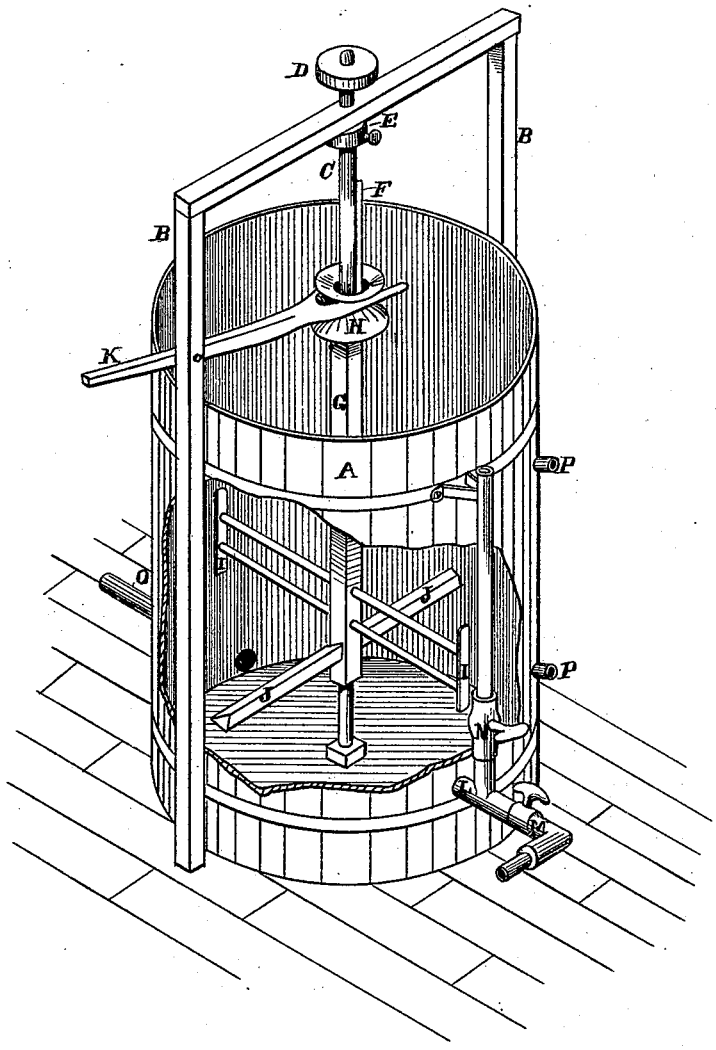
D. J. O'HARRA.

Apparatus for Washing Chloridized Ores.

No. 211,772. Patented Jan. 28, 1879.



Witnesses

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DAVID J. O'HARRA, OF RENO, NEVADA, ASSIGNOR OF ONE-HALF HIS RIGHT TO J. F. FERGUSON.

IMPROVEMENT IN APPARATUS FOR WASHING CHLORIDIZED ORES.

Specification forming part of Letters Patent No. **211,772**, dated January 28, 1879; application filed May 28, 1878.

To all whom it may concern:

Be it known that I, DAVID J. O'HARRA, of Reno, county of Washoe, and State of Nevada, have invented an Improved Ore-Washing Machine; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing.

My invention relates to an improved apparatus by means of which copper and all soluble chlorides may be washed out of roasted ore prior to amalgamating the gold and silver, and by means of which gold and silver may be washed out of solutions formed in any of the leaching or solving processes.

It consists of a tank, in which is mounted a vertical shaft having on it a feather, which engages with a groove in a collar attached to a wooden sleeve carrying arms and stirrers. Steam and water are admitted simultaneously to the tank, so that the water comes in heated under the ore. A discharge-opening and several openings for drawing off the clear liquor at various heights are provided. The sleeve carrying the stirrers and arms may be lifted up or down by means of a lever while it continues to revolve, and has diamond-shaped blades at the bottom, by which the stirrers may be gradually drawn down into a thick mass of ore, so that the mass may be agitated and stirred from the bottom.

The difficulty previously experienced in leaching processes, and which my apparatus is designed to obviate, is that in many cases where peculiar ores are treated it is impossible to filter through the mass of pulp satisfactorily. The solving liquids, being fed on top of the ore, must permeate the whole mass in order to accomplish their object. With my apparatus the liquid is forced in under the ore, which is continually agitated for a certain length of time until all the soluble chlorides are taken up in solution, and may be drawn off with the liquor, leaving the pulp ready for amalgamation again.

When the pulp has been allowed to settle, while the liquor was drawn off, it has often become necessary to shovel out all of the pulp from the tank in order to start up the stirrers, and then shovel the pulp in again gradually. In my apparatus this difficulty is obviated, as by the means employed the stirrers force their way down into the mass and stir it up, so that it will run out of the discharge-pipe into the proper receptacle or the amalgamating-pans.

Referring to the accompanying drawing, the figure is a perspective view of my apparatus with a portion of the tank cut away.

Let A represent the tank, in which the pulp is placed for treatment. Frame-work B extends up beside of and over the tank, for the purpose of holding the upper end of the vertical shaft C, as shown. This shaft C rests on a suitable bearing in the center of the tank A, its upper end being supported by the frame-work. On top of this shaft is a pulley, D, by which the shaft is revolved, and on the shaft, under the frame-work B, is a collar, E, which prevents the shaft C from being raised up out of its bearing. A feather, F, is formed on the shaft C, but does not reach quite up to the collar E, as shown, for the purpose hereinafter described.

Outside of and inclosing the vertical shaft C is a hollow wooden sleeve or shaft, G, arranged so as to admit of a vertical motion on the shaft C. On the upper end of the sleeve G is secured the metal sleeve or collar H, having a groove formed vertically on its inner edge to engage with the feather F on the shaft G, so that the wooden sleeve will revolve as the shaft does when the groove in the collar is engaged with the feather on the shaft. On the wooden sleeve G are secured several stirrers, J, with vertical scrapers I on their ends, which keep the mass in the tank thoroughly stirred and prevent it sticking to the sides of the tank. The lowest arm, J, is made in a diamond-shaped form, the opposite sides of the arms being set at opposite angles, as shown, so as to give a screw form to the arms, for the purpose hereinafter described.

The metal collar H on top of the sleeve G is so formed or flanged that a forked lever, K, may engage with it, and raise it and the sleeve G upward, without stopping the revolutions. When, however, this collar is raised by the lever K above the feather F on the shaft, the shaft will revolve without operating the wooden sleeve with its arms and scrapers. In any

other portion of the collar it will revolve with the shaft C and turn the wooden sleeve, arms, and scrapers.

In the bottom of the tank, on one side, is the pipe L, with which is connected the steam-pipe M and water-pipe N. The water-pipe N stands vertically and extends up alongside the tank A, as shown. Both water and steam pipes I provide with cocks or valves, as shown, so as to control the supply of water and steam. On the opposite side of the tank, at the bottom, is discharge-opening O, which may be kept closed with a plug until it is desired to draw off the charge in the tank. Several openings, P, are provided at various heights on the side of the tank, through which the liquor may be drawn off, as desired, after settling.

The operation of my device is as follows: The stirring apparatus is put in motion by allowing the groove in the collar-sleeve carrying the arms to engage with the feather on the driving-shaft. The valve in the water-pipe N is opened, and steam turned on through the pipe M. The water has weight enough with six feet or more pressure to prevent the steam from blowing up through it, and consequently the steam forces it into the bottom of the tank A through the pipe L, at the same time thoroughly heating it. A ton or more of roasted or chloridized ore is now charged into the tank. The stirring apparatus is kept moving at the rate of eight or nine revolutions per minute, and the steam is heating and constantly forcing a stream of hot water in at the bottom of the ore.

The agitation and the presence of the water cause the sands or heavier particles of ore to keep near the bottom, while the lighter portions, known as "slimes," come to the top. The whole charge of ore would not be more than eighteen inches high without the water; but after this is added and the agitation continued, the mass rises about three feet higher. The tank is made high enough to admit of the mass rising still higher; but the pulp only rises about five feet, so that all above that line is clear water, carrying soluble chlorides. This clear water constantly discharges through the upper one of the openings P in the tank, so that in a few hours the pulp is thoroughly washed free of anything soluble either in hot water or the solvent substances used.

When it is considered that the solving substances have accomplished their object, the water and steam are shut off. Then the stirrers are raised up about eighteen inches from the bottom by the means herein described, in order to get them above the heavier sands at the bottom, and the revolutions of the sleeve and stirrers are stopped. In a few minutes the pulp will settle and a few feet of clear water will be left on top. This is drawn off through the openings P as low as practicable without drawing muddy water. The pulp that remains is now in proper condition, with the right consistency, for the amalgamating-pans.

The stirrer is now put in motion again, the lever R being set free, and in a few revolutions the stirrer will work its way to the bottom of the pulp by it own weight. This is facilitated by the peculiar shape of the arms J, which, by the revolution of the sleeve to which they are attached, work, after the manner of a screw-blade, through the pulp. The plug in the discharge-pipe is drawn out, and the pulp is all discharged into the amalgamating-pans. The machine is then ready for the working of another charge.

By the use of this peculiar apparatus I am enabled to apply the water to the bottom of the pulp and cause it to rise through said pulp, heating it at the same time. In ordinary machines used for this purpose the charge is put in with a certain quantity of hot water and solving liquids, and the mass is agitated until the chlorides are supposed to be digested. The mass is then discharged into a filtering-tank and allowed to drain. This takes a great deal of time and the washing is imperfect, a large percentage of chlorides still remaining in the pulp. In the case of spar ores, which assume a pasty or clay-like consistency when being leached, the filtering is specially imperfect, and the leaching process has never been successful until then for this reason. The ore may even be crushed through a No. 20 screen, and still a portion of the pulp will be so sticky as to hold the water. This difficulty I overcome with my apparatus, which is applicable to all classes of ores capable of being leached. By the means employed the ore is given a thorough washing, the water being compelled to go through it and heat it at the same time.

The method by which I raise or lower the stirrer is especially important. With an ordinary fixed stirrer it could not be started up if the sands were allowed to settle around the bottom stirrers or paddles while the liquor was being drawn off. Moreover, if the driving power should happen to stop before the washing was finished the pulp would have to be shoveled out in order to start the machine and then put back again. By means of the grooved collar in the sleeve engaging with the feather on the driving-shaft in different positions, the stirrers may be raised and lowered without disconnecting from the driving-shaft; and as the bottom paddles set at an angle to the plane of motion by reason of their diamond shape, they cut their way down to the bottom of the pulp after the sands have settled. By the vertical arms on the ends of the scrapers I prevent the clayey portion of the pulp from building or accumulating around the side of the tank. If this should happen lumps would frequently fall down and create a turmoil, which would cause the muddy water to rise up in the clear water, thereby running off some of the pulp and preventing a constant stream of water from flowing from the machine.

To illustrate the advantages of the use of this apparatus for the purpose for which it is intended, it may be stated that with it I am

getting bullion with a fineness of .974 (where previously the bullion was extremely base, as the ore contained six per cent. of copper) from an ore which is spar ore and could not be leached or filtered in any other way, other modes of leaching and washing which were tried having all proved failures.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

The tub or tank A, with its steam, water, and discharge pipes, as shown, in combination with the central vertical shaft C and the sleeve G, with its scraper I and the diagonal or diamond-shaped arms J, and the clutch-lever K, all constructed substantially as set forth.

In witness whereof I have hereunto set my hand.

DAVID J. O'HARRA.

Witnesses:

FRANK A. BROOKS,

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