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Brigham Young University - Provo

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The Development of the Smelting Industry in the
Central Salt Lake Valley Communities of
Midvale, Murray, and Sandy
Prior to 1900

A Thesis
Presented to the
Department of History
Brigham Young University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Charles E. Hughes
August 1990

This thesis, by Charles E. Hughes is accepted in its present form by the Department of History of Brigham Young University as satisfying the thesis requirement for the degree of Master of Arts.

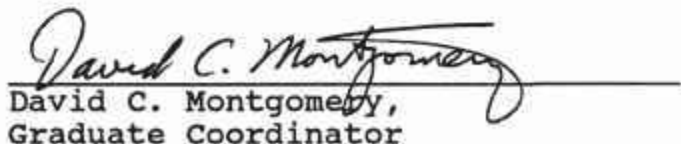


G. Wesley Johnson,
Committee Chairman



Thomas G. Alexander,
Committee Member

10 July 90
Date



David C. Montgomery,
Graduate Coordinator

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Chapter I

Introduction

Frederick Jackson Turner prefaced his classic essay, "The Significance of the Frontier in American History," by stating that the mining booms of the West opened isolated pockets of territory, that they were an explosive force, which left no region the same after the miners had been through.¹ Utah was unique in the fact that it did not follow Turner's thesis. The surrounding western territories and states were all opened first by mining men who were soon followed by farmers, manufacturers, ranchers, and town builders. The situation in Utah was the opposite--it was the farmers and town builders who arrived first, followed by the miners who came into already established communities. All the required elements for successful mining were in place: food, livestock for transportation purposes, simple manufacturing, and a readily available work-force (however unwilling they were at first.)

The emergence of Utah as a leader in the mining and ore processing industry during the twentieth century had its roots in the late 1800s. Many factors played a part in

¹Rodman W. Paul, Mining Frontiers of the Far West 1848-1880 (New York: Holt, Rinehart and Winston, 1963), 2.

developing what became by the 1920s the largest smelting center in North America. The central location, railroad access, and readily available water supply turned the Salt Lake Valley and surrounding communities, into the logical center for mineral processing in the Rocky Mountain region.

When the Mormons arrived in the valley in 1847, Brigham Young, the Mormon leader stressed the importance of developing agriculture and manufacturing. His goal was to enable the Saints to become self-sufficient and to live in relative isolation, away from the persecution the Mormons had experienced earlier in their history.² His plan would have worked, if it had not been for the discovery in 1849 of gold in California, ironically by Mormons. The ensuing gold rush of 1849 brought to the West thousands of men, women, and children intent on carving out a new life in the Western United States. The isolation that Brigham Young had wanted so desperately was soon to be shattered forever. The city soon became a hub for wagon trains of pioneer settlers headed for a new life in California.

The Civil War did not go unnoticed in Utah.³ Salt Lake City was strategically located, a crossroads for the transportation of mail and supplies. The Union army, in

²The Union Vedette, (Salt Lake City), January 1, 1864.

³For a more detailed study of the effects of the Civil War in Utah see E.B. Long, The Saints and the Union: Utah Territory during the Civil War, (Urbana, Illinois: University of Illinois Press, 1981).

Washington D.C., decided to station Federal troops in Salt Lake City to guard and maintain the safety of this important shipping corridor.⁴ Colonel Patrick Edward Connor was sent from California with his volunteer troops to establish a fort and protect the overland mail from Indians and other disruptions in service.

The story of how precious metal mining and ore processing began in Utah is first a story of these two men: Brigham Young and Colonel Connor. Brigham Young, the strong leader of The Church of Jesus Christ of Latter-day Saints (Mormons), was also a powerful civil and religious figure. On the other hand, Colonel Connor was a strong willed soldier of fortune, who arrived in Utah determined to end Mormon domination in the west.⁵ It was the onset of the Civil War and the arrival of Federal troops in Utah which set the stage for the future of mining in the state.

The investment capital needed for the establishment of Utah's mining and smelting industry was largely financed with outside money and foreign expertise. Brigham Young's antagonism towards the mining of precious metals largely excluded the Mormons from reaping the economic benefits and

⁴William Fox, "Patrick Edward Connor "Father" of Utah Mining" (Master's Thesis, Brigham Young University, 1966), 18-19.

⁵Ibid., 51.

capital gains that would soon be made by these outside investors.⁶

Even though gold and silver were first discovered in the early 1860s, the growth of the mining and smelting industry did not occur until the arrival of the transcontinental railroad in 1869. Before the arrival of the railroad, it was too difficult and expensive to transport the ore from the remote mines high in the mountains to the ore processing plants in the East and in Europe. By using the newly constructed railroads, the ore could be transported economically from the mines to centrally located smelting and refining plants.

The majority of the smelters built in the Salt Lake Valley were located along the Jordan River because of the adequate water supply essential for the smelting process. This location provided easy access to the mines by using narrow gauge railroads which conveniently transported the ore to the larger railhead of the Utah Southern.

The story of the development of this ore-processing industry was one of initial frustration and early failure. The search for gold was relatively easy and placer mining provided a simple way to recover the gold. Gold ore is normally found in veins or nuggets of pure ore, whereas silver and other precious metals are usually found in

⁶E. B. Long, The Saints and the Union: Utah Territory during the Civil War (Urbana: University of Illinois Press, 1981), 202.

conjunction with other minerals requiring a more complex method of extraction. The old Mexican saying that "it took a gold mine to find a silver mine" was true. The more complex methods required for silver extraction were generally unknown to the average western prospector. He had not acquired the skills necessary to locate and profitably extract silver and lead from the ore. Thus early attempts in the 1860s at silver mining were doomed to failure because the western hard-rock miner did not have the skill, the understanding, or the money needed for this more complex refining process. Prior to 1870 there were no profitable mining operations in Utah with the exception of some small placer mines in Bingham Canyon. It was not until (late 1870s) the European trained Mining Engineers (M.E.) arrived to assume the leadership and daily operation of the gold and silver mines that the western hard-rock mining industry turned the corner and started to bring in dazzling profits.⁷

The story of smelting and mining in Utah is the story of four distinct groups: the Mormon Church (and more specifically Brigham Young), the United States Army, local prospectors, and finally eastern and foreign financial interests whose capital and development funds were

⁷For a more detailed study of the role that Mining Engineers played in the development of the mining and smelting industry in the West see, Clark C. Spence, Mining Engineers and the American West: The Lace-Boot Brigade, 1849-1933 (New Haven: Yale University Press, 1970).

essential. During the early period (1860-1870), these four groups were at odds with each other, but by the 1880s the reality of what was at stake created a new attitude on the part of the Mormons and much of their earlier hostility disappeared.

Once the transcontinental railroad arrived in 1869 and increasingly more non-Mormons moved into Utah to pursue the vast riches that the Utah Mountains held, the Mormons recognized they could no longer remain isolated from the rest of the world. Brigham Young soon realized that great profits could be made by the Mormons providing supplies and labor for the mines opening in the surrounding mountains. Eventually, even the Mormons felt the silver fever, and it was noticed by Rossiter Raymond, a noted mining engineer of the nineteenth century, when he remarked that they "were locating and prospecting ledges with truly gentile zeal." The Mining and Scientific Press reported that "the country is covered with nomadic bands and parties of prospectors." Unfortunately for the Mormons, this newfound zeal came too late. By the early 1870s this lucrative industry was firmly in the hands of the gentiles.⁶ However, a few Mormons participated in the profits the mining industry provided.

Most of the previous studies about Utah ore production have focused on the glamorous mining industry, leaving the story of smelting relatively untouched. Most of the

⁶Paul, Mining Frontiers of the Far West, 151.

material on smelting is located only as footnotes in many of the more detailed mining histories. Noted historians such as Leonard Arrington, Clark Spence, Turrentine Jackson, and Thomas Alexander have only briefly mentioned this important industry. The history of smelting in other states has been examined, most notably by James E. Fell, Jr. His book, Ores to Metals: The Rocky Mountain Smelting Industry, is an excellent study of smelting in the state of Colorado.

Much of the material in this study dealing with specific Salt Lake Valley smelters was found in newspapers, both mining newspapers and the more general weekly papers of the day. Contemporary mining journals also discussed the smelting industry in Utah during this period. The Salt Lake County Recorder's Office provided specific locations for many of the smelters in Salt Lake County. The conflict between Brigham Young and Colonel Connor is documented in a number of sources, including Brigham Young's and Patrick Connor's own papers.

The Bancroft Library has in its collection of Early Americana the corporate records of all the companies that were incorporated in London to do business in Utah. These records provided information on the early history of about one third of the smelters operating in Salt Lake County. After the 1900s, where this study leaves off, most of the companies that had amalgamated from former smelter companies are still in operation, although not necessarily in Utah.

The difficulty in finding company records is compounded by the fact that prior to 1870 no general incorporation laws existed in Utah, and in fact, it was illegal to incorporate within the Territory. Furthermore, the anti-mining feeling in Utah prior to the mid 1870s created an atmosphere in which companies chose to incorporate outside of the territory. Hence, none of these records were available.

The story of the smelting industry can be divided up into three separate phases or periods. This study will concentrate on the first two of these developmental phases. During the early 1870s the smelting industry in Utah and specifically Salt Lake County, went through a growing or experimental stage. The technology was new and relatively unknown to the men who began smelting, and as a result, the industry failed to run profitably. Many of these early companies could not compete and went out of business.

The companies that survived did so by incorporating newer, more technologically advanced processes. Starting during the late 1870s, the second phase began. This period lasted up until the turn of the century, when the depression of the 1890s caused the smelting companies to merge and form large organizations in order to combat the ravages of the ensuing financial panic. This thesis will stop at the point when the smelting industry was firmly in the hands of the Guggenheim and Rockefeller families.

Chapter II

Conflict and Opposition: The Mormons and the United States Army

When Abraham Lincoln said, "Utah will yet become the treasure-house of the nation,"⁹ little did he know that his prophetic utterance would one day come true when the Kennecott Company built the largest open pit copper mine (Bingham Canyon) in North America. He could not know that by World War II, Utah would provide nearly one-third of the copper for a nation at war.¹⁰

The era of modern precious metal mining began in Salt Lake County in 1863 when silver ore was discovered in Bingham Canyon.¹¹ Soon after the first pioneers arrived in the Salt Lake valley, Brigham Young called men to explore the southern part of the Utah Territory and search for mineral deposits that might prove useful to the oncoming Mormon pioneers, specifically coal and iron. In 1849, the California gold rush created a dilemma for Brigham Young.

⁹ Edward Tullidge, History of Salt Lake City (Salt Lake City, 1886), 697.

¹⁰ Leonard J. Arrington, "Abundance from the Earth: The Beginnings of Commercial Mining in Utah," Utah Historical Quarterly, XXXI (Summer, 1963), 195.

¹¹ Ibid., 199.

He did not want the newly arriving pioneers to leave for the gold fields of California and abandon his colonization efforts. However, he also recognized the need for hard currency to develop an economically stable society. Finally, bowing to this need for hard currency, he called and sent fifty men to California to search for gold, hoping that they would return with some gold to meet the growing needs of the pioneers.¹²

As the Civil War intensified in the East, Brigham Young hoped that the Mormons' relative isolation in the Rocky Mountains would enable them to escape the strife and conflict affecting much of the nation. Abraham Lincoln also wanted to keep the Mormons out of the conflict and isolate them in the western mountains where they would not become a problem for him or the Union cause. In 1862, he told T. B. H. Stenhouse, a journalist, that he intended to leave the Mormons alone:

Stenhouse, when I was a boy on the farm in Illinois there was a great deal of timber on the farms which we had to clear away. Occasionally we would come to a log which had fallen down. It was too hard to split, too wet to burn, and too heavy to move, so we plowed around it. That's what I intend to do with the Mormons. You go back and tell Brigham Young that if he will let me alone I will let him alone.¹³

¹²For a more detailed study of the Mormon men sent to California to search for gold see Kenneth J. Davies, Mormon Gold: The Story of California's Mormon Argonauts (Salt Lake City: Olympus Publishing Company, 1984).

¹³Leonard J. Arrington, Brigham Young: American Moses (Urbana, Illinois: University of Illinois Press, 1986), 295.

This hands-off policy would have worked if it had not been for the efforts of Colonel Patrick Edward Connor. It was primarily due to the efforts of Colonel Connor that the Utah mining industry followed the course of development that it did. The mining of precious metals (gold, silver, copper, and lead) began in the Utah Territory primarily due to the efforts and encouragement of Colonel Connor and his federal troops stationed in Utah during the Civil War years.

Colonel Patrick Edward Connor

Colonel Patrick E. Connor called the father of Utah Mining by many, arrived in Utah, leading 750 California volunteers to keep the peace, protect the overland mail route, and to "keep an eye on Brigham."¹⁴ Because Abraham Lincoln was unsure about the Mormon position on the war, he felt they might take this opportunity to declare themselves independent and create their own separate commonwealth.¹⁵

Before coming to Utah, Connor served in the army during the Mexican War and was honorably discharged. After the Mexican War he returned to California where he made his home in the community of Stockton. He held several offices of public trust such as postmaster, secretary of the state

¹⁴Arrington, "Abundance From the Earth," 194.

¹⁵Ibid.

fair, and treasurer of the San Joaquin Agricultural Society.¹⁶

After the commencement of hostilities in the East, Governor John G. Downey of California called for volunteers to represent the state of California and Patrick Connor offered his services on August 23, 1861.¹⁷ On July 5, 1862, General George Wright issued orders for Connor to move with his regiment to the vicinity of Salt Lake City.

Orson F. Whitney, in his history of Utah, states that the orders to move Connor's regiment to Salt Lake City proved to be disappointing and a matter of chagrin to Connor and his men. They had volunteered to fight the rebels and not to guard the mail or watch over Mormons. While Connor's duties were to include protecting the mail routes and to keep the Indians in check, the real reason was to "watch and overawe the Mormon people" whose loyalty the Secretary of War doubted.¹⁸ In the diary of private Hiram Sinclair Tuttle, he stated the general feeling of disappointment in their being stationed in Utah and not going further east to take part in the fighting was very strong.¹⁹

¹⁶Fox, "Patrick Edward Connor "Father" of Utah Mining," 7.

¹⁷Ibid., 8.

¹⁸Orson F. Whitney, History of Utah, II (Salt Lake City: George Q. Cannon and Sons Co., 1893), 73.

¹⁹Hiram Sinclair Tuttle Personal Diary, Typed manuscript, Special Collections Bancroft Library, University of California, Berkeley.

These negative feelings experienced by Colonel Connor and his men were expressed in a letter written by Connor and addressed to Major-General Henry W. Halleck dated September 24, 1862. In this letter Connor asked Halleck to allow his men to travel to Panama and then make their way to the East to fight the rebels. He mentioned that his men were willing to forego the pay that was owed them in order to pay the transportation costs, and if this sum was not enough, they were willing to pay, out of their own pockets, any further expenses.²⁰ It seems clear that Connor and his men resented the duty which they had been assigned.

Connor felt strongly that one of his major, unspoken responsibilities was to reduce the Mormon strength in Utah. His feelings concerning the Mormons were no secret. To him:

. . . Mormonism as preached and practiced in this Territory is not only subversive of morals, in conflict with the civilization of the present age, and oppressive on the people, but also deeply and boldly in contravention of the laws and best interests of the Nation. . .²¹

Connor felt that there were two ways to "arrest its progress and prevent its spread." One was to act under the authority martial law provided by "punishing with a strong hand every infraction of law or loyalty." The other (which was soon divined by Brigham Young) was to flood the territory with as

²⁰War of the Rebellion, Official Records of the Union and Confederate Armies (Washington, D.C.: Government Printing Office, 1880-1900), ser. I, vol. L, pt. 2., 137.

²¹*Ibid.*, 655-56.

many prospectors and gold miners as possible, therefore diluting the Mormon strength and influence.²²

It is to Connor's credit that he realized the first course of action was impractical. He elected to pursue the later course and in a letter to his superiors in San Francisco, Connor spelled out his plan in detail. He reported that he felt certain the only way to peacefully dilute the Mormon population and reduce their strength was to import as many non-Mormons as possible through gold and silver mining. He reported that the "immigration to the Territory of a hardy, industrious, and enterprising population as could not but result in the happiest effects," namely the reduction of Mormon power and population. The presence of these outsiders "would tend to disabuse the mind of the latter [Mormons] of the false, frivolous, yet dangerous and constant teachings of their leaders, that the Government is their enemy and persecutor."²³

Writing to his superiors in San Francisco he reported that he had given his officers great latitude in allowing the men to prospect and fully explore the surrounding mountains in order that his plan could be accomplished. He stated that he felt that the Mormon question could now finally be settled by peaceful means without the expenditure of additional funds or the loss of life. He felt that now

²²Ibid.

²³Ibid.

"the dawn is breaking on this deluded people, even though their elders and bishops, and chief priests may escape the personal punishment their sins against law and crimes against humanity and the Government so richly merit."²⁴

On December 4th 1865, the Union Vedette²⁵ reported that, "The city is filled with strange faces. There is a continued incoming and outgoing of miners to and from the bannock region. . . Many, we learn, propose resting here till the spring opens, but with ready hands are preparing to prospect the gulches in this vicinity and further south." Connor's plan was working, the Territory was becoming well known around the West as a great resource of precious metals. For Brigham Young, the isolation that he sought was gone, due in large part to Patrick E. Connor and the United States Army.

Brigham Young, the Mormon Prophet

The discovery of gold in California was a difficult time for Brigham Young. His small band of pioneers were desperately trying to eke out an existence in the Salt Lake Valley when word reached them that gold was discovered only a short distance (700 miles) away. This distraction from the difficult task of establishing a home in the wilderness

²⁴Ibid., 657.

²⁵For a detailed history of the Union Vedette see Lyman C. Pedersen, Jr., "The Union Vedette: A Military Voice on the Mormon Frontier," Utah Historical Quarterly, 42 (Winter, 1974), 40-47.

was something Brigham Young did not want to happen; however, he soon realized he was powerless to stop it.

Brigham Young's negative attitude towards what the mining of precious metals would bring to his people had not changed—the outside influence and the detraction from the goals he had established. Several gold miners while traveling through Salt Lake City en route to California stopped in Salt Lake City and took advantage of Mormon hospitality during the winter and even married some of the Mormon girls. Even though some of these prospectors stayed in Utah, many more of them abandoned their young wives in the spring to continue on to the gold fields of California. This and other events caused Brigham Young to say as early as October 1848, that he hoped the gold miners would "be no nearer than eight hundred miles. If you elders of Israel want to go to the gold mines, go and be damned. If you go I would not give a picayune to keep you from damnation."²⁶ Brigham Young repeatedly promised the Saints that if they would stay in Utah they would obtain more riches at home than in the California gold fields.²⁷

The arrival of Connor and his troops into the Salt Lake Valley was looked upon as a slap in the face by Brigham Young and the Mormon community. The following statement

²⁶Robert G. Raymer, "Early Mining in Utah," Pacific Historical Review VIII (1939): 82.

²⁷Ibid.

made by Brigham Young sums up Mormon sentiment on the stationing of federal troops in the valley:

Now, right in time of war there could not be a greater insult offered, nor could one of a higher character than the Government have already offered to this corporation by locating that army within the limits of the corporation without asking leave.²⁸

These feelings of hostility felt by Brigham Young were very natural from someone who came to the Utah Territory expressly to escape from a government that had repeatedly failed to protect the Mormon people in the past, and now appeared to be on the brink of causing them even more affliction. The whole purpose of the Mormon migration had been to escape outside persecution and live in relative isolation.

Brigham Young felt that if God wanted the Mormons to have gold he would provide it for them. He said, "If he [God] makes us rich, he will make us rich in the same way that he became rich, by faithful labor, ceaseless perseverance and constant exertion and industry."²⁹ The Mormon priorities, and those of Brigham Young, were such that they did not want to acquire gold or silver, but instead they wanted to establish a community, build a temple, and finish the new tabernacle. Brigham Young only wanted to:

²⁸Journal History of the Church of Jesus Christ of Latter-day Saints, October 30, 1862, 1-2.

²⁹Ibid.

send the gospel to the nations, gather home the poor... We want riches but we do not want them in the shape of gold... It is a fearful deception which all the world labors under, and many of this people too, who profess to be not of the world, that gold is wealth... Should this feeling become universal on the discovery of gold mines in our immediate vicinity, nakedness, starvation, utter destruction and annihilation would be the inevitable lot of this people. Instead of its bringing to us wealth and independence, it would weld upon our necks chains of slavery, groveling dependence and utter overthrow.³⁰

Brigham Young felt that gold and silver were the last things which should be sought by Mormons. To him, an abundance of wheat and flour, wine, oil, fruit, cheese, silk, cotton, flax, vegetables, and the products from herds of cows and sheep were the main priorities in the valley. "The colossal wealth of the World is founded upon and sustained by the common staples of Life . . . It behooves us, brethren and sisters, to live near God and honor our profession, rather than to become insane after gold and paper money."³¹

By the beginning of 1864, Brigham Young saw that his plans for isolation in the West were coming to nought. The January 1, 1864, issue of the Union Vedette reported that, "The work is going bravely on and Brigham is too wise to check the onward movement . . . The opening of the mines

³⁰Ibid., 266-71.

³¹Arrington, "Abundance from the Earth," 201-2.

will now enrich and not impoverish or destroy [the Mormons].³²

The fact that Brigham Young disapproved of the army and all they were doing, prevented the Mormons from getting an early foothold on what became Utah's largest industry. The Mormons were in a perfect position to take advantage of the mineral resources waiting to be extracted in the mountains surrounding Salt Lake City, but by the time they realized the tremendous potential around them, the industry was already controlled by the more profit-minded gentiles from the East and overseas. However, many Mormons acquired vast fortunes in the mining industry. For the most part, though, the Mormons did not take full advantage of the vast mineral resources in the surrounding Mountains.

³²The Union Vedette (Salt Lake City), January 1, 1864.

Chapter III

The Beginnings of the Mining and Smelting Industry

The claim of who located the first silver and gold claims in the Salt Lake Valley is not clear. As early as 1848-49, the Mormon settlers Thomas and Sanford Bingham found outcroppings of silver ore in Bingham Canyon where they grazed their livestock. The brothers located many good finds but, after taking their samples to Brigham Young, were discouraged by him from following up on their claims. Apparently they covered up their finds with the intention of returning later to develop them, but never did. No effort was made to follow up on these claims until the Union army arrived under the command of Colonel Patrick E. Connor in 1863.

Regardless of who made the first discovery in Utah, the man responsible for the beginnings of the industry was Colonel Connor. As soon as the first discovery in Bingham Canyon was made, Connor and twenty-five others quickly located the claim as the Jordan Lode, later to be known as the "Old Jordan Mine."³³

³³Ibid. The Salt Lake County recorders Office contains the detailed records of Salt Lake County mining claims, found in the Mining Deeds Books.

The Millenial Star, a Mormon newspaper in England, commented on this discovery:

Considerable exertions have been made by General Connor and his confederates hunting for gold and silver mines; they consider they have discovered a silver mine in Bingham Canyon [sic.] that will yield \$160 per ton, which is considered worth working, the gold they have not yet got into, the apostate who dug out this silver mine for them discovered some iron pyrite which they supposed to be gold.³⁴

The headlines in the March 2, 1864 edition of the Deseret News, reported that "Gold! Gold! . . . Gold!" had been found; however, these headlines were followed with a story that contained somewhat less than enthusiastic support. The paper demanded to know where all this gold was to be found. "We presume, from what we hear, that it is still tolerably plenty in California, very plenty in Washington, Idaho, and Arizona Territory, and there is some in Colorado and Nevada Territories." The editorial went on to say that the gold of Utah Territory was found in the hands of "Madame Rumor." The only minerals of value to be found in Utah Territory were the less than glamorous minerals like salt, coal, and iron. The Deseret News would not admit publicly that there was any gold or silver to be found in Utah's mountains.³⁵

³⁴Journal History of the Church of Jesus Christ of Latter-day Saints, December 10, 1863, 1.

³⁵Deseret News (Salt Lake City), March 2, 1864.

The Union Vedette, took a decidedly opposite viewpoint from that of the Deseret News, in its editorial on November 27, 1863 the paper said:

The light is dawning on the people of Utah! The day of prosperity, so long deferred, is breaking and the unmentioned though cherished hope, whose fulfillment has for years been withheld, we believe is about being realized. The discovery of mines of precious metals near these great valleys and at the very hearthstone of this people, opens a wide field in the prospect of a near future of prosperity and increased wealth.³⁶

Utah's First Mining District

After staking the first claims in Bingham Canyon, General Connor³⁷ and some fifty-two other interested parties met together on September 17, 1863, in the Jordan Ward meetinghouse near Bishop Archibald Gardiner's (a West Jordan Mormon rancher and mill owner) mill, to organize the first mining district in the Utah Territory.

The Jordan Silver Mining Company was formally announced with some twenty-five stockholders and George Ogilvie listed as the "original discoverer." Also listed as stockholders were General Connor, John Egbert's father Samuel Egbert, Henry Beckstead, General Connor, various other Utahns, and some officers and men of the Volunteers.

³⁶The Union Vedette, November 27, 1863.

³⁷Soon after the battle of Bear River Colonel Connor was promoted to the rank of Brigadier General. For the remainder of this thesis I will refer to him by this new rank.

A second claim contiguous to the Old Jordan mine was filed, with Mrs. Reid, an officer's wife who located some silver ore while on a picnic in Bingham Canyon, listed as discoverer. Included among the twenty shareholders who filed this claim were General Connor and Captain Heitz. A third claim, the Vedette, with twenty-six shareholders, was also filed on September 17, 1863.

Following the style developed earlier in California, laws for the government of the district were drawn up, and the West Mountain Quartz mining District was organized. This first mining district in the Territory of Utah included the entire length of the Oquirrh Mountain Range, extending from Black Rock on the south end of the Great Salt Lake to the southern end of the range beyond Mercur.³⁸

Despite the urging of acting Governor Amos Reed, the territorial legislature failed to pass the required laws which would have permitted the incorporation of mining and other companies. It was not until 1870 when it became legal to incorporate under the laws of the Utah Territory. By this time it was too late. Most of the companies operating within the territory had incorporated elsewhere, either in England or in it East.³⁹

³⁸Arrington, "Abundance From the Earth," 199.

³⁹Union Vedette (Salt Lake City), December 4, 1863. various issues from January and February 1864 also deal with this problem. It was not until February 18, 1870 that the legislature passed laws allowing for the general incorporation of mining, manufacturing, and other commercial enterprises.

Soon after the creation of the West Mountain Quartz Mining District, the Little Cottonwood Mining District was organized. With the creation of these two districts the Salt Lake Valley was flanked on both the east and the west by organized mining districts providing sufficient quantities of good ore to stay in operation. This ready supply of ore was soon the basis for the mineral processing and refining industry in the Salt Lake Valley.

General Connor's involvement in Utah mining did not stop with the creation of the West Mountain Quartz Mining District. He felt it was his duty to continue to develop the mining industry in the West, and specifically in Utah. The following communication from General Connor to Captain Baldwin suggests the army sponsorship of increasing awareness of the mining industry in the Utah Territory:

CAPTAIN: You will proceed with your company tomorrow by way of Parley's Park to Uintah Valley, in this Territory, and at some central point establish a temporary depot for your supplies, after which you will return to this post the four teams with your command, driven by citizens. You will afford ample protection to prospectors and miners, and the Indians in that valley being all friendly, they will be treated with kindness by your command. You will cause the valley and vicinity to be thoroughly prospected by your men, and will report from time to time the result to this office. The discovery of placer mines is of special importance. You will therefore devote the most of your attention to their discovery. You will proceed to Fort Bridger, Utah Ter., by the way of Brown's Hole, on Green River, and report to the commanding officer of that post for duty on or about the 1st day of August next.⁴⁰

⁴⁰War of Rebellion, 846.

The results of this and other similar expeditions was that numerous bodies of valuable ore were located. Hiram Sinclair Tuttle, a soldier stationed in Utah with General Connor and his men, makes many references in his diary to prospecting while stationed in Utah.⁴¹

The army's attempts to mine gold by means of placer mining were successful, and gold was discovered in Bingham Canyon as early as 1864. In the spring of 1865, gravel washing (a method of placer mining) was initiated, and later in the same year extensive lode mining was conducted for profit. The value of gold production for the territory rose from virtually nothing in 1860 to \$55,000 in 1865, \$165,000 in 1868, and \$300,000 in 1870. By the end of 1871, about \$1,000,000 in gold had been recovered from the Bingham Canyon gravel.⁴² This trend however did not continue, and in the future only limited amounts of gold were found using this method.

The recovery of silver was a much harder process than for gold, where the ore is found relatively free of other minerals and processing the ore is relatively easy. Silver, however, is usually found with other minerals and needs to go through a complex refining process in order to extract it. The first large amounts of silver ore were discovered

⁴¹Hiram Sinclair Tuttle Diary, Bancroft Library, University of California, Berkeley.

⁴²Arrington, "Abundance", 202.

in Little Cottonwood Canyon during the summer of 1864 by General Connor and his men. He soon realized that some sort of mineral extraction process was required and he built two small smelters in the canyon to process his ore.⁴³ These smelters were extremely inefficient and most of the silver was lost in the slag. Most of the miners in the west during the 1860s, came from the gold fields of California, including Connor and his men. Silver refining required a skill and expertise not needed for gold mining. These early smelters failed not from a lack of effort, but from a lack of experience. The smelting industry would not get off the ground until men more experienced arrived in the territory to help build and run these new ore reduction operations.

General Connor built other furnaces near Stockton, Utah. In the fall of 1865, he purchased \$100,000 worth of smelting machinery from the Knickerbocker and Argenta Mining and Smelting Company of New York City. The General and his men attempted to separate the gold and silver from the lead. These early efforts failed. Another factor which spelled doom for this burgeoning new industry was the scarcity of coal. No other suitable fuel could be found to fire the smelting furnaces.⁴⁴ While the year of "steady, hopeful

⁴³Robert Wallace, "Early History of Lead Smelting in the West," Ax-I-Dent-Ax, XIV (May, 1929), 2.

⁴⁴Once the coal fields in eastern Utah were developed and the railroad was built providing access to these fields this problem of fuel was solved. This however, did not occur until later in the 1870s. Southwestern Wyoming also provided good

toil" ended in suspension, the trials proved that the ores were capable of reduction and could be smelted profitably with improved technology and suitable fuel for the furnaces.¹⁵

All these activities--prospecting, mining, and furnace building--were, according to Connor, "cheerfully executed."

With great energy my officers and men . . . [have] prospected the country, and succeeded in discovering rich gold and silver bearing rock. It is now a fact that the mines of Utah are equal to any west of the Missouri River, and only await the advent of capital to develop them.¹⁶

The fact that mining activity was "cheerfully executed" is easy to understand because the soldiers were being paid by the army and the additional financial returns from their mining ventures were held by them alone.

The army involvement, and subsequently most of the mining activity in general, ceased with the capitulation of General Robert E. Lee at Appomattox (1865). Soon thereafter the volunteers were disbanded and mustered out of the army. General Connor was transferred to Denver, and then to Washington D.C., where he was offered a regular commission but declined and finally mustered out of the service on April 30, 1866. He then returned to Utah to resume active direction of his varied mining and smelting interests.

quality coal for the Utah smelters.

¹⁵Edgar Ledyard, "Early Mining and Smelting South of Salt Lake City," AX-I-DENT-AX XVI (October, 1929), 4.

¹⁶War of rebellion, 1185.

"Connor [wrote Brigham Young upon Connor's return] is out of the service, and is here now as plain 'Pat,' engaged in mining business, which, as Government pap has been withdrawn, will likely, if he pursue it diligently, break him up financially."¹⁷ Connor died in Salt Lake City on December 17, 1891, within an estate valued at only \$5,000. Excessive speculation and a lack of mining knowledge doomed General Connor to life of continual involvement in mining without ever allowing him to reap the financial benefits that were associated with it.

With the departure of the volunteers, the mining and smelting activity in Utah effectively ceased until the arrival of the railroad in 1869. The lack of adequate transportation facilities, superior opportunities in neighboring territories, lack of sufficient coal for furnace fuel, and the inadequate skill of Connor and his volunteers all combined to render the early efforts as premature.

Arrival of the Railroad

The great influx of prospectors and many other non-Mormons into the Salt Lake Valley did not happen as General Connor had originally hoped. The remote location of the mines proved to be an insurmountable transportation problem which prevented the mining industry from becoming a profitable enterprise. From 1863 until 1869, only very

¹⁷Arrington, "Abundance," 205.

limited prospecting was done. The mines surrounding the Salt Lake Valley never went into full production during the 1860s because of the high cost of shipping the ore to the faraway refineries and smelters, usually back East.

The first recorded shipment of ore was made by the Walker Brothers, who in June, 1868, hauled a wagon-load of ore from Little Cottonwood Canyon to Unitah, Weber County, where it was loaded onto a Union Pacific Railroad car and shipped to Baltimore.⁴⁶ This was practically the only ore shipped until the arrival of the railroad in Utah in 1869. The cost of shipping ore out by wagon was too prohibitive. As a result mining and, more specifically, smelting did not begin developing until the 1870s.

The Utah Southern Railroad, connecting into the Union Pacific and Central Pacific Railroad, provided an easy means of transporting the ore from the valley to points east and west. The problem now faced by the mine owners was how to transport the ore from the mountain mines to the valley where it could be loaded into railroad cars and shipped to the smelters.

To be able to get the ore from the mines to the Jordan River, which the Utah Southern Railroad line followed, two narrow gauge railroads were built. The Bingham Canyon and Camp Floyd Railroad traveled from West Jordan (Midvale), to the mouth of Bingham Canyon. It began operation on October

⁴⁶Arrington, Abundance, 206.

15, 1873, and took about two and one-half hours to make the trip from the mouth of the canyon to West Jordan.⁴⁹ This train was noteworthy because it relied on gravity to get down to the Jordan River, and then used mules to pull it back to Bingham Canyon. The mules were carried in one of the cars and used on the return trip back up hill to the canyon.

The Wasatch and Jordan Valley railroad was also constructed at the same time to bring the ore from the mines in the Little Cottonwood District to Sandy Station where it tied into the Utah Southern Railroad line. The communities of West Jordan (Midvale) and Sandy would soon become major smelting sites in Utah due largely to the arrival of these two railway lines.

The completion of these spur and arterial railroads provided the means for the mine owners to get their ore to the railhead in the valley, where it could easily be shipped to the larger smelting and refining centers of Swansea (Wales), Baltimore, and San Francisco. Once shipments to these centers proved profitable, the export of ores catapulted from a few irregular weekly shipments in the fall of 1868 and throughout 1869, to "a regular and constant

⁴⁹Deseret News (Salt Lake City), October 15, 1873.

stream of from four to six hundred tons weekly."⁵⁰ In one month the Walker Brothers alone shipped 4,000 tons of ore.

The railroad, more than any other single factor, created the means by which the smelting industry in the Salt Lake Valley began. Mine owners found it financially more cost effective to ship bars of bullion rather than raw ore to the refining plants in the East. The central location of the Salt Lake Valley provided an inexpensive way to smelt not only Salt Lake Valley ore, but ore from all over the intermountain region. Ore from as far south as St. George and as far north as Idaho soon was being shipped to the Salt Lake Valley smelters.

⁵⁰John R. Murphy, The Mineral resources of the Territory of Utah (Salt lake City, 1872), 3-5.

Chapter IV

Investment Capital: Financing For a New Industry

After the transcontinental railroad arrived in Utah, the mining industry developed rapidly. Smelters were built throughout the valley to take advantage of the lower cost associated with shipping bullion rather than raw ore. However, before the smelting industry could get started, tremendous amounts of capital were needed. Because of the negative attitude expressed by the Mormon church toward mining in general, the majority of money used to finance the smelting industry had to come from outside of Utah.

The profits made by English investors during the Civil War created a large pool of investment capital, and these investors were just waiting for the right kind of ventures to come along. Utah mining and smelting were just the type of enterprises the British investment community had been seeking.

The high rates of interest being charged in the United States was another reason foreign investors were attracted to United States investments. After the war, the United States was still a debtor nation, and interest rates were

very high.⁵¹ Interest rates approached thirty to forty percent in Idaho and throughout the West, whereas in England the rates were comparably low at only three or four percent.

By the mid 1870s the Mormon church, which so strongly fought against the development of mining, reluctantly permitted its members to take jobs in the mines. The only stipulation was that the Mormons were required to work under the direction of their religious leaders. However, the church was not prepared to encourage open investment, in the mines and smelters. One result of this attitude was that by 1873, six of the seven banks operating in the territory were opened and owned by non-Mormons.⁵²

It was during the years 1869 to 1873 that Utah experienced the end of isolation and enjoyed a great boom in overseas investments, particularly from Great Britain. London banks were going through what one London periodical referred to as a "mining mania."⁵³

British Investments

During the four years from 1869 to 1873, the British investment community collectively risked an annual total of forty million dollars in the Utah mining and smelting

⁵¹Clark C. Spence, British Investments and the American Mining Frontier, 1860-1901 (Ithaca: New York, 1958), 53.

⁵²Leonard J. Arrington, "Banking Enterprises in Utah, 1847-1880," Business History Review 29 (1955), 312.

⁵³W. Turrentine Jackson, "British Impact on the Mining Industry," Utah Historical Quarterly XXXI (Fall, 1963), 349.

industry.⁵⁴ In the western United States alone there were ninety-four companies controlling investment capital of over eighteen million pounds (close to ninety million dollars) registered to engage in businesses related to mining or smelting between 1870-1873.⁵⁵ Between 1871-1873 the British invested in twenty Utah companies, with an initial capitalization of nearly 3.17 million pounds or over 15 million dollars.⁵⁶ Based on the number of companies organized during this time, Nevada still reigned as the number one location for British investment, with California next, and Colorado and Utah following close behind.⁵⁷ The amount of British investment in Utah prompted one Englishman to observe in 1872, "Nevada and the whole neighborhood of Mormon land has already absorbed so much British capital, that the mines are more British than American."⁵⁸

By 1870, the modus operandi for promoting the Utah mining industry had evolved into a sophisticated operation. Unscrupulous mine promoters organized limited liability corporations to operate the mines in what would soon cause

⁵⁴Microfilmed records of the Corporate Records Office, Bush House, London. Bancroft Library, University of California, Berkeley. Hereafter cited as (CRO, BLRP.)

⁵⁵These estimates are based on Clark Spence's book British Investments, appendix II, 201.

⁵⁶Microfilmed Records, Bush House, Berkeley.

⁵⁷Spence, British Investments, 201.

⁵⁸James Bonwick, The Mormons and the Silver Mines (London, 1872), 324.

irreparable damage to British investments and the mining industry in general. Vendors from the West made bonding contracts with promoters from England to sell their properties at three to four times the price they could receive in the United States. The promoter usually organized a syndicate, which would then try to sell to the public the idea of investing in a public mining company located in the American West. If this failed, the property was turned back to the vendor and he would begin the whole process again.⁵⁹

Promoters issued prospectuses to invite the public to invest in mining property. These were full of exaggeration and misrepresentations. The promoters deleted any conditional phrases or qualifying statements from the official reports of the mining engineers prior to releasing the prospectuses. During this period, mining engineers were plentiful and, for an appropriate fee, would write optimistic reports that could be edited to suit the needs of both the promoters and the vendors.⁶⁰

Prospectuses of proposed mining and smelting companies during the years 1860 to 1900 invariably carried the names of at least one or two prominent men to add weight and credibility. The Emma Silver Mining Company, Ltd. (1871)

⁵⁹Spence, British Investments. Chapter II. Spence goes into great detail about how this process worked.

⁶⁰Clark C. Spence, Mining Engineers and the American West: The lace-Boot Brigade, 1849-1933, (New Haven, 1970), 91.

was the most conspicuous example. The original board of directors was made up of the following individuals: the United States Minister to the Court of St. James, a former U.S. senator, and three members of British Parliament.⁶¹ Handsome fees and attractive blocks of stock were frequently offered as inducements to these distinguished men for the acceptance of these posts.⁶²

British capital first came to the Utah mining and smelting industry through the efforts of three investment syndicates. The first British investment experience in Utah was through the Utah Silver Mining Company, Limited, instigated by two Americans, I.C. Bateman and Colonel David Buel. This company was registered July, 1871, with an initial capitalization of 140,000 pounds.⁶³

Both men were well known to the mining communities in America and in Europe. Buel was sent to the 1867 French Exposition in Paris as a representative of the Reese River Mining District in Nevada with an ample supply of certified ore samples to be used for minting an exposition medal. From Paris, Buel went to London and sang the praises of western mining potential to a more than enthusiastic audiences. The American Journal of Mining expressed concern

⁶¹Spence, British Investments, 53.

⁶²Jackson, "British Investments," 351.

⁶³"Papers of the Utah Silver Mining Company, Limited."
(CRO, BLRP.)

about the amount of press David Buel was receiving from the London Mining Journal.⁶⁴ The Journal was concerned about the flagrant exaggeration of some of his statements.

On Buel's return to the States he joined forces with Bateman, and together they organized the Utah Mining Company. They acquired several claims in Bingham Canyon containing silver and lead. They soon erected the Buel and Bateman Smelting Works (Winnamuck) at the mouth of the canyon. The Salt Lake Herald spoke highly of the new works when on April 28, 1871, they said, that it was now possible to "convince the most skeptical of the possibility of a successful reduction of the Bingham Canyon ores, which heretofore were erroneously set down as so refractory that it was deemed impossible to reduce them."⁶⁵

After convincing Utah residents of the soundness of the mining operation, Bateman traveled to London where he secured the services of George Batters, an English broker principally associated with the successful floating of several Anglo-American mining companies. The next step in the operation was to secure the services of a mining engineer to validate the worthiness of the mines in question. Henry Janin, an American was hired, but he produced a negative report stating that the ore was only

⁶⁴American Journal of Mining V (February 15, 1868), 104-5.

⁶⁵Salt Lake Herald (Salt Lake City), April 28, 1871.

found in scattered pockets and was of a low grade quality.⁶⁶

Not wanting to hear such negative reports the British promoters quickly sent out their own engineer, James Nancarrow, who had managed mines in Mexico, Spain, and Chile. He was sent to get an "enthusiastic appraisal" of the property. Finally, Henry Sewell another British mining engineer, was hired to serve as umpire and mediate the two conflicting reports. Sewell sided with his fellow Britisher and after visiting Bingham Canyon, enthusiastically gave his endorsement to the venture.

All doubt was erased when Batters reported that Bateman refused cash for his Utah company but instead wanted only shares in the new British company.⁶⁷ Public confidence was so high that ten pound shares sold for an added premium of ten shillings. Thus nine mining claims in Bingham Canyon, including the Dartmouth, Portsmouth, Balshazzar, and Red Warrior mines passed into the hands of the new British company along with the Buel and Bateman Smelting Works.⁶⁸

⁶⁶Jackson, "British Investments," 351.

⁶⁷This would become the rule rather than the exception to selling American mining and smelting property in England. The American vendor would take at least half of the selling price in fully paid up shares, thus demonstrating his own confidence in the investment. However, the vendors often sold these shares as soon as possible and came back to America with the cash.

⁶⁸Jackson, "British Investments, 352. Papers of the Utah Silver Mining Company, Limited (Companies Registration Office, Bush House, London) These companies records are in the Bancroft Library, University of California, Berkeley, and were obtained as a part of the library's Program for the

John R. Murphy, recommended as one of the best smelter-men on the Pacific coast, was named as superintendent of the smelting works and quickly began writing back to London about the wonders of Bingham Canyon.⁶⁹

A second syndicate promoted the Emma Silver Mining Company, probably one of the most well known early mining companies in Utah history.⁷⁰ This company was soon to become the most famous (or infamous) of all the enterprises introduced to the British public in the 1870s.

Soon after launching the Emma Mining Company, Erwin Davis the resourceful San Francisco promoter, utilized his experience to start a new venture called the Flagstaff Silver Mining Company. Davis was a stockbroker by trade and set out to London to teach the British a thing or two about promotion and speculation. He found the British system, "decidedly old foggyish. They did not understand bulls and bears on the stock exchange."⁷¹

The Flagstaff Silver Mining Company, Limited, was established to mine a rich vein 2,000 feet long along the

Collection of Western Americana in Europe.

⁶⁹Ibid. This John Murphy is the same one who wrote a pamphlet describing the mineral resources of Utah that Bancroft quotes so heavily in his history.

⁷⁰Clark C. Spence in his scholarly book British Investments has devoted an entire chapter to the Emma mining Company (see Chapter VIII, 139-90.) Turrentine Jackson wrote an article in the Utah Historical Quarterly, 33 (October, 1955), dealing with the Emma Mining Company.

⁷¹Spence, British Investments, 26.

same vein as the Emma.⁷² For the prospectus, Professor Milos Claiborne Vincent of the Royal Geographical and Geological Society prepared an elaborate statement asserting among other things that a vein "of such richness and force, marked throughout with such indubitable character, cannot fail to be both productive and permanent."⁷³ William F. Blake, who had already reported as to the richness of the Emma wrote that the Flagstaff was a rich vein waiting to be scooped up. John R. Murphy writing from the Bingham Canyon office of the Utah Silver Mining Company also reported that the prospects of the mine were excellent.

Davis gathered together a distinguished board of directors quite distinct from the Emma board, headed by the Right Honorable Lord Robert Montague. Sir Alexander Malet, an outstanding British statesman and diplomat, personally guaranteed that the resources of the company would be properly handled and assumed the title of trustee.⁷⁴

The Flagstaff Company was capitalized at 300,000 pounds, second in size only to the Emma. Like the Emma, the first 100,000 pounds raised went to the vendors with the remaining 200,000 pounds allotted to them as paid-up shares. Soon the shares placed on the market were selling for a

⁷²"Papers of the Flagstaff Silver Mining Company, Limited." (CRO, BLRP.)

⁷³Jackson, "British Impact on Utah Mining," 352.

⁷⁴Ibid.

premium of two to three pounds above their original ten pound selling price.⁷⁵

The initial success of these three British companies spurred on the hopes of other English investors. During 1871-72 several smaller companies were registered in London with Utah ties. In fact, Utah became so popular during these years that in 1871 six out of eight mining companies registered that year had the word Utah in their title.

The British purchased other interests in Salt Lake County mines during these boom years. The Davenport Mining Company was organized to exploit the ores in the Davenport mine located in Little Cottonwood Canyon. Interested observers noted that spending on the mine was indeed liberal, if not lavish. A hoisting works was placed in the mine. A tramway was built to connect the mine with ore bins on Grizzly Flat. There wagons could be loaded to transport the ore to the two smelters which where built at the mouth of the canyon. Soon a small settlement grew up around the improvements on Grizzly Flat.⁷⁶

In Bingham Canyon, British investments also continued. The Saturn Silver Mining Company was organized to acquire a property known as the Idaho located on the Great Saturn Lode in the West Mountain District. The prospectus was full of

⁷⁵Ibid.

⁷⁶Salt Lake Tribune, November 23, 1872.

exaggeration stating that "this Lode is represented to be eleven feet thick!, solid silver and lead bearing ore."⁷⁷

Soon the bubble burst on the companies floated by George Batters. In January 1872, the assembled stockholders of the Utah Silver Mining Company learned that the vendors' statements had been highly colored. The manager had lost the entire amount of capital and then had gone ahead and spent an additional 8,000 pounds without permission from the board. They found out that the reports from the mining engineers were not completely accurate and in many cases were completely in error. The Engineering and Mining Journal had suggested that:

. . . when any expert of reputation advises against the purchase of a mine at a certain price, two votes cannot "outvote" him; and so long as our Western Country is full of good mines that can be cheaply bought, it is folly to go into doubtful schemes. Secondly, it is folly to send English, or other engineers, inexperienced in this country to report on the value of mines in our new districts. They come in a hurry, see nothing but what they came to see, are in the hands of vendors during their stay--and are subject to enormous temptation.⁷⁸

The Engineering and Mining Journal blamed the British for their own mistakes and did not lay the blame on the American vendors. But by this time it was too late. The negative attitude among the British concerning Utah was already beginning to brew.

⁷⁷Jackson, "British Impact on Utah Mining," 354.

⁷⁸Engineering and Mining Journal, 13 (January 30, 1872).

Rumors began to circulate the John Murphy had thrown bars of bullion into the smelting furnace when the English inspector had his back turned.⁷⁹ Then, when the furnace failed to produce the anticipated results, another larger smelter was built before it was recognized that the lead and silver found in Bingham Canyon could not profitably be reclaimed at the current prices.

News arrived that Bateman had been arrested and was being held in London jail. Somewhat cynically, the Territorial Enterprise of Virginia City reported:

There is nothing novel in this circumstance, as the many failures of English capital in Nevada attest; but it is possible that our English cousins have become disgusted with the misrepresentations of California and Nevada mine-sellers, and concluded to make an example of Mr. Bateman. After entering our protest against the arrest and incarceration of our old townsman-- which we presume will have but little weight with the London courts--we feel disposed to suggest for the protection of future mining operators in England that after offering for sale of a Nevada mine in London, and receiving the ducats therefore, the "party of the first part" should retire from Her Britannic Majesty's kingdom during the progress of developing the property conveyed. By observing this suggestion it is manifest, from the consideration of Mr. Bateman's difficulty, that much annoyance may be avoided. "Sell and leave" is evidently the true motto of Nevada operators in London.⁸⁰

The Utah Mining Journal also reported on this incident and mentioned that Mr. Bateman had "for many years enjoyed

⁷⁹Salt Lake Tribune, July 13, 1872.

⁸⁰Territorial Enterprise (Virginia City, Nevada), December 2, 1872. As quoted by Jackson in "British Impact on Utah Mining," 356.

the reputation of being a sound and prudent business man" and that he "was held in high esteem for honesty and uprightness in all his dealings."⁸¹ The editor expressed the hope that Mr. Bateman was only a victim of mistaken identity and unfortunate circumstances.

By 1875 the company was dissolved and had declared bankruptcy with no hope of reviving. In 1874, John Longmaid, a British engineer who was sent from London to manage the mine and smelter told the London board to, "discharge me and all the staff; there is no more ore to dress."⁸² Not only were there no dividends but the entire investment had been lost. The British public had provided somewhere near \$750,000 for this initial Utah mining enterprise.

The fate of other British mining interests were similar. Only the Flagstaff and the Emma were still in existence at the end of the 1870s and in these cases only because the English owners could not sell them. Without exception, the British companies organized to develop and operate Utah mines and smelters between 1871-73 were victimized by the modus operandi of the promotion of overseas mining companies. As a result over capitalization was the rule rather than the exception.

⁸¹Utah Mining Journal (Salt Lake City, Utah), December 6, 1872.

⁸² Mining Journal (London), 44 (October 10, 1874), 1116. quoted in Jackson, "British Impact on Utah Mining," 357.

Opportunistic vendors like Erwin Davis made a practice of picking up well-known western mines past their peak of production and selling them in England. The support or stamp of approval of the mining engineer was always the basis for successful exploitation of British investors. A favorable report did more to validate the claims made by vendors like Davis than any other single thing. The British were all too quick to point an accusing finger at American engineers who gave a favorable reports on property that did not produce. However, in the case of the Utah Silver Mining Company, the American engineer, Henry Janin, wrote an unfavorable report, only to be overruled by two English engineers.

Many other factors caused the downfall of these early Anglo-American companies. Natural disasters played a significant role in the lack of success of these companies. The English could not understand how a whole winter could go by without any mining activity going on. The weather, could and did, shut down mines and therefore shut down smelters for whole seasons. Snowslides would destroy mine equipment or close off access to the mines.

Also, competent managers were often difficult or impossible to locate. The English (and Americans) were limited by their lack of understanding about metallurgical processes. In many cases they had tremendous quantities of

low grade ore that proved to be very refractory⁸³ because of their limited knowledge at the time. The emphasis in Utah during the 1870s was upon silver and as significant discoveries were found in Nevada and Colorado the profit margin disappeared.

In just three years the value of British investment in six of Utah's largest mining companies dropped from nearly 3,389,000 pounds to less than 425,000 pounds, a loss of 2,974,000 pounds—just short of 15 million dollars. An additional 700,000 pounds were lost in smaller Utah companies. Is it any wonder that British investors, after having lost between 18 and 19 million dollars in Utah Mines, developed strong reservations about additional investments?⁸⁴

After 1874 British investment slowed down for the remainder of the decade. Even during the relative boom years of the 1880s British investment was only a fraction of what it was during the early 1870s. British investment continued to flow into the west but Utah was the least favored location. California, Colorado, and Montana continued to get English funds, but Utah saw only three new

⁸³The western ore was a silver-lead carbonate, compared to the eastern silver-lead oxide type ore. This carbonate ore proved to be very difficult to reduce.

⁸⁴Engineering and Mining Journal, XVII (January 31, 1874). These figures were widely circulated in many journals including the Mining and Scientific Press of San Francisco and Mining World of London.

mining and smelting companies begin operations during that decade. After the disastrous results of the 1870s, the British investor looked upon Utah with some sense of hope, albeit with a much more skeptical view.

Chapter V

The Early 1870s: A Period of Change and Adjustment

After the early efforts of General Connor to develop smelting operations in Stockton, Utah, the smelting industry was put on hold until the arrival of the railroad in 1869. The arrival of the railroad signaled the booming of the mineral industry in the Territory of Utah, making the development of the mineral resources in the mountains of Utah profitable.

Many smaller smelting operations began throughout the territory, but it would be the three communities of West Jordan (Midvale), Murray, and Sandy which would soon become the center of the smelting industry in Utah. Many factors played a part in the development of these three communities into what would become the largest smelting center in all of North America.

The railroads provided a fast, inexpensive way for mine operators to get their ore to the smelters. Railroad lines were constructed specifically to facilitate this need for ore transport. Narrow-gauge lines were built from the Utah Southern main line to the canyons east and west of the Salt Lake Valley. The location of these three cities made them the logical centers for ore reduction works.

Water was another important element in the reduction process, and the Jordan River passed close to all three of the above named communities. In addition to the Jordan River, two creeks, Little Cottonwood and Big Cottonwood, flowed from the canyons to the east of the valley and also provided water necessary for the smelting operations.

The mountains of volcanic origin surrounding the Salt Lake Valley contained an adequate supply of rich silver, lead, and copper ores to keep the smelting companies busy. The mine operators soon learned that it was cheaper to ship the lighter bars of base bullion than to try and transport raw ore to be smelted and refined by the large smelters in the East.

During the first half of the 1870s, mining, milling and smelting blossomed in Utah. From 1870 to 1876, Utah exported approximately \$26,000,000 of mineral products. This figure included smelted bullion as well as raw ore to be smelted elsewhere. The Engineering and Mining Journal reported in January 1876, that the cash value of all mining property in Utah had a value of \$60,000,000. This included thirty smelters, twelve stamp mills, four concentrating works and one separating and refining establishment, nearly all of which were within a sixty-mile radius of Salt Lake

City.⁸⁵ Utah's mining and smelting works in the late 1800s rivaled those found elsewhere in the country.

The early years of smelting in Utah were characterized by inexperience and lack of technical sophistication. From the arrival of the railroad in 1869, until about 1877, when more skilled mining engineers arrived from Europe along with European technology, the smelting industry went through a very expensive developmental period. Many smaller smelters had to close, and many went bankrupt because their operating margin was so slim.

During this early period operators dumped more precious metal in the slag than they saved in the bullion. The early furnace design was not suitable for reduction of the ore found in many western mines.⁸⁶ In many cases the brick used to line the blast furnace melted down before the ore inside reached smelting temperatures.⁸⁷ Furnace brick also called refractory brick was not available until the early 1870s. The availability of this stronger brick greatly improved the profitability of the smelting plants. As a result, before this brick was obtainable few of the Utah smelters (or any in the west) were profitable, reported Rossiter Raymond in

⁸⁵Ed. E.&M.J., "Utah Mining Interests," Engineering and Mining Journal 21 (January 29, 1876): 108.

⁸⁶Rossiter Raymond, Mining Statistics West of the Rocky Mountains (Washington, D.C.: GPO, 1872), 311.

⁸⁷H.Exdoc. 177 (43-2) 1651 "Mining Statistics West of the Rocky Mountains, 1874," 328.

his annual report to Congress as Commissioner of Mining Statistics. He noted that many of the Utah works were operated "without technical knowledge," and "much of their profits are lost in slag, dust, and matte which might easily be saved."⁸⁸ Raymond commented on these terrible conditions in his 1871 report to Congress:

The metallurgical industry here is conducted in a sadly careless and ignorant manner. There are now in the Territory some nineteen or twenty furnaces, mostly small shaft furnaces. The aggregate production in July [1871] was, however, only about 15 tons of base bullion daily--a proof that the furnaces are run very irregularly, as an inspection of the works also sufficiently shows. Ignorance of the nature and proper treatment of the ores is one reason.⁸⁹

Raymond made the observation that he could not understand how small inefficient smelters could remain in operation:

"The only explanation I can offer is, either that the proprietors of the furnaces are losing money without knowing it (a thing which may easily occur to persons inexperienced in the smelting business) or they are running the furnaces at a loss, with the intention of selling mines on the strength of alleged favorable results. Certain it is, if anything in metallurgy or mathematics is certain, that the smelting works now in operation cannot be legitimately making money, operated as they are, and paying what they do for ores."⁹⁰

⁸⁸H.Exdoc. 141 (43-1) 1608 "Mining Statistics West of the Rocky Mountains, 1873," 256.

⁸⁹Rossiter Raymond, Mining Statistics West of the Rocky Mountains (Washington, D.C.: GPO, 1872), 301.

⁹⁰Ibid., 302.

Unfortunately this was the case for many smaller operations located in Utah. Many of these smelters were owned by eastern companies which did not fully understand the smelting process, and, as a result, lost tremendous amounts of money. In many cases this fact was not discovered until it was too late. The smelters and the companies that controlled them simply disappeared. In some cases they were able to sell their assets, but in many instances they just declared bankruptcy.

This is the environment in which the smelting industry began in Utah. More than half of all the smelters that began during these first early years went bankrupt either due to mismanagement or to a lack of technical knowledge, and it is easy to see the fine line of profitability on which all the smelters were working. The owners and managers, as well as smelter workers, were indeed pioneers in this new fledgling industry.

The Community of West Jordan

West Jordan (Midvale) was a hub of smelting activity not only during the nineteenth century and well into the twentieth century. In 1904, well after the many smaller smelters stopped operating in Midvale, United States Smelting, Refining and Mining built a new plant on the same location. This large plant continued operating until the 1950s and was one of the largest smelting operations in the country.

All of the smelting activity that took place in Midvale was located in section 35, township 2 south, range 1 west, Midvale city, Salt Lake County. This site is located on both the north and south side of what is today 7800 S. and just west of 700 W. and east of the Jordan River.⁹¹

Galena/Old Jordan Smelting Works

The Galena/Old Jordan Smelting Works was the first recorded operation in the Midvale area. The Salt Lake Tribune announced on November 22, 1872, that a new smelting works was to be built under the supervision of Fred H. Meyers on the Bingham Canyon and Camp Floyd Railroad known as the Galena Smelting Works.⁹² Initially the smelter was scheduled to have two vertical blast furnaces capable of reducing forty tons of ore per day. The close proximity of the railroad (the Bingham Canyon and Camp Floyd railroad was nearing completion) and the nearness of an adequate supply of water (the Jordan River) made "this locality one that not be excelled in Utah."⁹³

Ore reduction began as early as April 1873. The smelter was owned by John Kerr from Salt Lake City. Only a few months after the smelter began operations it was

⁹¹All of the smelters sites in this thesis have been identified using information obtained from the Salt Lake County Recorders office.

⁹²Salt Lake Tribune, November 22, 1872, 2.

⁹³Salt Lake Tribune, December 10, 1872, 2.

purchased by James Carson and Thomas Buzzo, who changed its name to the Old Jordan Smelting Company. This name change was done to more closely align the smelter operations with their mine the Old Jordan in Bingham Canyon.

The first reference to this smelter in the county land records refers to a land purchase by Carson and Buzzo from Thomas Goff a farmer, in April 1874, for what was to become the Galena Canal located in section 35. The canal is still in operation today.⁹⁴ Additional property for the smelter itself was purchased from Joshua Terry in April 1874.⁹⁵ Then in June 1874, Carson and Buzzo sold the land to the Galena Silver Mining Company of which they were owners. The land record gives a detailed description of the property which was clearly located in section 35.⁹⁶ There is no other reference in the land records to the Galena Smelting Company or the Galena Silver Mining Company.

After the first few days of operation, the Salt lake Tribune, reported that the Galena smelter was making "successful runs; and have thus far proved a success."⁹⁷ This report was premature because the smelter had only been operating four days. In a later article, the Tribune

⁹⁴The Salt Lake County Recorders Office does not have any land records for this area prior to 1873.

⁹⁵Abstract Book I, pg. 362.

⁹⁶Abstract Book J, 4-5.

⁹⁷Salt Lake Tribune, April 22, 1873, 2.

reported that after ten days of operation with only one blast furnace, the smelter had reached an output of seventy-five tons of bullion, with an average assay value of about \$140 per ton.

The editor of the Tribune commented on the location of the smelter on April 29, 1873, when he summarized the selection of a perfect location by Mr. Meyers. "Mr. Meyers has certainly evinced much foresight and judgement in the matter, having secured a locality which embraces all the advantages necessary to insure perfect success."⁹⁸ Three factors made the location of the Galena smelter ideal: first, was the topographical characteristics of the site; second, the accessibility of water; and thirdly, the railroad and transportation factors.

Of the three factors, the only one not discussed up to this point is the factor dealing with topography. During the 1800s, the ideal location to build a smelting furnace was one where the lower levels were physically on lower levels than the upper levels. The side of a hill was the best possible location for a furnace, because an operator could load the ore into the furnace at the upper level and then remove the melted bullion and slag from a lower level.⁹⁹ The Galena smelter was built on the side of a

⁹⁸Salt Lake Tribune, April 29, 1873, 2.

⁹⁹Joseph M. Locke, Smelting Plants, The Selection of their Site and Adaptation and Equalization of their parts (Cincinnati, Ohio: The Lane and Bodley Co., 1883), 9. This is

hill which provided the ideal situation for smelter plant construction.

During the summer of 1874, James Carson and Thomas Buzzo purchased the smelter from Mr. Kerr in order to reduce the ore more profitably from their mine in Bingham Canyon, the Old Jordan. The reasons why Kerr sold are not known, but due to the ideal location of these works, he certainly could have received a good price.

The Deseret Evening News reported on November 24, 1873, that extensive improvements were being made to the Carson and Buzzo reducing (smelting) works on the banks of the Jordan River.

Buildings are in the course of erection there 290 feet long by 40 feet wide, for storing fuel and for reverberators for calcinating the ores. Another building is being put up which will be 160 feet long by 36 feet wide, and in which there will be six smelting furnaces. A flue 150 feet long and chimney stack over sixty feet high are already completed. The other additions and improvements will be completed within two or three weeks. These are now the largest smelting works in Utah.¹⁰⁰

The Utah Mining Gazette also had much to say concerning the improvements. The old works (Galena) consisted of three furnaces, two MacKenzie and one cuppola type, capable of producing eleven tons of bullion per day. These type furnaces were in wide use on the ores from the East. They

a book published by a manufacturer of smelting machinery. It is very detailed, and use many drawings to explain the whole smelting process.

¹⁰⁰Deseret Evening News, November 24, 1873.

worked by placing the charge (the raw ore) in the furnace along with the fuel and flux. The whole batch is then heated and the metal flows to the bottom of the furnace.

The new works under construction consisted of four reverberatory and six cuppola type furnaces. The reverberatory furnace worked on a different process than the other types of furnaces in wide use at this time. In the reverberatory furnace the charge and flux is never in direct contact with the heat source. Instead the heat is reflected towards the charge and the smelting is done in this manner. The buildings to house the furnaces were built of brick with a ten foot foundation.¹⁰¹

The natural formation of the bluff created an ideal location as previously described. It rose thirty feet providing "ample room for dumping slag and other waste for many years to come."¹⁰² The building to contain the reverberatory furnaces was erected on a foundation excavated out of the side of the bluff, eight feet below the level of its summit; while the house in which the six cuppola furnaces were built was still nine feet lower, on a similar foundation.¹⁰³

To produce a more efficient operation, Carson and Buzzo decided to make use of the nearby Jordan River by building a

¹⁰¹Utah Mining Gazette, November 29, 1873.

¹⁰²Ibid.

¹⁰³Ibid.

canal to bring the water closer to the reducing works. The Galena canal was approximately nine miles long, and began near the Point of the Mountain and extended to the smelter. The water power generated was a minimum of 500 horsepower. The blast engines, water works and other machinery were built to special order in Boston, Massachusetts.¹⁰⁴

The area which encompassed the works was nearly fifty acres, with an additional 150 acres purchased from farmers who complained of damage to their pastures from the deposit of the furnace smoke and dust.¹⁰⁵

For several reasons, the work at the Jordan Smelter stopped for varying lengths of time, but usually for the continued improvements that Carson and Buzzo were installing.¹⁰⁶ In October 1875, the Real Estate and Mining

¹⁰⁴Utah Mining Gazette, April 25, 1874.

¹⁰⁵Salt Lake County, recorders Office, Abstract Book I, pg. 362. The problem of smelter smoke was a serious issue even back in the late 1880s. The damage to agriculture and livestock was significant.. Numerous letters to the editor in both the Salt Lake Tribune and the Deseret Evening News made smelters owners take notice and do something about it. The solution in the 1870s was simply to build taller chimneys and to buy the land near the smelters, as was the case in the Old Jordan Smelter.

The problem got so bad that by the turn of the century this solution was not enough. In 1906 a group of farmers got together and brought a lawsuit against the smelters and demanded that smelting stop. The court agreed that the problem was bad and ordered that copper smelting stop.

¹⁰⁶The early furnaces had to be shut down and cleaned out every two or three months. The tuyeres, slag and bullion output vents needed to be cleaned and build up deposits of ore scraped off. See also the report written by Rossiter Raymond to the Congress, H.Exdoc. 177 (43-2) 1651 "Mining Statistics West of the Rocky Mountains, 1874," 347.

Gazette reported that the Jordan Smelting Works was again operating at full blast using two chimneys. The Jordan works were "by far the most extensive of its kind in the Territory."¹⁰⁷ In March 1876, the Engineering and Mining Journal reported an output from the number three furnace for the week ending 7 a.m., February 20, 1876: 74,127 tons of lead and 8,730 ounces of silver.

The Galena smelter fell victim to the same problems that beset all the western smelters; they initially were using the wrong type of furnace for smelting western ore. The reason for this was that the owners and engineers came from the East where cuppola furnaces were very popular. The Mackenzie patent type of furnace was the one most commonly used in the west. It was very difficult to produce bullion with enough metal content to make these furnaces profitable to use. One of the characteristics which distinguished the second phase of smelting industry was the replacement of these inefficient furnaces.¹⁰⁸ The replacement went slowly, and the ability of a smelting works to keep afloat financially, was in many cases, dependent on how quickly the switch to the better more efficient reverberatory type furnaces could be made.

¹⁰⁷Real Estate and Mining Gazette (Salt Lake City), October 1, 1875.

¹⁰⁸H.Exdoc. 177 (43-2) 1651 "Mining Statistics West of the Rocky Mountains, 1874," 328.

Sheridan Hill Smelting Works

The Sheridan Hill Smelting Company began operations in March 1874 when it purchased two properties from Thomas Goff¹⁰⁹ and Clarissa Arnold.¹¹⁰ These two properties lie within the boundaries of section 35, northeast 1/4, very close to the Galena/Old Jordan Works. No other reference, is found until the minutes of the Old Telegraph Board of Directors meeting in October 1878, when the Sheridan Hill Smelter property is mentioned, when the Sheridan Hill Smelting Company was no longer in business.

The Sheridan Hill Mining and Smelting Company was incorporated in the State of New York with an initial capital of \$600,000 on February 24, 1873. The President was Israel Schoenburg and the superintendent of smelting was Issac Schoenburg. Simon Bamberger was named superintendent of mining in the Sheridan Hill Mine located in Bingham Canyon.¹¹¹ The company was established to mine ores found in the Sheridan Hill Mine and to smelt that ore and other purchased ores from nearby mines.

The company initially erected its smelting works within 100 yards of the Galena smelter. They built works consisting of three furnaces, an office, and an hotel to

¹⁰⁹Abstract Book I, 269.

¹¹⁰Abstract Book I, 270.

¹¹¹Salt Lake Tribune, April 29, 1873, 2.

house the workers.¹¹² The works consisted of a forty horsepower oscillating engine to drive the blast¹¹³. Many new improvements were introduced in this smelting operation. The furnaces and associated machinery came from the celebrated Morgan Iron Works of New York City. One of the improvements was the construction of newly invented water and wind boxes in connection with the furnaces and collect some of the dust which escaped from the chimneys. The loss of great quantities of dust represented a significant loss of potential profit, because much of this dust contained very good quality minerals which for years had just been written off as losses associated with doing business.¹¹⁴

According to the Utah Mining Gazette, the Sheridan Hill Smelter began smelting operations in September 1873.¹¹⁵ Only two furnaces were in operation on this date, and no reason was given as to why the third furnace was not completed. In November the Deseret Evening News reported that two new furnaces were under construction, making the

¹¹²Salt Lake Tribune April 21, 1873, 2.

¹¹³The process of reducing raw ore to a bullion state requires the addition of compressed air to regulate the temperature of the fire in the furnace. The blast was the amount of compressed air that was fed into the furnace. Engines were needed to generate the compressed air.

¹¹⁴Salt Lake Tribune April 29, 1873, 2. It should be noted that it was profit that motivated the creation of these improvements and not from any concern about environmental problems.

¹¹⁵Utah Mining Gazette (Salt Lake City), September 9, 1873.

Sheridan Hill smelter one of the largest in the region."¹⁶ Also in November, the editors from the Utah Mining Gazette made a trip to see the progress on the Sheridan Hill smelter. They reported that "extensive improvements" were being made, "consisting of a new ore house, and a building to contain three additional furnaces, and a 60 horse-power engine." The paper gave no report as what type of furnaces were being installed, however, the cuppola (Mackenzie) type was probably the furnace type mentioned, because the reverberatory furnace did not begin to show up until the following year. The paper also reported that the smelter was currently running two furnaces, which smelted ores primarily from the Grizzly and Kempton mines in Bingham Canyon. The average production was from 160 to 180 bars of bullion per day.¹⁷

In the spring of 1874, the Deseret News reported that a new reverberatory furnace was being built at the Sheridan Hill Smelter.¹⁸ The introduction of these new reverberatory furnaces, which began to spring up all over the west, was a definite advancement in the art of smelting ore. The standard furnace type previous to this was the cuppola furnace also known as the MacKenzie, which was in

¹⁶Deseret Evening News (Salt Lake City), November 24, 1873.

¹⁷Utah Mining Gazette, November 29, 1873.

¹⁸Deseret Evening News, April 16, 1874.

wide use in Eastern smelting furnaces, and used primarily for melting pig iron in foundries. These cuppola furnaces did not operate well with the more earthy lead ores commonly found among the rather refractory grade of Western lead and silver ore. The reverberatory furnaces which were imported from European smelting centers, were designed to handle the Western grade of lead ore much better, and after their initial introduction in the west the yield experienced by the smelters rose dramatically.¹¹⁹

In May 1874, the Utah Mining Gazette gave a lengthy report on the condition of the Sheridan Hill Smelter. At this time the smelter was operating three cupola furnaces, with of one blast and one reverberatory furnace soon to be added.

The smelting process as used by the western smelters was a metallurgical one. The charge was placed in the furnace along with flux which was used to help draw off the metal in the raw ore. The fuel was added which would burn and melt the ore. After a sufficient period of time the metal would flow to the bottom of the furnace and the waste product known as slag would stay on top. The liquified metal was then drawn off through the bottom of the furnace and placed into molds. This product was then called bullion. Tuyeres, or small nozzles were used to provide air

¹¹⁹H.Exdoc. 141 (43-1) 1608 "Mining Statistics West of the Rocky Mountains, 1873," 267.

into the furnace to keep the temperatures hot enough to melt the ore and initiate the smelting process.

The power for the works (needed to provide air for the tuyeres) was supplied by steam furnished by two tubular flue boilers, and one oscillating steam engine of 60 horsepower. The steam boilers were connected to a Woodward steam pump with a capability of pumping 3,000 gallons of water per minute used to maintain a supply of air for the tuyeres of the furnaces. The use of steam power served a dual purpose. The water used to run the engines could also be used as a prevention and security against accidental fire.¹²⁰ The furnaces, engine house, feed floor and fuel bins are all enclosed within a building 160 feet long by 100 feet wide.¹²¹

The furnaces at Sheridan Hill were yielding five to six tons of bullion each per day. They were somewhat larger in size than the majority of lead furnaces erected in Utah.¹²² Another of the newer improvements incorporated into this smelter was the addition of flues or condensing chambers which carried the smoke and dust some 200 feet before it escaped up the chimney. The smoke and dust, which contained

¹²⁰Since the smelting works were built almost entirely of wood the threat of fire was a very real concern. Every precaution to avoid damage by fire was taken and having plenty of water on hand was a benefit.

¹²¹Utah Mining Gazette, May 3, 1874.

¹²²Ibid.

significant amounts of metal, could then cool and condense leaving the metals in the chambers before it escaped up the chimney.¹²³ The modern day "bag house" is a descendent from these early attempts.

The assay office which was located on the same site as the smelter, was reported to be the most complete of its kind attached to any reduction works in Utah. George M. Norton who was the superintendent in charge of the laboratory, was "well known for his ability in his profession."¹²⁴ The bullion was shipped back to the Schoenburg Brothers Metal House in New York City for refining and it was said that they were the first manufacturers of bullion suitable for the refining of white lead.¹²⁵

Rossiter Raymond, in his 1874, annual report to Congress, reported on the status of the Sheridan Hill smelter as follows:

The Sheridan Hill works located in West Jordan have four rectangular furnaces with water jackets and six tuyeres each. The furnaces are nine feet high from slag top to the charging door. Their

¹²³This technology would not significantly change and even into the twentieth century a variation would still be in use. The "bag house" served the same purpose. Hundreds of wool bags would be hung from the ceiling and the smoke from the furnaces would pass through these bags and collect some of the mineral rich dust before passing up through the chimney.

¹²⁴Utah Mining Gazette, May 3, 1874.

¹²⁵White Lead was used in the production of paint, and still was up until paint manufacturers stopped producing lead base paint.

size is 30 by 30 inches in the hearth; above they are widened to 4 foot by 4 foot. Their capacity is 15 to 18 tons of ore per day. The ore consists generally of 50 per cent of Neptune and Kempton ore containing 40 to 50 per cent lead and from 16 to 22 ounces of silver. The other 50 per cent is made up from other mines.¹²⁶

During the month of March 1874, the worst snowstorm in many years hit the Salt Lake Valley. In a two- to three-day period, twenty-one to twenty-three inches fell in the valley, with higher amounts falling in the mountains. This large amount of snow greatly curtailed the amount of ore that could be shipped from Little Cottonwood and Bingham Canyons to the Midvale Smelters. Slowdowns similar to these occurred on a regular basis from natural disasters such as rock and snow slides reducing production and causing concern among the Eastern and foreign investors. These problems were never fully understood and accepted by these non-western people.

Another problem in 1876 caused a further slowdown of production at the Sheridan Hill Smelter. The smelter workers at Sheridan Hill were working eight hour shifts when the superintendent, B.M. DuBell, saw fit to change the number of hours worked to twelve. Many of the men rebelled and were soon discharged. When other men were hired to take their place, the rest of the men working in the smelter attacked and drove away the new workers. Soon after a

¹²⁶H.Exdoc. 177 (43-2) serial set no. 1651, Mining Statistics West of the Rocky Mountains, Rossiter Raymond, 328.

complaint was filed before the Mining Commissioner, charging ten of the striking workers with riotous conduct. Nine of them were arrested and brought before the judge where they pleaded not guilty. There is no further news of this event, but it certainly caused a slowdown in production at the Sheridan Hill Smelter.¹²⁷

During much of 1877, the price for lead bullion dropped significantly, and this coupled with the rise in transportation costs caused many smelters in the valley to cut back or cease operations completely. The Sheridan Hill Smelter was affected by these adverse market conditions and on November 3, 1877, it was announced that the Sheridan Hill Mining and Smelting Company was dissolved due to mismanagement and bad market conditions.¹²⁸

Many factors affected the closing down the Sheridan Hill, not the least being the lack of new technology. Even though new reverberatory furnaces were installed, they were put in too late to significantly change the financial viability of this smelter. Bad management and the decline in lead prices during the late 1870s were also factors in the closing down of the Sheridan Hill works which at one time were one of the largest in the territory.

Other newspaper references mentioned that by 1877 the Sheridan Hill Smelter had been shut down due to

¹²⁷Salt Lake Tribune, October 21, 1876.

¹²⁸Engineering and Mining Journal, November 3, 1877, 333.

mismanagement.¹²⁹ Apparently, at some time previous to the meeting, the Jordan Smelting Company bought all the remaining assets of the Sheridan Hill Company.

The Smelters in the Community of Sandy

By the 1890s Sandy was to become the largest smelting center in Utah, producing millions of pounds of unrefined lead per year. However, in the early 1870s the story of smelter development in Sandy was very similar to what was being done in Midvale. The smelters located in Sandy included the Mingo/Mountain Chief, the Saturn, and the Flagstaff/Last Chance. These three smelters, all located near the center of what today is Sandy City, would create a booming industry for the many residents of Sandy. The narrow gauge railroad line, the Wasatch and Jordan Valley Railroad, would provide a steady supply of ore from the nearby Wasatch and Oquirrh Mountains.

Unlike the towns of Midvale and Murray, by the turn of the century the smelting industry in Sandy was all but gone. The new conglomerate companies just coming into the scene were hard at work buying up all the smaller smelters, ridding themselves of competition and consolidating the industry into just two major locations Midvale and Murray. The Mingo Smelting Company would hold out until the late 1890s when they too would be bought out by the American

¹²⁹Deseret Evening News (Salt Lake City), November 3, 1877.

Smelting and Refining Company (ASARCO), the large international smelting company controlled by the Guggenhiem family.¹³⁰

Flagstaff/Last Chance Smelting Works

The background of this company and the smelter associated with it, is very complex. There were two companies formed at approximately the same time 1871-2¹³¹ to mine ore in the Oquirrh and Wasatch Ranges: the Last Chance Silver Mining Company and the Flagstaff Silver Mining Company. Eventually these companies merged and existed only as modified versions of the Last Chance Company.¹³² This company is a perfect example of companies supported by the investment promotion that was going on in Britain during the early 1870s. What makes this particular company so remarkable is that it seems to have hanged on for so long.

¹³⁰The Guggenhiem family would move into the smelting industry in the Rocky Mountain region and build a multimillion dollar smelting plant in Murray. In order to reduce the competition they systematically bought out all the smaller competing smelters, including the ones in Sandy.

They were eventually in direct competition with the Rockefeller interests. It was the Rockefellers who founded the United States Smelting, Refining and Mining plant in Midvale.

¹³¹Papers of the Flagstaff Silver Mining Company and the Last Chance Silver mining Company, Limited (Companies Registration Office, Bush House, London). These records are available at the Bancroft Library, University of California, Berkeley, and were obtained as a part of the Library's Program for the Collection of Western Americana in Europe (hereafter cited CRO, BLRP.)

¹³²Ibid.

There are records of this company dating as late as 1903.¹³³ However, the actual smelting operations ceased much earlier than the twentieth century.

The actual smelter, The Last Chance Smelter, was owned by the Flagstaff Silver Mining Company of Utah, Limited. Another reason these two companies can be confusing is that they controlled mines from two different canyons: the Flagstaff mine was located in Little Cottonwood Canyon while the Last Chance mine was in Bingham Canyon. Ore was obtained from both of these sources. The smelter itself was located near Sandy Station just east of State Street at the corner of 9400 South, on the Utah Southern Railroad line.¹³⁴ This station was also the point where both the Bingham Canyon and Camp Floyd, and the Wasatch and Jordan Valley narrow gauge lines spurred off.

The works were clearly visible from the train as remembered by Mrs. Thomas L. Kane on a trip south to St. George. She mentioned stopping in Sandy on her trip and seeing the smelting works. As she tells her readers in her book Twelve Mormon Homes, the company was owned by the English and supervised by Germans.¹³⁵

¹³³Ibid.

¹³⁴Salt Lake County Recorders Office, Abstract Book A-5, 150.

¹³⁵Mrs. Thomas L. Kane, Twelve Mormons Homes (Philadelphia: William Wood, 1874), as cited in AX-I-DENT-AX (May 1932), 15.

The supervisor was a Mr. W.J. Wressels who commented that, "It is as pure [silver and lead bullion] as the Swansea Works and purer than we can obtain in Germany."¹³⁶ Initially, the works had two cuppola furnaces each capable of reducing ten tons of ore per day. It was first built by David Buel and I.C. Bateman, who then included the works into the deal with the British investors.¹³⁷

By November, 1872, the company had erected three vertical shaft cuppola furnaces. Two were in operation and one was still under construction. The motive power for this operation was primarily water, coming from Cottonwood Creek.¹³⁸

In December 1872, the Salt lake Tribune reported on an article which appeared in the London Mining World, a trade journal published in London, that said the Flagstaff Company smelter was doing "a fine business." Rossiter Raymond, in his report to Congress in the year 1874, said that the Last Chance Smelter was furnishing a "larger amount of base bullion than any other smelter in the territory." However, he also commented that they, like most of the other smelters

¹³⁶Ibid., The fact that the Last Chance Smelter was managed by a German was very unusual for so early in the period. The Germans did not generally arrive until later in the decade. This will be discussed in Chapter V.

¹³⁷Salt Lake Tribune, June 4, 1872, 1.

¹³⁸Salt lake Tribune, November 22, 1872, 2.

in the territory "seem to have run without any considerable profit."¹³⁹

The Salt Lake Tribune also reported that once the third furnace was installed and operational, the bullion output should double to eighteen to twenty tons of bullion per day. They stated that the price for bullion was steadily climbing, and bullion that had been selling for \$250 per ton was now selling for almost \$300 per ton.¹⁴⁰

The Flagstaff smelter incorporated a new type of furnace: one using a hot blast system instead of the standard cold blast. This hot blast system was the only one of its kind in the territory. Its primary importance was that it greatly reduced the amount of fuel needed to reduce the raw ore in the furnace.¹⁴¹ Raymond mentioned that the Last Chance Smelter also had put a "curious contrivance" on top of the stacks intended to catch the dust which it "fails to accomplish with any degree of perfection."¹⁴²

¹³⁹H.Exdoc. 177 (43-2) 1651 "Mining Statistics West of the Rocky Mountains, 1874," 329.

¹⁴⁰Salt Lake Tribune, December 12, 1872, 2.

¹⁴¹This new hot blast system used heated air through the tuyeres instead of the more common cold air. This speeded up the smelting process thus reducing the amount of fuel that was needed.

¹⁴²H. Exdoc. 177 (43-2) 1651 "Mining Statistics West of the Rocky Mountains, 1874," 329. Many of the improvements that were tried during this period were not instituted to improve any environmental problems but solely for the improvement of profits. The smelter operators knew for some time that much of their profits were being wasted as smoke leaving the chimneys. Many different types of improvements were made in

In January 1873, the company was still reported to be in excellent financial shape, paying dividends on all of its common stock. The company had been in business for almost a year and had already paid out over 69,000 pounds in dividends.¹⁴³

In the spring of 1874, the Flagstaff underwent improvements which included the addition of a new reverberatory furnace, bringing the total number of furnaces to four. The owners also intended to build a new engine house to replace the old one, which was badly in need of repairs. The Real Estate and Mining Gazette mentioned that in October 1875, the Flagstaff was one of the best paying operations in the territory.

The Saturn Smelting Company

The Saturn Silver Mining Company of Utah, Limited, was incorporated in England on 21 July, 1871.¹⁴⁴ The company was organized to mine and smelt ore from mines located in Bingham Canyon. The British company acquired the property from Alphonso Fitch Tilden and Mackswell Kinner both from Salt Lake City.

The Saturn Smelter was located near Sandy Station on the Utah Southern line, according to the Salt Lake Herald.

an effort to save some of this valuable smoke.

¹⁴³Salt Lake Tribune, January 27, 1873, 2.

¹⁴⁴Papers of the Saturn Silver Mining Company of Utah, Limited (CRO, BLRP).

The Salt Lake Herald also reported that the company was building three new furnaces with an anticipated capacity of fifty tons per day.¹⁴⁵ The Tribune reported on March 24, 1872, that the smelter would commence operations as soon as fuel could be found.

The plant began smelting ore in June 1872. Upon commencement of operations the Saturn Smelter had three cuppola blast furnaces, a six foot Sturtevant blower, a thirty horsepower engine, and a capacity of seventy tons per day. All of the furnaces and the engine were located under one roof, and the cost of building the complete works was \$20,000, a real bargain in smelter construction costs in those days. The superintendent of the works was William F. Fowler, considered a "fine metallurgist of the day."¹⁴⁶

Bullion shipments from the Saturn remained consistent, and during the month of July it shipped 148,118 pounds of lead bullion.¹⁴⁷ The ore used at the Saturn works were primarily obtained from the following mines: Emma, Vallejo, Last Chance, Frederick, Grizzly, Winsor, Plutarch, and the Wellington, all in Little Cottonwood Canyon. The following mines in Bingham Canyon also supplied ore to the Saturn smelter: Hidden Treasure, Spanish and Silver Hill. The

¹⁴⁵Salt Lake Herald, November 27, 1871, 3.

¹⁴⁶Salt Lake Tribune, June 4, 1872, 1.

¹⁴⁷Salt Lake Tribune, August 10, 1872, 3.

Saturn smelter received its fuel charcoal from Truckee, California, and Piedmont, Wyoming.

The November 27, 1872, edition of the Salt Lake Tribune called the Saturn Smelter "the Champion of the Territory." Citing that during a recent twenty-four hour run, the smelter was able to produce seventeen tons of bullion from two furnaces. The value of this bullion was close to \$300 per ton. On December 5, 1872, the Tribune reported that the Saturn Smelter was able to produce 107.5 tons of bullion during the previous ten days. The ten days prior to that they produced 142 tons. This bullion was assayed to contain 160 ounces of silver to the ton. Some of the bullion was sold to the Germania Refining Company located in Murray, where it was said by the superintendent to be "in point of ease of separation, far superior to the bullion of Spain, France, and Germany."¹⁴⁸

In the spring of 1873 the Saturn's older engine was replaced with a more powerful eighty horsepower one. Three more cuppola type furnaces were also erected to increase the amount of smelting performed.

Due to bad management and the decline in lead prices, the board of directors voted to dissolve the Saturn Silver Mining Company of Utah, Limited, on January 12, 1874.¹⁴⁹

¹⁴⁸Salt lake Tribune, December 5, 1872, 2.

¹⁴⁹Papers of the Saturn Silver Mining Company of Utah, Limited (CRO, BLRP).

The ownership of the smelter passed into the hands of the Sandy Smelting Company in October, 1875, where it continued to operate successfully under the supervision of Fred H. Meyers, the former superintendent of the Sheridan Hill Smelter in Midvale. Nothing more is known of this smelter until the Mingo Furnace Company acquired the land and equipment in 1877.

Mountain Chief Smelter

Being only a few yards to the south of the Saturn works, the Mountain Chief Smelter was located near the center of Sandy City in close proximity to Sandy Station. The Mountain Chief Smelter would later become the Mingo Furnace Company. The Mountain Chief was constructed in the early winter of 1872 and smelting operations began in May 1873. It started operations with two vertical blast furnaces.

In November 1873, the Mountain Chief Smelter ran into some legal problems with the owners of the Emma Mine, located in Little Cottonwood Canyon. The exact nature of the problems are not known, but the outcome was that the Mountain Chief Smelter was attached by the owners of the Emma Mine for the sum of \$1600.¹⁵⁰

¹⁵⁰Deseret Evening News, November 12, 1873. I believe that the problems had to do with the buying of Emma ore. The difficult financial times caused hardship on all the smelter operators including the Mountain Chief, and they probably had trouble paying for the ore.

The Mountain Chief Mining Company of Utah, Limited, dissolved on January 12, 1874,¹⁵¹ because of the financial panic during the fall of 1873.¹⁵² The furnaces were purchased by Thomas E. Clohecy, Esq. and the mines and associated mining machinery were sold at a sheriff's auction.

The Community of Murray

The smelters in Murray were located along the route of the Utah Southern Railroad, thus providing them with easy access to Eastern bullion markets. During the summer of 1871, the rates for shipping ore from Salt Lake City to Omaha, Nebraska were set at \$18-20 per ton.¹⁵³

The Woodhull Brothers Smelter

The Woodhull brothers first erected smelting works in Murray late in 1869. "The smelter was located just north of Big Cottonwood creek where it passed State Street the current location of the Murray Laundry [1939]."¹⁵⁴ They continued to run an economical smelting operation through 1870. However, they fell into the same problems that beset

¹⁵¹Papers of the Mountain Chief Mining Company of Utah, Limited (CRO, BLRP).

¹⁵²Utah Mining Gazette, June 6, 2.

¹⁵³Ibid., 300.

¹⁵⁴James W. Cahoon, Interviewed by Judge Moffat, 1937, Judge Moffat Collection, Utah State Historical Society, Salt Lake City, Utah.

all of the early smelter operators--the lack of technological expertise. Initially they created considerable excitement by producing 5,000 pounds of bullion in thirty-six hours. When the Woodhull Smelter first began operation, it consisted of a single cuppola with a capacity to handle eight tons of ore daily.

By 1871 the smelting works boasted of eighteen "well appointed and most efficient smelting furnaces . . . erected and put in running order," with an average production of sixteen tons each.¹⁵⁵ The assay value was approximately \$500 per ton in silver. "The metal was hauled to town, and stocked up in front of the Elephant store, where it attracted large numbers of people who were curious to see the pioneer bars of Utah."¹⁵⁶

The cost of the ore was high, the Woodhull brothers were not associated with any particular mining operation and had to purchase their ore on the open market. This proved to be extremely expensive, and after a few years the whole enterprise went broke.¹⁵⁷

Buel and Bateman Smelting Works

¹⁵⁵Murphy, Mineral Resources, 6.

¹⁵⁶Rossiter Raymond, Mines, Mills, and Furnaces of the Pacific States and Territories (New York: J.B. Ford and Company, 1871), 222.

¹⁵⁷Salt Lake Tribune, July 12, 1872.

Colonel David Buel's smelting works near Little Cottonwood creek and State Street was the next efficient furnace to begin operation. Construction of the smelter started in November 1870. It began producing bullion in January 1871. The works consisted of two hexagon furnaces.¹⁵⁸ They eventually became the property of the Flagstaff Silver Mining Company that dismantled the works and incorporated the equipment in their smelter in Sandy.

Wasatch Silver-Lead Smelting Company

Located on Big Cottonwood Creek about five miles north of Sandy were several smaller smelters. The Wasatch Silver-Lead Works was built in 1872. It was built to treat ore from the Reed and Benson, and Emma mines, in Little Cottonwood Canyon and from the Spanish mine in Bingham Canyon. These works were under the management of John Eddy, Esq. and the supervision of Mr. Wartenweiler, a young German who "thoroughly understands the smelting process."¹⁵⁹

There were two furnaces in operation, a small reverberatory furnace and a Scotch hearth vertical furnace. Running twenty-four hours a day, these two furnaces were capable of producing 35 tons of ore daily. In 1873 another furnace was under construction which was anticipated to have

¹⁵⁸Raymond, Mining Statistics of the West, 223.

¹⁵⁹Deseret Evening News, September 27, 1873.

the same capacity as the other two combined. In nine working weeks, 85 tons of bullion were produced from 239 tons of ore in one furnace.¹⁶⁰

The Salt Lake Tribune reported that the Wasatch Silver-Lead Works was destroyed by fire in February 1878.¹⁶¹ Mrs. Abbie Bird, in an interview with Judge David Moffat, remembers the "excitement of the men running to put out the fire and of seeing the flames."¹⁶² This smelter which was supervised by a German engineer, was one of the most efficient in the valley and, if not for a fire, would have lasted past the decline and high transportation costs of the late 1870s. The reverberatory furnace was installed at the insistence of Mr. Wartenweiler and it proved very satisfactory.

The American Hill Smelting Company

The American Hill Smelting works were located just east of State Street. Abbie Bird remembered that her father, Henry Atwood, sold the American Hill Smelting company the land on State Street in Murray.¹⁶³

¹⁶⁰The Mining Gazette, September 13, 1873.

¹⁶¹Salt Lake Tribune, February 23, 1878.

¹⁶²Abbie Atwood Bird, interviewed by Judge Moffat, September 22, 1939, Utah State Historical Society, Salt Lake City, Utah.

¹⁶³Abbie Atwood Bird, Interviewed by Judge Moffat.

The original intent of the American Hill Company was to establish a national mint in Murray. However, the facilities were not adequate and the enterprise was a total failure. Later it was turned into a smelting plant, and bullion was produced there.¹⁶⁴

The Mining Gazette reported on September 13, 1873, that extensive renovations were being made in the works. A new forty horsepower engine was installed and two new reverberatory furnaces were put in place.¹⁶⁵

The Germania Smelting and Refining Company

The Germania Smelting and Refining Company was the largest and most successful of all the Murray smelters. It was started on November 27, 1872,¹⁶⁶ when the company purchased a tract of land from Andrew Cahoon, Richard Gilbert, Robert Maxfield and Joshua Bennet.¹⁶⁷ The plant was located on State Street near where the ASARCO plant would later be built.

The Germania was the first refining plant in Utah. The first silver bars were shipped from these works. It was not until two years later that the Germania built a smelter so

¹⁶⁴Letter from Gottlieb Berger to Judge Moffat, January 20, 1936, Utah State Historical Society, Salt Lake City, Utah.

¹⁶⁵The Mining Gazette, September 13, 1873.

¹⁶⁶Cecil Alter, Utah, The Storied Domain (New York: The American Historical Society, 1932), 408.

¹⁶⁷Salt Lake County Recorders Office, Abstract Book A-1, 198.

that they could produce their own bullion. Judge Moffat reports from an interview with James W. Cahoon that the Germania was operating as a smelter about two years before he started working there.¹⁶⁸ On November 22, 1872, the Salt Lake Tribune reported that the Germania works would be completed soon, and that it was not an experimental project, "where the only object was to spend the funds of capitalists." The Germania works were to be built on the same process that proved very successful in Germany. The initial plan was to refine bullion produced in Utah, as well as bullion from surrounding territories.¹⁶⁹

In June 1873, the Germania works produced 85,000 ounces of silver bars, 400 tons of pure lead, and 858 ounces of gold. They increased their capital to \$600,000 and began the refining process almost exclusively for white lead.¹⁷⁰

Mr. Gustave Billing the resident manager, reported that during the year 1873 the facility was not completed and the works were not operating up to full capacity. The refining operation was only able to treat 10,000 tons of bullion during that year. All of the lead refined was sent to white-lead works in Chicago, Pittsburgh, Baltimore, Philadelphia, and New York.

¹⁶⁸James W. Cahoon, interviewed by David Moffat, 1939, Utah State Historical Society, Salt Lake City, Utah.

¹⁶⁹Salt Lake Tribune, November 22, 1872.

¹⁷⁰The Utah Mining Journal, September 13, 1873.

The works were situated along the Utah Southern Railroad and according to the Utah Mining Journal, were the most successful works in the United States. The plant consisted of six furnaces: two reverberatory softening furnaces, two calciners, and two flowing furnaces. The engine produced forty horsepower which was ample to supply the blast. The plant employed water as its motive force, using a pump capable of moving 300 gallons per minute.¹⁷¹ In May 1874 the Germania Company erected two blast furnaces in order to produce their own bullion instead of having to depend on other works for bullion. The Deseret Evening News reported that the Germania Works began to ship in ore from surrounding mines for this purpose.¹⁷²

The Germania used fume condensers to protect the men working at the plant as well as the people living nearby. These fume condensers caught the poisonous fumes before they could escape into the air. The Germania was very sensitive to the health and well being of the men working there, a concern not shared by the majority of other smelter operators in Utah.¹⁷³

¹⁷¹For a complete detailed description of this refining plant, unique in Utah, is located in The Utah Mining Journal, February 21, 1874. This description is about three pages long and gives in great detail the whole refining process.

¹⁷²The Deseret Evening News, May 15, 1874.

¹⁷³The Salt Lake Tribune, January 1, 1877.

In many cases, the ability of a smelter to remain in operation through these early years was based on a number of things. The amount of financial backing was probably the number one reason the smelters that survived were able to do so. The backing from foreign and Eastern investors played a major role in keeping these pioneering smelters in business.

The speed in which they were able to convert over to the more efficient reverberatory furnaces also played a significant part in their ability to survive. Coupled with this was the fact that the industry changed with the arrival of German engineers into the Western mining scene who enabled the industry to survive and grow into one of the major industrial developments of the nineteenth century.

Chapter VI

A Period of Stabilization: 1880s and 1890s

As the smelting industry moved into the final two decades of the nineteenth century, many changes were incorporated that allowed it to prosper and provide jobs for the many new gentile immigrants coming into the Salt Lake Valley. The mid 1870s were a weeding-out period for many of the smelters located in Salt Lake. Technology was changing rapidly, and the successful smelters made the necessary changes to stay competitive. The smelter owners all walked a fine line between failure and financial success, and it was the incorporation of new, innovative technology that provided the bridge between success or failure.

The arrival of German trained mining engineers also breathed new life into the difficult smelting industry. Engineers like Anton Eilers gave the industry the technological boost it needed. He was credited with building the Eilers Smelter at Pueblo, Colorado in 1883. This plant gained a reputation as a veritable metallurgical training school for newly trained mining engineers. He changed lead smelting from a rule-of-thumb affair to an

exact science by working out the theory and practice of slag formation on an accurate chemical basis.¹⁷⁴

The reverberatory furnace proved to be the technological advancement that put the smelting industry on the road to financial success for the rest of the century. The principle behind the operation of the reverberatory furnace was that the charge (ore) was not in contact with the fuel but is in contact with the flame or heat source. The furnace operates by deflecting or reverberating, the heated gases from the sloping roof onto the metal. This process proved to the salvation of the smelting industry and was implemented largely due to the influence of the German trained mining engineers.

The Old Jordan and Old Telegraph Smelters

On October 17, 1878, the Old Jordan Mining and Smelting Company was sold to Liberty E. Holden, who in turn formed the Old Telegraph Mining and Smelting Company.¹⁷⁵ No reason was given as to why Carson and Buzzo decided to sell an obviously lucrative smelting business. The only reason that can be surmised was that the low price of lead in 1877 seriously weakened their financial position.

¹⁷⁴Clark Spence, Mining Engineers and the American West: The Laclede Brigade, 1849-1933 (New Haven, Conn.: Yale University Press, 1970), 240.

¹⁷⁵Salt lake County, Records Office, Abstract Book N, 280.

The Old Telegraph Smelting Works were situated on the banks of the Jordan River, south of the Bingham Canyon and Camp Floyd Railroad at approximately 7800 South Street. The property was located in section 35, township 2 south, range 1 west.

The smelter was operating in the late 1870s, and the first record of this smelter was dated October 17, 1878.¹⁷⁶ The record shows that the two previous smelters, Sheridan Hill and Galena/Old Jordan, were no longer operating, and the Old Telegraph was the only operating smelter in Midvale. It was comprised of the works from both of the other two.

In 1879 the output from the Old Telegraph was quite substantial: 6,128,927 pounds of unrefined lead, 153,735 ounces of silver and 92 ounces of gold. In the following year, 1880, the output was similar: 4,242,608 pounds of lead, 119,401 ounces of silver, and 150 ounces of gold.¹⁷⁷ The output for these two years ranked the Old Telegraph smelter as one of the largest in the Territory.

On October 16, 1878, the board of directors of the Old Jordan Mining and Smelting Company agreed to sell to the Old Telegraph Mining and Smelting Company, owned by Liberty E. Holden, all their lands south of the Bingham Canyon and Camp

¹⁷⁶Salt Lake County, Records Office, Abstract Book N. 280.

¹⁷⁷Salt Lake Tribune, January 1, 1880, 1881, 4.

Floyd Railroad. This included the Sheridan Hill Smelter site, which was sold for the sum of \$40,000.¹⁷⁸

Liberty E. Holden was involved in many early mining activities. He had previously purchased the Old Telegraph Mine in Bingham Canyon and now wanted to use the smelter to provide him with a cheaper way of turning his ore into bullion without the added expense of shipping it back to smelters in the East. Unfortunately for Holden, most of his mining career was marred by lawsuits from disgruntled investors in his mining endeavors. Liberty Holden tried to downplay the value of the Old Telegraph Mine in order to purchase more of the stock for himself. When his Eastern and foreign investors realized what was happening they filed suit, which dragged on for many years.¹⁷⁹

The Salt Lake Tribune reported on January 1, 1879, that the Old Telegraph Works were the most economical in the country. By using water power supplied by the Galena Canal the operation in Midvale was able to run very cheaply. The smelter had the capacity to smelt over 200 tons per day, making it one of the largest in the territory.

On May 5, 1879, Liberty E. Holden sold his interest in the Old Telegraph Mining and Smelting Company to a French company called Societe des Mines D'Argent et Founderies de

¹⁷⁸Salt lake County, recorders Office, Abstract Book N. 961.

¹⁷⁹Engineering and Mining Journal, August 15, 1879, 98.

Bingham, for a cash price of \$3,000,000, probably the largest strictly cash transaction on record for any mining property.¹⁸⁰ Later, this company sold its interest to another french company called Societe civile des Mines de Lexington et de L'Utah.¹⁸¹

Later into the mid 1880s the Old Telegraph mine and smelter were acquired by a French company, Societe des Mines d'Argent et Founderies de Bingham. This was one of the first foreign (other than British) investments into the Utah economy.

By the 1880s, the ore from the surrounding mines was beginning to slack off in its quality, low grade ore was the norm and a more efficient means of working it had to be found. Reworking the old slag was an answer to declining profits. In February 1888, the Old Telegraph made one of the first attempts in the Utah Territory to rework some of its slag. This effort produced a profit of \$25,000 which made it worthwhile to continue this process, not only at this smelter but at all the smelters in the area.¹⁸² In some cases smelting companies bought slag from older

¹⁸⁰Salt Lake County, Recorders Office, Book N. pg. 968. Further reference to this transaction can be found in the Intermountain Mining Review (Salt Lake City), July 9, 1896, pg. 4, which explains the amount of cash and more fully describes the nature of the transaction.

¹⁸¹Salt lake County, Recorders Office, Mining Deeds Book N, 229-233.

¹⁸²Engineering and Mining Journal, February 11, 1888, 114.

discontinued companies and reworked their slag. The large ASARCO plant in Murray purchased the slag piles from surrounding communities and extracted the metals from them.

In July 1896, the Old Telegraph Mining and Smelting Company and the following French companies was sold to the Conglomerate Mining company. Three years later it was again sold to the United States Mining Company, an early progenitor of the United States Smelting, Refining and Mining Company which would control smelting in Midvale throughout the twentieth century. When the French company sold its interest to the Conglomerate Mining company in 1896, it brought an end to the smaller smelting operations of the nineteenth century.

Flagstaff/Last Chance Smelting Works

After 1877, the story gets a little cloudy. As the two companies, the Flagstaff Silver mining Company and the Last Chance Silver Mining Company were trying to reorganize, the smelter in Sandy was left out of the reorganization process. According to the county recorder a lawsuit was filed between the two companies and the ownership of the smelter was finally decided by a sheriff's sale.¹⁸³ On April 20, 1878, part of the smelter property was transferred to Erwin Davis,

¹⁸³There is no reference as to why this type of action was required however, I believe that the lead panic of the late 1870s was to blame. Most of the companies operating in Utah seemed to go through some sort of major reorganization during these months.

a mining promoter. Liberty E. Holden, after selling his interest in the Old Telegraph Mine and Smelter in Midvale, gained title to the smelter on February 17, 1881.¹⁸⁴

The Engineering and Mining Journal reported in November 1886 that the Old Flagstaff Smelter passed into the hands of Messrs. Lyon and McClean who were scheduled to install two eighty ton furnaces after making extensive repairs.¹⁸⁵ Lyon and McClean felt that they could rework the slag pile which would pay for the needed renovations.

After this there was no further reference made concerning the Flagstaff or Last Chance Smelters. After 1903, the British company had finally dissolved for the last time, and ASARCO was under way smelting all the ore brought into the valley.

Mingo Furnace Company

The Mingo Furnace Company became one of the largest in the territory and quickly turned Sandy into the center of smelting activity in the valley. By the 1890s, it was producing the larger amounts of bullion than any other smelting operation.

The first mention of the Mingo Smelter was in the Salt Lake Tribune in January 1, 1878. After the Mountain Chief company went bankrupt, the smelting works were operated by

¹⁸⁴Salt Lake County Recorders Office, Abstract Book A-5, 233.

¹⁸⁵Engineering and Mining Journal, November 13, 1886, 354.

various people until 1877. It was at this time that the Mingo Furnace Company acquired the property and began to do custom smelting work. They bought the ore from other mines, because they did not own any mines themselves. The Tribune reported in 1878, that the Mingo Smelter "is really the greatest reduction works in Utah."¹⁸⁶

By 1877 the Flagstaff/Last Chance Smelter was no longer operating, making the Mingo the only smelter operating in Sandy. The Mingo was operating with four furnaces and had the capability of reducing 20 tons of ore per furnace. When all the furnaces were running the smelter could produce sixteen car-loads of bullion per week. Sixty-five men were employed at the smelter, making the Mingo one of the largest single employers in Sandy. During the previous year (1877) the Mingo produced 3,049 tons of lead, 166,600 ounces of silver and 940 ounces of gold, making it the largest single producer in the territory.

In January 1880, the smelter was still producing high quality bullion under the supervision of John A. Knapp, "a thorough and skilled smelter." The furnaces were run exclusively on ores purchased from surrounding mines.¹⁸⁷

The Mingo smelter was continuing to produce high quality bullion in 1882. The Salt Lake Tribune called it the "most complete smelting works as are to be found in the

¹⁸⁶Salt Lake Tribune, January 1, 1878, 5.

¹⁸⁷Salt Lake Tribune, January 1, 1880, 4.

West."¹⁸⁸ During the year 1881, the Mingo had produced 19,000,000 pounds of base bullion, most of which was shipped back to the Pennsylvania Lead Company located in Pittsburgh, Pennsylvania. The Engineering and Mining Journal reported that since the Mingo began operations on January 1, 1877, it had run steadily and shipped its 2,000th carload of bullion. With an average of 13 tons per carload, it has shipped over 26,000 tons of base bullion.¹⁸⁹

A large fire devastated the Mingo plant in 1887, which caused the smelting operations to stop until the plant could be rebuilt. In June of 1888, the plant was again restarted and smelting began again. The new Mingo plant was reported in 1888 by the Engineering and Mining Journal to be "one of the best plants in the West and has been made as near fireproof as possible."¹⁹⁰

In August 1888, the Mingo Smelter was ready to begin operations again, after a long period while the plant was being rebuilt. The Daily Tribune, reported that it is an "important piece of news to be able to announce the resuming of work by this smelter, as it means renewed activity in mining all over the territory, and the employment directly and indirectly of several hundred laborers."¹⁹¹

¹⁸⁸Salt Lake Tribune, January 1, 1882, 5.

¹⁸⁹Engineering and Mining Journal, February 10, 1883, 77.

¹⁹⁰Engineering and Mining Journal, June 2, 1888, 405.

¹⁹¹The Daily Tribune (Salt Lake City), August 30, 1888.

In July, 1891, the Mingo Smelting Company was formed to take over the Mingo Furnace Company. James E. Schwartz of Pittsburgh was named as president.¹⁹² On this date the smelter property and machinery, at a value of over \$500,000 was transferred to the new company.

The Mingo ceased operations on December 26, 1900. The sale of the smelter and its associated machinery and property to the American Smelting and Refining Company was the end of smelting operations at the Mingo.¹⁹³ By the time the Mingo was sold, its machinery and furnaces were old and outdated. The cost of repair was greater than the cost of just allowing the fires in the furnaces to go out. ASARCO was preparing to build the largest smelter of its kind in North America at a cost of over \$1,000,000 in nearby Murray, and it felt that the wisest choice was to cease operation at the Mingo.

It was a sad day for smelter workers in Sandy. Now there that were no operating plants in the city. However, before formally closing the plant, the officials made each employee a present of a Christmas turkey.¹⁹⁴

The American Smelting and Refining Company leased the slag dumps from the city of Sandy for the next two years in

¹⁹²Engineering and Mining Journal, July 18, 1891.

¹⁹³Salt Lake County Recorders Office, Abstract Book D-2, 100.

¹⁹⁴The Daily Tribune, December 26, 1900, 6.

order to mine the vast quantities of slag that was left near the smelter.¹⁹⁵

The Hanauer (Morgan) Smelting Works

According to a conversation with James W. Cahoon (1938), Judge Moffat reported that the Morgan Smelter was built in 1872-73. It was located south of Big Cottonwood creek near State Street. The Morgan became the Hanauer sometime in the early 1880s. These works were located about one mile north of the Germania works.

Henry W. Brown¹⁹⁶, states that the Hanauer Smelting Works shared water from Big Cottonwood Creek with the Gordon Grist Mill also located near the Hanauer smelter. These two operations shared the water until approximately 1890, when the grist mill ceased operating. The Hanauer continued until about 1902, when it was shut down and purchased by the American Smelting and Refining Company.¹⁹⁷

In the late fall of 1884, the Hanauer Smelting Works were destroyed by fire. In the spring of 1885, the smelting works were rebuilt. They started operations again on March

¹⁹⁵Salt Lake County Recorders Office, Abstract Book D-2, 102.

¹⁹⁶The Progress company was a type of utility company that provided various city services including power and water to the city of Murray. It was owned in part by the Cahoon Family.

¹⁹⁷Judge David Moffat Collection, Utah State Historical Society, Salt Lake City, Utah.

11, 1885.¹⁹⁸ The new smelter also had increased capacity. In April 1888, the Hanauer Smelting Works were shut down to make extensive renovations. The addition of two new furnaces, both reverberatory types, increased the production by 33 percent. This addition made the smelter the largest in the territory.

A report, in the Engineering and Mining Journal, mentioned that the Hanauer was undergoing renovations to enable it to compete with any works in the state.¹⁹⁹ In June, 1898, the Hanauer Smelting Works added a new furnace with the capability to reduce 90 tons of ore per day. In the same new steel building there was room for two additional furnaces with the same capacity. The report also mentioned that the Hanauer had the best water supply in the Salt Lake Valley. Its condensing engine required 18,000 gallons per minute.

Soon after the turn of the century the Hanauer was purchased by ASARCO and shut down. Along with the Germania, the Hanauer was the largest and most advanced smelter in Murray.

The Horn Silver (Franklyn) Smelting Works

¹⁹⁸Engineering and Mining Journal, March 21, 1885, 197.

¹⁹⁹Engineering and Mining Journal, October 31, 1896, 419.

The Horn Silver Smelting Works were reported to be one mile north of the Germania, near the Hanauer Smelting Works. The property on which the Horn Silver was built was acquired from William Atwood on October 4, 1880.²⁰⁰ However, in a conversation with William G. Park, Judge David Moffat reported that Park, a lifelong resident of Murray cannot remember the Horn Silver Works.²⁰¹ In Bancroft's History of Utah he mentions that the Horn Silver was located one mile from the Germania.

The capacity of the Horn Silver was about 55 tons per day. This production was obtained using five shaft and one reverberatory type furnaces. These works along with the Germania were considered the "best in the country."²⁰²

The Horn Silver Smelter was constructed in 1881, to smelt ores from the Horn Silver mine located in the Silver Reef district, almost 225 miles to the south.²⁰³ Apparently the owners were under pressure to build their new works near the other Utah smelting works in the Salt Lake Valley.

The Germania Smelting and Refining Company

²⁰⁰Salt Lake County Records Office, Salt Lake City, Utah, Abstract Book A-1, 187.

²⁰¹William G. Park, interviewed by Judge David Moffat, David Moffat Collection, Utah State Historical Society, Salt Lake City, Utah.

²⁰²Bancroft, History of Utah, 749.

²⁰³Salt Lake Tribune, May 25, 1881, 3.

The noted mining engineer Anton Eilers was hired by the Germania Smelter and worked alongside Gustave Billings to turn the it into one of the premier smelters in the West. Billings was the financial expert at the plant but when technical problems beset the smelter it was Eiler's expertise that was the critical key to success. Eilers arrived from Germany after completing his education at the Mining Academy of Clausthal. Shortly after arriving in America, he met Rossiter Raymond and quickly developed a lifelong friendship. When Raymond became Commissioner of Mining Statistics in 1869, he hired Eilers as his deputy. Eilers toured mining districts throughout the West and wrote reports that made their way into Raymond's reports to Congress.

After being hired by Billings in 1876, Raymond and Eilers formed a partnership that took them to Colorado in 1878. They left the Germania Smelter and began their own operations in Leadville.²⁰⁴ On an average forty men were constantly employed working two shifts every twenty-four hours. During 1877, the smelter was able to produce 1,700 tons of base bullion having a total value of \$262,500.²⁰⁵

In April, 1882, the Germania built a white-lead refiner which made it possible for the Germania to produce their own

²⁰⁴James E. Fell, Jr. Ores to Metals: The Rocky Mountain Smelting Industry (Lincoln, Nebraska: University of Nebraska Press, 1979): 95-97.

²⁰⁵Ibid.

white-lead bullion. It was anticipated that this new refiner would have a capacity of nearly 3,000 tons per year to begin with, which would eventually be increased to 5,000 tons. At the end of 1882, the Germania produced 8,213,780 pounds of refined lead, 561,777 pounds of unrefined lead, 388,614 ounces of silver, and 815 ounces of gold. By 1883, the Germania was producing its own white-lead and lead pipe, instead of shipping their refined lead to refiners in the East.²⁰⁶

By the fall of 1883 two more furnaces were in operation making a total of four smelting furnaces employing over 250 men. The company was reducing ore from as far away as Montana and Idaho, as well as local ore from Utah. The smelter shipped fifty-six cars of bullion during the month of August 1883, valued at \$129,006. It was shipping approximately one car per week of white-lead and lead pipe valued at \$1500.

By the end of 1883, the Germania works built a new structure for the purpose of enlarging its manufacturing facilities. No lead products were shipped back to New York, because the plant was using all the lead it refined to manufacture pipe, white-lead, and all the lead used in the manufacture of paint. They also erected a "fine sampling

²⁰⁶The Engineering and Mining journal, February 3, 1883, 62.

mill, no such works nearer than Omaha or San Francisco."²⁰⁷

In the spring of 1886 the Germania closed down its operations to install a new engine of larger capacity.

In the summer of 1888, the smelter closed down its operations on account of high transportation costs. The "disastrous freight rates exacted by the railroads" forced the management of many of the smelters to close down and blow out their furnaces. The railroads were charging \$18 per ton for bullion and \$12 per ton for ore.²⁰⁸ The following spring the smelters started up again running thirty ovens and using Castle Gate coke for fuel.²⁰⁹ The smeltermen reported that the Castle Gate coke was just as good as anything from the East or Colorado.²¹⁰ The following summer the refining plant was improved and a new blast furnace, and three stacks were replaced at a cost of nearly \$250,000.

By the beginning of 1897, the Germania stopped the refining of its own base bullion. It began contracting out this process to the refiners at the Omaha and Grant works in

²⁰⁷The Engineering and Mining Journal, December 15, 1883.

²⁰⁸The Engineering and Mining Journal, July 28, 1888.

²⁰⁹Once the Rio Grande Railroad had rail lines running into the Carbon County, Price Utah area, good quality coking coal could be obtained. This greatly reduced the cost associated with doing business in the Salt Lake Valley.

²¹⁰The Engineering and Mining Journal, May 11, 1889.

Nebraska. This contract was worth an estimated \$1,255,000 to the Germania Company.²¹¹

On March 25, 1898, a fire broke out at the smelter destroying two of the seven stacks and causing the other five to be inoperable because their connections were damaged. It was reported that they would immediately be repaired, and by June of that same year they were operating again.²¹²

By the spring of 1899 all the smaller local smelters were closed down, leaving only the Germania still in operation. The ASARCO plant was under construction in Murray and soon the Germania would also close down.²¹³ The Germania could handle about 500 tons of ore per day through its five stacks.

In April 1900, a strike stopped production at the American Smelting and Refining Company's Germania plant. The men wanted an increase of thirty-five cents per day. The wages at the time for ordinary laborers were between \$1.40 and \$1.90 per day. Utah was an eight hour workday

²¹¹The Engineering and Mining Journal, April 24, 1897.

²¹²The Engineering and Mining Journal, June 11, 1898.

²¹³The Germania was purchased by ASARCO but allowed to remain operating until the new plant could be constructed. The details of this transaction is recorded in the Salt Lake County Recorders Office, Abstract Book D-4, July 7, 1899, 3.

state.²¹⁴ When the operations began again, only 300 of the original 550 men were back on the job and production was greatly curtailed.²¹⁵

In July 1901, construction was proceeding at the new ASARCO plant near the Germania. The Germania was employing over 700 men and treating "an unprecedented volume of ore."²¹⁶ During the month of August, the Germania reduced a record 13,000 tons of ore. The following year the big \$3,000,000 smelting plant of ASARCO was completed, and the Germania was shut down with all work transferred to the new plant.

With the closing of the Germania and the Mingo Smelters, this phase in the history of the smelting industry in Utah also came to a close. From this point on the industry would be controlled by the larger international companies: American Smelting and Refining Company (ASARCO), United States Smelting, Refining, and Mining (USSR&M), the International Smelting Company operating in Tooele, and Kennecott Copper Company operating a smelter in Garfield, Utah.

²¹⁴Utah was one of the few states passing legislation requiring an eight hour working day. Soon other states would pass similar legislation.

²¹⁵The engineering and Mining Journal, April 21, 1900.

²¹⁶The Salt Lake Daily Tribune, July 9, 1901.

Chapter VII

Conclusion

Three major factors played a key role in making the Salt Lake Valley as a center of the smelting industry in Utah. The closeness of the ore supply, the central location with access to an efficient means of transportation, and an excellent supply of water all provided the Salt Lake Valley with the resources necessary to recommend it as a smelting capital.

The early story of the smelting industry is characterized by conflict and opposition. Brigham Young and the early Mormon pioneers were opposed to the influx of non-Mormons into their western haven and fought the beginnings of this lucrative industry. The vision of Brigham Young did not include the mining of precious metals and therefore he tried hard to discourage his pioneering band to reject the fever that would soon grip the rest of the nation. But, the mining industry would not go away and Brigham Young realized that he had to allow his followers to take a limited role in its development. By the mid 1870s Mormons were working in the mines and smelters, albeit in a part time role. Some Mormons continued to devote the majority of their efforts to

agriculture but during the winter months they would work in the smelters.

To a large extent the story of the mining and smelting industry is a gentile or non-Mormon story. By the time Brigham Young saw the potential that could be reaped by mining and smelting the industry was firmly in the hands of the non-Mormons. It was also during this time that many Mormons were being persecuted for their polygamous beliefs and their money and property was confiscated, which prevented them from taking an ownership and investing role in this new industry.

Brigham Young was in some ways still to blame in this aspect as well. Even though he reluctantly agreed to allow his followers to work in the smelters and mines he refused to allow them to invest or take a speculative role in their development. However, by the late 1870s (Brigham Young died in 1877) and early 1880s a few wealthy Mormons were able to take advantage and capitalize on the tremendous profits that were available.

The early pioneering smelting operations began by General Connor were ill-conceived and inadequately staffed. The Utah ore was difficult to treat because of its refractory nature. These early efforts were crude at best, and a tremendous amount of money was lost trying to smelt the lead and silver ore found in the surrounding mountains.

However, the high cost associated with transporting the raw ore back to smelters in the East required that solutions to these early problems be found. The smelting industry tried many new technologies in an effort to solve the problems of reducing ore, and eventually came to adopt the successful reverberatory furnace widely used in Europe. With adoption of the reverberatory furnace, the region also benefitted from the expertise of the German mining engineers who implemented this new technology.

It was the skill of the German engineers that made it possible to solve many of the difficult technological problems that reduced the effectiveness of the smelting works. Unfortunately, this new expertise and technology did not arrive in time to save many of the earlier, smaller smelters operating in the early 1870s. Those smelters that did not change to the newer more efficient furnaces went bankrupt.

The late 1870s and 1880s saw a period of relative stabilization and growth. The smelters that survived generally remained active unless some other factor (fire or labor action) played a role in their demise. The Mingo, Germania, Hanauer, Horn Silver, and Old Telegraph smelters all maintained relatively solid output totals during these years.

The third period of change for the Utah smelting industry came as a result of the depression during the

1890s. Silver and lead prices both saw a decline, and small businesses had a difficult time surviving. The large international corporations saw the possible potential in the industry and realized that the only way to make the industry work was by consolidation. The smelter trusts were formed during this period by eastern industrialist families such as the Guggenheims and the Rockefellers. This move toward consolidation was the end for the smaller independent smelter operations. The Mingo, Germania, and the Hanauer were all purchased by the American Smelting and Refining Company interests, and the Old Telegraph was purchased by the predecessors to the United States Smelting Refining and Mining Company.

The twentieth century saw the continued development of the smelting industry, and by the 1920s the Salt Lake Valley had become the largest smelting center in all of North America. Smelting continued in the valley until 1958 when the USSR&M smelter closed down. However, the International Smelter in Tooele, Utah, continued operations until 1972. The Kennecott Copper Smelter in Garfield continues to smelt copper ore today. All that remains of this industrial legacy are a few crumbling foundations, abandoned slag piles and the clean up efforts reflected in current litigation.

GLOSSARY

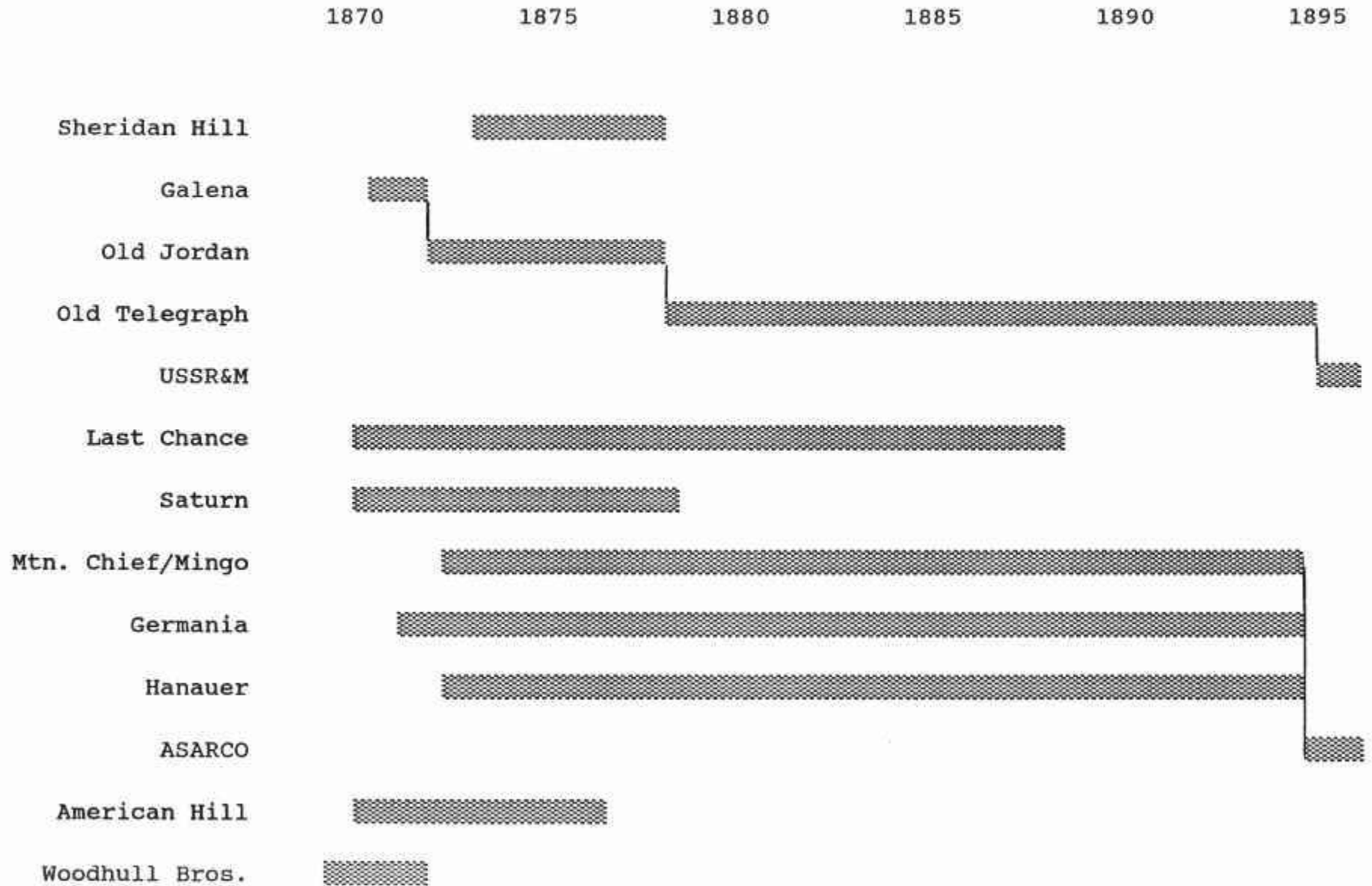
- Base Bullion.** Unrefined metal in mass, such as silver, lead or gold.
- Blast.** The air which is blown into a furnace is called the blast.
- Blast Furnace.** A tall, cylindrical furnace used in the smelting process. It is composed of five main parts: bottom, hearth, bosh, stack, and top. The raw ore is introduced into the furnace through the top with the fuel, it is then melted, and the metal and slag are separated and removed from the furnace.
- Calcinating.** The concentration of iron ores by roasting or burning to drive off carbon dioxide, etc., and to oxidize the minerals to a ferric state.
- Charge.** The total ore, pig iron, scrap, limestone, etc., introduced into a melting furnace for the production of a single amount of bullion.
- Cuppola Furnace.** This furnace is most commonly used for the production of pig iron in a foundry. It is lined with firebrick (refractories), and open at the top and bottom. The furnace is supported on legs which keeps it off the ground. The bottom is opened and the metal and slag are removed.
- Hexagon Furnace.** A blast furnace with a hexagonal pattern. It has six sides to the charge chamber.
- Mackenzie Furnace.** Another name for the cuppola type furnace.
- Matte.** An impure metallic sulphide product obtained from the smelting of sulphide ores of metals such as copper, lead, and nickel.
- Placer Mining.** A type of gold mining using water. Gold is often found in an alluvial, marine, or glacial deposits. Usually found by using the gold panning technique.

- Reduction.** The reverse of oxidation. A chemical change involving decrease in the state of oxidation. The chemical reaction in which oxygen is removed from the ore in a blast furnace. This process then leaves the mineral content and removes the other impurities.
- Refining.** The term as applied to metals in general, refers to operations performed after the crude metals have been extracted from their ores in order to obtain them in a condition of higher purity.
- Refractory.** The quality of resisting heat. Certain ore was said to be refractory meaning that it was difficult to reduce or smelt.
- Reverberatory Furnace.** A furnace in which the ore is exposed to the action of flame, but is not in contact with the fuel. The principal of the furnace is the deflection or reverberation of the heated gases from the sloping roof onto the ore.
- Slag.** In a furnace slag is the molten non-metallic layer formed by the reaction of the flux and the ore, which floats on the surface of the molten metal. This is removed and discarded as a waste product. Today it is used in the construction of highways, railroads tracks and even driveways in place of gravel.
- Smelting.** A metallurgical process, or series of processes, whereby a metal or compound is separated in a state of fusion from its ore or other material with which it is chemically combined or physically mixed. The separation of the impurities which are highly refractory involves the fusion of the ore with suitable fluxes to produce a melt consisting of two layers, the molten metal sinking to the bottom, and the slag on the top.
- Tuyere.** A nozzle through which air is blown into a furnace.

Appendix 1

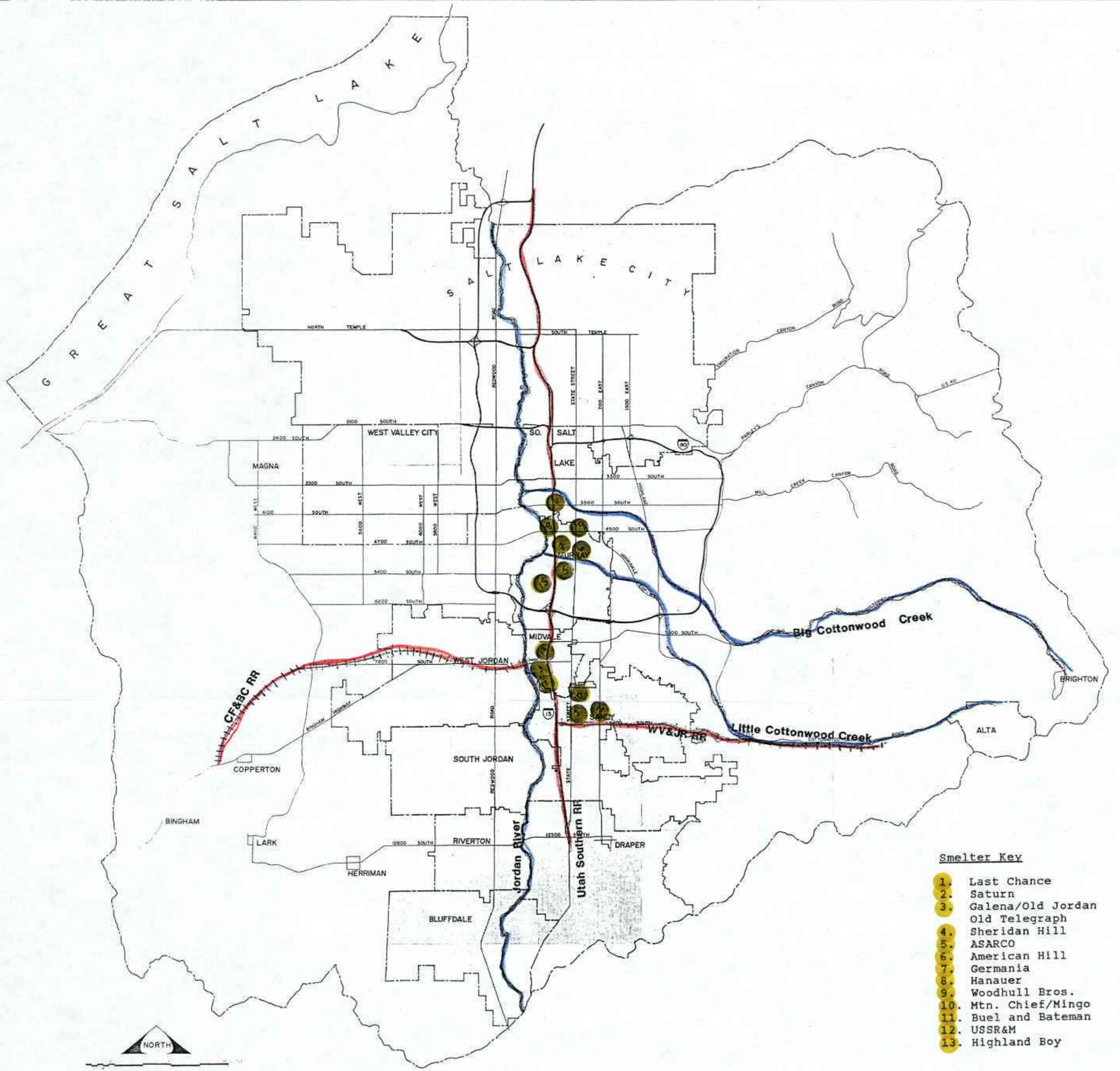
A chronological graph depicting the development of the Salt Lake Valley Smelting Industry.

The Development of the Smelter Industry in the Salt Lake Valley



Appendix 2

A map of the Salt Lake Valley showing the location of nineteenth century smelters, important railroads, and water supplies.



Smelter Key

1. Last Chance
2. Saturn
3. Galena/Old Jordan
4. Old Telegraph
5. Sheridan Hill
6. ASARCO
7. Germania
8. Hanauer
9. Woodhull Bros.
10. Mtn. Chief/Mingo
11. Buel and Bateman
12. USSR&M
13. Highland Boy

SALT LAKE COUNTY

March 1986

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The Development of the Smelting Industry in the
Central Salt Lake Valley Communities of
Midvale, Murray, and Sandy
Prior to 1900

Charles E. Hughes

Department of History

M. A. Degree, August 1990

ABSTRACT

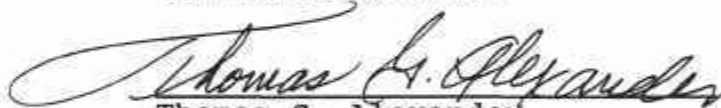
This thesis found that the three communities of Midvale, Murray, and Sandy were the center of the smelting industry in the Salt Lake Valley. These communities became the center of smelting because of their central location, the readily available water supply, and the availability of an inexpensive, efficient transportation system to ship the bullion. The smelters were surrounded by two major mountain ranges which provided a ready supply of good lead, silver, and copper ore.

The development of the smelting industry followed three separate phases or periods. The first phase was one of experimentation or period of discovery, in which the smelters operated without the technological skill necessary to be financially successful. The second phase was highlighted by the emergence of skilled German mining engineers who enabled the smelters to be financially successful. Phase three was ushered in during the late nineteenth century by the industrialists who consolidated the smaller smelters and built larger, more efficient plants.

COMMITTEE APPROVAL:



G. Wesley Johnson,
Committee Chairman



Thomas G. Alexander,
Committee Member



David C. Montgomery,
Graduate Coordinator