

UNITED STATES PATENT OFFICE

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METHOD OF SEPARATING THE VALUABLE PORTIONS OF THE TAILINGS PRODUCED IN THE TREATMENT OF ORES.

SPECIFICATION forming part of Letters Patent No. 420,432, dated February 4, 1890.

Application filed June 1, 1889. Serial No. 312,906. (No specimens.)

To all whom it may concern:

Be it known that I, ROBERT E. BOORAEM, a citizen of the United States, residing at Butte, in the county of Silver Bow and Territory of Montana, have invented certain new and useful Improvements in Methods of Separating the Valuable Portions of the Tailings Produced in the Treatment of Ores; 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 an improvement in the method of separation of valuable portions of the tailings produced by the initial process of treatment of ores of precious metals, and the object of the same is to separate such portion of the mass of tailings resulting from said process without subjecting the same to regrinding in pans or other machinery, and so save the larger portion of the tailings while the mass is still wet without allowing the same to accumulate for the purpose of working over. Thus, for example, in the ordinary silver-milling operations and amalgamation, chlorinations, &c., the resultant tailings, being wet, are allowed to lie in the dumps for future working until a large mass has accumulated, and in many cases the same, as a matter of fact, are never reworked, for the reason that the accumulated mass contains such a small amount of precious metal in proportion to its bulk that reworking of the same would be unwarranted, for as yet no successful process for reworking lean tailings has been invented.

Now, I have discovered that when the mass of tailings resulting from the initial process of treating precious metals which requires the ore or pulp to be previously roasted or chlorodized is carefully examined and assayed or subjected to other chemical examination the richer portion of the tailings is found in the form of lumps, or in the agglomerated portions of the mass. By the term "lumps" or "agglomerated" portions is meant portions of the ore or pulp of any size which is larger than the mesh of the screen of the stamp-battery in which the raw ore is originally crushed. Thus, for example, if a twenty-

mesh screen is used on the battery and the tailings are run over a ten-mesh screen, the particles too large to pass the latter are called "lumps" or "agglomerated" portions, for the reason that they are coarser than the original size of the crushed ore. These lumps are only noticed when the tailings are wet, and are lost and cannot be separated when the tailings have become dry. They are produced in the furnace, and especially in the rotary furnaces, where the motion of the furnace, with the common or marine salt used therein, tends to ball the fusible particles together with the salt. These lumps in the pulp can only be detected when wet, and have the appearance of small pebbles, so far as their artificial smoothness and hardness are concerned. If, now, by any convenient form of mechanical separation without reference to the particular agencies employed, these agglomerated portions or lumps can be separated from the mass, such portions will be found to contain all that is of value, and the remainder may be rejected as valueless. In this manner a larger percentage of richer matter is saved than before, and hence the expense of re-treatment is warranted. This is owing to the fact that the agglomeration or formation of lumps takes place during the chlorodizing or roasting process and previous to the amalgamation or leaching, and as the process of ordinary pan amalgamation consists in bringing the mercury into actual contact with the precious metals locked up in the particles of ore, the percentage of amalgamation is less when the mercury does not penetrate the lumps, and the precious metal is left unamalgamated in the latter. This may also be due to an imperfect chlorodizing in the furnace, owing to the lumped or balled condition, and any imperfection in the initial chlorodizing can be corrected after the lumps are separated in the second working of the same. Where leaching is resorted to as a means of extraction, the result is similar, the chemical action of the leaching-solutions upon the hard, fused, or glazed surfaces of the agglomerated portions being much less than upon the other portions of the mass, and the percentage of extraction correspondingly less. If, now, the

tailings be immediately screened or separated while they are still wet by other mechanical agencies—such, for example, as the ordinary hydraulic separator—it will be found that
5 the agglomerated portions or lumps may be readily separated and so saved, and prepared for retreatment by any convenient method.

It will be observed that the gist of the invention lies in the separation of the lumps
10 while the same are wet and as they are discharged as waste tailings from the initial process, and it is only practicable to separate under such conditions, for the reason that when the tailings have been allowed to dry,
15 or when they are exposed to the air, the agglomerated portions slack and crumble to pieces in time and become lost in the entire mass, which then, as a whole, becomes usually of too low a grade throughout to warrant reworking. The separation of the lumps as a
20 part of the initial process for immediate reworking, or for storage of these higher-grade lumped tailings in special places separate from the low-grade mass, gives at once a
25 classified product which is valuable.

Any method of separation may be resorted to that will permit of the separation of the agglomerated portions or lumps while wet, and I do not limit myself to any particular
30 agencies for that purpose, nor do I limit myself to the application of the invention to saving the precious metals; but am aware that

the invention is applicable to the separation of lead, copper, or other valuable metals, should the same be associated with the pre- 35 cious metals in the lumps so saved.

In cases where water is not plentiful and power convenient the ordinary rotary screen, largely in use throughout the West for sizing purposes, may be used. In cases where 40 there is a large supply of water hydraulic separation will be found most advantageous, as no power is required.

I claim as my invention—

The hereinbefore-described method of sep- 45 arating and saving the valuable portions of the tailings resultant from the initial process of treatment of precious metals, consisting in roasting or chlorodizing the ores, then leaching or amalgamating the same, and in me- 50chanically separating the agglomerated portions or lumps then in the tailings while the same are still wet, as an additional step in and as a part of the initial process by suitable means, and subsequently reworking the 55 same.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 21st day of May, 1889.

ROBT. E. BOORAEM.

Witnesses:

JOHN F. FORBIS,
HIRAM KNOWLES.