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C. G. BLUHM

PLACER MINING CLASSIFIER

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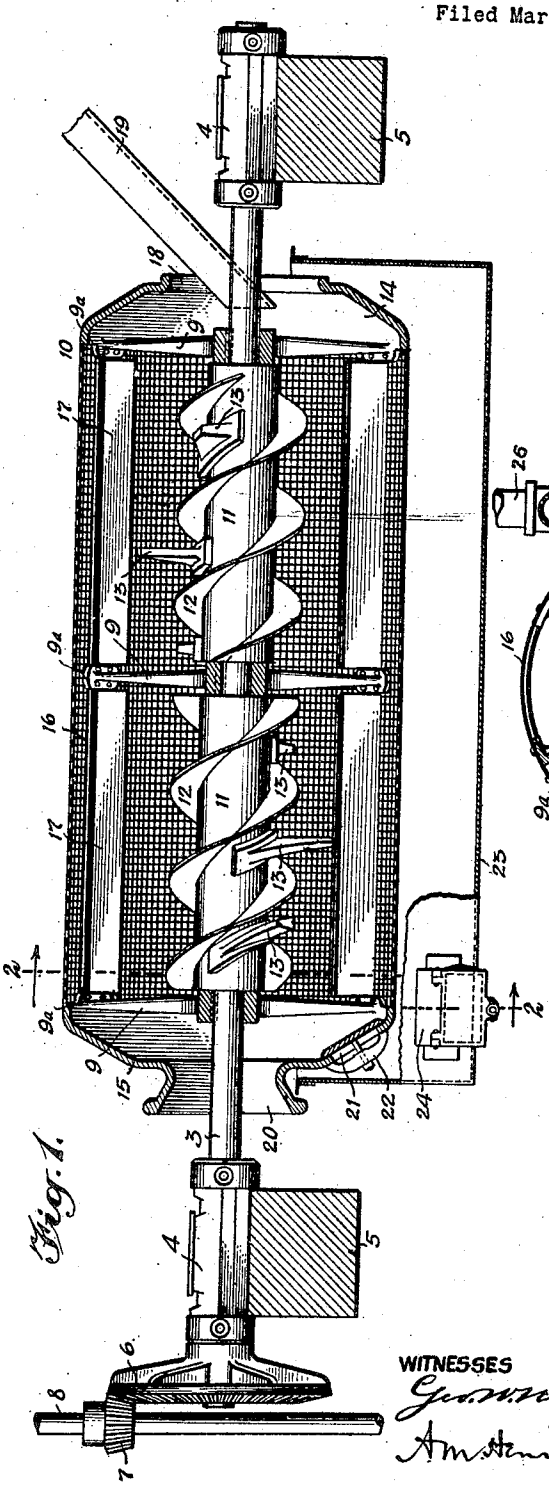


Fig. 1.

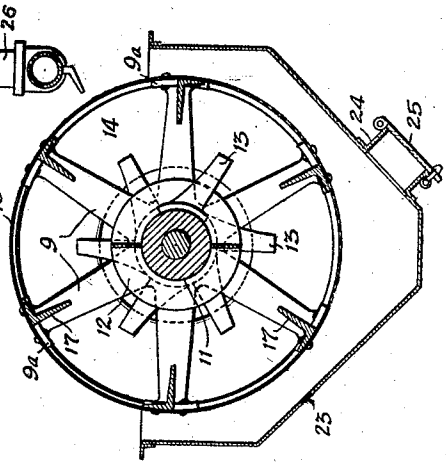


Fig. 2.

WITNESSES

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UNITED STATES PATENT OFFICE.

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PLACER-MINING CLASSIFIER.

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To all whom it may concern:

Be it known that I, CHARLES G. BLUHM, a citizen of the United States, and a resident of Fruita, in the county of Mesa and State of Colorado, have invented certain new and useful Improvements in Placer-Mining Classifiers, of which the following is a full, clear, and exact description.

This invention relates to apparatus for classifying or separating minerals; and a preferable embodiment thereof for reasons which appear below, is illustratively shown and described herein as a placer-mining classifier.

In that regard, the invention provides a classifier of the type including a rotating foraminous drum for receiving the gold-bearing sand or the like (hereinafter referred to merely as "sand"), a sand gravel charging door in the drum, means to cause a tumbling and agitation of the sand within the drum during rotation thereof and a gradual travel of the agitated material axially of the drum, a trough or tank for containing the washing fluid and in which fluid the drum and some of its contents are always partially submerged during rotation of the drum, a clean-out door in the drum, and a discharge door in the tank for drawing off the accumulated slime or fines, all as heretofore suggested many times in the placer-mining art. Further, the new classifier of the present invention is like the prior art in that said classifier includes longitudinal baffles or shelves spaced circumferentially of the drum on its interior.

The prime object of the invention is to provide a classifier as above indicated, but one including a novel collection of co-acting parts, which function in such manner as to permit exceedingly rapid, efficient and economical gold separation. In this connection, a further object is to provide such a classifier, and one which may be continuously operated as the result of the presence of means permitting the satisfactory charging of additional sand while previously charged sand is being classified by the apparatus.

I have discovered that a placer-mining classifier of the heretofore suggested type above described, and particularly when constructed to incorporate the baffle or shelf elements aforesaid, but involving a certain novel combination of parts in that other special elements hereinafter to be described are also incorporated, may be employed for effecting the separation of the metallic particles more rapidly, efficiently and satisfactorily than heretofore, and may also be employed for controlling the rate of separation such that while the quickest classification is obtained, no sacrifice of valuable material is made to obtain speed, while at the same time the sand, gravel and similar material is kept scattered rather uniformly throughout the drum interior and broken up and otherwise handled continuously in such a way as to avoid impact shocks of life-shortening force against any part of the apparatus, and particularly against the foraminous wall portions of the drum.

An object of the invention is particularly to provide a construction adapted to attain the results just described, but nevertheless a construction in which a rocking or oscillating trough or tank need not be provided, as heretofore suggested, to attain thorough and speedy classification.

The invention will be best understood from a consideration of the following detailed description when taken in connection with the accompanying drawing forming part of this specification; with the understanding, however, that such drawing illustrates, merely by way of example, one possible embodiment of the invention, and that the invention is not confined to any strict conformity with the showing in the drawing, but may be changed and modified so long as such changes and modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In said drawing:

Fig. 1 shows a classifier embodiment as above described, being generally a longitudinal vertical section; and

Fig. 2 is a transverse section taken on line 2—2 of Fig. 1.

Referring to the details of the drawing, a main horizontal shaft 3 set in bearings 4 on blocks 5 is rotated continuously by means of a bevel gear 6 fast thereon and meshing

with a bevel pinion 7 fast on a drive shaft 8. On and around this shaft 3 a rotating body is built and made fast. This body provides a central conveyor and breaker structure, which, in the present case, due to the employment of more than two spiders 9 for securing a drum body 10 to the shaft, includes two sub-structures 11. These two sub-structures, it will be understood, are in effect one conveyor, in that each includes a main tubular body carrying a screw-blade 12 each blade 12 is of the same hand as the other. These two sub-structures further constitute in effect really one conveyor structure in that each carries a plurality of offset spikes 13, preferably obliquely inclined relative to the shaft axis, similarly so inclined on both sub-structures, and preferably equidistant spirally of the shaft.

The drum body 10 comprises a dome-shaped casing 14 at the charge end of the classifier, preferably cast integral with the spider 9 at that end of the classifier; a somewhat similar dome-shaped casting 15 at the discharge end of the classifier, and preferably cast integral with the spider at that end of the classifier; and a cylindrical wall 16 between castings 14 and 15 and formed of wire mesh.

Baffle or shelf elements, in the present case conveniently made of angle-irons 17, are carried at the wall 16 to inwardly extend therefrom, preferably as shown in Fig. 2, that is, in radial alternation with spikes 13. These shelf-like baffle elements carried on the interior of the cylindrical wall of the drum, whatever their lines of extension and relative dispositions, are secured in place in any suitable way. In the present case they are riveted as best shown in Fig. 2 to wall 16; and such wall is riveted to terminal pads at the outer ends of the spider arms, these pads being marked 9^a in Fig. 1. It is desired especially to point out that these shelf-like baffle elements need not necessarily have straight-line parallel extensions as shown in the drawing, but may, on the contrary, be thus arranged spirally on the interior of the wall 16; thereby to give very fine results. But the construction as shown in the drawing is possibly the most practical, in view of the very good results obtained, and in view of the comparatively small expense involved in equipping a drum with such elements.

The end casting 14 of the drum has a central mouth 18 spaced around shaft 3. This, together with a chute 19, forms a means whereby the drum may be given additional charges of sand while the drum continues rotating, and the various conveyor and breaker means therein are functioning relative to previously charged sand.

The end casting 15 of the drum is formed with a bell-mouth 20 also loosely surrounding shaft 3 and for permitting the sand gradually to be discharged therefrom and from the drum after the sand has had separated from it all the gold or the like efficiently recoverable.

A hand-hole indicated at 21 is provided in said end casting 15, and equipped with a clamp-cover 22 of familiar design, for emergency use in cleaning out the drum in case of stoppage due to any cause, as the presence of a large and non-friable piece of rock, ore or similar material.

The tank for containing the washing fluid is indicated at 23. It will be particularly noted that no means are shown for rocking, oscillating or vibrating this tank, nor is a similar complication intended to be employed in carrying out the present invention. Such a feature is unnecessary, as indicated hereinabove.

Tank 23 has an opening or spout 24, at or near its bottom, normally closed by a hinge cover 25. This cover is opened as required for permitting the drawing off of the accumulated slime or fines.

It is recommended that wash-water pipes or nozzles be used relative to the exterior of the drum; and in this connection one such nozzle is indicated at 26 in Fig. 2. With such a provision, a stream of water may be sprayed on the outside of the foraminous wall 16, to keep the openings clean and so prevent clogging by mud or the like.

Such wall, when made of wire mesh, is formed of a mesh of a comparatively rugged and non-corrosive type. Of course this wall need not necessarily be made of mesh, as many substitutes are practicable to use, such as perforated or punched sheet metal. If desired, the wall 16 employed may be further secured in place on the spiders 9 by applying metal or other suitable bands around the same at spaced points along the length of the drum.

Operation: It is believed that the high efficiency of the new agitator and conveying means inside the constantly rotating drum, is due largely to the fact that the ledges, shelves or baffles 17, when they dump their picked-up sand-loads as they reach the top of the drum, do not drop such loads to the bottom of the drum until the loads are given an intervening treatment consisting of a slight axial conveyance and a spiral churning while partially in midair. This axial conveyance is apparently imparted chiefly by the screw-blades 12, and possibly also by spikes or projections 13. The spiral churning is apparently imparted chiefly by said spikes. It will be noted further than the tank is so designed as to permit the confining of a depth of washing fluid sufficient to keep the central structures 11 always partially submerged. At any rate, it is apparently the fact that blades 12 alone, whether

or not submerged in the washing fluid in the tank, and even when made of considerably greater diameter than that shown, fail utterly to give the results mentioned.

It will be understood that the ore, placer material or ground, in which it is known or supposed that gold or another valuable mineral is embedded, is fed into the drum by way of chute 17 and through opening 18 in end casting 14. This material is picked up by the baffles 17, after which, as just explained, the picked-up material is dropped onto the rotating structures 11. Thereupon, the screw-blade and spikes of each structure tend to force or convey the material toward the discharge end of the drum at the bell-mouth 20. If desired, the classifier may be set up so that the drum and structures 11 rotate about an axis suitably downwardly inclined toward said bell-mouth. As the result of such passage of the material through the drum, the material is broken up and disintegrated, thoroughly washed and scoured, and the particles of gold or other valuable mineral are released from the clay, gangue or the like originally carrying the same. Otherwise stated, the present structure separates the particles of gold or the like from their enclosing matrix, and furthermore insures such a thorough scouring that the precious components are always easily caught in the riffles or other devices provided. The particles of gold or the like pass through the foraminous wall 16 of the drum by gravity and accumulate in the tank; where same are subjected to further washing and scouring by the wave action set up in the washing fluid as the drum revolves. The scoured material, after having its gold or the like separated therefrom during its passage through the drum, passes out through the bell-mouth 20 at the discharge end of the drum onto a suitable platform or into a suitable receptacle. The peripheral speed of drum rotation, for best results, as now understood, should be something like 180 feet per minute; but this speed may vary rather considerably, depending on the ore or placer-ground being worked. Variously inclining the axis of rotation of the drum downward toward the discharge end of the drum, determines the length of time a given class of material will travel through the drum. It is recommended that a one inch elevation of the feed end of the drum, for each horizontal foot of drum length, constitute the general rule, subject to variations according to the nature of the material worked.

I claim:

1. In a mineral classifying apparatus, of the type including a washing fluid tank, a rotatable drum partially submerged in the fluid in the tank and having a foraminous side wall, and means inside the drum for treating the charged material during rotation of the drum by agitating such material and causing the same to travel lengthwise of the drum while being subjected to the action of such fluid, means for the purpose last mentioned including a rotatable structure within the drum and spaced from the side wall thereof and including a projecting helical blade, said rotatable structure also including a plurality of spaced projections.

2. The classifying apparatus defined in claim 1, wherein said spaced projections are of greater height than said blade.

3. The classifying apparatus defined in claim 1, wherein said spaced projections are of greater height than said blade, each such projection being in the nature of a spike spaced from said blade and spaced from its fellows spirally of the axis of rotation of the drum.

4. The classifying apparatus defined in claim 1, wherein said spaced projections are spike-like and arranged spirally of the axis of the drum and each obliquely inclined relative to such axis.

5. The classifying apparatus defined in claim 1, wherein there are provided a plurality of spaced ledges projecting inwardly from the interior of the side wall of the drum.

6. The classifying apparatus defined in claim 1, wherein said rotatable structure also includes a plurality of spaced ledges projecting inwardly from the interior of the side wall of the drum, said projections being spike-like and spaced spirally of the drum axis, and said projections being arranged in radial alternation with said ledges.

7. The classifying apparatus defined in claim 1, wherein said rotatable structure also includes a plurality of spaced ledges projecting inwardly from the interior of the side wall of the drum, said projections being spaced spirally of the drum axis, said projections being spike-like and of greater height than said blade.

8. In a mineral classifying apparatus, of the type including a washing fluid tank, a rotatable drum partially submerged in the fluid in the tank and having a foraminous side wall, and means inside the drum for treating the charged material during rotation of the drum by agitating such material and causing the same to travel lengthwise of the drum while being subjected to the action of such fluid, a drum structure including a plurality of spaced spiders, a plurality of end plates for the drum each cast integral with one of the spiders, said plates having central openings at points removed from said spiders axially of the drum, and a central tie-rod structure including a shaft and material-agitating means

carried by the shaft and also serving to space said castings a predetermined distance apart along the shaft.

9. The classifier apparatus defined in claim 8, wherein one of said plates is dished away from its spider and the central opening of that plate is several times the diameter of said shaft where the latter passes through the opening, whereby additional charges of material may be given the drum during rotation and classifying operation thereof relative to a previous charge.

CHARLES GEORGE BLUHM.