

The Lime-Burning Industry

By Rosemary Lewis

Jefferson County may not have been blessed with abundant precious minerals deposits such as were found in nearby Gilpin and Clear Creek counties, but it abounded with the industrial minerals so necessary to settlement and the construction of towns and cities.

Coal, clay, limestone, and sandstone crop out along the unique geologic feature of the hogback within easy reach of inexpensive surface mining techniques. As a further incentive to the early settlers, many of these deposits were located close to one another so an entrepreneur, if lucky, often had several mineral options available to explore and exploit in a quarter-section of land.

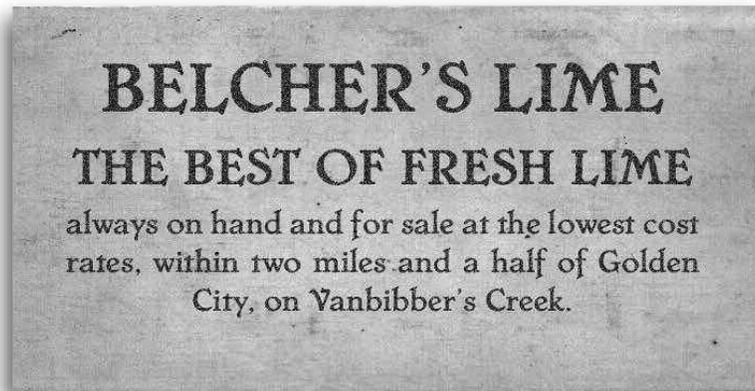
With these industrial minerals so readily available for the taking, kilns to convert the raw materials into usable commodities popped up across the landscape from Boulder to the Platte Canyon. Kilns were necessary to fire bricks and

The first generation or two of settlers developed Jefferson County's mineral wealth. A full catalog of quarries and kilns is not likely to be reconstructed a century later. Some of these operations were small scale, dedicated to the construction of local ranch buildings, and long since erased from the landscape. Others were large multi-faceted production plants located in or near Golden and Morrison. Of these many processes, the production of lime from limestone will be examined here as an example of the larger and more complex industrial process lines. Lime kilns were often found associated with other processes, such as brick making, but just as often they stood alone near the quarries that provided raw materials.

Limestone Processing

Limestone was, and still is, used in a wide variety of products, from the building industry to food purification. It is naturally found in a variety of colors — blues, whites, and grays — and may be utilized as quicklime, slaked lime, or milk of lime. Quarried limestone (calcium carbonate, CaCO_3) is crushed to a uniform size to control the process. The crushed lime is then placed in the kiln, either stacked with the fuel and closed in the kiln in a batch process, or introduced in a continuous flow process into what is called a vertical stack configuration. Both types of kilns were used in Jefferson County. The limestone is burned in the kiln at temperatures of more than 2,000 degrees F, producing quicklime (CaO) and carbon dioxide (CO_2). Quicklime is very caustic and will cause severe irritation when inhaled or in contact with moisture as in the eyes or on the skin, making it an environmental hazard to local populations who may be exposed to blowing dust from the works.

When water (H_2O) is carefully added to quicklime, the product is called slaked or hydrated lime (calcium hydroxide, $\text{Ca}(\text{OH})_2$). Hydrated lime has many of the same uses as quicklime but is more dilute and less caustic. The pioneer generation would have been most interested in using it in building applications (i.e., mortar,



Ad from Colorado Transcript, Jan. 23, 1867 (reconstructed).

pottery, convert limestone to lime, and melt sand into glass. The basic technology was relatively simple, requiring very little expertise or capital investment to start. Kilns were built within town boundaries and the confines of industrial works and out on the plains near the quarries. The far-flung location of the quarries and production works in turn influenced the construction of roads and railroads to transport the heavy bulk products to market. This flush of individual industrialism lasted only a half-century or so and had largely exhausted itself by the turn of the 20th century.

HISTORIC QUARRYING IN THE JEFFCO FOOTHILLS

stucco, plaster) and as a trace additive in the brick-making process, hence the rationale for a lime kiln to be located within a brick yard.

Pioneers in the Lime Industry

One of early Jefferson County's most prominent pioneers and town builders, the redoubtable Dr. Joseph Casto, had interests in lime production near the town of Mount Vernon. As early as 1859, Casto advertised the merits of the town and specifically listed the presence of limestone as one of the many advantages of the location. The opening of the Casto and Nelson Mount Vernon Lime Yards appeared in the local papers in the summer of 1860, making this one of the first such operations in the region. The Mount Vernon lime works appeared to be in operation for at least a decade under a variety of owners.

At the northern end of the county, C.H.H. Case offered lime from his operation on Van Bibber Creek as of 1868. In the following decade, mineral mining attracted the interests of out-of-state capitalists. In June 1879, the *Colorado Transcript* reported that the trio of Davis, Pritchard, and Hodges of Texas had leased clay- and lime-seamed land from Loveland and Welch

near Theodore "Doc" Hoyt's ranch at Ralston Creek and were building lime kilns there. Some of these men later invested in brick manufacturing in Golden.

Perhaps the largest of the lime operations were in the mid-county region, from Golden to Morrison around the west side of Green Mountain, not far from Casto's operation. In the summer of 1869, John A. Rowe, a coal miner from Pennsylvania, purchased a tract of land near the road between Apex and Bear Creek and, with his brother, started digging a tunnel for a coal mine. By the following summer not only had Rowe uncovered a good vein of coal, but he also established a large draw lime kiln one mile north of Bear Creek, producing 150 bushels of lime per day at 35 cents per bushel.

A little further to the south in May of 1885, a Mr. Garfield of Denver visited his Pike Quarry and its new lime kiln just east of Morrison. Garfield's lime kiln turned out to be extremely durable. This was a vertical stack configuration, allowing for the addition of fuel and limestone from the top, while the spent fuel and the lime were pulled out from the base of the kiln. This

"The Lime Kiln adjacent to the Quarry measured about 5 ft. in diameter with about 10 feet chimney draught resting on a stone furnace foundation about 3 feet above the ash-pit. ... It was reached by a wagon-road and daily seen ablaze with its orange-tinted tongues of fire shooting from 5-8 ft into the air and the white curls of smoke ascending from the pinewood furnace to the skies. Several loads of the calcined stone were the daily output, which formed a rather lucrative product [and] was delivered regularly at a siding of the main Rail-road tracks and unloaded into open freight cars."

—Kowald, 1935, from *A Brief Historical Sketch and Some Reminiscences of the Sacred Heart College*

The Garfield Lime Kiln in the 1980s after its landscape context was changed shortly before it was torn down.

Historic American Engineering Record, circa 1983.





This lime kiln was located on the banks of Bear Creek in downtown Morrison, about where the Morrison Liquor store currently stands. Fed by the limestone quarry visible on the hogback behind the kiln, it produced quantities of lime that were shipped by rail to Denver. Along with other kilns in the area, it provided a noxious haze during the town's settlement days. By 1896, when this photo was taken, it was reportedly being used as a barn.

Denver Public Library, Western History Collection X-11146.

kiln was built adjacent to an outcrop of limestone reportedly 25 feet thick and 300 feet long. The Denver, South Park, and Pacific Railroad built a spur line to Garfield's quarry and near the kiln. The Garfield kiln was documented in 1983 under the Historic American Engineering Record (HAER) provisions during the early planning stages of the Centennial Parkway/C-470 alignment construction. The kiln was found eligible for listing on the National Register and cited as the most intact example of a lime kiln in the area. Although this kiln did survive the advent of C-470, it was demolished in the early 1990s. Many other lime kilns were located within the town of Morrison itself and on the hillsides surrounding the town.

The City of Golden boasted its own lime kilns. As of Dec. 31, 1897, Golden had three "perpetual" (likely vertical stack) lime kilns operated by Prout & Ensign, J.E. Benjamin, and Welch, Pritchard & Company that together produced 60,000 bushels of lime valued at \$24,000, or about 40 cents per bushel. Of these, the Benjamin operation was perhaps the earliest established within the Golden city limits. John Emory Benjamin arrived in Golden around 1875 and established his patented lime kiln operation near the Colorado Central Depot at the foot of North

Table Mountain. Benjamin's son, Eugene Emory Benjamin, later founded the Arvada Flour Mill and served as mayor of Arvada.

By the end of 1898, no less an authority than civil engineer and local legend Edward Berthoud reported that Golden had only one lime kiln remaining and that competition had nearly killed the business of limestone quarrying. The likely competition was lime flowing from the convict-operated works at the state penitentiary in Canon City. The prison had a lime works from the mid 1880s, but by the turn of the century Denver businessmen were putting up major objections to this undercutting of the prices. The Jefferson County lime industry came to an end by 1910, as Portland cement and gypsum plasters increased in popularity and technological advances made these older stone kilns obsolete. Today, only a few crumbling kilns remain as evidence of this once-widespread industry. 

Sources:

Colorado Transcript, Feb 12, 1868; July 21, 1869; June 30, 1875 (Arvada Historical Society at www.arvadahistory.org); June 18, 1879; May 6, 1885; Dec 31, 1897; Oct 26, 1898.

Historic American Engineering Record, CO-11, Lime Kiln Near Morrison, Colorado Department of Highways, November 1983. <http://www.loc.gov/pictures/collection/hh/item/co0096/>

Rocky Mountain News, June 1870.

Western Mountaineer, Dec 28, 1859.