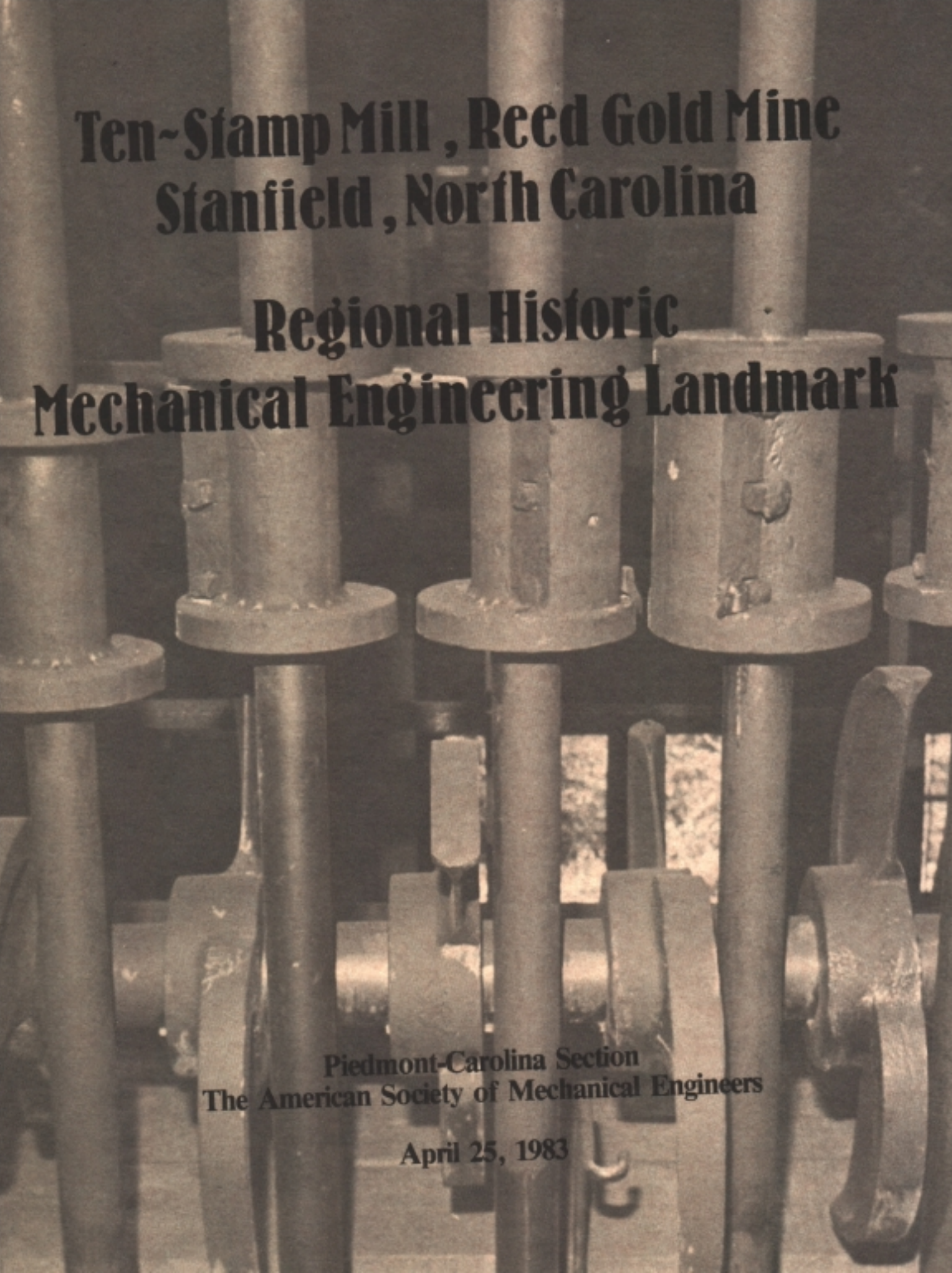


Ten-Stamp Mill, Reed Gold Mine Stanfield, North Carolina

Regional Historic Mechanical Engineering Landmark

Piedmont-Carolina Section
The American Society of Mechanical Engineers

April 25, 1983

GOLD!

The History of Gold Mining in North Carolina

When people think of gold mining they usually think of the American West — of California and Alaska. No one ever thinks of North Carolina, but, in fact, the first authenticated discovery of gold occurred there in 1799. That discovery, on the Cabarrus County farm of John Reed, resulted in the opening of the first extensive gold mining operation, which led to the nation's first gold rush.

During its peak years gold mining employed more of North Carolina's people than any occupation other than farming. The estimated value of the gold recovered reached over a million dollars a year, and prior to 1828 all native gold coined by the United States mint came from North Carolina. A United States mint, established at Charlotte in 1837, remained in operation until the outbreak of the Civil War in 1861. The state maintained its leadersbip in gold production until 1848, when it was eclipsed in importance by the California gold rush.

The Discovery of Gold

There is a charming anecdote about the early discovery of gold on the Reed farm. One Sunday in 1799 Reed's son, Conrad, who was then twelve years old and playing hooky from church, found a large yellow rock in Little Meadow Creek. None of the members of the Reed family were familiar with this metallic rock, so Reed took it to the nearby town of Concord for identification. When the local silversmith was unable to identify it, Reed took the rock home, where it served as a doorstop for the next three years. The rock was rumored to weigh seventeen pounds.

In 1802 Reed journeyed to the trading center in Fayetteville on business, and took the nugget to a silversmith there. This jeweler recognized the rock as gold and asked Reed if he would sell it, and if so, for how much. Reed asked what he considered the "big price" $3.50. Its approximate Worth at that time was $3,600. According to tradition, Reed used the money to purchase a calico dress and some coffee beans for his wife. It is said that he later recovered $1,000 from the jeweler, who subsequently had attempted to purchase more of the heavy rock.

The Reed family soon began searching in the creek for similar valuable rocks. In 1803 John Reed expanded the operation, taking three local men to form a mining partnership — his brother-in-law, Frederick Kizer; the Reverend James Love; and wealthy landowner, Martin Phifer, Jr. The partners supplied equipment and men (slaves) to dig for gold in the creek bed, Reed providing the land. The returns were divided equally. A number of nuggets and large amounts of gold in dust and particles were recovered in the sands along the stream. This early mining was called placer mining. Before the end of the first season, a slave named Pete caused wild excitement when he unearthed a twenty-eight-Pound nugget from the bottom of the creek.

The Reed Gold Mine was a thriving success and was one of the state's three major mines by the year 1824. Although mining for gold was indulged in only during late summer, after the crops had been planted and the stream had dried up, the proprietors realized a substantial profit. By that same year they had unearthed an estimated $100,000 worth of gold. Nuggets of remarkable size occasionally turned up. Before 1826 the recorded amount of gold found in pieces exceeding one pound totaled eighty-four pounds. Within a few years the calculated yield from the famous Little Meadow Creek had reached $200,000.

Mining the Ore

Placer or surface mining gave way to underground excavation when it was learned in 1825 that the metal existed also in veins of white quartz rock. The search for "lode" or vein gold required a great deal more money, labor, and machinery. Thus it was that even though lode mining began in surrounding counties soon after the quartz connection, it did not begin at Reed until 1831. Placer mining was still so productive on the Reed land that the miners were reluctant to spend the money necessary for underground mining. Up until then, the mining activity had remained essentially a family operation. Reed was not a participant in either the most advanced technology or the frenzied excitement of the 1820s. He apparently preferred to continue his profitable placer operations on a close-knit family basis rather than risk his capital in the uncertainty of a shift to extensive vein mining.

During the early 1830s, however, work at Reed finally progressed from placer to hard-rock mining. By then, cernturies-old European mining techniques were being employed in other mines of North Carolina. Miners dug deep shafts, and from them branched networks of tunnels called drifts that extruded at various levles to follow the veins. Sometimes miners carved out a room, or "stope," in their efforts to remove the vein material. Working by candlelight, they pried the rocks apart at their natural joints or fractures by using chisels, picks, shovels, crowbars, and gunpowder. Low wheelbarrows were used to haul ore along the drifts to the main shaft. In major Carolina mines, iron Cornish buckets called "kibbles" were commonly used to hoist ore and miners to the surface.

By the mid-nineteenth century some mines in the state had shafts several hundred feet deep. In 1854 the major underground portion at the Reed Mine's Upper Hill comprised no less than 15 separate shafts, many of them connected by a series of tunnels over 500 feet long. The initial shaft on Upper Hill was very productive and was said eventually to have yielded from $18,000 to $20,000 worth of gold. A number of shafts at depths varying up to ninety feet were subsequently sunk at both Upper and Lower Hill workings.

The raising of ore at Reed took place in the 110-foot-deep engine shaft on top of Upper Hill. A hoisting device, called a whim, was erected for this purpose. Besides hoisting, the engine shaft also had a pumping function with a steam pump capable of draining those portions of the mine which might be carved out below the 55-foot water level. A 50-horsepower steam engine, located in the 2,400-square-foot millhouse, operated the pump.

Though many Carolina mines were worked crudely on a small scale using minimal equipment — even some vein mines of importance were little advanced — technology had been creeping steadily into the gold fields since the mid-1820s. A number of foreign mining experts had appeared in the area. Among them was Charles E. Rothe, a man knowledgeable in European mining techniques, who came with geologist Denison Olmsted to study the region. They remained for several years to promote the systematic installation of machinery.

Processing the Gold

Much of the new machinery was used to ceush gold-bearing ore. Separating the gold from the quartz required huge Chilean grinding stones. larger rockers, and retorts. The circular Chilean mill was composed of one or more stone wheels set upon a stone base containing ore, water, and mercury and connected to, and revolving about, a vertical post. The rolling action of the heavy wheels crushed the ore into fine particles, releasing bits of gold to form an amalgam with mercury.

The stamp mill, which dates back to sixteenth century Germany, made its appearance in North Carolina around 1830. Resembling a large mortar and pestle, the stamp mill was a wooden structure covered at points of contact with iron.

The actual milling process was quite elaborate, although not very efficient. The ore was brought from the mine by wagon, wheelbarrow or tramway carts, and taken directly to a jaw crusher. The crusher broke the ore into pieces one to two inches in diameter. Depending on the type of equipment used, the ore was fed either by gravity or by hand from the crusher to the hoppers on the stamp mill. From the hoppers the ore was gravity-fed into mortar boxes, where it received countless blows from stamps dropping from above. Stamp mills could be powered by horses, water or steam engines. The trend was toward steam engines.

A ten-stamp mill, such as the one at Reed, had two hoppers and two mortar boxes. In each 6,000-pound mortar, the 750-pound stamps would rise and fall five to seven inches at a rate of 35 times per minute. As the ore was crushed it was mixed with water, and the finest particles floated out of the mortar box through a fine screen. Screens were made of brass or tinplate. A brass screen would last for approximately 25 working days, while one of tinplate had to be replaced about every 15 working days.

Seventy-two gallons of water were needed per stamp per hour. The mixture of water, crushed quartz and gold then flowed over the amalgamation plates that were attached to the apron tables, the copper amalgamation plates having been covered with a thin layer of mercury. The plates were laid either on a single plane or in stepped fashion. The advantage of the steps, as at the Reed Mine, was that the ore turned over when it crossed the step, thus allowing more gold to come in contact with the mercury. As the crushed ore passed over the plates, the gold and mercury formed an amalgam or blend.

Every day or so, the stamps were stopped, the first four feet of the amalgamation plates were cleaned of the amalgam, and fresh mercury was put on the plates. The amalgam was then retorted, the mercury condensed and reused, and the gold purified and cast. Replacement of worn shoes and dies was also done at this time if needed. The residue that collected in the mortar boxes was also removed and panned.

Roth the gold that did not adhere to the mercury and the quartz were washed onto the concentrating table with the water. The table was mechanized and moved back and forth along its long axis. The action caused the heavy gold to settle along strips of mahogany (called riffles) which were nailed to the top of the table, approximately one inch apart. As the table moved the gold not only settled behind the riffles, but it also traveled down the table and formed a concentrate at one end. Periodically, this concentrate was collected and the gold was removed through panning.

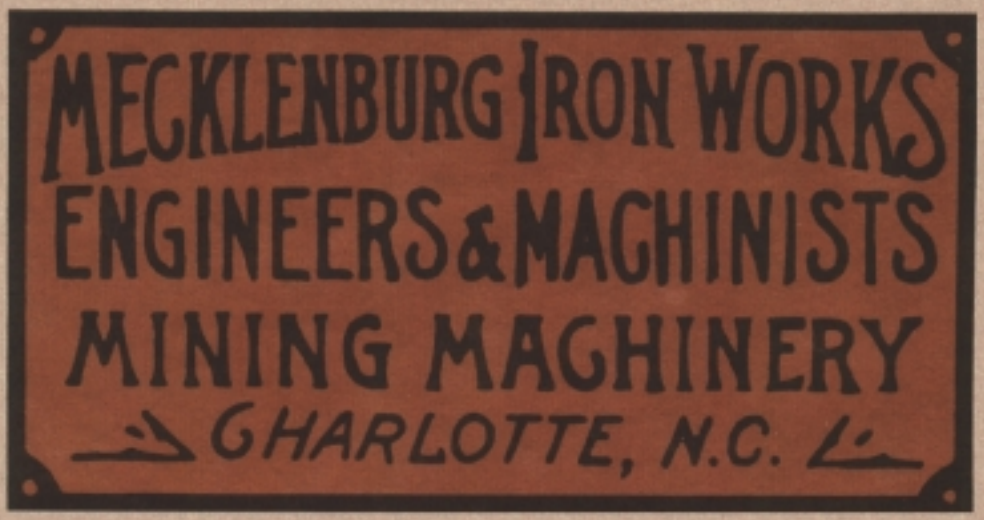
The mark of the ten-stamp mill, like dozens of similar mills throughout the late nineteenth-century South, was that all of its working parts were made of cast iron rather than of a combination of wood and iron. This technological advance, a vast improvement over early mills, had crossed the continent from California, where miners had made important changes in the old wooden European stamp mills inherited earlier from the South.

The Industry Wanes

John Reed died in 1845 at the age of 88. The local newspaper reported that he was a "faithful Christian, a good citizen, a kind parent and neighbor, and a helper of the poor." Though apparently illiterate, Reed had been a successful businessman and had died relatively wealthy. His estate, including the 745-acre farm, his gold mine, and 18 slaves, was valued at $40,000 — a handsome sum in those days.

In compliance with Reed's will, his executors offered the mine for sale. The purchasers were Reed's grandson and his son-in-law, who worked the mine in much the same way as in the 1830s. Although they did progress to the use of gunpowder for blasting, compared to other leading mines the Reed was still a small operation. In 1852, unable to repay debts, the mortgaged mine was sold to new owners for $3,000. This action marked the end of any significant involvement in the mine by members of the Reed family. During the following year the property changed hands a number of times, until, Selling at an inflated price, it became the possession of the Reed Gold and Copper Mining Company.

Little if any organized mining occurred in the late 1850s and the census of 1860 listed the mine as inactive. During the Civil War organized mining in all of North Carolina ceased. After the war, mining at Reed resumed again but a general decline in production, due primarily to decreased quantity and quality of the ore and poor management, developed into a long and erratic downward slide lasting for decades.



Manufacturer's identification plaque

(Actual size)

The last publicly known great find at Reed occurred in April 1896, shortly after the property had been pruchased by the Kelly family. A spectacular nugget of nearly 23 pounds was found just three-and-a-half feet beneath the topsoil of the hillside. The nugget prompted renewed interest in mining by its owners, for as late as 1898 they purchased a ten-stamp mill, presumably a second mill, from the Mecklenburg Iron Works of Charlotte. Evidently the ten-stamp mill replaced the machinery erected in 1895 and encouraged a last attempt at quartz mining at the Reed Mine. Although the new equipment saw service in 1899, the ore was of low quality and yielded a pitiful 60 cents in gold from each ton of ore.

The downward trend in mining in North Carolina that began in the late 1800s reserved for a brief period from 1900 to 1915. At that time Carolina mines underwent renewed efforts at expansion and modernization and produced the largest amount of gold to date since 1887. The Depression of the 1930s, with higher gold prices making mining more attractive, sparked another peak of renewed interest. This died in early 1942 when the federal government ordered that gold mining be suspended to divert production to national defense. After World War II little active mining took place in the state.

The last underground excavation recored at the Reed Gold Mine was in 1912.

The Reconstruction

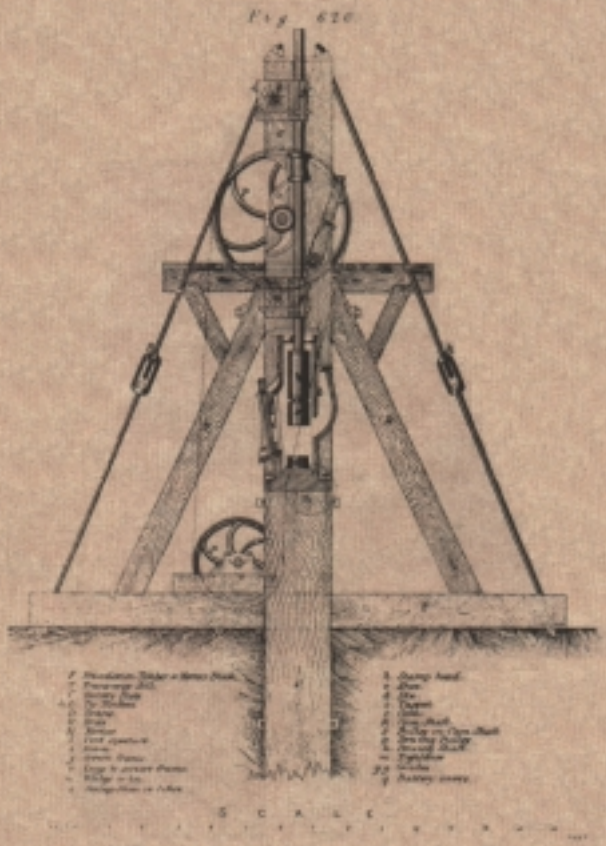
In 1971 the Kelly family donated the Reed Gold Mine and 70 acres of land to the State of North Carolina, with the state purchasing an additional 800 acres surrounding the mine. That year the Reed Gold Mine became a North Carolina Historic Site. Several of the mine shafts were reopened, enlarged and re-timbered to make them safe for visitors. A museum was established, and, in April 1982 after seven years of research, the ten-stamp mill was restored to operating condition and made presentable for viewing by the public.

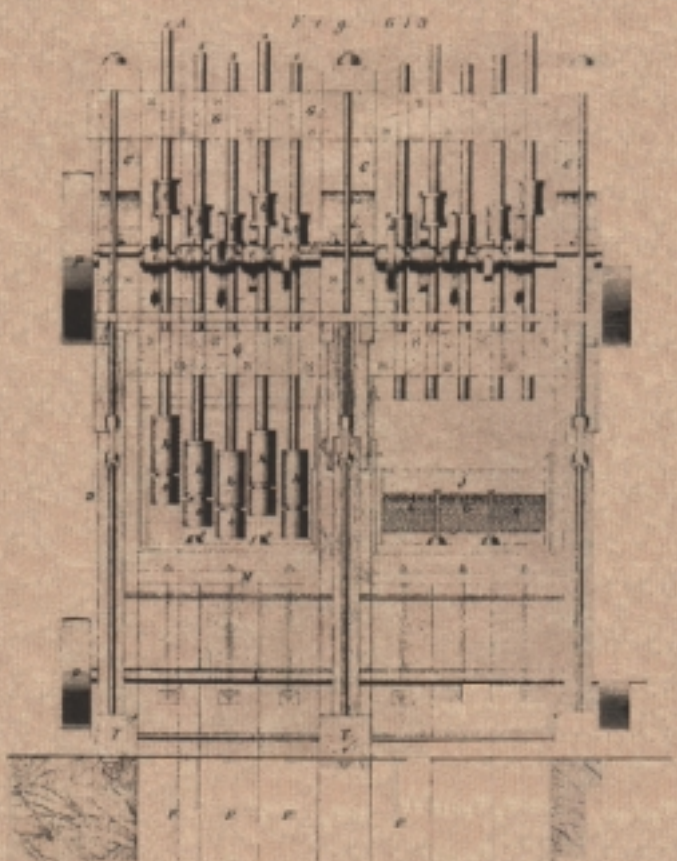
The present stamp mill is a reconstruction of the mill that was built soon after the Kelly family bought the property in 1895. The Kelly mill was located just upstream from the reconstruction. The ten-stamp mill was originally at the Coggins Mine in Montgomery County and moved to the Reed Gold Mine in 1974. It is believed to be the only one still in existence east of the Mississippi River and the last surviving mill built by the Mecklenburg Iron Works.

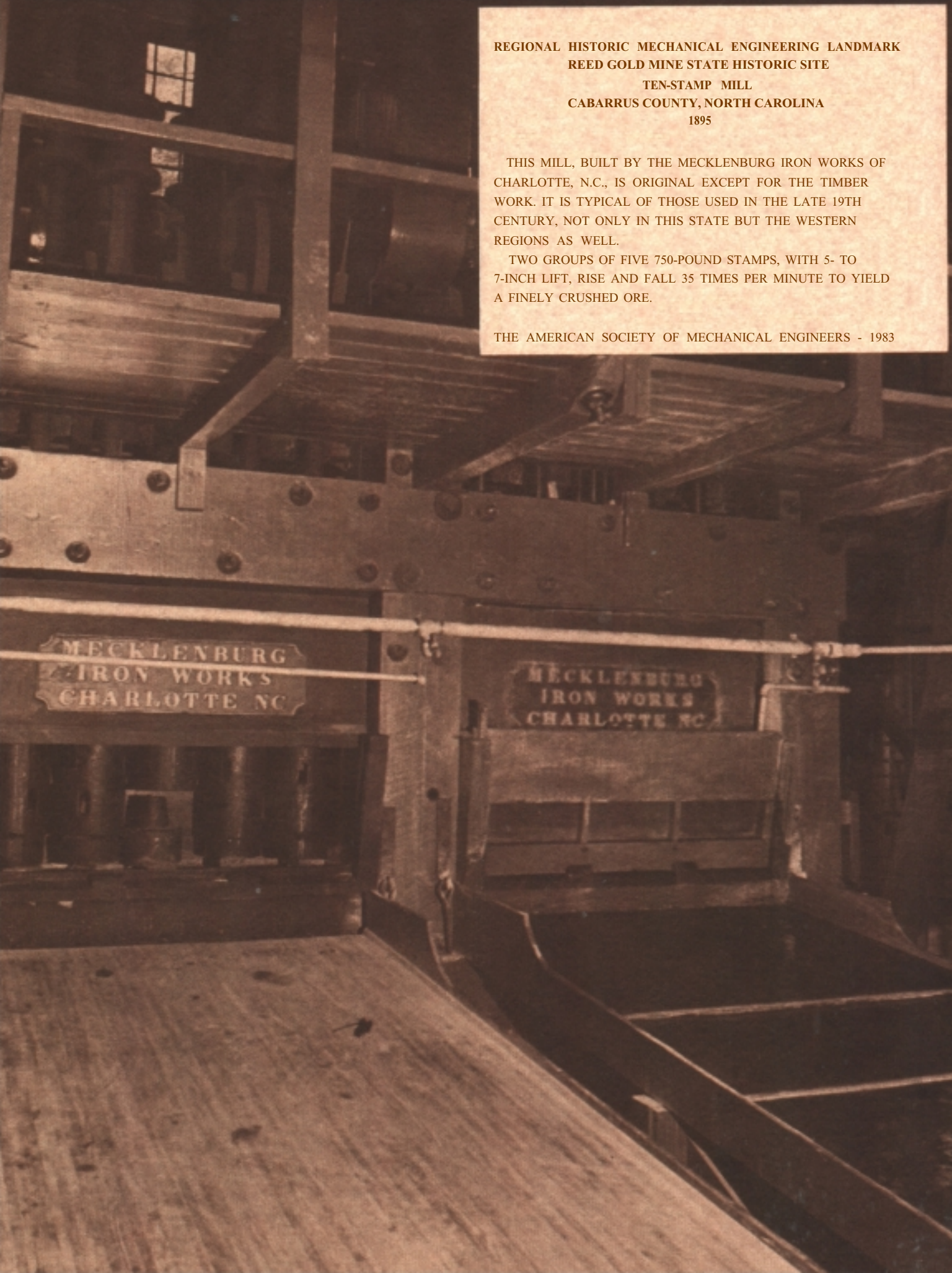
With Coggins Mine in operation until the early 1960s, the ten-stamp mill was in relatively good condition when re-erected at Reed. Except for replacing some of the oak timbers in the base of the machine, polishing the shafts, and rebaitting the bearings, no other major work was done to restore the stamp mill. The mill is essentially the same in every respect as that which pounded the gold-bearing ore into dust at the Reed Gold mine in 1895.

The copper amalgamating plates were used at the Haile Mine in Lancaster County, South Carolina. They are on loan to the site by the Thies family of Charlotte. The Wilfley concentrating table was originally used in Idaho Spring, Colorado.

ORE DRESSING MACHINERY — STAMPS







REGIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK
REED GOLD MINE STATE HISTORIC SITE
TEN-STAMP MILL
CABARRUS COUNTY, NORTH CAROLINA
1895

THIS MILL, BUILT BY THE MECKLENBURG IRON WORKS OF CHARLOTTE, N.C., IS ORIGINAL EXCEPT FOR THE TIMBER WORK. IT IS TYPICAL OF THOSE USED IN THE LATE 19TH CENTURY, NOT ONLY IN THIS STATE BUT THE WESTERN REGIONS AS WELL.

TWO GROUPS OF FIVE 750-POUND STAMPS, WITH 5- TO 7-INCH LIFT, RISE AND FALL 35 TIMES PER MINUTE TO YIELD A FINELY CRUSHED ORE.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS - 1983

Acknowledgements

The Piedmont-Carolina Section gratefully acknowledges the efforts of all who cooperated on the landmark designation, particularly the staff at the Reed Gold Mine State Historic Site.

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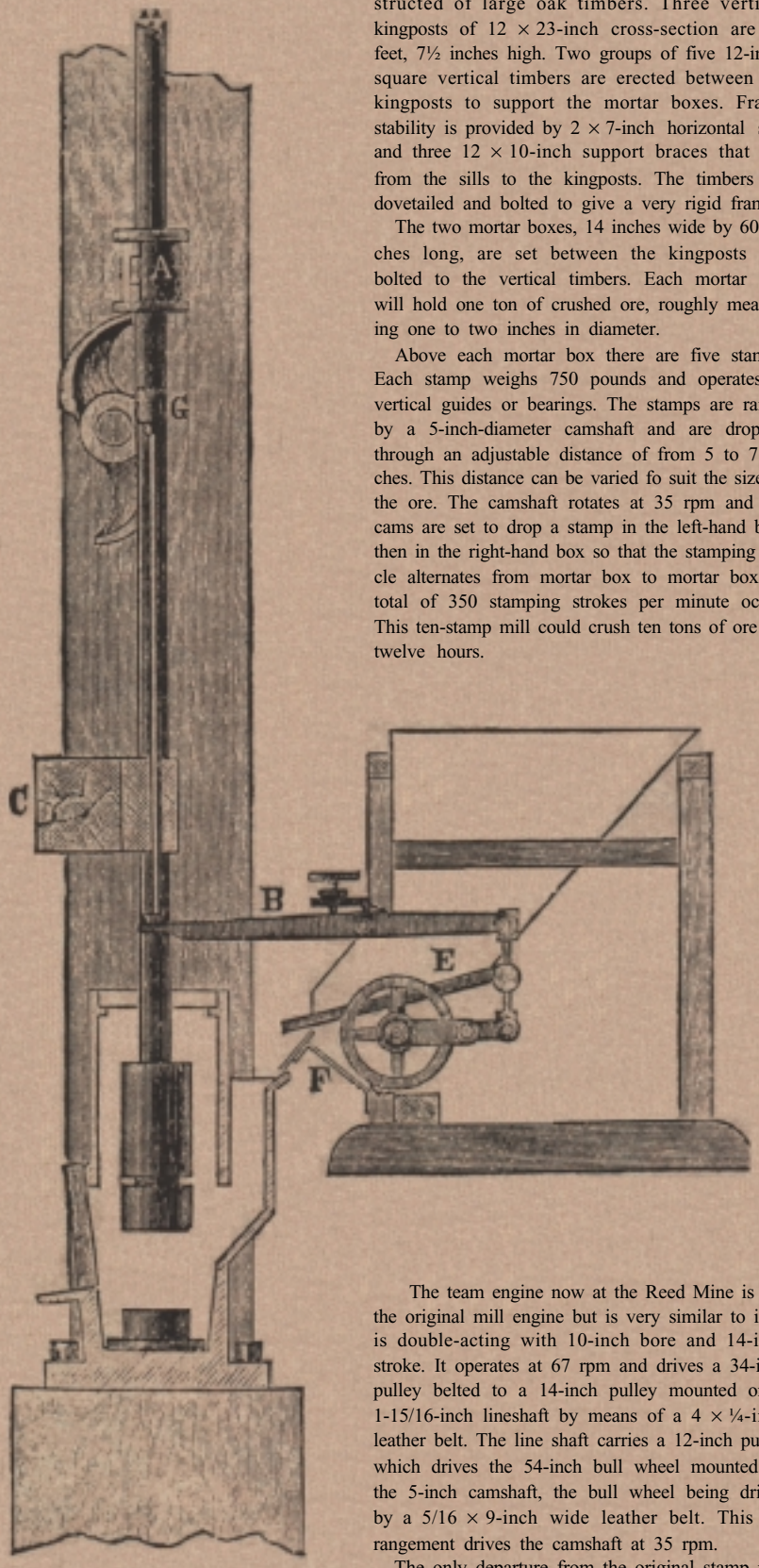
The ten-stamp mill at the Reed Gold Mine State Historic Site is the sixth Regional Landmark to be designated since the ASME program began in 1973. Since then, 11 International and 65 National Landmarks have been recognized by the Society. Each represents a progressive step in the evolution of mechanical engineering and each reflects its influence on society, whether it is of significance in its immediate locale, in the country, or throughout the world. For more information about this and other programs sponsored by the ASME National History and Heritage Committee please contact the ASME Public Information Department, 345 E. 47th St., New York, N.Y. 10017 (212-705-7740).

Sources for material in brochure: *Golden Promise in the Piedmont: The Story of John Reed's Mine,* Richard F. Knapp; *Reed Gold Mine Guidebook,* Division of Archives & History, North Carolina Department of Cultural Resources.

CHALLENGE FEEDER



A—Tappet. D—Hopper.
B—Lever. E—Carrier Table.
C—Lower Guide. F—Chute.

Scale, 3-8ths to foot.

Technical Data

The ten-stamp mill has a very heavy frame constructed of large oak timbers. Three vertical kingposts of 12 × 23-inch cross-section are 18 feet, 7½ inches high. Two groups of five 12-inch-square vertical timbers are erected between the kingposts to support the mortar boxes. Frame stability is provided by 2 × 7-inch horizontal sills and three 12 × 10-inch support braces that run from the sills to the kingposts. The timbers are dovetailed and bolted to give a very rigid frame.

The two mortar boxes, 14 inches wide by 60 inches long, are set between the kingposts and bolted to the vertical timbers. Each mortar box will hold one ton of crushed ore, roughly measuring one to two inches in diameter.

Above each mortar box there are five stamps. Each stamp weighs 750 pounds and operates in vertical guides or bearings. The stamps are raised by a 5-inch-diameter camshaft and are dropped through an adjustable distance of from 5 to 7 inches. This distance can be varied fo suit the size of the ore. The camshaft rotates at 35 rpm and the cams are set to drop a stamp in the left-hand box, then in the right-hand box so that the stamping cycle alternates from mortar box to mortar box, A total of 350 stamping strokes per minute occur. This ten-stamp mill could crush ten tons of ore in twelve hours.

The team engine now at the Reed Mine is not the original mill engine but is very similar to it. It is double-acting with 10-inch bore and 14-inch stroke. It operates at 67 rpm and drives a 34-inch pulley belted to a 14-inch pulley mounted on a 1-15/16-inch lineshaft by means of a 4 × ¼-inch leather belt. The line shaft carries a 12-inch pulley which drives the 54-inch bull wheel mounted on the 5-inch camshaft, the bull wheel being driven by a 5/16 × 9-inch wide leather belt. This arrangement drives the camshaft at 35 rpm.

The only departure from the original stamp mill is the use of a 30-hp electric motor which is connected by pulleys and belts to the lineshaft. This motor now provides the drive for the stamp mill, as an operating steam engine would be quite impractical for intermittent operation.