(No Model.) 2 Sheets—Sheet 1.

F. G. GOULD & J. K. FIRTH.

CONCENTRATING MACHINE.

No. 492,007. Patented Feb. 21, 1893.

Fig. 1.

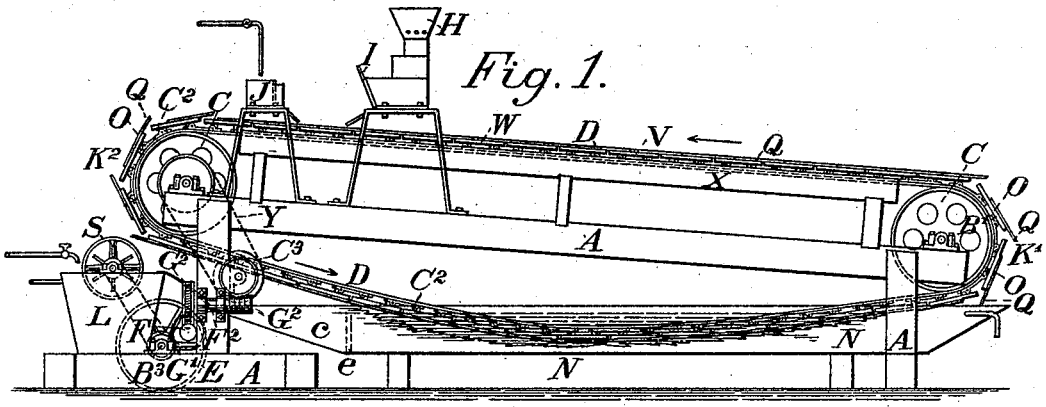


Fig. 2.

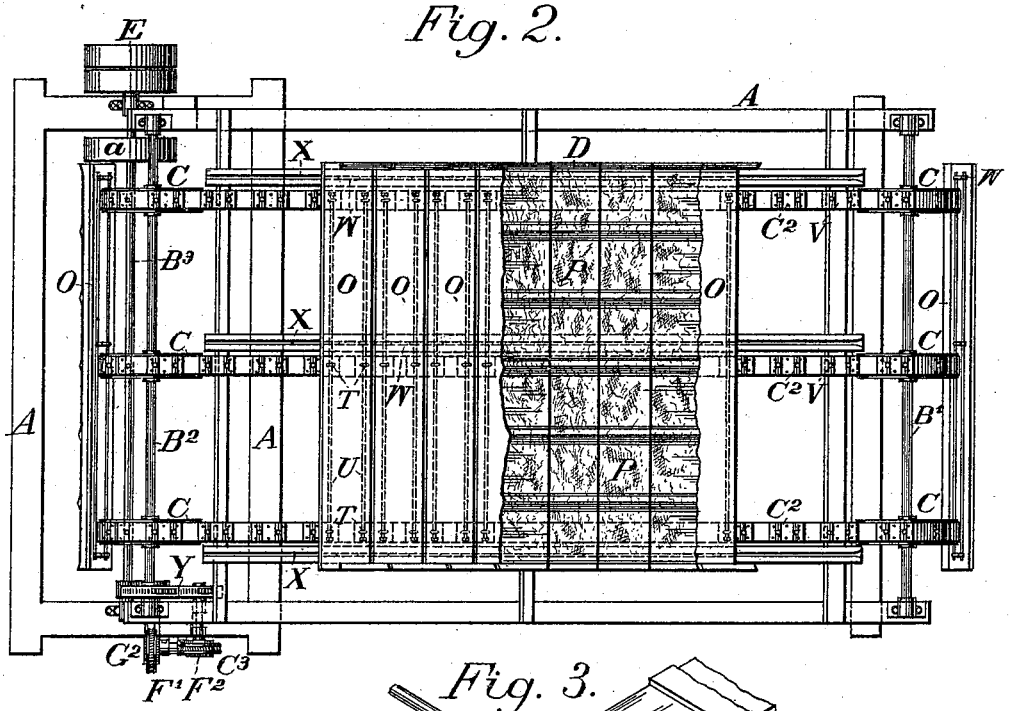
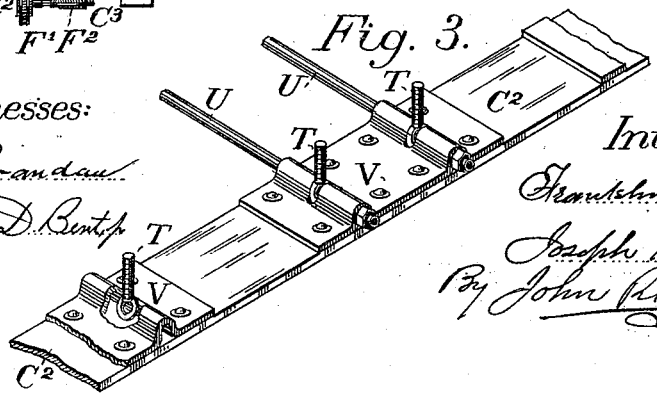


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

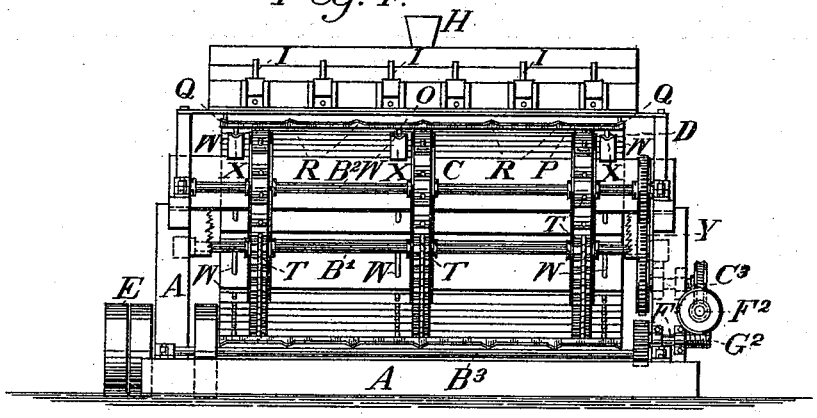


Fig. 5.

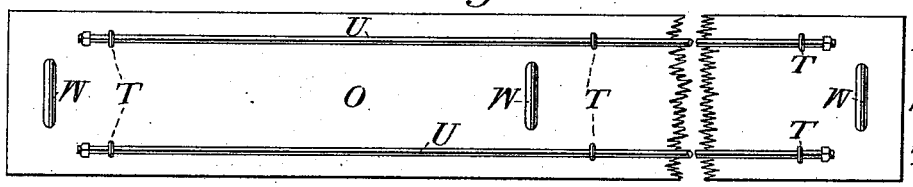


Fig. 6.

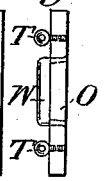


Fig. 7.

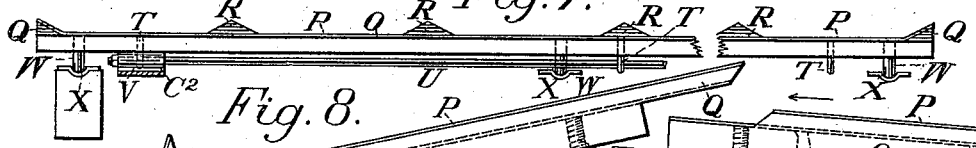
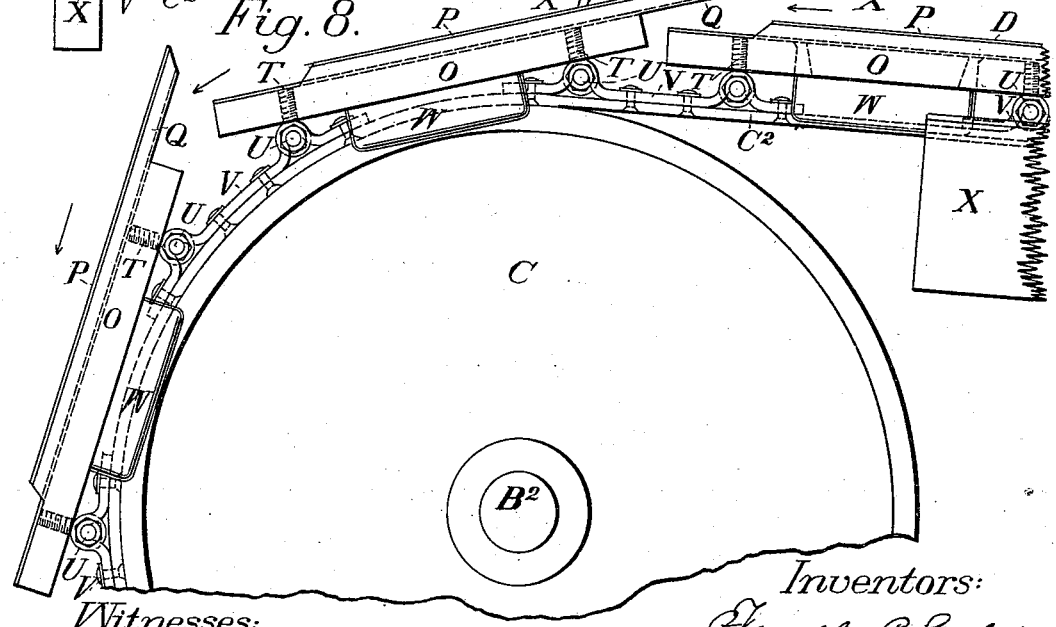


Fig. 8.



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UNITED STATES PATENT OFFICE.

FRANKLIN G. GOULD, OF BOSTON, MASSACHUSETTS, AND JOSEPH K. FIRTH, OF SAN FRANCISCO, CALIFORNIA.

CONCENTRATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 492,007, dated February 21, 1893.

Application filed April 6, 1892. Serial No. 428,057. (No model.)

To all whom it may concern:

Be it known that we, FRANKLIN G. GOULD, of Boston, county of Suffolk, State of Massachusetts, and JOSEPH K. FIRTH, of the city and county of San Francisco, State of California, citizens of the United States, have invented certain new and useful Improvements in Machines for Concentrating and Saving Fine Metallic Particles; and we hereby declare the following specification and drawings accompanying the same to be a full, clear, and exact description of our invention.

Our invention relates to a method of saving fine mineral particles, especially of gold and silver, by means of the process commonly called concentration, by a method in which the selection or separation of such fine particles is attained by indented textile or woven surfaces of fibrous material.

Our invention consists in exposing the slimes or fine sludge, after treatment by the common concentrating processes, to a further and more perfect residual process, wherein the material is passed over canvas or other textile surfaces, and in suitable devices for conveying and treating slimes or sludge; also in the method of supporting and presenting the textile surfaces so that their operation will be continuous and automatic, as set forth and explained in the drawings hereinafter referred to.

The object of our invention is to save the fine particles of free metal, or sulphurets thereof, that remain in suspension and are lost when the slimes are treated on flat surfaces by agitation and water alone, and when gravity is depended upon for selection or concentration; also to provide mechanism that will perform this function without manuel labor or attention other than is required in the ordinary process of concentration, by means of automatic machinery.

Referring to the drawings: Figure 1 is a side elevation of a concentrating machine for fine particles, constructed according to our invention. Fig. 2 is a plan view of the same machine, having the main portion of the apron or catching surfaces removed. Fig. 3 is an enlarged detail, showing a section of the bands to which the apron is attached, and by means of which it is propelled. Fig. 4 is a partial end view of Figs. 1 and 2, with some of the parts removed. Fig. 5 is an enlarged flat view on the bottom of one of the slats or plates comprising the apron or traveling platen on which is mounted the textile material forming the outer or working surface. Fig. 6 is an end view of Fig. 5. Fig. 7 is an edge view of Fig. 5, showing the textile material mounted thereon, also the means of fastening the same to the plates or slats. Fig. 8 is an enlarged side view of a section of the apron or platen, the propelling bands to which it is attached, and other connected details.

Similar letters of reference are employed in the different figures to indicate corresponding parts.

The losses due to the incomplete performance of common concentrating machines is well known. The fine particles of metals, or their sulphurets, are held in suspension, and are not precipitated by the action of water and agitation, hence pass off in the slimes and are lost. The peculiar function of surfaces composed of textile or woven material for catching and saving such fine metallic particles is well known, and, to some extent, has been applied, but by less perfect means than is attained by our invention.

Referring now to the drawings, A A A is a supporting frame of the usual construction to which the various parts of the machine are attached. At the ends of this frame are mounted two shafts, B' B^2, having on them wheels or drums C, around which passes the endless apron D, as shown in Figs. 1 and 2.

The machine is driven from the pulleys E, placed at either side of the machine on the shaft B^3. To this shaft is geared a short spindle F', on the end of which is a worm or tangent screw G' meshing into the wheel C^3. This wheel C^3, drives a second short shaft or spindle F^2 on which is a second worm or tangent screw G^2 meshing into the wheel C^3, and from the axis of this wheel a pitch chain Y conveys motion to the shaft B^2, giving to the apron D a slow movement toward its highest end. The method of gearing can be varied to suit the circumstances of any case; the one shown being the one we employ by preference.

The material to be treated is fed into a box

or hopper H, and is led out through the sluices I, at several points, falling on the apron D, where it meets a supply of water escaping from the tank J, in the usual manner of concentrating machines. From this feeding point the material is carried toward the lowest end of the machine against the movement of the apron D by the force of the water, the sand or gangue falling off the table at K′, while the fine metal particles, which lodge on the face of the platen for reasons hereinafter to be explained, pass on over the other end of the machine at K^2. To remove the metallic particles and sulphurets from the apron D, we employ a washing wheel S, driven from the shaft B^3 by means of a pulley *a*, shown in Fig. 2. This washing wheel S is, in the present case, mounted on a tank L and provided with vanes, so that when in rotation it will dash or discharge the water contained in the tank against the faces of the endless apron D, and thus wash off the adhering concentrates, which are then carried into the trough or tank N, in front of a vertical division *e* therein, as shown in Fig. 1. The main portion of the concentrates, thus washed off, settle in the first division *c* of the trough or tank N, and are not carried forward by the overflow into the main body of water, and, consequently, do not lodge upon the inner side of the apron D as it passes through the water in the main part of the trough or tank N. The wheel S can be mounted at any position with respect to the tank or trough N, and the shaft B^3, or, if desired, one or more may be mounted on and operate in a division of the trough or tank N, the purpose being to thoroughly wash the exterior and interstices of the apron D. Thus far the processes we employ are analogous to those known and practiced in concentrating, but the endless apron D, which, with its connections, forms the main part of our invention, operates in a different manner, and has special functions in respect to all material that cannot be concentrated or collected by gravity. This apron D is not a continuous web but is formed of a series of sections consisting of plates O, preferably made of wood, covered with canvas and attached to flexible bands C^2 that pass around the wheels or drums C at each end of the machine. On their exterior surfaces these slats or bars O are covered with sheets of textile material P, preferably a kind of canvas woven for the purpose and held as shown in Fig. 7, and in the following manner: At the ends of the plates or slats O are fastened angular ledges Q, to which the canvas or covering P is attached. On the top of this canvas covering are placed transversely other ledges or bars R of triangular section, which serve to divide the face of the apron into a corresponding number of channels in the direction of its movement and transverse to the main bars or slats O. These ledges Q and R are not fixed centrally on the bars or slats O, but as shown in Fig. 8, projecting over the rear edge to support the edge of the canvas covering P, and set back from the front edge, so that when the apron is in a straight line, as shown at the top in Fig. 1, it will present a continuous surface, and be impervious by means of its sections overlapping, so that no water or material can escape through it. At the ends, in passing over the drums or wheels C, the slats or bars O assume the position shown in Figs. 1 and 8, also in passing through the trough or tank N when in a curved form as seen in Fig. 1, the joints between the sections being open permits any material lodged there to be washed out.

To attach the bars or slats O to the flexible bands C^2 we employ eye bolts T, as shown in Fig. 3, and through these eye bolts pass rods U, which, with the covering pieces V, riveted to the band C^2, form a hinge joint, permitting the slats or bars O to assume a tangential position in passing over the wheels or drums C. We do not confine ourselves to these details of construction which can be varied in various ways to suit particular uses, or for other reasons. The flexible bands C^2 can be substituted by a metallic chain, and the slats or bars O attached by various suitable devices.

To support the apron D at its upper or working surface, we employ shoes or slides W, attached at two or more points on the inner or under face as shown in Figs. 5, 6 and 7. These shoes or slides move in the supporting guideways X, which have their bearing on the main frame A, as seen in Figs. 1, 2 and 4. It will thus be seen that the top or catching surface of the apron D forms a continuous plane of canvas or other suitable textile material, but being reinforced or supported on the bars or slats O, and the projecting ledges R, offers a plane surface uniform throughout. These canvas covered surfaces are shown as flat planes, but it is obvious that the grooves, ripples, or undulations, can be made in these surfaces, the slats or bars O being formed with such configuration and the canvas cover fastened thereto. The textile covering being relieved of all strain, and having in itself no function of support, is not destroyed as in previous practice when such material has been employed for similar purposes. The interstices of the woven fabric, by some peculiar action, supposedly mechanical, catch and retain the fine metallic particles of silver, gold, or other metal, permitting the gangue to wash off. The apron being formed of a series of sections the cloth covering can be reversed, removed, or renewed, on any one of the sections, or a part of them, without disturbing the rest, and no injury by accident is liable to occur beyond the covering of one, or at most a few sections at a time.

Having thus described the nature and objects of our invention, with the manner of constructing and applying the same, what we claim as new, and desire to secure by Letters Patent, is—

1. In a machine for concentrating fine metallic particles, an endless apron, moving over

wheels or drums, and guides and composed of hinged textile covered sections, that when in a straight line, or at the top of the machine, will present a continuous surface, impervious to water or the material treated thereon, substantially in the manner and for the purposes described.

2. In a machine for concentrating fine metallic particles, an endless apron, mounted on wheels or drums, and fixed guides, composed of hinged sections consisting of bars or slats, so joined as to form a continuous plane when the apron is in a straight line, the outer or working surfaces of the sections covered with canvas or other textile material, in the manner and for the purposes substantially as shown and described.

3. In a machine for concentrating fine metallic particles, an endless apron composed of hinged sections as herein described, their outer surfaces covered with canvas or other textile material, and provided with transverse ledges at their ends and intermediate points, so that when the apron is extended in a straight line, these ledges will form parallel channels in the line of the apron's movement, in the manner substantially and for the purposes specified.

4. In a machine for concentrating fine metallic particles, an endless apron consisting of hinged sections, covered on their outer faces with canvas or other suitable textile material, provided with ledges or ribs to form parallel channels when the apron is extended and straight, these ledges or ribs and the textile covering, overlapping at the sides of the bars or slots, so as to form a close joint between them when the apron is in a straight line on its top or working side, in the manner substantially and for the purposes herein specified.

5. In a machine for concentrating fine metallic particles, an endless apron, composed of hinged sections, covered on their outer or working faces with canvas or other textile material, overlapping at their sides, to form an impervious surface when the apron is extended in a straight line, and attached on their inner faces to a flexible band or chain by means of hinged joints, so that they will pass over the drums or wheels in a position tangential thereto, substantially in the manner specified, and for the purposes set forth.

In testimony whereof we have hereunto affixed our signatures in the presence of two witnesses.

FRANKLIN G. GOULD.
JOSEPH K. FIRTH.

Witnesses:
ALFRED A. ENQUIST,
WILSON D. BENT, Jr.