s to one rising to six to even eight thousand students. This growth of Michigan Tech gave a great boost to a local economy that had seen the last of its mines shut down.<sup>3</sup>

In its post-mining days, the Keweenaw's economy was also revived in part by a local forest-products industry and by some light manufacturing. Tourism became an important contributor, too. In the second half of the twentieth century, with vacation-by-auto in vogue and with a Mackinaw Bridge connecting Upper and Lower Michigan, the Copper Country became more frequented by travelers. Some came to see nature; others to see history.

Modern travelers, like early settlers, have been taken by the Keweenaw's water, woods, and winters. Tourists come this far north because of the grandeur of Superior's shoreline, because of cool summer temperatures, and because of mile after mile of green woods seen along two-lane, winding roads. They have come to camp, hike, fish, hunt for mineral specimens, or just to look. In the last ten to fifteen years, winter tourism has grown to rival summer's, thanks to the deep blanket of lake effect snow covering the land. Some winter tourists come to ski, but more come pulling snowmobiles behind their pickups, so they can ride along hundreds of miles of trails cutting through woods and only occasionally through a settlement of any size. A fair number of these visitors, summer and winter, think that this land is a little-touched wilderness. They focus on the

natural environment, but don't see it all, or understand how the hand of settlement and industry changed it. They see the pristine parts of the shoreline, but somehow overlook the Torch Lake shoreline, designated an EPA Superfund site due to its degraded condition after a century of milling and reclamation. They see a forest, but don't always see that it is new growth on cut-over land. They ride what seems a wilderness snowmobile trail, without realizing that a mining company's railroad first cut that route, and used it to deliver thousands and thousands of tons of copper rock from mine to mill.

Other tourists have come because of history, and to see history. They come to see the old mines and their old towns, come to see the Keweenaw, because it doesn't look like the rest of modern America. The Copper Country has some things that other places lack. Like the ghost-towns, the abandoned mine locations, that pop up every so often as you drive north of Calumet along US-41 to Copper Harbor. Like the haunting, grown-over cemeteries, one Catholic and one Protestant, at the Cliff mine. Like the partly submerged suction dredge by Mason on Torch Lake, that pumped stamp sands to a reclamation plant. Like the lone steam stamp left in the Copper Country that stands a vigil at the ruins of the Ahmeek mill in Tamarack City. Like the log houses beside the road that cuts over from the Phoenix mine location to the commercial, shoreline village of Eagle River. Like the dam made of steel, of all things, at Redridge, for impounding water for two stamp mills. Like the 150-foot tall shaft-rockhouse atop Quincy Hill that towers over the valley of Portage Lake. Like the stone boat sitting on solid ground beside U.S. 41 near Mohawk. This Depression-era, WPA make-work project is a perfect regional icon, with a hull and deck laid up of mine rock and Jacobsville sandstone, and a gun mount that is really a machine rock drill.

The region looks different, not only for what it has, but for what it has not. Since 1920, most of the rest of America has had more money than the Copper Country. The rest of America busily made itself new along streets and highways, while much of the Copper Country lay dormant. People drive north from cities surrounded by post-war suburbs, by commercial strip developments, shopping centers, shopping malls, and interstate highways and beltways – to a finger of land on Lake Superior whose villages and mine locations reflect the late nineteenth and early twentieth centuries, and not the early twenty-first century. By the 1950s, in many parts of America the modern roadside was already taking shape, a roadside of fast food outlets and chain motels, of shopping centers and standardized signage and architecture. That roadside vista showed up late in the Copper Country, arriving in a limited way in the late 1970s and early 1980s. Thanks largely to the economic boost given Houghton by Michigan Tech being there, that small city saw the first modest shopping mall open its doors in 1978 and boasted the region's first Burger King and McDonalds. The Copper Country's first regional strip development went up on M-26 south of Houghton, between the city, with its turn-of-the-century downtown, and the new mall. This strip filled in over the last quarter century and now very much resembles other parts of the United States. Besides the mall, it now claims a Wal-Mart and a Shopko. It has two supermarkets; a Blockbuster; an electronics store; a florist/garden center; a furniture store; numerous fast food outlets (including Pizza Hut, McDonald's, Taco Bell, Dairy Queen, and Kentucky Fried Chicken); a new car dealership plus a convenience gas station, auto service garages, car-washes, and used

car dealers; and a Holiday Inn Express. Only the well-tutored or the observant could find any thing with a local or regional look in all of this. There are, however, a few ties to the past. The mall is named the “Copper Country Mall.” Keweenaw Gem & Gift sells copper and mineral specimens, plus trinkets and crafty things made of copper, and has a few mining artifacts on its lot. To create flat building sites for Wal-Mart and Holiday Inn Express, earthmovers carved away parts of sand hills, leaving steep banks. To keep the banks from eroding down, they hauled in mine spoil from the poor rock piles adjacent to abandoned mines. They landscaped the hills with a cascade of poor rock. These days, poor rock is being robbed from the piles where the mines left it and is being used across the Keweenaw, in places it never used to be.

The modern roadside vista seen along M-26 south of Houghton remains quite a novelty, however. It is replicated in very few places along the Keweenaw, and never on this scale. Convenience store/gas stations, true, have been sprinkled rather liberally along the outskirts of many settlements, but other parts of the modern picture are usually lacking. To this day, the city of Hancock has no chain-operated fast food restaurant, no large national merchandiser, and relatively few buildings downtown that date after 1920. Calumet Township only since the mid-1990s has a modern commercial development located near the old C&H mine atop the Conglomerate lode. “Mine Street Station,” as it is known, is an island of late-twentieth century Americana (Burger King, Pamida merchandiser, AmericInn Motel, Honda dealer, auto repair shop) amid a sea of abandoned ground, which had once bustled with mining activity, and still-standing mine structures and houses. By way of contrast, streetscapes along the villages of Calumet, Laurium and Lake Linden evidence virtually none of this. With brick or stone buildings, with elaborate cornices, with some cast-iron fronts and large display windows – they look much like they did a century or so ago. Deletions – buildings going down – as well as some notable cases of “remuddling” – have changed their appearance more than new construction going up.

Since the closing of the last mines, there has been a tension on the Keweenaw, a tension between believers in the old and believers in the new, between advocates of historic preservation and advocates of growth and development. Surely, the population has not universally respected or treasured its old mine, mill, and smelter sites, or its old downtowns, or even its old churches. Some of this is very understandable. It takes a certain mind cast to see cultural value in a pile of waste rock, or in an abandoned smelter with fallen in roofs, weathered wooden structures stripped of paint, and rusted metal ones. The mining companies did not help matters by leaving parts of shorelines a mess. They scrapped out things of value, while leaving behind wrecked shells of buildings, massive, concrete foundations for steam stamps, and vast sterile beaches of stamp sands, upon which almost nothing grew.

Many residents of the Keweenaw have seen, they think, too much old, and not enough new. Old mines, old mine location houses, old stores, old gas stations, old over-grown cemeteries that nobody could afford to care for, or even wanted to. For many, the old is symbolic of decline, symbolic of a broken promise. The mining industry was here for people for about 125 years, but its not here now to help take care of anybody, so it is time

to move on. Time to become less of a special place on the great lake wedded to a now-dead industry; time to become more like the rest of the modern “world below.”

At the same time, the Keweenaw has always had its champions of history and historic preservation. This has been rooted, perhaps, in the strong belief that the Keweenaw was and is a special place, and that the people who came here were a special people. The early pioneers surely sensed this. Early on, they started collecting historical documents and photographs. Many wrote published reminiscences, with titles such as “A Narrative of One Year in the Wilderness,” “Some Incidents of Pioneer Life in the Upper Peninsula of Michigan,” “Some Early Mining Days at Portage Lake,” and “Recollections of Civil War Conditions in the Copper Country.” In 1874, they held an inaugural “Old Settlers Ball” in Eagle River. On January 21, 1886, about three hundred people came to Calumet to help two of the earliest settlers, Daniel and Lucena Brockway, celebrate their fiftieth wedding anniversary. Guests signed a registry – and they recorded just when they had arrived at this place. These people were definitely conscious of their history, of their role in history as American pioneers. At the party were 147 guests who had migrated from the “world below” to the Copper Country. In addition to the Brockways, two others had come in the 1840s, fourteen in the 1850s, forty-two in the 1860s, and eighty-nine in the 1870s or later.<sup>4</sup>

While much history was saved – by the mining companies themselves, by local governments, county historical societies, private collectors and others, much was lost. The Copper Country, it seemed, had always been in the business of making and losing history at the same time, particularly when it came to the built environment. At abandoned locations, nature worked diligently to reclaim the site by regenerating forests and by collapsing dilapidated buildings under heavy snow loads. As a consequence, many nineteenth century mines – including important and well populated ones, such as the Cliff mine – are now just archaeological sites, with no standing structures. Meanwhile, the mines that ran for many decades and into the twentieth century often consumed their past while taking care of the present and future. They buried original sites under piles of poor rock and periodically replaced worn out or antiquated buildings and technologies with new. And when the end finally came, companies generally did not just walk away from a site, leaving it intact as a kind of time capsule. To squeeze out the last worth from their physical plant, they sold or auctioned off machinery and equipment, or salvaged it for scrap.

Sometimes the most expedient way to salvage an old air compressor or hoist was to bring in a wrecking ball and bash down much of the building that once enclosed and protected it. That way, a salvage crew could more easily yank the old machinery out. Because of mine closures, machinery sales, salvage drives, occasional fires, environmental deterioration, and sometimes the adaptive reuse of old structures, today no mine site on the Keweenaw is as it was. Often, major parts or site features are there, such as the Champion No. 4 shaft-house, hoisthouse and machine shop at Painesdale; or the machine shop, drill shop and gearhouse at C&H; or the No. 2 hoisthouse and shaft-rockhouse at Quincy. At many places, substantial ruins are there. But not a single site today looks anything like it did when the mine was in operation.

In terms of their preservation, stamp mills have fared far worse than the mines. Many company houses survive at mill towns, ranging from Mason, Tamarack City, and Lake Linden on Torch Lake; to Freda and Redridge on one side of the Keweenaw; and to Gay on the other. Material evidence of milling (and reclamation) abounds on many of the Keweenaw's shorelines, in the form of stamp sand beaches, occasional dams and penstocks, concrete piers and machinery pads, and the ruins of walls. But no major mill building stands in good repair; no good collection of washing and separating machinery exists; no Cornish drop stamps survive. One lone steam stamp at the Ahmeek mill and a row of ball mills in Ontonagon County represent the most significant milling artifacts to be found above ground and *in situ* on the Keweenaw.

Copper smelters on the Keweenaw were not nearly as numerous as mines or mills. Five of them clustered along the waterways at the center of Houghton County, near the biggest mines that accounted for the greatest production. Alongside Portage Lake stood the Detroit and Lake Superior smelter, Copper Range's Michigan smelter, the Quincy smelter, and the Dollar Bay Smelting Works. At Torch Lake stood the largest of them all, the Calumet and Hecla Smelting Corporation's works. As company-owned or independent custom smelters closed, most eventually fell under the wrecking ball, or had their furnaces and casting machinery removed so that buildings could be used for something else. Only one building – the office – stands at the site of the once vast Michigan smelter site west of Houghton. The Houghton County Road Commission occupies some buildings remaining from the Detroit and Lake Superior smelter, whose technological components were ripped out long ago. On Torch Lake, most of the C&H smelter complex has disappeared from the landscape, but a few standing buildings have been converted to new uses. One smelter, however, did remain surprisingly intact: Quincy's, originally constructed in 1898. Perhaps the Quincy smelter, of all the historic, mining-related industrial complexes on the Keweenaw, was left most like a time capsule, as if men had just left work one day, leaving their stuff behind. It was hardly in pristine or original condition when finally shut around 1970, but it retained reverberatory and crucible furnaces, ladles, a casting wheel, two reciprocating steam engines, an electrical plant, considerable machinery and tools, most of its buildings, and a slag pile of black, glassy smelter waste. But even a time capsule site diminishes over time. Decades of little maintenance, followed by decades of virtually no maintenance, accompanied by considerable vandalism and theft, have severely compromised much of the smelter's historic fabric, leaving it in an advanced state of deterioration.<sup>5</sup>

The mines were not only copper producers; they were communities. Companies decided the fates of houses and neighborhoods as they slowed and then stopped operations. Sometimes they tore down or torched abandoned houses to eliminate them as a public nuisance. Much of the Lower Pewabic neighborhood at the Quincy mine disappeared in this manner. At other places, companies sold off their houses that were in decent repair to interested buyers, who may have lived there for years before, paying rent to their employer. When companies did that, private owners in former company houses, quite naturally and appropriately, started modifying them to suit their particular tastes and needs. Hundreds of houses went into private hands around the old C&H mine and in

Painesdale, once home of Copper Range's Champion mine.<sup>6</sup> Recent home buyers started painting the once-identical houses in new hues, added or enclosed a porch, built a garage, or modernized windows and doors. In this manner, residents preserved some large and important mine location neighborhoods, neighborhoods of houses which started to take on a new cast, once the mining companies no longer owned, rented out, and maintained them.

Many local historical groups and museums – small and always under-funded – started to step in more and more in to protect, preserve, and even interpret the threatened and sometimes vanishing industrial and cultural landscape of the mining era. In Calumet, Coppertown USA opened a mining museum in Calumet and Hecla's old pattern shop, which had been a part of the company's foundry operations. On Quincy Hill, the Quincy Mine Hoist Association, a non-profit corporation, dedicated itself to the preservation of the huge Nordberg steam hoist and the shaft-rockhouse at the No. 2 shaft. The Houghton Country Historical Society – located at Lake Linden in the old Calumet and Hecla mill office – collected manuscripts, photographs, artifacts, and even some buildings. The Keweenaw Historical Society acquired the lighthouse and Rathbone school in Eagle Harbor, the church and blacksmith shop in Phoenix, and much of the abandoned Central mine. The Ontonagon Historical Society ran its museum and ultimately acquired its local lighthouse. The Keweenaw Heritage Center at Calumet strove to rehabilitate the hundred year old, French Catholic church, St. Anne's. Painesdale Mine & Shaft, Inc. adopted the Champion mine's No. 4 shafthouse – the oldest still standing in the district – as its preservation project, while the Old Victoria organization rallied to preserve a cluster of log houses at the Victoria mine. The Copper Range Historical Society, thinking the mines south of Portage Lake had never received their full share of attention, opened a museum in the village of South Range that emphasizes the peoples and places associated with the Baltic, Trimountain, and Champion mines.

The state of Michigan and the federal government became involved, too. On the northern end of the old mineral range, Michigan created Fort Wilkins State Park to preserve and interpret the army post built in the 1840s to help maintain order on the remote Keweenaw frontier. On the southern end of the range, Michigan's Porcupine Mountains Wilderness State Park included, within its boundaries, the archaeological remains of small mining operations. The state-supported university, Michigan Tech, did its part by operating the A. E. Seaman Mineral Museum, housing local copper and mineral specimens, plus select photographs and artifacts. As part of its library, the university created the MTU Archives and Copper Country Historical Collections. Those collections became extremely important, as they grew to include records from individuals, local governments, and especially the surviving corporate records of the three most important companies to ever mine on the Keweenaw: C&H, Copper Range, and Quincy. In a manner somewhat akin to the state's Porcupine Mountains Wilderness State Park, the federal government operated the Isle Royale National Park, on the island in Lake Superior to the west of the Keweenaw Peninsula. The Park Service manages and markets Isle Royale as a wilderness area, a land of moose and wolves. But Isle Royale and the Keweenaw share common geological features, share some of the same rock strata, and share a history – from the 1840s through the rest of the nineteenth century – of mining. The big difference

was that the industry that grew on the mainland withered on the island. Still, Isle Royale National Park, amidst its wilderness, shelters the archaeological features of copper mining activity.

In the 1980s, some severe and disappointing preservation losses seemed to trigger an even greater interest in local history and preservation. After decades of hard times, neglect, and even abuse, two of the most significant structures in the history of C&H and the village and township of Calumet were pulled down due to hazardous structural conditions, a lack of funds for stabilization or renovation, and perhaps due to a lack of appreciation for what their loss would really mean, until they were gone. The Italian Hall, scene of the worst disaster in the history of the Keweenaw, scene of the great 1913 Christmas Eve tragedy that killed seventy-four people in the midst of the long, divisive labor strike, came down in 1984. The Superior engine house, which once showcased one of the greatest steam engines in America, which once stood as perhaps the premier technological symbol of Calumet and Hecla's supremacy – it came down, too.

Not long after these demolitions, the idea was born, especially in Calumet, that more needed to be done to hold on to what was left. The idea was born that maybe their future should be their past. That the village and the township of Calumet had a history that could be “sold,” that could be used to revitalize the community, attract outside funding, boost tourism, and stimulate appropriate new development amidst the old, original fabric. The proponents of economic development via the path of preservation and history had a recent model to follow: the Lowell National Historical Park in Massachusetts. This was no typical National Park, with boundaries drawn around some spot of natural beauty, but a park with boundaries drawn around a gritty industrial city filled with abandoned textile mills, power canals, old housing stock, and a dwindling downtown. But Lowell had an important history – of being one of the premier, early industrial cities in America, renown for its mill girls, boarding houses, and its water-powered factory system. Lowell had parlayed its history into a National Park designation. The idea gained currency in Calumet in the late 1980s that perhaps it, too, because of its history, could be made a unit of the National Park Service.

In response to a congressional request, the National Park service began studying this possibility in the late 1980s. Before the movement to establishment a National Park at Calumet could advance very far, the area needed to be studied to see if it qualified for National Historic Landmark (NHL) status. That hurdle needed to be cleared – that in terms of its history and physical remains, some piece of local geography had to pass muster as an NHL. Kathleen Lidfors surveyed the area for the NPS and subsequently prepared historic district studies and an NHL nomination that the Park Service approved. In preparing her studies, Lidfors did not just look at Calumet; she looked beyond it. She sought to designate some historic district boundaries that had both practical and historical limits. The boundaries should not set off or include too much property on the Keweenaw, but at the same time, the districts needed to be large enough to capture the broad sweep of the region's history and include many of its most important and best preserved historic resources. In 1978, the Historic American Engineering Record, a part of the National Park Service, had conducted a thorough examination of the Quincy

Mining Company and its physical remains. That site was well understood and documented, and Lidfors made Quincy a second focal point of her work. She knew that Calumet and Quincy were both extremely important to the region's history. She saw that they were very dissimilar, and yet complementary, in terms of their historic landscapes. Consequently, her 1988 NHL nomination included two historic districts or geographical units: one at Calumet, and a second, ten miles south, at Quincy.

Over the next several years, local boosters on the Keweenaw strove to achieve broad support for a national historical park, while the National Park Service conducted further investigations and in 1991 published Study of Alternatives, Proposed Keweenaw National Historical Park. The extended bureaucratic and political process of creating a new park culminated on October 27, 1992, when the U. S. Congress passed Public Law 102-543, "An Act to Establish the Keweenaw National Historical Park."<sup>7</sup> The legislation did not specify hard and fast park boundaries, but as the park took shape, the working boundaries became like those of the historic districts proposed by Lidfors in 1988, with a Quincy Unit and a Calumet Unit. Since this was to be a new type of National Park – a *partnership* park – most of the property in each unit would stay in private hands or under local control. The federal government could acquire select properties, but was not to buy up either unit in its entirety. The NPS, in myriad ways, working with myriad partners, would help protect, preserve, and interpret the nationally significant history of Keweenaw copper mining, both inside and outside the park's boundaries.

The Quincy Mining Company and the Calumet and Hecla Mining Company were very different companies. C&H was the singular giant, the one-of-a-kind mine on the Keweenaw. It made more copper and more money than any other company. It could be imperious, secretive, and smug. It lived by its own rules, in a manner that less wealthy mines could not replicate. It hired the most people, built the most houses, and erected by far the largest, most expensive physical plant. It led; all the other mines followed. Amongst the followers, Quincy was the best of the rest, at least through 1900, before the Copper Range company arose to out-strip "Old Reliable" as a producer. Compared to C&H, Quincy worked more carefully to squeeze profits from its lode. Sometimes, particularly during the boom times of the 1890s through the First World War, Quincy could afford to invest heavily in remaking its mine plant, while adding new mills and a smelter. But prior to that, it often settled for "making do" with what it already had, instead of buying the newest or the best. Virtually every part of the C&H industrial empire dwarfed what Quincy had. What was true of hoist engines or railcars or mill and smelter capacities was also true of housing, or hospitals, or doctors, or involvement in schools. Quincy did not exert as much social control in the region as C&H, nor did it run as many paternalistic programs.

The Quincy unit includes some 1,120 acres. It includes the mine site atop Quincy Hill, a run of land going down the hillside, and the site of the Quincy smelter on Portage Lake. The hilltop portion of the unit includes some of Quincy's earliest company houses, built in the 1860s, to the latest houses, built around the First World War era. Besides the houses for ordinary workers, the site includes the mine agent's Italianate house and those of other upper level managers. Some very important Quincy buildings or structures still

stand on the hilltop. There are three generations of No. 2 hoist houses: one built of poor rock, one of Jacobsville sandstone, and one of reinforced concrete and brick, which houses the giant Nordberg steam hoist. The No. 2 steel-frame shaft-rockhouse of 1908 still towers over the site, full of its original equipment. Quincy's office building remains intact, as does its supply office. Many other industrial structures are in ruins, or nearly so: abandoned shaft collars, hoisthouses, boilerhouses, dryhouses, machine and blacksmith shops, rail lines and a locomotive engine house. Crushed poor rock forms the floor of the industrial district, and poor rock piles are still heaped up in places. Below the mine, at the base of the hill and on the shore of Portage Lake, stands Quincy's 1898 smelter, modified over the decades but virtually intact – yet in a very dilapidated and threatened condition.

The Calumet unit of about 750 acres includes within its boundaries the Village of Calumet and much historic fabric, industrial and residential, within Calumet Township. Time and demolition long ago carried off most of the great mine plant that once stood along Mine Street. Today only one shafthouse, Osceola No. 13, stands in the industrial core of the Calumet park unit. Other significant C&H buildings still standing, whose exteriors have been preserved largely in original condition, include the machine, pattern, blacksmith, drill and paint shops; the Superior boilerhouse; the C&H bathhouse, library, and administration building; a dry; a captain's office; the No. 1 warehouse; and the Agassiz House, where the long-time company president stayed while visiting the mine. This unit also includes the commercial district of the Village of Calumet and residences there. It also includes many dwellings in Calumet Township, on the margins of the mine and village, in neighborhoods such as Albion, Blue Jacket, Hecla, and Newtown. Many of these houses were company built; many others were privately built, but on leased land owned by C&H. Altogether, most of the structures within this unit were built between the late nineteenth century and about 1920. While similar in age, they reflect a great diversity of structural types and cultural uses: technological mine structures, private houses, company houses, office buildings, storage buildings, shops, stores, schools, churches, clubs, a fire station, a major theatre, and village hall.

The Quincy and Calumet units of the Keweenaw National Historical Park are just as different as the companies had been. The two units contain very dissimilar physical remains and present entirely different landscapes. But these differences are instructive, because if a visitor puts the two units together, a fuller picture of Keweenaw mine sites emerges. In the most general of terms, the Quincy park unit looks more like a typical mine on the Keweenaw. It has a relatively low density of structures and an open vista. If a visitor looks across the site atop Quincy Hill, beyond the mine is not more mine or more housing or more town – but a view of fields or valley. That vista mirrors the one found at most nineteenth century mines, which were quite isolated and literally carved out of the woods. The Quincy mine unit doesn't have numerous stores and shops and churches and bars – those were down in Hancock. It doesn't have paved streets through the remnants of neighborhoods like Lower Pewabic, Hardscrabble or Limerick, but unpaved lanes or paths. Like most mine communities on the Keweenaw, in its industrial core and neighborhoods it lacks all kinds of amenities and citified things, like pavement,

street lights, sidewalks, storefronts. Quincy Hill has all the look of a mine *location*, as opposed to a mine *town*.

The premier mine town on the Keweenaw was Calumet. Here the vistas are very different. A visitor does not see through or beyond this park unit to discover the natural environment. This historic district is more densely packed with buildings than Quincy Hill, and it is more of a living place than Quincy Hill. A visitor looks out from one street of housing to discover another row of houses; or looks out from a neighborhood to discover the remains of a mine; or looks out from the remains of a mine to discover an occupied, functioning village; or looks down a Fifth or Sixth Street to discover churches, storefronts, apartments. Nowhere else on the Keweenaw did so many mines cluster as tightly together as at Calumet; nowhere else on the Keweenaw did so many people live and work. Nowhere else on the Keweenaw was so much money made. Nowhere else on the Keweenaw did the boom years of 1890 through the First World War leave behind so much rich architecture. This place is no mine location, but a turn of the century industrial city built around one of the world's greatest mines.

Any visitor to the Copper Country who is interested in the history of the place, its mines and its people, should be encouraged to visit the corner of Red Jacket Road and Mine Street in Calumet, and to slowly turn around to see the various parts of the landscape visible from this spot. Within just a short distance one finds the mine: its railroad roundhouse, machine shop, warehouse, and the stack over by the Superior enginehouse. This was near the heart of the mine, filled once with heavy industry, smoke, noise, rail traffic in and out. Sitting adjacent to this industrial tumult was the C&H library and administration building, plus the Miscowaubic Club, a gathering place for the area's well to do. Also hard by the industrial core of this place sat Calumet's high school and grade school. Look to the east to discover a nest of church steeples only a few blocks away and the head of the village's Fifth Street, its main commercial street. Housing, too, is found only a block from this corner, which seems to have been near the center of everything. The view reinforces a main historical point about this entire region and its mines. On the Keweenaw, life and work, and company and community, were never far apart.

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<sup>1</sup> Schoolcraft, Narrative Journal, 178.

<sup>2</sup> Swineford, History and Review of the Material Resources of the South Shore of Lake Superior, 44-45.

<sup>3</sup> David T. Halkola, Michigan Tech Centennial, 1885-1985 (Houghton, 1985), 3-16, 76, 121.

<sup>4</sup> Lankton, "One Family's Journey," 26.

<sup>5</sup> For historic maps and photos of the smelter and for descriptions and assessments of structures and artifacts, see Patrick Martin and Gianfranco Archimede, "The Quincy Mining Company Smelting Works: 1898: Historic Land Use Survey Project," unpublished report for the Keweenaw National Historical Park (June 2002).

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<sup>6</sup> Painesdale is indeed one of the most historic and best preserved mining communities in the Copper Country. See Irene Jackson Henry, U.S. Department of the Interior, National Register of Historic Places, “Registration Form for Painesdale, Michigan,” (3 Nov. 1992).

<sup>7</sup> U. S. Dept. of the Interior, National Park Service, Keweenaw National Historical Park, Michigan: Final General Management Plan & Environmental Impact Statement (April 1998), 173-79. Maps of the park’s two units are also found in this publication.

APPENDIX  
Area Maps

All maps are located at the MTU Archives and Copper Country Historical Collection.

	Map Drawer
<b>Copper Mining</b>	
Geological Survey – Upper Peninsula (1873)	12(b)
Map of the Copper Range (1898)	6(c)
Lake Superior Copper Region (HAER, 1978)	26(a), 2
<b>Mine Locations</b>	
Copper Range	
Champion Copper Co, Surface Map (1913)	27(u)
Calumet and Hecla	
Calumet and Hecla Mine Location (1917)	61(e), 7
Quincy Mining Company	
Drawing of Quincy Location (1902)	QB001(0165)
Quincy Mine Location Maps (HAER, 1978)	26(a)
<b>Stamp Mills</b>	
C&H Mill, Torch Lake	
Mills along Torch Lake (1923)	61(b), Gen. 1
Osceola, Lake #2, Tamarack and Ahmeek	
Mill Sites (1923)	61(b), C&H26
Quincy Stamp Mill Location 1890-1928 (HAER, 1978)	26(c), 26
<b>Smelters</b>	
Lake Superior Smelting Co.	
Hancock Works	61(b), LSS1
Quincy Smelting Works 1920 (HAER, 1978)	26(c), 29
<b>Transportation</b>	
Rail	
Rand McNally Railroad Investor's Map (1914)	14(m)
Copper Range Railroad (1903)	10(k)
Keweenaw Peninsula – Copper Range Railroad (1913)	41(626)
Water	
Portage Lake and River (1865)	20(o)
Portage Lake and River (1908)	20(n)

## Communities

Calumet	
General Map, Calumet and Vicinity (1924)	103(a)
Calumet and Vicinity (~1911)	8(k)
Hancock	
City of Hancock, Plat Map (1906)	74(a)
Laurium	
Calumet and Vicinity (~1911)	8(k)
Painesdale	
Copper Range Company Lands (Date unknown)	6(a)
Champion Copper Co. Surface Map (1913)	27(u)

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