2 Sheets—Sheet 1.

E. W. STEPHENS.

Ore-Concentrator.

No. 212,330. **Patented Feb. 18, 1879.**

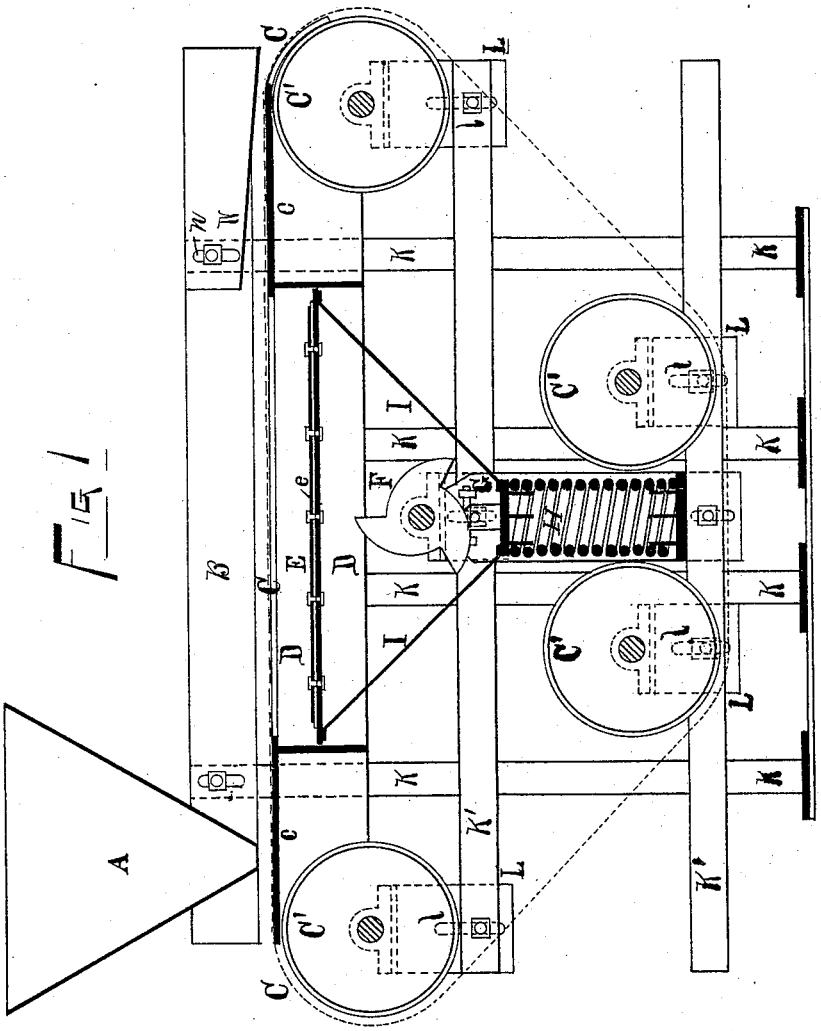

FIG 1

Witnesses,

Jas. S. Miller

P. A. Cooney

Inventor

Edward W. Stephens

by Jno. K. Hallock

atty.

2 Sheets—Sheet 2.

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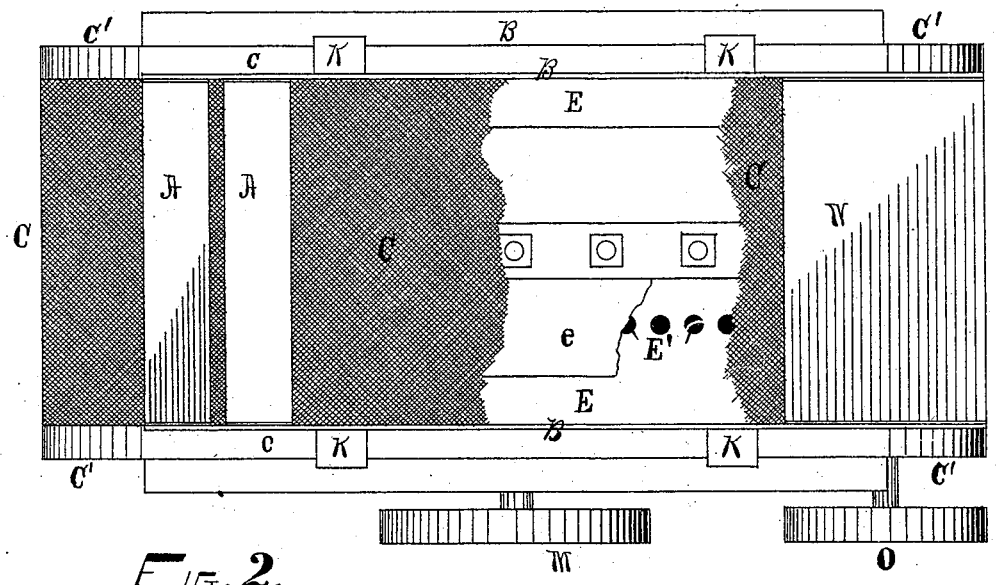

FIG. 2.

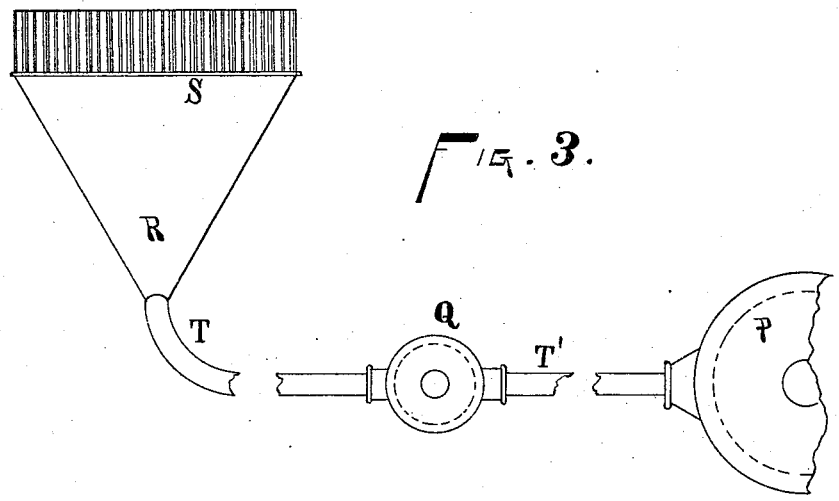

FIG. 3.

Witnesses,

Jas. S. Miller.

P. H. Cooney

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UNITED STATES PATENT OFFICE.

EDWARD W. STEPHENS, OF ERIE, PENNSYLVANIA.

IMPROVEMENT IN ORE-CONCENTRATORS.

Specification forming part of Letters Patent No. **212,330**, dated February 18, 1879; application filed September 27, 1878.

To all whom it may concern:

Be it known that I, EDWARD W. STEPHENS, of Erie, in the county of Erie and State of Pennsylvania, have invented a new and useful Ore-Concentrator; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to that class of ore-concentrators in which the concentration is effected by a wind-blast, and which are known as "dry concentrators;" and more particularly my invention relates to such of said dry concentrators as use a movable ore-bed arranged to pass over an air-blast chamber, and which perform the operation of concentration during the passage of the said bed over said air-blast chamber.

I have discovered that for perfect work of concentration by such a machine it is necessary that the material to be concentrated must be uniformly spread upon the bed, that this uniformity must be kept up and not disturbed during the passage of the material over the blast, that there must be no moving of the particles upon each other laterally—that is, like a current—but they must move only with the bed, except as moved vertically by the action of the blast; for if the matter on the ore-bed is spread thicker in one place than another the air will rush through the weak point and a uniform concentration will not take place. It is also essential that the blast be effected by such means as will make it uniform upon all parts of the bed exposed to it.

So far as I am aware these requisites are not maintained in the devices heretofore invented for this purpose.

The mechanism by which I accomplish these results is as follows: first, an adjustable feeding-hopper whose mouth is equal in width to the ore-bed; second, an ore-bed placed in an essentially horizontal position, so that it will carry the ore so as to prevent lateral movement of the particles; third, a horizontal blast-plate occupying the whole area of the blast-chamber, and provided with valves enough to admit the air freely to all parts of the chamber, and adjusted to move bodily in a vertical direction, so as to effect a blast of uniform intensity against all parts of the ore-bed exposed to it; fourth, removing the lighter particles from the heavy ones after stratification has taken place by means of the air-blast, by a horizontal splitting-knife which lies parallel with the ore-bed and is adjusted vertically, so as to pass between the strata and separate the stratum of rock from the stratum of mineral. By the use of this separating-knife the strata are split apart as the ore-bed moves, and there is no piling up of the rock, as is the case where it is removed by a scraper.

In contradistinction to the above, and to illustrate fully the scope of my improvements, I refer to the patent of S. R. Krom, November 20, 1866, No. 59,773. In this patent will be seen the movable ore-bed superimposed above a blast-chamber; but the ore-bed is placed on an incline, and the lighter particles are made to roll back down the incline past the small-mouthed hopper, and are discharged from the machine at the opposite side from which the metal is discharged. The material on the ore-bed is not kept of uniform thickness, and the particles have to move upon each other laterally, in order to discharge the light stratum. The mouth of the hopper is narrow, in order to allow the tailings to pass by it, and hence the oncoming sand is not evenly spread on the table. There is no horizontal blast-plate for giving a uniform blast.

Having thus fully described the object, purpose, and scope of my invention, I will proceed to describe the construction and operation of my device, as shown in the accompanying drawings.

Figure 1 is a longitudinal vertical section through the center of the machine. Fig. 2 is a plan view of the top of the machine, with parts removed or broken so as to show parts below. Fig. 3 shows the manner in which a blast from a fan may be applied so as to obtain uniformity of action, if desired.

A is the hopper in which the granulated ore is placed to be fed to the machine. C is the ore-bed. This is made of fine wire, and has meshes so small as to prevent the granulated ore passing through them, but which admit of a free passage of air up through them. D is the blast-chamber, over which the ore-bed is placed. B are the side boards of the ore-bed. C′ C′ are rollers on which the ore-bed, which is in the form of an endless belt,

is adjusted so as to be moved by them. The ore-bed passes under the hopper and over the air-blast chamber by a slow and steady motion.

The machine should be so placed that the ore-bed shall lie perfectly horizontal. The mouth of the hopper is of the same width as the ore-bed, and the ore falls upon the bed in a perfectly even layer, and as it moves with the bed over the blast no lateral movement of the particles is permitted, and no unevenness of thickness of the layer will occur.

E is the blast-plate, which fits the chamber D, and it moves vertically therein by means of a tappet-wheel operating upon it or appliances connected with it and a reacting-spring, H. The walls of the blast-chamber are parallel, and the blast-plate moves in it like a piston-head. This plate is provided with openings E′, (see Fig. 2,) which are covered by valves *e*. There should be enough of these valve-openings to insure the filling of the whole space above the plate with air quickly as the plate descends, for the movement of the plate is rapid, and it sends, when reacted by a spring, H, quick sharp puffs of air through the meshes of the bed. These air-puffs agitate the ore vertically, and the result is, that the particles of rock which are lighter than the metal rise to the top of the layer, while the heavy metal settles to the bottom, and thus a stratification of the ore takes place. None of the work is done by screening, but is wholly specific action.

I do not desire to be limited to any precise means for operating the blast-plate; but its action must be such as to throw pulsations of air through the ore-bed.

By the continuous action of the ore-bed the layer of ore on it after it is stratified by the action of the blast is presented to the splitting-knife N. This knife is very thin on its edge, and it lies parallel with the ore-bed, and is made so as to be adjustable vertically, so that it can be so placed as to come in contact with the layer on the bed at the line of demarkation between the stratum of metal and the stratum of ore.

The knife, at its rear or back, may be deflected down, so as to serve as an apron or chute; but this must be beyond the point where the bed runs around the roller. This knife will receive the upper stratum, and the lower stratum will pass on with the bed, and as it passes around the roller the metal will be deposited in a separate receptacle from the stratum taken up by the knife. Thus the separation is effected, and that, it will be seen, is done after the stratification has taken place.

The operation of my machine will thus be seen to be, first, a perfect and even spreading of the ore upon the bed; second, a stratification of this layer of ore; and, third, a separation of the strata thus formed. The first of these operations takes place before the ore reaches the blast-chamber, the second while the ore is over the blast-chamber, and the third after it has passed beyond the blast-chamber. The movement of the ore during these operations is continuously horizontal and in one direction, excepting, of course, the vertical action of the ore while exposed to the blast.

A particle of ore when started from the hopper never turns back, nor does it move forward, except as it moves with the ore-bed.

What I claim is as follows:

1. In combination with the horizontally-movable bed of an ore-concentrator, a blast-chamber located directly beneath and extending across the entire width of the same, and provided with a plate or piston which fills said chamber horizontally, and when moved upward causes a uniform flow of air upward through the superimposed portion of said bed, substantially as specified.

2. In an ore-concentrator which has a horizontally-movable ore-bed, the combination therewith of a splitting-knife placed parallel with said bed, substantially as and for the purposes set forth.

3. An ore-concentrator having the following elements: an air-blast chamber, a superimposed horizontally-traveling ore-bed, a feeding-hopper with mouth of equal width with the ore-bed, and a splitting-knife placed parallel with said bed, constructed and arranged to operate in the manner substantially as described.

4. An ore-concentrator in which is combined the following elements, viz: a horizontal continuously-moving ore-bed, mechanism for feeding ore upon the same, and mechanism for producing a blast which shall force a current of air upward uniformly through each portion of the said ore-bed, substantially as and for the purpose set forth.

In testimony whereof I, the said EDWARD W. STEPHENS, have hereunto set my hand.

EDWARD W. STEPHENS.

Witnesses:
JNO. K. HALLOCK,
JOHN FERRIER.