No. 852,558. PATENTED MAY 7, 1907.

C. T. HEISEL.

CENTRIFUGAL CONCENTRATOR.

APPLICATION FILED SEPT. 13, 1904.

Fig. 1.

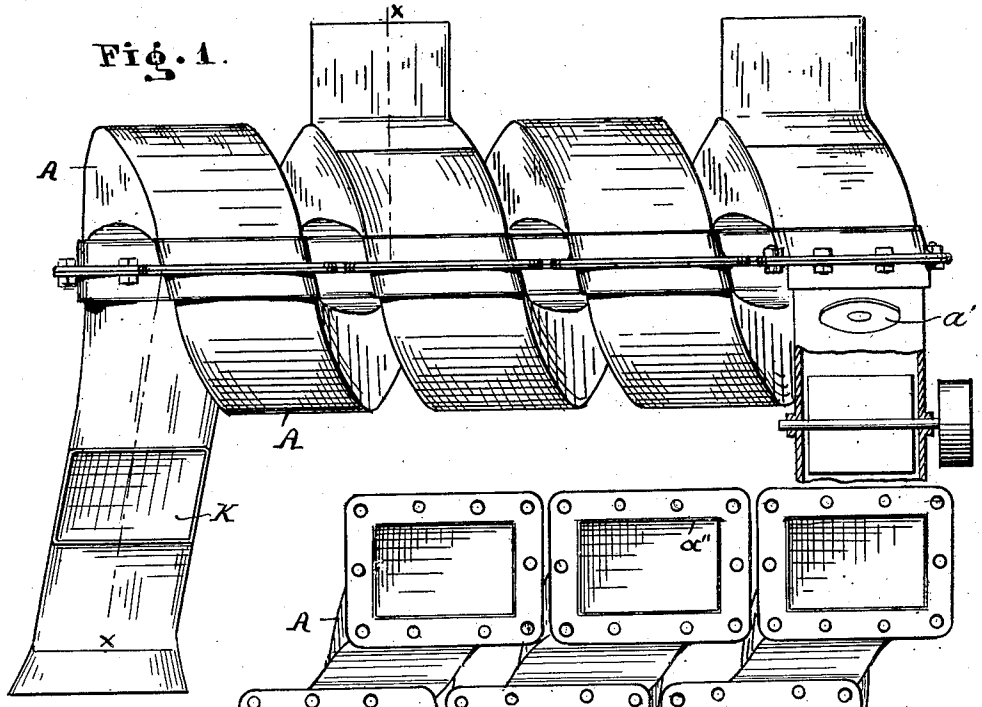


Fig. 2

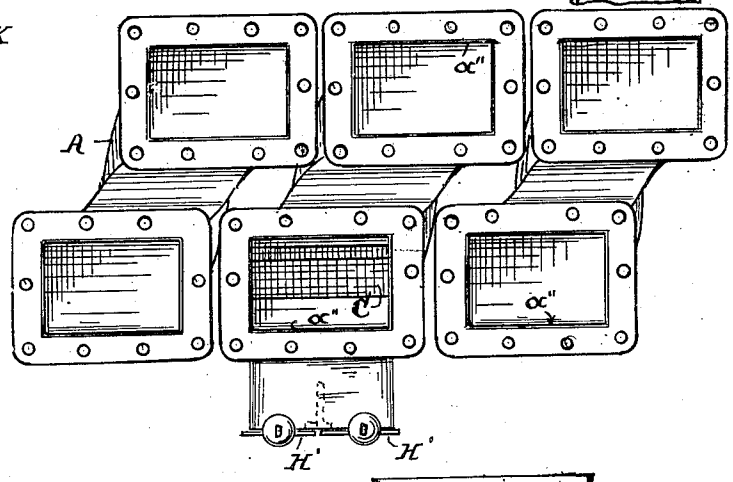
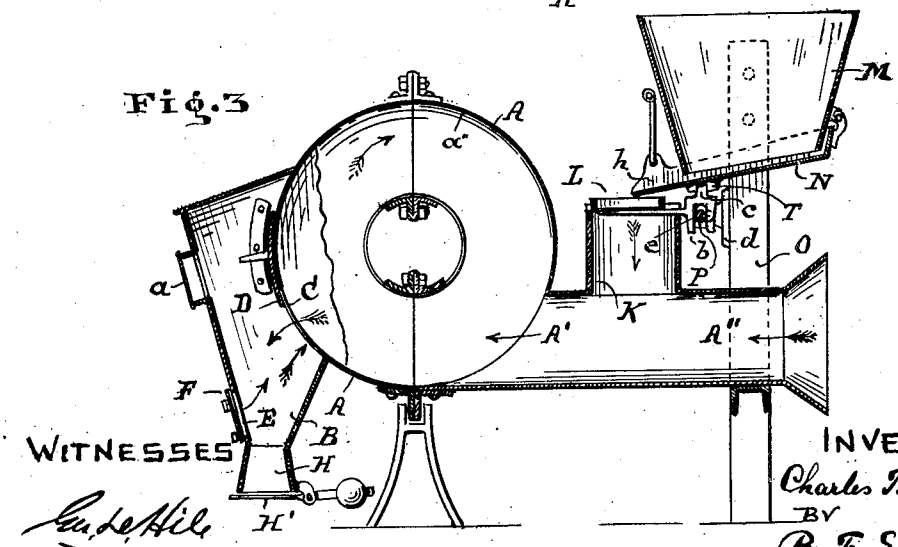


Fig. 3



WITNESSES

Geo. LeHill

M. S. Parr.

INVENTOR

Charles T. Heisel

BY

B. F. Eibler Atty

UNITED STATES PATENT OFFICE.

CHARLES T. HEISEL, OF CLEVELAND, OHIO.

CENTRIFUGAL CONCENTRATOR.

No. 852,558. Specification of Letters Patent. Patented May 7, 1907.

Application filed September 13, 1904. Serial No. 224,288.

To all whom it may concern:

Be it known that I, CHARLES T. HEISEL, a citizen of the United States, residing in the city of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Centrifugal Concentrators, of which the following is a specification, a separate application for a combined ore separator and amalgamator having been filed under Serial Number 224,289, September 13, 1904, and one for the mode or process of extracting gold from its ore under Serial Number 224,287, on September 13, 1904.

My invention relates to improvements in concentrators, and the object of my invention is to provide an apparatus wherein various kinds of finely pulverized materials of different gravity can be separated or concentrated in a dry state or condition by the use of air, or in a moist state or condition by the use of water or other fluid, and also for classifying finely pulverized material of the same gravity, by separating them as to their different grades of fineness or coarseness, by feeding the finely pulverized material into the apparatus no faster than will allow the propelling medium to keep the material in constant suspension from start to finish. I attain this object in an apparatus constructed and arranged substantially as shown in the accompanying drawing in which

Figure 1 represents a plan view of said concentrator. Fig. 2 is a partial vertical sectional view thereof, and Fig. 3 is a vertical sectional view on line X X.

Like letters of reference denote like parts in the drawing and specification.

Substantially this apparatus consists of a helical or evolute shaped conduit, which is preferably built up in sections, a feeding device and means effecting an air draft or fluid current through said conduit, side compartments for receiving and discharging the concentrates, and means for regulating a side draft or current through said compartments, to act as a screen or a resistance which overcomes the centrifugal force of the lighter material.

The volume of air, or other medium which travels in a helical path along and through said conduit serves as a propelling medium for moving the pulverized material upon being fed into said conduit. Depending upon the force of the air or other draft, more or less centrifugal force will be imparted to the material undergoing concentration, (respectively separation,) according to their specific gravity.

The conduit through which the material is drawn may comprise more or less sections or windings, depending upon the nature of the material to be separated or concentrated, in each of the windings so much of a separation of the light from the heavy is effected, finally the lightest is drawn off through the last winding as tailings or waste material.

This improved concentrator is adapted for concentrating different kinds of materials, but is more particularly intended for concentrating gold bearing ore and placer dirt which is subsequently treated in a combined separator and amalgamator for which I make separate application for Letters Patent.

As above stated, the helical or evolute conduit is preferably built up in sections to facilitate transportation thereof into or in mountainous countries or regions, and making repairs, etc.

As shown two sections A A complete just one winding and any number of such windings may be assembled into one conduit.

Flanged and bolted connections are preferred for the sections, which are preferably built up of sheet metal; the terminals thereof are bound in flanged fittings which are bolted face to face (preferably in vertical direction). With material thus prepared, a conduit of any desirable length can thus be readily built up and also taken apart from or at any point thereof. Along the conduit side pockets or side compartments are attached to any number of the circular sections which communicate with them by way of openings C, a cover or slide D is provided for each of said openings for the purpose of regulating the extent of said openings, said slides can conveniently be reached for adjustment upon removal of the hand hole plate *a*.

Near the bottom and preferably in the outer wall of said side compartments are openings E which are likewise under control of a cover or slide F, explanation concerning the purpose of said openings will be hereafter made.

A removable hand hole plate *a'* is provided upon the circular part of some of the sections for observation and other purposes.

The intake A' is practically a horizontal extension of the first section of the conduit, at A'' air or a fluid is drawn in, suction being

caused by some suitable exhausting medium placed in communication with the terminal of the conduit. The suction force may vary according to the nature of the material that is subjected to concentration.

At suitable distance from out of the first section intersects a vertical branch K with the conduit part A′, by way of said branch the material to be concentrated is fed in controllable quantities. Over the mouth of said branch K is placed a sieve L and above said sieve is posited a hopper M with a bottom agitator N. The said agitator N may be drawn more or less close unto the hopper M for the purpose of governing the quantity to be fed; while the sieve is provided to distribute such quantities in a uniformly divided state into the conduit. Motion may be imparted to the sieve and agitator in any suitable manner. As shown there is attached to the sieve a yoke *b* with an upwardly extending pin *c*, and journaled in bearing *d* of the hopper stands O is a crank or cam shaft P, which imparts a reciprocating motion to the sieve and vibratory motion to the loosely suspended agitator. The reciprocating motion of the sieve is caused by the crank or cam pin *e* striking one or the other side of the yoke, while the vibratory motion of the agitator is effected owing to the engagement of pin *c* into an obliquely extending groove, which is formed by parallel depending lugs T of the bottom of the agitator. The vibratory motion of the agitator delivers the material to the spout *h* from where it drops onto the sieve and subsequently into the conduit. The moment the pulverized material reaches the conduit, motion is imparted thereto by the draft or current effected within said conduit.

Depending upon the force of the draft or current or the nature of the material, the latter is whirled with more or less rapidity along the outer circularly winding walls of the conduit inducing or developing centrifugal force. Centrifugal force throws the material outwardly, thus the heavier particles are always nearest the outer walls and escape first in passing or reaching the openings C to be collected in the compartments B from where it discharges automatically from out of the channels H H by way of the counterbalanced bottoms or gates H′ H′, which in consequence of the suction are held closed until the weight of the accumulation overcomes the suction, when they automatically discharge and are immediately closed again by virtue of said suction and counterbalances. Other suitable means however may be employed to accomplish such results.

Naturally through that opening which is nearest the intake, the heaviest material will escape, while through the succeeding openings, lighter materials will pass out. Obviously the conduit with side openings can be extended to such a length that finally the entire contents of the conduit will pass out into the side pockets or the tailings may be discharged into the open air or some dumping pit.

By way of the openings E side drafts or currents can be effected; in this way the discharge of the concentrate can be regulated and separately so within each and every one of these side pockets or compartments. If, for instance, air enters the pocket nearest the intake, then only the very heaviest material will enter said pocket, or in other words, the collection therein is diminished and such are the conditions with each and every one of the side pockets, the concentration of material within each of the pockets can thus be regulated in a very simple, sensitive and automatic manner. This side draft or current can be regulated so delicately, that every stage from very little to nearly all of the material treated may be allowed to pass through the openings C, as this side draft or current acts as a screen or resistance through which the heavier particles will pass in consequence of the centrifugal force they have acquired in whirling around and through the helical or evolute shaped conduit.

While in the drawings the cross sections of the conduit are shown to be of rectangular form, there may be departures made from such form, for in regard to shape, the outer wall *a″* only is of importance, and the contour of said wall should be straight or approximately flat as shown. The entire conduit may be supported upon a suitable foundation or standards (not shown).

What I claim and desire to secure by Letters Patent is:

1. In a concentrator the combination of a helical conduit, a feeder therefor, suitable means forming compartments at the side of the conduit having openings leading from the outer air into the conduit, means to vary the size of conduit openings, means to regulate the size of the outer air openings, means near the terminal of the conduit to induce an air current therethrough, and also through the side compartments into the conduit through the outer air openings and the conduit openings for the purpose of regulating the discharge of the material into said side compartments, as shown and set forth.

2. A concentrator for pulverized ore, comprising a helical conduit, a suitable feeding device, means near the terminal of the conduit to induce an air current therethrough, suitable means forming compartments at the side of the conduit having openings leading from the outer air into the conduit, means to vary the size of the conduit openings, means to regulate the outer air openings, and suction-closed balanced gates at the bottom of the compartments whereby the concentrate

is automatically discharged, all constructed and arranged substantially as and for the purpose set forth.

3. In a concentrator for pulverized materials the combination of a helical conduit, a power agitated feed hopper and sieve at one end thereof, means at the opposite end to induce an air current therethrough, suitable means forming compartments at the side of the conduit having suction closed balanced gates at the bottom thereof, and having openings leading from the outer air into the conduit, means to vary the size of the conduit openings, means to regulate the outer air openings whereby a graduated classification of the material is effected in and along said compartments as and for the purpose set forth.

4. In a concentrator for pulverized materials, the combination with its helically winding conduit and suitable means forming side compartments therewith of means at or near the end of the conduit for inducing an air draft therethrough and means to vary the size of the openings in said compartments leading from the outer air and into the said conduit for regulating the discharge of the heavier material into said compartments.

5. In a concentrator for pulverized materials the combination with a helically winding conduit of suitable means forming compartments along one side of said conduit, said compartments having controllable openings leading from the outer air and controllable openings leading into the conduit and means inducing an air draft through said conduit and the said compartments for the purpose as set forth.

CHARLES T. HEISEL.

Witnesses:
GEO. D. HILE,
B. F. EIBLER.