No. 782,078. PATENTED FEB. 7, 1905.

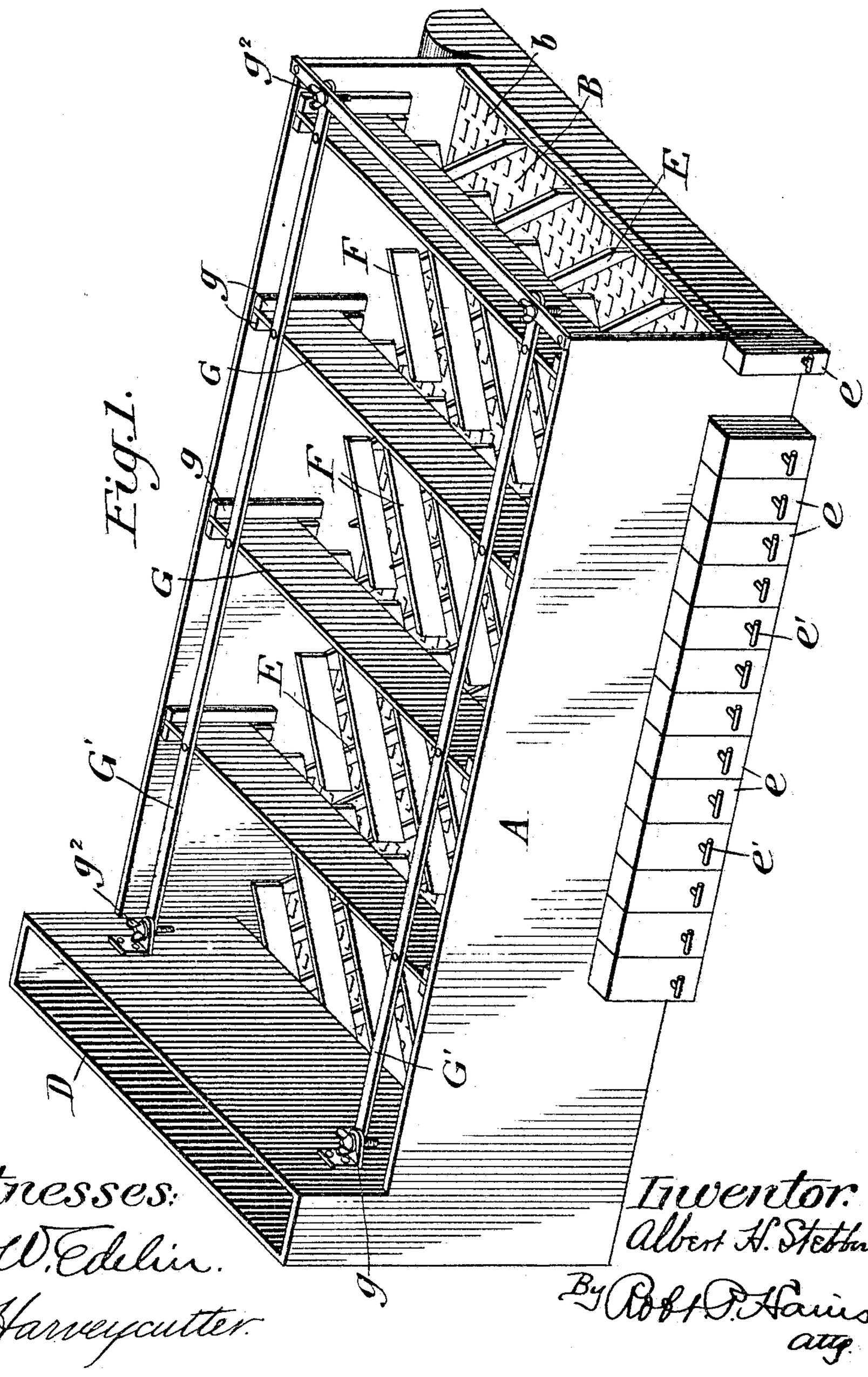
A. H. STEBBINS.

ORE CONCENTRATOR.

APPLICATION FILED OCT. 9, 1902.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
D. W. Edelin.
A. Harveycutter.

Inventor:
Albert H. Stebbins.
By Robt. P. Harris.
Atty.

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2 SHEETS—SHEET 2.

Fig. 2.

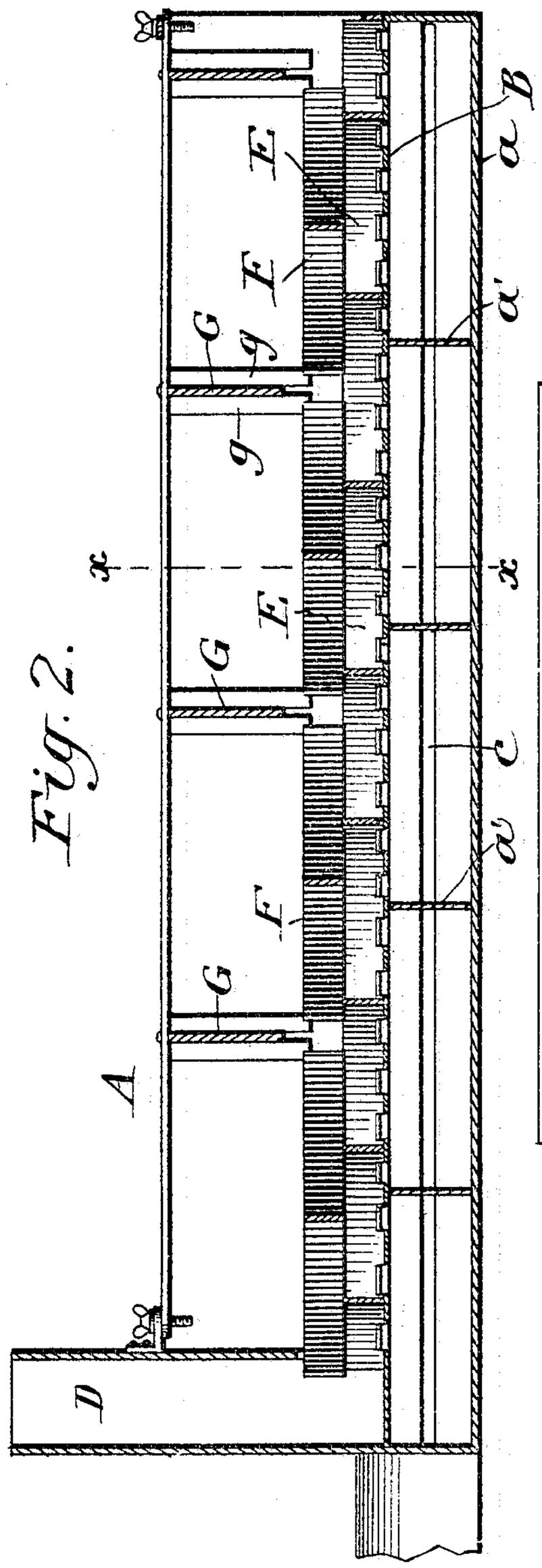
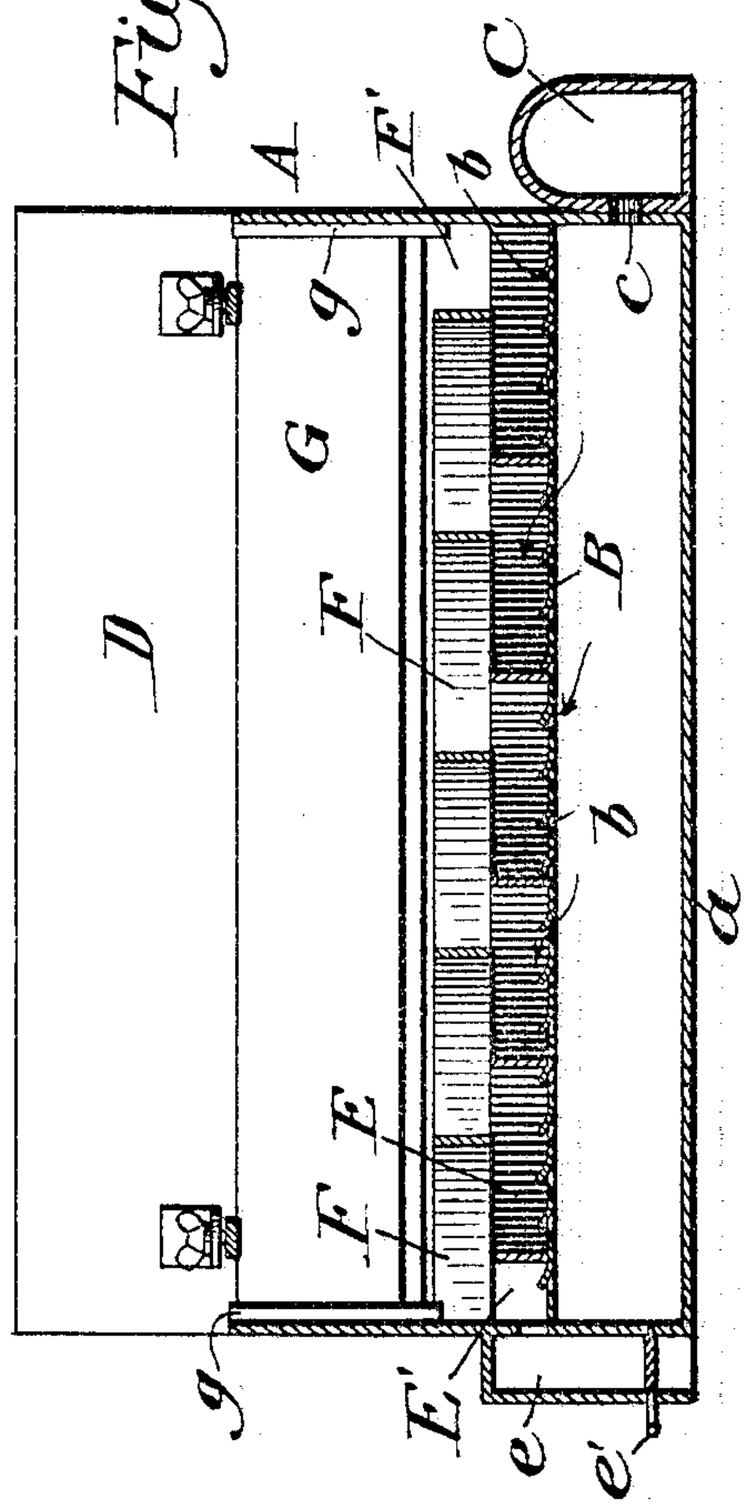


Fig. 3.



Witnesses:
O. W. Edelin.
A. Harveycutter.

Inventor:
Albert H. Stebbins,
By Robt. O. Harris.
atty.

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UNITED STATES PATENT OFFICE.

ALBERT H. STEBBINS, OF LITTLE ROCK, ARKANSAS.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 782,078, dated February 7, 1905.

Application filed October 9, 1902. Serial No. 126,478.

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 ground or comminuted material containing metals and valuable ores is subjected to the action of an agitating medium, it becomes stratified and the light or waste material will rise to the top or upper portion of the mass, while the heavier metal and valuable ores will gravitate to the bottom of the mass. If, when the mass is being thus stratified, it is bodily moved over a series of directing wings or guides arranged at different angles to the movement of the mass at different levels, it is apparent that the mass may be separated, the heavier particles being directed by the lower wings or guides and the upper particles by the upper wings or guides, and these two qualities of particles may be independently collected. This treatment when applied to metal or ore bearing material results in the separation of the particles of the mass, the values constituting the lowest strata and moved by the lower guides or wings in one direction, while the lighter and waste particles constitute the upper strata and are moved by the upper guides or wings in another direction.

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 the lighter particles in the stratified mass in one direction and the heavier particles in a different direction, and while in the present embodiment of my invention I have shown an apparatus provided with means, such as wings or guides, 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 character of material 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.

In the drawings, Figure 1 is a perspective view of one simple form of machine embodying my invention. Fig. 2 is a central longitudinal section thereof, and Fig. 3 is a cross-section on line *x x*, Fig. 2.

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 divided or comminuted state, is fed or delivered through a suitable feed-hopper D at one end of the machine. The space between the concentrating-surface B and the bottom *a* of the frame will constitute an air-chamber and may, if desired, be divided into sections or partitions, as *a'*. Extending preferably along one side of the box-like frame A is the air-conduit C, having suitable inlet connection with the air-chamber beneath the concentrating-surface, as by means of the slot *c*, although any usual or desired form of inlet connection may be employed, the conduit itself being in communication with any usual source of air-pressure supply.

The concentrating-surface B is perforated and preferably, though not necessarily, formed of sheet metal, the perforations being desirably formed by punching up a portion of the metal at short intervals, as at *b*, thus forming a lip or offset to direct the air or fluid currents along and over the concentrating-surface, as shown by the arrows, Fig. 3. In the present embodiment of my invention I have shown the perforations formed to direct the air or fluid currents crosswise of the machine over the concentrating-surface to better enable the force of the fluid-currents to move the heavier particles toward the concentrate-chutes, as will more fully hereinafter appear, and although this has been found to be a desirable disposition of the perforations it is evident that the direction thereof may be varied to suit the special circumstances in any case without departing from the spirit of my

invention. Arranged along one side of the box-like frame A are a series of concentrate-chutes *e* to carry the values from the concentrating-surface, and each chute may be provided with a stopper or valve, as *e'*, whereby any number of chutes may be shut off, as desired.

Immediately above and resting upon the concentrating-surface B are a series of guiding partitions or wings E, extending from one side of the box-like frame diagonally toward the other, where are disposed the concentrate-chutes *e*. These lower guiding partitions or wings, however, stop short of the side where the concentrate-chutes *e* are disposed, as shown in Fig. 3, to form a concentrating-valley E', Fig. 3, extending longitudinally of the machine and between the ends of the lower guiding-partitions and the side wall of the frame. This is to enable the concentrates to pass down the valley to such chutes as are open, and thus be carried from the machine. Since the lower guiding wings or partitions E serve to guide the lower strata of ore-pulp toward the concentrate-chutes, I will hereinafter designate these lower wings or partitions as the "concentrate-guides."

Above and resting upon the first set of guiding-partitions just described is another set of guiding-partitions F to act upon the upper strata of the material to move them toward the opposite side of the machine. This set of guiding wings or partitions is preferably composed of short pieces or wings, as shown in Fig. 1, extending over two or more of the concentrate-guides, but set so that the material leaving one of the upper guides or partitions comes into contact with another wing to continue its movement in the desired direction. At the space between these short lengths of wings or partitions the material may flow around the ends of the wings to some extent; but the general trend of the light material will by the short length of wing or partition be continued to the desired side of the machine. This set of upper guiding wings or partitions begins against the wall of the machine next over the concentrate-valley, as shown in Fig. 3, and extends on over the concentrate-valley in a more or less broken manner in the direction of the opposite wall of the machine, but does not extend entirely to it, leaving a space for the tailings, and this space, which is above the upper edges of the lower or concentrate guides, as shown in Fig. 3, I will designate as the "tailing-valley," as it extends similar to the concentrate-valley E lengthwise of the machine and adjacent the opposite side thereof, but above the upper edges of the concentrate-guides.

From the construction thus far described it will be apparent that material fed into the feed-hopper D will by proper inclination of the box-like frame A tend to move toward the opposite end thereof, and being acted upon by the air or fluid currents introduced through the conduit C the material will become stratified, the heavier particles gravitating to the bottom. The action of the air or fluid currents, as indicated by the arrows in Fig. 3, is exerted upon the mass of material supported by the concentrating-surface to push it forward in the path or direction given to the currents as they pass through the perforations *b*, such path in the present instance being toward the concentrate-chutes. Such action of the air, however, is of short duration comparatively, and then it loses its forward direction and force and goes upward through the mass of material to give agitation thereto and enable the heavier particles to sift to the bottom. Such agitation of the mass, also by reason of the inclined position in which the machine is held, will cause the entire mass of the material to move from the hopper D toward the discharge end of the machine. The material thus moving over the concentrating-surface being stratified by the air or fluid currents and the heavier particles gravitating to the bottom, the values contained in these heavier particles will by the concentrate-guides be directed toward the concentrate-valley E' and then into the concentrate-chutes *e*, while the lighter particles being carried to the top of the mass will be guided by the upper guiding means or partitions, which I will designate the "tailing-guides," toward the opposite side of the machine into the tailing-valley F' and will eventually be discharged from the end of the machine. It is obvious, of course, that, if desired, suitable discharge-chutes similar to the concentrate-chutes may be provided for the tailings.

Arranged above the concentrate and tailing guides E and F are a set of regulating cross-bars G, extending transverse of the machine and guided at their ends in suitable guideways formed by the guide-strips *g g*. Any number of these regulating cross-bars may be employed, as circumstances may dictate, and they are carried by a longitudinal framing comprising strips G', supported at opposite ends by means of set-screws g^2, whereby the vertical adjustment of the regulating cross-bars G may be made toward and from the tailing concentrate-guides. The short lengths of tailing-guides F are disposed as shown in Figs. 1 and 2, so that the regulating cross-bars G may, if desired, be lowered down between the ends of the tailing-guides to rest upon the top of the concentrate-guides. While I have shown in this illustration of my invention a series of set-screws g^2 for giving proper adjustment to the regulating cross-bars, it will be understood, of course, that any suitable adjusting devices may be employed for this purpose.

The general operation of the machine from the construction thus far described will be evident and, briefly, is to the effect that ma-

terial fed into the hopper D will move toward the opposite end of the machine owing to the slant position in which the machine will be disposed and by virtue also of the agitating force of the air or fluid currents. The regulating-bars G will be adjusted to such position above the tailing-guides, dependent upon the character of material being treated, so as to permit a desired quantity of material to be acted upon and depending also upon the character thereof. The air or fluid currents over the concentrating-surface will act, as already described, to stratify and agitate the mass of material and to move the heavier particles toward the concentrate-chutes, such particles being guided in said movement by the concentrate-guides, the lighter particles at this time being also guided in an opposite direction toward the other side of the machine, where, passing down the tailing-valley, they are discharged from the end, the concentrates being collected as desired from the opposite side. It will be noted that the direction of the inlet of the air or fluid from the conduit C corresponds to the direction of the perforations in the concentrate-surface B, whereby there is no change of direction of these currents as they pass through the concentrate-surface to act upon the material. It will be obvious also that this machine, while primarily intended to be used without any jigging motion, may, however, be used in connection with any suitable jigging apparatus, if desired. It will also be noted that the perforations in the concentrate-surface are so formed that the air or fluid currents being forced therethrough will move at first substantially parallel to and over the concentrate-surface and after acting on the mass of material will then rise therethrough, thus assisting in the stratification and the disposition of the lighter particles at the top or upper portion of the mass. It will be noted that the openings of the said perforations are in the present instance directed so as to force the currents over the concentrate-surface toward the concentrate valley or chutes *e*, thereby assisting the action of the concentrate-guides E in directing the values to the desired point or points. It is obvious that the disposition and direction of perforations or openings may be varied.

It has not been deemed necessary to illustrate or describe any means for jarring the device, as these are well known and may or may not be employed, according to circumstances of use, as will be obvious to one skilled in the art.

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

1. In a concentrator, the combination of a frame, a concentrating-surface supported by said frame, a series of concentrate-guides disposed diagonally over the concentrate-surface, a series of tailing-guides disposed above the concentrate-guides, said concentrate and tailing guides being arranged at an angle to each other, the concentrating-surface being formed of sheet material having perforations therein the walls of which are offset to direct fluid-currents over or substantially parallel to the said surface.

2. In a concentrator, the combination of a frame, a concentrating-surface formed of substantially rigid sheet material supported by said frame, a series of concentrate-guides disposed diagonally over the concentrate-surface, a series of tailing-guides disposed above the concentrate-guides, said concentrate and tailing guides being arranged at an angle to each other, the sheet material of the concentrating-surface having perforations punched therein the walls of which are offset to direct fluid-currents over or substantially parallel to the said surface.

3. In a concentrator, the combination of a frame, a concentrating-surface arranged upon said frame and provided with perforations, a series of concentrate-guides disposed above said concentrating-surface, a series of tailing-guides disposed above the concentrate-guides, said concentrate and tailing guides being disposed at an angle to each other, and regulating cross-bars disposed above said guides.

4. In a concentrator, the combination of a box-like frame, a concentrating-surface arranged above the bottom thereof and provided with perforations, a series of concentrate-guides disposed above and upon said concentrating-surface, a series of tailing-guides disposed above the concentrate-guides, said concentrate and tailing guides being disposed at an angle to each other, and regulating cross-bars disposed above said guides, and means for adjusting said regulating cross-bars toward and from the concentrating-surface.

5. In a concentrator, the combination of a frame, a feed-hopper at one end thereof, the concentrating-surface arranged upon said frame and provided with perforations, said perforations being directed toward one side of the machine, a series of concentrate-chutes arranged upon the side of the machine to which the perforations are directed, a series of diagonal concentrate-guides disposed above the concentrating-surface, and a series of tailing-guides disposed above the concentrate-guides and arranged at an angle to the concentrate-guides.

6. In a concentrator, the combination of a frame, a concentrating-surface arranged upon the same and provided with perforations, the walls of the perforations being offset to direct the fluid-currents over and parallel to said concentrating-surfaces, a series of concentrate-chutes arranged at one side of said frame, a series of concentrate-guides above the concentrating-surface and extending diagonally from the opposite side of the machine toward the concentrate-chutes, said concentrate-guides

ending short of the side of the machine where the concentrate-chutes are located to form a concentrate-valley.

7. In a concentrator, the combination of a frame, a concentrating-surface provided with perforations and arranged upon the said frame, the walls of the perforations being offset to direct fluid-currents over and parallel to said coneentrating-surface, a series of concentrate-chutes at one side of the said frame, a series of concentrate-guides arranged diagonally of said frame and above the concentrating-surface, and a series of tailing-guides disposed above the concentrate-guides at an angle thereto, said concentrate and tailing guides forming respectively concentrate and tailing valleys at opposite sides of the machine.

8. In a concentrator, the combination of a box-like frame, a concentrating-surface provided with perforations and arranged above the bottom of the said frame, a series of concentrate-chutes at one side of the said frame, a series of concentrate-guides arranged diagonally of said frame and above the concentrating-surface, and a series of tailing-guides disposed above the concentrate-guides at an angle thereto, said concentrate and tailing guides forming respectively concentrate and tailing valleys at opposite sides of the machine, and regulating cross-bars disposed above said guides.

9. In a concentrator, the combination of a box-like frame having a feed-hopper at one end, a concentrating-surface formed of rigid material and arranged above the bottom of said frame to form an air or other fluid chamber, means for introducing air or other fluid into said chamber, said concentrating-surface being provided with perforations directed to one side of the machine, a series of concentrate-chutes disposed on the side of the machine to which the perforations are directed, a series of concentrate-guides arranged above the concentrating-surface, and a series of tailing-guides arranged above the concentrate-guides, said concentrate and tailing guides respectively forming valleys at opposite sides of the machine.

10. In a machine of the class described, the combination of a frame, a concentrating-surface supported thereby, said surface having perforations the walls of which are offset to direct fluid-currents substantially parallel to the said concentrating-surface, a series of concentrate-guides arranged above and diagonally to said concentrating-surface, a concentrate-valley at one side of the machine to which the concentrate-guides direct the values, a series of tailing-guides disposed above the concentrate-guides and at an angle thereto, and a tailing-valley to which the tailing-guides direct the tailings.

11. In a machine of the class described, the combination of a frame, a concentrating-surface, formed of substantially rigid material and supported thereby, said surface having perforations the walls of which are offset to direct fluid-currents over or substantially parallel to the said concentrating-surface, a series of concentrate-guides arranged above and diagonally to said concentrating-surface, a concentrate-valley at one side of the machine to which the concentrate-guides direct the values, a series of tailing-guides disposed above the concentrate-guides and at an angle thereto, and a tailing-valley to which the tailing-guides direct the tailings.

12. In a machine of the class described, the combination of a frame, a concentrating-surface formed of substantially rigid sheet material and supported thereby to form a fluid-chamber beneath said surface, said concentrating-surface having perforations formed with lips or offsets to direct fluid-currents over or substantially parallel to said surface, concentrate and tailing guides disposed above said surface, said guides being arranged at an angle to each other to direct different strata of material in different directions and means for directing fluid-currents through said chamber and perforations of said concentrating-surface.

13. In a machine of the class described, the combination of a frame, a concentrating-surface supported thereby to form a fluid-chamber and having perforations formed therein, said perforations having the walls offset to direct fluid-currents over or substantially parallel to said surface, concentrate-guides arranged diagonally of said surface, tailing-guides, each formed in a plurality of pieces diagonally of the concentrating-surface, and means for directing fluid-currents through the perforations of the concentrating-surface and means for collecting the values.

14. In a machine of the class described, the combination of a frame, a concentrating-surface supported thereby and forming with said frame a fluid-chamber, said concentrating-surface being formed of sheet material and having perforations the walls of which are offset to direct fluid-currents over or substantially parallel to the said surface to thereby move material over said surface, a series of concentrate-guides and tailing-guides disposed at an angle to each other, the former in connection with the fluid-currents passing over the concentrating-surface, moving the concentrates or values, and means for directing fluid-currents through the perforations of the concentrating-surface and means for collecting said values.

ALBERT H. STEBBINS.

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