A. H. STEBBINS.

METHOD FOR CONCENTRATING ORES.

APPLICATION FILED MAY 19, 1902.

923,455. Patented June 1, 1909.

Fig. 1.

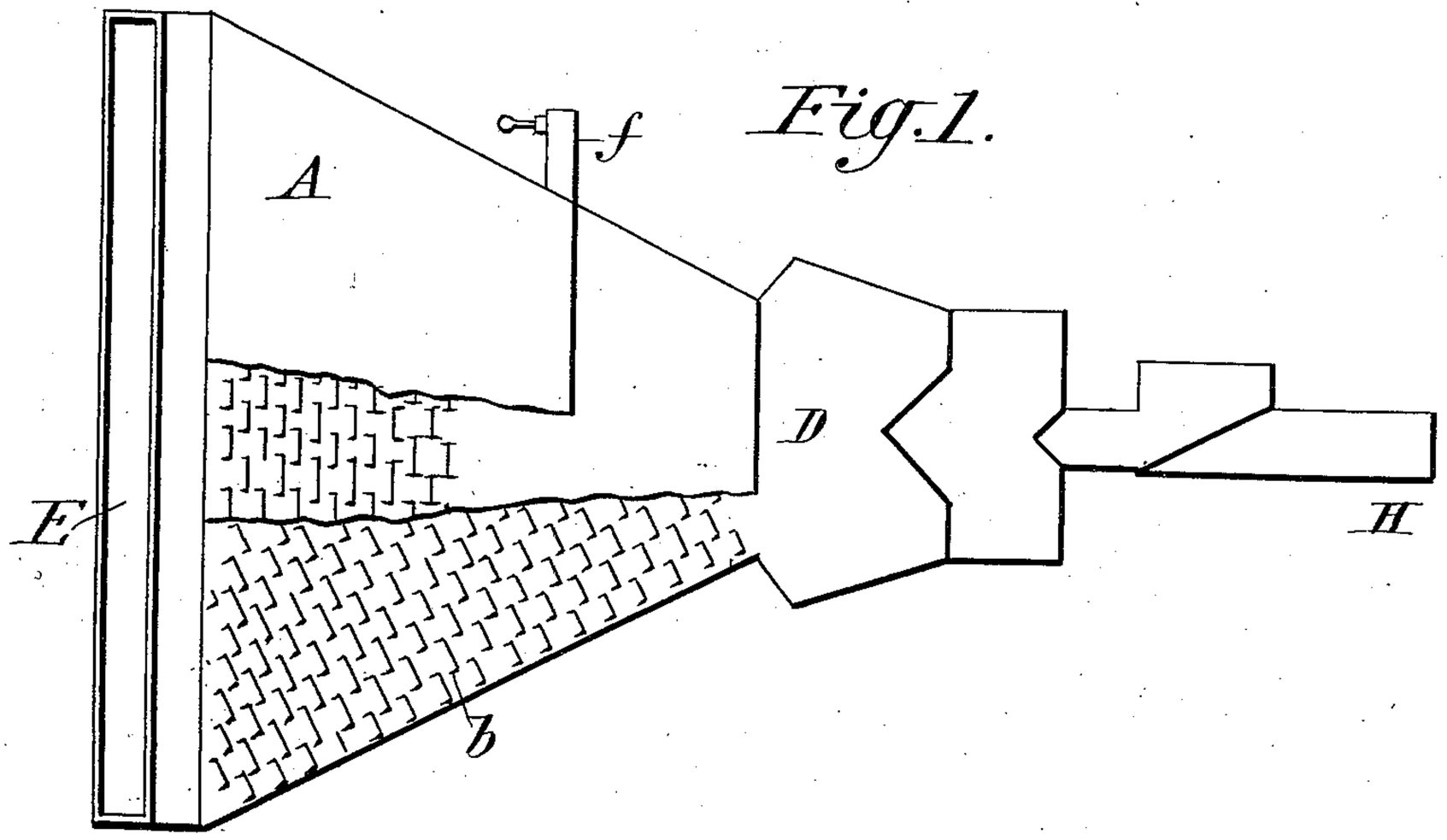
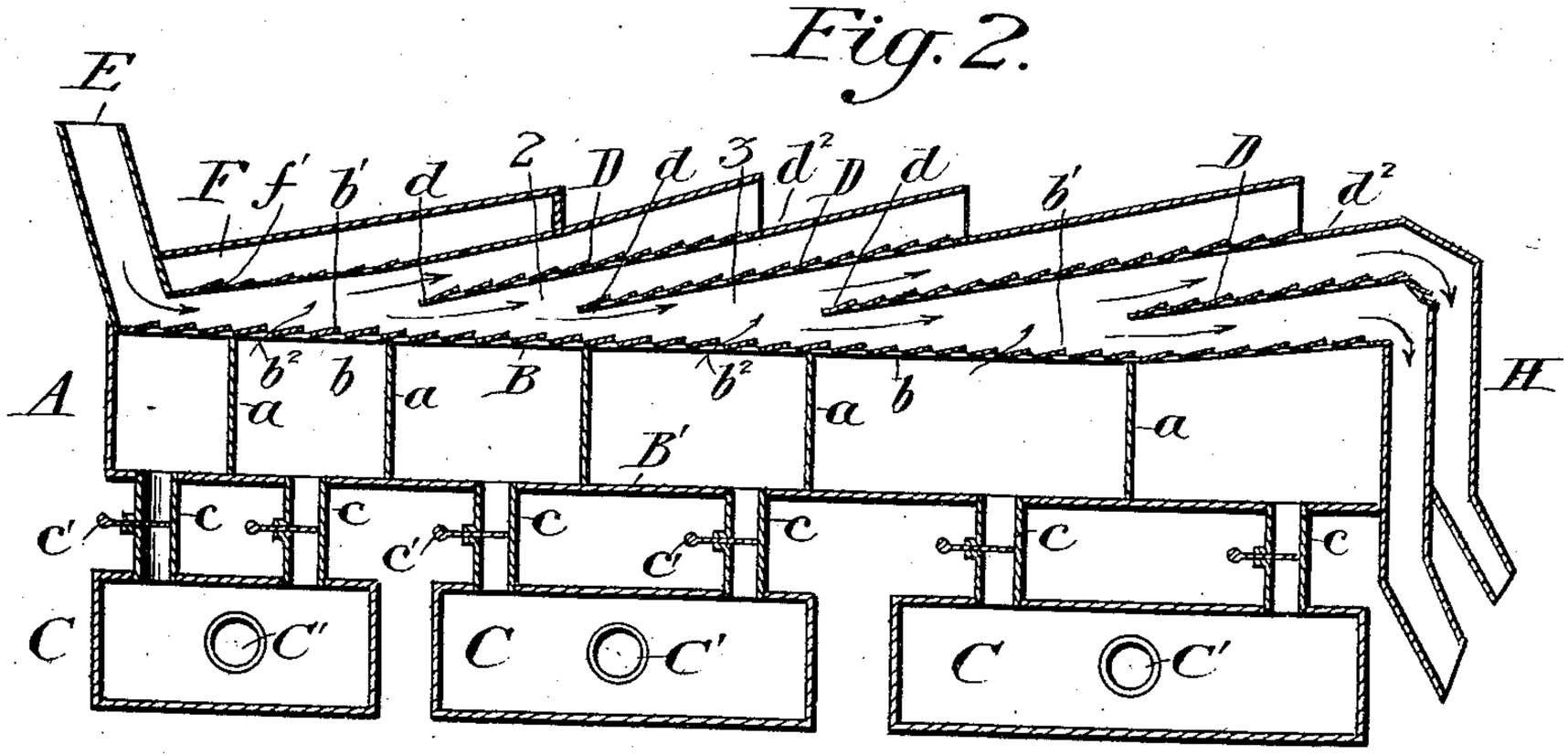


Fig. 2.



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UNITED STATES PATENT OFFICE.

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METHOD FOR CONCENTRATING ORES.

No. 923,455. Specification of Letters Patent. Patented June 1, 1909.

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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 Methods for Concentrating Ores, of which the following is a specification.

The invention to be hereinafter described relates to a method for concentrating ores; that is, for separating the valuable portion of ore bearing material from the accompanying impurities. It is well known that the particles forming a mass of valuable ore bearing material differ in size and specific gravity and that the valuable portion of such mass consists of the particles of relatively greater specific gravity than the accompanying impurities; and I have taken advantage of these known facts in devising my improved method whereby the lighter particles may be removed and the heavy or valuable particles collected and separated from the impurities.

I have found that if a mass of finely divided or comminuted ore bearing material is subjected to the action of air or fluid blasts directed through the mass that the said mass will become greatly agitated and the lighter particles or impurities will be carried to the top of the mass, while the heavier and valuable portion of the ore bearing material will gravitate to the bottom, thus stratifying the mass of material with the lighter particles or waste material on top. If when a mass of such material is thus stratified the top strata is removed and then the material still subjected to the action of air or fluid blasts passing through it, further stratification will take place with the lighter particles of the mass then being treated being carried to the top; thus successively if the mass of finely divided or comminuted material be stratified and the top strata be successively removed from any particular portion of the material, it is evident that finally there will remain only the heavier or valuable portions of the ore bearing material.

With the object of securing the above defined results, my invention in the present instance consists in continuously subjecting a mass of finely divided ore or comminuted material to air or fluid blasts directed through the mass from the bottom to the top thereof to stratify the material with the lighter portions on top and then in successively removing the upper strata of material as the mass is moved under the action of the air or fluid blasts, all as will hereinafter be more fully described and definitely pointed out in the claims.

In the drawings I have shown one form of a device suitable for performing or carrying out my method, as hereinbefore shown and set forth, in which—

Figure 1 is a plan view of an apparatus with a portion thereof broken away to show parts beneath; and Fig. 2 is a longitudinal central section thereof.

In the drawing, A represents any suitable form of frame upon which is supported a concentrating surface B located a distance above the bottom B′ of the frame A. The boxlike frame A may if desired be separated into separate compartments by partitions *a*, to which may be connected suitable air drums or chambers C by pipes *c* containing controlling valves *c′* and having inlet pipes C′, from which it will be seen that air or other fluid admitted into the drums or chambers C may be directed beneath the concentrating surface B contained within the boxlike frame A; and its force and character may be controlled by means of the valves *c′*.

The concentrating surface B may be of any usual form, and in the present instance I have shown the same as composed of sheet metal having perforations *b* thereof directing the air or other fluid currents through and over the surface of the concentrating surface B by the walls of said perforations *b* being offset as shown at *b′*, Fig. 2, whereby the air or other fluid currents passing through the concentrating surface B will be directed as indicated by the arrows b^2.

Arranged above the concentrating surface B are a series of cutting and conveying boards D, preferably supported from the sides of the boxlike frame A, said cu ting and conveying boards being arranged diagonally of the concentrating surface B and inclined thereto as shown in Fig. 2, with the cutting ends *d* of said cutting and conveying boards nearer to the concentrating surface B than the delivery ends d^2, as will be clearly seen from Fig. 2.

Arranged at one end of the boxlike frame A is the feed hopper E, through which material to be treated may be fed to the concentrating surface B; and immediately adjacent the feed hopper E is a regulating chamber F having a valve *f*, and the lower wall of which

chamber is perforated as shown at f' so that a portion of the air or fluid currents that may pass through the concentrating surface may enter the regulating chamber F and be directed out of the machine.

Assuming material is fed to the concentrating surface B through the feed hopper E, it will be apparent that the air or fluid currents first acting upon said material under the regulating chamber F will serve to stratify said material with the lighter particles on top of the mass, while the heavier particles will under the action of gravity seek the lower level next adjacent the concentrating surface B. The material thus stratified will also under the action of the air or fluid currents as they pass in the direction of the arrows b^2 through the concentrating surface serve to move the mass of material along said concentrating surface from the discharge end H, and the stratified mass meeting the cutting edge *d* of the first cutting and conveying board D—that is, the one nearer the feed end of the device—will have the upper strata of layer of particles cut from the mass as the latter passes under the cutting edge *d* referred to. As the mass now moves to the position between the first and second cutting and conveying boards, represented by the numeral 2, it will be evident that the air or fluid currents passing through the concentrating surface will continue to agitate the mass so that the lighter particles still remaining in the mass will rise to the top and be themselves cut off by the second cutting and conveying board as the mass passes thereunder. Between the cutting edges of the first and second cutting and conveying boards the material will bunch or accumulate by reason of the generally triangular shape of the boxlike frame A, and although the mass of material at this point will as a whole be of greater specific gravity than the mass first fed to the machine, yet said mass between the cutting edges *dd* of the first and second cutting boards contains valueless particles which it is desired to eliminate, and which the successive stratification by virtue of the air or fluid blasts passing over the concentrating surface B will carry to the top, and as the mass passing under the second cutting and conveying board to the position designated by the numeral 3 the top strata of this stratified mass will be removed, so that the mass of material at the point 3 between the second and third cutting and conveying boards will as a whole be of greater specific gravity than the material first fed into the machine, or that at the position 2 between the first and second cutting and conveying boards.

Between the second and third cutting and conveying boards and their cutting edges *dd* the material will be again acted upon by the air or fluid currents, and owing to the shape of the boxlike frame A the material will bunch, thus preventing too free passage of the air or fluid currents through the mass of material at this point, and the lighter particles of such mass will here also be carried to the top and the entire mass be stratified in a manner similar to that hereinbefore described until any particular mass of material passing through the machine will reach the edge of the last cutting and conveying board near the discharge end of the machine where the last stratification of the material takes place and the top layer of the then stratified material is cut off and delivered from the machine over the cutting and conveying boards, while the valuable particles continue through the feed chute to be collected as desired.

While I have described the above machine as embodying my present invention, it is to be understood, of course, that my method is not limited to any character of machine.

From the above description it will be understood that my invention consists in subjecting any mass of material to the action of air or fluid currents whereby said mass of material is stratified and moved, and while thus stratifying and moving said material the top strata thereof is successively removed so that after a certain number of eliminations of top strata by the successive operation there remains only the lower valuable portion of the material.

It will be evident also that I may subject different portions of the material at their different positions of stratification to blasts of air or fluid currents which differ in force so that as the specific gravity of any particular portion of the material becomes greater, the force of air or fluid currents acting thereon may be made proportionately greater in order to effect the stratification thereof.

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

1. The method of separating ores from their accompanying impurities, which consists in feeding the ore in such manner as to form a continuous bed traveling in one general direction, agitating and stratifying said material by passing fluid currents through said bed throughout its length and in a direction substantially parallel with the line of travel of the material, and causing said fluid currents to also remove the topmost stratum of each successive stratification assumed by said bed as the feed thereof progresses; and successively increasing the force of the fluid currents toward the discharge end of said bed.

2. The method of separating ores from their accompanying impurities, which consists in feeding the ore in such manner as to form a continuous bed traveling in one general direction, agitating and stratifying said material by passing fluid currents through

said bed throughout its length and in a direction substantially parallel with the line of travel of the material, and causing said fluid currents to also remove the topmost stratum of each successive stratification assumed by said bed as the feed thereof progresses, reducing the width of the bed to bunch or increase the thickness of the material as the impurities are removed, and successively increasing the force of the fluid currents as the width of the bed diminishes.

ALBERT H. STEBBINS.

In presence of—
W. H. AUDERICH,
J. E. LEAS.