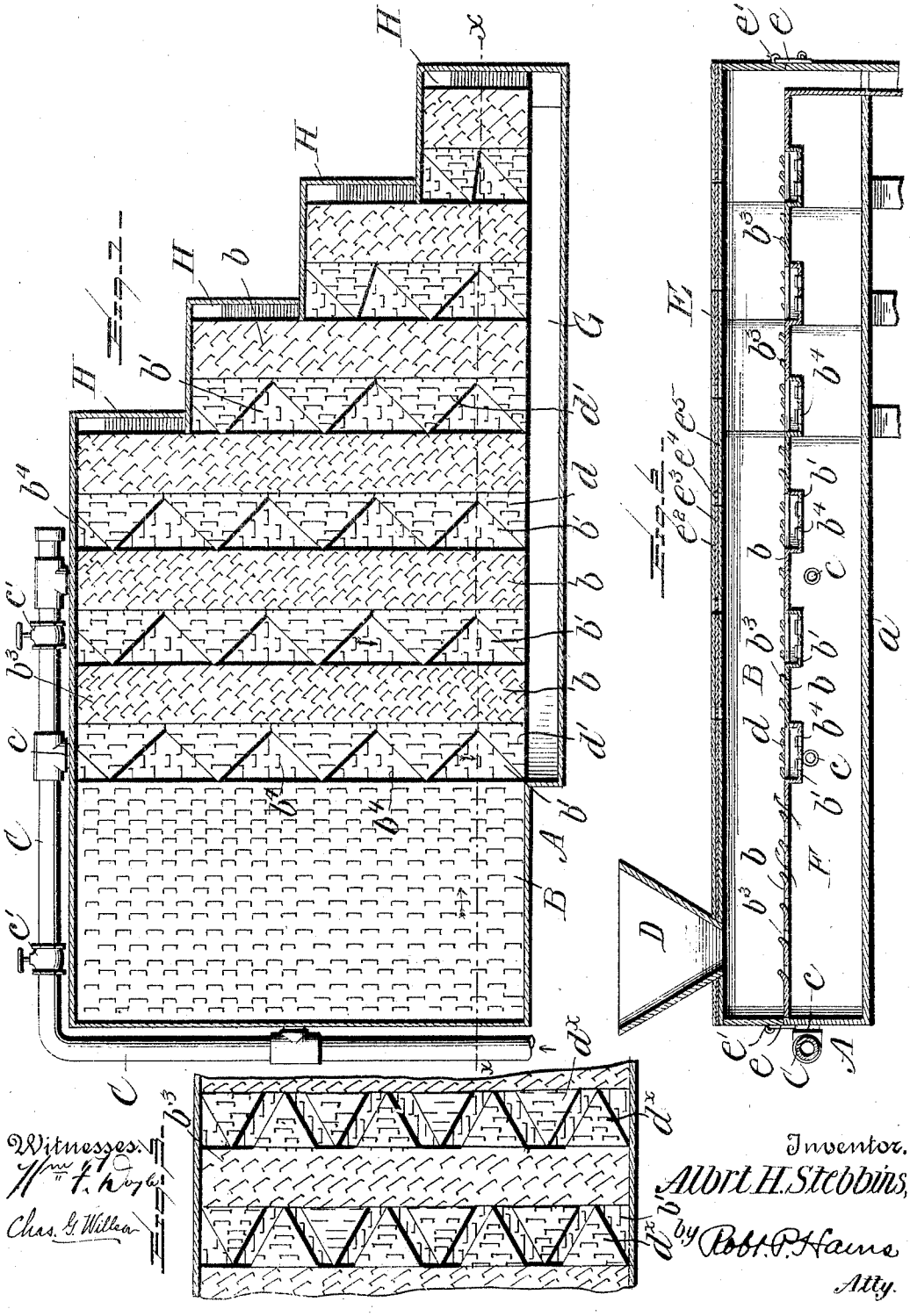
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A. H. STEBBINS.

CONCENTRATING MACHINE.

APPLICATION FILED MAR. 10, 1902.

NO MODEL.



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No. 775,947. Patented November 29, 1904.

UNITED STATES PATENT OFFICE.

ALBERT H. STEBBINS, OF LITTLE ROCK, ARKANSAS.

CONCENTRATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 775,947, dated November 29, 1904.

Application filed March 10, 1902. Serial No. 97,507. (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 and State of Arkansas, have invented certain new and useful Improvements in Concentrating-Machines, of which the following is a specification.

The invention to be hereinafter described relates to concentrators whereby metals and ores are separated and reclaimed from their accompanying impurities. When material containing metals and valuable ores is subjected to the action of an agitating force, it becomes stratified and the light or waste material will rise to the top of the mass, while the metals and valuable ores constituting the heavier particles will gravitate to the bottom of the mass, and if when the mass is thus stratified the upper portion is subjected to a moving force in one direction while the lower section is subjected to a moving force in a different direction it is evident that the valuable portions of the mass may be separated and collected from the remainder.

It is the general object of my present invention to provide means for carrying out the operations above indicated—that is, for stratifying the mass of material by the passage therethrough of air or other fluid currents and to then direct such air or fluid currents into different courses, so that the lighter particles in the stratified mass will be moved in one direction while the heavier particles in the mass will be moved in a different direction, and while in the present embodiment of my invention I have shown an apparatus provided with means for giving a definite direction to the two portions of the stratified mass referred to it is obvious that the direction of either portion of the mass may be changed to suit the particular circumstances or characters of ore being treated.

With the above general objects in view my invention consists of the parts and combinations, as will be hereinafter more fully described, and definitely pointed out in the claims.

I do not claim, broadly, in this specification a separating-surface having perforated sections arranged in different planes except in combination with cutting-board extended over the sections in the lower plane, as such forms the subject of my application, Serial No. 92,494, filed February 14, 1902.

In the drawings, Figure 1 is a plan view of an apparatus embodying my invention, the top or cover being removed to more clearly disclose the parts beneath constituting the concentrating-surface. Fig. 2 is a section on line x x of Fig. 1; and Fig. 3 is a detail plan of a portion of the concentrating-surface and its cutting-boards, presenting a modified form to be hereinafter explained.

The main body of the machine consists of a box-like frame A of any suitable form and construction in which is supported some distance above the bottom a thereof a concentrating-surface (designated generally by the letter B) and on which the material, preferably in a finely divided or comminuted state, is fed or delivered through a suitable hopper D, supported above the concentrating-surface, as shown, on the detachable lid or cover E, the said cover when in use being detachably connected to the box-like frame A by any desirable form of latch or hook connection e e'.

The concentrating-surface B is provided with perforations arranged in a plurality of series, each series of perforations being arranged at an angle to the perforations of another series to direct the air or fluid currents across the concentrating-surface in different directions, as will hereinafter more fully appear. The concentrating-surface B is preferably formed of a series of concentrating-sections b b', arranged in different planes, as more clearly shown in Fig. 2, the number of said different planes being represented as two in the construction illustrated—that is, all of the sections b are arranged in one plane, while all of the sections b' are arranged in another plane below the plane of sections b; but it is evident, of course, that the number of planes of sections may be varied, although the construction embodying the two planes of sections, as illustrated, has been found by me to give good practical results. It will also be evident that where a greater number of planes

of concentrating-sections are employed they will be arranged substantially as shown in Fig. 2—namely, the upper plane of sections will be arranged adjacent to the next lower plane of sections throughout the series of planes of sections, so that an upper section will alternate with a section on the plane next below it.

Between the concentrating-surface B and the bottom *a* of the box-like frame A is an air or fluid chamber F, into which suitable continuous or intermittent blasts of air or other fluid may be introduced by means of a pipe C, connected at suitable intervals, as at *c*, with the box-like frame beneath the concentrating-surface. If desired, I may provide one or more valves in the pipe C, as at *c'*, so that the force and character of blasts of air or other fluid may be controlled as they enter the air or fluid chamber F and whereby said blasts may be permitted to be introduced at one or a plurality of points beneath the concentrating-surface B, as will be evident from Fig. 1.

The upper concentrating-sections *b* of the concentrating-surface are perforated, so as to direct air or other fluid currents across the surface of the upper concentrating-sections *b*, as shown in Figs. 1 and 2, the said perforations being formed by forcing a portion of the material of said section upward or offsetting it above the opposite wall of the opening thus formed, as shown at b^3. The lower plane of concentrating-sections *b'* are likewise perforated in a similar manner by forcing a portion of the material of each section upward and offsetting it, as before stated, with the opening directed at an angle to the openings in the upper concentrating-sections *b*, as shown at b^4 in Fig. 2. In the present illustration of my invention I have shown the perforations b^3 in the upper concentrating-sections *b* as directed diagonally across said concentrating-sections, (see Fig. 1,) and I have shown the perforations b^4 in the lower concentrating-sections *b'* as directed across the machine or lengthwise of the concentrating-sections *b'*; but it is to be understood, of course, that the relative directions given to the perforations in the different planes of sections may be varied as desired and will be controlled also by the character of material being treated and the character of fluid available for use. In any event, however, the perforations in one plane will direct the currents in a different direction to thereby cause the different portions of material under treatment to be moved in different directions, as hereinbefore generally referred to.

While the apparatus constituting my invention may be employed without a cover E during the treatment of some forms of material, yet such cover is desirable under some conditions, and I have therefore provided a cover E, adapted to be removably secured to the box-like frame above the concentrating-surface B, as hereinbefore described; but in the use of said cover it is desirable also that the air or fluid currents have a certain amount of escapement, and this I accomplish by forming the cover as best shown in Fig. 2—that is, of two layers of perforated material, such as e^2 e^3, having the perforations e^4, with a middle layer e^5 of some permeable material, such as a fabric, the purpose of which is to confine the material under treatment and the air or fluid currents and yet permit such air or fluid currents a certain amount of relief. While the construction of cover I have above described is a good practical form, yet it will be understood that any form of cover which will permit the air or fluid currents to slowly pass therethrough will answer the purpose.

At the side of the machine I have provided a concentrate-chute G, into which the concentrates or heavy portion of the material under treatment may fall from the concentrating-surface and be collected at the end of the chute. This concentrate-chute in the form of the apparatus illustrated is disposed along the edge of the box-like frame; but it will be understood that such concentrate-chute may be located in any convenient position to receive thereinto the concentrates or heavy portion of the material as it is delivered from the concentrating-surface. At the end of the machine also I have disposed a series of waste-chutes H, into which the light portions of the material may be discharged, preferably from the upper section *b*, as shown, and while I have shown a number of such waste-chutes it will be evident that the number may be varied as desired and disposed differently with relation to the concentrating-surface.

From the construction thus far described it will be noted that ore-pulp or like material fed to the concentrating-surface B through the feed-chute D or at that end of the machine will be acted on first by the currents of air or fluid passing through the upper section *b*, which currents by direction of the openings b^3 will cause the mass of material thereon to become stratified more or less, with the heavier particles at the bottom, and simultaneously with such stratification the material will be fed by the force of these currents toward the opposite end of the machine until it reaches the first concentrate-section *b'* in the lower plane within the section *b*, at which point the valuable particles will gravitate to the bottom or directly upon said section *b'*, and by direction of the perforations b^4 in said section the said valuable products will be moved along the length of said concentrate-section *b'*, while the light or waste material forming the main portion of the upper strata will be carried onto the next upper section *b*, and so from section to section of the concentrate-surface the material will be subjected to repeated stratification and movement of the heavier particles in one direction, while the lighter particles will

be moved in another direction. In order to facilitate the movement of the lighter particles from the top of the mass contained on any lower section b', I have provided cutting boards or knives, preferably shaped as a saw-tooth or scalloped, as shown at d, the said cutting-boards being arranged above the lower concentrating-sections b', the ends of the cutting-board preferably resting upon the edges of the adjacent upper concentrating-sections b, so that they in reality form bridges covering a portion of the space above the lower concentrating-sections b'. The saw-toothed or scalloped cutting-boards are preferably perforated, as at d', in a manner similar to the formation of the perforations in the concentrating-sections, so that any material passing onto the top of the said cutting-boards will be transferred by the passage of the air or fluid currents through said perforations onto the next higher concentrating-section b. The forces used for transportation of the material over the cutting-boards are the forces coming through the concentrating-surface beneath the said boards, such forces being the air or fluid currents, and it being but a relatively short distance between the cutting and conveying board and the concentrating-section b' beneath the same the layer of ore-pulp under the said board will be comparatively thin and the air or fluid gets through it easily, passing therefrom on through the perforations in the cutting and conveying board, by which perforations it receives any new desired direction and serves to transfer the material in that direction when it lodges upon the surface of the said board.

It will be evident from the construction thus far described that as the stratified material passes from the upper section onto a lower section b' and is moved by the force of the air or fluid currents in a new direction, owing to the perforations in the lower concentrating-section b', the upper strata of light material will be cut by the cutting boards or knives d from the lower portion of the material, and such light material passing onto the top of the cutting-boards will be given a new direction of travel by virtue of the perforations d' in said boards, whereby the light material will be transferred onto the next higher concentrating-section b, and this operation will continue throughout the extent of the machine until finally the lighter portion of the material being now thoroughly denuded of its valuable portions will fall into one of the waste-chutes H, while the heavier particles will be transported by the lower concentrating-sections b' into the concentrating-chute G.

The apparatus as thus described consists of an arrangement of a concentrating-surface in which are combined various levels or planes with perforations therethrough to direct the fluid forces in a manner for each level or plane to work independently of the adjacent one and yet in a sense in conjunction therewith and the placing at the lower planes of cutting boards or knives, preferably perforated, to segregate from the material on the lower planes the top part thereof and facilitate its transportation to an adjacent higher plane. It is obvious, of course, that the concentrating-surface may be arranged at any desired angle from a horizontal; but I have found that the form illustrated gives good practical results; but, in fact, the concentrating-surface may be so arranged that different angles may be attained, if desired, and the saw-toothed cutting-boards may be differently disposed over the lower plane of sections of the concentrating-surface than that disclosed in Figs. 1 and 2, and I have shown as a modification of this a construction in Fig. 3, wherein the cutting and conveying boards $d^{\times}$ are arranged over the lower concentrating-section b' alternately with their point or apex in different directions, as indicated in Fig. 3, and other modifications will suggest themselves to one versed in this class of machines; but the principle involved will remain unchanged—that is, a disposition of cutting-boards above the lower plane of concentrating-sections to transport the upper strata of material from the lower concentrating-sections b' to the upper concentrating-section b, as hereinbefore fully described. In the present embodiment of my invention I have also shown the concentrating-sections as of uniform size and dimensions and parallel with each other; but this is merely a matter of convenient form, as they may be arranged in varying sizes, as will be evident without illustration, and their angular disposition to each other and to the box-like frame may be varied likewise.

The present apparatus, while primarily designed for the separation of dry material, can be used with advantage with both air and water or either of them as the separating medium, and in either case the air or water forced from beneath through the concentrating-surface accomplishes all the agitation necessary for stratification, and thereby eliminates the necessity of shaking and jigging machinery.

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

1. In an ore-concentrator, the combination of a frame, a perforated concentrating-surface supported thereby and a fluid-chamber beneath said surface, said concentrating-surface comprising sections arranged in different planes, means for introducing blasts of gaseous fluid beneath the concentrating-surface to stratify and move material supported thereon, and cutting-boards extended over the lower sections to cut the top layers of material from the stratified mass upon the lower sections and transfer it to a section in a higher plane.

2. In an ore-concentrator, the combination of a frame, a concentrating-surface supported

thereby above the bottom of said frame to provide a fluid-chamber, said concentrating-surface comprising perforated concentrate-sections arranged in different planes, the perforations of the different sections being arranged at an angle to each other, means for introducing fluid-blasts beneath the concentrating-surface, and cutting-boards disposed above the concentrate-sections of the lower plane to cut the top portion from the material upon the lower concentrate-sections and transfer it to a concentrate-section in a higher plane.

3. In an ore-concentrator, the combination of a frame, a concentrating-surface supported thereby above the bottom of said frame to provide a fluid-chamber, said concentrating-surface comprising perforated concentrate-sections arranged in different planes, the perforations of the different sections being arranged at an angle to each other, the walls of said perforations being offset to direct the currents of fluid over said sections, means for introducing fluid-blasts beneath the concentrating-surface, and cutting-boards disposed above the concentrate-sections of the lower plane to cut the top portion from the material upon the lower concentrate-sections and transfer it to a concentrate-section in a higher plane.

4. In an ore-concentrator, the combination of a box-like frame, a concentrating-surface comprising perforated concentrate-sections arranged in different planes, the walls of the perforations in said sections being offset to direct fluid-currents over said concentrate-sections, and the perforations in the sections of one plane being angularly disposed with relation to the perforations in the sections of another plane so that the fluid-currents issuing through the perforations in the sections will tend to move the material in different directions, means for introducing fluid-currents beneath the concentrate-sections, and cutting-boards disposed above the sections in the lower plane to cut off the top portion of the material supported on said lower sections.

5. In an ore-concentrator, the combination of a box-like frame, or concentrating-surface supported by said frame and comprising perforated concentrate-sections arranged in different planes, means for introducing blasts of gaseous fluid beneath said concentrate-sections to stratify and move material supported thereon, and perforated cutting-boards disposed above the concentrate-sections in the lower plane to cut off and direct the top portion of material supported on said lower sections onto a section in a higher plane.

6. In an ore-concentrator, the combination of a box-like frame, a concentrating-surface supported by said frame and comprising perforated sections arranged in different planes, means for introducing blasts of gaseous fluid beneath said concentrate-sections to stratify and move material supported thereon, and perforated cutting-boards wider at one end than at the other disposed above the concentrate-sections in the lower plane to cut off and direct the top portion of material supported on said lower sections onto a section in a higher plane.

7. In an ore-concentrator, the combination of a frame, a perforated concentrating-surface supported thereby to provide a fluid-chamber beneath said surface, said concentrating-surface comprising sections arranged in different planes, means for introducing blasts of gaseous fluid beneath the concentrating-surface to stratify and move material supported thereon, and cutting-boards extended over the lower sections to cut the top layers of material from the stratified mass upon the lower sections and transfer it to a section in a higher plane, and a cover supported above the concentrating-surface.

8. In an ore-concentrator, the combination of a box-like frame, a concentrating-surface supported by said frame and comprising perforated concentrate-sections arranged in different horizontal planes, means for introducing blasts of gaseous fluid beneath the concentrating-surface, cutting-boards disposed above the lower concentrate-sections, the perforations in the sections in different planes being arranged at an angle to each other to move material thereon in different directions and the said cutting-boards being provided with perforations to direct the material supported thereby onto the higher concentrate-sections.

ALBERT H. STEBBINS.

In presence of—
J. E. LEAS,
J. M. WELLS.