Miners, managers, and machines : industrial accidents and occupational disease in the Butte underground, 1880-1920
by Brian Lee Shovers

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in History
Montana State University


Abstract:
Between 1880 and 1920 Butte, Montana achieved world-class mining status for its copper production. At the same time, thousands of men succumbed to industrial accidents and contracted occupational disease in the Butte underground, making Butte mining significantly more dangerous than other industrial occupations of that era. Three major factors affected working conditions and worker safety in Butte: new mining technologies, corporate management, and worker attitude.

The introduction of new mining technologies and corporate mine ownership after 1900 combined to create a sometimes dangerous dynamic between the miner and the work place in Butte. While technological advances in hoisting, tramming, lighting and ventilation generally improved underground working conditions, other technological adaptations such as the machine drill, increased the hazard of respiratory disease. In the end, the operational efficiencies associated with the new technologies could not alleviate the difficult problems of managing and supervising a highly independent, transient, and often inexperienced work force.

With the beginning of the twentieth century and the consolidation of most of the major Butte mines under the corporate entity of Amalgamated Copper Company (later the Anaconda Copper Mining Company), conflict between worker and management above ground increased. At issue were wages, conditions, and a corporate reluctance to accept responsibility for occupational hazards. The new atmosphere of mistrust between miners and their supervisors provoked a defiant attitude towards the work place by workers which increased the potential for industrial accidents.

Eforts by organized labor to improve underground conditions in Butte through protective legislation, compensation for work-related accidents and disabilities, and through work stoppages, failed to halt industrial accidents or to effectively alter a recalcitrant disregard held by miners for the dangers of the work place, created over a forty year period in which thousands of Butte miners lost their lives on the job.

This study consists of six chapters: Chapter One is an introduction; Chapter Two offers a profile of the miner's life above and below ground; Chapter Three examines the impact of new mining technologies on the dynamics of the work place; Chapter Four explores the high incidence of accidental fatalities and occupational health hazards in the Butte underground; Chapter Five documents the miners struggle to improve working conditions; and Chapter Six is a conclusion.

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Master of Arts

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History

MONTANA STATE UNIVERSITY
Bozeman, Montana

April 1987

# APPROVAL

of a thesis submitted by

Brian Lee Shovers

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

April 17, 1987
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# ACKNOWLEDGEMENTS

This thesis could not have been completed without the guidance and assistance of three individuals. Paula Petrik, my primary thesis advisor deserves credit for steering me towards my chosen topic and for providing focus to my research and encouragement to me throughout. I am also indebted to Robert Rydell for his insightful criticism and enthusiasm for my topic from the outset. Finally, I would like to thank Teresa Jordan for her helpful critiques of my paper from start to finish.

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# ABSTRACT

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The introduction of new mining technologies and corporate mine ownership after 1900 combined to create a sometimes dangerous dynamic between the miner and the work place in Butte. While technological advances in hoisting, tramming, lighting and ventilation generally improved underground working conditions, other technological adaptations such as the machine drill, increased the hazard of respiratory disease. In the end, the operational efficiencies associated with the new technologies could not alleviate the difficult problems of managing and supervising a highly independent, transient, and often inexperienced work force.

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Efforts by organized labor to improve underground conditions in Butte through protective legislation, compensation for work-related accidents and disabilities, and through work stoppages, failed to halt industrial accidents or to effectively alter a recalcitrant disregard held by miners for the dangers of the work place, created over a forty year period in which thousands of Butte miners lost their lives on the job.

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# Chapter 1

## INTRODUCTION

On May 15, 1917, a coroner's jury convened in Butte, Montana to investigate the accidental death of miner Charles Borlace. Borlace, a thirty-eight-year-old Cornishman from Michigan, died in the Alice Mine when the cage he was riding plummeted two hundred feet to the bottom of the shaft. The bolt connecting the engine brake to the cable drum snapped, and the safety devices designed to catch a runaway cage also failed. During the inquest, the hoist engineer, John Davis, testified that every precaution had been taken to prevent such an accident. Just that morning, the machinist, John Campbell, had inspected the hoisting engine and bolts for defects. When questioned further, however, the engineer revealed that the accident might never have happened had he followed normal practices, brought the cage in the adjacent shaft to a complete stop, and engaged the clutch. Yet, the coroner's jury exonerated both the hoist engineer and the mining company of all blame for Borlace's death, a verdict repeated in virtually every fatal mining accident investigated in the copper mining district of Butte, Montana between 1880 and 1920.[1]

The circumstances surrounding this case and the more than one thousand other fatal mine accidents that occurred during this period were much more complex than this coroner's jury suggested. They raise important questions about the effect of the industrial mining process on the worker. A simplistic analysis of Borlace's death could lead to an indictment

of new mining technologies, for machines--the hoist and safety devices--had failed. But technology cannot be evaluated outside of the social context in which it was used. The hoisting device that failed Charles Borlace was part of a much larger process that encompassed a politically and economically powerful corporation, a pre-industrial immigrant culture, fraternal associations, and labor unions. The conflict in the Butte underground among these various forces and its impact on working conditions is the subject of this study.[2]

My purpose is to focus on the dangers within the Butte underground, a subject thus far only mentioned parenthetically by other mining historians. There are excellent studies of the struggle for corporate control over Butte minerals and on the evolution of organized labor and radical politics in Butte, but none of these attempt to explain the social and economic forces linking life above ground with the dangers below ground. My study poses the hypothesis that the causes of hazardous working conditions and industrial accidents cannot be evaluated without paying attention to technological advances in the mining process, as well as political and economic relationships at work in the community at large. The high number of worker fatalities that occurred in the Butte mines resulted from a complex set of technological, economic, environmental and social circumstances. Interactions between underground miners and managers mirrored the political culture found above ground, often to the detriment of the health and safety of the work force.

Hardrock mining had always been a dangerous occupation, fraught with hazards unimagined by the worker above ground, but between 1880

and 1920 an alarming number of men died in industrial accidents and of occupational diseases in the copper mines of Butte. Butte ranked as one of the most dangerous mining districts in the world, with a fatal accident rate three times higher than traditional mining districts in Cornwall. The danger was directly related to the large scale mining operation developed in Butte in the late nineteenth and early twentieth centuries. The story of large scale copper mining in Butte actually begins before 1883 on the east coast.

The chronology actually starts in1876, thousands of miles from Butte in Philadelphia, with Alexander Graham Bell's demonstration of the telephone at the Centennial Exhibition. Bell's new invention required copper, as did Thomas Edison's incandescent light bulb, patented in 1880. These two technological advances, along with expanded industrial and residential use of electricity, created enormous demand for copper in the last two decades of the nineteenth century.

A set of fortuitous geologic, technologic, and economic circumstances coalesced in Butte to create an industry capable of satisfying this new demand. In 1883 Marcus Daly hoisted his first bucket of copper ore from the Anaconda Mine, which would ultimately become one of the world's richest copper mines. Copper cannot be mined and processed without a substantial investment of capital, which Marcus Daly guaranteed for Butte with the creation of the Hearst, Haggin and Tevis Syndicate in 1882. This venture eventually led to the first integrated copper company in America. In 1881 the Utah and Northern Railroad arrived to carry ore for processing and sale. By 1887, only four years after Marcus Daly began producing ore from his Anaconda Mine, his corporation led the world in copper production.

Smelting and refining proved another major hurdle which Daly handily overcame in 1891 with the construction of the first electrolytic refinery-- it used an electrical process to remove all impurities from copper-- in the West, twenty-six miles from Butte, in Anaconda. William A. Clark and F. Augustus Heinze both owned important Butte mining interests and remained agressive competitors of Daly's. Heinze personally waged an unsuccessful war against consolidation efforts by Amalgamated Copper, a precursor to ACM and the inheritor of Daly's mineral properties. By 1910, New York and Boston investors consolidated the individual entrepreneurial efforts of Daly, Clark and Heinze into a massive corporate enterprise to become known as the Anaconda Copper Mining Company (ACM). The Anaconda Company continued to dominate world copper production for the next thirty years, affecting the interplay between technology and safety within the Butte underground.[3]

The power of mining corporations like the Anaconda Company is not new to historians, but contemporary mining histories have most often focused on details of mining camp life, corporate maneuvering within the industry, descriptions of the machinery and processes necessary to extract metals, and the politics of organized labor without paying adequate attention to the interaction of people and the industrial process. Only a small group of historians, led most recently by Merritt Roe Smith, Ronald C. Brown, and Mark Wyman, have closely examined the impact of technological change on the worker. In Harper's Ferry Armory and the New Technology: The Challenge of Change, Smith explored the impact of worker resistance to technological changes in America's early armaments industry. Brown and

Wyman's books marked a departure from earlier historical studies of the mining West in that they focused more directly on the impact of industrial technologies on miners' lives. Although Brown and Wyman both focused on occupational hazards of the work place, they arrived at very different assessments of technological innovations. In Hard-Rock Miners: The Intermountain West, 1860-1920, which ignores Butte mining, Brown carefully documented the life of the industrial work force and concluded that new mining technologies ultimately made the work place safer and the work more dependable for the worker. Wyman, on the other hand, in Hard Rock Epic: Western Miners and the Industrial Revolution, 1860-1910, indicted both new technologies for creating unforseen hazards underground and mine owners for failing to accept responsibility for company negligence, citing specific examples of unsafe conditions and accidents in Butte associated with new mining techniques. The work of both Brown and Wyman prompted consideration of some broader questions regarding the relationship between new mining technologies and worker safety.[4]

This study of the Butte miner and working conditions draws together several historiographic traditions -- the history of technology, the history of mining in the West, and the history of business and labor. My study of Butte, following Smith's lead, focuses on the workers themselves -- on how particular technological innovations affected them and how they responded to new hazards in the work place. What I contribute in this approach is the use of new source materials, as well as a fresh interpretation of Butte mining. No one has looked at the coroner's inquest prior to my research as a source of information about relationships between miners and supervisors,

about the liabilities inherent in new mining technologies, and about worker habits and attitudes. Evidence of these relationships emerges, in part, from the voices of miners and their supervisors recorded in a sample of over two hundred surviving coroner's inquests. This testimony reveals the complexity of circumstances associated with industrial mine accidents; the corporate domination of workers on the job and within the society at large; and the importance of communication between workers and management. While the inquest provided an unusual opportunity to hear miners talk about their work, the facts regarding management's complicity in fatal mine accidents often remained unspoken because of fear of reprisal. Witnesses to fatal accidents testified in the presence of company supervisors during coroner's inquests, leaving them vulnerable to blacklisting and intimidation for speaking out against company negligence, a very real possibility in a city where a single corporation dominated the mining economy. Coroner's inquests, in short, were hardly "value-free." Nevertheless, they unveil the conditions under which miners labored in Butte during the early part of the twentieth century and illuminate the political and economic hegemony maintained by the Anaconda Company over its employees.

My study builds on two other scholarly studies which focused on the social implications of technological change in the mining industry. In "Immigrant Workers and Industrial Hazards: The Irish Miners of Butte, 1880-1919," historian David Emmons described the extent of industrial hazards for Irish miners in Butte and their collective response through fraternal associations. Emmons concluded that this unified cultural response helped the Irish cope with their hazardous jobs. In "Technological

Advances, Organizational Structure, and Underground Mining Fatalities in the Upper Michigan Copper Mines, 1860-1929," Michigan scholars Larry Lankton and Jack Martin used data documenting the cause of mine accidents in Calumet, Michigan to evaluate the impact of technology on worker safety. They concluded that the extraordinary increase in fatalities during this period was due to industrial expansion and an increase in the size of the work force, and that the larger, more technologically sophisticated operations were generally safer than the more primitive, smaller mines.[5] My data from Butte suggests a different conclusion, however. If the years between 1915 and 1917 are any indication, it showed the smaller Butte mines achieved safer working conditions and a lower fatal accident rate than the larger operations.[6]

Scholarly study of industrial hardrock mining is a relatively recent phenomenon in the historiography of the American West. Although mining has represented a major western industry since the 1860s, historians have typically emphasized the romantic era of the California gold rush or labor violence in Colorado, Idaho and Montana during the early part of the twentieth century. A different approach began to characterize the subject in1950 with historian Vernon Jensen's, Heritage of Conflict: Labor Relations in the Nonferrous Metals Industry Up to 1930. Jensen described conflict between labor and management in the copper and silver industry -- paying particular attention to the evolution and demise of organized labor in Butte -- as a consequence of particular economic, social, political, psychological and geographical forces. According to Jensen, these conflicts over issues of property versus human rights between managers and miners remained

unresolved. Two overviews of the gold and silver mining frontier followed in 1963: The Bonanza West, 1848-1900 by Wiliam Greever, and Mining Frontiers of the Far West, 1848-1880 by Rodman Paul. Greever describes the progressive advance of the mining frontier culminating in the Alaskan gold rush. Paul documents the interrelationship among widely divergent mining frontiers, linked together by elaborate transportation systems and by miners who carried new technologies from place to place and adapted existing methods to new circumstances. Otis Young, Jr. describes the establishment of an American mining tradition in his two books, Western Mining, (1970), and Black Powder and Hand Steel, (1976). In both works, Young offers elaborate descriptions of gold and silver mining techniques, tools, and their origins. Historian Richard Lingenfelter, in his 1974 study, The Hardrock Miners: A History of the Mining Labor Movement in the American West, 1863-1893, argued that militant labor unions were a necessary response to industrial mining and that most labor relations during this period remained peaceful, and that violent labor strife has been exaggerated.[7] The work of these five prominent mining historians provided my departure point for examining the technological and social forces impinging on the Butte miner between 1883 and 1920.

The political and economic forces that affected those working in the Butte mines is the subject of two recent books, The Battle for Butte: Mining and Politics on the Northern Frontier, 1864-1906 by Michael Malone and Copper Mining and Management by Thomas Navin. Malone described the lengthy individual and corporate struggle for dominion over Butte's rich copper mines. He argued that the struggle for control and Anaconda's

hegemony over state economic affairs engendered widespread prejudice against big business and a legacy of public resignation -- attitudes that ultimately affected safety within the Butte underground. Navin's study emphasized corporate management, in an industry intimately tied to high capital investment and continuous technological innovation. Navin provided insight into Anaconda's place in the world market, and the all important relationship between copper mining management and the worker.[8]

During the last ten years a number of western historians have turned their attention to industrial hardrock mining and its occupational hazards, creating a more clear picture of the impact of industrialization on the rural landscape and population. My study of Butte miners is part of this recent historical tradition and, if it helps illuminate an understanding of the impact of industrial technologies and management strategies on the worker and the work place and sheds light on how these changes below ground were reflected in the culture of the community at large, I will have accomplished my goal.

## ENDNOTES

1. Inquest No. 8164," Charles Borlace," 13 May 1917, Office of the Clerk of Court, Butte-Silver Bow County, Butte, Montana, [hereafter repository location will not appear].

2. Edwin T. Layton, ed., Technology and Social Change in America (New York: Harper & Row, Publishers, 1973), 1-8. In his introduction to this collection of essays Layton defines technology as "knowledge at work within a social context." This definition helps the historian view the industrial accidents in Butte in a broader perspective.

3. Michael Malone, The Battle for Butte: Mining and Politics on the Northern Frontier, 1864-1906 (Seattle: University of Washington Press, 1981), 11-57.

4. Ronald C. Brown, Hard-Rock Miners: The Intermountain West, 1860-1920 (College Station: Texas A & M University Press, 1979); Mark Wyman, Hard Rock Epic: Western Miners and the Industrial Revolution, 1860-1910 (Berkeley: University of California Press, 1979).

5. David Emmons, "Immigrant Workers and Industrial Hazards: The Irish Miners of Butte, 1880-1919," Journal of American Ethnic History 5 (Fall 1985); Larry Lankton and Jack K. Martin, "Technological Advance, Organization, Structure, and Underground Mining Fatalities in the Upper Michigan Copper Mines, 1860-1929," Technology and Culture (Forthcoming).

6. The Anode, February 1918, 5.

7. Vernon Jensen, Heritage of Conflict: Labor Relations in the Nonferrous Metals Industry Up to 1930 (Ithaca: Cornell University Press, 1950); William Greever, The Bonanza West, 1848-1900 ( Norman: University of Oklahoma Press, 1963); Rodman Paul, Mining Frontiers of the Far West, 1848-1880 (New York: Holt, Rinehart & Winston, 1963); Otis Young, Jr., Western Mining: An Informal Account of Precious-Metals Prospecting, Placering, Lode Mining, and Milling on the American Frontier From Spanish Times to 1893 (Norman: University of Oklahoma Press, 1970); Black Powder and Hand Steel (Norman: University of Oklahoma Press, 1976); Richard Lingenfelter, The Hardrock Miners: A History of the Mining Labor Movement in the American West, 1863-1893 (Berkeley: University of California Press, 1974).

8. Malone, Battle for Butte; Thomas Navin, Copper Mining and Management (Tucson: University of Arizona Press, 1978).

## Chapter 2

## LIFE ABOVE AND BELOW GROUND ON THE INDUSTRIAL FRONTIER

Beneath a craggy ridge of the continental divide in the sparsely vegetated upper reaches of the Summit Valley located in southwestern Montana, sixty million years of complex geologic phenomena produced one of the world's richest deposits of nonferrous metals--gold, silver, manganese, zinc, and copper. Toward the end of the nineteenth century, miners exposed the mineral wealth beneath the city of Butte, Montana -- a veritable treasure chest of precious and industrial metals. During the last century miners removed nearly five billion pounds of zinc, seven hundred million ounces of silver, and nearly three million ounces of gold from the granite underlying the Butte hill. But copper made the mining district's reputation.[1]

The search for copper brought an industrial way of life to Montana. Thousands of Butte miners, many of them immigrants, lost their lives due to industrial accidents and respiratory diseases contracted working underground in Butte between 1880 and 1920. Men died from falling rock, explosions, hoisting mishaps, fires, and from inhaling the silica dust released from breaking rock with the machine drill. The individual miner became part of a much larger, more complex, and sometimes more dangerous technological process of ore extraction, over which he often exercised little control. To understand fully the impact of new technologies on the Butte

miner and the dynamics that developed between the urban community that rapidly emerged around the mines and the world below ground requires investigation.

From its humble beginnings as a gold and silver camp, Butte grew into a cosmopolitan city equal to its burgeoning new industry, mushrooming from a population of 3,363 in 1880 to 30,470 by 1900.[2] Butte's population increased tenfold during the last two decades of the nineteenth century. Copper mining inspired an urban, industrial character in Butte's architecture that was more reminiscent of San Francisco, Massachusetts or Pennsylvania mill towns than the northern Rockies of Montana. Certainly Butte bore no resemblance to the neighboring agricultural communities of Bozeman and Missoula. In the Glittering Hill, a novel set in Butte during the 1890s, Clyde Murphy aptly portrayed the incongruity of the sprawling mining metropolis set against the backdrop of its pristine mountainous surroundings:

> Then came a cavalcade of memories--of snow crowning the distant Continental Divide; of droves of men at shift-changing time, coming off the hill, now in clusters and again in long thin files; of the incessant clamor of streetcar bells, of the thunder of steel wheels on steel rails; of the screeching of mine whistles; of the sharp clopping of horses' hoofs on the cobblestones; ...[3]

Marching up the flanks of the Butte hill were clusters of workers' cottages, small hip-roofed woodframe houses, built in close proximity to the over three dozen operating mines spread across the hill toward the East Ridge. The miners and their families congregated in ethnic and occupational enclaves close to their work and their fellow countrymen: in Walkerville

(site of Butte's most prosperous silver mines, the Alice and the Lexington); in Centerville, a predominantly Cornish and Irish neighborhood; in Dublin Gulch, adjacent to Marcus Daly's Anaconda Mine; and, in Finntown, Meaderville and McQueen to the east, home to Finns, Italians, Serbians, Croatians, and Butte's major smelters. These neighborhoods were linked to the mines and the commercial district by a street railway as early as 1890.[4] From the intersection of Park and Main, the heart of Butte's commercial district, an observer could clearly view the frenetic economic and social life of this bustling metropolis.

By 1900 Butte was indisputably the economic capital of Montana and the most significant urban center between Minneapolis and Spokane. An imposing architecture of stone, brick, and cast iron replaced the woodframe false fronts of the gold and silver camp. Within view of the busy street corner of Park and Main, the observer could look north up the hill and see mining baron William A. Clark's First National Bank; the Hennessy Building (the elaborately detailed six-story brick department store and headquarters of the Anaconda Company); the Miner's Union Hall (the headquarters of the West's most powerful labor union); and the imposing black steel headframes looming along the hill in the distance. When the mines changed shifts, streetcars, horse-drawn wagons, and miners clogged Main Street going north, making their way to and from work, each man re-entering the above ground world dominated by boarding houses, cafes, saloons, theaters, churches, and a landscape disfigured by the spoils of the city's mining enterprise.

Butte, in 1900, bore the distinctive imprint of both its industrial

economy and its work force. Reports from friends and relatives describing wages unequalled in the mill towns along the Eastern seaboard or in the Michigan copper mines lured European immigrants to Butte by the thousands beginning in 1883. By 1900 over 34 percent of the Butte population was foreign-born, dominated by the Irish, English, and Canadians who comprised approximately 64 percent of the foreign-born population.[5] During the first two decades of the twentieth century, the ethnic makeup of the population remained relatively constant but not static. By 1910 Finns constituted 10 percent of Butte's foreign-born; immigrants from southern and eastern Europe had increased, while Irish and British arrivals had declined.[6]

At the beginning of the twentieth century, Butte was a city of miners; over 60 percent of Butte's adult males worked in the mines. At the same time, thousands of men labored above ground as blacksmiths, ironworkers, boilermakers, carpenters, and smeltermen, in occupations supporting the mining industry and in a wide variety of other businesses that supported Butte's large urban population.[7] In addition, the work force in 1900 included 3,000 women working as teachers, milliners, clerks, laundresses, waitresses, domestics, prostitutes, and boarding house operators.[8]

Butte of 1900 bore little resemblance to the frontier settlement conceived of and described by Frederick Jackson Turner in his all-encompassing frontier thesis presented in1893. The thousands of European immigrants who made their way to Butte, Montana between 1880 and 1910 brought with them European religious and social values.

Traditional ethnic values persisted in the Irish, Cornish, Finnish, and Italian communities through the religious and fraternal institutions that were created in their respective neighborhoods between 1880 and 1910. The industrial urban character of Butte reshaped the values of the second and third generations of these immigrant populations.

These primarily rural European immigrants relied on the church, and fraternal and ethnic organizations and traditions in facing the perils of industrial employment and an unfamiliar urban way of life. Dozens of churches emerged to serve Butte's varied ethnic population: the Catholic church predominated in serving the large Irish and growing Slavic and Italian communities; the Methodists followed with their large Cornish membership; the Scandinavians continued their Lutheran traditions; and the Jewish community supported two synagogues.[10] Dozens of secret societies also formed along ethnic or occupational lines as a means of easing the transition into an industrial environment. In some cases, these organizations fulfilled a function beyond maintaining the ethnic traditions of the homeland. Such was the case with the Ancient Order of Hibernians (AOH), an Irish independence organization first transplanted to America in 1836 and later to Butte. In Butte, the AOH upheld Irish traditions, but more important, it sought work for its members and provided sickness and accident benefits for its over one thousand members, most of whom worked in the mines.[11]

Economic opportunity attracted European immigrants and native-born miners to the increasingly dangerous and unhealthy conditions found in the Butte underground. In 1900 the single working man

predominated in Butte.[12] Clearly, high wages lured many single men west. During the first decade of the twentieth century, laborers in the steel mills of Braddock, Pennsylvania worked twelve hours a day for just over $2 in wages while the Butte miner, regardless of experience, earned $3.50 for eight hours of work.[13] While the cost of living was somewhat higher in Butte, relatively stable employment provided opportunity for both single men and those men with families. If home ownership represented an index of working-class economic opportunity and security, then Butte in fact did offer the immigrant miner part of what promoters had promised. In 1900, over 50 percent of the Irish miners who had lived in Butte for between four and seven years owned their own homes, and by 1910 this percentage was even greater.[14]

Repeatedly, American men and women have journeyed west for economic opportunity. Significantly, by 1900 it was not the promise of gold or fertile land which attracted thousands to southwestern Montana; it was the possibility of a weekly paycheck. Between 1873 and 1900, the United States suffered from periodic economic downturns, and, after the Panic of 1893, silver mining in the West came to a standstill because of the repeal of the Sherman Silver Purchase Act, making good paying jobs in the Butte underground attractive to both the native and immigrant worker. Under these circumstances, the prospect of a guaranteed wage attracted the nations' artisans and mechanics.[15] But balanced against the possibilities presented by this new life in the West were the grim statistics of accidental death underground and the ever-present occupational hazard of miner's

consumption and debilitating respiratory ailments. Along with the promise of a paycheck, new arrivals from the green hills of West County Cork, Ireland, or from the forested Keweenaw Penninsula of northern Michigan encountered a city devoid of vegetation and trees, choked by the sulphur and arsenic-laden smoke emitted from the local smelters and despoiled by mounds of mine waste. Confronted by depressed national economic conditions Butte's high wages and the promise of a relatively independent lifestyle initially overshadowed these industrial and environmental liabilities.

Part of the lure of underground mining derived from the independent nature of the work. Statistics regarding transcience among Butte miners between 1914 and1920 underscore this attitude. During 1914 each job on the Butte hill was held by two and one-half men compared to nine men for each job in 1920, indicating a persistent movement from mine to mine.[16] Dick Matthew, a man who worked a variety of jobs underground in Butte beginning in 1928, described mining as "the most independent laboring job there is." According to Matthew, who came to Butte from a ranch in Choteau, Montana, the miner "designs his own work and there ain't nobody looking down your collar."[17] The miners' independent nature derived partly from the large number of job prospects. An extremely rich and extensive mining district and a growing demand for copper, and later zinc and manganese, created almost unlimited opportunity for the experienced miner. Endless opportunity translated into an occupational independence that often clashed with the complex technological process

engineered by corporate managers, creating unforeseen hazards underground for the worker. By 1900 the Butte miner found his life divided between two very different but connected worlds.

The unflagging energy in the streets of Butte in 1900--the throngs of men and women frequenting the shops along East Park, the clanging streetcars climbing up Main, the newsboys on the corners hawking papers, and the music and chatter drifting out of the cafes and saloons on Main Street-- mimicked the activity day and night in the candle-lit passageways thousands of feet beneath the streets of Butte. While the snow fell and temperatures above ground plummeted to -20 degrees Fahrenheit, the miners, stripped to their waists, prepared for a day of work in a dimly lit stope where temperatures reached 90 degrees Fahrenheit. More than 2,000 feet separated these two worlds: the world above distinguished from the one below by the work performed, the work place itself, and the language spoken.

As early as 1890, miners practiced their trade in more than thirty mines, varying in size from twenty to four hundred employees, dispersed across the Butte hill.[18] Regardless of size, the primary task remained the same: follow the ore vein and get the ore to the surface. The size of the mine did, however, sometimes alter the tools used to accomplish this task. Moving larger volumes of men and ore to and from the surface required the aid of more complex tools and machinery. For example, a small mining operation of twenty to one hundred men might rely on hand drills for breaking the rock and a bucket and small steam hoist for transporting men

and ore to the surface, while a mine employing hundreds of men would probably use machine drills and a system of cages and skips for the movement of men and ore.

While the size and sophistication of the mining operation in Butte varied enormously, the length of the work day did not. The ten-hour day prevailed until 1905 in the mines of the Amalgamated Copper Company, which controlled approximately two-thirds of the working Butte mines, even though the state legislature mandated an eight-hour day in 1901.[19] While the smaller mines like the Tramway and the Belle of Butte worked a single shift, the larger mines like the Mountain Con and the Anaconda operated two and sometimes three shifts, to amortize their larger capital investment. Butte miners worked seven days a week, averaging twenty-seven days a month, and received time off only when the shaft needed repair or the machines maintenance. During the early years, the Parrot was the only mine of any size to give its workers a Sunday holiday.[20]

The workday ordinarily began for miners on the day shift at seven a.m. After donning work clothes in the "dry" or change house, miners gathered around the shaft collar (surface opening) to await transportation in a bucket or cage down the shaft to their assigned level and work station. The bucket, large enough for two or three men to stand, was attached to a manila -- later, wire-- rope, and descended down the shaft by means of a steam-powered engine. This hoisting engine was eventually powered by compressed air and later electricity. The rope ran up over a sheave wheel (pulley) located at the top of the headframe, a four-legged wooden and later

steel structure located over the shaft collar, and was attached to a large cylindrical drum (10 to 20 feet in diameter) located in the hoist house. As the size of the operation expanded, the bucket was ultimately replaced by a cage, a steel conveyance not unlike an elevator car, within which five to seven miners could stand to be hoisted. Eventually skips, large steel boxes capable of holding from seven to ten tons of rock, carried the ore to the surface.[21]

Miners travelling to and from the work station entrusted their safety to the stationary engineer. The engineer raised and lowered the cages and skips guided by either an audible bell system or a visible set of lights linked to a signal apparatus located at every level. There was a station tender at each level (normally every 100 feet) whose job it was to load men and materials and signal its destination to the engineer. In Hardrock Miners, Ronald C. Brown aptly described the miners' sense of helplessness as they descended to the work place:

> As the warning bell sounded, the cage dropped into the dark shaft. The only light came from lanterns affixed to the cage itself and from those passed on the way down. Likened by some miners to being buried alive, the fall produced only muted sounds, the smell of damp ground, and the rush of air; then from the pit of the stomach came the sinking feeling that accompanied the rapid fall.[22]

At an early date miners alerted the territorial legislature to the dangers associated with the bucket and the open cage, such as men falling from these conveyances from dizziness or catching clothing or tools against the shaft walls. As early as 1887, Montana passed a law prohibiting work in

a vertical shaft below the 300-foot level without an iron- bonneted safety cage.[23] By the early part of the twentieth century, engineers improved the iron-bonneted cage by adding one-half inch iron plate on three sides and a four-foot safety gate on the front. Even these safety features did not eliminate hoisting fatalities or the apprehension of miners about dropping as much as 3,000 feet into the earth at a speed of from 500 to 800 feet per minute.

Having arrived at their work level, the miners proceeded from the station (an enlarged area adjacent to the shaft) into the drift (a four- to eight-foot wide horizontal tunnel that followed the orebody), the way lit only by candle or torch. Electric lights appeared in the Walkerville silver mines as early as 1881, but the shafts and drifts in the majority of Butte mines were not lit electrically until the 1890s. Carbide lamps replaced candles for light in the Butte stopes around 1912.[24] Crosscuts, or horizontal tunnels connecting orebodies, intersected the drifts.

The job commenced when the miner reached his assigned work station. Tasks ranged from the most unskilled mucking (shovelling ore or waste into a car or down a chute) and tramming (pushing an ore car down a track to the station for loading) to the highly skilled trade of blasting and timbering. Miners generally worked in pairs following the ore vein either up (an overhead stope) or down (an underhand stope) from the level with hammer and steel and blasting powder. With contract mining, a popular employment system in Butte, the amount of rock removed or broken during a day determined a man's wage. Four men, working as a team on opposite

shifts, performed all these various tasks. The miner removed the ore from the vein by drilling a number of six- to eight-foot-deep holes, one to two inches wide, into the Butte granite. Then he loaded six to twelve holes with dynamite and ignited the charge, bringing down tons of rock in a timed series of blasts. Until the late 1890s, this drilling was done by two men without power tools, one wielding a sledge and the other holding and turning a hand steel, a skill perfected over the centuries in the tin mines of Cornwall and passed on through Cornish immigrants working in the copper mines of Michigan and the silver mines of Nevada.[25] Although the labor-saving machine drill eventually replaced the physically demanding technique of hand-drilling, the primary task of ore removal remained virtually unchanged.

The task of ore removal could not be accomplished without the specialized skills of an industrial work force that included pumpmen (assigned to keeping the work place free of water), mule skinners, and later motormen (charged with delivering the ore car from the drift to the station), shaftmen (employees who timbered the descending shaft), and samplers, surveyors, and geologists (specialists who analyzed the orebody and charted the course of development). The underground operations also relied on a host of men on the surface including topmen (workers responsible for removing the ore cars and men from the cages), sawyers, blacksmiths, machinists, electricians, compressor men, ropemen (men charged with maintaining and replacing the wire rope used for hoisting), and teamsters, later replaced by locomotive men. Still, the majority of men actually

worked underground; there was approximately one man on surface for every four underground. Those working underground took orders from the shift bosses, who might supervise from twenty to sixty men, and the bosses took their lead from the mine foremen and the superintendent on top, and the assistant foremen working underground.

The Butte miner may have been less closely supervised than his contemporaries toiling in a Pennsylvania steel mill, but the labor was neither any less demanding, nor were the conditions any less trying. For eight to ten hours a day, the men hired to bring the copper ore to the surface performed physically exhausting labor in a confined environment, a world unto itself. The miner typically spent his entire day or night in perpetual underground darkness, laboring in a stope or raise just high enough for a man to stand erect at temperatures as high as 107 degrees Fahrenheit at 100 percent humidity. At the 3800-foot level of the Stewart Mine, not only did the air temperatures reach these extremes, but also the water pumped from the stopes there reached 113 degrees Fahrenheit.[26]

Where the work place was not hot and humid, another potentially more hazardous condition persisted: dusty air. The silica dust that filled the air from the machine drill posed an unseen danger to the miner: miners' consumption or silicosis, an often fatal lung disease. Until 1916 miners drilled practically all stopes without wetting the surface, creating an epidemic of respiratory diseases underground unmatched in any other industry.[27] John Gillie, general superintendent of Amalgamated Copper Company, testified before a federal industrial relations commission in 1914

that dust was an inherent, unavoidable aspect of mining. In a single year, according to Gillie, miners detonated over four million pounds of powder in the Butte underground, filling poorly ventilated stopes with deadly granite dust.[28] The introduction of wet drilling districtwide by 1925 eventually improved the dust problem, but failed to eliminate the deadly hazard.

Just as the heat and dust readily diminished the strength of even a young man working underground, so did an atmosphere laden with the smells of human and animal excrement, powder, sweat, and rotting food. Hundreds of men shared their workspace with the mules enlisted to pull ore cars to the station. Not until 1923 did ACM completely replace the mule with electric locomotives.[29] Toilet cars did not make widespread appearance in the Butte district until after 1916, forcing the miners to relieve themselves wherever convenient and creating an unsanitary and fertile environment for disease and vermine.

Life underground did not accommodate those weak of heart or mind. Even the young and physically robust could barely endure the heat, bad air, noise, darkness, and strenuous work of the underground. In 1915 Jacob Oliver, an experienced miner of thirty-five years and the Deputy State Mine Inspector between 1890 and 1892, testified before the Commons Commission on Industrial Relations that the average life of a miner under contemporary conditions was sixteen years.[30] At $3.50 a day, the wages of a Butte miner were high, in fact almost twice that paid Michigan copper miners.[31] Yet the high wages did not compensate for a work life cut short by a disabling injury, a fatal industrial accident, or the crippling disease of

miners' consumption. The throngs of European immigrants who made their way to Butte to work in its copper mines found a perilous work environment, inhabited by unfamiliar machines, routines, and unforeseen hazards.

## ENDNOTES

1. Henry McClernan, "Sixty Million Years of History: The Formation of Butte Copper," The Speculator: A Journal of Butte and Southwest Montana History 1 (Summer 1984),16. These figures are in 1984 dollars.

2. Abstract of the 12th Census of the U. S., 1900 (Washington: Government Printing Office, 1903), 100. The population figure for Silver Bow County is 47, 635, and the city of Butte dominates the county.

3. Clyde P. Murphy, The Glittering Hill (New York: World Publishing Co., 1944), 19.

4. Rex Myers, "The Butte Rail Connection: Mining and Transportation, 1880-1980," The Speculator: A Journal of Butte and Southwest Montana History 1(Summer 1984): 32-33.

5. Abstract of the 12th Census of the U. S., 106.

6. Abstract of the 13th Census of the U.S., (Washington: Government Printing Office, 1913), 212.

7. Abstract of the 12th Census of the U.S., Special Report (Washington: Government Printing Office, 1904), 432.

8. Mary Murphy, "Women's Work in a Man's World," The Speculator: A Journal of Butte and Southwest Montana History 1 (Winter 1984): 19. According to Murphy, twenty-two percent of Butte's 13,000 women worked as wage earners.

9. Dale Martin and Brian Shovers, "Butte, Montana: An Architectural and Historical Inventory of the National Landmark District," an unpublished report, Butte Historical Society, 1986, 31-53.

10. Ibid.

11. Dave Emmons, "Immigrant Workers and Industrial Hazards: The Irish Miners of Butte, 1880-1919," Journal of American Ethnic History 5 (Fall 1985): 45-47.

12. Abstract of the 12th Census, 131. Abstract of the 13th Census, 166. In 1900 only 31.7 percent of the Butte men were married. This number increased to 43.7 percent by 1910.

14. Emmons, "Immigrant Workers and Industrial Hazards," 58. This figure on home ownership is extracted from the manuscript censuses of 1900 and 1910. It is derived from a sample of 193 Irish miners and it includes only those with children, excluding those who are single or childless.

15. George Brown Tindall, America: A Narrative History (New York: W.W. Norton, 1984), 700-702; 763. Tindall provides an overview of the periodic economic depressions in America between 1873 and 1893.

16. Paul F. Brissenden, "The Butte Miners and the Rustling Card," American Economic Review (December 1920): 770.

17. Dick Matthew, interview with author, Butte, Montana, 24 January 1986.

18. Annual Report of Inspector of Mines,State of Montana, 1890 (Helena: Independent Publishing Co., 1890), 17.

19. U.S. Commission on Industrial Relations, Mining Conditions and Industrial Relations at Butte, Montana, Senate Document 415, 64th Congress, 1st Session, 1915, Final Report & Testimony, Vol. IV, 3853. [Hereafter cited as "Commons Commission Report."]

20. Annual Report of Inspector of Mines,State of Montana, 1889 (Helena: Independent Publishing Co., 1889), 99. [Hereafter cited as Mine Inspector Report, 1889.]

21. Brian Shovers, "The Emergence of a World-Class Mining District: A Survey of the Evolution of Butte Mining and Its Mineyards," unpublished report, Butte Historical Society, 1984, 7-12.

22. Ronald C. Brown, Hard-Rock Miners: The Intermountain West, 1860-1920 (College Station, Texas: Texas A&M University Press, 1979), 67. For more information on the perils of hoisting men, see 92-102 in Mark Wyman's Hard-Rock Epic: Western Miners and the Industrial Revolution, 1860-1910 (Berkeley: University of California Press, 1979).

23. Mine Inspector Report, 1889, 96.

24. Wyman, Hard-Rock Epic, 103, for information on electrification of Butte mines. Dating of the introduction of the carbide lamp from interview with Ed Shea, interview with author, Butte, Montana, 23 January 1986.

25. Shovers, "Butte Mining," 13. The exact date that the machine drill arrived in the Butte district is undocumented, but the Annual Report of the Inspector of Mines, State of Montana, 1897 (Helena: Independent Publishing Co., 1897) mentions the use of Ingersoll-Sergeant drills at the Mountain Con Mine.

26. G.S. Rice & R.R. Sayers, "Review of Safety & Health Conditions in the Mines at Butte," U.S. Bureau of Mines Bulletin 257 (Washington: Government Printing Office, 1925), 15.

27. Ibid., 12.

28. "Commons Commission Report," 3950.

29. William B. Daly, et. al., "Mining Methods in the Butte District," Transactions of American Institute of Mining Engineers, Vol. LXXII, 1925 (New York: AIME, 1926), 244-87.

30. "Commons Commission Report," 3916.

31. Mine Inspector Report 1889, 112.

## Chapter 3

## NEW TECHNOLOGIES AND THE DYNAMICS OF THE WORK PLACE

In the early part of the twentieth century, the U.S. Department of Labor considered mining a very dangerous occupation, and for good reason. The fatality rate for an American metal miner in 1908 was almost three times greater than that of a combat soldier.[1] On June 20, 1909, the Butte Miner reported the following gruesome incident, a tragedy that underscored the labor department's statistics:

> Hapis Sirois, a topman at the Moonlight mine, better known as Joe King, met a horrible death by being hoisted up into the sheaves at the mine yesterday morning. Sirois was hurled from the cage almost as soon as it came in contact with the sheave wheel and fell a distance of 1550 feet to the sump. The body was reduced to a mass of bones protruding from the torn and bleeding flesh. It was unrecognizable.

That very same year, forty-four other miners, many of them foreign-born like Sirois, lost their lives beneath the Butte hill. In this case, like numerous other accidents that occurred during this era in Butte, the unfortunate French-Canadian miner had no control over his own fate; a machine caused his death, a machine improperly operated by an apprentice hoist engineer. A variety of circumstances, ranging from the instability of local orebodies to the use of complex new mining technologies to a reliance on an untrained and fiercely independent work force, made the Butte mining district more dangerous than its European counterparts, particularly during the early part of the twentieth century.

The widespread use of more complex machinery in the Butte

underground by 1890 created a new, sometimes dangerous dynamic within the work place. Beginning in 1890 the entire mining operation became larger, more complex, and infinitely more difficult to supervise. During a time when technological change required a highly trained and carefully supervised work force, large numbers of untrained, rural European immigrants peopled the Butte underground. A horrific loss of life, unparalleled in American industrial history, marred the transition from small-scale traditional hardrock mining to large-scale industrial mining in Butte.

Between 1860 and 1910, the invention and application of new mining technologies revolutionized hardrock mining in the American West. Machines replaced hand labor in drilling, hoisting, and tramming, allowing miners to reach depths and production levels previously out of reach. The introduction of electricity to the underground permitted another surge in productivity, as well as improved the miner's work environment through better lighting and ventilation.[2] As mining historian Mark Wyman points out in Hard-Rock Epic, however, the new breed of mining machinery also contributed to an alarming increase in underground fatalities. Corporate industrialists, often geographically removed from the tragedies regularly occurring on their properties, took little time to weigh the human impact of new technologies.[3]

The transition from hand drill to machine drill happened over a fifteen-year period. Trial and error eventually produced a tool light enough to be operated by a single man and durable enough to withstand the rigors of the underground. It did not take mine managers long to recognize the productive advantages of the superhuman machine drill. At the Quincy Mine

in Michigan, the Rand drill enabled 50 percent fewer miners to produce 50 percent more copper. By 1895 the Leyner, and Ingersoll & Rand machine drills prevailed on the Butte hill, almost completely replacing the hand sledge and steel. Somewhat earlier, dynamite replaced black powder, again increasing the miner's productive capabilities with its superior ground-breaking attributes.[4]

While mine superintendents tallied up mounting dividends, the Butte obituaries recorded the legacy of this new machine technology. The machine drill filled the unventilated stopes with silica dust. Inhaled by miners, these sharp-edged dust particles scarred the lungs of unsuspecting workers, creating an epidemic of tuberculosis and respiratory disease among miners. A significant number of Butte miners between the ages of twenty-five and forty-four filled the local cemeteries, and between the years 1907 and 1914, over 50 percent of the miners who died within that age group succumbed to a respiratory disease.[5]

A national public outcry ultimately prompted a technological solution to this devastating health hazard, but thousands of Butte miners died before mine owners introduced wet drilling and mechanical ventilation systems to abate the dust. By 1914, ACM installed 150 Ram water drills, a drill that had proved successful in Arizona mines in reducing the dust level, and by 1925 all the company mines had converted to wet drilling.[6] In February of 1918, ACM organized the first ventilation and hygiene department in the copper industry, and the department supervised the installation of eighteen reversible surface fans and an additional one thousand auxiliary fans underground as well as forty miles of flexible air ducts to carry fresh air into the drifts and stopes.[7] While improved drilling and ventilating technologies