

(No Model.)

2 Sheets—Sheet 1.

F. M. ENDLICH.
ORE CONCENTRATOR.

No. 461,425.

Patented Oct. 20, 1891.

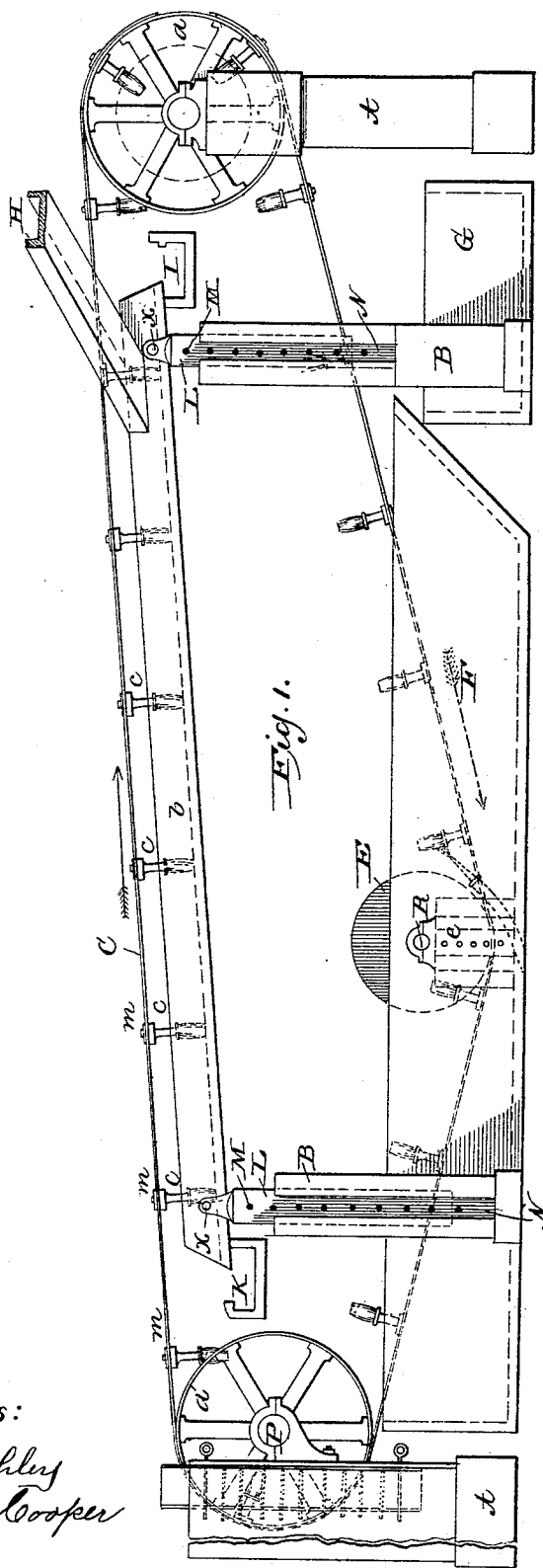


Fig. 1.

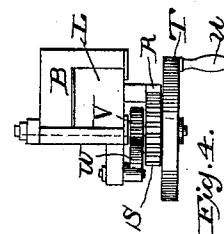


Fig. 4.



Fig. 7.

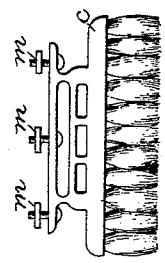


Fig. 6.

Witnesses:

Arthur Ashley
Henry C. Cooper

Inventor:

Frederic W. Endlich, by
Thos. J. Johnston,
attorney.

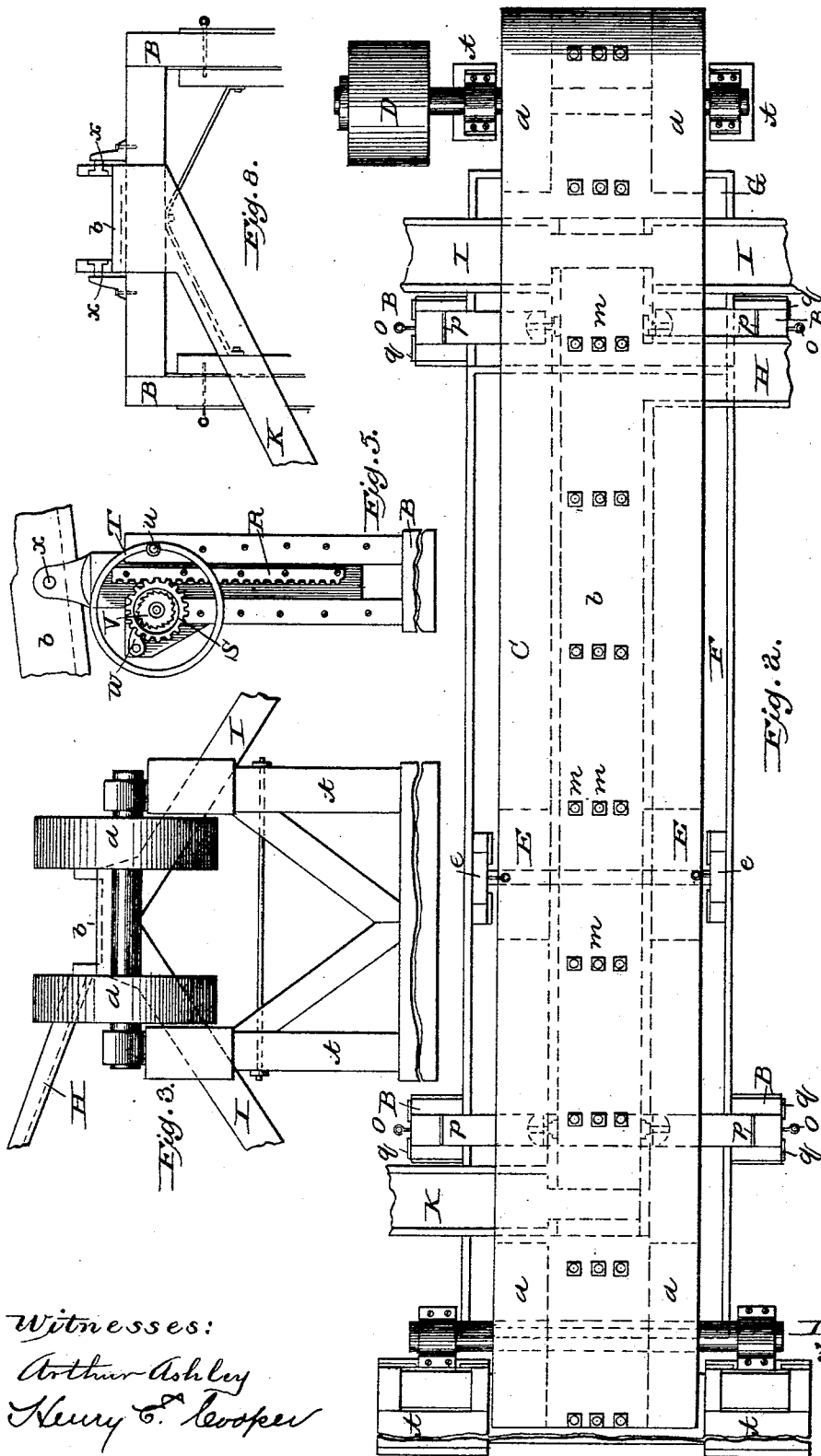
(No Model.)

2 Sheets—Sheet 2.

F. M. ENDLICH.
ORE CONCENTRATOR.

No. 461,425.

Patented Oct. 20, 1891.



Witnesses:

Arthur Ashley
Henry E. Cooper

Inventor:
Frederic W. Cuddehe
by
Shes. J. Johnston,
Attorney.

UNITED STATES PATENT OFFICE.

FREDERIC MILLER ENDLICH, OF OURAY, COLORADO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 461,425, dated October 20, 1891.

Application filed May 25, 1891. Serial No. 393,998. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC MILLER ENDLICH, engineer, a citizen of the United States, residing at Ouray, in the county of Ouray and State of Colorado, have invented certain new and useful Improvements in Ore-Concentrators, of which the following is a specification.

My invention relates to concentrators, and more particularly to that class of such machines in which brushes are passed through the current of water in the sluice for the purpose of collecting and saving particles of floating ore, ore-sluice, or float-gold that may be contained in the water. In some forms of bud-
dles brushes have been used for a similar purpose by passing through them the current by hand at a right angle to its course; but this action is intermittent and incapable of adjustment according to the character of the ore.
Various other devices have been employed for collecting the floating or suspended particles; but none have fully answered the purpose, and they frequently fail to save minute fragments of brittle ores, which, on account of the smallness of the particles, are often carried along by the water and go to waste in the tailings. These particles may float at or near the surface, may be distributed throughout the volume of water, or may sink to the bottom of the flume, their position depending upon the volume and speed of the water in the race and upon their physical condition.

My invention consists, briefly, of a belt carrying brushes at certain intervals, their motion being in an opposite direction to that of the water in the sluice through which they travel. They act as agitators and collectors, mechanically carrying the floating or suspended materials into proper receptacles.

My invention consists, further, in making the sluice and the belt carrying the brushes relatively adjustable, so that the brushes may skim through the surface water, may be semi-submerged, or may travel only along the bottom, may enter the water at the center or near either end of the sluice, may skim the surface at one end of the sluice and touch bottom at the other, or vice versa. To this end I provide adjustments whereby either end of the sluice may be raised or lowered and another independent adjustment which raises or lowers at will the pulleys at one end of the belt,

thus enabling the engineer to approximate the belt and the sluice, to separate them, or, within certain practical limits, to vary indefinitely their relative angle.

The elements of novelty will be more particularly set forth in the claims annexed to this specification.

In the drawings, which show the form in which I prefer to embody my invention, Figure 1 is a side elevation. Fig. 2 is a plan. Fig. 3 is an end elevation from the upper end with the driving-pulley and the belt omitted. Fig. 4 is a detail plan view of an alternative form of vertical adjustment. Fig. 5 is a side elevation of the parts shown in Fig. 4. Fig. 6 is a side elevation, and Fig. 7 an end elevation, of one of the brushes; and Fig. 8 is an end elevation from the lower end, showing the framing.

Referring by letter, A A represent the frame carrying the pulleys *a a*, and B B similar suitable framings supporting the sluice-box *b*. The pulleys *a a* are spaced apart on their shaft far enough to allow of the passage between them of the brushes *c c*, fixed at suitable intervals to the belt C, passing over the pulleys, which derive motion from the driving-pulley D, employing any suitable prime mover. An approximate size for the pulleys would be eighteen inches diameter and four inches face. If properly adjusted, the belt (which is laced and preferably of rubber) will travel without side-play; but the pulleys may have flanges on their outer edges, if desired. After leaving the pulleys *a a* the belt passes down into a tank F, the water in which washes out from the brushes the particles collected by them in the sluice, which settle to the bottom, from whence they are removed from time to time. In this tank are placed two idlers E E, which serve by means of their adjustments *e e* to maintain the tension of the belt and to keep it at a proper angle, thus permitting it to drain into the tank F. It will be manifest that when the belt is adjusted to change its angle to the sluice these idlers must also be changed to a proper relative position, and their size, though otherwise unimportant, must be sufficient to permit the brushes to pass beneath without touching the shaft.

A suitable form of brush is shown in Figs. 6 and 7. The frame may be of cast-iron, and

is a skeleton made as light as possible, not only to save weight, but that the openings may allow the water in the sluice and tank to pass freely, and thus lessen the power required to operate the machine. The brushes are spaced apart on the belt to suit the character of the ore being worked. It will seldom be necessary to put them closer together than nine inches or farther apart than eighteen. The finer and lighter the material to be saved the closer must they be placed. To facilitate repairs the tufts of bristles are separately secured in place, and the brushes are removably attached to the belt by means of the bolts and nuts *m m*.

Should it be found that the brushes do not free themselves while passing through the tank F from the ore collected in the sluice, a jet or jets of water may be introduced to play on them, preferably while passing near the pulleys E E. This arrangement is seldom necessary. Whenever sufficient material has accumulated, it is transferred from the tank F into the box G by hand.

The water carrying the ore or metal in suspension enters the sluice *b* from the flume H, and, flowing downward, passes away through the flume K. In its passage it encounters the brushes, which, passing upward, sweep any matter near the bottom of the sluice into the flumes I I, from which it is carried by the current into appropriate collecting-boxes. (Not shown, but of any common form.) The flumes I I are supplied with water by holes tapped in the bottom of the sluice *b* at its upper end, the upward motion of the brushes causing enough water to pass into the flumes I I through these holes and over the end of the sluiceway to carry off any crushed ore or sluices, which may be passed into them by the brushes.

The means of vertically adjusting the sluice-box may be of any kind. I have shown two forms. The first consists of a slot in the supporting-post B, wherein slides an upright standard L, provided with holes M, registering with similar holes in the slot. Pins *o o* pass through the holes, securing the standard at the desired height. The plates *q q* prevent lateral motion. An iron plate *p* is also interposed between the post and the standard to prevent undue wear and warping and to provide a firm bearing for the pins *o o*. The other form of adjustment is by rack and pinion, as shown in Figs. 4 and 5, wherein the arrangement of standard and slot, with their protecting-irons, is as previously described; but a rack R is attached to the standard actuated by the pinion S and maintained at the adjusted height by means of the ratchet V and pawl W. It is manifest that this will enable the engineer to give the machine a more delicate adjustment, which may at times become desirable, though in most cases the simpler form will be entirely adequate. Either one of these forms of adjustment may be employed for raising and lowering the pulleys at the lower end of

the belt, by which means its pitch relative to the sluice can be varied at will. The construction and operation of such an adjustment being precisely similar to those already depicted, no more detailed description is necessary.

The pitch of the supply-flume H need only be sufficient to feed the water moderately, while the flumes I I, which run in opposite directions, should have a sharp pitch to enable them to clear themselves rapidly, as should also the discharge-flume K for the same reason. The edge of the discharge-flume K is shown rounded off to prevent wear of the brushes. The standards I are journaled to the sluice-box *b*, as shown at *x x*, Figs. 1, 5, and 8.

The advantages of this form of concentrator are that it may be easily and cheaply built, being mostly of wood and having but few expensive parts; that it provides means for adjusting the pitch of belt and sluice, thus regulating the flow of the pulp-bearing water to suit the requirements of the ore being treated; that the brushes collect the material while passing through the water, and that they may also sweep the bottom of the sluice; that where the valuable pulp, being finer and lighter than the valueless, is carried in suspension, leaving the latter to sink to the bottom, the brushes may clear the bottom and remove only the valuable parts. Where the reverse is the case, the brushes may sweep the bottom. Where the valuable float will not rise unless agitated, the end of the flume may be lowered, so that the brushes pass through the upper part of the current until the middle of the sluice is reached, where they touch the bottom and agitate the pulp, releasing the float, which is caught by the brushes below. The machine is thus completely adjustable. It is also automatic, for when once adjusted it need not be changed until the character of the ore changes. The power required is small and the daily capacity very large.

The length of the flume depends on the character of the ore. The finer and lighter the pulp the longer the flume and the less its pitch. Ten feet is a minimum and twenty a maximum length. Where the belt is very long it should be supported at intervals by idler-pulleys carried on a proper frame attached to the frame-work of the machine.

The flume should be ten or twelve inches wide and of five or six inches depth. The brushes must correspond; but the bristles should be about three inches long and so spaced as to let part of the water escape between them. The speed should be about eight or ten revolutions per minute, but should be varied according to the character of the ore.

Having thus described my invention, what I claim, and wish to protect by Letters Patent of the United States, is—

1. In a concentrator, in combination, a sluiceway, independent means of vertical ad-

justment for each end thereof, a belt carrying brushes adapted to travel in the sluiceway, and means for effecting the vertical adjustment of one end of the belt, substantially as described.

2. In a concentrator, in combination, a sluiceway and a belt carrying brushes traveling in the sluice, the belt driven by pulleys spaced apart on a common shaft and engaging a portion only of the belt-surface, substantially as described.

3. In a concentrator, in combination, a sluiceway and a belt carrying brushes removably attached thereto, the brushes being adapted to travel in the sluiceway against a current of water and the belt being driven by pulleys spaced apart on a common shaft and engaging a portion only of the belt-surface, substantially as described.

4. In a concentrator, in combination, a sluiceway, a tank thereunder, and a belt carrying brushes traveling in the sluice and passing through the water in the tank, substantially as described.

5. In a concentrator, in combination, a sluiceway, a tank thereunder provided with

idler-pulleys, and a belt carrying brushes traveling in the sluice and passing around the idlers through the water in the tank, whereby the brushes are positively submerged at each passage, substantially as described.

6. In a concentrator, in combination, a sluiceway, a belt carrying brushes traveling against a stream of water in the sluice, and flumes at the upper end of the sluice, whereby the waste water drawn upward may be discharged and the ore therein recovered, substantially as described.

7. In a concentrator, in combination, a sluiceway, a vertical adjustment at each end thereof actuated by a rack and pinion, a belt carrying brushes traveling against a stream of water in the sluice, and means for vertical adjustment of the pulleys at one end of the belt, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

FREDERIC MILLER ENDLICH.

Witnesses:

R. BIANCHIÉ,

H. C. DICKINSON.

It is hereby certified that in Letters Patent No. 461,425, granted October 20, 1891, upon the application of Frederic Miller Endlich, of Ouray, Colorado, for an improvement in "Ore-Concentrators," errors appear in the printed specification requiring correction, as follows: In line 15, page 1, a comma should be inserted after the word "buddles," and in line 16, same page, the words "through them" should read *them through*; and that the Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 27th day of October, A. D. 1891.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.