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40th Annual New Mexico Mineral Symposium
November 9-10, 2019,Socorro, NM
pp.15-18

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The Cresson mine (figure 1)—situated between Cripple Creek and Victor, Colorado—was established in 1894 (MacKell, 2003). No one is certain who started the mine, but records show that two brothers, insurance agents J.R. and Eugene Harbeck from Chicago, were early owners. After a hard night of drinking, they sobered up the next day and learned of their new acquisition (MacKell, 2003). The Cresson Mining and Milling Company was organized a year later, in 1895, to raise capital and operate the mine (Patton and Wolf, 1915). The mine continued operating through several leases with low but steady proceeds.

The Cresson mine became profitable when Richard Roelofs, a known mining innovator, was hired by the Harbecks as mine manager in 1895. Roelofs wrote on an undated letterhead: "I was a prospector, a leaser, a miner, an assayer and chemist, an underground shift boss, foreman, superintendent and then general manager of one to the greatest of Colorado's mines" (Roelofs, n.d.).

Roelofs (figure 2) was a newcomer to Colorado, as many were when the Cripple Creek gold rush ignited in 1891. He moved to Cripple Creek in 1893 with his wife Mabel. They had one child, Richard Jr., who was born on August 19, 1894 in Cripple Creek.

Roelofs introduced new technology and mining techniques at the Cresson mine, including an aerial tramway he designed that transported ore to a railway at the bottom of the large hill on which the Cresson sat. The tramway reduced the costs of transporting ore (Sprague, 1953). Roelofs deepened the shaft and enlarged the mined-out voids, or stopes. The Cresson's stopes were the largest in the district, at almost 100 m in width and hundreds of meters high. It is estimated that several houses could fit inside the stopes of the Cresson (Jensen, 2003; Sprague, 1953). Roelofs's work allowed the Cresson mine to be debt free by 1911, and it earned $150,000 annually between 1912-1913.

Miners discovered the famous Cresson vug by accident on November 25, 1914 (Smith Jr., Feitz, and

Figure1. Early view of the Cresson mine, Cripple Creek, Colorado. Photograph date circa 1914, courtesy of the Cripple Creek District Museum.

Raines, 1985). While following large ore shoots on the 12th level, miners broke into the large chamber, or "vug," which was in the shape of a pear (Patton and Wolf, 1915). The vug was approximately 12 m tall, 7 m long, and 4 m wide. The walls were lined with delicate, sparkling crystals of gold tellurides; however, many had fallen to the floor—disturbed by nearby blasting (Jensen, 2003).

The ore minerals in the vug were mostly the gold tellurides sylvanite and calaverite. Sylvanite is comprised of gold, silver, and tellurium, while calaverite contains only gold and tellurium. The tellurides within the Cresson vug occurred as crystals, varying in length from 1 to 3 mm. On some crystals of calaverite, pure gold was found, suggesting chemical alteration (Patton and Wolf, 1915). These ore minerals penetrated beyond the surface of the vug into the surrounding rock to depths of up to 1.5 m (Mehls and Mehls, 2001).

The gold camp was soon buzzing with conversation about the vug, and word of the discovery spread across the nation. National newspapers said the vug "staggers the imagination," and another paper declared it "the most important strike ever made in the Cripple Creek District" (Various period newspapers: Cripple Creek District Museum, n.d.). This astonishing discovery supported Cripple Creek's claim that it was the "World's Greatest Gold Camp."

The vug, and a considerable amount of Cresson ore, was a part of the Cresson pipe, or blowout. The Cresson pipe is an elliptical cylinder of lamprophyric material (mafic rocks) 100 to 150 m in diameter (Jensen, 2003). The lamprophyric matrix graded into a lighter colored carbonate matrix (Jensen, 2003). The entire blowout is encased inside a diatreme, a carrot-shaped volcanic complex, emplaced in the Oligocene (~ 30 Ma) that reached deep into the crust (Jensen, 2003). The perimeter of the pipe produced 2,000,000 ounces of gold, indicating major deposits of gold-bearing solutions along the contact between the Cresson pipe and the diatreme (Jensen, 2003).

The gold ore from the vug was so valuable that Roelofs quickly took measures to prevent theft or high grading. He ordered a storehouse built underground (on the same level as the Cresson vug) into an old drift and secured it with solid steel doors. Bags of gold ore were stacked by hand and securely locked inside. A newspaper article described the magnitude of ore as "they had stacked between 80 to 100 tons of the phenomenally rich ore at the time of my visit, and from all indications, will continue stacking this ore for some time" (Various period newspapers: Cripple Creek District Museum, n.d.). At times, up to $500,000 (1914 value, or $36,250,000 in today's dollars) worth of gold ore was stored there.

The Cresson vug's valuable gold ore also needed special handling. Roelofs hired guards to protect the vug and ore. The guards watched over the ore on every part of its journey through mining, transportation, and processing—keeping it safe from thieves. Two to three armed guards worked each shift underground, providing constant protection to the ore and vug. To prevent high grading, Roelofs allowed only two of the most trusted and senior miners to work the vug at a time, and always under close supervision.

Figure 2. Richard Roelofs, manager of the Cresson mine. Photograph date 1914, courtesy of the Cripple Creek District Museum.

The Cresson mine took precautions to secure the ore while it traveled on the railways to smelters. These measures included locked box cars and guards carrying sawed-off shotguns and rifles, who rode inside and on the top of the cars (Newton, 1928).

Accounts claim that gold ore was scraped off the vug's walls and then shoveled into large canvas bags (figure 3). It took four weeks to mine the vug out (Cunningham, 2000).

There were two main grades of ore from the Cresson vug: the first grade included ore worth over $5,000 (1914 dollars) per ton and the second grade from $1,000 to $1,500 (1914 dollars) per ton ("$10,000,000 Strike in Cresson Mine Proves Again that Colorado is the Paradise for the Gold Hunter," 1914, p. 5). The higher-grade ore had 250-plus ounces of gold per ton, while the second grade of ore had 75-plus ounces per ton, based on the 1914 gold price of $20 per ounce (Historical Gold Prices, 2015).

Figure 3. Canvas bags of gold ore from the Cresson vug are brought to the surface. Men are getting the bags ready for shipment. Photograph date 1914, courtesy of the Cripple Creek District Museum.

In all, a whopping 60,000 ounces of gold was recovered from the vug (Hunter, 2002). The total value of the vug's ore in 1914 gold prices was $1,200,000 (Smith Jr., Feitz, and Raines, 1985). Based on today's gold values, the vug's rich ore would be worth over $87,000,000.

The discovery of the Cresson vug prompted other mines in the district to deepen their shafts, since the vug was found on a deep level of the Cresson. Mine owners also expanded exploration in their mines.

The Cresson mine was operated for 66 years, finally closing in 1961 (Munn, 1984). After finishing as one of the top producing mines in the district, its buildings were torn down and the head frame and its machinery were moved to a park in Victor.

In the early 1990s, exploration geologists discovered a 2.5 million-ounce gold deposit in the same area as the historic Cresson mine, called the Cresson deposit. The Cripple Creek and Victor Gold Mining Company submitted permit applications in 1994 for open pit mining of the Cresson deposit and surrounding areas. Mining started in December 1994, and by the end of 1995, 76,500 ounces of gold were produced. The Cripple Creek and Victor Gold Mining Company is still mining the area today under the ownership of Newmont Goldcorp with headquarters in Greenwood Village, Colorado.

The original Cresson mine shaft is long gone, and in its place is the Cresson open pit at 518 m deep (Poulson, personal communication, 2019). Newmont will deepen the pit another 91 m for an ultimate depth of 609 m. At this point, a portal for underground exploration is planned at the bottom of the pit. This project is planned in two phases. In phase one, a decline drift is planned with 762 m of easterly exploratory drifting underneath the Cresson pit. The intent is to establish drill bays at the end of the drift for core drilling below the historic Orpha May and Vindicator mines. The estimated cost of this phase is $26 million. Phase two includes 3,048 m of exploration drifting and positioning core drilling bays at an additional $100 million cost. The goal is to prove the potential for underground mining projects. If Newmont Goldcorp's investment council approves this plan, the project would start as early as the first quarter of 2020 (Poulson, personal communication, 2019).

The Cresson mine took its place among the important mines in Cripple Creek as a result of its early establishment in the district, an innovative mine manager, expansive underground workings, and the discovery of the rich Cresson vug. Mining continues at the Cresson today.

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