S. R. KROM.

Apparatus for Separating Metal from Ores.

No. 58,839. Patented Oct. 16, 1866.

Fig. 1.

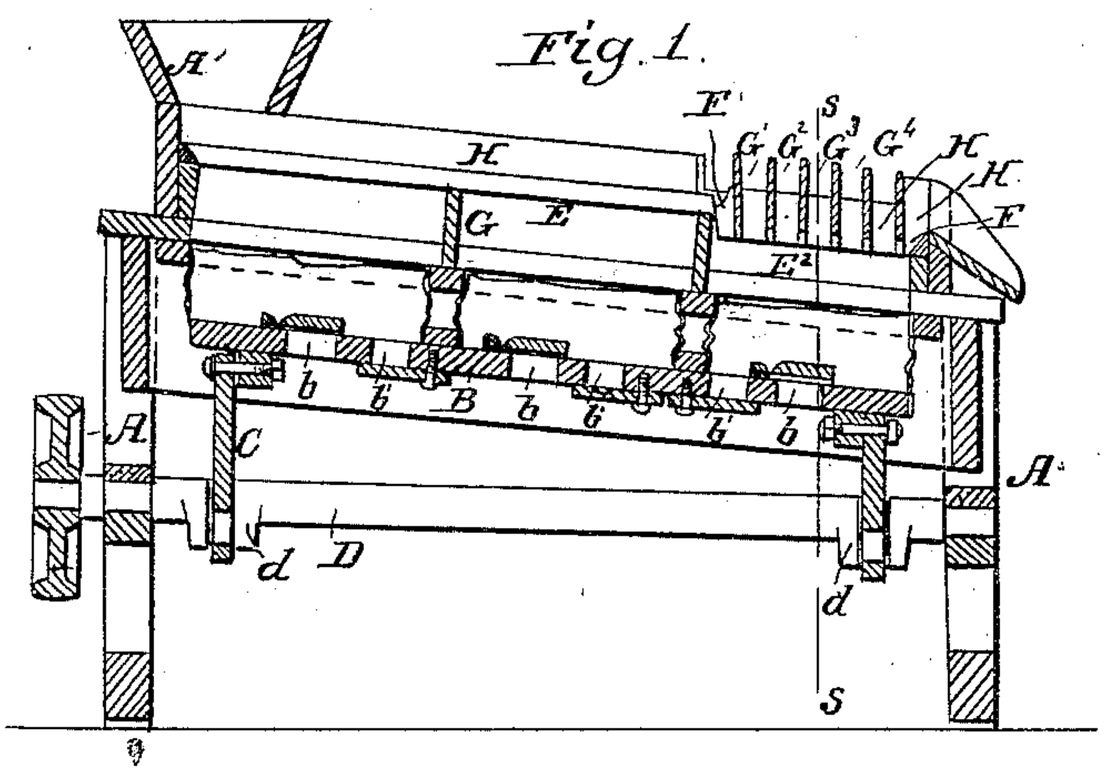


Fig. 2.

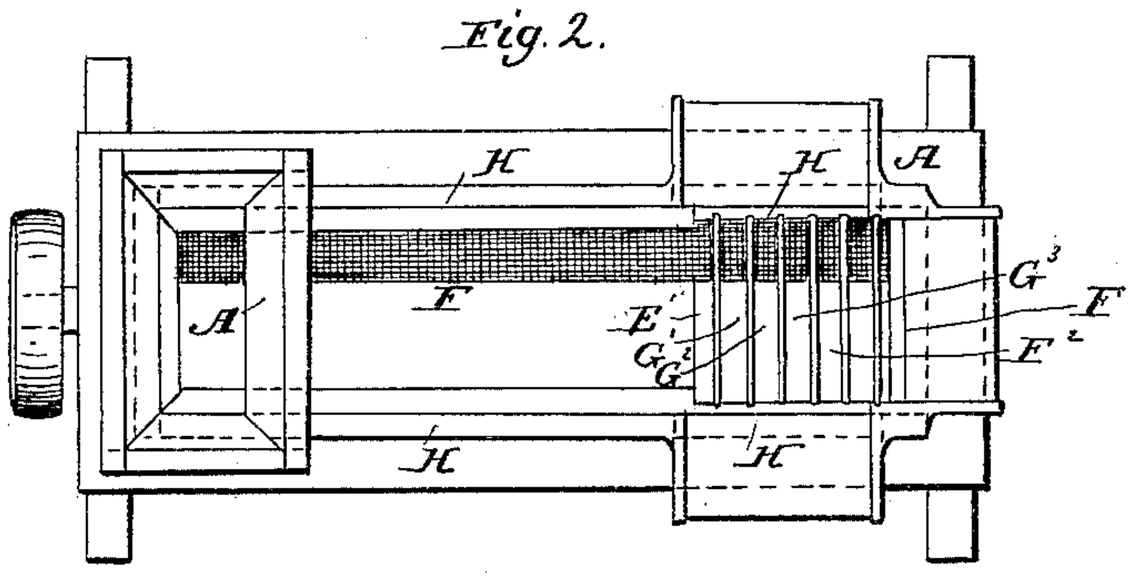
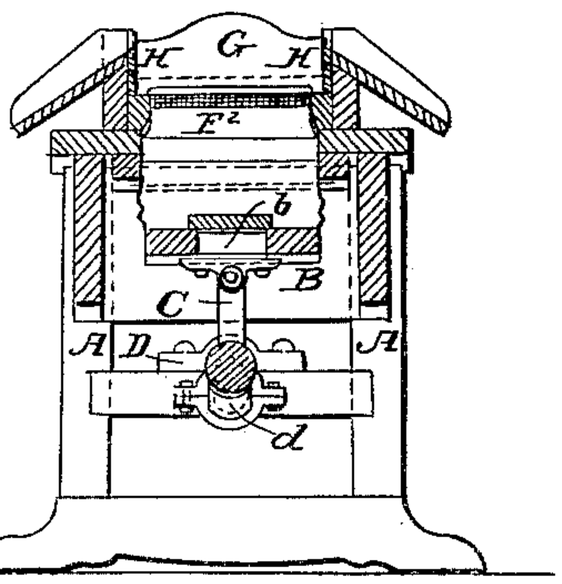


Fig. 3.



Witnesses:
D. W. Stetson
Chas. A. Duffy.

Inventor:
Stephen R. Krom

UNITED STATES PATENT OFFICE.

STEPHEN R. KROM, OF NEW YORK, N. Y.

IMPROVED APPARATUS FOR SEPARATING METALS FROM ORES.

Specification forming part of Letters Patent No. **58,839,** dated October 16, 1866.

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 afterward designate the points which I claim as new.

The accompanying drawings form a part of this specification.

Figure 1 is a longitudinal vertical section. Fig. 2 is a plan view. Fig. 3 is a transverse section on the line S S in Fig. 1.

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

A is a frame-work, on which the various parts are supported, and A′ is a hopper mounted thereon. B is the bottom or moving portion of a bellows. It is provided with induction-valves *b*, and with regulating-valves *b′*, by opening which latter to a greater or less extent the air received in the bellows at each reciprocation may be allowed to escape, so as to diminish the force of the blast. C C are links or connections conveying motion from the cranks *d d* on the rotating shaft D, which is driven by a steam-engine or other convenient power through the aid of gearing or a belt. (Not represented.)

The machine stands in an inclined position. The finely-broken ore is placed in the hopper A′ at the upper end, and the dense metal is delivered at the opposite end of the machine in a continuous stream, while the tailings are poured over each side near the lower end of the machine in continuous streams.

E is a finely-perforated bed or sieve, which may be conveniently made of wire-cloth, using copper or brass wire for the purpose. This is supported by the cross-grating G in the position represented. The main portion E of this bed is inclined uniformly. At the foot of this incline the bed descends a short distance, as indicated by E^1. From the bottom of this perpendicular part the bed again inclines uniformly, as represented by E^2. The space between the descent E^1 and the fixed bar F, which stands at the foot of the bed, I designate as a "pocket." It is adapted to accumulate the material to a considerably greater depth than will accumulate on the part E, and I provide means for effectually stopping the progress of the light material along this past the pocket and compelling the light material to escape laterally, while the dense material alone is allowed to traverse onward and flow over the foot-bar F into an appropriate receptacle. (Not represented.)

G^1 G^2, &c., are adjustable slides or gates fitted in grooves in the frame-work H, and adapted to be raised and lowered at will. Each may be adjusted to extend down very near to the bottom of the pocket, or may be elevated to a higher level, or removed altogether.

The material lying on the part E is prevented from escaping laterally by high side-boards H H. These side-boards are reduced in height immediately adjacent to the gates G^1, &c., so as to facilitate the escape of the upper stratum or light material laterally as it arrives at this part of the machine.

Any suitable mechanism (not represented) may be employed to raise and lower the gates either to equal or to variable extents. I can increase or diminish the number of the gates, as may be required.

In operating the machine the ore is placed

in the hopper A′ and allowed to spread itself in a thin layer—say about one inch in depth—on the perforated bed E. The puffs of air from the bellows B lift the whole material slightly and aid it in traversing down the incline, becoming separated on the way, the light being lifted with more effect than the dense material. On arriving at the pocket the material forms two distinct strata, the heavy metal at the bottom and the lighter tailings on the top. The first gate, G^1, should extend down to such depth that its lower edge is in the lower stratum, so that it tends to stop all the tailings, and to compel the latter to accumulate until it runs off at the sides, while the metal progresses forward underneath. I have discovered that under such conditions all the metal will ultimately pass under the gates. Unfortunately, also, the tailings will work down in small quantities under the first gate so situated; but I find that a duplication of such gates will effect entire separation from the metal by the means described. The material which passes the first bar or gate, G^1, and accumulates against the second, G^2, is composed mainly of metal, but with a small proportion of tailings on and near its surface. The jets of air from below continue to operate slightly, lifting and agitating this mass sufficiently to bring the tailings to the surface and keep them in a distinct layer. The action of the material in passing the second gate is the same as in passing the first gate, except that a smaller quantity of tailings will pass under, the spaces at the sides being open to allow the tailings free egress at each side. It results that the material which escapes opposite the first gate is earthy matter alone; but the material which escapes opposite the last gates, when several are employed, is mingled with some metal, and it is well to receive the tailings from those points in separate spouts, (not represented,) so that it may be again subjected to treatment. Thus the material proceeds until it is delivered over the foot-board F as pure metal, or sufficiently pure for the purposes required.

The bellows B may be divided into several sections, worked by the single board or bottom, as represented, or may be formed in entirely separate and distinct bellows, operated at equal or unequal times. I consider the plan represented simple and efficient.

I attach particular importance to the fact that the air is blown up through the lower bed, E^2, by bellows, or a section of bellows, the interior of which is not in connection with the apparatus which blows through the higher bed, E, because the material, by lying thicker on the lower bed, E^2, offers more resistance to the air and requires a higher pressure of air to overcome it, and in case the chambers below were in free communication all or nearly all the air would rise through the higher bed, E. As I arrange it, the air under the lower bed, E^2, is compelled to find an escape through the dense material lying thereon.

The valves b' allow an adjustment of the several bellows or portions of bellows, so as to graduate the effect to the density or condition of the material with great nicety, as also to graduate the effect of the air on the different beds.

It will, of course, be obvious that I can use cylinders and pistons, or equivalent rectangular cases with followers moving freely therein, in lieu of bellows, if preferred, and can vary the form of the gates at will.

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

1. In combination with the intermittent blowing means and with two or more passages for the escape of the separated materials, the employment of one or more gates, G, so arranged as to act on the material to retard the upper strata without retarding the lower strata as it passes down the incline, substantially in the manner and for the purpose herein set forth.

2. In connection with the above, the perforated beds E and E^2, arranged at different levels, as herein specified, so that the material shall be separated or partially separated into distinct layers on the upper bed and be accumulated in thicker strata and separated and led away in independent streams by the gate or gates on the lower bed, as herein set forth.

STEPHEN R. KROM.

Witnesses:
D. W. STETSON,
CYRUS W. DUFFY.