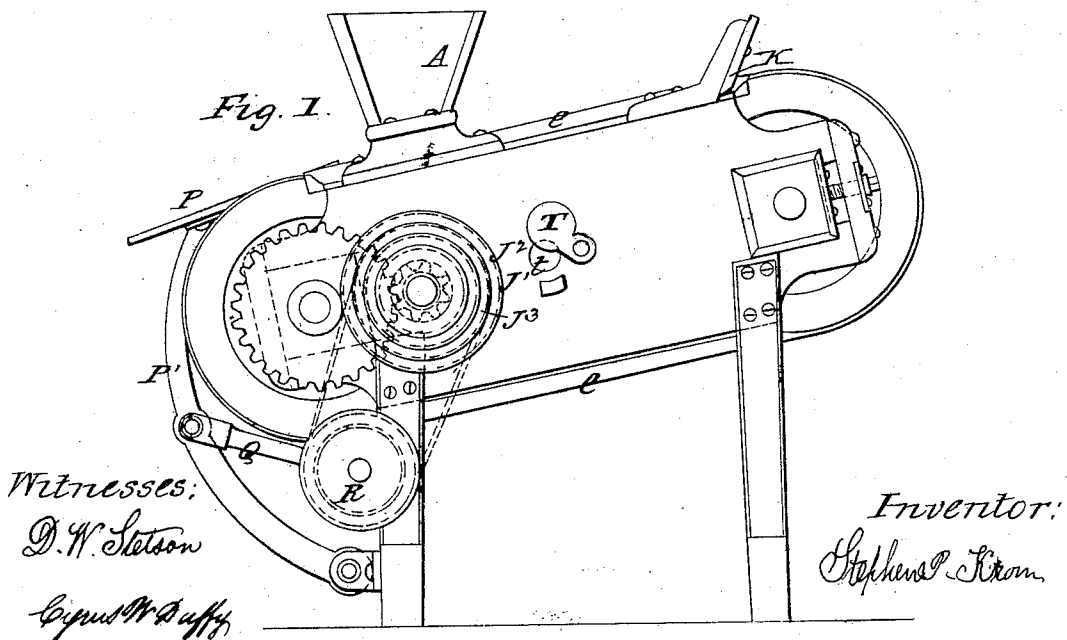
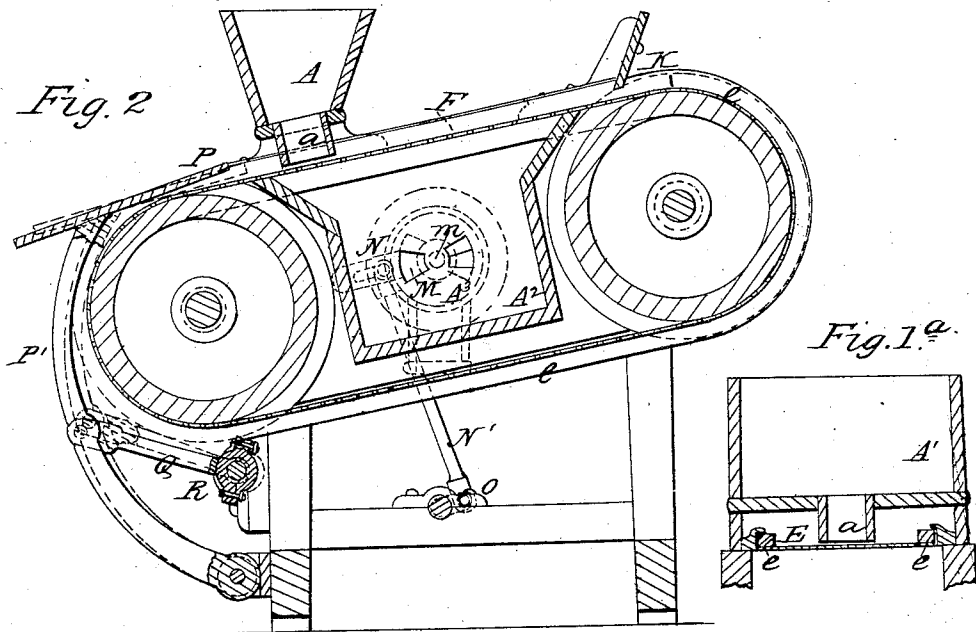


S. R. KROM.

Apparatus for Separating Metals from Ores.

No. 59,773.

Patented Nov. 20, 1866.



UNITED STATES PATENT OFFICE.

STEPHEN R. KROM, ASSIGNOR TO APOLLOS R. WETMORE, OF NEW YORK, N. Y.

IMPROVED APPARATUS FOR SEPARATING METALS FROM ORES.

Specification forming part of Letters Patent No. 59,773, dated November 20, 1896.

To all whom it may concern :

Be it known that I, STEPHEN R. KROM, of New York, in the county and State of New York, have invented certain new and useful Improvements in Separators adapted for concentrating ores in a granular state, or for separating grains generally which are of different specific gravities, and of equal or nearly equal size.

My machine is one of that class in which intermittent jets of air or other fluid are projected upward through a perforated bottom or sieve, on which the material lies, so as to loosen and agitate the mass in a manner which has been found to be peculiarly favorable for their separation, carrying the lighter grains to the top and allowing the heavier grains to sink to the bottom of the strata. The machine is also of that class which delivers continuously—delivering the dense matter, the rich ore of lead, for example, in one stream, and the lighter matter, as the silicious particles, in another stream or streams.

I will describe my invention with reference to its use for separating dense ores from the lighter matter, generally called tailings; it being understood that the machine may be equally useful in separating other materials of different specific gravities.

I will first proceed to describe what I consider the best means of carrying out the invention, and will afterwards designate the points which I claim as new. The accompanying drawings form a part of this specification.

Figure 1 is a side elevation, and Fig. 2 is a longitudinal vertical section.

Similar letters of reference indicate like parts in both the figures.

A is a frame work, upon which the various parts are supported; A¹ is a hopper mounted thereon; *a* is a tube leading from the hopper down nearly to the perforated bed E. The bed, E, is made of wire cloth in the form of an endless belt with sides, *e e*, carried around therewith. The belt is stretched by means of adjustable pulleys, J¹ J², which are rotated slowly by gear from any convenient power. The belt is set on an incline as represented, so that when the ore is delivered on the belt and air is projected upward in gentle puffs through the mass the whole mass will tend to move gradually down the incline and the

lighter material at the same time be thrown to the surface. The air may be supplied in puffs by means of a bellows placed directly under the portion of the bed which is loaded with material; but in lieu thereof I prefer to employ simply a trunk or hollow casing, as represented by A², to receive the air from a bellows or blowing means at a distance not represented. I esteem it important to apply the blast in sharply intermittent puffs. A removal of the bellows to a distance tends to lessen the sharpness of the puffs, but I have invented means which allow my blowing device to be mounted wherever most convenient, and to operate at a distance either intermittently or continuously, while the effect on the material is sharply intermittent.

A³ is a casing which extends from the side of the air trunk, or case A². The interior of A³ is made in a cylindrical form and encloses the valve M, which corresponds in its exterior to the inside of the casing A³, and is adapted to partially rotate on the rocking shaft *m*. N is a slotted arm which is fixed on the shaft *m* of the valve M, and receives a rapid motion in opposite directions from a connection to a crank or other suitable device not represented. At each vibration it shuts off and again lets on the currents of air, so that the result is a succession of sharp puffs.

P is an inclined sheet of metal or other suitable material mounted on the lever P¹, as represented, and which is rapidly vibrated by the aid of the connection Q from the revolving crank R, or other suitable mechanism.

To operate my invention the finely-broken ore is placed in the hopper A¹, from which its descent upon the bed E, through the tube *a*, may be regulated by any ordinary means. The material, on reaching the bed E, is carried slowly upward by the rotation of the belt, while the whole is lifted and agitated by the puffs of air. Under these conditions the dense particles sink to the perforated bed, while the lighter particles rise to the surface and form a separate stratum. The action of the air at each puff tends to throw the material upward in an inclined direction at right angles to the belt E. This latter fact gives a tendency to the material to move down the incline in opposition to the motion of the belt E. Now, for the same reason that the lighter substance comes to the top, it tends to move downward

along the inclined plane more rapidly than the dense material; that is to say, it is lifted more and projected further down the plane at each puff of the air upward through the inclined bed. My machine takes advantage of this fact to ultimately separate the material and deliver the dense grains at the proper end of the inclined bed by the traverse of the belt E, while the light material is driven down the incline and ultimately delivered at the opposite end of the machine. The rate at which the pulleys J¹ J², are rotated is made adjustable by means of cone pulleys not represented, so that the speed of the belt E may be very nicely graduated according to the material which is worked and the force of the wind employed. The inclination of the entire machine may also be varied by blocking up one end of the machine or the other as it may be required in treating different materials. I propose to regulate the force of the blast, the rapidity of the succession of the jets, the thickness of the stratum of material, the inclination of the belt, and the speed of the belt, as shall be found by experience to be most expedient with each material. The proper operation in all cases is to give the belt a velocity intermediate between the speed at which the metal or densest material is driven down the incline by the action of the jets, and that at which the tailings or lightest material is so driven down. If, for example, the metal moves down at the rate of one-half inch per second and the tailings at the rate of one inch, then the belt should move at the rate of three-fourths of an inch per second. Thus adjusted the machine will precipitate the metal over the higher end of the machine and will deliver the tailings from the lower end of the machine. We have been successful in separating and delivering the separated materials without the plate P; but as the air is obviously obstructed by the pulley at the extreme lower end of the incline, and consequently the lifting action of the jets ceases to move the material down a little before it is fairly delivered, I propose to employ such a plate, when required, to prevent the accumulation of too great a quantity of tailings on the belt. The tailings are thrown upon the edge of the plate P, and slide freely off and cause no further trouble. The sides of the perforated belt E may be formed of leather, rubber, or other elastic material, or pieces of wood in short lengths can be employed. Any ordinary means may be employed to diminish the leakage of air between the belt and the top of the air-casing A².

T is an adjustable valve which controls a passage, *t*, from which a portion of the air in the air-trunk A² may be allowed to escape. Its office is to afford a convenient means to

regulate the force of the puffs of air. When this valve is shut tightly the puffs are delivered upward through the belt E with the full force due to the action of the blowing-machine, not represented, and to the opening provided by the oscillation of the valve M. As the valve T is opened the force of the blast is diminished.

K is a scraper, the office of which is to prevent the top of a stratum from being carried upward and delivered. This scraper is chiefly serviceable in cases where a small quantity of tailings traverse upon the surface of the dense material. The scraper may be adjusted to allow the free passage of any required thickness of stratum beneath it. The position of this scraper, K, as also of the feeding hopper A¹, may be varied on the frame A by placing them nearer together or further apart, as the material shall require. Much depends on the richness of the material. The adjusting of the position of these parts up and down on the incline, as also the adjusting the height of the scraper K, and the force of the blast, &c., should be greatly governed thereby.

The tubes *a* may be duplicated as required.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. I claim giving the intermittent action to the blast in a separating machine, substantially as specified, by means of the valve M, or its equivalent, operating between the blowing means and the perforated bed, substantially as herein set forth.

2. I claim the endless traversing perforated bed E in combination with means for blowing through the upper half thereof, so as to lift and agitate the material thereon, substantially as herein set forth.

3. I claim the tube *a* or its equivalent, of less breadth than the endless belt E and adapted to carry the fresh material down and deposit it immediately upon the endless belt E, while the lighter material is allowed to traverse past it down the incline, substantially as and for the purpose herein specified.

4. I claim the scraper K, arranged to operate in combination with the endless traversing perforated bed E, and with means for producing intermittent blasts or puffs of air through the same, substantially as and for the purpose herein specified.

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

STEPHEN R. KROM.

Witnesses:

D. W. STETSON,
CYRUS W. DUFFY.