

(No Model.)

2 Sheets—Sheet 1

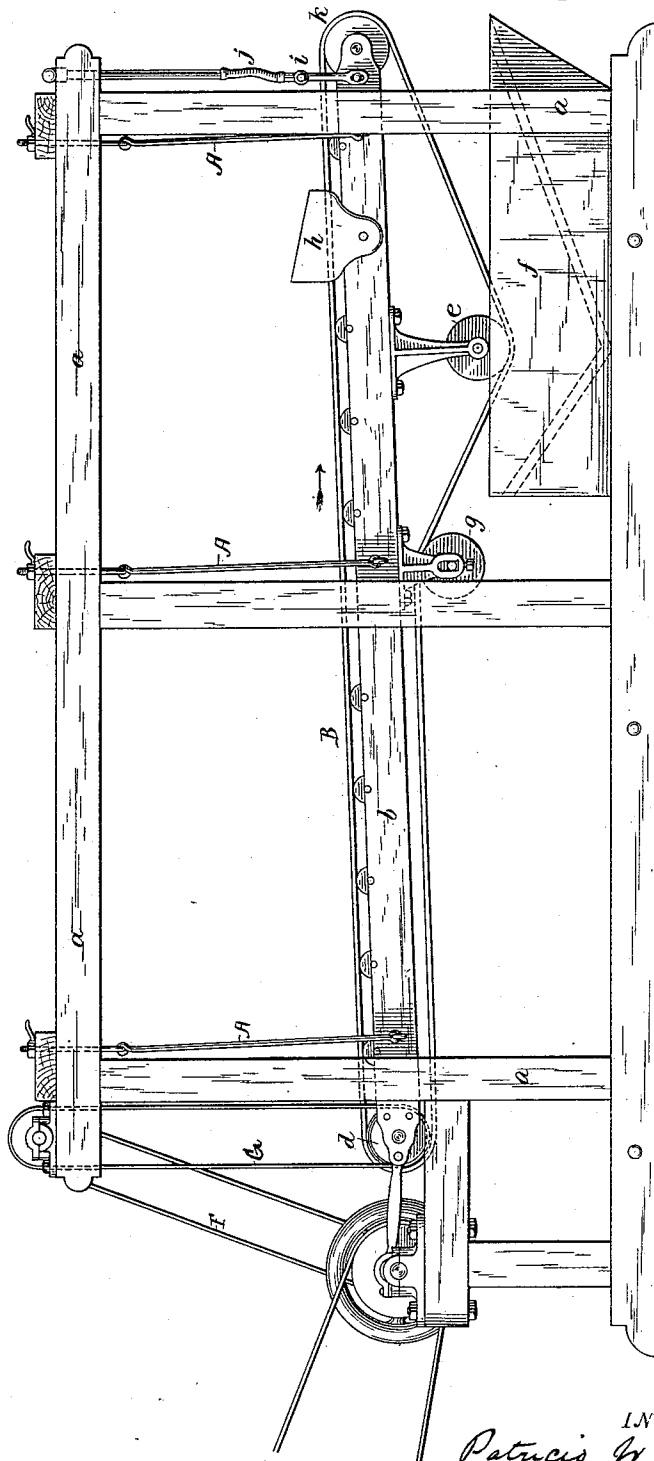
P. W. DUFFIELD.

ORE CONCENTRATOR.

No. 275,809.

Patented Apr. 17, 1883.

Fig. 1,



WITNESSES

Wm A. Shunkle,
Geo W. Creek.

By his Attorneys

INVENTOR

Patucio W. Duffield
Duffield & Duffield

(No Model.)

2 Sheets—Sheet 2.

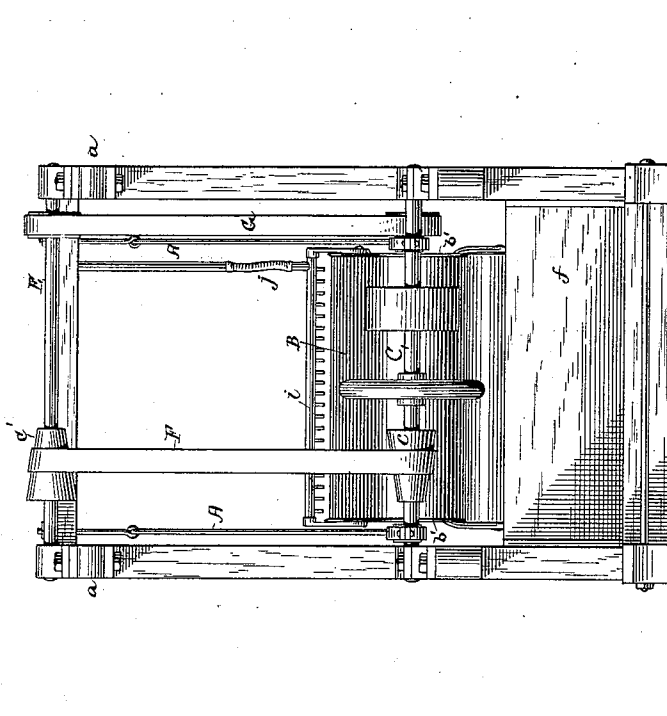
P. W. DUFFIELD.

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Fig. 2.



WITNESSES

Wm. A. Skinkle
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UNITED STATES PATENT OFFICE.

PATRICIO W. DUFFIELD, OF NEW YORK, N. Y.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 275,809, dated April 17, 1883.

Application filed October 12, 1882. (No model.)

To all whom it may concern:

Be it known that I, PATRICIO W. DUFFIELD, a subject of the Queen of Great Britain, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Ore-Concentrators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to the class of machines which are used for the purpose of treating ore as it comes from the crusher mixed with the water, so as to separate the mineral portion from the tailings or waste. Heretofore the best machines which have been used for this purpose consisted of an inclined endless revolving belt mounted upon a reciprocating frame. This frame was connected with a crank in such a manner as to be caused to reciprocate in a horizontal plane with a regular uniform motion. In some machines this reciprocation was in the direction of the travel of the belt; in others it was at right angles to the travel of the belt. The object of both directions of reciprocation was the same—namely, to cause the heavier particles of mineral to settle upon the surface of the belt and cling thereto, while the lighter particles remain suspended in the water with which the ore was mixed when it was discharged onto the belt. This condition of affairs caused the mineral portion clinging to the belt to be carried up the incline by the motion of the belt. Extending across over the belt, at a position nearer its upper end than the place where the crushed ore was discharged onto the belt, was a pipe or other device for distributing water, which water was discharged from the pipe in small jets, so as to fall upon the mineral as it was carried up by the belt and give it a final washing, so as to cleanse it from any waste which might still cling to it. This perforated water-distributor has heretofore been attached to the frame of the machine, so that it did not move in unison with the reciprocations of the belt, and thus some of the material received but little washing, as it was carried under the water at a double speed, resulting from the motion of the belt and the motion of the frame when moving in the direction in which the belt was moving, while other parts of the material were carried under the

jets of water a second time by the backward motion of the frame, and thus received a double washing. This resulted in a great waste of water, because it was necessary to discharge sufficient water through the jets to allow of the thorough washing of the material when it was passing at its highest speed, which was much more water than was required when the back movement of the frame was taking place and the materials passing slowly under the jets or being subjected to the double washing. Machines of a different class have been proposed in which reciprocating frames were employed in combination with water-distributing pipes moving with said frames; but in this case the movement of the material under the water depended upon the jerking motion imparted to the frame, and consequently, as in the machines previously referred to, there was a great difference in the speed with which some of the material passed under the jets, and unless an inordinate amount of water was employed much of the material was insufficiently washed.

My improvement consists in a machine to overcome this waste of water incidental to these machines, whereby the material being washed is always carried under the water at a uniform speed. To this end I have combined a perforated water-distributor with the reciprocating frame of the belt, so that it shall follow all the motions of that frame and reciprocate in unison with the belt.

In the drawings I have shown a machine which contains my improvements.

Figure 1 represents a side view of my machine, and Fig. 2 represents an end view thereof.

From an outer stationary frame, *a*, is suspended, by adjustable links *A*, the shaking-frame *b*, which supports the revolving belt *B*, on which the concentration is effected. The belt is made of rubber or canvas, with raised edges or flanges *b'* along the sides to prevent sand or water flowing off sideways, and is supported in an inclined position, so that the materials are fed on near the upper end, and the tailings or waste flow down the length of the belt and discharge at the lower end, the minerals being discharged at the upper end. The shaking-frame is connected to a short crank-shaft, *C*,

by which a regular horizontal reciprocating motion is communicated to the supported belt. Motion is conveyed to the belt B from the crank-shaft C through cone-pulley *c*, connected with the cone-pulley *c'* on a counter-shaft, E, supported at the top of frame *a* by a belt, F, and from said shaft E by a like belt, G, to roller *d*, around which latter this end of the belt B passes. The depressing-roller *e* dips the belt into a water-tank, *f*, where the mineral carried over by the belt is washed off and deposited. The tightener-roller *g* serves to keep the tension of the belt uniform and to raise it as it leaves the water-tank, so that the portion of the belt between the rollers *g* and *d* is substantially horizontal or inclined upward from *d* to *g*, so that none of the waste or tailings flowing off of the lower end of the belt can run back into the mineral-tank. The crushed ore mixed with the water as it comes from the crusher flows onto the belt from the distributor *h*, as heretofore. The water-distributor *i* is secured to the shaking-frame or to some other apparatus, whereby it is caused to move in unison with the shaking or reciprocating motion of the belt. It consists of a pipe extending transversely across above the belt, and provided with perforations along its length for distributing water. When attached to the reciprocating frame, as shown in the drawings, water may be conducted to it from a stationary pipe through a flexible connecting-piece, *j*, as shown.

The operation of the machine is as follows: The crushed ore and water flowing from the distributor are dropped evenly across the width of the belt and flow down the incline, subject to the regular shaking motion imparted by the shaft and connections. This shaking motion tends to settle the heavier particles of mineral onto the surface of the belt, to which they cling, while the lighter particles of waste rock flow down, suspended in the water. The forward slow travel of the belt brings up the settled particles of mineral continuously until the jets of water from the shaking water-distributor are met with. Here the final separation of mineral and waste rock is effected, for the jets of water wash back the light particles and allow the clean heavy mineral to pass onward. From this point the mineral passes

around the roller and clings to the belt until it is carried into the mineral-tank, when it is washed off and deposited.

In the drawings, I have shown my improvement applied to a machine in which the reciprocating or shaking motion is communicated to the belt in the direction of the travel of the belt; but by attaching the water-distributor to the frame in the same manner my improvement may be applied to machines of the same class in which the shaking or reciprocating motion is applied to the belt in a direction at right angles with the travel of the belt.

In the old machines, where the water-distributor was attached to the stationary frame, the effect of the reciprocation of the belt was to constantly change the point of impact of the water-jets on the ascending mineral, necessitating the use of more water for the final separation of the sand and mineral, and so causing a greater loss of the fine particles of the latter, which were carried off down the belt in the excess of water.

With my improvement the water-distributor reciprocates in unison with the belt and delivers the jets of water always at the same relative point on the belt at every portion of the reciprocating stroke, and by this means every portion of the mineral is kept for the same length of time under the water-jets, and a uniform delivery of mineral past the jets by the forward travel of the belt is caused at every portion of the reciprocating stroke, and as a consequence the use of less water and a corresponding diminution of the loss of fine material in the operation is produced.

I am aware that it is not new to make a water-distributor move in unison with a reciprocating bed; but such apparatus as heretofore made had no endless belt for carrying the ore.

What I claim is—

In an ore-concentrator, an endless traveling belt and means for imparting a reciprocating motion thereto, in combination with a water-distributor constructed to move in unison with the reciprocating belt, substantially as described.

PATRICIO W. DUFFIELD.

Witnesses:

LIVINGSTON GIFFORD,
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