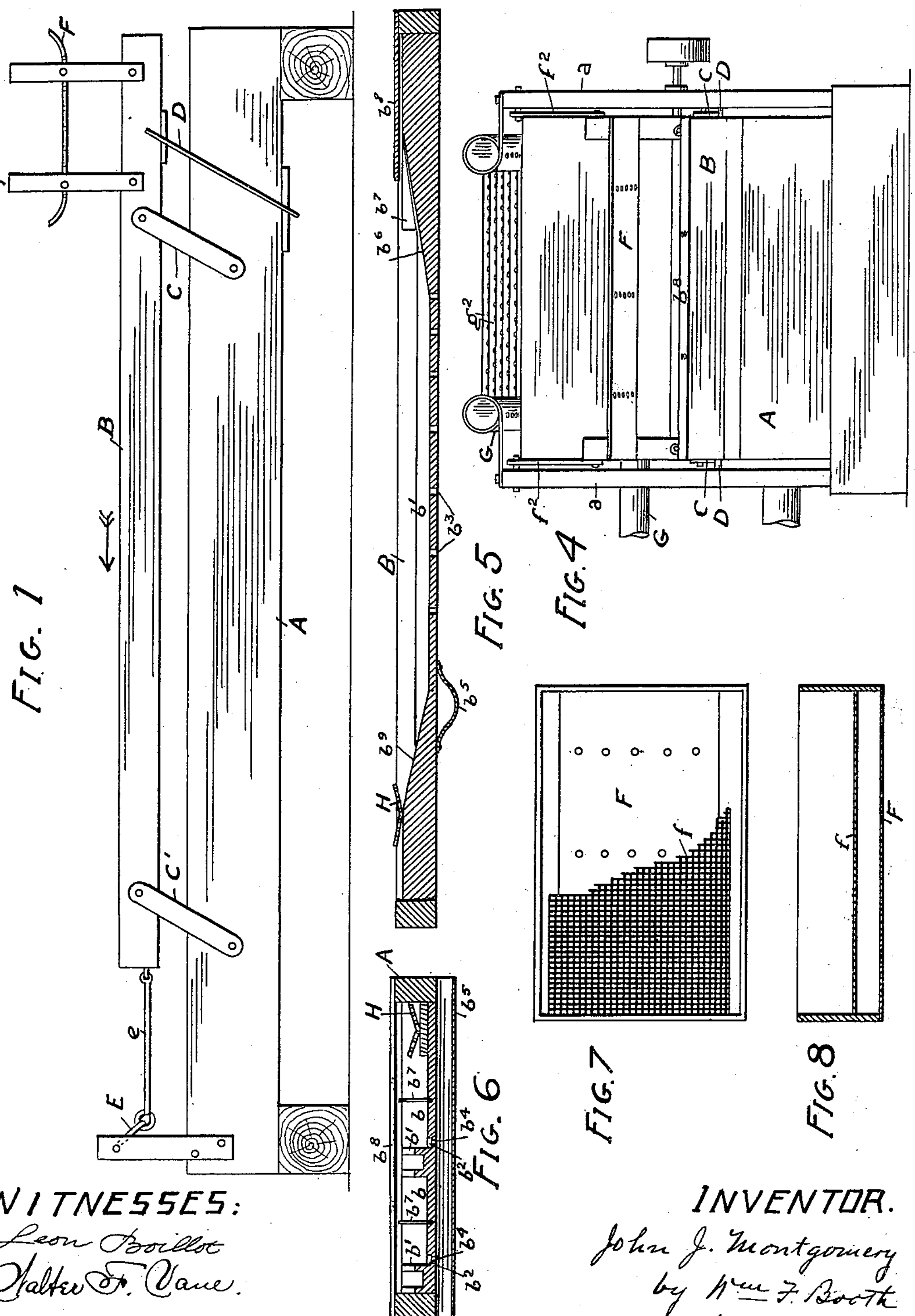
No. 742,889. PATENTED NOV. 3, 1903.

J. J. MONTGOMERY.

CONCENTRATOR.

APPLICATION FILED JUNE 13, 1902.

NO MODEL. 2 SHEETS—SHEET 1.



WITNESSES:

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Walter F. Vane.

INVENTOR.

John J. Montgomery

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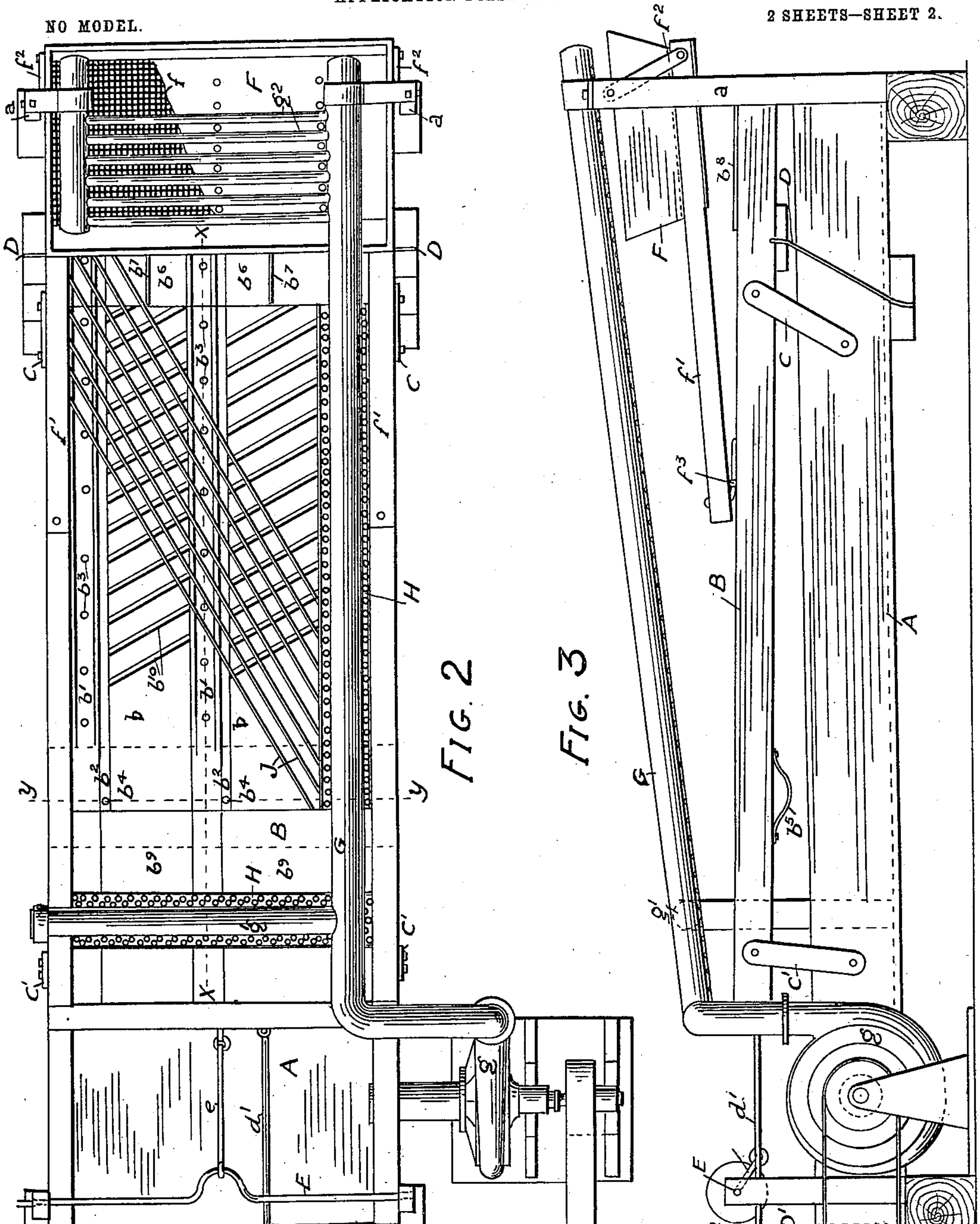

FIG. 2

FIG. 3

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INVENTOR:

John J. Montgomery

by Wm. F. Booth

his Attorney.

No. 742,889. Patented November 3, 1903.

UNITED STATES PATENT OFFICE.

JOHN J. MONTGOMERY, OF SANTA CLARA, CALIFORNIA.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 742,889, dated November 3, 1903.

Application filed June 13, 1902. Serial No. 111,462. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. MONTGOMERY, a citizen of the United States, residing at Santa Clara, county of Santa Clara, State of California, 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 same.

My invention relates to that class of ore-concentrators in which separation by reason of difference in specific gravity of the particles is effected by means of a shaking table.

My invention consists, essentially, in a concentrating-table having means for supplying the material to one end thereof combined with means for imparting to said table a vibrating movement in the direction of the travel of the material thereon and means affecting the table to peculiarly modify or qualify this movement and effect thereby the travel of the material toward the other end.

It also consists in the novel construction, arrangement, and combinations of parts, which I shall hereinafter fully describe and claim.

Referring to the accompanying drawings, Figure 1 is a side view of a simple form of my concentrator, showing the main features of my invention and illustrating its principles. Fig. 2 is a plan of my concentrator, showing its complete form, the screen *f* of the feeder being partially broken. Fig. 3 is a side elevation of same. Fig. 4 is an end view from the feeder end. Fig. 5 is a longitudinal vertical section of the table B on the line *x x* of Fig. 2. Fig. 6 is a vertical cross-section of same on line *y y* of Fig. 2. Fig. 7 is a plan of the feeder F, the screen *f* being partially broken away. Fig. 8 is a vertical section of same.

Referring to Fig. 1, A is a stationary bed. B is a concentrating-table. C C′ represent supporting-links pivoted to bed and table. D is a compensating-spring, also secured to bed and table. E is a crank-shaft with connection *e* to the table, and F is a feeder adapted to supply the material to one end of the table. It will be seen that the supporting-links C C′ are arranged at an inclination to the surface of the table, and as in the arrangement shown the travel of the material on the table is to be from the feed end to the other end the links must be arranged at an angle against the direction of said travel—that is to say, an inclination toward the feed end of the table. It will be seen also that the spring D is arranged, as is shown by its inclination, to compensate for the downward pull of gravity on the table and to be at its maximum pressure when supporting the table at the lowest extremity of movement. When the table B is carried by its links C C′ as thus inclined and is constrained by the spring D or other force in a manner to compensate for the downward pull of gravity, the vibratory movement of said table in the plane of the link-angles imparted to it by the crank-shaft E will under these conditions effect a travel of the particles upon it in the direction of the arrow—that is, from the feed end to the other end. This is due to the gradually-accelerated combined up and forward movement of the table carrying the particles with it and the more pronouncedly accelerated start of the combined down and back movement, causing the table to slip from under the particles, thereby leaving them in their advanced position. The direction of these movements is due to the links C C′ being inclined to the table-surface at an angle against the travel of the particles thereon, while the acceleration of the movement and the difference therein between the up-and-down stroke are due to the spring D, arranged to compensate for gravity.

It will readily be seen from the foregoing that the rapidity of the travel of the particles upon the table is determined by the angle to which the links C C′ are adjusted and the adjustment of the compensating-spring with respect to its pressure, said travel being slower if the adjustment of the links approaches the perpendicular and the adjustment of the spring be such as to minimize its pressure and being faster under opposite adjustments of links and spring. From this general law flow two further results, which must be noticed at this point. The first is that this travel of the particles on the surface of the table will take place even though the feed end be lower than the other end, provided the adjustments of links and spring above noted be properly made, so that the particles under this influence will ascend an inclined plane even against a descending stream of water. The second is that in accordance with the statement that the rapidity of the travel of the particles is determined by these adjustments it follows that if the table be supported at its ends by links at different inclinations which give a different angular movement then the velocity of translation will be different at the two ends. Both these results find important application in practice, as I shall demonstrate in connection with my complete machine to be presently described, the first result—namely, the inclined table and the travel uphill—giving a more complete separation and an opportunity of better disposing of the worthless particles and the second result giving what may be termed a "graduated" separation at the most proper times and places, for by having a great angular movement at the feed end and a lesser inclination at the farther end the particles gradually decrease in the velocity of movement and finally come to rest. As a consequence of this the table-channels gradually fill up and the upper or worthless particles pass off in their discharges or are carried off by the washing of the water.

Speaking generally of the inclination of the supporting-links it may be stated that the algebraic sum of their angles must be an angle against the direction of movement of the particles and have a common influence on the whole concentrating-surface, by which I mean that whatever may be the inclination of any particular link or links with respect to the table the combined angles give the effect of an angle against the direction of the movement of the particles, and this expression—to wit, an angle against the direction of the travel of the material—I shall use as signifying such arrangement, whether all the links are so inclined or the sum of their angles is such as to give an angle against said movement. The best embodiment of these essential principles is illustrated in the remaining figures of the drawings.

A is the bed of any suitable character, here indicated, Fig. 3, as a receptacle to receive the discharge of the tailings from the concentrating-table.

B is the concentrating-table. It is supported at an inclination in the direction of its length, as shown in Fig. 3. Its supports may be from above or, as here shown, from below. These supports consist of links C and C′, pivoted to the bed and to the table on each side. The pair of links C, which are near the lower end of the table, are inclined from the perpendicular, the inclination being toward the lower end of the table, Fig. 3. The pair of links C′, which support the upper end of the table, may be similarly inclined to the lower pair of links, as in Fig. 1, or they may be at a less inclination and even substantially perpendicular, as shown in Fig. 3, providing the algebraic sum of the angles of all the links be, as I have heretofore stated, an angle against the direction of the travel of the material.

D represents springs secured below to the bed and above to the table. The position of these springs is, as here indicated, an inclined one, the inclination being in the direction of the lower end of the table, so that they compensate for the downward pull of gravity and are at their greatest pressure when the table is at its lowest point, Fig. 3. A supplementary spring D′ may also be used at the end of the bed A, Figs. 2 and 3. This spring is connected with the table by a rod d', and its pressure may be adjusted by the nuts d^2. Said spring is likewise arranged to be at its maximum pressure when the table is at its lowest point, as indicated in Fig. 3.

F is the feeder for supplying the material. This consists of a suitably-perforated plate having a sifting-screen f over it. The feeder is carried by arms f', which at their outer ends are connected by pivoted links f^2 with standards a, rising from the bed A, their inner ends being connected by a loose joint at f^3 with the table B, so that the feeder partakes of the reciprocating motion which is to be imparted to the table, as I will presently describe. It will be seen that the feeder is so located as to supply the material to the lower end of the inclined concentrating-table B, and it will also be seen that the supporting-links f^2 are arranged at an angle on the other side of the perpendicular to that at which the supporting-links C C′ of the table are arranged—that is to say, the links f^2 incline toward the upper end of the table, Fig. 3.

A reciprocating motion is imparted to the table in the direction of the travel of the material thereon, which in the present construction is the direction of the length of the table. This motion may be imparted by any suitable mechanism, and for the sake of illustration I have here shown a crank-shaft E and connecting-rod e.

When the machine is used with water, I have a pipe G, supplied with water from any suitable source. I have here indicated a centrifugal pump g, which may be supposed to take the water from the bed A. The water is supplied to the table at proper points. I have here shown it as supplying it from the pipe G, which is suitably perforated, along one side of the table and from a branch g' along the upper end of the table, the delivery being preferably made upon intervening screens H to break up the force of and to better distribute the water.

The surface of the table B may be of any suitable character, either plain or broken by riffles, barriers, or other obstructions, such as indicated by b^{10} in Fig. 2. I have here shown it in its best form as composed of a plurality of parallel lengthwise channels or troughs b, having border ridges b' and shallow grooves b^2 adjacent thereto, Figs. 2 and 6. In the ridges b', which are themselves grooved, as seen in Figs. 5 and 6, are made throughout their length at various points discharge-apertures b^3 through their bottoms for the tailings, Figs. 2 and 5. At the upper ends of the channel-grooves b^2 are made discharges b^4 for the concentrates, which are received in a suitable chute b^5, located under the table and which is adapted to suitably dispose of them, while the tailings fall through apertures b^3 into the bed A, from which they may be in suitable manner removed. The whole surface of the table may be continuous; but it is best provided at its lower end with inclined planes b^6, Fig. 5, with low divisions b^7 to better distribute the material from an overlying apertured directing-plate b^8 into the side of the channels b opposite their grooves b^2. The table at its upper end is provided with inclined planes b^9, Fig. 5, which serve the purpose of preventing the concentrates from banking up and washing over past their discharges b^4 and also to better direct the water which is supplied from the head of the table. Extending from the water-pipe G over the feeder-screen f is a series of water-pipe branches g^2, which serve the double purpose of supplying water to assist in the feed of the material and as a screen to better sift the material as it is delivered upon said pipes. Across the table above its surface are the inclined wires J, which serve as agitators to whip up and keep light the material as it travels up the table.

The operation of the machine is as follows: The table reciprocates or vibrates in the direction of its length, and as said table is supported by links which are inclined as described and as the table is affected by the springs adjusted as described the travel of the particles upon the principles I have stated will be up the incline toward the upper end of the table. During this travel the heavier particles will move faster and farther and sink lower than the lighter particles and will thereby effect a separation. During the course of travel the lighter particles or tailings will continually pass off from the top of the mass through the discharges b^3, while the heavier particles will pass into and travel along in the channel-grooves b^2 and continually move upward to their discharges b^4. The speed of travel and the regulation of this speed at the proper points, as before mentioned, are secured by the proper adjustment of the links C C' and springs D, so that the separation is gradual, being more pronounced at the feed end, and opportunity is afforded to dispose of the tailings according to the necessity of the operation. The travel of the material is gradually retarded as it approaches the upper end of the table, and the concentrates are stopped at the point desired. The object of mounting the feeder F in the manner described—that is to say, with its supporting-links arranged at an opposite inclination to the links C C' of the table—is to cause in the material upon said feeder a travel opposite to that of the material on the table, which results in carrying the debris on the feeder-plate backwardly and discharging it over the lower end or foot of the machine, thereby effectually disposing of it.

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

1. In a concentrator, the combination of a concentrating-table, means for vibrating said table in the direction of the travel of the material thereon, means for supplying the material to one end of said table, supports for said table inclined to its surface at an angle against the direction of the travel of the material thereon, a spring to compensate the downward pull of gravity on the table, discharges for the tailings through the table at points throughout its length, and discharges for the concentrates at the end of the table opposite to that at which the material is supplied.

2. In a concentrator, the combination of a concentrating-table, means for vibrating said table in the direction of the travel of the material thereon, means for supplying the material to one end of said table, supports for said table inclined to its surface at an angle against the direction of the travel of the material thereon, a spring to compensate the downward pull of gravity on the table, a plurality of parallel channels on the table extending in the direction of the travel of the material, said channels having discharges at intervals disposed beside their sides for the tailings, and having discharges for the concentrates at their ends opposite to that at which the material is supplied.

3. In a concentrator, the combination of a concentrating-table, means for vibrating said table in the direction of the travel of the material thereon, supports for the table inclined to its surface at an angle against the direction of the travel of the material thereon, a spring to compensate the downward pull of gravity on the table, a feeder to supply the material to one end of the table, said feeder having its rear edge projecting beyond said table end and being connected with and deriving a vibrating movement from the table, and links pivotally supporting said feeder and arranged at an angle on the other side of the perpendicular to that at which the supports of the table are arranged, whereby the debris from the feeder is carried over its projecting rear edge and discharged over the end of the table.

4. In a concentrator, the combination of an inclined concentrating-table, means for vibrating said table in the direction of the travel of the material thereon, means for supplying

the material to the lower end of said table, supports for said table inclined to its surface at an angle against the direction of the travel of the material thereon, a spring to compensate for the downward pull of gravity on the table and a series of wires across and above the surface of the table disposed in the path of the material thereon.

In witness whereof I have hereunto set my hand.

JOHN J. MONTGOMERY.

Witnesses:
WALTER F. VANE,
D. B. RICHARDS.