

## **BONANZAS & BORRASCAS – A COMSTOCK MINING HISTORY**

**[P]**

### **The Biggest Bonanza:**

#### **Refining A Financial Bonanza, Other Mineral Mercury, Founders' Cash Flow**

Pacific Mill and Mining made money for its principal and the small circle of investors. There is not much debate that it was organized to serve the refining needs of Consolidated Virginia and California Mining Companies, and when these mines had reached the end of the road (as had Comstock mining in general) the milling business had collapsed. By the middle of the 1880s, when Comstock production had fallen to a fraction of its 1870 levels, many of Pacific properties had been sold or abandoned. In the years between the creation of Pacific (1874) and the demise of Consolidated Virginia and California Mining (1881) milling operations enjoyed substantial profits even as milling rates dropped. It helped, of course, that Pacific was the exclusive refiner for the largest and richest mines in the history of the Comstock. In addition, though, these were Mackay and Fair operations that like the mines that they served were well managed. Mackey and Fair, even before they had joined forces with Flood and O'Brien, had acquired several mills in the late 1860s to process ores from their Kentuck and Hale & Norcross mines. They were not novices in the milling business when they organized Pacific. The dozen or so mills that can be verified as Pacific properties included the mills Mackay and Fair bought in the 1860s plus mills purchased or built in the 1870s. Eighteen mills processed ores from Consolidated Virginia and California, and the ownership by Pacific of at least 12 of these mills can be firmly documented. They were Bacon, Brunswick, California, Consolidated, Empire State, French, Hoosier State, Mariposa, Morgan, Occidental, Omega, and Sacramento. The ownership of the other six mills - Devil's Gate, Kelsey, Mexican, Nevada, Rhode Island and Winfield – could not be so firmly documented. It could not be determined if Pacific owned all or part of these six mills, leased them or simply signed milling contracts with them on a per-need basis. Mill ownership can be difficult to trace because mills were sold, renamed and even dismantled and rebuilt. All of the mills doing work for Pacific stretched from Virginia City south (along what is now Highway 341) to the Carson River and then to Carson City and east through Six Mile Cañon toward Sutro and appear on a recent survey map developed by Nevada agencies responsible for cleaning up toxic sites.<sup>1</sup>

The Bacon Mill was probably the first milling property that any of The Quartet acquired. In the 1866 state survey C. L. Lowe and James Fair were listed as the mill's owners. Lowe was also the principal owner of Hale & Norcross. More than likely ore from Hale & Norcross was processed at Bacon, since the mine apparently did not own any mills. Not only did Fair own part of Bacon, but he also worked for Lowe at Hale & Norcross for a few months in 1867. His departure occurred under somewhat cloudy circumstances, but he remained a owner of Bacon and perhaps became the sole proprietor. In 1868 when Mackay and Fair acquired Hale & Norcross Mackey may also have acquired part-ownership in Bacon. Although the details are scant, Bacon, it would

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<sup>1</sup> See above footnote for sources on how much ore the mining companies shipped monthly to each mill. The mill survey has been published on-line at Bureau of Corrective Actions, Superfund Branch, Nevada Division of Environmental Protection – [www.ndep.nv.gov/bca/carsonriver/criver\\_3.htm](http://www.ndep.nv.gov/bca/carsonriver/criver_3.htm).

appear, continued to be operated as a separate entity from the mine. In 1872 after the disposal of Hale & Norcross and before the founding of Consolidated Virginia Fair addressed a long letter to Flood and O'Brien concerning various financial matters. He noted that Bacon's improvements had cost \$8,490.25 in addition to the cost of the mill, which he did not specify. Bacon was in continuous operation until its dismantlement in 1883. Other mills cited in Fair's letter (without specific dates) were Trench and Mariposa. Trench, Bacon's neighbor, was apparently bought in 1870 at a cost of \$49,670.50. Improvements added another \$21,574.27 for a total investment of \$71,244.77. Trench did not appear on the 1866 survey, and its prior owner(s) cannot be identified. Mariposa's owner, on the other hand, was simply identified as McCurdy in the 1866 survey, and while it was purchased for only \$11,557.00, in 1870, it needed \$16,518.01 worth of repairs. A third mill, Marysville, was mentioned in the letter, but according to Fair it should not be listed as a property because no money had exchanged hands. The implication was that the transaction was never completed. In any event it never showed up the monthly milling accounts for Consolidated Virginia and California. What can be said was that Marysville was owned in 1866 by O'Neale, Rule & Glazier, was located in Gold Hill near other mining properties that Mackey and Fair acquired and was officially sited on Nevada's recently completed superfund survey.<sup>2</sup>

In the early 1870s Mackay and Fair along with Flood and O'Brien were busy purchasing more milling properties. Since they had not yet founded Pacific Mill and Mining, they may simply have acquired and operated the mills as separate entities apart from their mining interests. Empire State Mill probably entered the fold in November 1870. Empire State was formerly a Sharon property, and while Sharon and the Mackay and Fair crowd were perennial adversaries, they were not averse to negotiating business deals and transactions that might advance their financial goals. Occidental, whose previous owner, if any, is not known, was purchased after that. Fair remarked with respect to both properties without further explanation that the accounts should be adjusted to show that other parties had acquired an interest in these two properties, although these transactions were not recorded in Virginia City.<sup>3</sup> At the time of the creation of Pacific Mill and Mining, then, the Quartet owned or controlled five or six mills. Once established, Pacific undertook an aggressive plan of building and buying more mills. That included, of course, the previously discussed construction and reconstruction of Consolidated and California mills as well as the construction of Omega Mill. These three projects probably required outlays of approximately \$1.5 million. In addition in 1875 Pacific Mill and Mining added Morgan and Brunswick (the latter also purchased from

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<sup>2</sup> For data on mills from the mid-1860s see "Annual Report of the Surveyor-General of the State of Nevada for the Year 1866" in *State Journal and Appendix*, 3<sup>rd</sup> Legislative Session (1867), insert after p. 21. Letter from James Fair to James Flood and William O'Brien, 19 December 1872 in Mackay & Fair Company, Letters, July 1871-July 1877, #5, Special Collections, Library, University of Nevada at Reno.

<sup>3</sup> Letter from James Fair to James Flood and William O'Brien, 19 December 1872 in Mackay & Fair Company, Letters, July 1871-July 1877, #5, Special Collections, Library, University of Nevada at Reno. Hoosier State Mill may also have been purchased in 1873 as a part of Hoosier Mine. Built in 1862 by Clarke and Hearst, custom millers, it did not process any Consolidated Virginia ores until 1875. See Account of Supplies, Hoosier Mine, January 1873 in Mackay, Fair, Flood & O'Brien Archives, NC356/1/20, Nevada Historical Society.

Sharon) at a cost of \$100,000 and \$250,000 respectively. A third purchase (without price or date) was Sacramento.<sup>4</sup>

The departure of James Fair from The Firm in 1881 required audits of how the profits should be distributed. The surviving record is not complete but still useful in trying to estimate the profits, which accrued to Mackay and Fair and their associates. The firm may have begun reorganization in 1880 when a Supplemental List of company officers was filed in San Francisco. Mackay was listed as President, E. C. Platt as Vice-President and W. H. Lowell as Secretary, and Mackay and Platt were listed as directors along with three others.<sup>5</sup> Fair's name was nowhere to be found in this document, although he still could have been a stockholder. Nor were the names of other known to be associated with Pacific: Flood, O'Brien (died in 1878), William Barron and Solomon Heydenfelt. There was little doubt at the time of the separation that Fair and Mackay owned and controlled the lion's share of the milling firm. The required audits date from 1881 and 1883 and contained information supplied by an accountant who had re-examined Pacific's books in connection with the Dewy-Burke suit. The first audit (1881) declared the "net profits" between 1 August 1874 and 1 July 1881 to be \$8,821,711.66.<sup>6</sup> They were "derived from working ores, slimes and tailings, slimes sold, dividends from Woodworth Mill (½) & dividends from Eagle Salt Works...." This figure described "net profits" from all Pacific operations and not the returns that accrued to company's owners. What made the accounting "messy" was that the principal owners, Mackay and Fair, apparently paid out-of-pocket the bills for construction and repair of the mills and for other expenses in connection with managing Pacific, and then Pacific reimbursed them for those outlays as a part of the transfer of company profits to their private account. It was difficult to determine from the transfer what were reimbursements for the outlays and what were distributions of the profits. In addition, if the other investors were granted dividends, those figures were not reported in the audit or in the transfer. Of the net profits stated above, \$7,675,644.47 were "turned over" to the account of Mackay & Fair. Of that amount some of the monies paid to Mackay & Fair account were for reimbursements so that the distributions or dividends may have constituted as much as \$6.5 to \$6.6 million. Presumably these distributions represented earnings from operations. Two years later in an up-dated version of Pacific's balance sheet dividends distributed to Mackay & Fair from 30 April 1877 (more than three years after the company was founded) to 31 May

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<sup>4</sup> These projects will be discussed in greater detail below.

<sup>5</sup> Supplemental List of the Officers of the Pacific Mill and Mining Company, January 1880, NC80, Special Collections, Library, University of Nevada at Reno. The directors included George Congdon, Cornelius O'Conner and William Legle. Congdon and O'Conner were directors of Consolidated Virginia and California Mining Companies and would be among the founders of a newly established company through the consolidation of the two mining companies, in 1884. See authenticated copy (1886) of Certificate of Consolidation, 1884, of Consolidated Virginia and California Mining Companies, Mackay, Fair, Flood and O'Brien Archives, NC356/1/42, Nevada Historical Society.

<sup>6</sup> Grant Smith (*The Comstock Lode*, 254) also analyzed Pacific Mill and Mining audits that he found in the library the Mackay School of Mines, University of Nevada Reno, where John Mackay's archives were first housed. Those archives were later transferred to Special Collection in the University Library. Smith did not provide a specific reference, and therefore the document that he used could not be located. It could still be in Special Collections but was not turned up during my research. The document that I am using has different figures, has fewer details and is housed in the Nevada Historical Society. "Net Profits" may be an inaccurate description as defined by contemporary accounting standards.

1881 were revised downward to \$6,647,067.89 to reflect more accurately how much of the transfer entailed reimbursements.<sup>7</sup> The person responsible for assembling the numbers and correcting the accounts was J. H. Gager, who apparently served as an accountant for Mackay, Fair, Flood and O'Brien in San Francisco. By 1883, of course, not only had Fair dissolved his relationship with Mackay (and presumably been paid off) but also Pacific's business had fallen on hard times. Mills were being shut down or sold off, and while tens of thousands of dollars of equipment and inventory remained, milling income had virtually disappeared.<sup>8</sup> An exact figure of Pacific's surplus, distributed to Mackay and Fair (presumably to their associates) from its founding to its demise, may never be known, but a reasonable estimate at the very minimum would be \$6.5 to \$7.0 million.

Pacific's main business was "working ores, slimes and tailings". It also sold slimes and tailings and earned dividends from subsidiary businesses purchased by Mackay and Fair in support of Pacific's milling operations. The distributions from these subsidiaries were insignificant in comparison to those from the milling operations.<sup>9</sup> As Consolidated Virginia and California's output reached hundreds of thousands of tons per year milling capacity had to be expanded and upgraded. Details on these matters as well as other transactions appeared in these quasi-audits, and they can be added to information gleaned from other archival sources on the composition of the company. These were mainly transfers to an account under the name of Mackay & Fair to cover capital outlays, and this was the same account to which Pacific profits were also credited. Monies from this account were then distributed to Pacific's principal owners – Mackay & Fair – and presumably from their account to other investors who deserved a share of the profits. The fact that the figures had to be revised would suggest caution in dealing with these figures.

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<sup>7</sup> "Operations of the Pacific Mill & Mining Co. – at Virginia – from August 1<sup>st</sup> 1874 to July 1<sup>st</sup> 1881", Pacific Mill and Mining Company Financial Records, 1874-1881, Mackay, Fair, Flood, O'Brien Archive, NC356/1/2 & 13, Nevada Historical Society.

<sup>8</sup> Ledger #4, 1883-1885, Pacific Mill and Mining Company Records, 1876-1884, NC80, Special Collections, Library, University of Nevada at Reno.

<sup>9</sup> The Woodworth Mill reference is somewhat mysterious. In 1870 The Quartet purchased a half interest (\$12,000) in Woodworth Mine, its location unknown because it did appear on any the previously discussed surveys. Nothing else is known about the mine. In the early 1870s a Woodworth Mill appeared on the Mineralogist's survey of mills in Lyon County, and it is possible that the mine and mill occupied the same property. The other possibility is that the mill was a separate property and closer to Virginia City. In the same letter concerning the purchase of the Woodworth Mine there was a reference to the fact that The Quartet also owned half an interest in a "Woodworth Sluice Property". The mill cost them almost \$39,000 and another \$85,000 to \$90,000 to improve the sluices and others facilities. Two possible explanations occur: it may have been purchased in connection with their ownership of the Virginia and Gold Hill Water Company, incorporated in 1871, or it may have been purchased in connection with the construction of the Omega Mill, which as a tailings mill had need for the sluices. In terms of analyzing Pacific finances, however, the Woodworth Mill is not especially crucial because no figures on the size of the dividend are given. "Operations of the Pacific Mill & Mining Co. – at Virginia – from August 1<sup>st</sup> 1874 to July 1<sup>st</sup> 1881", Pacific Mill and Mining Company Financial Records, 1874-1881, Mackay, Fair, Flood, O'Brien Archive, NC356/1/13, Nevada Historical Society; Letter from James Fair to James Flood and William O'Brien, 19 December 1872 in Mackay & Fair Company, Letters, July 1871-July 1877, #5, Special Collections, Library, University of Nevada at Reno; and "Biennial Report of the State Mineralogist of the State of Nevada for The Years 1871 and 1872," *Appendix to Journal of the Senate*, 6<sup>th</sup> Legislative Session, 1873, 100. Eliot Lord wrote a long section Virginia and Gold Hill Water Company, set up by Mackay, Fair *et al.* in 1871 without any mention of Woodworth in *Comstock Miners and Mining*, 322-333.

These are summaries from accounts that have not been found and may not now exist. A further problem is that the descriptions of the summaries are not as precise as one would prefer in order to make a detailed analysis.

As the two tables above indicate, the audits revealed two categories of Pacific finances. The first was initially described as “Total Net Profits”. This appears to be the surplus (or difference) between milling receipts and expenses. The “net profit” of Pacific on 1 July 1881 was more than \$8.8 million, but by 1 September 1883 it had fallen to \$8.1 million. The decline of three-quarters of a million dollars is not explained in the account nor could an explanation be derived from a recombination of the figures themselves. Furthermore a charge of more than \$425,000 and a reimbursement of more than \$11,000 reduced the net profit even further to \$7.7 million. The reduction in net profits by \$425,000 in the statement of 1 September 1883 was not explained either, although the reimbursement of \$11,000 was said to arise from a correction in accounting for money owed Mackay and Fair for construction expenses. Gross net profits from Pacific milling operations and ancillary businesses from 1874 to 1883 fell somewhere between \$8 and \$9 million. About a quarter of the profits were transferred from the firm to its principals – Mackay & Fair – as reimbursements for construction and related charges and the remainder could be treated as basically dividends. About 1.4 tons of crushed ore from Consolidated Virginia and California passed through Pacific’s amalgamation mills (most of it through mills that it owned) at an average rate of about \$11 per ton for a total of \$15 million. Tailings, slimes and ancillary business probably generated several hundred thousands dollars more in revenues. It would appear that 40 to 50 percent of Pacific’s income constituted the so-called net profits or perhaps more appropriately operating surpluses. This was possible even as milling rates dropped by 30 percent from a high of \$13 per ton to \$9 per ton. More about the efficiencies at Pacific’s mills will be examined toward the end of this section.

The reimbursements to Mackay and Fair for capital outlays shed some light on how they financed the expansion of Pacific’s milling capacity. As discussed earlier Mackay, Fair *et al.* owned several mills that were incorporated into the new firm, Pacific Mill and Mining Company, in 1874. The audits confirmed the acquisition of (and the reimbursement for) Morgan Mill on 9 September 1875 for \$100,000 and Brunswick on 1 October 1875 for \$225,000, and the “removal and reconstruction” of Mariposa Mill, one of the original properties, for just under \$11,500. Mackay and Fair launched and underwrote the construction of a new mill, Consolidated (Virginia) in 1874 that won rave reviews from the State Mineralogist in his 1875 report to the state legislature. He described the battery building as 110 feet long by 10 feet wide, the pan building as 120 feet long and 92 feet wide, the engine room as 58 feet long by 92 feet wide, the agitator room as 20 feet long by 92 feet wide and the retort house as 24 feet long by 60 feet wide for a total of 26,000 square feet at a cost of several hundred thousand dollars.<sup>10</sup> Consolidated milled about 60,000 tons of ore between January and October 1875 when the October fire destroyed it and adjacent facilities. The 1881 audit simply declared without elaboration that the money spent on the “old” Consolidated Mill and “old”

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<sup>10</sup> “Biennial Report of the State Mineralogist...1873 and 1874” in *Appendix to Journals of Senate and Assembly*, 7<sup>th</sup> Legislative Session, 1875, 133.

California Battery (probably the battery building mentioned above) had been removed (the meaning of which was unclear). Nothing about reimbursements to Mackay and Fair for the new “old” buildings was reported in the audits. One item included the purchase on 25 September 1875 of machinery (nearly \$93,000) for the Consolidated Mill, although it is not clear if this was a payment for machinery to be delivered (and therefore may have escaped the fire) or for machinery already delivered (and a casualty of the fire). A second new mill, California, close to completion at the time of the fire, escaped damage and was up and running as of 1 January 1876. Two California Mill entries appear in the audits: an undated reimbursement of nearly \$275,000 and a dated reimbursement (12 November 1875) of \$150,000 for a total of \$425,000. In the aftermath of the fire Consolidated Mill was rebuilt at a cost (minimally) of \$308,000, and it began processing ore in the fall of 1876. Reimbursements for the new California Mill and the new (post-fire) Consolidated Mill totaled more than \$732,000, and if this total were added to the estimated expenditure for the construction of Consolidated Mill and the California Battery lost in the fire these four facilities cost Mackay and Fair more than a million dollars. In accord with the audit, however, only reimbursements for the new California Mill and the “reconstructed” Consolidated Mill are entered. The remaining mill project to consider was the slimes or tailings mill Omega that Mackay and Fair built (and were reimbursed for) at a cost of more than \$255,000. Although the reimbursements to Mackay and Fair included outlays for mill supplies, property transfers (including Eagle Salt Works) and miscellaneous items, 90 to 95 percent of the reimbursements (which totaled between \$1.5 and \$1.6 million) were for the acquisition and construction of milling facilities. Even if Mackay and Fair alone or in partnership with several others expended, say, \$2 million to create Pacific Mill and Mining, the return on capital of \$5 to \$6 million certainly made it a highly profitable venture.<sup>11</sup>

What made the return on investment several times greater than the outlay for plant and equipment was the revenue flow derived from milling operations. In modern parlance Pacific was a “cash cow”. Because of the richness of the ores and the efficiency of the operations Pacific generated large operating surpluses. This can be seen in a statement of receipts and expenses from 10 of the mills under the umbrella of Pacific Mill and Mining for June 1877. Not all mills were equal in terms of comparative costs and potential profits. It will be recalled that 1877 was the best year for Consolidated Virginia and California combined with nearly \$32,000,000 worth of ore being extracted and processed. For Consolidated Virginia it was the second best year and for California the best year. Ores from Consolidated Virginia in June yielded \$72 per ton (crushed ore), the lowest yield for the year, while ores from California yielded \$82 per ton, close to the average for the year. The ores were split among the mills in the following manner: ores from Consolidated Virginia went to California (68 percent), Trench (16 percent), Bacon (12 percent) and Mariposa (4 percent); ores from California to Consolidated (41 percent), Brunswick (27 percent), Morgan (15 percent) and Occidental and Sacramento (8 percent each). The two tailings mills, Mariposa and Omega, processed about 12,000 tons for the quarter (April-June) and we can assume that perhaps a third of that was processed in

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<sup>11</sup> The figures included in the text and the tables are from Pacific Mill and Mining Company Financial Records, 1874-1881, Mackay, Fair, Flood, O’Brien Archive, NC356/1/2 &13, Nevada Historical Society.

June.<sup>12</sup> How ore was allotted to the mills was not explained, and mills were regularly switched from mine to the other mine without any explanation. The efficiency and availability of mill may have had some role in these decisions.

Mill accounts for June 1877 show the cost to reduce a ton of ore (for the moment I ignore the tailings facilities) and the profit to be realized from reduction. The mills did not own the ores. The reduction rate in June at all the mills was \$10 per ton. At the beginning of 1877 some of Pacific's mills charged a rate of \$12 per ton, but by the middle of the year all the mills had dropped their rates to \$10 per ton. Whatever it cost per ton for supplies, labor, freight and repairs was deducted from the mill rate. In addition what the mill could earn from the bullion in the "slimes" would be added to the per-ton rate. If the costs were \$7 per ton and the slimes yielded \$2 per ton, then the profits would be \$5 per ton ( $\$10 + \$2 - \$7$ ). Without the slimes Pacific Mill and Mining's profits averaged \$2.19 or 22 percent on each ton of ore from Consolidated Virginia and \$2.64 or 26 percent on each ton from California. The slimes from Consolidated Virginia ores added \$2.56 per ton and from California \$2.48 per ton. In nominal terms (dollars and cents) the profit from the reduction of the slimes as measured by the value of the bullion could often equal that from the amalgamation of the ores. For this single month California Mill had the best profit record for those mills reducing ores from Consolidated Virginia, and Brunswick Mill had the best record for those mills reducing California ores. Mariposa proved to be the least profitable with Consolidated Virginia ores and Occidental with California ores. Labor costs per ton differed across the spectrum of mills. Average labor costs for the four mills processing Consolidated Virginia ores was \$1.60 per ton whereas California Mill spent only \$1.17 per ton. With respect to the mills processing California ores Brunswick had similarly low labor costs at \$1.16 per ton against an average for the five mills of \$1.59. The two-year-old California Mill may have registered lower unit labor costs because it was among the most efficient mills, and perhaps (no explanation given) rebuilding Brunswick had raised its efficiency and lowered its per-unit labor outlays. Other factors such as grades of ores assigned to the mills may have played a role. In both Mariposa and Occidental labor was between \$2.00 and \$2.10 per ton. The cost of supplies per ton did not vary significantly from mill to mill. Apparently the mills paid the cost to deliver the ore from the mine, and that cost ranged from near zero in the case of Consolidated and California mills, which were next door to the mines, to \$1.75 per ton for mills along the Carson River near Carson City. Repairs were reported at three mills – Sacramento, Consolidated and California – but none at the other mills. Other expenses that one could think of – administrative and legal, for example – were not noted. These appear to be mainly operating costs.<sup>13</sup>

Among the items needed to do the refining, such as wood, castings (shoes and dies) and bluestone (copper sulfate), quicksilver was the most crucial ingredient. Quicksilver or mercury was first applied to the reduction of low-grade silver ores in

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<sup>12</sup> Bullion Records, June 1877, Consolidated Virginia and California Mining Companies, NC99/1/3/5 & 7, Special Collections, Library, University of Nevada at Reno.

<sup>13</sup> "Comparative Statement of the Operations of Mills, June, 1877," Pacific Mill and Mining Co, records 1865-1884, Bancroft Library, P-G 207, Oversize Box 1, Folder 11. The calculation given above are mine based upon data from this statement.

sixteenth-century Mexico and Peru through a process invented by Bartolomé Medina. In colonial mines large stone were used to pulverize the ore before it was incorporated with mercury, salt and several other ingredients in open round patios that had large wooden spatulas attached by a rod to a donkey that stirred the mixture by walking around the patio. Even individuals were known to walk around in the mixture with tragic consequences, of course. By the time of the Comstock bonanza the patio process had undergone important modifications. The plants still consisted of stamps along with batteries for grinding the ores and smashing the rocks, but a mechanized system of pans and agitators in long building had replaced the patios. Mills were identified in terms of the numbers of stamps and the pans. The process of amalgamating the ore with the mercury, which could take up to three months in the patios, had been reduced to weeks and even days. In general the higher the quality of the ore the more mercury was required to separate the metals. Mercury was bought from California and Arizona miners and as far away as Hong Kong. The quality of the mercury was important, and the higher the quality the greater the efficiency of the mercury in amalgamating with the ore. Only a fraction of the mercury in the pan was lost with each incorporation, and what appeared as mercury expenses in mill accounts was mainly to recharge the amalgamation pans after a batch of ore had been successfully amalgamated. These recharges were unpredictable and could vary from pan to pan and mill to mill. Recovery of the mercury, which some Spanish colonial miners also practiced, consisted of heating the amalgam of ore and mercury to evaporate the mercury, which could then be condensed into a "retort" that was usable again. Devices for capturing and restoring mercury were far more effective in the late nineteenth century than 100 or 200 years before.<sup>14</sup>

Amalgamation had been invented primarily to make refining various ore grades profitable. In colonial Spanish America high-grade ores were often smelted rather than amalgamated because mercury sold through the royal monopoly was expensive. Along the Comstock and in the West generally, however, mercury was used even with high-grade ores. The higher the grade of ore the larger the quantity of mercury had to be. Mill superintendents had learned from experience how to adjust the quantity of mercury with respect to the quality of the ore. If manuals existed with the individual milling operations, they have not shown up in the archives that I have consulted. Frequent assays could provide some guidance on how much mercury should be incorporated with the ores. Those who have written about the Comstock have accepted as rough estimates the following: if the pans accommodated 2,000 to 3,000 pounds of ore, then they needed 200 to 300 pounds of mercury with an expected loss of one pound per pan per operation. Such a loss amounted to 0.3 to 0.5 percent of the total. In addition to the experience in accommodating for grades of ores, some plants and crews were highly efficient at incorporating and reserving quicksilver and therefore minimized the loss and lowered the cost. A loss of one pound per ton was a yardstick based on all Comstock operations. The fact that mercury could be used more than once was what made amalgamation an economically viable procedure. If each pan required an average mercury charge of 10

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<sup>14</sup> Much has been written about Medina and the patio process. For example, see Peter Bakewell, *Silver Mining and Society in Colonial Mexico, Zacatecas 1546-1700*, (Cambridge: Cambridge University Press, 1971), Chapter 7. All the Comstock's major historians – DeQuille, Lord and Smith discusses aspects of the refining operations.

percent or 200 to 300 pounds, and that charge had to be replaced in each pan after each operation, then amalgamation would have proved to be prohibitively expensive. For example, in 1877 the Pacific mills reduced over 366,000 tons of ore. To replace 200 to 300 pounds of mercury in each pan after each operation would have cost at 50 cent per pound \$37 to \$55 million dollars. That meant that the cost of the mercury alone would have been \$100-per ton, and the total amalgamation costs would have been many times higher than the \$10 to \$15 per ton that appears in the mill accounts.<sup>15</sup>

The total quantity of mercury shipped to and employed by Comstock millers or in particular by Pacific Mill and Mining cannot be stated with any degree of accuracy. This could only be determined if we had a full accounting of mercury purchases by all millers. A 1992 report on "Mercury Contamination of the Carson River" estimated that 15 million pounds (7,500 tons) of mercury entered the Carson River basin, mainly from mills located along or in the vicinity of the river.<sup>16</sup> Comstock millers processed more than seven million tons of ore up to 1885. Based on the performance of the Pacific mills in 1877, each ton of crushed ore required a charge (to cover the loss) of about three pounds of mercury. If that figure were applied to seven million tons, then at least 21,000,000 pounds entered the Comstock region up to 1885. That three-quarters of it found its way into the Carson River would not be surprising inasmuch as many large mills were located on the river itself and in the watershed that drained into the river. Even though the majority of the mills were situated some miles from the river and many were clustered in and around Virginia City and Gold Hill, the reach of the Carson River watershed was extensive. The cost to buy and transport 21,000,000 pounds (275,000 flasks) at 50 cent per pound was \$10 to \$11 million or 2.5 percent of the total bullion value of gold and silver. A fairly straightforward calculation indicates that The Firm accounted for a fifth or \$2 million of the money spent on the mercury purchases plus the freight. The legacy in the form of contamination and rehabilitation of the environment will be many times that figure.<sup>17</sup>

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<sup>15</sup> The reference to the Pacific mills based on data from "Comparative Statement of the Operations of Mills, June, 1877," Pacific Mill and Mining Co, Records 1865-1884, Bancroft Library, P-G 207, Oversize Box 1, Folder 11. Also see Smith, *The Comstock Lode*, 257.

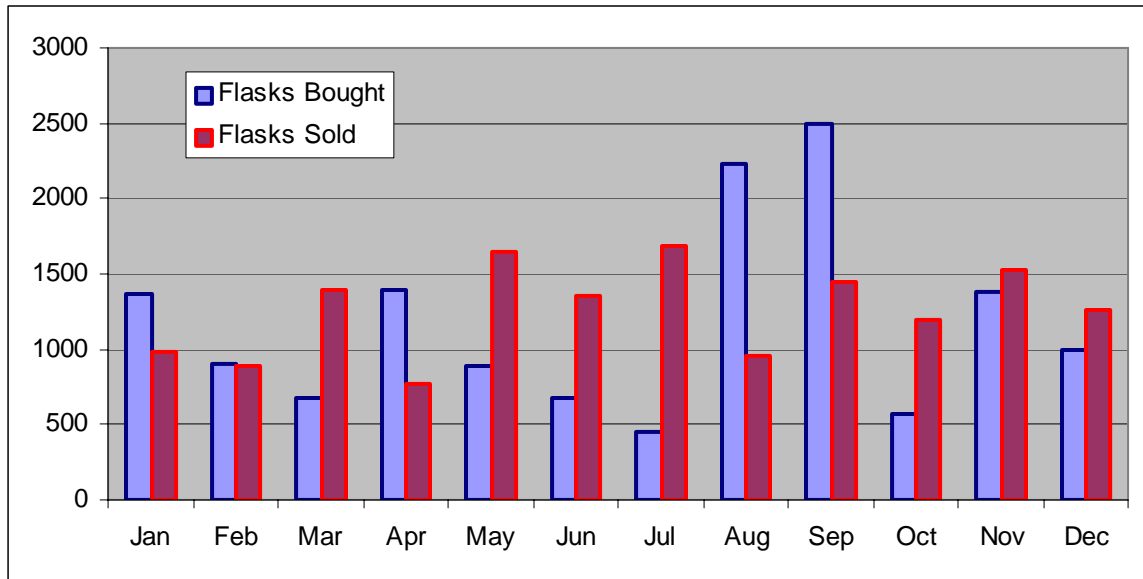
<sup>16</sup> *Quarterly Newsletter of Nevada Bureau of Mines and Geology*, Winter, 1992. This figure was taken from a 1942 report that is not available on-line.

<sup>17</sup> The number of flasks and the cost per flask from calculations made from the data in "Comparative Statement of the Operations of Mills, June, 1877," Pacific Mill and Mining Co, Records 1865-1884, Bancroft Library, P-G 207, Box 2.

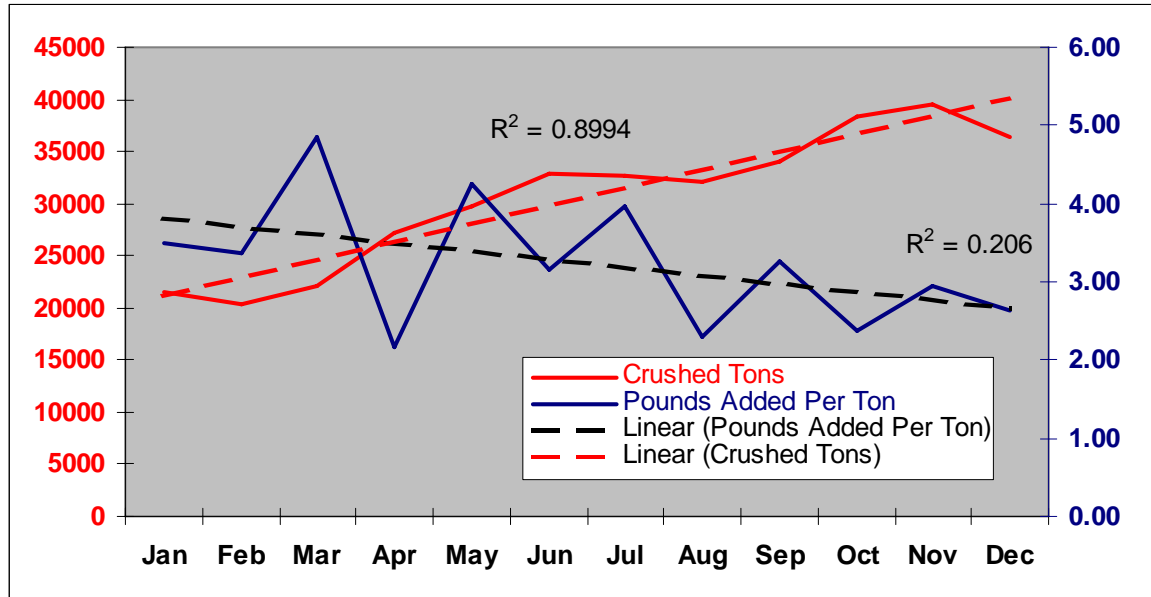
**FIGURE 1  
SUMMARIES OF MONTHLY QUICKSILVER TRANSACTIONS, 1877,  
PACIFIC MILL AND MINING COMPANY**

Month	Tons Crushed	Bullion Returned	Flasks Bought	Cost	Price/#	Flasks Sold to PMMC	Pounds Sold Per Ton	Cost	Price/#
Jan	21535	\$3,222,725	1367	\$50,647.87	\$0.484	980	3.49	\$41,233.50	\$0.549
Feb	20333	\$3,081,112	900	\$32,647.85	\$0.474	890	3.35	\$34,042.50	\$0.499
Mar	22057	\$3,408,014	675	\$22,978.68	\$0.444	1395	4.84	\$53,358.75	\$0.499
Apr	27161	\$2,709,443	1400	\$46,536.98	\$0.434	765	2.16	\$29,261.25	\$0.499
May	29642	\$2,106,886	895	\$29,889.98	\$0.436	1643	4.25	\$62,844.75	\$0.499
Jun	32943	\$1,923,481	675	\$22,978.68	\$0.444	1355	3.15	\$51,828.75	\$0.499
Jul	32626	\$1,628,698	450	\$15,319.12	\$0.444	1691	3.97	\$64,680.75	\$0.499
Aug	32184	\$1,627,880	2227	\$83,582.81	\$0.490	960	2.28	\$36,720.00	\$0.499
Sep	34057	\$1,794,641	2500	\$99,730.19	\$0.521	1450	3.26	\$61,008.75	\$0.549
Oct	38368	\$1,888,523	575	\$19,708.31	\$0.447	1190	2.38	\$50,069.75	\$0.549
Nov	39566	\$1,731,309	1375	\$49,183.80	\$0.467	1529	2.96	\$58,280.37	\$0.498
Dec	36412	\$1,715,623	1000	\$36,383.50	\$0.475	1255	2.64	\$48,003.75	\$0.499
<b>Total</b>	366884	\$26,838,335	14039	\$509,587.77	\$0.474	15103	3.15	\$591,332.87	\$0.511
<b>Mean</b>	30573.67	\$2,236,527.92	1169.92	\$42,465.65	\$0.463	1258.58	3.23	\$49,277.74	

**FIGURE 2  
FLASKS OF QUICKSILVER BOUGHT AND SOLD IN THE ACCOUNT OF  
MACKAY AND FAIR, 1877**



**FIGURE 3**  
**TRENDS FOR FLASKS OF QUICKSILVER BOUGHT AND SOLD IN THE**  
**ACCOUNT OF MACKAY AND FAIR, 1877**



See footnotes 15, 17.

Pacific Mill and Mining purchased millions of pounds of mercury to maintain its amalgamation operations each year. It was by far the largest purchaser of mercury ever on the Comstock. It did not purchase mercury directly, at least in a technical sense. Flood and O'Brien through their San Francisco offices signed the contracts for delivery of mercury in behalf of the account of Mackay & Fair in Virginia City, which sold the mercury to Pacific Mill and Mining. (This was the same account referred to earlier with references to transactions between Mackay and Fair and Pacific Mill and Mining as well Mackay and Fair and Pacific Wood, Lumber and Flume, which the Quartet owned.) Thus the Mackay & Fair account will show what Flood & O'Brien paid for the mercury and then what Mackay & Flood received for the mercury when it was sold to Pacific Mill and Mining. One might assume that the volume of mercury purchased by The Firm gave it some leverage in negotiating prices, but if that was the case it cannot be verified from the transactions detailed in the accounts. During the middle years of the 1870s demand for mercury was higher than it had ever been, and that pushed up prices significantly by as much as a third to a half. Once the boom had ended, prices fell by a fifth or more. No serious mercury shortages were alluded to in company correspondence, although it occasionally contained references to dissatisfaction over quality, defective flasks and delays in shipments. Mercury from Hong Kong was more expensive by a few pennies per pound than mercury from the western United States, although certainly the freight increased the cost per pound by even more. (Size of flask may have been different and therefore direct comparisons are not possible.) The Hong Kong purchases were undertaken to insure a substantial inventory at a time when California was at its peak and Consolidated Virginia was staging a comeback. The total purchase may have amounted to 5,000 flasks (383,000 pounds) but as many as 3,500 flasks and perhaps 4,000 flasks

had not yet arrived in Virginia City by the end of the year. Under these conditions Hong Kong would not soon replace domestic suppliers. From the annual mercury statements one can observe that the price of mercury was not as much a concern as maintaining the supply of mercury in Virginia City.<sup>18</sup>

At the start of 1877 during the final phase of the Big Bonanza the accounts of Mackay & Fair showed that 2,838 flask or 217,000 pounds were on hand in Virginia City. During the year Flood & O'Brien bought 14,039 flasks or 1.1 million pounds, which were shipped to Virginia City. Another 300,000 pounds had been purchased in Hong Kong and was awaiting shipment to San Francisco. About 1.2 million pounds were distributed, and at the end of the year 136,000 pounds remained as well as the 300,000 pounds as yet undelivered. At the rate that ore was being delivered to Pacific mills, this was only enough mercury for a little more than a month had the mercury supply line for some reason dried up. Of course a few other mines were still producing ore on the Comstock, and the mills processing their ores also needed mercury so that the total quantity arriving in Virginia City from all sources and for all operations during 1877 may have been several hundred thousand pounds higher.

There was a negative correlation (-.27) between the purchases of mercury in the account of Flood & O'Brien and the sales of mercury from that account to the account of Mackay & Fair. During the entire year flasks purchased averaged 1,170 while sales averaged 1,259. This was a time when crushed ores from Consolidated Virginia and California rose from 21,535 tons in January to 36,412 tons in December, a rate of over 4 percent a month ( $r^2=90$  percent). For the first half of 1877 purchases averaged 985 flask per month and for the second half 1,385 flasks, while sales averaged 1,171 and 1,486 respectively. Clearly continuous rising tonnage at the Pacific mills required that purchases after falling off in the first half of the year be accelerated to keep pace and maintain inventories. Indeed on 1 August the inventory based on Mackay & Fair's account had fallen dangerously low to 481 flasks (37,000 pounds) when the average inventory for the first of the month was about 2,400 flasks. In August domestic purchases (2,250 flasks) by Flood and O'Brien had increased five times over July's purchases (450 flasks). This was about the time that the decision to purchase Hong Kong mercury must have been made. The largest single monthly purchase of 2,500 flasks was made in September, and that included 1,000 flasks or 40 percent from Hong Kong. Even though nearly 4,000 flasks from Hong Kong remained to be delivered by the end of the year, the first-of-the-month inventories began to return to near normal levels.

To allow inventories, as reported the first day of each month, to decline from an average of 2,900 flasks from January through June to 1,800 flasks from July through December may have been a deliberate decision on the part of the management. It surely was not a function of any significant change in per-pound price for mercury. It was a few pennies higher per pound in the second half of 1877 and the first half. Perhaps United States mercury suppliers were under some constraint, and as Consolidated Virginia and

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<sup>18</sup>The above observations and those that follow were based upon the examination of the "Quicksilver Statement, 1877," in Miscellaneous Accounts, Mackay, Fair & Co., NC95, Special Collections, Library, University of Nevada at Reno.

California ore output increased more rapidly than mercury purchases, inventory levels simply had to decline. But another factor may have been at work. It is possible that to make the amalgamation of the ores perform efficiently the recharging of the mercury pans required increasingly larger amounts over time. This possibility shows up when we construct some ratios of pounds of mercury sold to Pacific Mill and Mining against tons crushed (a rough measure at best). Those ratios increased between the first half and the second half by amount 20 percent. In the first half the recharges consisted of about 0.31 (in tenths) of a pound per ton and during the second half they had increased to 0.36 of a pound. The reasons for this could be that the quality of the ore or the quality of the mercury demanded larger recharges to complete the amalgamation or that efficiency of the operations had fallen off somehow. From monthly per-ton calculations for 1877 it can be said that there was a modest upswing in bullion returns from crushed ores in the second half of 1877 but hardly enough to account for larger recharges.

The average price paid by The Firm was \$0.474 per pound on the purchases of nearly 1.4 million pounds. (Hong Kong's purchases are included in this figure because they had been paid for.) The average monthly price for purchases by Flood and O'Brien ranged from \$0.434 to \$0.521 per pound. Only once, in September 1877, when they purchased more than 380,000 pounds of mercury in Hong Kong, did the average price exceed \$0.50 per pound. The cost of freight to Virginia City on average was 2.25 cents per pound. To buy and ship a pound of mercury from its source to Virginia City cost on average \$0.497, or 50 cent per pound. The price of the sale of a pound of mercury by Mackay & Fair to Pacific mills was higher by a few pennies than the combined average purchase and freight costs. Their accounts always showed how much was on hand after sales plus purchases. There may be an appropriate explanation for boosting the price paid by Pacific by a few pennies, such as covering office expenses, etc., but whatever the explanation was it cannot be found in the accounts themselves. What this meant in financial terms was that Flood & O'Brien paid approximately \$530,000 for 14,000 flasks and their freight, or \$0.495 per pound, for which they were duly reimbursed by Mackay & Fair, who then sold 15,000 flasks from the stock at nearly \$600,000 or \$0.511 per pound. Given the inconsistencies and inaccuracies that exist in these accounts it is probably wise not to make too much of the difference between figures for purchases and sales within the same operation. Still, based upon an examination of the accounts, each flask of the mercury sold by Flood & O'Brien to Mackay & Fair cost a few cents more per flask when sold by Mackay & Fair to Pacific Mill and Mining.

From the beginning of Mackay and Fair's tenure on the Comstock entailed the intertwining of separate companies to handle distinct tasks in the exploitation of the Lode. With the founding of Consolidated Virginia and California Mining Companies this became even more elaborate but not necessarily illegal. Mackey and Fair were the principals in the companies from mining to refining, from logging to banking. Flood and O'Brien were part owners in most if not all of the companies, as well as a handful of other long-time business associates. Since the mining company stocks sold on the San Francisco Exchange, those companies had stockholders beyond the Mackay and Fair circle. Still Mackay and Fair owned tens of thousands of Consolidated Virginia and California shares and had a controlling interest in all the companies that they had created.

And Mackay probably held more shares of the mining companies than Fair or anyone else. In addition to the ownership links there were managerial or administrative links. Fair was the long-time day-to-day superintendent of Consolidated Virginia and California Mines, although Mackay was on the site most of the time and acted as superintendent when Fair was gone or indisposed. D. B. Lyman was the equally long-time superintendent of Pacific Mill and Mining Company. In the office itself the manager or administrator was J. Minor Taylor, who joined The Firm in 1874. Many of letters and reports written by Fair, Mackay and others were actually the work of Taylor as his name or initials often appeared at the bottom of letters and reports. He was also responsible for maintaining the office accounts for all of Mackay and Fair businesses. From all indications he was a meticulous and conscientious manager. The mining company finances were elaborately recorded in bound volumes and in considerable detail. The accounts of the other businesses were on the basis of what have survived less elaborate and specific, although they were still functional. Flood and O'Brien handled some bookkeeping in San Francisco, although few records have survived in the archives that I have consulted. Taylor made it clear that the Mackay & Fair Account was the accounting umbrella for all the businesses outside of Consolidated Virginia and California Mining Companies. In response to inquiries that arose out of the Dewey litigation he wrote in a letter to Flood and Fair on 11 September 1881 that "[W]hen I entered your employ in December 1874 Mackay and Fair were the mediums (and have so remained) through which all transactions of the Pacific Mill and Mining Company with Flood and O'Brien and J. C. Flood and Co. were made." Taylor further noted that the Mackay & Fair Account was actually recorded in their names as Quicksilver Accounts, and that was the title that appeared in the heading of each page for the 1877 document that has survived. It is unclear if Taylor regarded this as an error or a risk and if so whether he sought to change the accounts to fit more closely with what they reflected. This did not mean that Pacific Mill and Mining (of any other business entity) lacked financial records and ledgers to keep track of day-to-day operations. Indeed the financial documents relative to mill operations, discussed above, were highly detailed. The Mackay & Fair Accounts or, as they were titled, "Quicksilver Statements", concerned the purchase and sale of quicksilver on the one hand and the remittance of funds, presumably gross profits, generated by the businesses that Mackay and Fair owned or controlled in association with Flood and O'Brien.<sup>19</sup>

Monthly Quicksilver Statements generally consisted of three parts contained within two pages. Most of the Statements were signed by J. Minor Taylor in behalf of Mackay & Fair in Virginia City and dated. The general format was consistent from month-to-month, but the entries themselves varied considerably. It was not always clear from the entries exactly what items were being referenced with respect to Mackay and Fair's Account. The first page concerned mainly mercury transactions between the accounts of Mackay & Fair and Flood & O'Brien. The quantity of mercury on hand at the start and the end of the month was noted along with purchases and sales and remittances in cash from Virginia City to San Francisco. These transactions were discussed above.

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<sup>19</sup> Copy of Letter to Messrs. Flood and Fair from J. Minor Taylor, Virginia City, 11 September 1881 in Grant Smith Archives, Binder 4, "Bonanza Firm", NC229, Special Collections, Library, University of Nevada at Reno.

The second part concerned the remittances of monies accruing to Mackay and Fair's Virginia City account from Pacific's milling operations to Flood and O'Brien's San Francisco account. The remittances were in the form of cash, bank drafts and bullion. This section was particularly interesting because a "running total" was calculated each month, and that figure closely approximated the "net profits" under review in the Dewey-Burke suit and the Mackay-Fair distribution in subsequent years (also discussed above). Finally the third section carried the heading of "Cash Receipts & Disbursements". This was a summary of cash transactions involving the Mackay & Fair Account. The account received cash from the mercury business as well as the milling and logging businesses. The cash transferred from Virginia City to San Francisco was only a portion of the total transfers. The value of these Monthly Quicksilver Statements (which obviously dealt with more than quicksilver) even for just one year is that they make it possible to study the stream of income to Mackay, Fair *et al.* from their ancillary businesses. Let me underscore that these remittances did not include the ingots from the ore extracted from The Firm's mines. Most of milled ore was shipped from the Comstock to the Federal Mint in San Francisco for the final assay and the conversion into bullion.<sup>20</sup> It was the bullion, of course, that came to represent the great wealth of Mackay, Fair *et al.* But, as can be seen from the monthly accounts the ancillary business could also yield income for the principals.

The remittances involving Pacific Mill and Mining had the largest numbers and the most complicated entries. Total remittances as of 1 January 1877 were \$2,428,131.53. Pacific had been in operation since 1874, and in the first two or three years the mills had generated substantial operating profits. During 1877 total remittances rose to \$4,272,567.98, an increase of 72 percent. Total remittances continued to grow; by the end of 1879 they had exceeded \$7.2 million and by the middle of 1881 when the dissolution of the Pacific partnership was completed they had surpassed \$8.9 million. That figure is close to what the "net profits" were said in one of the two documents drawn up for the dissolution. Remittances continued after the middle of 1881 and may have pushed the total somewhere above \$9 million.<sup>21</sup> The remittances may not have been so much "net profits" as "operating surpluses". From the 1877 Monthly Statements and other documents it cannot be said that all of Pacific's operational and capital expenses had been met prior to the transfer of money from Virginia City to San Francisco. The Monthly Statements simply did no more than record what had been transferred. Still the "running total" through 1877 and beyond corresponded to what other sources declared to be "net profits". While the figures themselves remain ambiguous, the entries for the year 1877 taken as a whole offer some interesting insights into how Pacific's owners managed their affairs.

The manner in which the monthly remittances of Pacific Mill and Mining funds were entered into the Mackay and Fair accounts followed several different formats. Entries under Pacific remittances were stated in cash and drafts with no further

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<sup>20</sup> A small part of the ore output was minted in Carson City and then shipped to San Francisco.

<sup>21</sup> The totals for the years between 1878 and 1881 were taken from a typescript copy by Grant Smith of a Letter to Messrs. Flood and Fair from J. Minor Taylor, Virginia City, 11 September 1881 in Grant Smith Archives, Binder 4, "Bonanza Firm", NC229, Special Collections, Library, University of Nevada at Reno.

description of the origination of the entries. Some entries were describe more specifically as proceeds from sales of silver bars, mostly silver, and from sales of slime or mill bullion plus rebates on freight on the Virginia & Truckee Railroad. Other entries (equal to a quarter of a million dollars) were described as “Bullion in Transit in the account of PMM&Co” or “Fine Silver to be accounted for by PMM&Co” but were kept separate from the remittances and were not included in the running total. It is not evident from the Statements why this was so. It will be recalled that Pacific charged Consolidated Virginia, California and other mining operations a rate per ton to mill the ore and that gold and silver bullion was then registered under the mining company. Even as the rate fell Pacific was processing so much ores of high grades in efficient mills that it could make a dollar or two per ton over and above its costs. Some of those operating profits may have been remitted in the form or cash or banks drafts. But Pacific also earned money from processing slimes and other residues that remained in the possession of the milling company, and the entries concerned with income from sales of bars may well have reflected that side of the milling business. In any event Pacific, incorporated primarily to process ores from Consolidated Virginia and California proved to be a moneymaker in its own right.

The third part of the Quicksilver Statements, Cash Receipts & Disbursements, tracked the receipt and disbursement of cash and its equivalent as opposed to bars of silver and other similar non-liquid financial instruments in the Mackay & Fair Account. Cash flowed in from previously discussed mercury sales and milling proceeds and from another ancillary business, Pacific Wood, Lumber & Flume Co and were listed as “debits” in the Mackay & Fair Account. Cash from these businesses was disbursed to the Flood & O’Brien account and listed as “credits” to the Mackay & Fair Account. The total cash entered as debits was almost \$2 million for 1877 and the total entered as credits more than \$1.6 million. Not surprisingly during the course of the year some cash was held in reserve in the Mackay & Fair Account. Some of the cash or equivalent entries in Pacific Mill and Mining remittances also showed up in Cash Receipts & Disbursements (as they should). Of the receipts, actually in accounting terms a debit, the breakdown was as followed: \$1 million from Pacific Mill and Mining, \$600,000 from quicksilver and \$300,000 from Pacific wood, Lumber and Flume. Conversely on the disbursements, a credit, more than \$1 million in cash was disbursed from Mackay & Fair to Flood & O’Brien in the account of Pacific Mill and Mining and \$150,000 in the account of Pacific Wood, Lumber and Flume. Mercury disbursements were almost equal to mercury receipts. The Pacific Mill and Mining disbursements were greater than the receipts for 1877 whereas the Pacific Wood, Lumber and Flume were about half of the receipts. Cash transfers from The Quartet’s related business was only a fraction of what they gained from their mines, but gross operating profits, which these disbursements may represent, of \$1 million in a single year was by any measure a highly valued business.<sup>22</sup>

### **Links:**

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<sup>22</sup> “Quicksilver Statement, 1877,” in Miscellaneous Accounts, Mackay, Fair & Co., NC95, Special Collections, Library, University of Nevada at Reno.