

The Janin Brothers: Mining Engineers

Clark C. Spence

Most early western mining was based on simple individualistic techniques of high blister and callous labor and low capital input. Gold was usually found in placer deposits, readily worked in pans, rockers or sluice boxes. Free-milling quartz was found in outcrops on or near the surface and could readily be crushed with a stamp mill and the gold separated with mercury—all easy but inefficient. But obvious placer deposits were worked out quickly and free-milling ores all too scarce. To follow outcroppings deep into the earth took capital and technology: drilling, blasting, tunneling, shafting, ventilating, moving ore underground and hoisting it to the surface. Working complex ores, especially silver, required experimentation and costly new refining and smelting processes; and in time new “mass production” approaches like gold dredging and the low-grade copper techniques at the turn of the century all required vast inputs of capital and technological know-how. This was the era of the corporation and the engineer.

It is into this historical context that we introduce the three Janin brothers—Louis, Henry, and Alexis. Among the first of the trained mining and metallurgical engineers they helped guide western mining from the unsystematic rule-of-thumb “by guess and by God” approach to the more scientific. At the same time, they were typical of an increasingly important versatile new breed centered on the American West but who consulted and managed mines and smelters the world over and were as much at home in Antofagasta and Nome as in Denver or San Francisco. Early leaders in their field, but not giants, the Janins were part of a unique fraternity—part of “that brilliant group of pioneer mining engineers and metallurgists who set the standard of the profession in those early days,” as one mining editor put it.¹

Louis, Henry, and Alexis Janin were among the six sons of a prominent New Orleans lawyer, Louis, Sr., who had been involved in litigation at the New Almaden quicksilver mine in California, and saw great potential in western mining, not only for investment but for professional careers for his sons.

All the Janins were Southern partisans. Indeed, another brother had been killed fighting for the

Confederacy. In private, the brothers damned “That miserable Lincoln & his cabinet,” Alexis flew the Confederate flag from his window in Germany, and both Louis and Henry would have enlisted had their father not prohibited it. “When Papa refused to let Henry and myself go South,” said Louis, “I determined to think and to say as little as possible about the war, and have found the plan to work admirably.”²

The eldest of the three, Louis, attended Yale, and along with Henry, who was a year younger, studied from 1857 to 1860 at what was then the world’s pre-eminent mining school at Freiberg in Saxony. Henry was there because of his father, and after ten months suggested that he would rather be a lawyer instead, but papa demurred and Henry continued his engineering training.³ Finished at Freiberg, the boys did the traditional tour of mines in eastern Europe, enrolled in a short course at the École des Mines in Paris, which Louis thought would be a fine place to study were it not for so many other attractions, and were in California by early 1861.⁴

Meanwhile, Alexis, the baby of the three, had been lingering in Dresden and Paris, since 1858. “Alexis I fear is developing fast into a Parisian Gamin” and ought to return to the United States, Louis wrote early in 1865.⁵ During his ten years abroad, Alexis would take a bachelor’s degree at the University of Paris and complete the practical course in smelting at Freiberg, where he took piano lessons, fought the obligatory duel, and reluctantly returned to the United States in the fall of 1868.⁶

Like other newly trained engineers of the day, the Janins at first took whatever jobs were available, as much for experience as for wages. In California in 1861, Louis was quickly put in charge of the Enriquita quicksilver mine near San Jose, with a house, a cook and a salary of \$200 a month—a sum with which I am quite satisfied as it is my first attempt in business and being yet ‘a youth to fortune and to fame unknown.’” At the same time, Henry was on the Enriquita’s payroll at \$100 a month as bookkeeper and time keeper, but soon moved up to mining captain.⁷ But the Enriquita was hardly a going enterprise. Lacking capital and losing a lawsuit with the New Almaden Company, it soon closed down—a

miserable speculation for papa," Louis noted. At the end of 1861, Henry was in charge and was "growing fatter than ever" on his \$166 a month as he wound things down at the mine. Louis had taken an office in San Francisco. But the tottery Enriquita had introduced them both to the practical mining world.⁸

From these beginnings, the brothers went separate ways, demonstrating the jack-of-all-trades nature of the engineering profession. Louis ran the Mexican mill on the Comstock Lode at a salary of \$2,000 a year and expenses. "This is less than I have a right to expect," he wrote, but the business is just what I have been desirous to engage in, as I will acquire all the experience necessary to my future success.⁹ It was hard, demanding work, but it intrigued him: "There is a sufficient variety in my business at this mill to keep up my interest in what I have to do," he wrote his mother.¹⁰ Still, at times he was discouraged. "I will accept no position from which I cannot get more than \$5000--a year," he vowed. "Working for small wages is 'played out.'"¹¹ He was concerned that in Nevada "speculation in mining stocks is so rife, and so little money is invested in mines as a source of interest."¹²

At the Mexican Mill, Louis sought to adapt basic Freiberg amalgamation processes to reclaim the large amount of silver being lost in the slimes and tailings. The Comstock was still in the grip of "process mania," with every ragged would-be mill man hawking some easy "dead-sure" formula for treating ores and debris--cedar or sage brush concoctions, alum, borax, saltpeter, nicotine sheep dip, and every acid imaginable. Eschewing such wild whimsies, Louis first tried to convert the Rivot process, which his partners hoped might "revolutionize the mining and metallurgical world," but which he thought "does not promise much."¹³ The experimental furnace he sought to install was barred by the new superintendent of the Mexican mill, who, said Louis, "is an ass."¹⁴ He then set up his equipment at a plant a mile-and-a-half away, but within a few months, he had "thrown up" the Rivot Process because of outside interference, had taken charge of the Gould and Curry Mill at Virginia City, and had asked Henry to join him--"but I am afraid that he is lost in schemes."¹⁵

Using a modified Freiberg barrel amalgamation process, Louis was successful in profitably re-working the tailings at the Gould & Curry Mill. He took the mill on contract and for every dollar per ton he was able to save on working the ore, he was to receive \$100 a month additional salary in addition to his \$300 salary. He noted he made plenty of money but spent it "because I have no wife to help me keep it,

but yet seldom in want and never flush."¹⁶

As he described them, his living accommodations were hardly luxurious: I and two companions sleep in a small room 10x12 ft, which serves at the same time for sitting room and office. The room is one-half of a little shanty made of rough boards with "intervals of 15 minutes" between them, so that we have plenty of air. We have one chair, one little table, a tin wash basin and one tumbler between us. . . . One of my companions is a carpenter and the other is the clerk of the mine. This latter one & myself dine together at the workmen's lodging house, but we are still so imbued with aristocratic notions that we dine after the men are finished, and have a table cloth (to be sure, a very dirty one) set for us. We eat our hash and watery potatoes with the greatest contentment, although hash in fly time is not the most desirable food.¹⁷

"Everything is going swimmingly with me," he reported early in 1865, though admitting that the business was monotonous and "The Mining Companies are getting mean."¹⁸ Noting that his income was \$10,000-11,000 a year, sufficient "for us to live comfortably," Louis married Elizabeth Marshall late in 1865, no doubt improving his living situation in the process.¹⁹

While Henry was "cruising around California hunting up oil-wells," Louis had put the Gould & Curry Mill on a paying basis. Then in addition to the mill, he took on the management of a mine. "I like variety in my business," he explained. Still, in the same year, he was one of the organizers and stockholders of the Sutro Tunnel Company and would be active in helping raise capital for this ambitious enterprise to tap important Comstock mines.²⁰

In 1866, under Louis's superintendency, the Gould & Curry Silver Mining Company built the first reservoir mill especially for treating slimes and tailings. He was also in charge of the Gould & Curry mine, which was doing poorly. "The Trustees are on the rampage," he wrote. "I am 'blowed up' by nearly every mail."²¹ For a time in the fall of 1866, a lack of water silenced the mill temporarily.²² With his own reservoir in Six-mile Cañon, Louis amassed some 100,000 tons of slimes and tailings and in 1867 started work on his own. With a good deal of research, he got his best results from blue vitriol (sulfate of copper) and salt. Unfortunately a freshet swept down the cañon and carried off most of his rich slimes. In 1868, Henry joined in the mill enterprise,

taking a third interest, and mortgaging his interest for \$8,000, leaving him with no other income except his profession "which only serves to nourish and keep up my lazy body." "A creditor is not a bad thing to have," he wrote philosophically, "as he takes more interest in one's life & doings than a mere friend would."²³

Fresh from a decade in Europe, young Alexis, too, joined the group as a kind of consultant late in 1868 and the Janin process proved efficient and profitable. But efforts to patent it failed and the word got out; other mills took it up and the Janins were no longer able to buy rich tailings, so went out of business, thus ending Louis's Comstock milling contributions.²⁴

Meanwhile, in Virginia City, Alexis was beginning what was to be an auspicious career in metallurgy and milling. "He is just in the position he ought to occupy to keep him out of mischief," Henry reported. "Plenty of work" in a small-scale sampling and assaying business with von Liebenan, a sharp, steady old Freiberg companion who "rolls his 'r's' 'hor-r-r-ibly.'" Moreover, Henry told his mother: "He has introduced into his partner's house the unheard of luxury of sheets. How effeminate!"²⁵

In the summer of 1871, Alexis had taken a temporary job to work the rebellious ore of the Nevada Butte Mining Company in Galena, Nevada. In an isolated setting, the company, which "is not very rich," agreed to pay Alexis \$300 a month while he introduced the process into the new mill and to keep him on permanently if satisfaction was mutual. This was a far cry from life in Europe, he thought, but not unpleasant. Living in the house of a company superintendent was agreeable. "In the evening we play cards and talk till about 9 o'clock when everyone goes to bed. This sort of life is new to me and quite pleasant."²⁶

All three brothers, even while still working on Comstock metallurgy, served as experts in examining mining property for potential buyers, another common and very important function of the mining engineer. Louis and Henry especially would be considered at the top of their profession in this field, though uncomfortable travel, rough living and the chance of a damaged reputation were all part of it. Louis, for example, made "a very trying and disagreeable" journey to the Reese River mines in 1863 in a jammed stagecoach, which overturned enroute, but was impressed enough to invest \$7,000 "for myself and others."²⁷

At times, worried that "I am growing to be too much of a mill man and too little of a miner," Louis proposed to join with Henry for a few months "and travel as much as possible--at other people's expense;"

and to dabble in Comstock mines with money borrowed in San Francisco.²⁸ While examining mines in Arizona and Mexico late in 1863, Louis and his party was attacked by Apaches who fired the grass along the bed of the Santa Cruz River. Firing away with a Henry rifle, "Young Janin behaved with great coolness" but understood that discretion was the better part of valor. "They're getting rather too many for us, Colonel," he told one of his comrades, "and I think we had better leave." Two companions were killed, but the rest escaped. Unharmed, Louis examined a mine in Sonora, and returned to San Francisco, where he admitted that he had been busy reporting on mines "and refreshing myself by visiting the young ladies."²⁹

Only a few months after this episode, Henry was also "experting" at Reese River and on the Colorado River in Arizona. To examine mines north of Fort Mojave, he traveled in a six-seated mule-drawn ambulance, with a plentiful supply "of the good things which are packed up in tin cans for the benefit of people who have to cross uninhabited Deserts"--including hams, bacon, and wines. As for Indians, Henry assured his father, "the route we travel is as safe as the streets of San Fr."³⁰

Henry was still more of an examining engineer, but with investment aspirations. In the spring of 1866, according to his account, he made a rough trip to inspect the Owyhee mines in Idaho. "I accepted the 'job' as there are indeed 1000 reasons (i. e. \$.) why I should do so. I am pained to say that I feel I did not charge enough."³¹ Louis thought that Henry "ranks about the first" in his profession and could have his choice of assignments. Henry reported to his mother: "Frequent trips into the sage brush & inhaling of a fair amount of alkaline dust, are necessary to me to preserve any self respect & to pay my hotel bills."³²

One of Alexis' inspecting trips to Arizona began with thirty-six hours on the Southern Pacific railroad, followed by more than three days by stage to Prescott, part of the time with passengers sitting on a variety of mail bags and express boxes. From Prescott, he had another ride of seventy miles to the Tip Top mines. Throughout, the food consisted "principally of fat pork, beans (Arizona strawberries) and 'canned truck,'" and the mining camp reminded him of Bret Harte's California more than twenty-five years before:

Everybody carried a big revolver and was prepared to shoot on small provocation. During my stay a cold blooded murder was committed and there being no county officials in the neighborhood nothing was done about it for a few days. Finally

we organized and arrested the suspected parties and gave them a trial my "bed room" serving as a court of justice. At this time a Methodist preacher came around and was engaged to preach a sermon over the grave of the dead man, but a drunken Irishman swore that no Protestant sermon should be preached there and attempted to shoot the minister while he was performing the ceremony. So we took him too, tied him up with the other man whom we held for the murder, and sent the whole gang off to the county jail at Prescott. . . .³³

Most, not all, of Alexis' professional trips had to do with recommendations for treating ores and many were in Central or South America. One trip in 1884 to a hot, unhealthy, tedious Central American country required forty days at sea, coming and going.³⁴ Later he was in La Paz, Bolivia on business for an important mining client and sometimes he spent much of the year consulting in Mexico.³⁵

Henry and Louis both came to be regarded as among the country's premier examining engineers and their services were much in demand throughout the western hemisphere. A man who hated to write long reports and preferred a simple "Yes" or "No" answer, in general, Henry was a pessimist who operated on the premise that "the chances are always against a mine."³⁶ He was described as "Cool as a cucumber, with a temper that could not be ruffled by almost any breeze; self-reliant, determined, and confident," "When he goes anywhere, it is always with the understanding that the mine must be a d__d good one on merit; and the regular fee for examination must be a large one. . . ."³⁷

It was Henry who examined and invested in the Homestake mine in the Black Hills in 1876 along with California capitalists headed by George Hearst, who may have been "dirty, slovenly, and extremely vulgar" to Mary Hallock Foote, but who was nonetheless one of the country's shrewdest mining operators. One hundred and fifteen years later, the Homestake is still producing gold.

Not only did Henry examine mines for capitalists, he also sought out gold and silver mines that had shut down because of water or outmoded methods, and promoted them. Among the properties he placed in this fashion was the Minas Prietas in Mexico, the Harshaw in southern Arizona, the Mount Pleasant mine in California.³⁸ He had invested some \$30,000 in stock of the Mimbres Mining Company in New Mexico in 1880.³⁹ Henry made trips to Alaska several times in the 1880s and to British Columbian mines,

although he wintered in London.⁴⁰ Henry must have had some success in his promotions, though his own comments were modest: "I am proud to say that as a speculator, I never did anybody any good. Some speculators have made money for their intended victims even though such was not the 'intention of the Composer.'"⁴¹

Louis was sometimes associated with Henry in mine ventures and in 1879 went east to sell enough stock in an Arizona mine they had in order to build a mill and put the property on a paying basis.⁴² But more and more, neither of his brothers liked to work with Henry: in 1885 Louis indicated that Henry was the only man with whom he had ever had a business disagreement.⁴³ As one of the most prominent of western engineers, Louis was much in demand for examination work in Mexico, British Columbia, and in all parts of the West, including the Black Hills and the great Anaconda mine at Butte, which he once inspected for the Rothschilds.⁴⁴

What is remarkable is not that the Janins built fine reputations as examining experts, but that they did it in the face of an early scandal in which Henry played a leading role. Standard advice to the neophyte examining expert was to trust nobody: "write Caveat Emptor (in quotes and italics) in your notebook" and "Be as Cold Blooded and as Unenthusiastic as a Clam." Most mining engineers were exposed to salted property at one time or another in their careers, but rarely was it so spectacular and well-publicized as the 1872 diamond scandal.

Hired in 1872 to examine "fabulous" diamond and ruby deposits in an unidentified part of the West (it turned out to be northwestern Colorado), Henry brought forth a dazzling report on this "wonderfully rich discovery, and one that will prove extremely profitable," and exercised his option, as partial pay for his services, to subscribe a substantial number of shares in the new company at favorable rates.⁴⁵ Soon, however, the mining world was shocked when geologist Clarence King visited the "fields" and exposed the whole as a clever salting swindle, with Janin the prime dupe.⁴⁶ Undoubtedly, Henry's reputation suffered, but he did not die "of a broken heart," as one writer insists, nor did he leave the United States to begin a new career in England as a result.⁴⁷ Rather, though he vowed to cut back on examinations "for some time to come," he weathered the storm of criticism, paid back his profits, and continued his career and emerged as one of the most influential engineers of his day.⁴⁸

Louis, too, nearly came a--cropper twenty years later. It was charged that he had examined the Mulatos mine in Sonora and failed to discover that it

had been gutted and then salted; another engineer found the chicanery before any transaction was completed.⁴⁹

In addition to their extensive professional work in the western hemisphere, Louis and Alexis would spend extended periods of time as consultants in Japan, which in the seventies was still novel to westerners. In 1873 Louis was employed for a year at a salary of \$12,000--considered handsome indeed--by a Japanese entrepreneur who controlled a number of mines. Political troubles, over-capitalization, and the death of his patron prompted Louis to return home at the end of his contract. No doubt he was perturbed by a diagnosis made by an insurance doctor in Tokyo that incipient heart disease might cause him to "shuffle off this mortal earth" at any time.⁵⁰ It did--forty-one years later. Alexis also traveled to Japan in 1873, as a consultant to a consortium on the island of Sado. So successful was his work there that he remained nearly three years before he returned to the Pacific Coast.⁵¹

Louis, especially, fulfilled another function of the mining engineer in the west: he served as a paid expert, testifying in cases of litigation--"courtroom mining," the more flippant called it. Early in his career, Louis confided to a brother, himself a lawyer, that litigation was the bane of the mineral world. "I never knew of such quarrelsome, law-loving people as the Nevadians," he wrote. "There seem to be a half-a-dozen claimants to each piece of property in the Territory, and each must go to law about it." Lawyers kept the pot boiling, and peaceful citizens, said Louis, "often sigh out the wish that they were all hung."⁵²

Nevadans were not alone: litigation was one of the major auxiliary industries of the mining West. Claims overlapped. "Everybody's spurs were running into everybody else's angles," it was said. Mining law proved incredibly complex, its interpretation difficult, confusing, and expensive. A poor mine--"as barren as a mule," as the expression went--posed no problem, but a successful property could be counted upon to produce a crop of lawsuits directly proportional to the richness of its ore. In five years, the twelve leading mines on the Comstock were engaged in a total of 245 lawsuits, which consumed about ten percent of their total production. During the peak of his "war" against Anaconda, Augustus Heinze employed thirty-seven lawyers and was involved in 133 suits. Lawyers profited most, but many engineers, Louis among them, would also reap substantial fees.

By far the most cases were those in which mining titles were in dispute under the so-called federal apex

law set forth explicitly in 1872, which gave the locator of a vein or lode the right to follow it, "with its dips, angles and variations," downward to any depth beyond the sidelines, provided that its top, or apex was enclosed within the end lines of the location.⁵³ It was to provide technical "answers" to questions of vein structure and formation that brought geologists and engineers like Louis Janin to the stand as paid expert witnesses, a scene described graphically by one of the masters of the art:

A dozen lawyers on a side,
And eminent experts multiplied;
Maps of the biggest and the best,
And models till you couldn't rest
Samples of rock and vein formation
And assays showing "mineralization,"
And theories of that or this,
And revelation of "genesis,"
And summings--up of sound and fury.
No matter now which party lost--
It took the mine to pay the cost;
And all the famous fight who saw
Beheld, with mingled pride and awe,
What science breeds when crossed with law.⁵⁴

Although he also testified in the late '70s that tailings from hydraulic mining would not harm vegetation and indeed would be beneficial to farm land and, on former milling practices on the Comstock,⁵⁵ most of Louis's evidence came in apex cases, and would take him at various times to camps with such intriguing western names as Calico, Deadwood, and Tombstone, not to mention Rossland, British Columbia or Butte, where he was a regular among the star-studded cast of prominent geologists and engineers heard on both sides of Anaconda's many disputes.

Like many mining engineers, the Janin brothers were interesting, well-read, well-traveled people; Henry and Louis, at least, fitted into San Francisco society. Like others of their Freiberg contemporaries, according to novelist Mary Hallock Foote, "They are very clever cosmopolitan sort of men--not easily enthusiastic--do not reveal themselves very much but draw out other people." Louis, she thought, was a cynic: "He is the most difficult to understand and, therefore, perhaps the most fascinating." In the mid-seventies, she described him as "dark and strong jawed--very black, troubled looking eyes."⁵⁶ More than thirty years later, he was "enormously stout but always picturesque and delightful."⁵⁷

Henry Janin moved in the same orbit--"the spoiled

child of many a social circle," someone said.

He accommodates himself gracefully to a given situation; lives well, on the best of the land; drinks only the best of wines, and smokes only the best of cigars. Aristocratic in his tastes, gentlemanly in demeanor, and careless of the opinions of those he does not esteem. . . .⁵⁸

Geologist Clarence King thought him a man of wit and a model of polite society and "as champagne and daring a talker as ever I saw."⁵⁹ It was Henry who retained a body servant, a black man who even accompanied him on his examining trips to keep his cloths brushed and pressed.⁶⁰ Alexis was known as "an accomplished man," a near academic who acquired an excellent command of Japanese and spoke German, French, Italian, and Spanish "with great fluency."⁶¹ While in Japan he wrote Henry, asking for "any good new books which may appear."

I want something "meaty" in the Herbert Spencer and Buckle style. I have read a good deal of Herbert latterly and like him immensely. A volume or two of John Stuart Mill on Political Economy or such like subjects, a little Husby, some Tyndall, and a volume or two showing that whatever is, is wrong, will be about the ticket.⁶²

A person of "generous and cultured nature," "an attractive, brilliant man of much social charm," Louis attracted fledgling engineers around him. It was he who first offered Herbert Hoover a job, initially as a typist, then as an engineer; subsequently he recommended the young Stanford graduate for the important appointment in Australia that really sent Hoover on his way.⁶³ His three sons all became mining engineers, but illness cut short the active careers of two of them and only one, Charles, would achieve the kind of national prominence in his field that came to his father and uncles.

None of the brothers became wealthy in the fashion of the millionaire mining men like Hoover, John Hays Hammond, or Daniel Jackling. Alexis died of heart disease in 1897, leaving what seems to have been a small estate. Probably Henry, who bought, sold, and speculated in mining property with some abandon, made more money than his brothers, and died in comfortable circumstances in 1911: a nasty divorce action a few years earlier had indicated substantial assets. Louis did well, lived well, but was never truly drawn into the scramble for dollars and probably struggled some in his later years. One friend wrote

another in 1905 that Louis would be delighted to report on property. "The fee would not only be welcome, but confidentially, I believe it is needed."⁶⁴

But money is not the only standard of success. The Janins were all leaders of mining and metallurgical engineering in the last half of the nineteenth century--the period of great change, when experts trained primarily in Germany did a great deal to put the western mineral industry on its feet. Behind them would come a new generation of mining engineers, educated at the Columbia School of mines or that "regular green-goggled mining mill" at Berkeley. Louis was described as a "man of brilliant and worldly wisdom," "a notable influence in development of western metal mining." Henry disliked management, preferred to be a scout in the field and because he invested his own money successfully in good prospects, his opinions carried great weight. For much of his professional life, Alexis would specialize in amalgamation and "he probably knew more about that process than any other engineer," but was still at work on the definitive book on ore treatment when he died.⁶⁵ In the words of a leading mining editor at that time: "Few men have done as much for mining and metallurgy in the West as Alexis Janin and his brothers Louis and Henry."⁶⁶

NOTES

1. Thomas A. Rickard, ed., *Rossiter Worthington Raymond*. NY: American Institute of Mining & Metallurgical Engineers, 1920, 64.
2. Louis Janin to his mother, Juliet Covington Janin (Cañada del Diablo, December 15, 1861 & Virginia City, March 9, 1865), both Janin MSS, Box 10, Henry E. Huntington Library; Alexis Janin to Juliet Covington Janin (Paris, April 24, 1865 & Freiberg, July 9, 1865), Janin MSS, Box 5.
3. Henry Janin to Louis Janin, Sr. (Freiberg, June 2, 1858), Janin MSS, Box 6.
4. Louis Janin, Jr. to Juliet Covington Janin (Paris, November 5, 1860, Janin MSS, Box 9).
5. Louis Janin, Jr. to Juliet Covington Janin (Virginia City, March 20, 1865), Janin MSS, Box 10.
6. Alexis Janin to Juliet Covington Janin (Freiberg, May 11 & 21, August 22, November 3, 1865; March 23, 1868), Janin MSS, Box 5.
7. Louis Janin to Juliet Covington Janin (Enriqueta Mine, June 16, 1861 & June 16, 1861), Janin MSS, Box 10.
8. Louis Janin to Juliet Covington Janin (Enriqueta mine, August 25 & October 1861; Cañada del Diablo, December 15, 1861; San Francisco, January 28, 1862), Janin MSS, Box 10.
9. Louis Janin to Juliet Covington Janin (San Francisco, April 23, 1862), Janin MSS, Box 10.
10. Louis Janin to Juliet Covington Janin (Empire City, Nevada, October 17, 1862), Janin MSS, Box 10.
11. Louis Janin to Juliet Covington Janin (Empire City, August 9, 1863), Janin MSS, Box 10.
12. Louis Janin, Jr. to Louis Janin, Sr. (Empire City, March 29, 1863), Janin MSS, Box 10.
13. Louis Janin to Edward Janin (San Francisco, October 6, 1863), Janin MSS, Box 10; Louis Janin to Juliet Covington Janin (Virginia City, July 17, 1864), Janin MSS, Box 10.

14. Louis Janin, Jr. to Louis Janin, Sr. (Virginia City, July 30, 1864), Janin MSS, Box 10.
15. Louis Janin to Juliet Covington Janin (Virginia City, October 5, 1864), Janin MSS, Box 10.
16. Louis Janin, Jr. to Louis Janin, Sr. (Gould & Curry Mill, November 20, 1864), Janin MSS, Box 10.
17. Louis Janin to Juliet Covington Janin (Ormsby County, Nevada, August 2, 1864), Janin MSS, Box 10.
18. Louis Janin, Jr. to Louis Janin, Sr. (Virginia City, September 10, 1865), Janin MSS, Box 10.
19. Louis Janin to Juliet Covington Janin (Virginia City, June 27, 1865).
20. See Louis Janin to Adolph Sutro (Virginia City, December 1, 1865; January 21; February 1, 14; October 11, December 5, 1866; February 8, 1867), all in Adolph Sutro MSS, Box 5, Bancroft Library.
21. Louis Janin to Adolph Sutro (Virginia City, March 11, 1867), Sutro MSS, Box 6.
22. Louis Janin to Juliet Covington Janin (Virginia City, September 2, 1866), Janin MSS, Box 10.
23. Henry Janin to Louis Janin, Sr. (Virginia City, April 7, 1869), Janin MSS, Box 6.
24. *Engineering and Mining Journal*, LI (February 21, 1891), 231.
25. Alexis Janin to Albert Janin (Shermantown, December 6, 1869), Janin MSS, Box 5; Henry Janin to Juliet Covington Janin (Virginia City, January 14, 1870; Hamilton, Nevada, January 30, 1870), Janin MSS, Box 6.
26. Alexis Janin to Juliet Covington Janin (Galena, Nevada, July 16, 1871), Janin MSS, Box 5.
27. Louis Janin to Juliet Covington Janin (Empire City, September 11, 1863), Janin MSS, Box 10.
28. Louis Janin, Jr. to Louis Janin, Sr. (Gould & Curry Mill, February 8, 1865), Janin MSS, Box 10.
29. J. Ross Browne Adventures in Apache Country. New York: Harper & Bros., 1871, 217–221; Louis Janin to Juliet Covington Janin (San Francisco, April 12, 1864), Janin MSS, Box 10.
30. Henry Janin to Louis Janin, Sr. (Los Angeles, July [n. d.], 1864, Janin MSS, Box 6; Louis Janin, Jr. to Louis Janin, Sr. (Gould & Curry Mill, November 20, 1864), Janin MSS, Box 10.
31. Henry Janin to Louis Janin, Sr. (Salt Lake City, June 20, 1866), Janin MSS, Box 6.
32. Louis Janin to Juliet Covington Janin (Virginia City, September 2, 66); Henry Janin to Juliet Covington Janin (Hamilton, Nevada, August 12, 1870), Janin MSS, Box 6.
33. Alexis Janin to Juliet Covington Janin (San Francisco, March 28, 1878), Janin MSS, Box 5.
34. Alexis Janin to Juliet Covington Janin (San Francisco, February 11, 1884), Janin MSS, Box 5.
35. Alexis Janin to Juliet Covington Janin (La Paz, August 31, 1886); Alexis Janin to Albert Janin (San Francisco, January 20, 1889), Janin MSS, Box 5.
36. Henry Janin to Juliet Covington Janin (Denver, July [n. d.], 1875).
37. *Pacific Coast Annual Mining Review* (1878), 51.
38. Thurman Wilkins, *Clarence King*. NY: Macmillan, 1958, 269–70, 274.
39. James D. Hague to Henry Janin (New York, June 3, 1880), Hague letterbook 4, James D. Hague MSS, Henry E. Huntington Library.
40. Alexis Janin to Juliet Covington Janin (San Francisco, June 13, 1885), Janin MSS, Box 5; A. B. Davis to James D. Hague (New York, August 4, 1888), James D. Hague MSS, Box 11; *Mining and Scientific Press*, LXXI (December 7, 1895), 374; *Engineering and Mining Journal*, LX (November 9, 1895), 447.
41. Henry Janin to James D. Hague (London, April 4, 1899), James D. Hague MSS, Box 12.
42. Henry Janin to S. L. M. Barlow (San Francisco, September 29, 1879), S. L. M. Barlow MSS, Box 127.
43. Louis Janin to James D. Hague (n. p., October 26, 1885), Hague MSS, Box 12.
44. *Engineering and Mining Journal*, XXIX (January 31 & February 7, 1880), 79, 95; LX (May 25, 1895), p. 491; *Mining and Scientific Press*, CX (May 15, 1915), 762; John Hays Hammond, *The Autobiography of John Hays Hammond*. New York: Farrar & Rinehart, 1935, I, 110, 114; Louis Janin to James D. Hague (El Paso, May 15, 1888), Hague MSS, Box 12; H. J. Jory to Samuel Christy (San Francisco, February 12, 1892), Samuel Christy MSS, Bancroft Library; Jonathan Bourne to Charles Janin (Portland, February 27, 1903), copy, Bourne letterbook (Feb. 9–Nov. 9, 1903), Jonathan Bourne MSS, University of Oregon Library.
45. Wilkins, *Clarence King*, 159; *London Times*, December 2, 1872; Henry Janin to S. L. M. Barlow (New York, June 26, 1872), copy, S. L. M. Barlow MSS, Box 81, Henry E. Huntington Library.
46. See Thomas A. Rickard, *A History of American Mining*. NY & London: McGraw-Hill, 380–96; Wilkins, *Clarence King*, 159–68; *AIME Bulletin* No. 53 (May, 1911), xxviii–xxxvi; *Mining and Scientific Press*, XXV (November 30 & December 14, 1872), 344, 380; William Goetzmann, *Exploration and Empire*. New York: Knopf, 1966, 452–57.
47. Charles H. Leckenby, *The Tread of Pioneers*. Steamboat Springs: Steamboat Pilot Press, 1945, 140–41; Wilson Rockwell, *Sunset Slope*. Denver: Big Mountain Press, 1956, 228.
48. Henry Janin to S. L. M. Barlow (n. p., January 24, 1873), S. L. M. Barlow MSS, Box 86; Charles Hoffmann to Josiah D. Whitney (Oakland, December 15, 1872), Charles Hoffmann MSS, Bancroft Library; Henry Janin, *A Brief Statement of My Part in the Unfortunate Diamond Affair*. San Francisco: privately printed, 1873, 1–32.
49. H. J. Jory to Samuel Christy (San Francisco, February 12, 1892), Samuel Christy MSS, Bancroft Library.
50. *Reese River Reveille*, March 27, 1873; *Mining and Scientific Press*, XXVI (March 29, 1873), 201; Louis Janin to Juliet Covington Janin (Tokyo, June 21, 1873), Janin MSS, Box 10; Louis Janin to Henry Janin (Tokyo, July 7, August 6 & October 30, 1873; March 8, 1874, all in Janin MSS, Box 9.
51. Alexis Janin to Juliet Covington Janin (Sado, December 12, 1876; Paris, December 24, 1876 & January 24, 1877), all in Janin MSS, Box 5.
52. Louis Janin to Edward Janin (Empire City, October 12, 1862), Janin MSS, Box 9.
53. See U. S. *Statutes at Large*, 14 (July 26, 1866), 251; U. S. *Statutes at Large*, 17 (May 10, 1872), 91.
54. Rossiter W. Raymond, "Lawyers and Experts," quoted in Rickard, *Rossiter Worthington Raymond*, 95.
55. Louis Janin to James D. Hague (San Francisco, December 8, 1891), Hague MSS, Box 12; Robert L. Kelley, *Gold vs. Grain*. Glendale: Arthur H. Clark, 108–109.
56. Mary Hallock Foote to Helena deKay Gilder (New Almaden, December 7, 1876), Mary Hallock Foote MSS, Stanford University Libraries.
57. Mary Hallock Foote to Helena deKay Gilder (Grass Valley, August 2, [1908?], Mary Hallock Foote MSS).
58. *Pacific Coast Annual Mining Review* (1878), 51.
59. Clarence King to James D. Hague (San Francisco, July 15, 1884), Hague MSS, Box 12.
60. *Engineering and Mining Journal*, CXV (May 26, 1923), 919.
61. *Engineering and Mining Journal*, LXIII (January 23, 1897), 95.
62. Alexis Janin to James Hague (Tokyo, October 31, 1873); Alexis Janin to Henry Janin (Tokyo, November 5, 1873), both in Janin MSS, Box 5.
63. *Dictionary of American Biography*, IX, 609; Herbert Hoover, *The Memoirs of Herbert Hoover*. NY: Macmillan, 1951, I, 26–27, 29; Louis Janin to James D. Hague (San Francisco, June 16, 1897), Hague MSS, Box 12.
64. W. B. Bourn to James D. Hague (San Francisco, March 7, 1905), Hague MSS, Box 11.
65. *Engineering and Mining Journal*, LXIII (January 23, 1897), 95; *Mining and Scientific Press*, LXXIV (January 16, 1897), 55.
66. *Mining and Scientific Press*, LXXIV (January 16, 1897), 55.