

(No Model.)

E. B. HASTINGS.
Ore Separator.

No. 236,023.

Patented Dec. 28, 1880.

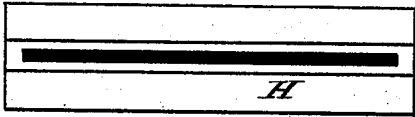


Fig 2

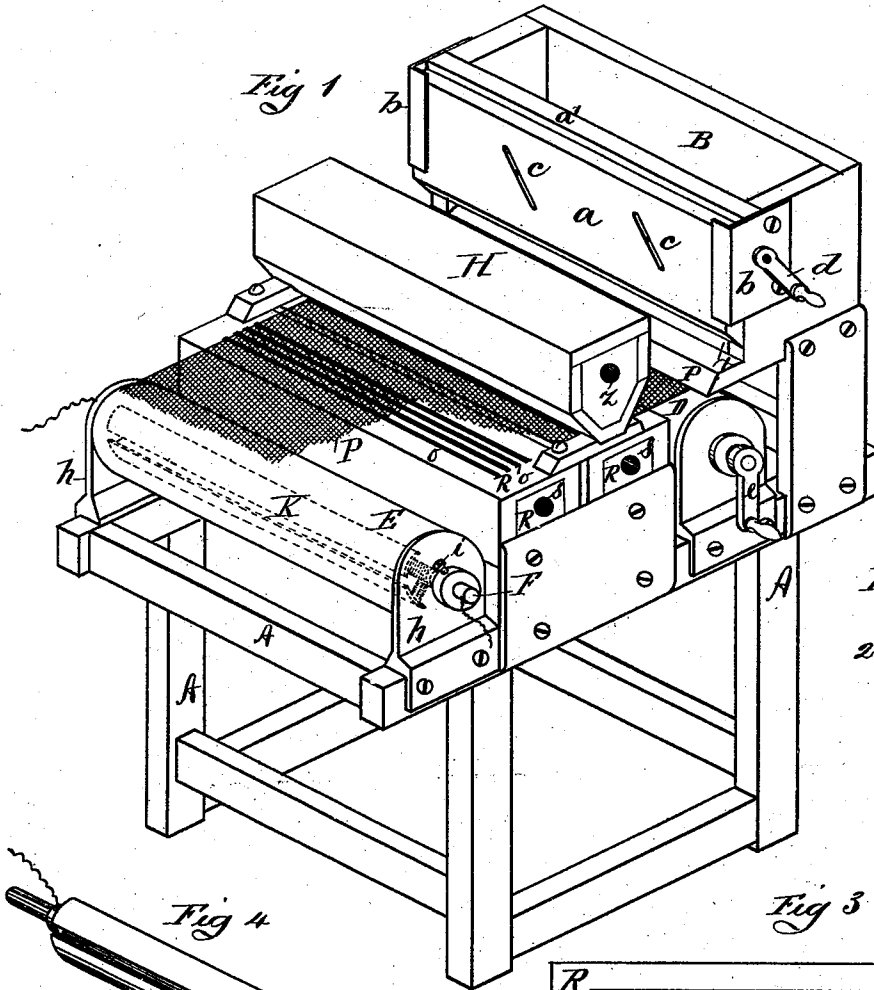
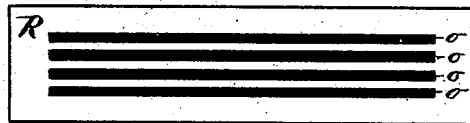
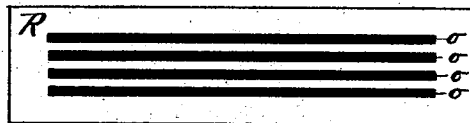


Fig 1

Fig 5

Fig 4

Fig 3



Witnesses
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EMORY B. HASTINGS, OF PALMER, MASS., ASSIGNOR OF ONE-HALF TO
ROBERT L. GODDARD AND JOSEPH F. HOLBROOK, OF SAME PLACE.

ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 236,023, dated December 28, 1880.

Application filed April 7, 1880. (No model.)

To all whom it may concern:

Be it known that I, EMORY B. HASTINGS, a citizen of the United States, residing at Palmer, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Ore-Separators, of which the following is a specification.

My invention relates to that class of ore-separators in which the stamped ore and bearing rock are separated one from the other by being brought in contact with a blast of air; and the object of my invention is to provide improved devices for manipulating said stamped ore-bearing rock, whereby a more perfect separation of ore and earthy substances is obtained, and for operating upon magnetic ores so as to subject the product of the stamp-mill to both pneumatic and magnetic action, whereby nearly all of the metal is saved.

I attain the above objects by the construction and devices illustrated in the accompanying drawings, in which—

Figure 1 is an isometrical view of my improved machine, showing its wire-cloth apron broken away. Fig. 2 is a plan view of the under side of the exhaust-box. Fig. 3 is a plan view of the upper sides of the blast-boxes, and Fig. 4 is a view of the magnet and its shaft detached from the machine. Fig. 5 is a vertical section of one of standards *h*.

Like letters refer to like parts in the several figures.

Upon a suitable frame, A, I mount the various parts of the machine, which consist of an ore-box, B, adapted to receive the stamped material to be operated upon. Said box B is provided with a gate, *a*, which is caused to be lifted or lowered, by mechanism hereinafter described, to govern the discharge of the pulverized material through an aperture, *x*, onto the endless apron of the machine. The gate *a* is held against the side proper *a'* of the box by two corner clips, *b*, and a bar worked horizontally in a groove in side *a'* has inserted in it two pins, *c*, which project into two oblique slots. (Shown in gate *a*.) The said bar, in which pins *c* are fixed, is moved longitudinally in side

a by turning the crank *d*, to which is attached a screwed rod, which engages in a nut fixed in the end of said bar.

An apron-roll, D, is adapted to be revolved in proper bearing-supports on frame A by applying power thereto by means of a driving pulley or gear secured to the roller-shaft where the crank *e* is shown. A second apron-roll, E, is supported between two standards, *h*, on frame A. Roller E is tubular in form, and is adapted to revolve on inwardly-projecting hubs 2, formed on the inner sides of standards *h*.

A shaft, F, runs centrally through roller E, supported in standards *h*, in which it is secured by a set-screw, *i*. Upon shaft F is placed an electro-magnet, *k*. (Shown in dotted lines in Fig. 1 as inside of roller E, and illustrated in Fig. 4.) Said electro-magnet is adapted in form transversely over its face to the shape of the interior of roller E, so that the face of the magnet may be quite close to the inside of said roller, and is nearly of the length of the latter.

Upon the rollers D and E is placed an endless apron, P, of wire-cloth or other similar material, and adapted to be moved horizontally on the machine by the revolution of roller D.

Under the top portion of apron P, on frame A, is located one or more air-blast boxes, R, having formed in the upper side thereof air-passages *o*, as shown in Figs. 1 and 3. A current of air under suitable pressure is conducted into boxes R by tubes connected to the openings *s* (shown in the ends of said boxes,) and escapes through the long air-passages *o* with considerable force against the apron P, which is drawn along, sliding over and upon the top side of said boxes, driven, as heretofore described, by roller D.

Directly over the air-blast boxes R, and in close proximity to the surface of apron P, I locate the air-exhaust box H, as shown in Fig. 1. This box is provided with an outlet-opening, *z*, to which is attached a suitable pipe, connecting with an exhaust fan-blower or other suitable pneumatic device for rapidly

and forcibly exhausting the air from said box, the under side of which is provided with a narrow long aperture, as shown in Fig. 2.

In practice I provide an exhaust-box over each blast-box; but in the drawings one is left off, so that the relative arrangement of apron and blast-box may be more clearly shown.

The operation of my machine when used in separating non-magnetic ores is as follows—viz: The fineness of the meshes of apron P is determined by the quality of the stamped ore and quartz, care being taken that it shall be so adapted to the fineness of the ore as to prevent its falling through the meshes, and when this class of ores is treated the magnet K is allowed to rest inactive. At first a small quantity of ore and quartz is allowed to pass over the apron between the blast and exhaust-boxes for the purpose of regulating the air-currents to their densities. The box B is now filled with the stamped ore and quartz, and gate *a* is raised to such a height as will permit the flow of the requisite quantity of material onto the apron, and the latter carries it slowly over the upper side of the blast-boxes R and under the exhaust-box H. It will be understood that the aperture in the latter stands about midway between the outer ones in the blast-boxes R, and that strong blast and suction or exhaust-air currents are simultaneously acting in the space between the boxes R and H, through which the apron, covered with the ore and pulverized quartz, is passing.

The air-blast is continuous in its action through the air-passages *o* in boxes R; but as there are a number of said passages the crushed ore and quartz upon the apron encounters, several times in succession, the blast-currents. Thus the material is, by the employment of a steady air-current, subjected to a species of "jigging" operation, the result of which is to lift the lighter earthy particles of the mass up away from the apron, while the heavier metallic portion lies upon the apron itself. Each time that the stamped material is exposed to an air-blast through one of the passages *o* the lighter earthy part of it is thrown up off from the apron, and is at once caught by the suction air-current which rushes from each side of box H into the aperture in its side next to the apron into said box, whence it is drawn by the air-current escaping therefrom, and discharged into any convenient receptacle.

After stamped material shall have been subjected to the two aforesaid simultaneously-acting air-currents, that portion of it which remains on the apron after it has been carried over the boxes R will be found to consist almost entirely of the metallic portion of it, which is carried over roller E and allowed to drop into any suitable receptacle under it.

When this machine is employed for separating magnetic ores from earthy substances

the magnet E is caused to co-operate with the aforesaid air-currents to remove all foreign substances from the ore, as follows: The magnet is connected by the wires shown in Figs. 1 and 4 with a suitable battery or dynamo-electric machine. Thus, such portion of the surface of roller E and of the wire-cloth apron as is opposite the face of the magnet K inside of said roller will become electrically excited to such a degree as to attract and retain upon the side of roller E, next to the end of the machine, such ore as may be upon the apron at that point just for the instant; but the non-magnetic or earthy matter will fall immediately away from the roller, while the ore will be carried slightly under the roller and dropped as soon as it passes beyond the influence of the magnet.

Attempts which have heretofore been made to cause the separation of ores and earthy substances by subjecting the stamped mass to the action, first, of a lifting air-current, and then directing a current of air against the upwardly-borne lighter substances to blow them away from the ore, have failed to result satisfactorily, owing to the fact that such floating particles as happened to be within the range of the blown air-current would be carried with it, while those outside of its range would fall back onto the ore, and the proper separation would not be effected.

What I claim as my invention is—

1. The within-described process for separating rocky or earthy substances from ores, which consists in spreading said ores and earthy substances over the surface of a moving wire-cloth apron, and while so moving lifting out the light particles by an upward air-blast, and carrying off said particles by an exhausting air-current, substantially as set forth.

2. The hereinbefore-described process for separating rocky or earthy substances from ores susceptible of being influenced by magnetic attraction, which consists in spreading said ores and earthy substances over the surface of a moving wire-cloth apron, and while so moving lifting out the light particles by an upward air-blast, and carrying off said particles by an exhausting air-current, and then subjecting the materials remaining upon the apron to the attraction of an electro-magnet, substantially as set forth.

3. The combination, in an ore-separating machine, of the endless apron P, the air-blast box or boxes R, and the air-suction box or boxes H, substantially as and for the purpose set forth.

4. The combination, in an ore-separating machine, of the endless apron P, the air-blast box or boxes R, the air-suction box or boxes H, and an electro-magnet for acting upon the ore after it has been subjected to the action of lifting and suction air-currents, substantially as and for the purpose specified.

5. The combination, with the endless apron

P, of the air-blast box or boxes R, located transversely thereunder, and provided with a series of longitudinal air-escape passages, o, substantially as and for the purpose described.

5 6. The combination, in an ore-separating machine, of the endless apron P, the air-blast box or boxes R, and an electro-magnet for act-

ing upon the ore after it has been subjected to the action of the air-blast current, substantially as and for the purpose set forth.

EMORY B. HASTINGS.

In presence of—

WM. H. CHAPIN,
GURDON BILL.