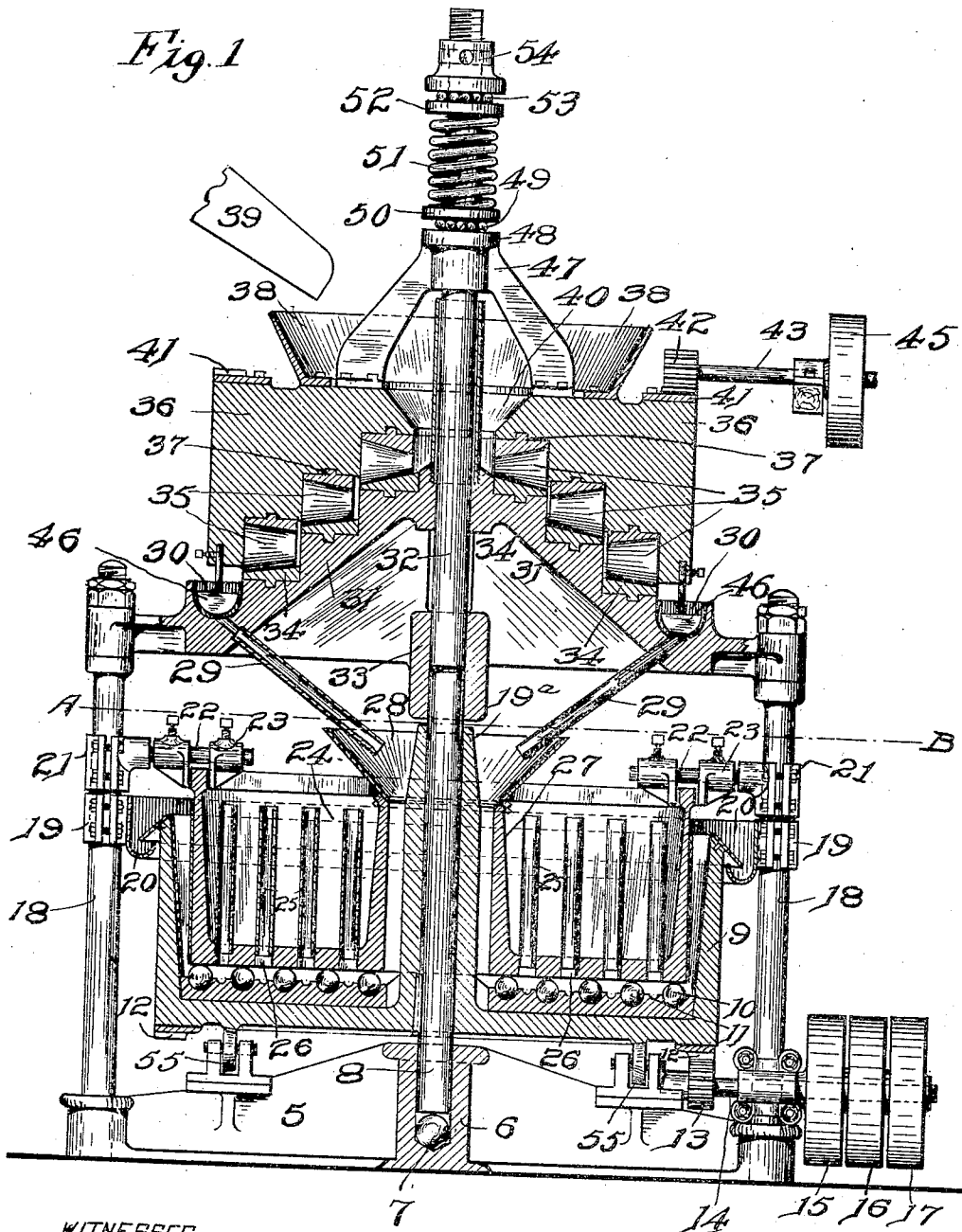


C. R. HOTCHKISS.
AMALGAMATOR.
APPLICATION FILED OCT. 17, 1908.

945,539.

Patented Jan. 4, 1910.
2 SHEETS—SHEET 1.



WITNESSES

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Fig. 2.

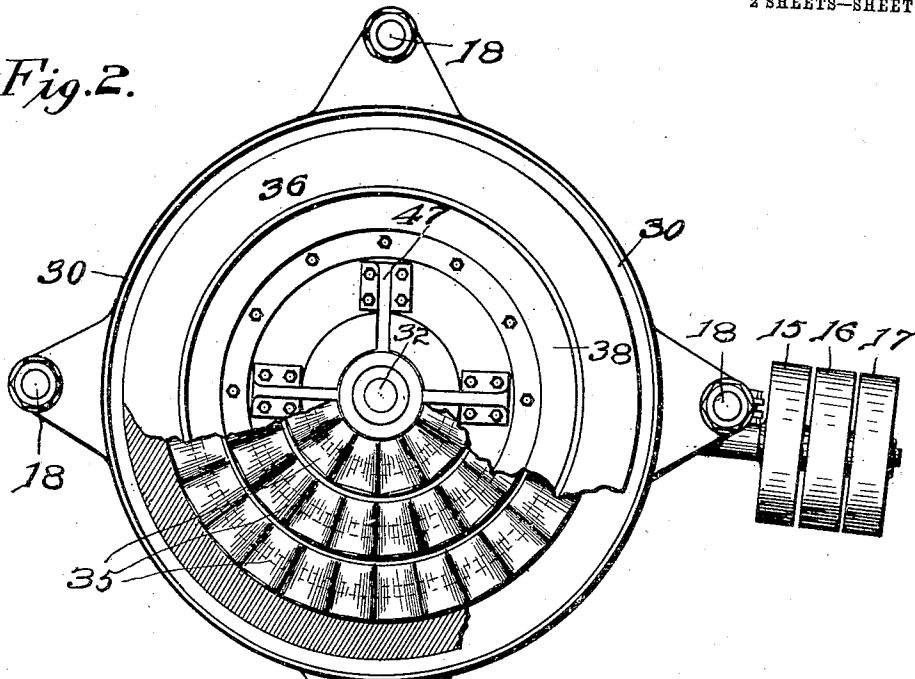
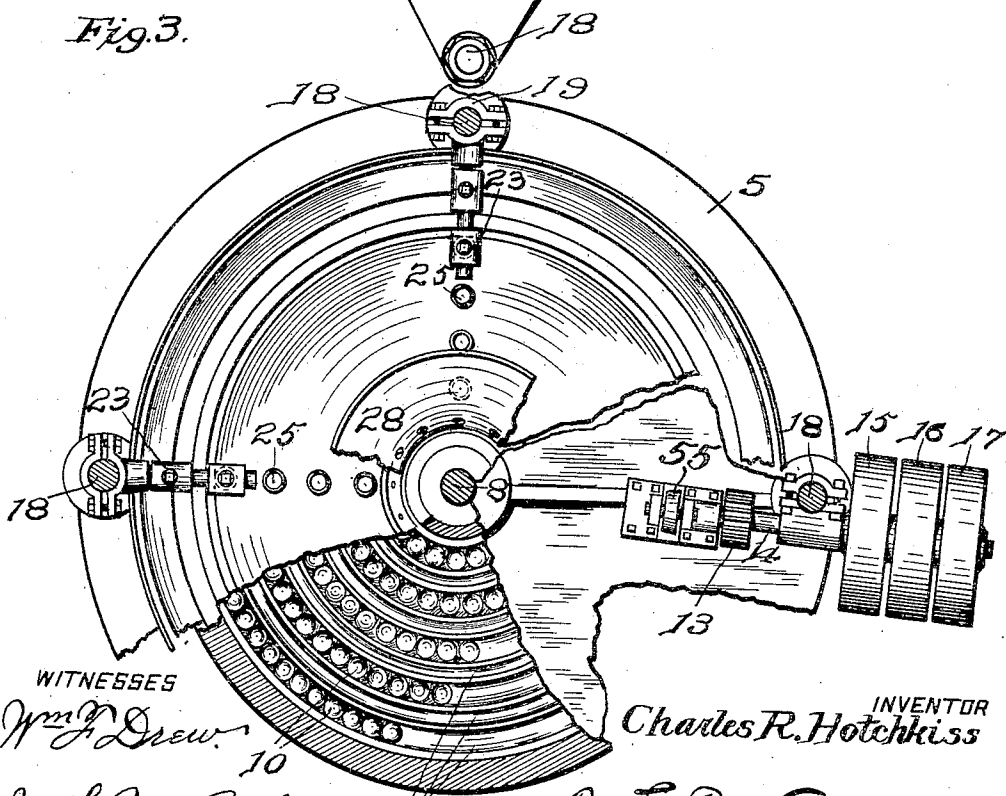


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES R. HOTCHKISS, OF OAKLAND, CALIFORNIA, ASSIGNOR OF ONE-HALF TO
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AMALGAMATOR.

945,539.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES R. HOTCHKISS, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Amalgamators, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to machines for obtaining precious metals from ores, and has especially in view a machine of the character specified in which the ore is first ground to a pulp and then delivered to an amalgamating tub, or the like, where the pulp is held under water and air pressure in contact with quicksilver and the precious metals separated from the pulp and thoroughly scoured, the waste material being floated away from said precious metals and conveyed from the machine.

The invention contemplates an upper grinding cone provided with a plurality of grinding rollers arranged in series in stepped relation which act upon and grind the ore, or rocks between them and an intermediate cone. The ground material is subsequently delivered in pulp form to a lower amalgamating tub containing quicksilver channels and scouring and sliming balls, a second tub being mounted within said amalgamating tub adapted to contain a supply of water which overflows into the latter and causes the formation of eddies over the quicksilver channels. In this manner the precious metal is separated from the pulp and maintained in contact with the quicksilver, the waste material overflowing from the amalgamating tub into a suitable discharge.

To the accomplishment of the recited object and others coördinate therewith, the preferred embodiment of my invention resides in that construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and embraced within the scope of the appended claims.

In said drawings:—Figure 1 is a central vertical sectional view of the ore grinding and separating machine. Fig. 2 is a top plan view, partly in section to show the arrangement of the grinding rollers. Fig. 3 is a transverse sectional view of the machine, taken on the line A—B, Fig. 1, show-

ing the arrangement of the sliming and scouring balls and also the quicksilver channels.

Referring more particularly to the drawings for a detail description of my invention, the numeral 5 designates a base or foundation of the machine which has a centrally located socket (6) having ball bearings (7) therein, upon which is seated a vertical supporting shaft (8) which has fastened thereon an amalgamating tub (9) provided with a plurality of circular rows of scouring and sliming balls (10), between which rows a circular series of quicksilver channels (11) are formed. The bottom of said amalgamating tub is equipped with a circular, toothed, track (12) with which a gear (13) carried by a power shaft (14), carrying respectively, a forward, reverse and idler pulley (15), (16) and (17) adapted for belt connection with a suitable source of power, not shown. Said base (5) is also provided with standards (18) which carry adjustable clamps (19) which hold a receptacle or trough (20) in position to receive the waste material from the amalgamating tub (9). The said standards also carry adjustable clamps (21) which are provided with inwardly projecting horizontal arms (22) also carrying adjustable clamps (23) which support a water tub (24) in a suspended position within the amalgamating tub (9). The water tub is provided with a circular series of vertically arranged tubes (25) which communicate with bottom openings (26) formed in the said water tub and which are arranged directly over the quicksilver channels (11) formed in the bottom of the amalgamating tub (9).

The central portion of the water tub (24) is provided with an upstanding tube (27) surrounding the collar (19^a) which connects the amalgamating tub (9) with the shaft (8), and at its top, said tube (27) has mounted thereon a hopper (28) which has a pipe connection (29) with a pulp trough (30) carried by a lower grinding cone (31), the outer sides of which are clamped to the upper portion of the side standards (18). Said lower cone (31) has a shaft (32) passing therethrough which has a collar connection (33) with the vertical shaft (8). The grinding surface of said lower cone is

equipped with a plurality of rows of grinding faces (34), arranged in stepped relation and upon which grinding rollers (35) work.

An upper cone (36) is nested upon the lower cone (31) and is provided upon its lower face with a series of rows of grinding surfaces (37), arranged in stepped relation similar to the grinding surfaces of the lower cone and between which the rollers (35) are located. A hopper (38) is carried by the upper surface of the said cone (36), said hopper being in communication with a material feeding chute (39), and is arranged to deliver the material to the upper series of grinding rollers through a central opening (40) formed in said cone (36). The upper outer edge portion of said cone (36) is provided with a circular, toothed track (41) with which a pinion (42) engages, said pinion being carried by a power shaft (43), having mounted thereon a pulley (45) which communicates with a suitable source of power, not shown. The lower outer edge of said cone (36) carries depending and adjustable scrapers (46) which extend into the pulp trough (30) and serve to carry the pulp from said trough to the discharge pipes (29).

The upper cone (36) is loose on the shaft (32) and has a bracket (47) carrying a collar (48) surrounding the said shaft and presenting a flat upper surface upon which a row of ball bearings (49) are seated, and said shaft has a ball race (50) above said bearings, the flat upper surface of which forms a seat for a coiled spring (51), the upper end of which abuts against a collar (52) forming seats for another series of ball bearings (53) above which the said shaft is threaded for the reception of a tension nut (54). It will be seen that by adjusting the nut (54) on the shaft, the desired pressure of the upper cone (36) upon the grinding rollers (35) may be had.

The operation of the machine is as follows:—Material is fed from the chute (39) into the hopper (38), thence through the central opening (40) in the upper cone (36) to the grinding rollers (35), and after traversing the various series of stepped grinding surfaces, is delivered in pulp form into the trough (30), it being understood, of course, that the said upper cone (36) is being rotated through the medium of the pinion (42) and the track (41). The scrapers (46) carried by the cone (36) carry the material through the said trough and cause it to flow through the discharge pipes (29) and through the central tube (27) to the amalgamating tub (9). The water tub (24) being filled with water to about the level of the tops of the water tubes (25), it will be seen that the agitation of said tub, incident to the rapid rotation of the grinding cone (35) and also the amalgamating tub (9)

through its described track and pinion rotating means, will cause water to flow over said tubes (25) and into the amalgamating tub and cause an eddy to be formed over each of the quicksilver channels, which assisted by the pressure of the air, prevents the escape of the precious metal by floating, and retains such precious metal in a position where it will be thoroughly scoured and slined by the balls (10). The waste material which is separated from the precious metals is caused to float up over the sides of the said amalgamating tub (9) and into the discharge outlet or tail race (20).

To assist in the rapid rotation of the amalgamating tub, the foundation base (5) may be provided with antifriction rollers (55) which support the bottom of said tub, as is clearly exhibited in Figs. 1 and 3 of the accompanying drawings.

From the foregoing description it will be seen that by the described arrangement of the grinding cones, the material is fed to the amalgamating tub in a finely ground or pulpy condition, and that through the arrangement of the scouring balls and the quicksilver channels, which are in direct communication with the water supply, the pulp is submerged and held under a pressure of water and air, which permits of the segregation and floating away of the waste materials according to their specific gravity, and insures the saving of the precious metals no matter how free or fine the particles are.

What I claim is:—

1. An ore amalgamating machine, comprising a tub provided with ore scouring balls and quicksilver channels, and a water tub adapted to deliver water directly over each quicksilver channel.
2. An amalgamating machine, comprising a tub provided with alternating circular rows of scouring balls and quicksilver channels, and a water tub held suspended within said tub and provided with water tubes adapted to deliver water directly over said quicksilver channels.
3. An amalgamating machine, comprising a tub provided with alternating rows of scouring balls and quicksilver channels, and a water tub held in a suspended and adjustable position within said amalgamating tub and adapted to deliver water directly over said quicksilver channels.
4. An amalgamating machine, comprising a central shaft, a tub having a central sleeve keyed to said shaft and further provided with ore scouring balls and quicksilver channels, and an adjustably mounted water tub within said tub having a central tube communicating with the latter and further provided with means to deliver water over said quicksilver channels.
5. An amalgamating machine, comprising an amalgamating tub provided with ore

scouring balls and quicksilver channels, a water tub disposed within said amalgamating tub having a central tube provided at one end with a hopper and having its opposite end in communication with said amalgamating tub and further provided with vertically disposed water tubes to deliver water over said quicksilver channels.

6. A machine of the character described comprising a rotatable amalgamating tub in communication with a source of ore supply and provided with alternating series of scouring balls and quicksilver channels, and a source of water supply adjustably suspended within said amalgamating tub and provided with water outlets arranged in series and corresponding with the quicksilver channels of the amalgamating tub.

7. A machine of the character described comprising a rotatable amalgamating tub in communication with a source of ore supply, and provided with alternating series of scouring balls and quicksilver channels, and a water tub adjustably suspended within said amalgamating tub and provided with a plurality of discharge outlets corresponding with and adapted to deliver water to each quicksilver channel.

8. A machine of the character described comprising a rotatable amalgamating tub, and a water tub suspended therein and provided with upstanding discharge tubes for delivering a plurality of streams of water to said amalgamating tub when the water tub is agitated by the rotation of the amalgamating tub.

9. A machine of the character described comprising a rotatable amalgamating tub provided with alternating rows of scouring balls and quicksilver channels, a water tub suspended within said amalgamating tub and provided with a plurality of rows of openings in its bottom corresponding with the quicksilver channels, and an upstanding water tube mounted in each opening and adapted to deliver water to the quicksilver channels of the amalgamating tub.

10. A machine of the character described comprising a base carrying standards and a central shaft, an amalgamating tub mounted on said shaft, an adjustable trough suspended on said standards and receiving the overflow from said amalgamating tub, and an adjustable water tub mounted on said standards and suspended within said amalgamating tub and provided with upstanding tubes for delivering water to said amalgamating tub.

11. A machine of the character described comprising a shaft, an amalgamating tub rotated thereby, a water tub surrounding said shaft, and suspended within said amalgamating tub, said water tub being provided with a plurality of discharge openings in its bottom, and a water tube mounted in each opening and projecting within the water tub for automatically delivering water to the amalgamating tub.

12. A machine of the character described comprising a rotatable amalgamating tub provided with a plurality of quicksilver channels, a water tub suspended in said amalgamating tub and provided with discharge openings in its bottom, which are in alinement with the channels in the amalgamating tub, and a water tube mounted in each opening and projecting into said water tube for automatically delivering water from the same.

13. A machine of the character described comprising a base, a shaft mounted therein, an amalgamating tub mounted on and rotated by said shaft, standards carried by said base, inwardly projecting arms adjustably mounted on said standards, and a water delivering tub supported by said arms and surrounding said shaft and suspended within the amalgamating tub.

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

CHARLES R. HOTCHKISS.

Witnesses:

H. C. SCHROEDER,
F. P. SCHROEDER.