

948,766.

B. MacDONALD.
 APPARATUS FOR TREATING ORE PULP.
 APPLICATION FILED OCT. 25, 1909.

Patented Feb. 8, 1910.

2 SHEETS—SHEET 2.

Fig. 3,

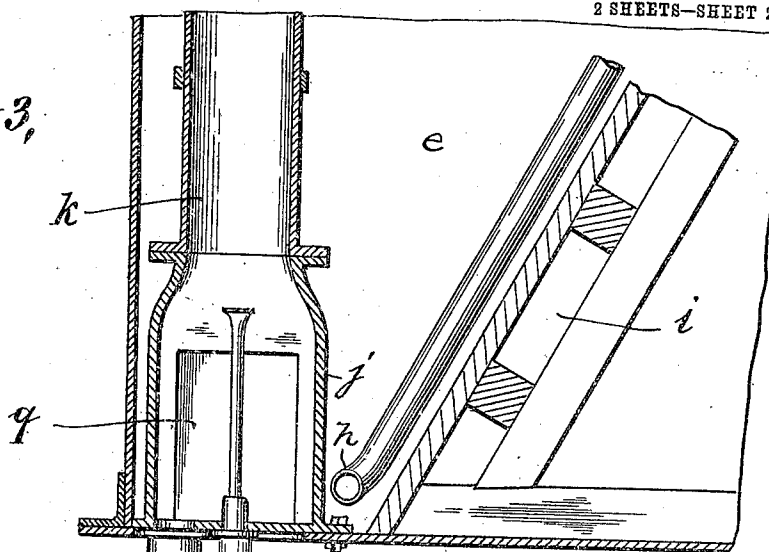


Fig. 4,

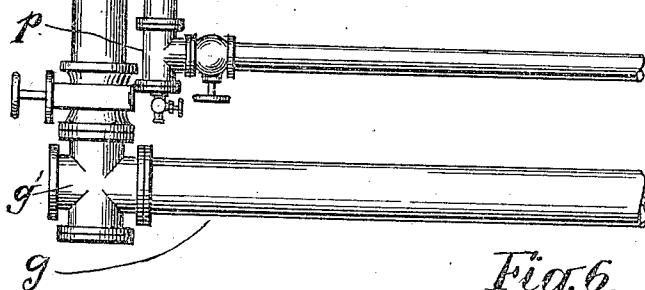
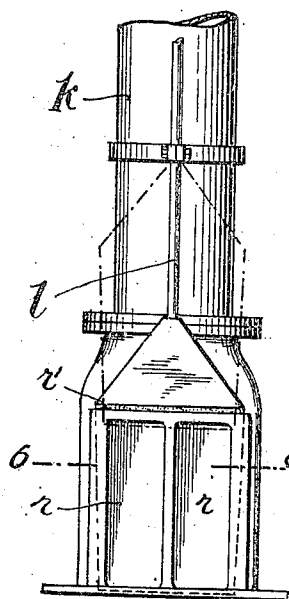


Fig. 5,

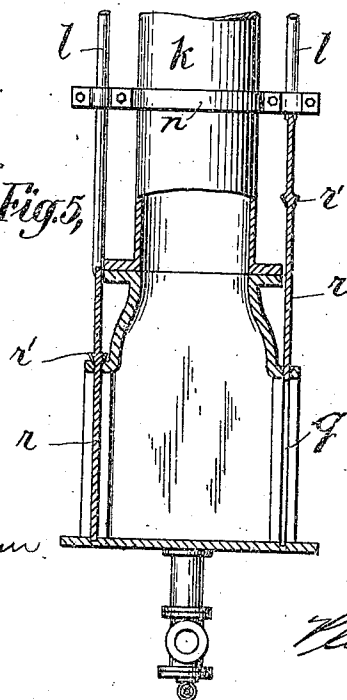
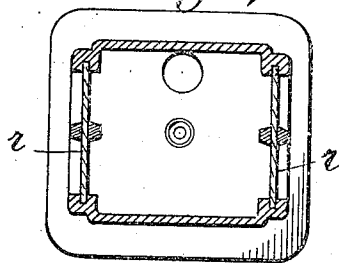


Fig. 6,



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APPARATUS FOR TREATING ORE-PULP.

948,766.

Specification of Letters Patent.

Patented Feb. 8, 1910.

Application filed October 25, 1909. Serial No. 524,498.

To all whom it may concern:

Be it known that I, BERNARD MacDONALD, a citizen of the United States, residing in the city of Guanajuato, State of Guanajuato, Republic of Mexico, have invented certain new and useful Improvements in Apparatus for Treating Ore-Pulp; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in apparatus for the treatment of ore pulp and slimes through the agency of any of the usual solvents appropriate for dissolving out the gold and silver values contained therein, such as the customary cyanid solution or the like.

The specific gravity of the solid particles in the ore pulp or slimes to be treated is not uniform, and, for that reason, while the lighter particles are held in fairly free suspension in the tank in which they are to be treated, the heavier particles tend to settle constantly to the bottom of the tank, and, depositing themselves thereon are practically withdrawn from the effective action of the solvents.

The main purpose of my invention is to prevent or minimize this deposition of the heavier particles on the bottom of the tank, and to constantly transfer them as they settle toward the bottom to the upper part of the tank where they are redelivered to the top of the charge. By this expedient, which is effected without the employment of mechanical stirrers or agitators, an intimate agitation and intermingling of all of the particles of the charge with the cyanid or other chemical solution employed is effected, the entire volume of the charge being kept of a substantially homogeneous consistency, with the result that the process is hastened and the output increased.

In the practice of my invention, I provide a receiving tank for the charge to be treated, of such height and capacity as will best subserve the particular exigencies of use. In the bottom of the receiving tank I arrange inclined partitioning, which divides the lower portion of the tank into a plurality of bottom compartments or pockets. Each of these bottom compartments or pockets is designed to be provided with a vertical transfer pipe, open at its lower end and extending upwardly so as to discharge

into the top of the tank, a continuous transfer of the heavier parts of the charge being maintained through the transfer pipes and back again into the tank by means of air injector jets projecting upwardly through the bottom of the tank and discharging in the direction of the longitudinal centers of the pipes. Each of the transfer pipes is supported upon a valve casing, bolted or otherwise secured to the bottom of the tank and thus constituting a firm pedestal effectively sustaining the transfer pipe in its vertical position. In order to keep the main body portion of the tank as free as possible from obstruction, the valve casings and the transfer pipes may either be located entirely outside of the tank, communicating therewith by appropriate pipe nipples, or they may both be located within the tank but preferably in close proximity to the interior wall thereof so as to leave the central portion free for the charge. I also find it convenient to furnish the transfer pipes with supplemental devices for insuring their stability in the tank, these supplemental devices consisting of stay-bolts, attached to the flanges or other portions of the pipe and passing through the tank walls, the outer ends of these stay-bolts being screw-threaded so as to receive appropriate retaining nuts. In addition to their function of serving as valve casings for the transfer pipes, the said valve casings are likewise connected to the discharge pipe system which leads the pulp, after it has been subjected for the desired period of time to the action of the cyanid or other solution, to the waste dump or filter presses for pressing out the solution from the pulp; and the valve casings are provided on opposite sides with regulable cut-off valves, preferably of key-stone shape and having rubber, leather or other packing to insure their hermetic closing, so that, when desired, the valve casings may be entirely closed, thereby preventing the discharge pipe openings from becoming choked and clogged in case of settlement of the pulp, and also permitting the effective area of the openings into the valve casing to be varied at will, as may be desired from time to time during the progress of the treatment of the charge in the tank.

The charge may be supplied to the tank from an overhead main which discharges into the funnel of a charge pipe located at the top of the tank. This charge pipe is

intended to open into the charge through jet apertures at or near the bottom of the tank so that the delivery of the pulp being charged into the tank through these apertures under the hydrostatic head due to the height of the charge pipe will stir up and keep in agitation so as to secure a homogeneous mixture, the pulp particles, thereby preventing the heavier particles thereof from settling in a compact mass on the bottom of the tank. Accordingly, the charge pipe is of such height (say from 40 to 47 feet, or thereabout), as to furnish the necessary hydrostatic pressure to insure a vigorous exit of the charge from the jet openings. After the charge of ore pulp or slime has been supplied to the tank, or at intervals during such supply, a body of compressed air or water under pressure may be admitted through the charge pipe to further agitate the particles of the charge and prevent settling, and to this end, the charge pipe may be provided with a cut-off valve immediately below its receiving funnel and above the branch which supplies the compressed air or water under pressure, so that, by closing the said valve the compressed air or water under pressure may be directed down into the charge for the length of time desired. The receiving funnel may be provided with a perforated bottom for supporting the chemicals which are to go into solution, so that a preliminary admixture of the pulp and the solution takes place as the charge passes downwardly through the charge pipe. In my preferred construction, the charge pipe is located within the tank, so as to be subjected to equal pressure from within and without, and the main body portion of the charge pipe is in close proximity to the tank wall so as to minimize obstruction and enable it to be effectively supported from the tank wall. I also prefer to have the main body portion of the charge pipe terminate at the summit of the ridge-like partition and to then continue it in the form of two divergent branches which extend downwardly and forwardly into the tank along the inclined sides of the ridge-like partition, in such manner that the open ends of the branches will constitute the jet tubes just referred to.

In the accompanying drawings, I have illustrated one typical form of apparatus embodying my hereinbefore described improvements, similar letters of reference indicating similar parts.

Figure 1 represents the apparatus partly in vertical section and partly in elevation, the apparatus being shown broken away about midway of its height; Fig. 2 represents a horizontal section and plan view on a plane indicated by the line 2—2 of Fig. 1; Fig. 3 represents, on a larger scale, partly in section and partly in elevation, the parts

in the immediate vicinity of the valve casing; Fig. 4 represents a detached side view of the valve casing and the adjacent portion of the transfer pipe; Fig. 5 represents a view, partly in section and partly in elevation, at right angles to the view shown in Fig. 4; and Fig. 6 represents a horizontal cross-section on a plane indicated by the line 6—6 of Fig. 4.

Referring to the drawings, *e* indicates a suitable tank, preferably of steel, for receiving the charge of ore pulp or slime and for treating the same with the cyanid or other chemical solution, said tank being of suitable height and capacity and supported upon any appropriate foundation, not shown. The ore pulp or slime to be charged into the tank for treatment therein may be supplied from an overhead main *a* having gate valves *b*, *c*. Such a main is adapted to supply a series of tanks, or any individual apparatus of a series, by closing the appropriate gate valve *b* and opening the gate valve *c*. The charge is received, in the first instance, by the funnel *d* connected to the upper end of the charging pipe *e'* and containing a perforated bottom *d* upon which rests the cyanid or other chemical to be brought into solution. Immediately below the funnel *d*, the charge pipe is provided with a cut-off valve *f* and at a lower level it is provided with a branch pipe connection *g*, whereby, upon closing the cut-off *f*, compressed air or water under pressure may be admitted into the charge pipe *e'* and directed downwardly therethrough for the purpose, hereinbefore described. At its lower end, the tank is subdivided into a plurality of compartments or pockets by transverse partitioning having inclined sides. In the drawing, this partitioning takes the form of a single ridge-like gable *i*, thereby making but two compartments, but it is evident that they may be increased in number if desired, their main function being to prevent the accumulation of a mound-like body of pulp at the center of the bottom of the tank and, instead, to direct the heavier particles of the charge constantly toward the valve casings and transfer pipes. The ridge-like partitioning may be conveniently constructed of a wooden under-frame covered with appropriately inclined boards or planking. Where there are but two compartments or pockets, the main body portion of the charge pipe *e'* is intended to rest upon the summit of the gable *i* and at one end thereof, and, from this point it preferably extends downward and forwardly, terminating in branch jets *h* directed toward the valve casings.

The valve casings *j* are located at the bottom of the compartments or pockets into which the lower portion of the tank is divided, and are bolted or otherwise secured to

the tank, so as to constitute rigid pedestals for the support of the transfer pipes k themselves. The valve casings j are provided with openings q , whose effective area is adapted to be varied by the valves or slide-gates r , having operating rods l which extend upwardly alongside the transfer pipes to the top of the tank. At their upper ends, the operating rods l pass through the bearings l' , supported from the top of the tank, so that, by pulling upwardly upon the hand-grasps m , the valves or slide-gates r may be raised to any desired degree appropriate to the circumstances of the case; or, by pushing down the operating rods l the valves or slide-gates r , or either of them, may be entirely closed, and this closure may be made air tight by means of gaskets r' of leather, rubber, or the like, as indicated in Figs. 4 and 5. The operating rods l are kept rigid and guided in their vertical play by straps n fastened around the transfer pipes k and having lugs or projections (as shown more fully in Figs. 4 and 5), through which the operating rods l slide freely. In order to further insure the stability of the transfer pipes k , stay rods n' , bolted or otherwise secured to the pipes, (as for instance to flanges on the pipes) extend through the walls of the tank and are secured in place by tightening retaining nuts, as shown. The transfer pipes k are provided at their open ends with tees o having outlets o' for the delivery of the pulp, transferred through the pipes, on to the top of the pulp mass in the tank, and being further provided with perforated tops o^2 , for the escape of the injecting air into the atmosphere after having exercised its transferring function.

The air injector jets, as shown, extend upwardly through the bottom of the tank and well up within the valve casings, where they terminate in expanded or bell-shaped ends, as shown, so as to correspondingly distribute the issuing air. These air injecting jets are supplied from any suitable piping conveying compressed air, as, for instance, the piping p .

The outlets for the pulp, after it has been subjected to treatment in the tank for the desired length of time, are located within the valve casings, and these outlets discharge through the down-takes g' and pipe g which convey the treated charge to the waste dump, or to any other desired place of destination, as, for instance, the customary filter for squeezing the solution from the pulp. The location of the discharge openings within the valve casings serves to protect them from being clogged or obstructed by the heavier portions of the charge, for the reason that the flow in the valve casing, while the charge is being treated is constantly upward under the transferring action of the air injector jets, and, when it is desired, for

any reason, to stop the transfer, without discharging the pulp in the tank, the discharge openings can be entirely cut off by the simple expedient of completely closing the valves or gates r .

Having thus described my invention what I claim is:—

1. Apparatus for the treatment of ore pulp by cyanid or other chemical solutions, comprising a receiving tank for the charge, a ridge partition extending across the bottom of the tank and dividing its lower portion into pockets or compartments, a transfer pipe for each of the said pockets or compartments, said transfer pipes communicating with the lower portions of the pockets or compartments and extending to the upper portion of the tank, means for supplying the charge to the tank, and injecting jets for transferring to the top of the charge, through the transfer pipes, the heavier portions which tend to settle to the bottom; substantially as described.

2. Apparatus for the treatment of ore pulp by cyanid or other chemical solutions, comprising a receiving tank for the charge, a ridge partition extending across the bottom of the tank and dividing its lower portion into pockets or compartments, a transfer pipe for each of the said pockets or compartments, said transfer pipes communicating with the lower portions of the pockets or compartments and extending to the upper portion of the tank, means for supplying the charge to the tank, and injecting jets for transferring to the top of the charge, through the transfer pipes, the heavier portions which tend to settle to the bottom, the transfer pipes being provided at their lower portions with valve casings upon which they are supported; substantially as described.

3. Apparatus for the treatment of ore pulp by cyanid or other chemical solutions, comprising a receiving tank for the charge, a ridge partition extending across the bottom of the tank and dividing its lower portion into pockets or compartments, said transfer pipes communicating with the lower portions of the pockets or compartments and extending to the upper portion of the tank, means for supplying the charge to the tank, and injecting jets for transferring to the top of the charge, through the transfer pipes, the heavier portions which tend to settle to the bottom, the transfer pipes being provided at their lower portions with valve casings upon which they are supported and the valve casings being provided with valve operating rods having strap guides carried by the transfer pipes; substantially as described.

4. Apparatus for the treatment of ore pulp by cyanid or other chemical solutions, comprising a receiving tank for the charge, a ridge partition extending across the bot-

tom of the tank and dividing its lower portion into pockets or compartments, a transfer pipe for each of the said pockets or compartments, said transfer pipes communicating with the lower portions of the pockets or compartments and extending to the upper portion of the tank, a charge pipe located at one end of the ridge partition and having branches discharging into the bottom of the pockets or compartments and injector pipes for transferring to the top of the charge, through the transfer pipe, the heavier portions which tend to settle to the bottom; substantially as described.

5. In apparatus for the treatment of ore pulp by cyanid or other chemical solutions, means for transferring to the top of the charge the heavier portions which tend to settle to the bottom, said means consisting of valve casings located at the bottom of the tank and on opposite sides thereof, transfer pipes mounted upon the valve casings and delivering into the top of the tank, air injecting nozzles extending upwardly into the valve casings, and valves for regulating the valve casing openings; substantially as described.

6. In apparatus for the treatment of ore pulp by cyanid or other chemical solutions, means for transferring to the top of the charge, through the transfer pipes, the heavier portions which tend to settle to the bottom, said means consisting of valve casings located at the bottom of the tank and on opposite sides thereof, transfer pipes mounted upon the valve casings and delivering into the top of the tank, air injecting nozzles extending upwardly into the valve casings, valves for regulating the valve casing openings, and means for discharging the pulp after treatment, said means consisting of discharge pipes communicating with the interior of the valve casings; substantially as described.

7. In apparatus for treating ore pulp with cyanid or other chemical solutions, the combination with the vertical transfer pipes, of means for supporting said pipes from the wall of the tank, said means consisting of stay bolts attached to the pipes and passing

through the walls of the tank, and nuts for securing the bolts in place; substantially as described.

8. In apparatus for treating ore pulp with cyanid or other chemical solutions, the combination with a receiving tank, of a charge pipe therefor, said charge pipe being provided at its upper end with a receiving funnel for the chemicals to be dissolved, and terminating at its lower end in two downwardly and forwardly extending branches, the main body portion of the charge pipe being arranged contiguous to the wall of the tank so as to correspondingly minimize obstruction of the tank's interior; substantially as described.

9. In apparatus for treating ore pulp with cyanid or other chemical solutions, the combination with a receiving tank for the charge, of transfer pipes provided with injector nozzles for effecting a transfer of the charge through said pipes and back into the tank, valve casings upon which the transfer pipes are supported, discharge pipes communicating with the interior of the valve casings, and cut-off valves for closing the openings of the valve casings or regulably varying the effective area of said openings at will; substantially as described.

10. In apparatus for treating ore pulp with cyanid or other chemical solutions, the combination with a receiving tank, of a charge pipe therefor, said charge pipe being provided at its upper end with a receiving funnel for the chemicals to be dissolved, and being likewise provided at its upper end with a branch pipe connection for the admission of water or air under pressure, and a valve between the funnel and said branch pipe, whereby, when desired, water or compressed air may be introduced through the charge pipe for the purpose of agitating the charge in the tank; substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

BERNARD MacDONALD.

Witnesses:

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LAURA B. PENFIELD.