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F. A. WISWELL.

ORE OR SAND CONCENTRATOR.

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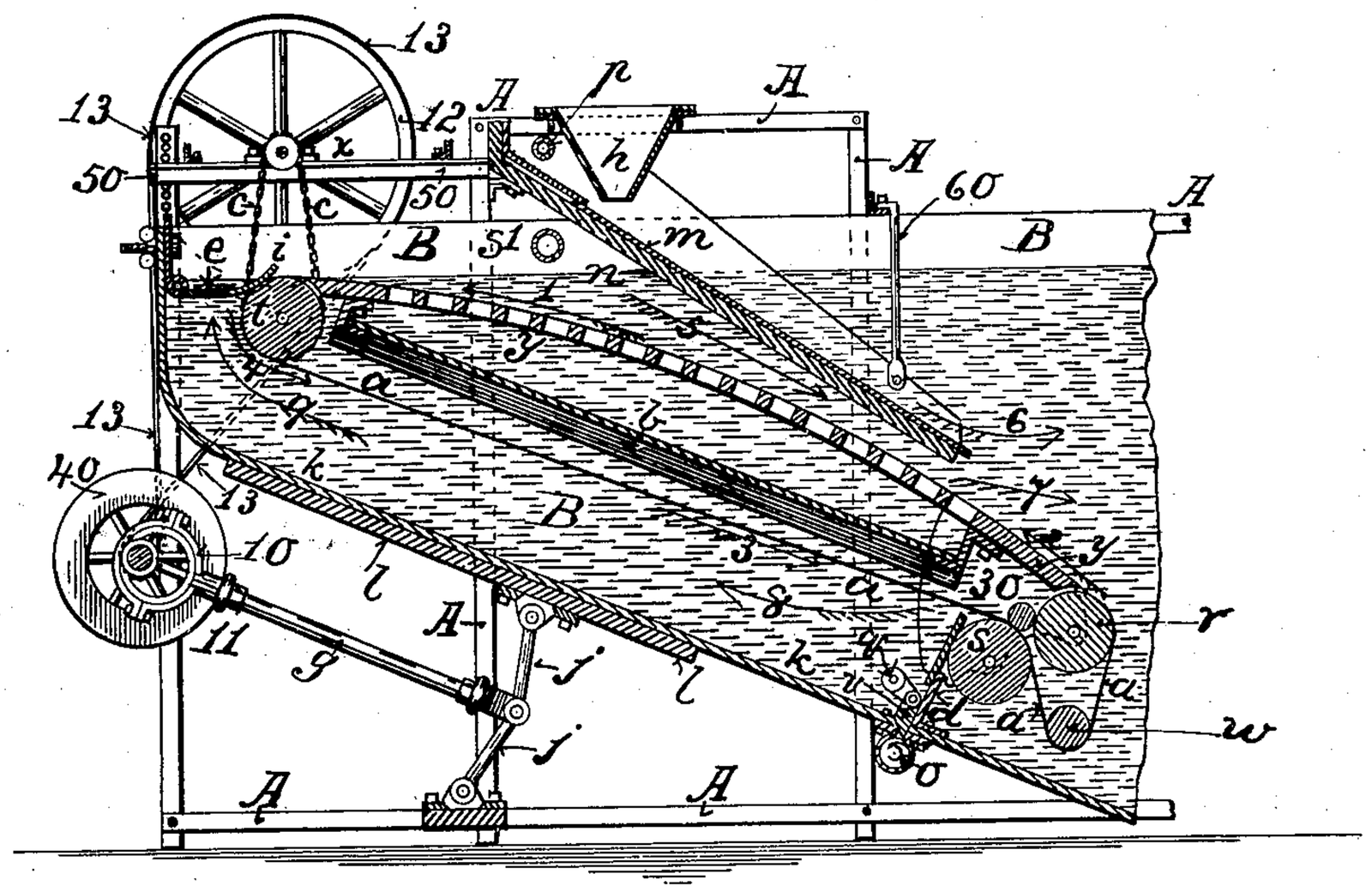

Witnesses:
Alfred W. Asper
Frank H. Clark.

Inventor:
Frederick A. Wiswell.

UNITED STATES PATENT OFFICE.

FREDERICK A. WISWELL, OF SALT LAKE CITY, UTAH, ASSIGNOR TO WISWELL MILLING MACHINERY AND MINING COMPANY, OF SALT LAKE CITY, UTAH.

ORE OR SAND CONCENTRATOR.

No. 861,787. Specification of Letters Patent. Patented July 30, 1907.

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To all whom it may concern:

Be it known that I, FREDERICK A. WISWELL, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented new and useful Improvements in Ore or Sand Concentrators, of which the following is a specification.

My invention relates to devices for separating and saving the more valuable parts of pulverized ore or from gravel or sand, with the assistance of water.

Heretofore tables slightly inclined and adapted to carry a thin layer of water and pulp, with or without a moving apron and with or without lateral movement or vibration have been used, some of these forms of tables provided with fixed riffles, other forms having riffles attached to or forming part of a moving endless apron, in all of which forms dependence is had for the separation of the lighter particles of the ore, gravel or sand upon the rapidity with which the thin layer of water is made to move on the pulverized ore, sand or gravel, in some machines the ore material being agitated by short sharp jerks of the table in the direction of its inclination, in others by rapid vibratory movement in a direction at right angles to its inclination, in which case the thin layer of water, by its rapidity of movement over the ore material carries away the lighter particles to waste. The shape of the particles, however, has much to do with effective separation by such a surface current of water, angular particles such as are the product of ordinary pulverizers, behaving quite different from water worn particles such as are found in placer sands.

By my invention the shape of a particle of ore has but little to do with effective separation because the main dependence is had on the difference in the specific gravity between the mineral bearing particles and that of the barren particles.

In the accompanying drawing forming a part of this specification, the view being a vertical, longitudinal section of my invention.

My invention consists of a frame A supporting a tank B having an inclined bottom *k* of sufficient flexibility to permit of vibration in a direction at right angles to its plane of inclination, a plate *l* being secured to the under side of the said bottom *k* to which plate *l* is pivoted to the upper end of a toggle joint *j*, *j*, the middle joint of which is pivoted to a connecting rod *g*, the other end of which is connected with an eccentric 10 that is mounted on a shaft 80 which is journaled in bearings secured to the frame A of the machine, the said shaft 80 being provided with a pulley 40 driven by a belt from a suitable source of power. Within the said tank B, at a suitable distance above the said bottom *k* is an adjustably supported table *y*, its top perforated with a number of holes. The said table *y* is adjustably inclined in the direction of its length, and carries at its upper end, journaled at each end, a roll *t* which is provided with sprocket-wheels at each end, each of the said sprocket-wheels being peripherally inclosed by a sprocket-chain *c* each of which also incloses other sprocket-wheels. Both of the last mentioned sprocket-wheels are mounted on, and secured to a shaft *x* that is journaled in bearings secured to an adjustable part 50 of the frame of the machine, whereby this end of the said table *y* may be raised or lowered, and thereby inclined more or less, as desired. The lower end of the said table *y* is provided with two rolls, *r*, *s*, whose ends are pivoted in brackets projecting from the said table *y*. The upper surfaces of the rolls *t* and *r* are on a line with the top surface of the said table *y*, while the roll *s* is placed a suitable distance below the said roll *r* to serve to support the apron *a* for the purpose presently set forth. The lower end of the table *y* is supported at the desired position by means of a downwardly projecting bracket at each side, near the end, of the said table *y*, the lower extremity of each of said bracket being cut away in such a way as to rest upon the extreme upper ends of the partition-dam *d*. This construction permits the adjustable end of the table *y* to be raised or lowered without detrimental change of position of the lower end of said table *y*. The table *y* is longitudinally and upwardly curved and covered by a moving endless apron *a*, which is made to travel in the direction of the arrows 1, 2, 3, 4, covering the perforations in the table *y* and returning beneath the said table *y*, over the roll *s*. The said apron *a* is made sufficiently long to carry supported thereby a weight-roll *w* which keeps the said apron *a* taut, and by the tension so produced begets enough friction on the driven roll *t* to cause it to travel at a speed commensurate with that of the said roll *t*. The upward curvature of the table *y* serves to maintain an equable pressure of the said apron *a* upon the upper surface of the said table *y* at all parts alike.

Superimposed above the table *y*, and adjustably supported by the frame of the machine is a chute *m*, the office of which is to convey the previously sized pulverulent ore from the feed hopper *h* to near the lower end of the table *y*, and in order to facilitate the descent of said ore a longitudinally perforated spray-pipe *p* is provided, the said spray-pipe *p* being disposed transversely to the length of the chute *m*, whose top may consist of an amalgamated plate for catching and retaining any particles of gold, if any, that may be in condition for amalgamation. The lower part of the said tank is subdivided transversely by a partition or dam *d* placed immediately below a narrow transverse slit in the bottom *k* of said tank. The said slit is fitted with a long valve *v* of equal length with that of the said slit which opens into a transversely placed tube carrying within a worm-conveyer *o*, whose shaft projects through a stuffing-box, the projecting end of the said shaft being provided with a crank for rotating the said

worm-conveyer *o*. The valve *v* is operated by means of links connecting it to cranks *q*, to which the said links are pivoted, the said cranks *q* being mounted on and secured to a small shaft, one end of which projects through a stuffing-box in the side of the tank and the projecting end of the shaft provided with a lever for operating the said valve *v* from the outside of the said tank.

At the upper end of the table *y*, and resting on the roll *t* is the free edge of a "clack" valve *i*, extending from side to side of the tank, hinged at its other edge to vertically adjustable straps adjustably secured to the shallow end of the tank in such a manner that when the adjustable end of the table *y* is raised or lowered, the said valve *i* may be also adjusted to suit. This valve *i* is provided with an auxiliary valve *e* of large openings, that shown being known as "organ-valve", consisting of a row of holes covered by one long strap secured at each end. Another valve *u*, is secured by its lower edge to the upper edge of the partition dam *d*. The said valve *u* is of flexible material, its upper edge resting against the roll *s* and transversely filling the entire distance between the downwardly projecting brackets, one on each side of the lower end of the table *y*.

The purpose of the valves *e*, *i*, and the valve *u* is as follows:—By the up and down movements of the diaphragm bottom *k* of the tank the contained water in the said tank is made to pulsate, causing the apron *a* to vibrate synchronously therewith, because of the perforations in the table *y* permitting regurgitation of the water therethrough, but the said apron *a* possessing tension by the means herein-before described causes, during the upward movement of the said bottom *k*, an increase of pressure of that portion of the water that is confined between the valves *e*, *i*, and *u* and the said apron *a*, the valve *u* closing, the valve *e*, *i* opening, while the downward movement of the said bottom *k* causes a momentary ingress of water by the valve *u*, the valve *e*, *i* closing, the rapid succession of up and down movements of the bottom *k*, in conjunction with the said valves *e*, *i*, and *u*, acting in the nature of a diaphragm pump, and causing a circulation of water above and below the table *y* in the direction of the arrows 6, 7, 8, 9.

In operation the previously pulverized ore or sand is placed in the hopper *h*, from which, through a slit in the bottom the finely divided material passes on to the chute *m*, and, by means of a spray of water from the spray-pipe *p*, is made to descend the incline of the said chute *m* to the lower part of the table *y*, and falling on the slowly upwardly moving apron *a* becomes stratified by the pulsations of the surrounding water, the heavier parts of the ore or sand settling to the apron *a* and being carried upward and away from the superincumbent barren material which, assisted by the gentle movement of the water in the direction of the arrows 6, 7, 8, 9, falls in a steady flow over the lower roll *r* into an ordinary elevator well-pocket from which, by means of a bracket elevator, or other suitable means the "tailings" are removed. The "concentrates" are gradually and constantly carried on the apron *a* up over the roll *t* and dropped upon the inclined floor or bottom *k*, which by its constant vibration causes the said "concentrates" to slide down to the partition dam *d* from which point, by opening the valve *v*, they will fall into the worm conveyer *o* and be removed from time to time by rotating the said worm conveyer *o*.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. In a device for separating materials, the combination of a tank adapted to contain water, a longitudinally inclined perforated table therein, an endless apron traversing said table, sufficiently wide to cover the perforations thereof, and means for intermittently pulsating water in said tank, substantially as and for the purpose set forth.

2. In an ore and sand separating device, the combination of a tank adapted to contain water, and provided with a flexible bottom connected with suitable actuating apparatus for causing said bottom to rapidly vibrate and produce corresponding pulsations of the water within the said tank, which also contains a suitably supported perforated table longitudinally inclined and upwardly curved, and traversed by an endless apron of sufficient width to cover the said perforations, substantially as and for the purpose set forth.

3. In a device for concentrating pulverized ores and sand, the combination of a tank adapted to contain water; a perforated table therein, rolls at each end of the table, power connections for driving one of said rolls, an endless apron longitudnially inclosing said table and rolls, means for vertically adjusting one end of said table; said tank being provided with a flexible bottom and toggle mechanism for vertically vibrating said bottom, substantially as and for the purpose set forth.

4. In a machine for separating minerals, the combination of a tank adapted to contain water, an upwardly curved table therein; rolls at each end on the table, an endless apron longitudinally enveloping said table and rolls; a dam transversely dividing said tank into two compartments; one end of said table resting on the said dam, the other end of the table supported by means admitting of vertical adjustment; one of said rolls driven by suitable power connections, substantially as hereinbefore set forth.

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

FREDERICK A. WISWELL.

Witnesses:
JOHN W. BALL,
FRANK H. CLARK.