

Chapter 8

ROOTS OF THE CALUMET

A Short History of the Calumet and Arizona Mining Company

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Introduction

*Me Pard was a fellow called Tony-
A likeable chap all-around,
A good one for drillin, hand-blastin'-
A fair one, at catchin' hup ground.*

*'E' ated those chaps they called Texans,
'E' adn't no use for a Finn,
The Swedes, the Bohunks and Mexicans
'E' ated them creatures like sin.*

*'E' said it was God made the Dagoes-
The Devil, e' said, made the Dutch,
But oo' ever hit was made the Cousin Jack
'E' reckinned, 'e didn't make much.*

(Ned White)¹

Of all of the ethnic groups that poured into Bisbee, Arizona at the turn of the century it was the Cornish Miner or Cousin Jack who brought the technology that allowed the camp to become a large industrial complex during the first half of this century

Bisbee is at once both quaint and beautiful. Its reason for being is the rich deposits of copper, gold and silver that once underlay its rugged limestone surface. Over a century of copper production from this camp produced enough copper to build a belt for the world sixteen inches wide and one inch thick². Since discovery in the 1870s the history of the camp has been well documented. The tradition of mineral production was the result of the great economic genius of several people and the persistence of many hard rock miners.

A question often asked by historians is, "Did James Douglas make Bisbee or was it Bisbee that made James Douglas?" Certainly, it was the success of James Douglas at Bisbee that brought the Copper Queen Consolidated Mining Company and Phelps Dodge Corporation into a position of leadership in the copper mining industry. There is no doubt that it was Douglas' metallurgical proficiency that made the production of anode copper profitable in this waterless, fuelless land. It was others, however, that

brought in the necessary sophistication in geological and mining technology needed to find the scattered ore deposits of the Warren Mining District.

Douglas himself brought in some of this talent, but a major contribution was made by the Calumet and Arizona Company. The initial staffing and direction of this company was provided by a group of "Scots" and "Cousin Jacks" from Michigan's Calumet copper country. The Cousins, regardless of the passing generations that were born on American soil, referred to England as "the omeland" and "ome" was the "Old Country."³ From the tin mines in Cornwall to the copper mines of Michigan, to the western copper camps these professional miners brought skills and discipline to underground mining. Their skills in hand-drilling, blasting, timbering, pumping and stoping were a point of tradition and outright snobbish pride; after all, they had mined tin for the Romans.⁴ This pride and tradition can be recognized in the Cornish toast "To fish, tin and copper."⁵

The forerunner of the Calumet & Arizona Mining Company, the Lake Superior & Western Development Company, was formed in a room over a drug store in Red Jacket, Michigan in 1899. It would be used as a development company to find and develop copper deposits. A new company would be formed and financed to mine the deposit after an asset had been identified. This would allow the formation of capital necessary for a large copper mining company with several shafts and a smelter.

The Scots and Cousins who formed this original company brought their technology to Bisbee, Arizona at all levels of management. It was this technology applied at the top levels that allowed the company to find and mine Bisbee's hidden mineral deposits. This company, later became the Calumet & Arizona Mining Company (C&A), and became an extremely profitable copper company in just a few years.

During the darkest days of the great depression in the 1930s the C&A merged into the Phelps Dodge

Corporation. After this marriage of necessity Phelps Dodge quickly adopted the C&A technology and absorbed it into its own operations. Building on this base Phelps Dodge became one of America's greatest copper companies. In this advanced technical position Phelps Dodge was able to survive the 1970s and 80s without being absorbed by oil companies or foreign interests.

Cap'n Hoatson and the Legend

The legend of the C&A's entrance into Bisbee according to Ira Joralemon⁶, brings two vacationing Michigan mine captains to Bisbee in 1898. The father and son combination of Cap'n Tom and Jim Hoatson had worked their way up to prominent positions in Michigan's copper country. They had come to Arizona to escape the long winter in the Upper Peninsula and to see for themselves the "red elephant"⁷ that was rampaging in the deserts of the Arizona Territory. It was a rude awakening for the Upper Peninsularians to find that there were other copper deposits in North America. The high-grade deposits in Bisbee and Butte had already won a wide reputation, and Arizona's Warren Mining District had an enthusiastic following in the industry journals.⁸ For an image of Bisbee in 1898 see Figure 1.

In turn-of-the-century Bisbee, the Hoatsons found cousins and friends who had journeyed westward at an earlier time. In the grand tradition of miners, they gathered at local bars at shift change. Ten hours of hard physical labor in dark and dirty conditions creates a terrible thirst. Miners who knew of the excellent management provided by the Hoatsons were probably anxious to demonstrate their knowledge by criticism of the Copper Queen's short management experience.

Under these close working conditions, the information that a drift in fine ore from the Spray Shaft toward the side line of the Irish Mag Claim would have been a poorly kept secret. Miners would have been proud of this knowledge, and some may have known and disclosed that these claims were not controlled by the Copper Queen. In a similar manner the Hoatsons would determine that the Copper Queen had offered the owner \$50,000 for the property, that this offer had been refused and the owner was asking \$500,000.

Father and son climbed the steep limestone precipice that comprised Mag Hill. The older Hoatson had completed over 35 years of underground mining, and as he sat on a rock to catch his

breath and enjoy the warm February sun, he soon fell asleep. Legend has it that once asleep, he dreamed of the well prepared mine maps that were so familiar to him from the Michigan copper country.

These maps were laid out like floor plans for a tall building. In rich colors of red, green, blue, yellow, brown and black ink on large sheets of starched linen, they showed the workings and geology on each level. The boundaries of the mine workings and various geological formations were shown as they crossed the plane of each plan. The maps in his dream, however, were not of any mine that he had ever worked; instead, they were maps of the ground under his sleeping body. They showed a shaft nine hundred feet deep and the location of a massive copper ore body. On 100-foot levels, drifts ran horizontally in several directions to the boundaries of the claims. Stopes mined the rich ore between these levels.

The visions were still vivid when he awoke, and he was immediately convinced that this was to be the single most important discovery in the district. He convinced the younger Hoatson of his vision, and they immediately left for Calumet, Michigan, to raise money for the project. They needed \$50,000 to option the property and another \$200,000 for equipment, supplies and labor. They also would need money for a second property payment of \$100,000. If the mine was worthwhile they would be able to pay off the balance of the \$500,000 from operating proceeds.

The Reality

Very early in the history of the Bisbee camp, Dr. Douglas had decided that the iron-stained outcrop of the volcanic neck that made up Sacramento Hill was the limit of the ore in Bisbee. He was so sure of his position that he never bothered to acquire the other claims in that area although they were offered and could have been bought cheaply. He had been quoted as saying, "The Copper Queen had all the ground it needed. If someone could find ore under those barren lime hills, he was welcome to it."⁹

Douglas had entered Bisbee 18 years earlier at the age of 43.¹⁰ He must have been quite an anomaly in the early days of Bisbee. It was said that Bisbee had accumulated all of the bad element that left Tombstone to avoid law and order. Douglas personified the educated, highly cultured gentlemen of the eastern rich. He was well educated in Canada and abroad where he had studied medicine and the min-

istry. He had managed an insane asylum, taught chemistry and had a series of financial failures in copper smelting. The populace of Bisbee was uncouth at its very best. Yet Douglas was instantly respected and admired. Perhaps it was his experience in dealing with the mentally ill that prepared him for the crowd at Bisbee. In fact, his principal asset was that he was well liked and trusted.

In 1881 he had been hired by Phelps Dodge & Company, a metal trading firm, to examine the United Verde Mine at Jerome in the Arizona Territory. Here a deposit of copper-rich bornite outcropped on the surface. It was 300 feet thick and could be traced on the surface for a half mile along strike. He wrote back that the prospect was a promising one, but, "Its remoteness would make it impossible to operate successfully until there was a railroad in Northern Arizona's Verde Valley."¹¹

On a later examination trip to Bisbee, he found a mineralized outcrop that was less than 50 feet in diameter and was surrounded by what appeared to be some of the most barren limestone in North America. Bisbee at that time was somewhat further from a railroad than Jerome but an interest in the property could be acquired for only \$40,000.¹² The property was immediately acquired and Douglas asked to take a percentage in the property instead of his usual fee.

Success at Bisbee did not come easy. The ore had a bad habit of terminating, and new ore leads were not easily found. The ore bodies were high grade, but they were small and elusive. Douglas had run out of ore several times and was about to fold up operations when luck bequeathed the Copper Queen and through either a new discovery or through skillful negotiations Douglas arranged a purchase or a merger with a neighbor. Through phenomenal good luck and the application of business acumen the camp was succeeding and Douglas was acquiring a reputation from its success.

Over the years, Douglas and the Copper Queen managers had developed a policy of paying only modestly when acquiring properties. With the Copper Queen smelter and their capture of the water source for the district, they became overly confident of being the ultimate buyers of any worthwhile mining claim in the district. Mineral exploration is a process of eliminating doubt, and the Copper Queen may have felt that they could eliminate some of this doubt by buying or merging only with those properties that had a blocked-out ore reserve. This is still a popular philosophy with large mining companies.

The Irish Mag Claim

About 1890, a drunken Irish miner and prospector named Jim Daly or Daley¹³ located claims on a limestone ridge south of the Copper Queen and west of Sacramento Hill. He called these claims the Irish Mag group in honor of his favorite lady of Brewery Gulch's tenderloin. He approached Douglas and tried to sell him the claims but was refused.¹⁴ The rebuke to Daly started a right-of-way feud with the Copper Queen. In a heated dispute, Daly beat up a Copper Queen watchman. Bill Lowther, the local constable, tried to arrest Daly over the incident but was shot and killed in the attempt. Daly avoided prosecution by fleeing into Mexico where he died from excessive Mexican alcohol.

Several parties tried to claim Daly's estate. Angela Diaz, a woman who had been living with him in Bisbee, claimed to be his wife and said that she had advanced him money to secure title to the claims. She, in turn, sold whatever interest she might accrue to Martin Costello, a Tombstone barkeeper¹⁵. A second Mrs. Daly rode the train into Bisbee from Leadville, Colorado and laid her claim to the Daly estate. Andy Mehan, a saloon keeper from Brewery Gulch,¹⁶ produced a bill of sale and claimed that he had bought the property from Daly in Mexico just before he had gone on his last man-killing drunk. Two storekeepers from Tombstone named Cohen¹⁷ foreclosed a mortgage on Mehan and assumed his rights to the Daly property. Ownership was fought out in the courts, to the delight of the local lawyers. The judge finally awarded the estate to Martin Costello, who got title to the Irish Mag and four other claims.

The Copper Queen, in the meantime, continued to be prospect and ore was found closer and closer to the Mag sideline. Douglas was trying to acquire the Mag from Costello, but Costello was asking the unheard of price of \$500,000. At that time, this would have been the most expensive mineral prospect in Arizona.¹⁸ There were a few shallow prospects on the Mag property but no showing of ore. Douglas offered \$50,000 and was refused. It was apparent that he was backing off from his earlier position that there was no ore south of Sacramento Hill.

Truth According to the C&A

According to a testimonial made to Charles Briggs¹⁹, president of the C&A, the initial directors and officers of the corporation were Charles Briggs,

President; James Hoatson and James Milligan, Vice Presidents; Norman MacDonald, Treasurer. John H. Holman, Joseph L. Lathrop, John Graham, Gordon R. Campbell and W. Arthur Phipps were directors. The company was registered under the Laws of West Virginia with a capital stock of \$200,000 represented by 20,000 shares, each having a par value of \$10.00.

The mission of the company²⁰ was, "To acquire and develop mining claims believed to contain commercial copper-bearing ore bodies." When (and if) the exploration of these claims was successful, the properties would be sold to a mining company to be organized at a later date. With a developed mine and a blocked out ore reserve, this new company would be able to raise sufficient capital to purchase, equip, and operate the mine on a commercial scale.

The promoters were to manage the operations of the company and take down stock as compensation. The one exception, John Graham, was sent as a scout to Arizona to contact property owners and make the preliminary arrangements. For this work, he would be paid a small salary and expenses.

John Graham, had worked as a miner for the Copper Queen Consolidated Mining Company at Bisbee and had provided information and shown samples of ore from the Irish Mag to his old boss, Captain Tom Hoatson. At the time the company was formed, he was an employee of the Tamarack Copper Mine in Calumet, Michigan. James Hoatson was selected to make an examination of the property. He had been associated with copper mining in Butte, Montana, as well as the Michigan copper country. His judgment would be based on his personal experiences.

After visiting the property, James Hoatson corroborated Graham's report and added that the claims would prove very valuable and recommended their purchase. The litigation on the Irish Mag claims was still in progress, and Hoatson had to wait six months for the title to be cleared. At that time, Costello set the asking price at \$500,000. It was indeed a high price, but Graham was able to talk Costello into taking \$50,000 down. The balance was to be paid over the next five years²¹.

Raising the Capital

Up to this time, the C&A stock had not been offered to the public, so the development company had limited funds. Gordon R. Campbell²² an attorney and a director of the C&A, was sent to Arizona to examine the titles. Campbell's favorable title opinion

brought about the public offering of the company's stock. The promise was made to the investors that if the project proved to be successful, they would receive several times their costs of the original stock. On the other hand, if no ore were found the total investment would be lost.

Because of the sterling character of the original officers and directors of the company, the stock was quickly sold among a small group of close associates. Many of these original stockholders were miners and merchants in the Calumet area. As soon as the funds were available Briggs and Milligan returned to Arizona to make the first payment of \$50,000 and to start preparations for shaft sinking. Ground-breaking took place on November 1, 1899.

Shortly after this event, faith in the company started to decay when unfounded rumors began to circulate: certain influential men in the area were reported to have gained information that the claims were worthless. The directors and promoters of the company stuck to their original statement that if successful the shareholders would receive several times their original investment, but if no ore was found, the total sum invested would be lost. They also added that they did not want unwilling stockholders and that any investor who wanted out would have his original investment returned. Some of the investors took the later option, and the company had to take the initial offering outside of the Michigan copper country so that sufficient funding would be available to continue shaft sinking.

Among the new investors solicited was Thomas F. Cole, a miner, business man and president and general manager of the Oliver Iron Mining Company, a rich subsidiary of the United Steel Corporation. The principal display was Campbell's map of the Warren Mining District showing the properties controlled by the Copper Queen Consolidated Mining Company and the properties optioned by the Lake Superior & Western Development Company in contrasting colors. What was known of the workings of the Copper Queen and the nearest ore bodies also were shown on the map. It was explained that the Copper Queen was the only operating company in the district, that it had entered the district in 1881, and that it had earned \$676,252.78 in the first year of its activity. Hoatson explained that the equipment and technology being used by this inexperienced company were crude, but that the ores averaged a phenomenal 16.29% copper and carried important values in gold and silver.²³

Cole was obviously impressed. He immediately

bought several of the original subscriptions and encouraged George E. Tener of Pittsburgh to visit the property and invest if he thought it was worthwhile. With the support of these two important gentlemen, the recently depleted funds were replaced and development of the Irish Mag shaft continued.

The Grand Gamble Begins

By the fall of 1900 the shaft had been sunk to 750 feet, but no ore had been found. The company had all but run out of money. Several times additional subscriptions had to be obtained. With no ore showing in the shaft and little money left from the last fund raising, Captain Hoatson gave instructions to drift northeastward from the shaft on the 650 and 750 foot levels. Fate, in the Warren Mining District, has usually rewarded those with faith and perseverance: consequently, these drifts ran into high grade ore in February 1901. Initial reserves were estimated at over 500,000 tons averaging in excess of 7% copper.²⁴

Formation of the Calumet & Arizona Mining Company

The property at this point had reached a state of progress where the original developers had envisioned the sale to an operating company. For this purpose, they formed the CALUMET & ARIZONA MINING COMPANY, naming it after their immediate area and the area of interest. It was formed with an initial capital stock authorization of \$2,500,000 with initial shares at a par value of \$10.00 each. The first 100,000 shares, were traded for the outstanding stock of the Lake Superior & Western Development Company. An additional 100,000 shares were sold for cash subscriptions at par value and 50,000 shares were retained to acquire additional properties of merit as opportunities arose.

At this time the company controlled 150 acres of mineral lands and 480 acres of additional land. Seventy-five men were working two shifts and the working shaft was down 1,256 feet on December 31, 1901.

Raising \$1,000,000 in Michigan in 1901 seemed formidable despite the encouraging ore reserves. A copper mine of this magnitude had not been floated for several years without support from the markets in Massachusetts. These markets controlled most of the American copper production. In March 1901, Briggs, Hoatson, Cole, Tener and d'Autremont went to Bisbee to reaffirm their faith in the venture. Thomas F. Cole examined the mine.

After reviewing the rich ore that was being developed Cole and the others wired their brokers in Michigan and Duluth to purchase all of the stock they could afford. They also encouraged their friends, relatives and acquaintances to do the same. As a result of their enthusiasm, a large portion of the stock in the new company was acquired by wage earners in the Michigan copper and iron mines. This initial offering was over subscribed in its first day. The stock entered the market at a 200% premium over par.

In the next year these funds would be spent to add production facilities to the mine in Bisbee and to build a 300 ton-per-day copper smelter in Douglas, Arizona. Douglas was 25 miles from the mine, but it was a more favorable site for the smelting facility. There was abundant water and the site was near the Copper Queen Smelter and close to the Copper Queen's El Paso and Southwestern Railroad. The Copper Queen smelter had already set a precedent for smelter operations in the area.

In the Directors' Report for March 1st to December 31, 1902²⁵ Charles Briggs, president of the company, proudly stated that the first furnace at the Douglas Reduction Works was blown in November 15th, 1902. Production from then until the 31st of December was 2,066,647 pounds of copper, with gold and silver averaging \$8.00 per ton. By the end of 1903 assets of the C&A had grown to \$1,758,613 and \$400,000 was paid in dividends.²⁶ A view of Bisbee's Main Street in 1904 shows the prosperity brought on by the C&A, the Copper Queen, and several other active companies in the district.

Copper Queen Friendship

A competitive friendship existed between the Copper Queen and the C&A from the very beginning. This was demonstrated by C&A's announcement that they had contracted with Phelps Dodge & Co. to sell the C&A copper. Further, they had contracted with the Copper Queen's El Paso and Southwestern Railroad for shipping of their ores to Douglas and then shipping their anodes from Douglas to the port of Galveston, Texas. From Galveston, the anodes were shipped to the Nichols Chemical Company of New York where they were electrolytically refined. As a further demonstration of cooperation, Douglas refused to apply the law of apex and instead arranged for a vertical sideline agreement between the two companies, thus avoiding the litigation that plagued other mines.

Without the cooperation of the Copper Queen,

C&A may not have been successful with it, C&A was extremely successful. Over the 30-year life of the C&A the original investors received over \$164.00 in dividends for their initial \$10 per share investment price. In the merger of 1932, every shareholder of the C&A received seven shares of Phelps Dodge Corporation stock for every three shares of C&A and a cash bonus.

Cousin Jack Technology

C&A's real contribution to mining in Bisbee, however, was the great advance in technology that the Cousin Jacks and their experienced management team brought with them. This contribution included their detailed geological mapping techniques, ingenious methods of timbering, advanced engineering and equipment that had been perfected in Michigan's copper and iron country.

One of C&A's first priorities was to establish a detailed system of geological mapping. This included preparing an accurate base map of all the claim boundaries at a scale that would be easy to read and maintain. This turned out to be one inch equal to 50 feet. The Copper Queen was mapped at a scale of one inch equals 200 feet, which proved inadequate for accurate mapping.

These base maps were duplicated for each level in the shaft and for each elevation of eight and one half feet above the levels. Most of the levels in the district were established at 100-foot intervals. Workings and geology as they were developed in the mine were carefully plotted on each level and floor map. Assays from samples showing the copper values were added to these maps by the engineers and geologists. The Copper Queen quickly copied these practices.

The Spray Shaft was one of the Copper Queen's most modern shafts, yet its usefulness was limited by a hoist that did not allow continued sinking of the shaft.

Both the Copper Queen and the C&A were using mule haulage in the first few years of the century. The C&A, however, brought in electric haulage developed in Michigan's copper country as soon as possible. This system was promptly copied by the Copper Queen.

As soon as money was available from the operation of the Irish Mag, the C&A started forming other exploration and development companies. Among these was the Junction Development Company, Calumet and Pittsburg Mining, Lake Superior and

Pittsburg, Pittsburg and Duluth and the Superior & Pittsburg Copper Company.

As soon as these companies had developed ore reserves they were merged into the C&A and the C&A was reorganized to purchase and accommodate the new property. This was normally accomplished by issuing shares of C&A stock for the new company.

Beginning in Cornwall, the Cousin Jacks had developed extensive dewatering pumps to remove water from the underground workings. In the Warren Mining District, the C&A quickly developed a major pumping system for the district in the Junction Shaft. In this effort, they drained not only their own workings, but also the workings of the Copper Queen, Shattuck and Denn mines. Also from the Cornish experience, the C&A brought in extensive air moving equipment to provide ventilation to their lower workings.

Cousin Jacks claimed to be the developers of square set mining. The first use of this method of supporting heavy ground was in Nevada's Comstock in 1860. This method was adapted, perfected and modified to accommodate the heavy sulfide ground in Bisbee. Although it is a very slow and expensive method of mining, it insures safe and accurate extraction of the ore with little dilution. A desirable feature with very high grade ores.²⁷

The C&A was also a pioneer in providing for its employees. Very early in its history, the C&A set up hospitalization and medical care for its employees. This practice was started by the Copper Queen and soon turned into competition between the two companies to provide good medical services for their employees and their families. Although Bisbee was a remote western mining town, it provided some of the best hospitals available in the Arizona Territory.

Safety was always a goal of the C&A as well as the Copper Queen. Both companies developed strong safety programs at very early stages in their development. The Copper Queen authored and printed extensive instruction manuals for miners and mine workers. Today these manuals are highly prized as collectors items.

The C&A also provided its employees with housing and recreational opportunities. In 1903 they formed the Warren Company and started building the Warren Townsite. To provide transportation throughout the district the Warren Company also built the trolley car system.

Conclusion

At the end of 1904, the C&A was well on its way to becoming a major copper producer. In the first decades of the 20th century it became an aggressive and interesting company. It had a serious scrape with organized labor and played a major role in the Deportation of the IWW (Wobblies) in 1917. In the depth of the great depression of the 1930s it contributed its assets to the survival of Phelps Dodge Corporation through a merger of assets, technologies and management.

While the C&A was being organized over a drug store in Red Jacket Michigan, John C. Greenway, a 1895 Yale athlete was set to lead a charge up Cuba's San Juan Hill for Teddy Roosevelt's "Splendid Little War." In 1910, after joining the C&A he lead the company to charge into new mines in New Mexico, Ajo and other Arizona deposits with new technologies that he helped to develop in the Minnesota Iron Ranges. Greenway married late in life to the widow of a fellow Rough Rider. She became the first woman congressman from Arizona.

Always the soldier, Greenway served in World War I to gain the rank of Colonel and was decorated with high honors. His name has been given to American Legion Posts and Arizona landmarks. His likeness is enshrined in the nation's capital with Father Kino as representatives of the state of Arizona.

Many long faces in Michigan's copper country watched the investment they once scorned support many rich and famous lifestyles as the western copper rolled out and dividends rolled in.

C&A's positive effect on the Phelps Dodge's balance sheet was felt until the Ajo pit was shut down in the 1980s.

Footnotes

1. McKinney, Marion White, *Ned White, Arizona's "Bard of Brewery Gulch"*, Golden Bell Press, Denver, 1965. p57-8.
2. Graham, Richard W., "Bisbee, Arizona", *Mineralogical Record* Vol. 12 No. 5, Sep. - Oct. 1981, p. 259-319.
3. H. Mason Coggin, Childhood memories from Bisbee 1941 to 1956.
4. Embrey, P. G. and R. F. Symes, *Minerals of Cornwall and Devon*, British Museum London and

the Mineralogical Record Inc., Tucson Arizona, 1987, p. 20.

5. Murdoch, William A., *Boom Copper, The story of the First U. S. Mining Boom*, Drier and Koepel, eighth printing, Calumet, Michigan, 1964, p. 202

6. Joralemon, Ira B., *Copper The Encompassing Story of Mankind's First Metal*, Howell North Books, Berkeley, CA, 1973, pp. 133-142.

7. "To see the elephant", was a phrase used to describe California's Gold Rush of 1849. It referred to the entire experience. Red Elephant is used here to describe the parallel of the undeclared copper rush at the turn of the century.

8. WEEDS COPPER HANDBOOK

9. Douglas, James, "Historical Sketch," *The Copper Queen Mines and Works, Arizona, U.S.A.* Excerpts from the Transactions of the Institution of Mining and Metallurgy, Twenty-second Session, London, 1912-1913, p. 537.

10. Joralemon 1973, p. 120-125.

11. Ibid. p. 142 Joralemon originally accused Dr. Douglas in his earlier book, *Romantic Copper*, of turning down the United Verde Mine that later paid out \$100,000,000 to Senator William A. Clark of Montana. Joralemon made the referenced quote in a footnote in his chapter on Bisbee. He was one of the many top notch geologists who worked for the Calumet company in both Bisbee and Ajo. The association was also a good one for Joralemon. The reputation that he gained for his work with this very successful company helped him find important work later.

12. Coggin, H. Mason., "Frank Murphy, An Arizona Gold Miner," *History of Mining in Arizona*, Vol II, Ed. M. Canty & M. Greeley, Mining Club of the Southwest, Tucson, 1992, p. 109. Indicates that Senator Clark bought the Jerome property shortly after Douglas' insult for a price between \$200,000 and \$250,000. This price may have been too steep for the conservative Douglas.

13. (Douglas 1912) p.546 Douglas apparently did not remember Daly's first name in 1912. The name Jim was taken from *Rock to Riches*, (Dunning, H. Charles and Edward H. Peplow Jr. Southwest Publishing, Phoenix, AZ 1959) p. 104. Dunning did not cite a previous author and it is not likely that he knew Mr. Daly since they were not contemporaries. Many authors have used the spelling Daley.

14. (Douglas 1912) p.546 claimed that he recognized that Daly was insane.
15. Fathauer, Isabel Shattuck, Lemuel C. Shattuck, "A Little Mining, A Little Banking and A Little Beer, Westernlore Press, Tucson, 1991, p. 92.
16. (Douglas 1912) claimed that Mehan lived in Colorado.
- 17.(Dunning, 1959) p. 104.
18. Coggin,1992, p. 111.
19. Newett, George A., *The Story of Calumet & Arizona Mining Company, A Testimonial to Mr. Charles Briggs for Twenty Years Its President*, Ishpeming Iron Ore, Ishpeming, Michigan, 1922, 36 pages.
20. (Newett 1922 p. 6).
21. (Newett 1922 p. 18).
- 22.Gordon R. Campbell, an attorney and director of the C&A.
23. (Newett 1922 p. 24).
24. Briggs, Charles, President, *Annual Report to Stockholders*, Calumet & Arizona Mining Company, Calumet, Michigan 1903.
25. (Briggs 1903)
26. (Briggs 1903)
27. Peele, Robert, *Mining Engineer's Handbook*, John Wiley & Sons, 3rd Ed, John Wiley & Sons, New York, 1941,p.10-197,198.
28. Graham, 1981, p. 278.
29. Graham, 1981, p. 270.
30. Graham, 1981, p. 272 Graham credits this image from the Bisbee Historical Museum to the Holbrook. The author obtained this copy from another source.
31. Graham, 1981. p. 276.
32. Coggin, experience.
33. Coggin, experience.
34. Murdoch, 1964, (see photo) p. 144.
- 35.Embrey, 1987, (see Photo) p. 30.
36. Copper Queen Consolidated Mining Company, *Copper Queen 6 Int.*, Arizona Department of Mines and Mineral Resources, Tax Map File, c. 1917

37. Calumet & Arizona Mining Company, *Irish Mag Mine Composite.*, Arizona Department of Mines and Mineral Resources, Tax Map File, c. 1917.

38. Copper Queen Branch, *Code of Safe Practice for Stope Mining*, Phelps Dodge Corporation, Safety Department, Bisbee, Arizona, 1968, p51.

39. *Phelps Dodge A Copper Centennial 1881-1981*, Printed as a Pay Dirt Supplement, Bisbee, Arizona Summer 1981 p.22.

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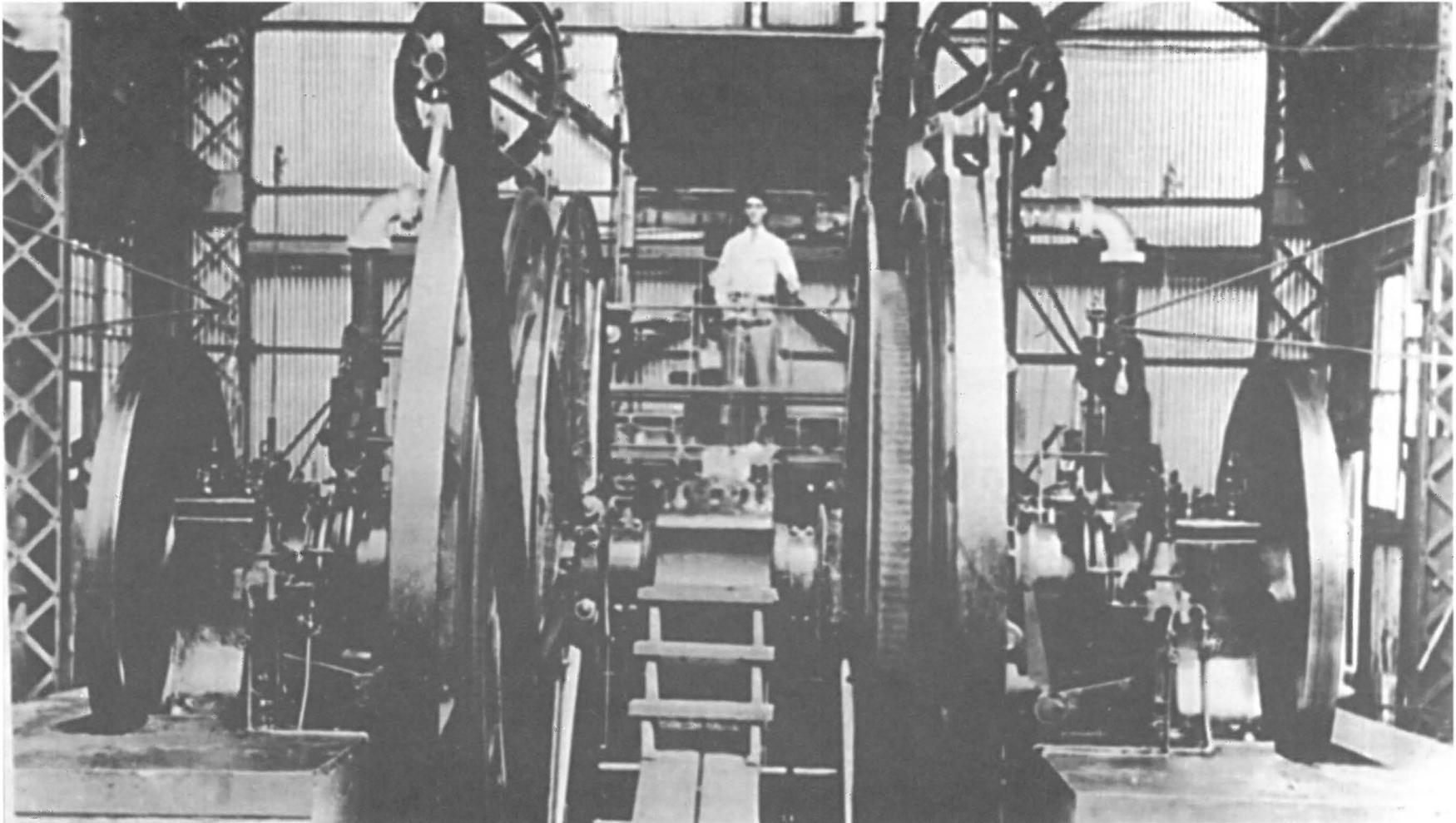
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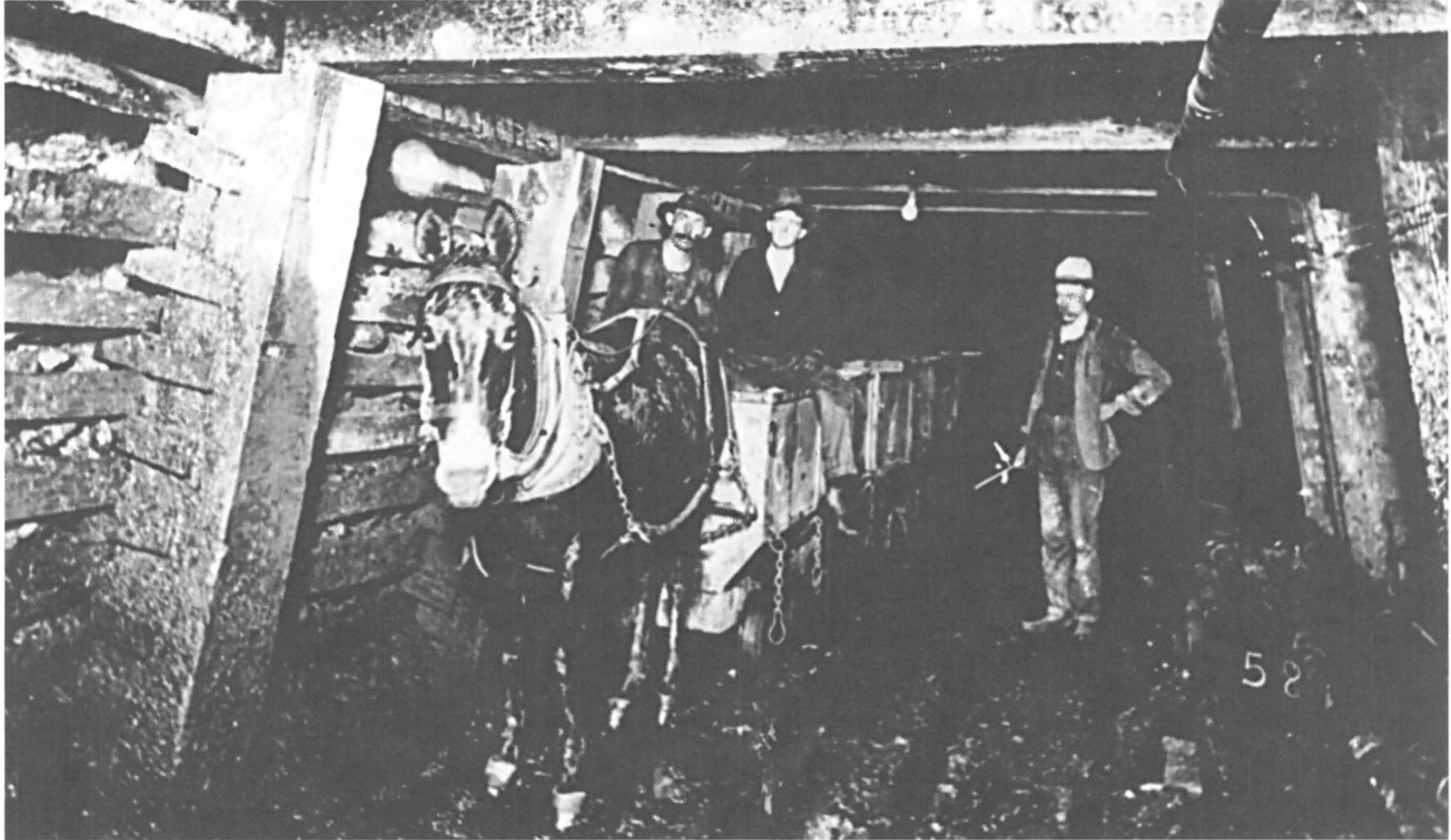
This is approximately how Bisbee looked at the time the directors of the Lake Superior & Western Exploration Company entered the district. The Copper Queen smelter can be seen making smoke in the bottom of Tombstone Canyon. Beyond the smelter stacks and just to the right the Copper Queen's Czar and Spray shafts can be seen. The C&A's initial location in the district was just beyond this property. Courtesy H. Mason Coggin Collection.



This hoist allowed the Spray Shaft to be sunk to a depth of 1060 feet. It was started about 1889 by the Holbrook and Cave Mining Company and turned over to the Copper Queen in 1892. At that time no ore had been found in the mine. By 1894 it had become a major producer and impressive orebodies had been developed to the east of the shaft. It was these deposits that inspired the Hoatson's to take Graham's advice to purchase the Irish Mag. The ore reserves of the Spray were essentially depleted by 1913. The shaft site was covered by the waste from the Lavender pit dumps in 1968. Courtesy H. Mason Coggin Collection.



Activity in Bisbee's main street had grown feverishly by 1904. There were three major copper producing companies in the district working around the clock and more than a dozen exploration and development companies acquiring positions in the district and developing their properties. Main Street and Brewery Gulch were at the heart of the business district. Courtesy H. Mason Coggin Collection.



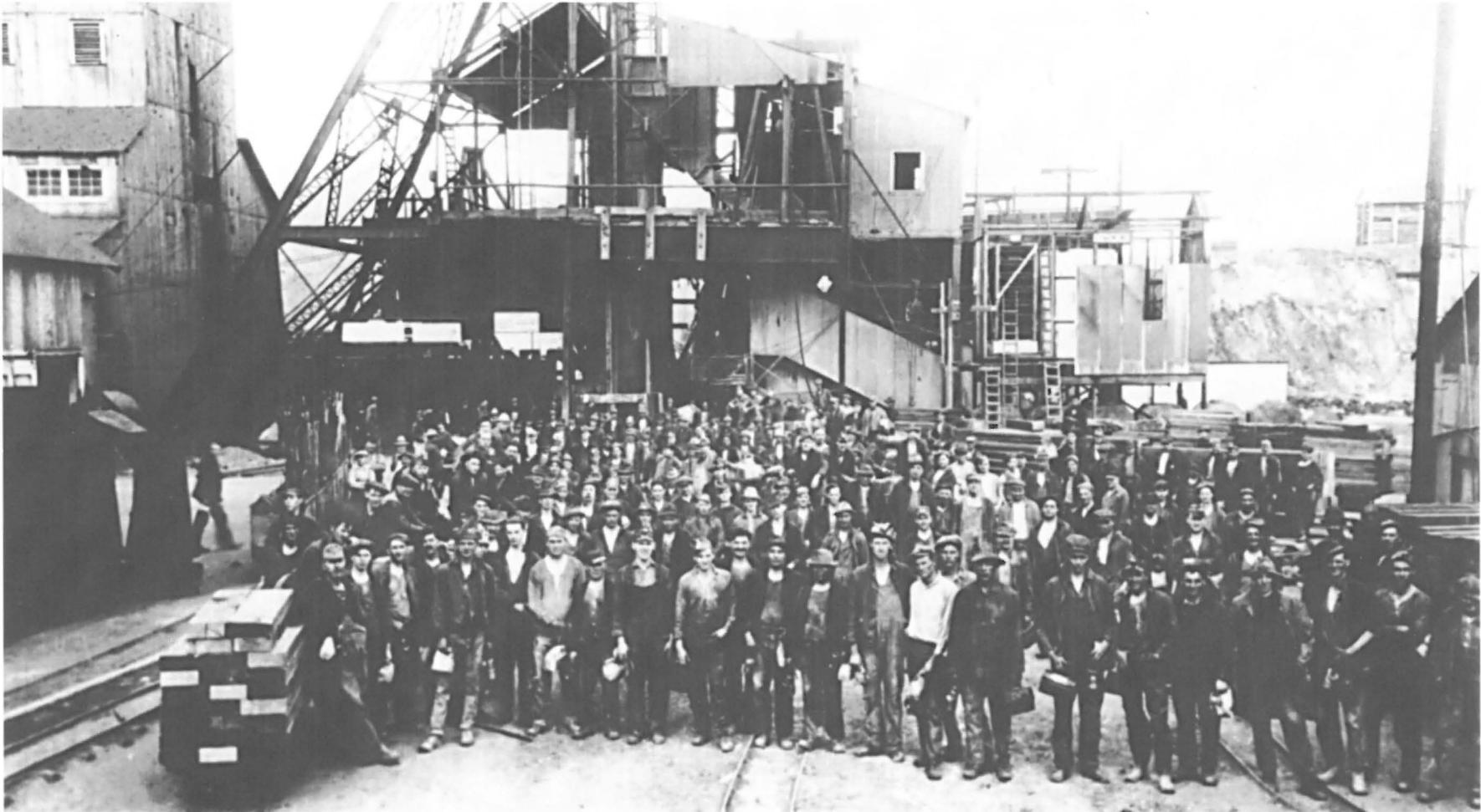
Mule Haulage was extensively used in early western mines for tramping trains of ore cars from the stopes. The ore was hauled to the shaft where it could be hoisted to the surface. This photo, which was taken in the Czar, shows a happy and contented mule pulling a string of four empty cars back to the stopes for another load of ore or waste.² Mules were prized by both the company and the teamsters as labor saving devices and were treated with great care and respect. Both the C&A and Copper Queen had established mule barns in all their workings where the mules were fed and rested between shifts. Even during strikes the mule tenders were allowed to cross picket lines to care for the stock. Note the electric light suspended from the timbers and the candle stick carried by the shift boss standing by the train. Courtesy H. Mason Coggin Collection.



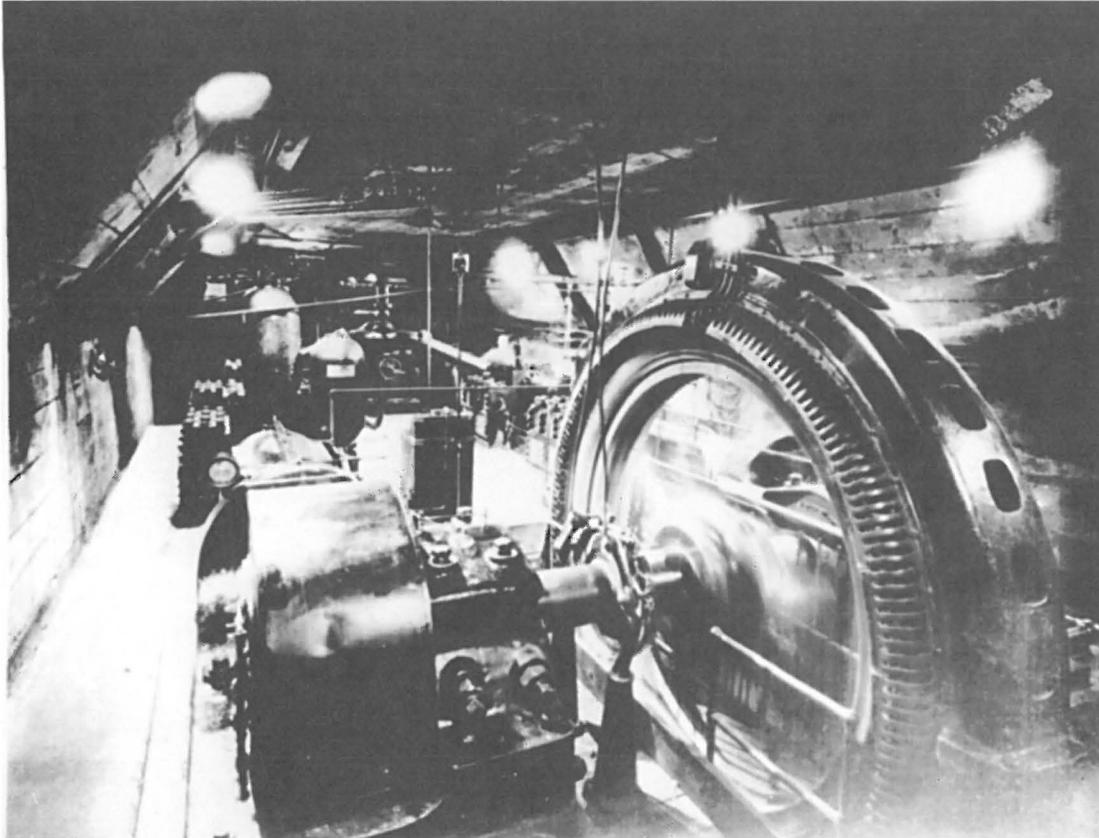
Getting mules into the mine was a major undertaking. To keep the animals from hurting themselves during transport in the small shaft and cage compartments they were securely wrapped in this canvas sweater, bound and hoisted into the cage shown in the background. Once underground, where this picture was taken, the wraps were removed and the mule released into his new environment. As indicated by the attendees present, moving the mules was a labor intensive effort. Note that in this photo one of the miners is wearing a carbide lamp. However, the shaft and station area are being illuminated by electric lights. Courtesy H. Mason Coggin Collection.



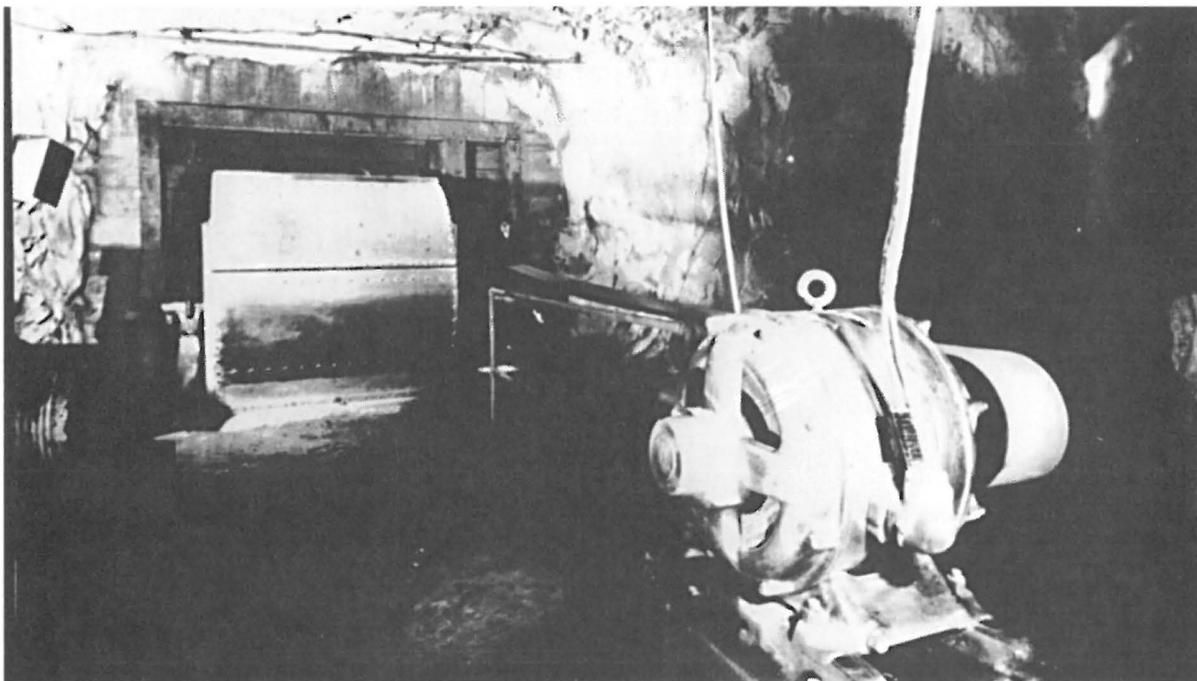
Following close on the heels of the electric lights were the electric trolley locomotive and other conveniences. Although electric lights, trolley locomotives and machine drilling were commonplace on Michigan's Keweenaw Peninsula it was apparently not until the C&A showed up in Bisbee that they were adopted by the Copper Queen. Courtesy H. Mason Coggin Collection.³



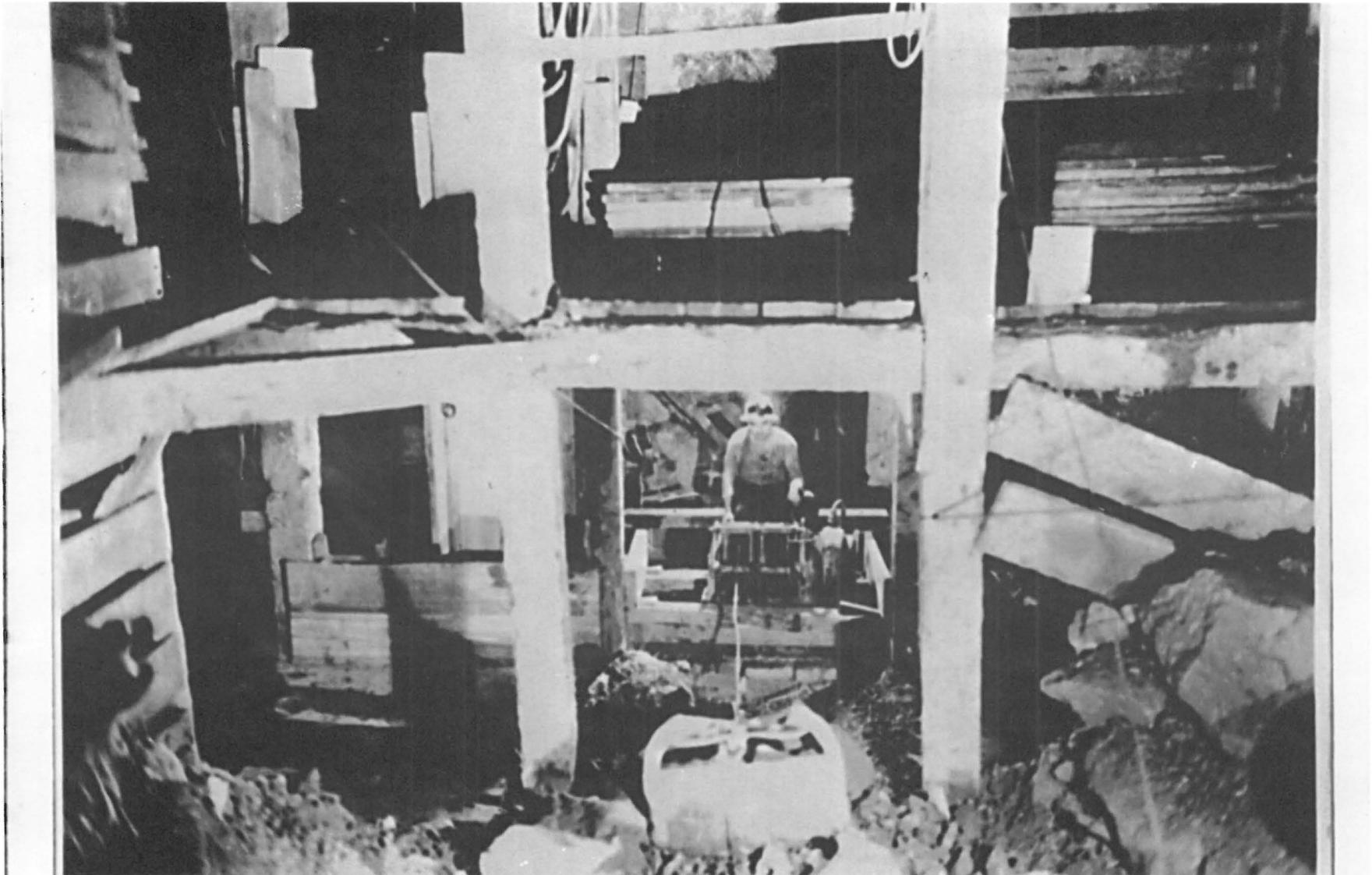
The day shift at the Junction Shaft gathered for this image before going underground. It is easy to see that this group is going on shift rather than coming up because their faces are clean. The Junction Shaft was sunk on the Wander claim to a final depth of 2,727 feet. It was started in 1903 by the Junction Development Company. This company was one of many created by the original directors of the Calumet & Arizona on capital that was acquired for exploration purposes. If the venture was successful at finding copper the company was sold or merged into the C&A.⁴ The Junction, as it turned out, was one of the most productive mines in the Warren Mining District. From a combination of oxide and sulfides it produced vast amounts of copper, lead and zinc. It was also one of the major sources of gold that made Bisbee Arizona's largest gold producer. Because of its technologically advanced hoisting system and its fast hoists it was the central hoisting shaft in the district until the mid-1960s.⁵ Courtesy H. Mason Coggin Collection.



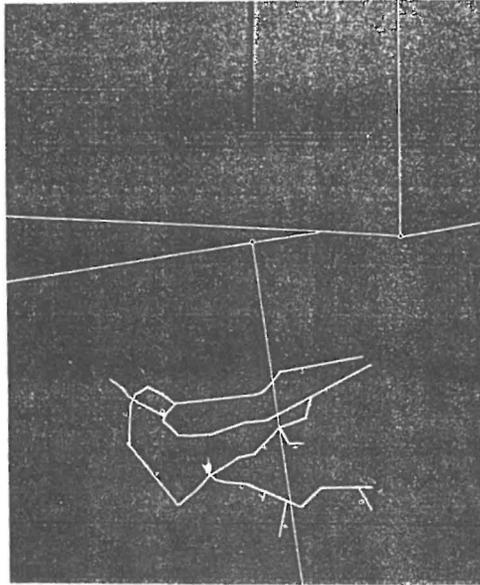
The Junction Shaft was also the major pumping facility for the district. It was served with pumping stations on the 2700 and 2200 levels for fresh waters and had an acid pumping station on the 1800 level. In this capacity it served both the C&A and Copper Queen until the merger of 1931 and then the Phelps Dodge Corporation until 1990s. Courtesy H. Mason Coggin Collection.



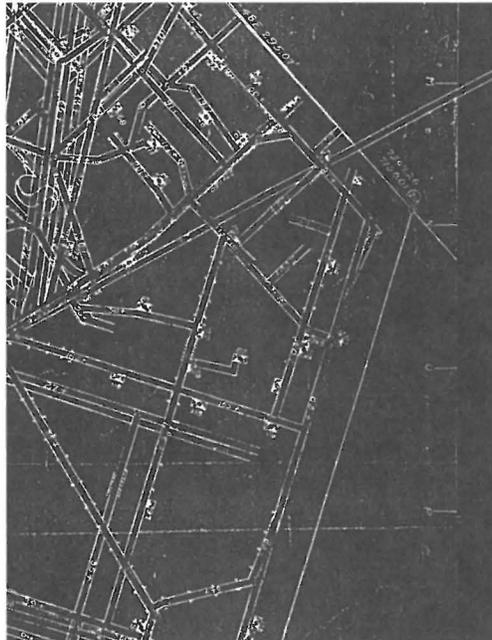
Michigan copper and iron mines were deep requiring large ventilation fans to circulate fresh air into the workings. This fan was installed on the 1600 level of the Campbell Shaft by the C&A to insure adequate ventilation. Courtesy H. Mason Coggin Collection.



The forests of Michigan's Upper Peninsula provided the timber for square set mining. Extensive timber use was required in Bisbee due to the "heavy" nature of the ground. The adaption of square set mining by the Cousin Jack was a natural outcome from his experience in Cornwall.⁷ Courtesy H. Mason Coggin Collection.

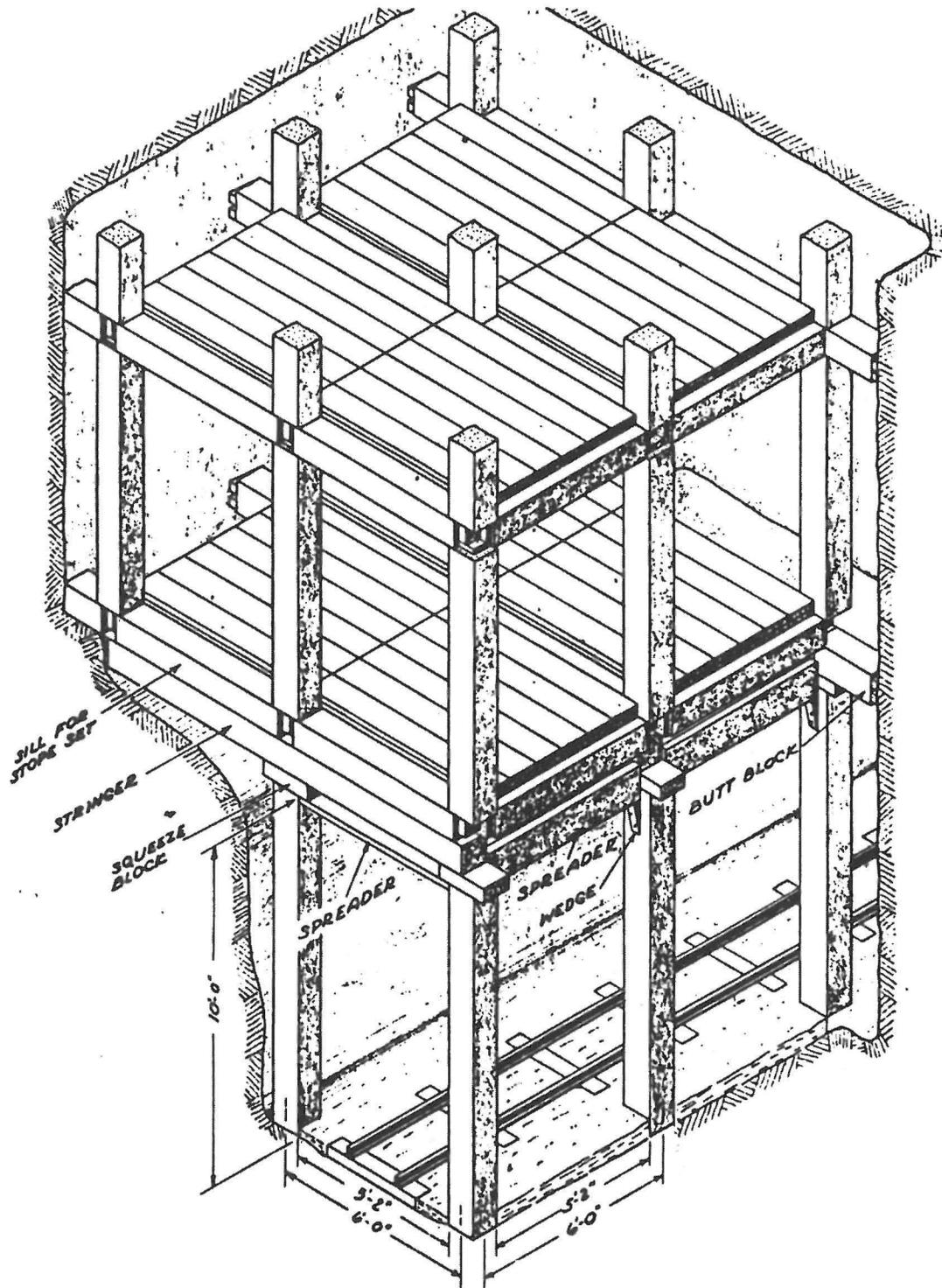


This is a portion of the map filed with the Arizona State Tax office in 1917 showing the 6th Interior Level of the Southwest Mine of the Copper Queen Consolidated Mining Company. It shows the location of the underground drifts and crosscuts on a scale of one inch equals two hundred feet. The solid straight lines terminated in a small circle, are the boundaries of various mining claims projected onto level maps. This form of mapping was typical of the technical work done by the Copper Queen at the turn of the century. This map was simply updated and submitted in 1917. Courtesy H. Mason Coggin Collection.

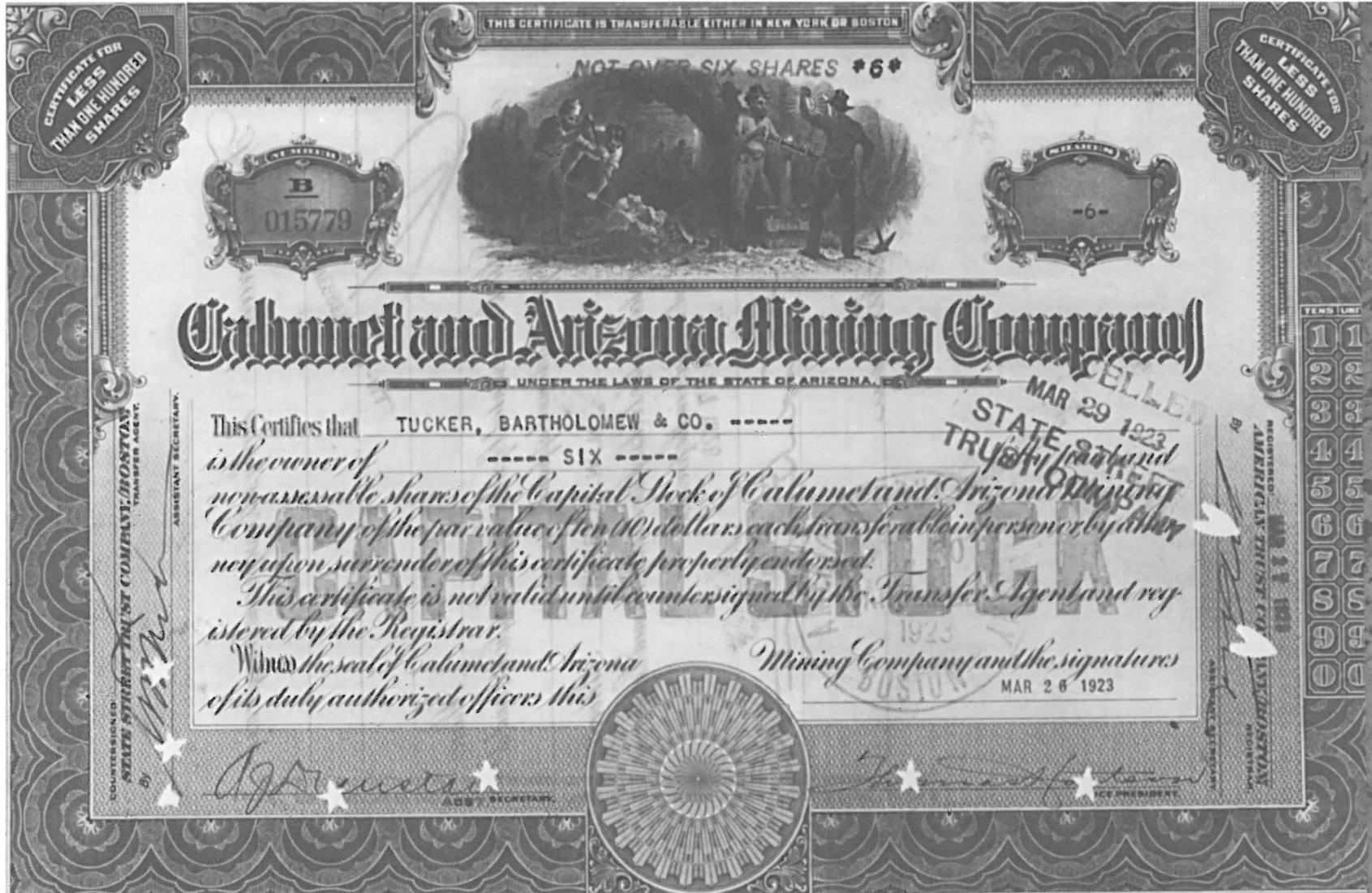


This reproduction was taken from the 1916 Tax Map of the Calumet & Arizona and shows a portion of the composite map from the Irish Mag Shaft drawn at a scale of one inch equal to fifty feet. The mine was mapped at this scale to allow accurate mapping of not only the workings on the levels, but also the workings for every floor at each eight and half feet of elevation between the 100 foot levels. The C&A mapped not only the workings but also the geology and assays on each level and each floor. It was this precise mapping that allowed them to maintain the close control that was needed to find and develop ore in the district. The originals of these maps were done on starched linen with colored inks. Note also that the C&A defined the claim corners with a circular symbol which is referenced with a numeric value and north-south coordinates calculated to the nearest hundredth of a foot. This type of precision kept the C&A from mining into Copper Queen ground. The long crosscut leaving the Mag sideline was the result of cooperation between the two companies to share drainage, ventilation and access. Courtesy H. Mason Coggin Collection.

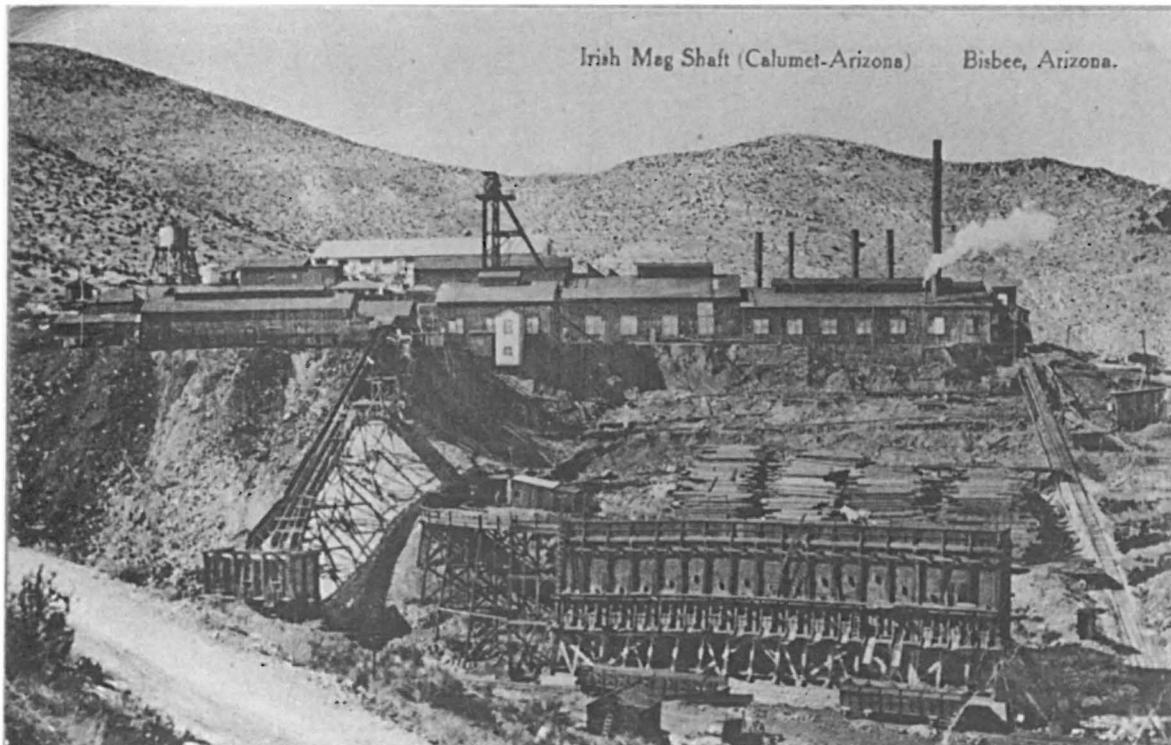
SILL TIMBER FOR MINING ABOVE DRIFT



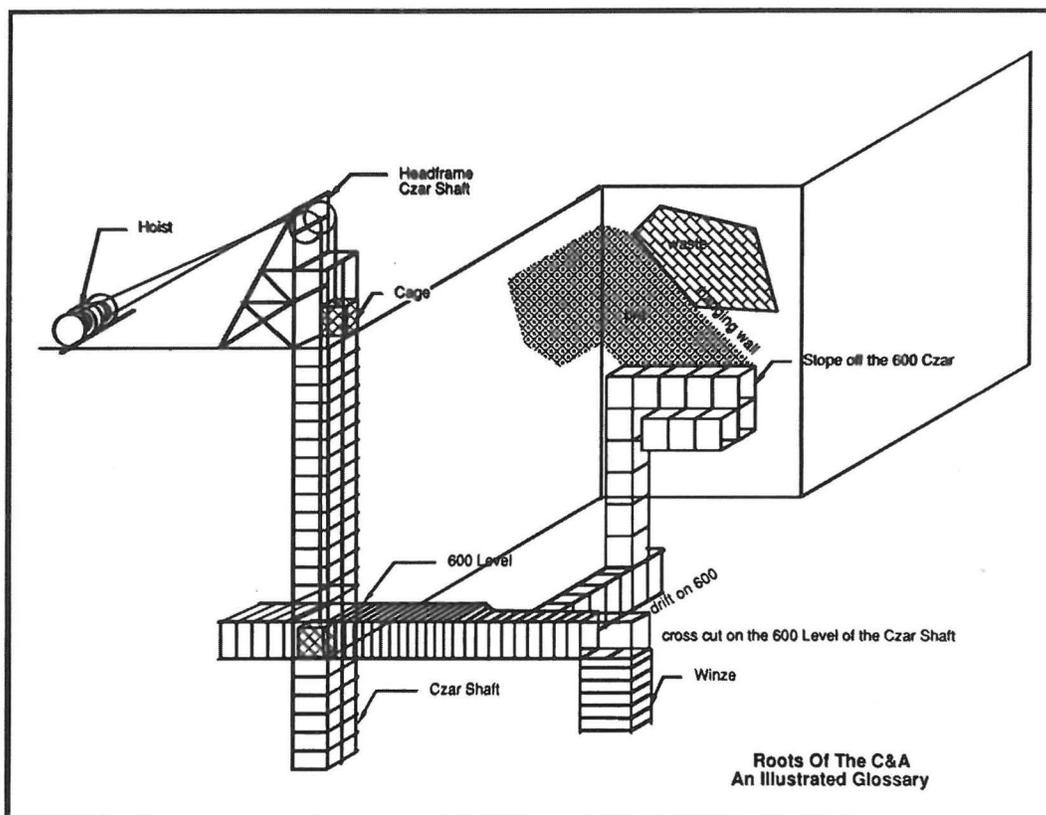
Illustrated here is a typical design for a square set stope for the Copper Queen Branch of Phelps Dodge Corporation. It has changed little since the Calumet & Arizona brought it into the camp in the early 1900s. Courtesy H. Mason Coggin Collection.



This Calumet and Arizona Mining Company stock certificate was issued March 29, 1923 to Bartholomew & Co. for six shares of Capital Stock. Note that by this time the company was registered under the laws of the State of Arizona. Courtesy H. Mason Coggin Collection.



The Irish Mag and surface works. This was the property that turned Calumet & Arizona Mining Company into a major copper producer. The C&A used some of the income from this mine to locate and acquire thousands of acres of claims in the Warren Mining District and cut off the Copper Queen from entering the south end of the district. Courtesy H. Mason Coggin Collection.



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