

GOLD FROM THE SULPHURETS

by amalgamation in wooden barrels, the same that has been successfully employed at the St. John Del Rey mine, for nearly half a century, in place of the chlorination process now so much used in this state. I feel assured by the former process more gold will be saved, and at a considerably less cost.

The St. John del Rey mine is owned by an English Co., and has been profitably worked for upwards of 45 years. Last year, (1880) in their fiftieth annual report it appears they stamped 63,540 tons of veinstone, and state the cost of milling the same was 3s. 11½d. per ton, about \$1; and that the net profit for that year's workings was \$315,000.

The veinstone of the St. John del Rey mine is a mixture of magnetic, arsenical and common pyrites disseminated in a quartzose gangue, and is composed of about 40 p.c. of silica, and 60 p.c. of pyritic matter—the arsenical pyrites carrying the most gold. The smallest grain of gold is rarely seen before concentration.

THEIR PROCESS OF AMALGAMATION.

is nearly perfect, but the stamping and concentration very defective, the stamps doing but little duty, only 1½ tons per head during the 24 hours. Their plan of concentration being principally what is called "straking," consisting of a number of fixed inclined trays 30 ft. in length and 18 inches wide, with a fall of one inch to the foot; the trays are covered for the first 16 ft. with bullock skins tanned with the hair on them, and in lengths of two feet two inches; below these are a series of blankets or baize cloths of the same length. The deposit of sulphurets on the first three skins contains nearly all the gold, and amounts to about 0.42 of a cubic ft. per ton of veinstone. Stamped, it contains about 30 ounces of gold per ton, all of which with the exception of one ounce is in a free state, the ounce of gold being mechanically mixed with the coarser grains of pyrites.

It is estimated that in stamping and straking, 10 p.c. of the total amount of the gold is carried off in suspension by the water.

Their loss in amalgamation is comparatively trifling as far as I can gather from their numerous reports, and will average less than 4 p.c.—the loss of mercury is 0.45 ounces per cubic foot of sulphurets amalgamated. The apparatus employed for amalgamation of the sulphurets, consists of wooden barrels, 4 ft. in length, and two feet five inches in diameter, having a capacity of 20 cubic ft. The charge of sulphurets for each barrel is one ton and a half free from decomposition, and 60 lbs of mercury. There is also a sufficient amount of clean water at the same time introduced to give the slimes the necessary degree of fluidity to enable the globules of quicksilver formed to become properly incorporated, without allowing them to become sufficiently mobile to admit of the setting of the mercury and amalgam at the bottom. The barrels when charged are allowed to rotate from 20 to 30 hours, making 18 revolutions per minute in accordance with the state of the atmosphere.

The contents of the barrels are afterwards washed in an apparatus called a "saxe," which is used to separate the gold amalgam from the refuse. In this country it might be perhaps better to employ separators the same as these used in the different pan mills.

In their report of 1880 the results of their trials of the Comstock pan system was anything but satisfactory, indeed in the milling for gold that system appears to be too costly for low-grade ores, and not fit for the rich. It is better calculated for the treatment of veinstone which contains in the ton from five to ten ounces of silver, and that in a suitable mineralized condition as chlorides, etc.

The attempts to grind the sulphurets when they contain upwards of 50 p. c. of pyritic matter, and to amalgamate the mechanically combined gold enclosed in the particles of pyrites, at the same time and in the same pan, has not been attended with success from the earliest attempts, some of which I witnessed in Brazil in 1832, which was then made in an apparatus being a modification of the Hungarian bowl. The St. John del Rey sulphurets when ready for the barrel contain about 95 p. c. pyritic matter, and are reduced so fine that 90 p. c. of it will pass through a sieve having 100 holes to the linear inch.

What I have tried of the Californian Sulphurets the pyritic matter varies from 70 p. c. to 90 p. c., and about 75 p. c. of it will pass through a sieve of 100 holes to the linear inch.

The following analysis was made by John A. Phillips, F.G.S., and published in his Metallurgy of Gold and silver. I lately received a letter from him, wherein he tells me he is going to publish another work on gold:

ANALYSES OF AUKIFEROUS CALIFORNIA PYRITES CONCENTRATED FROM TAILINGS BY JOHN A. PHILLIPS,

	from Grass Valley.	from near Sonora.	North Star Grass Valley.
Sulphur.....	46.700	37.250	43.720
Arsenic.....	.310	8.490	1.360
Iron.....	41.650	36.540	39.250
Copper.....	trace.	trace.	.220
Lead.....	trace.	.400	trace.
Gold.....	.037	.302	.026
Silver.....	.036	not	.012
Cobalt.....	.036	determined.	.150
Silica.....	10.970	17.150	14.230
Totals.....	99.703	100.162	08.968

PER TON OF 20 CWT.

	Oz.	Dwt.	Gr.	Oz.	Dwt.	Gr.	Oz.	Dwt.	Gr.
Gold.....	12	2	0	93	13	0	8	10	0
Silver.....	11	6	0				3	18	0

The condition of most of the gold in California sulphurets is much the same as that met with in the St. John del Rey mines, and if treated in the same way will amalgamate as easily. It only wants to be reduced a little finer. It will be time enough to adopt any of the new processes for the treatment of *rebellious gold ores* when they discover *any other ore* of gold, except telluric gold, which, so far, has only been met with in small quantities. In a pamphlet published by Mr. Kitto on the Gold Fields of Victoria as far back as 1867, Mr. Kitto states that the average

COST OF MINING AND MILLING

of the gold quartz in the Victoria District was under 13 p. c., say, \$3 per ton. Some of the mines were deeper than those in the Bodie district, and the veinstone much harder to stamp, and the gold, unlike that of Bodie, which is mostly free, was mechanically mixed with the pyritic matter, and consequently much more difficult to save. The Port William Co. had, up to 1866, stamped 388,681 tons of veinstone, which yielded gold equal to six tons of 2,000 lbs each. For four weeks' returns, October of that year, the quantity of quartz stamped 4,342 tons, yielding 1,355 oz. 10 dwt. of gold, an average of 6 dwt. 5½ grains per ton—a little more than \$6. The receipts were £5,944 4s. 6d.

The introduction of the Comstock pan system may have caused the shutting down of the Mammoth and many of the Bodie mines which produce low-grade ore. The wet-stamping of rich silver ores is a great mistake, and even in the wet-stamping of low-grade silver ores, unless they contain a large proportion of chlorides, they should be concentrated before amalgamation.

Concentrations on a small scale can be made much closer with the Bates than any other instrument, and consequently it is very useful in checking the working of large machines.

A great deal of useful information may be obtained from "Baron Inigo Born's" book on "Amalgamation," published in 1791, wherein he describes and illustrates with drawings, the process of "Movable Casks for Cold Amalgamation."

CARELESS WORKING.

A copper miner who understands anything of his business, would be horrified if you were to propose to him to work his mine after the fashion of some of our silver mines; that is, neglect to make a careful assorting of the richer ore when broken underground, and at the grass to mix rich ore with comparatively waste rock and then pass them together through the stamps, taking the chances afterward of whatsoever they may be, to recover the ore by pans, etc. He would tell you how much would be lost and carried away in suspension with the water, and what a large proportion would go to enrich the slime pits.

In the treatment of low-grade silver ores the concentration of the ore after stamping by such a machine as the "Frue concentrator," would, I think, reduce the cost of milling and at the same time save more silver. I take this opportunity to express the pleasure it gave me on visiting

THE STATE MINING BUREAU

To see how well and with what great taste the collection we presented to that institution was arranged and also the satisfaction I felt that the joint labor of so few should have been crowned with success. We must not forget, however, that through the liberality of Mr. John Mackay we were enabled to send the collection to the Paris exhibition of 1878, where it won for this State a gold medal—proving its great value.

In the Mining Bureau it may be said to have formed the nucleus of a collection for industrial purposes which has already grown so rapidly that it is superior to any on this coast, filling