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Frank Norris Studies

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Frank Norris and Gold Mining
A Brief Illustrated Tour

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In *McTeague* and a handful of short stories, Frank Norris sets scenes in and around gold mines. True to form, Norris's interest in embuing his works with real-world detail leads him to make occasional references to particular mining tools and practices. Although in total Norris only specifically mentions about a dozen mining terms, these dozen terms span the mining process from beginning to end.[1]

There are two principal forms that gold deposits take: lode gold and placer gold (*placer* rhyming with *passer*). Lode gold is embedded in hard rock—often in veins running parallel to quartz or some other mineral; placer gold is located in surface soils, deposited over time through erosion and water currents. The processes involved in mining these two unalike types of deposits are very different. A gold-rich mountain can have both lode gold—embedded in the hard rock core of the mountain—and placer gold—distributed throughout the soil and gravel around and on top of the hard rock. Therefore, any given gold mining area will often require more than one means of extracting the element from the source-site. Norris captures this variety of activities at a gold mine when he writes in *McTeague*:

> But there were men in these mountains, like lice on mammoths' hides, fighting them stubbornly, now with hydraulic "monitors," now with drill and dynamite, boring into the vitals of them, or tearing away great yellow gravelly scars in the flanks of them, sucking their blood, extracting gold. (268)[2]

The "drill and dynamite" were used to cut into hard rock deposits, to "bore into the vitals" of the mountains. The hydraulic monitors, on the other hand, were large water cannons used to strip mine the mountain's placer deposits, leaving behind the "gravelly scars" in the surface. Water is a key ingredient in placer mining. The operative principle is that gold is heavier than the minerals in which it is embedded. Because it is heavier, gold will tend to sink relative to the materials surrounding it. This, of course, is the basis of panning for gold: as the soil and gravel are slowly washed over the sides of the pan, the grains of gold will sink to the bottom of the pan. When everything else has been washed away, a skilled panner will have only these grains remaining for collection. Panning, of course, has little merit as a vast commercial venture, and so miners devised a series of devices that allow for placer mining on a large and more profitable scale.

The hydraulic monitor—or hydraulic giant, or water cannon (see figure 1)—shot water at the surface of a gold-rich site, causing sections of the surface soil to flow down and into channels where the gold was collected (figure 2 shows one of these hydraulic giants in operation). The water pressure needed for this type of placer mining was great, and this pressure was typically created by running water through long, descending pipelines. As the water in the pipe accelerated, the diameter of the pipe would decrease, which increased the water pressure. A hydraulic cannon used a century ago at a mine in northern Georgia, for example, used twenty-six miles of pipeline, which descended down the side of a mountain at about eight feet per mile.[3] The cannon itself had a five inch nozzle though which the water shot out. As a general formula, the diameter of the pipe where the water first enters would be about 2½ times the diameter of the nozzle. The nozzles on these hydraulic giants generally ranged from two to eight inches.

The dirt and rock washed away by the hydraulic cannon was directed into a sluice (see figure 3). A sluice was a channel in which raised ridges about 1½ inches high —"riffles"—appear at regular intervals. There were numerous shapes and patterns that these riffles could take, but they all worked on the same premise: as water and soil flow down the sluice, the heavier gold particles will be caught in the intervals between the riffles, while the water and other minerals will flow over the riffles. After a time, the flow of water and soil down the sluice is stopped, and the gold deposited between the riffles is scraped out. Sometimes miners place a coating of mercury in the riffles. Mercury has the convenient property of attracting and binding to gold particles, thus trapping them and preventing the finer ones from slipping over the riffles and escaping the sluice. The combined mercury and gold is an *amalgam*, and the process of combining the

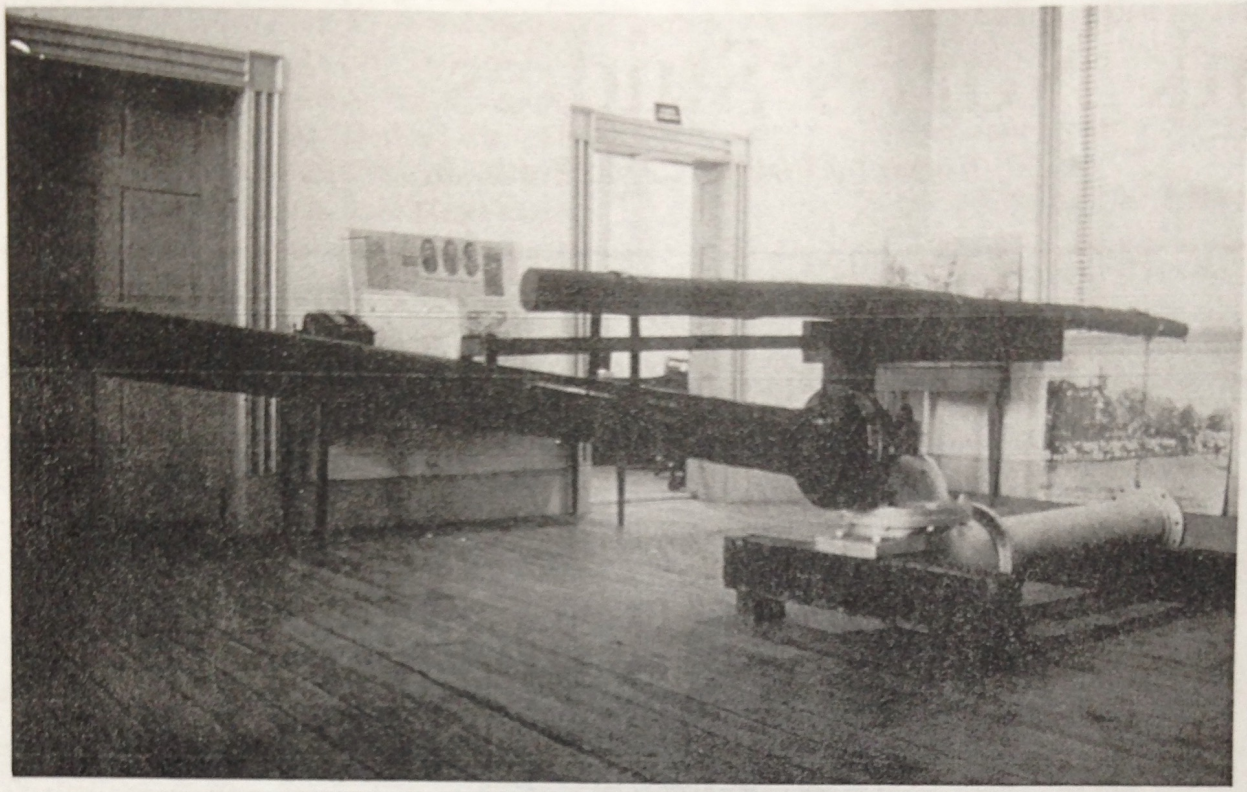

Figure 1

Figure 2

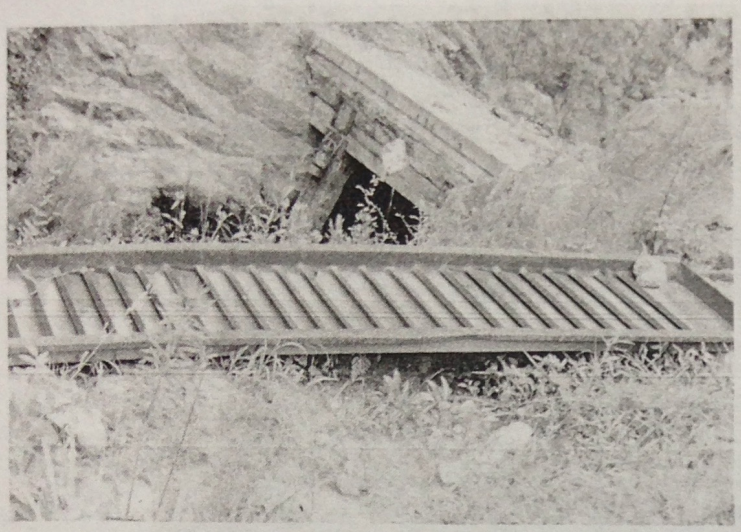

Figure 3

two heavy elements is called *amalgamation*. Separating the mercury and gold once collected is easy: simply heat the mixture and the mercury vaporizes, leaving only the gold behind (this gaseous mercury can be—and usually was—captured, condensed, and reused). As helpful as mercury could be in a sluice, amalgamation was equally, if not more, important in the stamp mill (which will be discussed shortly).

Riffles might be incorporated into a flume as well as a sluice. Flumes, or canals, were typically constructed out of wood and were used to divert streams and rivers out of their normal course (see figure 4, in which the riffles will be noted at the bottom-center). When it was discovered that river beds could be mined profitably for gold, the first obstacle became the river itself. To overcome this problem, it would be dammed and diverted into a flume. The flume would carry the water a certain distance and then redirect it back into the riverbed. This cleared a section of the riverbed for mining. Along the way, the river water was passed over riffles in order to capture any suspended gold particles.

Whether mining riverbeds or mountain sides, all of the soil, gravel, loose rock, and clay is eventually washed away, revealing the underlying bedrock. Reaching the bedrock was important, for through natural processes—earthquake vibrations and so forth—the placer gold descends until reaches the bedrock and cannot descend any further. A bedrock cleaner—such as the title character in Norris's story "Shorty Stack, Pugilist"—has the task of collecting the gold deposited in the crannies of the bedrock.[4]

In order to extract lode gold from bedrock or hard rock one must temporarily abandon water in favor of "drill and dynamite." Compared to placer gold, lode gold is much more difficult to recover, for one must break down the rock into manageable chunks of ore. This ore must then be further crushed in order to separate the gold. Once gold has been located—usually by first finding a vein of quartz—the miner must determine the best method for approaching the vein with an eye toward blasting and removing the valuable ore. This can be done either by sinking a shaft downward, or tunneling inward. In *McTeague*, the Big Dipper mine uses a tunnel instead of a shaft: Norris writes that McTeague "made his way to the tunnel mouth, climbed into a car in the waiting ore train, and was hauled into the mine" (272). The typical tunnel entrance was nothing grand, simply a dark hole blasted into the side of the mountain (see figures 5 and 6). The tunnel entrance of the Big Dipper mine where McTeague goes to work may have, as in figure 6, tracks leading into the tunnel entrance so that carts of ore can be rolled out of the mine.[5] Reducing the hard rock to ore that can be carted out of the mine was done primarily with dynamite. At this stage of the process, much of the hard work consisted of drilling holes into the rock in which to place the sticks. There were a number of drills developed in the mid-to-late nineteenth century to accomplish this task, from manual drills in the early days to much more robust and sophisticated drills in the late nineteenth century that were powered by compressed air. One of the earliest of these compressed-air drills was invented by Charles Burleigh in the 1860s. Norris refers to this drill as the "Burly": "The Burly drill boring for blasts broke out from time to time in an irregular chug-chug, chug-chug, while the engine that pumped the water from the mine coughed and strangled at short intervals" (273). The Burleigh drill was mounted on a vertical beam for stability and leverage. The compressed air drove a piston that propelled the drilling bar. The bit would strike the rock surface an average of 200 times per minute, breaking into the rock and carving out a hole in which to place the charges of dynamite. In an improved version of the drill he originally designed with John W. Brooks and Stephen F. Gates in 1866, Burleigh made it possible for the drilling bar to rotate; thus, the drill bit not only thrust forward, but also turned, significantly improving the performance of the drill.[6]

At the Big Dipper mine, McTeague, we are told, takes a job as a "chuck tender" (271). McTeague's job was to help operate a Burleigh drill:

> McTeague tended the chuck. In a way he was the assistant of the man who worked the Burly. It was his duty to replace the drills in the Burly, putting in longer ones as the hole got deeper and deeper. From time to time he rapped the drill with a pole-pick when it stuck fast or fitchered. (273)

Similar in function, if not in form or method, to any hand

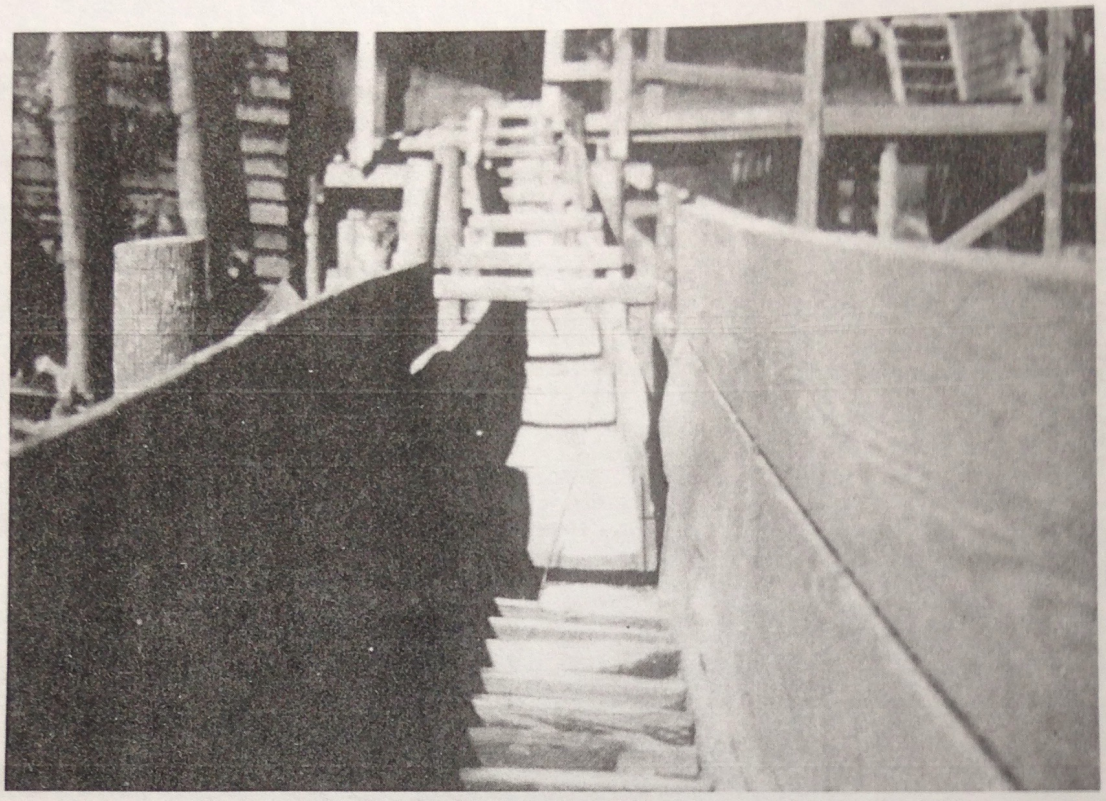

Figure 4

Figure 5

Figure 6

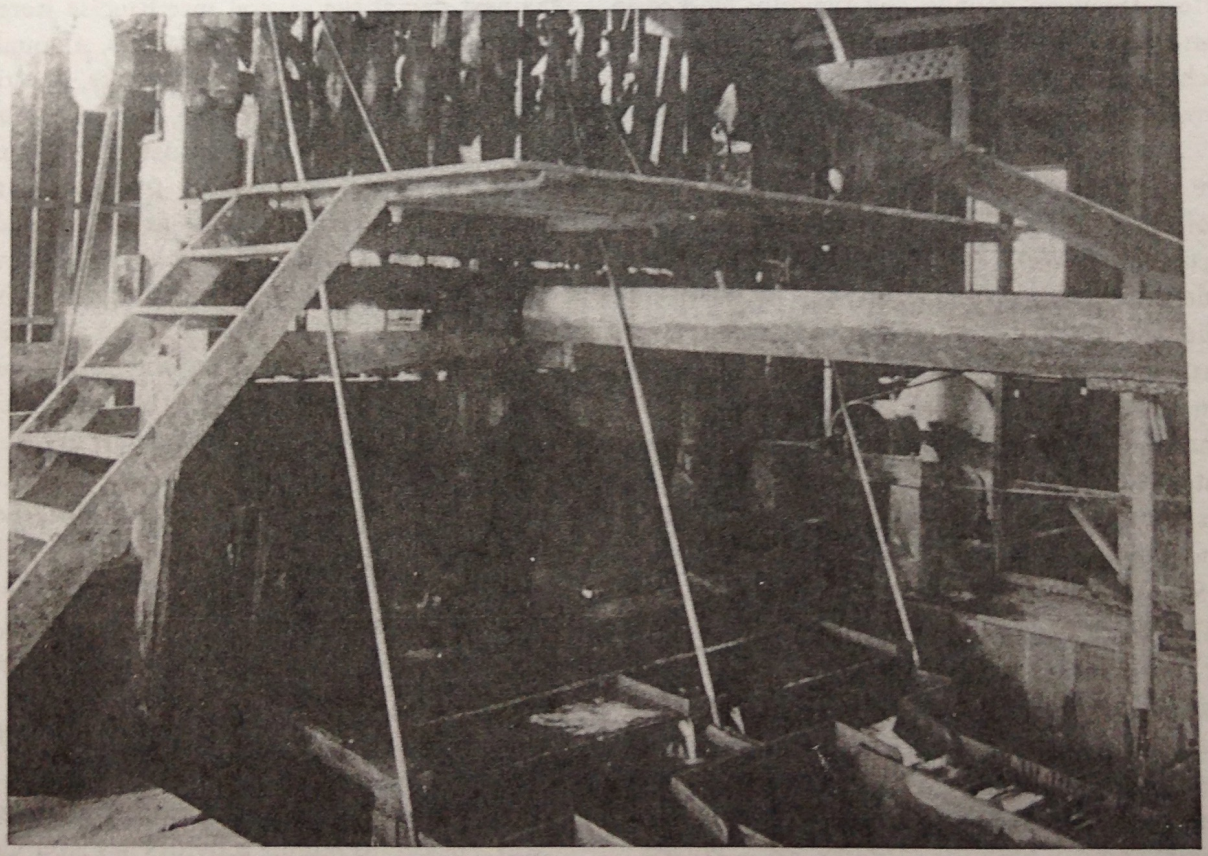

Figure 7

drill found in neighborhood garages today, the bits in rock drills such as the Burleigh were held in place by a chuck. The dynamite charges needed to be set several feet into the rock, but, because of their relatively fixed operating position, it was impractical to drill starting with a single long drill bit. Therefore, one would begin to drill with a short bit and gradually work through increasingly longer bits until a cavity was deep enough for the charges to be properly set. Sometimes these drill bits got stuck in the hole—"fitchered" as Norris writes—and the drill operators were lucky if they were able to knock them free with a blow of a pick. Sometimes the drill bit would not budge with a mere blow, and a second hole would have to be drilled near the original hole, charges set, and the stuck bit literally blasted free. Too often, however, the impact of the blast would bend the drill bit, leaving it useless.

The blasted rock would be loaded into ore carts and hauled to the surface of the mine where it would then be taken to the stamp mill (see figure 7). First introduced in California mines, the stamp mill was where the blasted ore was crushed into grit so that the gold could be separated from the other minerals. The stamp mill worked on the principle of the pharmacist's mortar and pestle: the ore would be ground to a powder by solid iron cylinders (it is the stamp mill that is pictured in the opening frames of Stroheim's *Greed*). These cylinders often weighed up to a thousand pounds, and typically worked in banks, or batteries, of five. Each cylinder would be raised about ten inches in a system of pistons (pictured in figure 8), then they would drop on the ore packed into the "battery box" below. At this point water is often added to the mix. When the ore is sufficiently crushed, the water carries the ore over a plate of copper coated with mercury (see figure 9). On these "amalgamation plates" the gold particles bind to the mercury while the remaining ore washes on. The amalgamation plates did not catch all of the gold—in fact, they often caught less than half of the gold particles—so, after crossing the amalgamation plates the crushed ore could be run through a sluice or some other contrivance that would collect an additional percentage of the gold.

Norris was attracted to these stamp mills as a symbol of power and the grinding pressure of natural law or human circumstance. Stamp mills are mentioned in "A Reversion to Type" and "The Wife of Chino," but they play a more thematic role in *McTeague*, where Norris writes of

> the prolonged thunder of the stamp mill, the crusher, the insatiable monster, gnashing the rocks to powder with its long iron teeth, vomiting them out again in a thin stream of wet gray mud. Its enormous maw, fed night and day with the car-boys' loads, gorged itself with gravel, and spat out the gold, grinding the rocks between its jaws, glutted, as it were, with the very entrails of the earth, and growling over its endless meal, like some savage animal, some legendary dragon, some fabulous beast, symbol of inordinate and monstrous gluttony. (268-69)

At regular intervals the stamp mill would have to be stopped so that the gold could be collected from the amalgamation plates and from the sluices. Norris refers to this process in "The Wife of Chino" (terming the riffles "ripples"):

> Once every two weeks Lockwood "cleaned up and amalgamated"—that is to say, the mill was stopped and the "ripples" where the gold was caught were scraped clean. Then the ore was sifted out, melted down, and poured into the mould, whence it emerged as the "brick," a dun-coloured rectangle, rough-edged, immensely heavy, which represented anywhere from two to six thousand dollars. This was sent down by express to the smelting house.[7]

Finally, just as Norris demonstrates a knowledge of large-scale placer and lode mining with hydraulic monitors, Burleigh drills, and stamp mills, he also reveals a familiarity with prospecting and small-scale placer mining. When McTeague teams up with Cribbens to go prospecting for gold, they first arm themselves with the necessary supplies: "They fitted out the next day at the general merchandise store of Keeler—picks, shovels, prospectors' hammers, a couple of cradles, pans, bacon, flour, coffee, and the like, and they bought a burro on which to pack their kit" (281). With one exception, all of these items are self-explanatory, the common kit of prospectors. It is the mention of "cradles" that indicates Norris knew some of the finer details of small-scale placer mining and prospecting. Cradles—or "rockers" as they are often called—are tiered, rectangular boxes. The top tier is a screen. Soil is shoveled onto the screen where it is dampened with water. The finer gold and dirt pass through the screen when the device is rocked back and forth, while the chunks of gravel and rock—and the occasional nugget of gold, if the prospector is lucky—remain on the screen to be examined and discarded. Falling through the screen, the soil lands on the second tier, which is a tilted frame lined with canvas. As the water and soil flow down the frame, bits of gold are caught in the canvas. Once beyond the canvas, the water and soil flow onto the bottom tier, which is essentially a mini-sluice with riffles to catch any remaining gold particles. The whole device is typically about three or four feet long and a foot and a half wide, and can be loaded onto a burro.[8]

With the exception of the prospecting scenes in *McTeague*, Norris places his mining activities in Placer County, California. Norris himself spent some time in 1897 at the Big

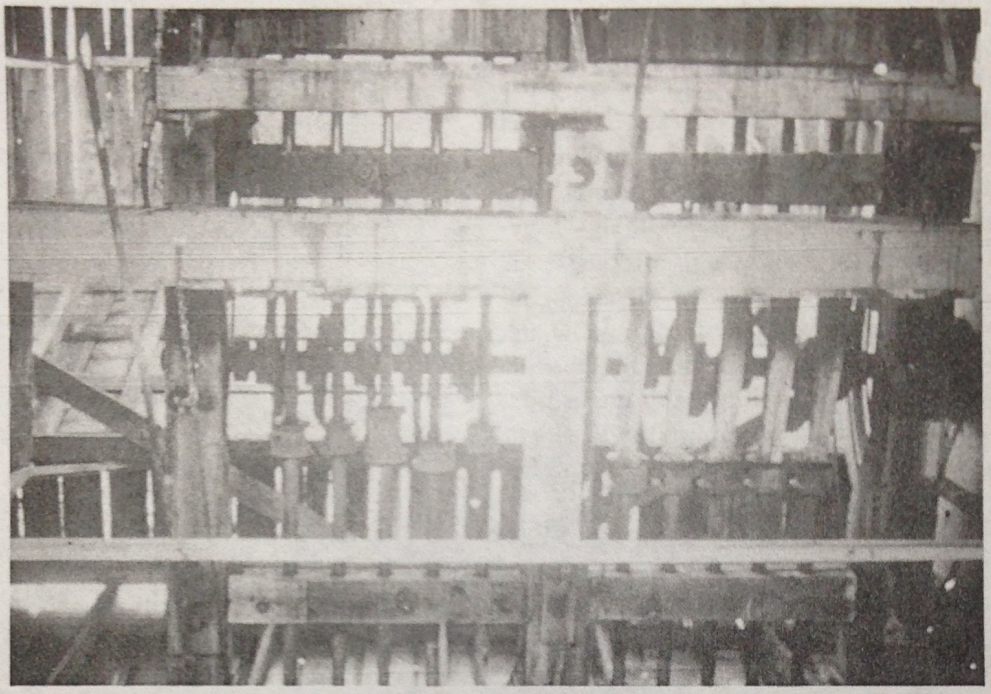

Figure 8

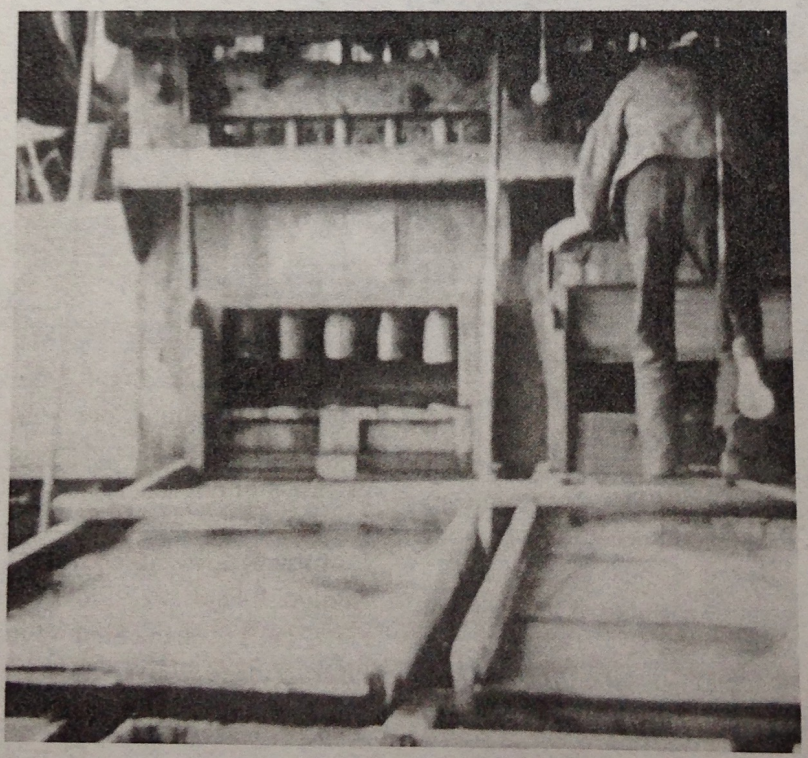

Figure 9

Dipper mine in Placer County run by his friend Seymour Waterhouse.[9] Located in the Sierras, halfway between Sacramento and Reno, the Placer County mining region is situated in what became known to miners as the "Mother Lode." This 120-mile-long belt of gold-rich mining areas runs parallel to the western slope of the Sierras and extends from Placer County to Mariposa County.[10] In the mid-nineteenth century there was probably no better place to observe gold mining—from prospecting, to placer mining, to blasting and crushing hard rock—than this section of the United States. Here Norris could observe gold mining in all of its dimensions and on both large and small scales. Then, though a select and careful use of key terms and descriptive detail, he could use this distinctive landscape as a canvas to paint his tales upon, tales in which Norris sought to mine the "black, unsearched penetralia of the soul of man."[11]

Notes

I would like to thank the following for their help as I gathered the material for this essay: Sharon Johnson and Terry Seabolt of the Dahlonega Courthouse Gold Museum, Johnny E. Parker of the Consolidated Gold Mines, the Georgia Department of Archives and History, and the Georgia Department of Natural Resources. Figure 1 appears courtesy of the Georgia Department of Natural resources; figures 2 and 5-9, the Georgia Department of Archives and History; and figure 3, the Consolidated Gold Mine.

[1]My primary source for information on gold mining was Wallace R. Witcombe's *All About Mining* (New York: Longmans, Green, 1939). Other sources were: William S. Greever, *The Bonanza West* (Norman: University of Oklahoma Press, 1963); J.M. West, *How to Mine and Prospect for Placer Gold* (Washington, D.C.: U.S. Department of Interior, Bureau of Mines, 1971); George J. Young, *Elements of Mining*, 4th edition (New York: McGraw-Hill, 1946).

[2]Page references are to the Library of America's edition of *McTeague: A Story of San Francisco* (New York: Vintage, 1990).

[3]The mine mentioned is the Consolidated Gold Mine in Dahlonega, Ga. The nozzle of the hydraulic cannon is on display at the mine.

[4]See *The Apprenticeship Writings of Frank Norris, 1896-1898*, 2 volumes in 1, ed. Joseph R. McElrath, Jr., and Douglass K. Burgess (Philadelphia: The American Philosophical Society, 1996), vol. 2, 188.

[5]Figure 6 is a photograph of the tunnel entrance of the Calhoun Gold Mine in northern Georgia, shot in the early 1900s.

[6]Information on the Burleigh drill was derived primarily from C.H. Vivian, "Rock-Drill High Lights," *Compressed Air Magazine*, 51 (March 1946), 71-76.

[7]*A Deal in Wheat and Other Stories of the Old and New West*, volume 4 in *The Argonaut Manuscript Limited Edition of Frank Norris's Works* (Garden City, N.Y.: Doubleday, Doran & Co., 1903), 192.

[8]Diagrams of "rockers" can be seen in West (24) and Witcombe (124).

[9]See the notes by Donald Pizer in the Library of America edition of *McTeague* (315).

[10]Rodman W. Paul, *California Gold* (Lincoln: University of Nebraska Press, 1947), 39-40.

[11]Frank Norris, "A Plea for Romantic Fiction," in *The Literary Criticism of Frank Norris*, ed. Donald Pizer (Austin: University of Texas Press, 1964), 78.

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