No. 661,086. Patented Nov. 6, 1900.

A. H. STEBBINS.

ORE CONCENTRATOR.

(Application filed Dec. 18, 1899.)

(No Model.)

Fig. 1.

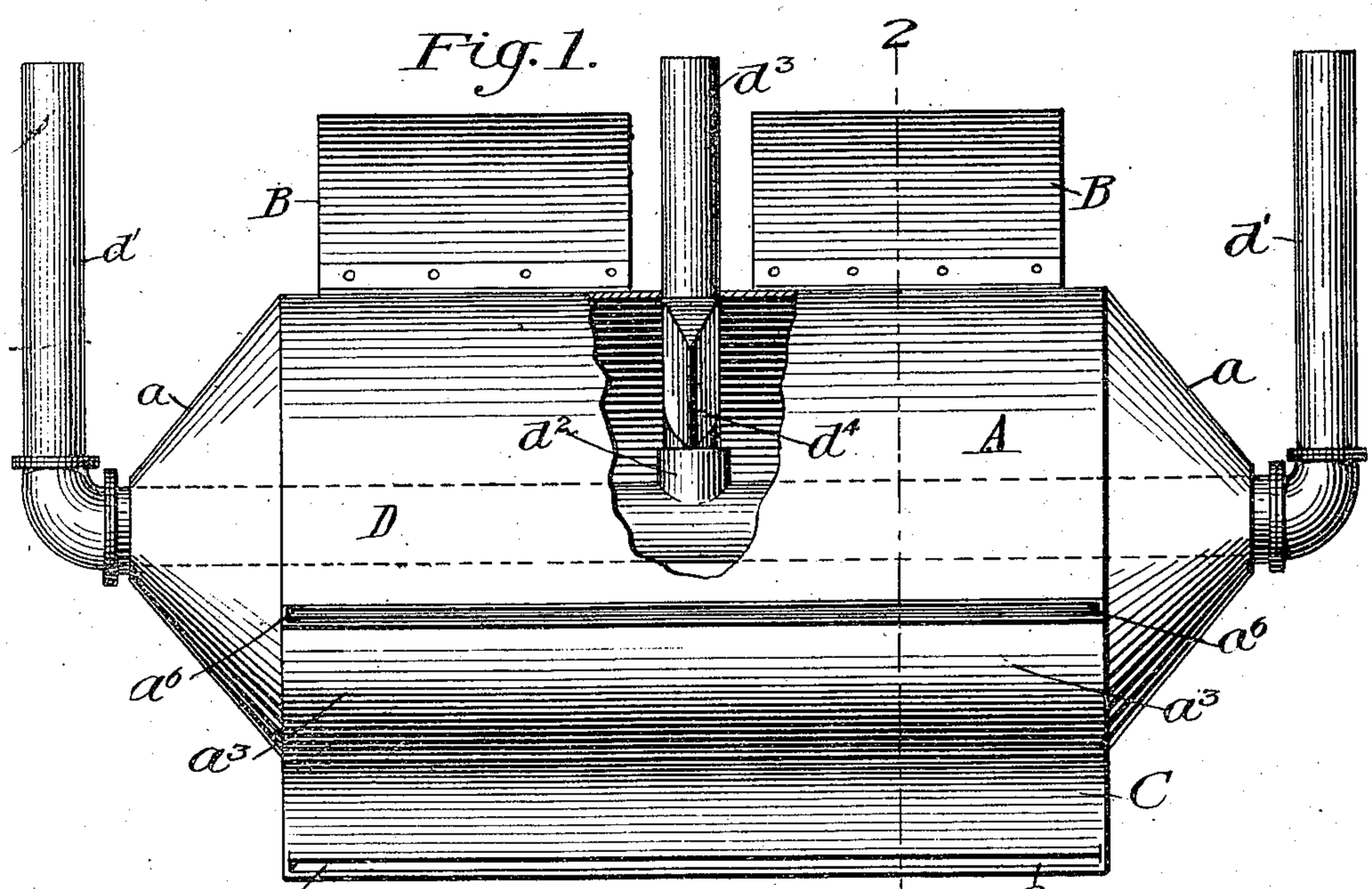


Fig. 2.

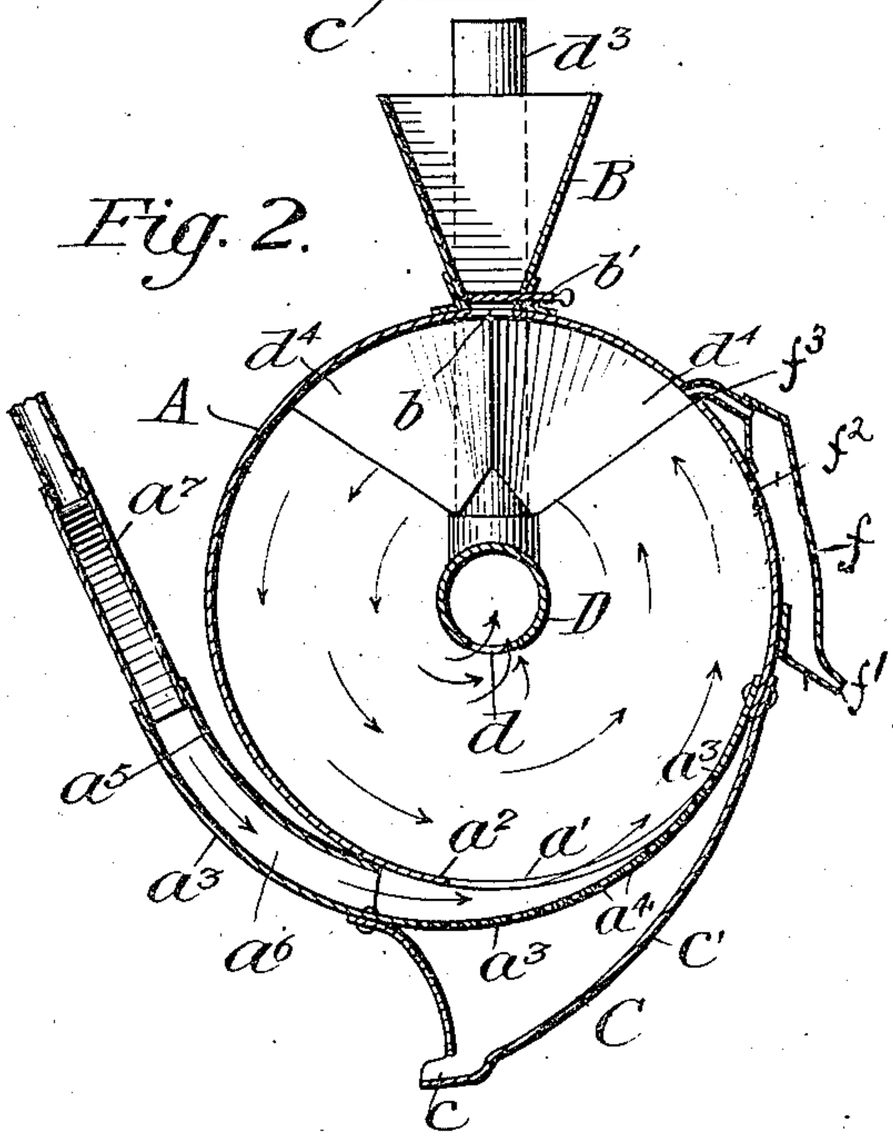
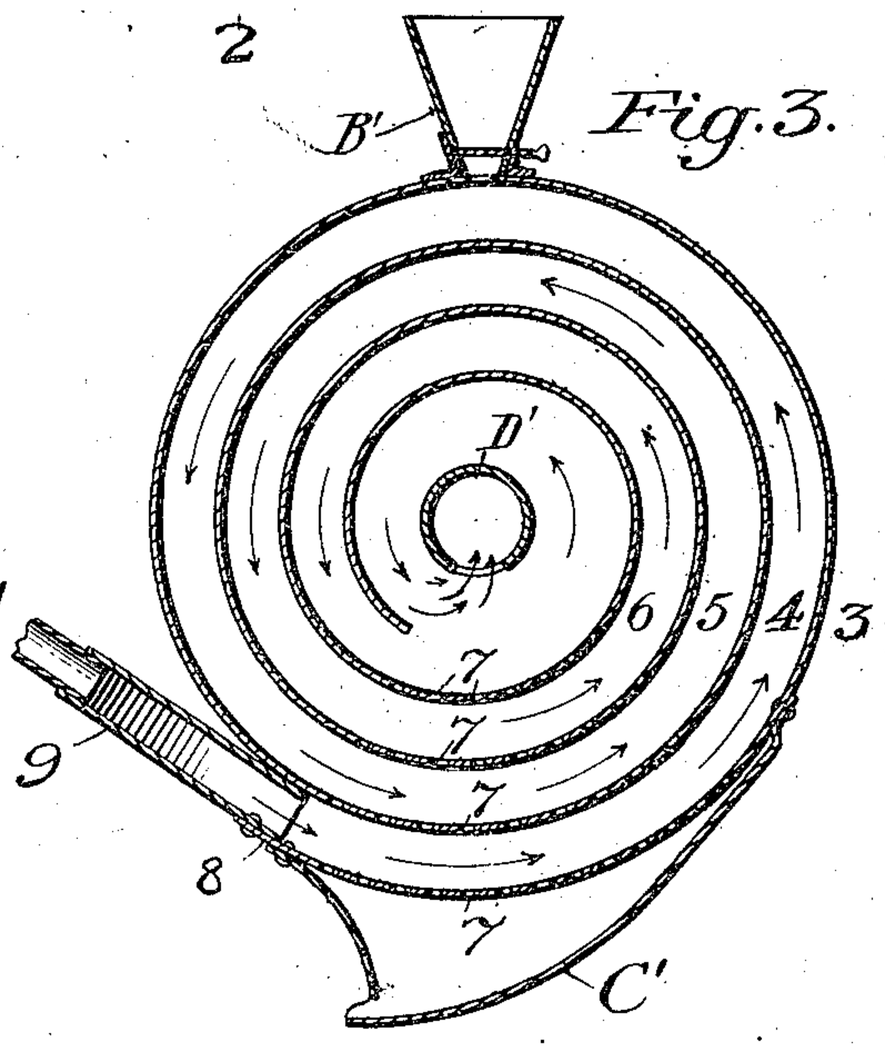


Fig. 3.



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UNITED STATES PATENT OFFICE.

ALBERT H. STEBBINS, OF LITTLE ROCK, ARKANSAS.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 661,086, dated November 6, 1900.

Application filed December 18, 1899. Serial No. 740,805. (No model.)

To all whom it may concern:

Be it known that I, ALBERT H. STEBBINS, a citizen of the United States, residing at Little Rock, in the county of Pulaski, State of Arkansas, have invented certain new and useful Improvements in Ore-Concentrators, of which the following is a specification.

My invention relates to ore-concentrators, and more particularly to a construction of such machine wherein the finely-divided ore is separated from its impurities by means of an air-blast. In my present construction the ore is introduced into a cylindrical or substantially cylindrical drum, which is provided with an air-blast inlet arranged substantially the length of the drum to direct the air-blast in a direction nearly tangential thereto, whereby air-currents are formed which move in circular or nearly circular paths within the drum to thereby permit the heavy and valuable portion of the ore to settle to the bottom of the drum, while the lighter particles are forced by the reduced air-currents into an exhaust-cylinder. I preferably feed the divided or pulverized ores to the drum by one or more chutes arranged above the axial center thereof, and likewise by preference I introduce the air-blast in a thin sheet the substantial length of the drum and in a direction nearly tangential to the drum in order that the circular air-currents will meet the sheet of ground or pulverized ore as it enters through the chute and force the same in circular paths throughout the length of the drum. The circular movement thus produced subjects the ore to a centrifugal action in which the heavier particles are thrown outward to the wall of the drum and ultimately escape through a discharge-opening in the bottom thereof, as will hereinafter more fully appear, and be definitely pointed out in the claims.

In the drawings, Figure 1 is an elevation of one form of my device having a portion of the drum or casing broken away to show the parts within. Fig. 2 is a cross-section on the line 2 2 of Fig. 1, and Fig. 3 is a cross-section of a modified form to be described.

The main separating-chamber consists of a drum A, made of any desired material and preferably of cylindrical form, though it may be varied in this respect without departing from the spirit of my invention, and this drum is provided with end heads a a of any usual or desired form, but shown in this instance as conical. Preferably on the top of drum A are located the feed-chutes B B, extending nearly the length thereof and having narrow feed-openings b, which may, if desired, be regulated as to width by the valve b' to thus control the amount of ore being passed therethrough. While I have shown two of these feed-chutes, it is obvious, of course, that any number may be used; but whatever the number I prefer to make the feed-opening b nearly the length of the drum, so that the ore may be fed substantially throughout the length thereof in a fine sheet.

In the bottom of the drum I provide the air-blast opening a', preferably by making the wall discontinuous at a^2 and continuing the wall a^3 on a curve tangential to the drum. This opening a' extends throughout the length of the drum and serves not only as the inlet for the air-blast, as will presently appear, but also as a discharge-opening for the heavy particles of ore, which, falling through said opening onto the wall a^3, pass through perforations a^4 into the concentrate-box C, which, as clearly indicated in Fig. 1, also extends the length of the drum. The box C has a discharge-spout c, through which the concentrates pass as they fall down the inclined wall c' of the box.

On the side of the drum and above the concentrator-box C, I preferably provide an additional concentrator-box to thereby increase the efficiency of the machine. As the air-blast enters the drum in the form of a thin sheet through the opening a' it is given a circular course by the contour of the drum, and any ores or other material that may fall into the path of the air-currents entering the drum will at once be borne by said currents in their circular movement. Such movement of the ore induces a centrifugal action in the separation of the heavier from the lighter particles, for the reason that the heavier particles will by their increased resistance to change in direction of movement as compared with the action of the lighter particles be thrown to the wall of the drum and travel around in contact with it, there being a constant tendency under centrifugal action for said heavy particles to seek an escape through the wall

of the drum. I have taken advantage of this fact to increase the separating capacity and effectiveness of the machine by providing a side concentrate-box f above the main concentrate-box C. I connect the box f to the drum in any suitable manner and establish communication between the interior of the drum and box by an opening f^2, which may extend more or less the full length of the drum. It may happen under some conditions that an excess of air-pressure will be formed in the side concentrate-box, to relieve which I connect the upper portion of the box to the drum by a small passage way or tube f^3, which will permit the excessive air-pressure to be relieved by a return to the drum. In the bottom of the side concentrate-box I form a discharge-opening f', through which the heavy particles escaping through the opening f^2 may be withdrawn. It will be evident that many of the heavy particles will pass into the side concentrate-box and out of the machine, while the great mass of material will be carried around by the air-currents.

Coextensive with the wall a^3, lengthwise of the drum A, is the wall a^5, thus forming an air-blast inlet or passage a^6, extending the length of the drum, and through any usual or preferred form of connection, as a^7, the passage or inlet a^6 is coupled to any usual air-blast device. (Not necessary to illustrate.)

Passing through the drum lengthwise thereof and preferably axially thereto is a cylinder or pipe D, which I will designate the "exhaust-cylinder." This exhaust-cylinder has an opening d extending substantially throughout its length and preferably located in the lower or bottom portion thereof, and its opposite ends pass through the heads $a\,a$ of the drum, where they connect with the exhaust-pipes $d'\,d'$. I have found by experience that the size of the opening d to secure the best results in practice should be such that its area is slightly in excess of the combined areas of the exhaust-pipes and the width thereof should be about one-fifth the circumference of the exhaust-cylinder, though these dimensions may be varied. Between the ends of the exhaust-cylinder, at the point d^2, I connect the exhaust-pipe d^3 in order to assist in the effectual discharge of the lighter particles or waste products, and in order that the pipe d^3 shall exert a minimum disturbing effect upon the circular movements of the air-currents within the drum I place at opposite sides of the pipe d^3 the wings $d^4\,d^4$, which encircle the pipe and extend on both sides thereof as wedges, which act to gradually divide the air as it circles around the interior of the drum without offering any great disturbing influence upon the circular movements of the air-currents. While I have shown three exhaust-pipes connected to the exhaust-cylinder, it is obvious that the number may be varied as desired and one or more be omitted.

In the modification illustrated by Fig. 3 I have formed the drum as a continuous spiral, in which the several convolutions 3, 4, 5, and 6 are provided with perforations 7 7, through which the heavy particles of ore can pass. The outside spiral, formed by the walls 3 and 4, is connected at 8 to the air-blast connection 9, so that as ore is fed through the chute B' the air-currents carry it around the spiral course and the heavy particles, under the influence of gravity, pass through the perforations 7 and finally into the concentrate-box C', while the lighter waste material continues onward with the currents and is carried into the exhaust-cylinder and from the machine.

It will be noticed that in both the forms of my device the air-blast as it enters the drum in a fine sheet sweeps over the perforations in the wall above the concentrate-box, thus insuring repeated action of the air-blast on the concentrates as they seek to pass into the concentrate-box. The effect of this is to thoroughly eliminate from the valuable products all undesirable light material and a thorough cleaning of the concentrates.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an ore-concentrator, the combination of an outer cylindrical drum, a feed-chute for feeding material to the inside of said drum, an exhaust-cylinder centrally located in said drum and having an opening therein on the side opposite the feed-chute, an air-blast inlet extending the length of said drum and arranged substantially tangential thereto, and a discharge-opening in the wall of said drum over which the blast is directed.

2. In an ore-concentrator, the combination of an outer cylindrical drum, a feed-chute leading into said drum in the upper portion thereof, an exhaust-cylinder having an opening through its wall and extending axially the length of said drum, an exhaust-pipe connected to said exhaust-cylinder, an air-inlet extending the length of said drum and arranged substantially tangential thereto, a discharge-opening in the wall of the drum over which the incoming blast is directed and a concentrate-box below said drum.

3. In an ore-concentrator, the combination of an outer cylindrical drum, a feed-chute for feeding material thereto, an exhaust-cylinder located in said drum, an air-blast inlet extending substantially the length of the drum and arranged tangential thereof and below the feed-opening, a concentrate-box communicating with the lower portion of said drum and a concentrate-box communicating with the side of said drum.

4. In an ore-concentrator, the combination of a drum having an opening in the lower portion, a feed-chute having an elongated opening to feed the material thereto in a sheet lengthwise of the drum, an exhaust-cylinder arranged axially of said drum and having an opening in the wall thereof, an air-blast inlet arranged tangential to and extending the length of the drum, the lower wall of said air-

blast inlet being provided with perforations, and a concentrate-box below said perforations.

5. In an ore-concentrator, the combination of a drum, a feed-chute having an elongated opening through which the material is fed to the interior of the drum in a thin sheet and a valve in said opening, an exhaust-cylinder within the drum and having an opening in its wall opposite the feed-opening, said drum being provided in its lower portion with an opening extending the length thereof through which the concentrates pass, an air-inlet communicating with said opening and arranged tangential to the drum, and a concentrator-box below the drum.

6. In an ore-concentrator, the combination of a drum having an opening in its lower portion throughout its length, an air-inlet in communication with said opening and arranged tangential to the drum, a feed-chute having an elongated opening, an exhaust-cylinder within said drum, an exhaust-pipe communicating with said cylinder through the cylindrical wall of the drum and wings extending on opposite sides of the exhaust-pipe in the space between the exhaust-cylinder and the interior wall of the drum.

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