

No. 858,456.

PATENTED JULY 2, 1907.

C. T. HEISEL.  
COMBINED ORE SEPARATOR AND AMALGAMATOR.

APPLICATION FILED SEPT. 13, 1904.

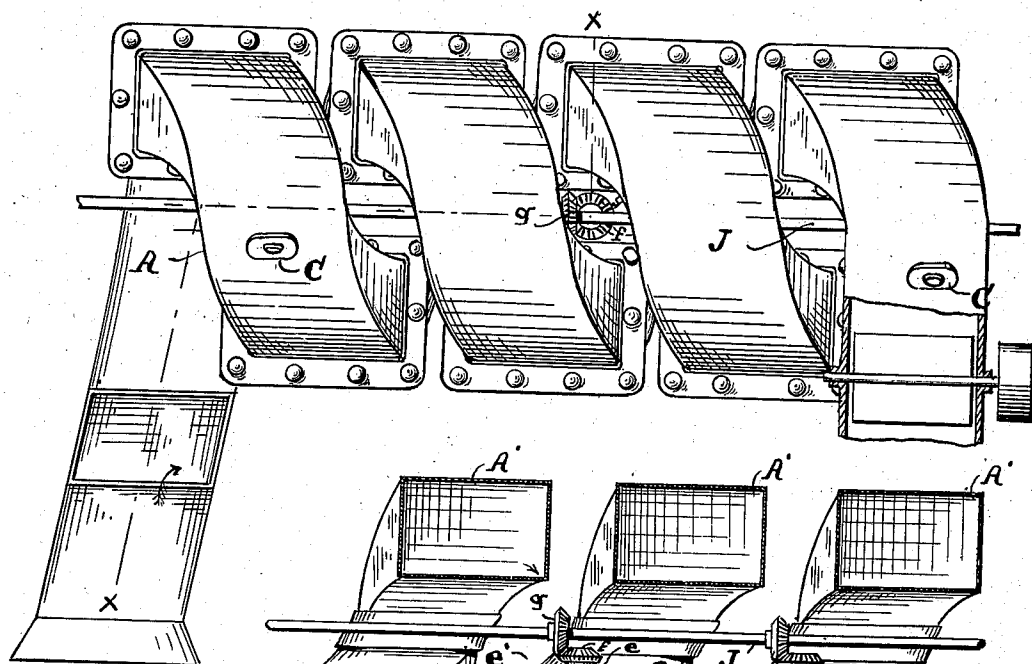


Fig. 1

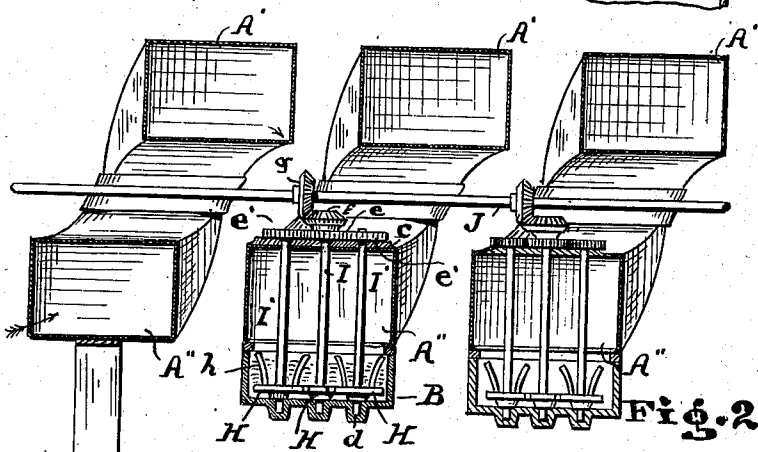


Fig. 2

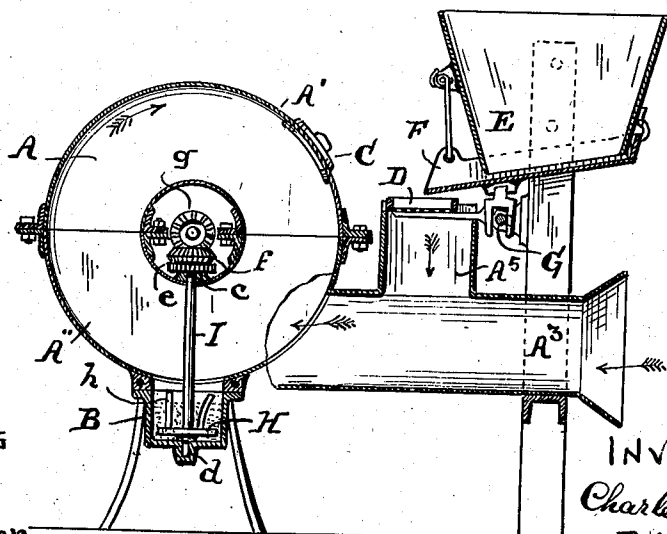


Fig. 3

WITNESSES

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# UNITED STATES PATENT OFFICE.

CHARLES T. HEISEL, OF CLEVELAND, OHIO.

## COMBINED ORE SEPARATOR AND AMALGAMATOR.

No. 858,456.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed September 13, 1904. Serial No. 224,289.

*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 a Combined Ore Separator and Amalgamator, of which the following is a specification, a separate application for a centrifugal concentrator having been filed September 13, 1904, Serial No. 224,288, and one for the process or mode of extracting gold from its ore on September 13, 1904, Serial No. 224,287.

My invention relates to improvements in gold separating and amalgamating apparatus in which precious metals are freed from gangue and amalgamated with mercury, either in a dry state by the use of air or in a moist state or condition through the medium of water or other fluid.

The object of my improvement is to combine with an ore separator, an amalgamator wherein precious metals are gradually separated from gangue and simultaneously amalgamated with mercury. I attain this object in an apparatus which is constructed and equipped substantially as shown in the accompanying drawings, in which

Figure 1 is a plan view of said concentrator and amalgamator combined. Fig. 2 is a partial vertical sectional view thereof and Fig. 3 represents a cross sectional view of same on line x x.

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

Substantially my improvement comprises a separator and amalgamator combined, in and through the helical or evolute shaped conduit of which, a draft or current is produced for the purpose of separating the precious metals which are amalgamated as they become separated from the gangue; the amalgamators being located adjacent to the helical path which is established by said conduit. The draft or current may be increased or diminished according to the nature of the finely pulverized materials to be treated, or the coarseness or fineness of the gold or precious metal to be separated. The draft or current in carrying the material along the approximately circular or helical path will produce or impart centrifugal force thereto, and consequently the heaviest material will crowd closest to the outer wall of the conduit to leave its helical path when or wherever opportunity is afforded for doing so. In providing compartments along the bottom or lower part of the conduit the heavier material (precious metal) will collect in said successive compartments and it can be readily amalgamated therein with mercury with which these compartments are charged, agitators being also provided therein to settle or precipitate the gold to promote or facilitate amalgamation.

In the drawings A represents the helical conduit, which is preferably built up in sections A' A'', to the lowest part of the lower sections A'' are attached the

vessels B in any approved manner. Each section is so formed that two of them complete one winding and there may be as many windings as found necessary in order to make the separation complete of the precious metal from gangue. The cross section of the conduit may be made in rectangular form as shown in Fig. 2 or any suitable shape, so long as the circumferential wall is flat or approximately so.

Flanged and bolt-connections are preferred for the sections, which are preferably constructed of sheet metal; the terminals there of are bound in flanged fittings which are bolted face to face (preferably in horizontal direction). With sections thus prepared a conduit of any desirable length can be readily built up and also taken apart from or at any point thereof, such features being especially desirable in order to facilitate transportation of such structures into and in mountainous countries or regions, and for making repairs etc.

A removable hand hole plate C is provided upon the upper sections for observation or other purposes.

The intake A<sup>3</sup> is practically a horizontal extension of the first section of the conduit, and it is at this part that the air or fluid is taken in, to be passed through the entire conduit with more or less rapidity, depending upon the amount and nature of the material undergoing treatment, (respectively separation and amalgamation) under the influence of centrifugal force or action. At the opposite terminal of the conduit may be applied an exhausting medium or a means which causes a draft or current to traverse the conduit with sufficient force capable of holding and conveying the material therein in a state of constant suspension, or practically nearly so, as far as the heavier material is concerned. The pulverized material is first introduced by way of the branch A<sup>5</sup>; over the mouth of said branch is placed a sieve D and directly above the sieve there is situated a hopper E with a loose bottom member F, which may be drawn more or less close unto said hopper for the purpose of controlling the quantity to be fed, whereas by means of the sieve the material is agitated and delivered into the conduit in a more or less finely divided state.

Motion may be imparted to the hopper-bottom and sieve in any suitable manner. As shown, there is a cam-shaft G applied, which agitates the sieve and the latter agitates the hopper.

As shown, the vessels B extend across the entire width of the windings of the conduit, and there is placed a series of agitators H within each of said vessels or compartments which stir the concentrate and settle or precipitate the collected particles of gold and facilitate their amalgamation with the mercury. These agitators are secured to the shafts I I' I' which extend into the vessel and also through the conduit (suitable bearings c d being provided for.)

The central shaft I is provided with a spur gear e and

bevel gear *f*, the latter meshes into a bevel gear *g* of the main driving shaft *J*, and spur gears *e' e'* mesh into the gear *e*; in this manner the agitators are driven simultaneously in all the vessels it being presupposed that the main shaft is equipped with as many driving bevel gears *g* as there are amalgamators. Each of the agitators *H* is provided with forwardly projecting (inclined) prongs *h* which extend to the top of the vessel and agitate the concentrates in the vessels. The main shaft is journaled in suitable bearings which may be placed intermediate and outside the conduit.

The pulverized material upon leaving the sieve reaches the conduit and is drawn along same by the force of the draft or current prevailing therein. The force of the draft or current and the nature of the material determine the speed under which the material is whirled along the conduit and in doing so more or less centrifugal force is imparted thereto and the heaviest material, (precious metal) will drop, quickest into the vessel *B* to be amalgamated as they collect therein.

In the apparatus as above described, it depends simply upon the length or number of windings of the conduit and the number of amalgamators connected therewith, in order to effect an absolute separation and amalgamation of the precious metals from gangue, so that nothing but the tailings will be exhausted from said conduit. From time to time, the vessels *B*

are removed, emptied, recharged with mercury and replaced under said windings, thus practically speaking the operation of this ore separator and amalgamator is continuous and also efficient in the highest degree. Obviously the bulk of amalgamation is done in the vessels nearest the intake for this reason; said vessels may diminish in depth from the intake towards the discharge end of the conduit. Furthermore, this separator may be used for concentrating or separating, material independent of amalgamation.

The entire conduit may be mounted upon a suitable frame work or standards, which also furnish support for bearings of the main shaft, hopper etc.

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

In an ore separator and amalgamator, the combination with the helical conduit thereof, of a hopper and sieve feeding device arranged at or near the entrance of said conduit, means producing an air current through said conduit said means being located at or near the exit of said conduit to convey material through said conduit, vessels containing mercury, said vessels being attached at bottom openings of said conduit and agitators in said vessels provided for the purpose of precipitating the precious metals in said vessels.

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Witnesses:

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