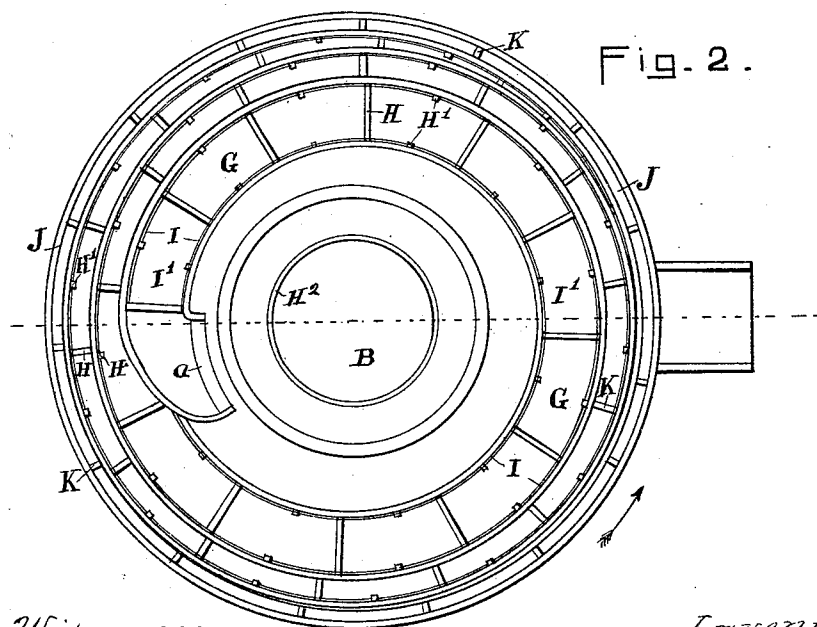
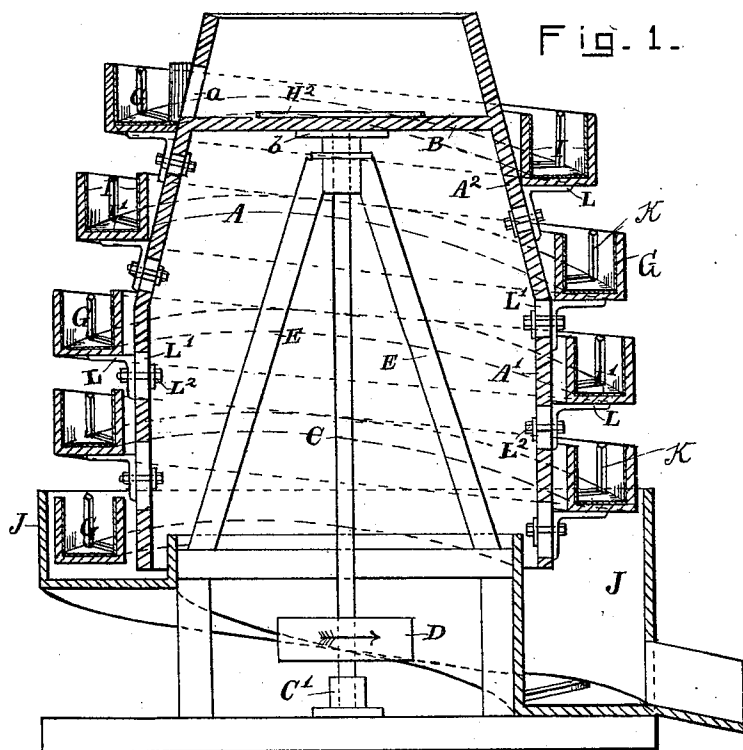


(No Model.)

C. A. HOLMES.
CONCENTRATOR.

No. 579,679.

Patented Mar. 30, 1897.



Witnesses.
O. P. Anderson
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UNITED STATES PATENT OFFICE.

CLARENCE A. HOLMES, OF SEATTLE, WASHINGTON.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 579,679, dated March 30, 1897.

Application filed June 9, 1896. Serial No. 594,865. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE A. HOLMES, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Concentrators; 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 concentrating devices or machines designed to separate the heavier particles in a pulverized mass from the lighter particles. It is more particularly designed to operate upon placer-deposits, separating the gold from the sand and gravel, but it may be used upon any material in which the conditions are at all similar.

In the drawings, Figure 1 is a central vertical section of my device, and Fig. 2 a top plan view of the same.

My device consists, essentially, of a revolving vertical cylinder having a spiral flume constructed about it on a descending grade and having amalgamating-plates and riffles on the bottom and sides, together with such other devices as may be necessary to operate it.

The cylinder A, which forms a framework upon which the other parts are placed, is shown in the drawings as composed of a strictly cylindrical portion A' and a frustum of a cone A², joined to the cylinder at its upper end. Instead of the upper portion being conical, as shown, it might be a continuation of the cylinder without departing materially from the spirit of my invention. Also the conical portion might extend to the bottom, leaving no truly cylindrical portion. I will herein, however, refer to it generally as the "cylinder," meaning thereby either form. This cylinder A is made open at the bottom and with a floor or head B across it a little below the top. This forms a hopper or receptacle for the material to be operated upon. A flanged collar b is fixed centrally to the under side of the floor B and also to the upper end of the vertical shaft C. This shaft turns

in a bearing fixed to the upper ends of the braces E E and in the step-bearing C' at its lower end. A pulley D or any other suitable means is provided by which the shaft and the cylinder A may be rotated. A section at a of one side of the cylinder above the floor B is removed to the level of the floor. Starting from this point is the spiral flume G. This is attached to the outside of the cylinder, winding about it on a descending grade. It is shown as of a rectangular cross-section, but may be made of a curved or any other cross-section desired. Upon the bottom and sides of this spiral flume are placed amalgamating-plates I' and I. A series of riffles or raised cross-strips H H' are placed across the bottom and side surfaces of the flume. Surrounding the lower end of the cylinder A and the spiral flume G is the waste-flume J. The upper edge of the outer side of this flume is level and slightly above the lower end of the spiral flume G. The bottom slopes at a regular angle from the point opposite the discharge each way to the discharge. The inner edge is somewhat lower than the outer. Riffles K are placed across this flume as well as amalgamating-plates in the bottom. One or more riffles H² are placed upon the floor B. This assists in retaining the coarse gold on this floor and prevents its getting upon the plates of the flume G.

The cylinder A is rotated by a belt connection from the pulley D or any other suitable means to some motor, which will give it the required speed of revolution. This would be for a four-foot cylinder between twenty and thirty revolutions per minute. The material to be washed or concentrated is deposited within the hopper formed by that portion of the cylinder or cone above the floor B. This may be done by hand or by the action of a stream of water. In any event a sufficient volume of water with which to work the material is supplied. The centrifugal force due to the rotation of the cylinder, together with the force of gravity, causes the water to flow out at the opening a into the upper end of the spiral flume G, carrying with it the material

being washed. It passes down in this flume and around the cylinder until it is discharged from the lower end into the waste-flume J.

The direction of rotation of the cylinder A and the spiral frame G is against the flow of water—that is, the water is carried one way by the slope of the flume and the flume is moved in the other way by the rotation of the cylinder. By nicely balancing these forces the forward flow of any portion of the water may be made exactly equal to the backward motion of the flume. In order that this adjustment may be readily made, the flume is supported on movable brackets L, which are secured to the cylinder by bolts L', passing through slots L' in the cylinder-walls. These are movable vertically, by which means the grade of the flume may be varied within certain limits. The riffles in the flume create numerous eddies, which keep the water and sand agitated, so that there will be no settling or banking up of the mineral matter carried by the water. This would occur, however, in spite of the riffles if the direction of rotation was the same as the flow of water. As mentioned above, the influence of the grade and the rotation upon the water and its suspended or transported matter may be balanced. In this case centrifugal action comes in to affect only such portions of the mass as are carried back by reason of friction with the flume-surfaces, and consequently have a motion of rotation relative to a fixed point. The friction which causes this backward motion would be greatest on those particles lying next to the flume-surfaces, and hence would be greatest on the heavier particles of the mineral mass, as they would naturally be near the bottom.

The grade of the inner edge of the flume being greater than at any other point by reason of its spiral character, giving hence a greater velocity to the water, and the speed of backward motion being less at the same point because the circumference is less, resulting in less retardation by reason of friction, all results in giving the swiftest flow on the inner edge of the flume. This of course is true only when there is a proper adjustment of the speed to the grade of the flume.

That portion of the water and suspended material which by reason of friction is carried backward with the flume is affected more or less by centrifugal force and is carried outward toward the outer edge. This results in a peculiar combination of currents. There is, first, the forward flow down the flume induced by the grade, which current is broken into numerous eddies by the riffles. There is, secondly, a radially outward current next to the bottom of the flume caused by the centrifugal force resulting from the friction of the water on the flume, and a radially inward current upon the surface induced by the outward flow of the lower portion. The heavier

portions are sure of contact with the bottom or outer side plates, and the lighter particles, which would float, with the inner plates. Upon one or the other every particle of gold is sure to be caught. It will thus be seen that an essential point in the successful operation of my device is the rotation of the flume against the flow of the current. Were the rotation in the opposite direction the forces which are balanced against each other in my device would be working together, with the result that the water and sand would be crowded to the outer portion of the flume and the sand would bank up and pack solidly in the angle and behind the riffles. As it is operated, however, this never occurs. The constant stirring which the water gets keeps the mineral matter suspended. The coarse gold will be found on the floor B.

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

1. In a concentrating device, the combination of a spiral flume having a downward incline from end to end, and means for rotating it about its central axis in a direction opposite the flow of water therein, and means in said flume for arresting and holding the metallic particles, substantially as shown and described.

2. In a concentrating device, the combination of a spiral flume having a downward incline from end to end, and means for rotating it about its central axis opposite the flow of water therein, and riffles upon the bottom and sides of said flume, substantially as shown and described.

3. In a concentrating device, the combination of a vertical cylinder arranged to revolve about its axis, with a spiral flume attached to the outside of said cylinder and having a downward incline from end to end, means for revolving the same in a direction opposite the flow of water in the flume and riffles and amalgamating-plates on the sides and bottom of said flume, substantially as shown and described.

4. In a concentrating device the combination of a vertical cylinder having a hopper or box formed in its upper end, and a side discharge-opening therefrom, with a flume connected with said discharge-opening and extending spirally about said cylinder, riffles and amalgamating-plates on the sides and bottom of said flume, and means for rotating said cylinder opposite the flow of water in the flume, substantially as shown and described.

5. In a concentrating device, the combination of a spiral flume having an incline from one end to the other, means for adjusting the amount of this incline, and means for rotating said flume in a direction opposite the flow of water therein, and means for arresting and holding the metal particles therein, substantially as shown and described.

6. In a concentrating device the combination with a vertical cylinder having a head or partition near the upper end and a side discharge-opening just above the partition, a
5 vertical shaft fixed centrally to the under side of the partition and means for supporting and revolving the same, of a flume surrounding the cylinder or cone, on a descending spiral and having its upper end connected

to the side discharge-opening in the upper 10 end of the cylinder, substantially as shown and described.

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

CLARENCE A. HOLMES.

Witnesses:

H. L. REYNOLDS,

C. A. MCKENZIE.