No. 676,969. Patented June 25, 1901.

A. H. STEBBINS.

ORE CONCENTRATOR.

(Application filed Apr. 25, 1900.)

(No Model.)

Fig. 1.

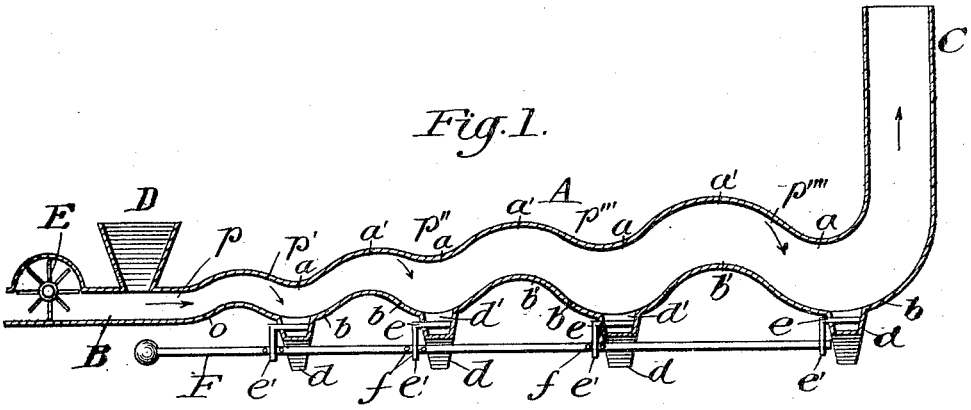


Fig 2

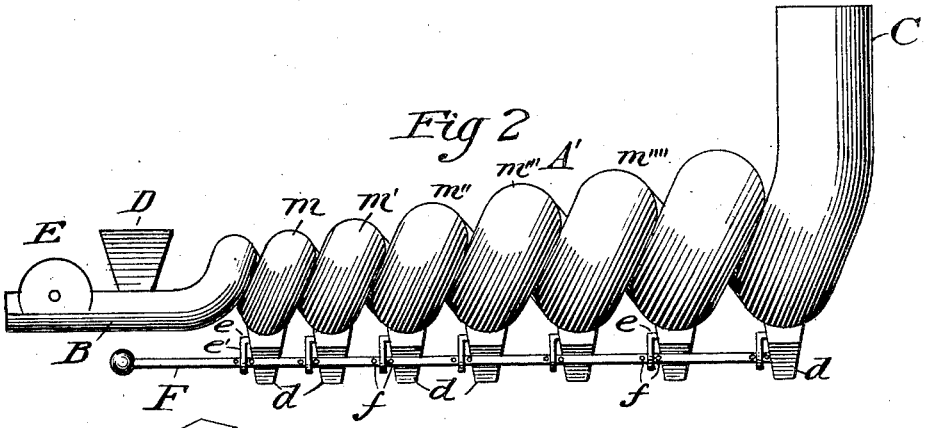


Fig. 4.

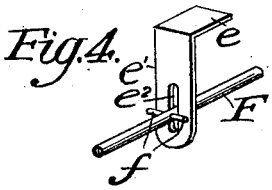
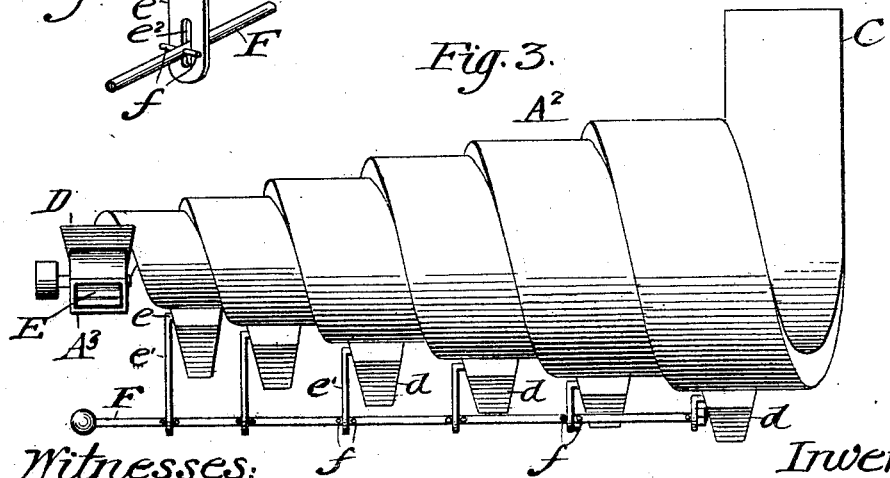


Fig. 3.



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UNITED STATES PATENT OFFICE.

ALBERT H. STEBBINS, OF LITTLE ROCK, ARKANSAS.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 676,969, dated June 25, 1901.

Application filed April 25, 1900. Serial No. 14,263. (No model.)

To all whom it may concern:

Be it known that I, ALBERT H. STEBBINS, a citizen of the United States, and a resident of Little Rock, in the county of Pulaski and State of Arkansas, have invented Improvements in Ore-Concentrators, of which the following is a specification.

The invention to be hereinafter described relates to ore-concentrators of that type wherein the finely-divided ore is carried by a moving body of air, water, or other fluid longitudinally through an extended pipe or incasement. It is a well-recognized fact that different minerals and often different forms and mixtures of the same mineral when finely divided have different specific gravities and also many different shapes, some values being almost perfect cubes, some nearly round, others quite flat. In fact, they occur in a great variety of shapes. In gold ores, for instance, the particles vary in shape and size between very wide limits—from those so small as not to be readily detected by the naked eye to those of considerable bulk—and all such variations in specific gravity and size of the particles of ore largely control the practical and successful handling of the material.

It is the object of my present invention to provide a successive or gradational concentrator that will be readily applicable to the successful treatment of all such ores and which will separate the concentrates according to their relative specific gravity and size; and with this object in view my invention consists of the parts and combinations as will be hereinafter fully described, and definitely pointed out in the claims.

In the drawings, Figure 1 is a sectional view of a successive or gradational concentrator embodying my invention. Fig. 2 is a side view of a slightly-modified form. Fig. 3 is a side view of another modification. Fig. 4 is a detail view of one form of connection between the dumping-doors and operating-handle.

The concentrator as disclosed by Fig. 1 consists of a long casing A of constantly-increasing cross-sectional area from the inlet B to the outlet C, which is of general serpentine form, whereby a number of elevations and depressions are provided throughout the length of the casing. Preferably in the lowest portion of each of the depressions *b* in the lower wall there is provided a discharge-chute *d*, normally closed air-tight by the dumping-door *e*, placed in said chute, preferably of the same shape or contour as and a short distance below the lower wall *b* of the casing, to thereby provide a pocket *d'*, into which the concentrates may fall and by which they may be retained ready to be discharged through the chute *d* when the dumping-door is opened, as will hereinafter appear.

Connected to each dumping-door *e* is a projection *e'*, by which said door may be operated to open and close the passage into the chute, and each dumping-door is preferably connected to an operating-handle F, by which all the dumping-doors may be opened and closed simultaneously. In order that the dumping-doors may be separately as well as conjointly operated, I provide any usual form of detachable connection between the handle F and the projection *e'*—as, for instance, the projection *e'* has an elongated slot e^2 formed therein, through which the handle F passes, said handle being provided on opposite sides of the projection *e'* with stop-pins *f f*, which normally are out of register with the slot e^2, but which when the handle is turned part way on its axis will register with said slot e^2 and permit the dumping-doors to be slid independently of the handle and of each other, as will be obvious.

At the inlet end B of the casing I may provide any usual or suitable means for forcing air, water, or other fluid through the concentrator, either mixed with the finely-divided ore, or, as shown in the present embodiment of my invention, the inlet end of the concentrator may be provided with a hopper D, by which the finely-divided ore may be fed in front of a driving device, as the wheel E, by which air, water, or other fluid may be forced through the concentrator to and out of the enlarged exit C, as indicated by arrows.

It will be noticed that the upper wall of the casing A corresponds in general contour to that of the lower wall—that is, it has elevations and depressions—and, referring to the inner surface of the upper wall, the elevations *a* of the upper wall are disposed opposite the depressions *b* of the lower wall and the depres-

sions a' of the upper wall are disposed opposite the elevations of the lower wall. The effect of this disposition of parts is that as the mixture or other fluid and the finely-divided ore are forcibly urged longitudinally of the casing A the particles of ore will tend to travel in a straight line, as indicated by the arrow p, but meeting the first rise or elevatien at o in the lower wall of the casing they will be directed upward, and in their further onward movement through the casing will meet the curved upper wall and be by it directed in the direction of the arrow p'. The casing at this point being gradually increased in cross-sectional area from the inlet end, the force of the air or fluid will be less energetic in its effect on the heavier particles of ore, which, being deflected in the direction of arrow p' toward the first chute d, will come to rest in the first depression of the casing below the arrow p'. The lighter particles will continue with the diminished current of air or other fluid and will be directed by the curved wall of the first depression in the lower wall toward the down-curve in the upper wall above the second depression in the lower wall and will be deflected by the said down-curve in the upper wall in the direction of arrow p''. The heaviest particles of those remaining being thus driven toward the second discharge-chute d, and the current of air, water, or other fluid being further diminished in force by the increased cross-sectional area of the said casing, said particles will come to rest in the second depression of the lower wall of the casing below arrow p''. The action of the remaining portions of the concentrator at the points p''' and p'''' continue to act on the particles of ore, as pointed out above, until at the last discharge-chute, by reason of the increased cross-sectional area of the casing and the deflecting action of the walls thereof, the lightest particles of ore will come to rest above the dumping-door ready to be dropped into the chute.

In the form shown by Fig. 2 I have disclosed a concentrator constructed as a spiral, the casing of which is of increasing cross-sectional area from the inlet B to the outlet C and has a series of elevations and depressions in the form of spirals, and preferably each spiral m, m', m'', &c., is provided with a discharge-chute d, having a dumping-door, as explained above. The only essential distinction of this form of device over that of Fig. 1 is that the concentrator is formed of a casing or pipe disposed as a spiral, the constantly-changing direction of the air, water, or other carrying fluid and the gradual increasing cross-sectional area of the casing causing the particles of ore to settle and rest in the depressions in the lower wall of each spiral over the dumping-door, substantially as set forth with respect to the construction of Fig. 1.

In the modification of the concentrator as shown by Fig. 3 the casing is formed as a spiral A^2, the cross-section of which is preferably rectangular, as at A^3, and increases progressively from the inlet to the outlet end thereof. To the depressions formed by the lower turn of the spiral the chutes d, in all essentials the same as those already described, are connected, having the dumping-doors e operated conjointly by the handle F, as set forth. By this construction of concentrator it will be noticed that I am enabled to separate the particles of ore from their mixture of impurities according to the size of said particles and specific gravity of the ores being treated, so that the different depressions in the casing above the dumping-doors of the chutes will contain the valuable particles of ore arranged according to their size and specific gravities progressively from the first to the last depression, the heaviest particles being found in the depression nearest the inlet, while the lightest will be found in the last depression, nearest the outlet. This gradational separation is of great importance, as the subsequent reclaiming of the values can be regulated to suit the particular size and character of the particles as they are delivered each from its chute, as will be readily understood.

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

1. An ore-concentrator comprising an undulating casing provided with an inlet and outlet and having a gradually-increasing cross-sectional area from the inlet to the outlet, the upper and lower walls of the undulating casing being correspondingly curved to form oppositely-curved elevations and depressions, in the latter of which, formed in the lower wall, the concentrates may settle, so that a blast of air striking the down bend or curve in the upper wall of the said casing the said blast will be deflected to strike the concentrates in the lower part of the curve in the lower wall of the casing to effectually clean the concentrates collected therein and to separate the lighter from the heavier concentrates.

2. An ore-concentrator comprising an undulating casing provided with an inlet and an open outlet and having a gradually-increasing cross-sectional area from the inlet to the outlet, the upper and lower walls of the undulating casing being correspondingly curved to form oppositely-curved elevations and depressions in the latter of which, formed in the lower wall, the concentrates may settle, so that a blast of air striking the down bend or curve in the upper wall of the casing the said blast will be deflected to strike the concentrates in the lower part of the curve in the lower wall of the casing to effectually clean the concentrates collected therein and to separate the lighter from the heavier concentrates, discharge-chutes in said depressions and doors arranged one in each chute.

3. An ore-concentrator comprising an un-

dulating casing provided with an inlet and an open outlet and having a gradually-increasing cross-sectional area from the inlet to the outlet, the upper and lower walls of the undulating casing being correspondingly curved to form oppositely-curved elevations and depressions in the latter of which formed in the lower wall the concentrates may settle, so that a blast of air striking the down bend or curve in the upper wall of the casing the said blast will be deflected to strike the concentrates in the lower part of the curve in the lower wall of the casing to effectually clean the concentrates collected therein and to separate the lighter from the heavier concentrates, a series of separate discharge-chutes, a dumping-door for each chute, and means for simultaneously operating said doors.

4. An ore-concentrator comprising an undulating casing provided with an inlet and an open outlet and having a gradually-increasing cross-sectional area from the inlet to the outlet, the upper and lower walls of the undulating casing being correspondingly curved to form oppositely-curved elevations and depressions in the latter of which formed in the lower wall the concentrates may settle, so that a blast of air striking the down bend or curve in the upper wall of the casing the said blast will be deflected to strike the concentrates in the lower part of the curve in the lower wall of the casing to effectually clean the concentrates collected therein and to separate the lighter from the heavier concentrates, a series of separate discharge-chutes, one for each depression, a dumping-door for each chute, and means for simultaneously or independently operating said doors.

5. In an ore-concentrator the combination of an undulating casing having an inlet at one end and an open outlet at the other end and being of gradually-increasing cross-sectional area from one end to the other, the upper and lower walls of the undulating casing being curved to form oppositely-curved elevations and depressions, the latter in the lower wall being adapted to collect the concentrates, so that a blast of air striking the down-curve in the upper wall of the casing will be deflected directly upon and strike the concentrates in the lower part of the curve in the lower wall of the casing to effectually clean the concentrates collected therein and separate the lighter from the heavier concentrates and air-tight doors arranged one in each chute to prevent back pressure.

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