(No Model.)

2 Sheets—Sheet 1.

J. H. WILHELM.

ORE SEPARATOR.

No. 256,183. Patented Apr. 11, 1882.

Fig. 2.

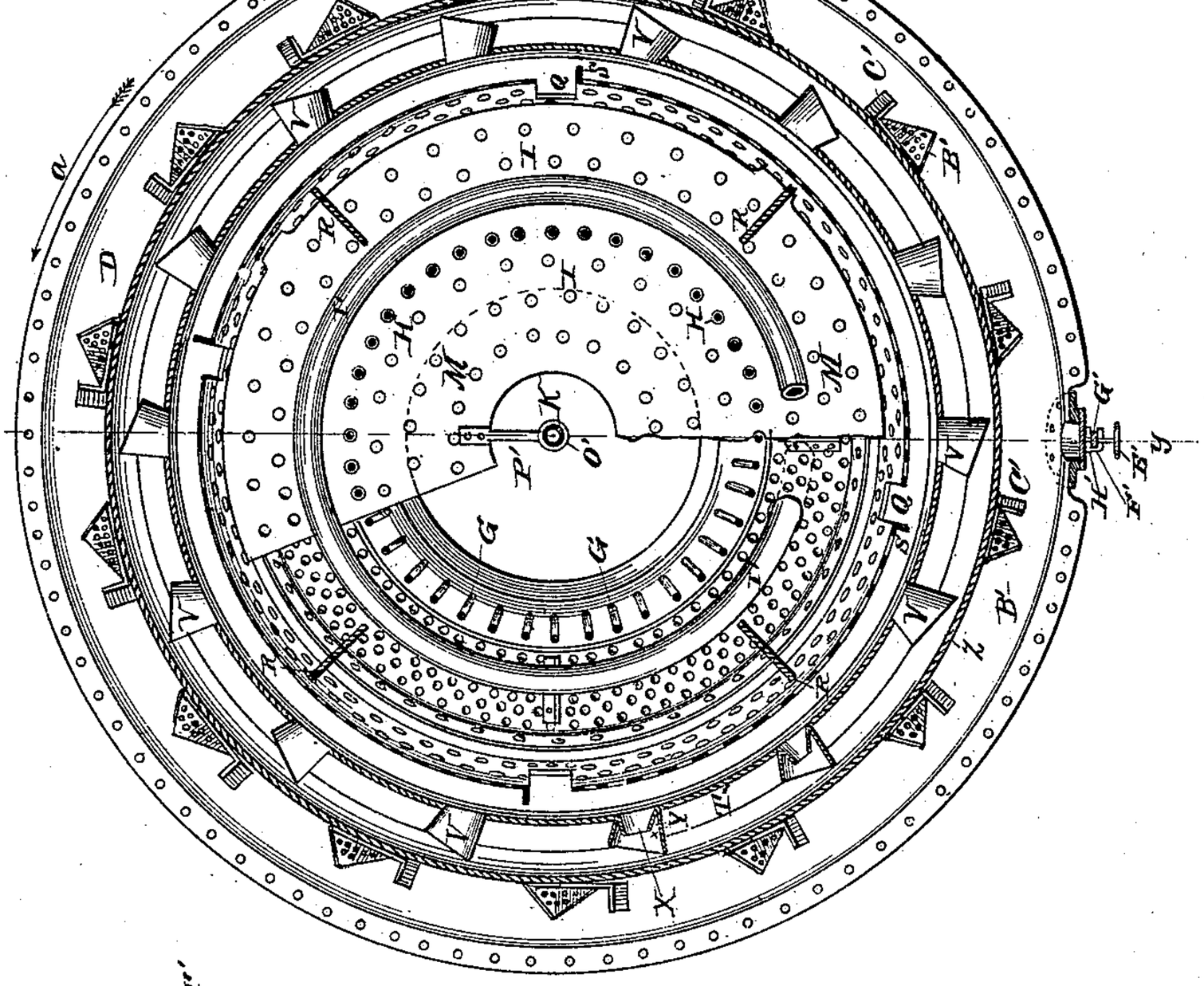
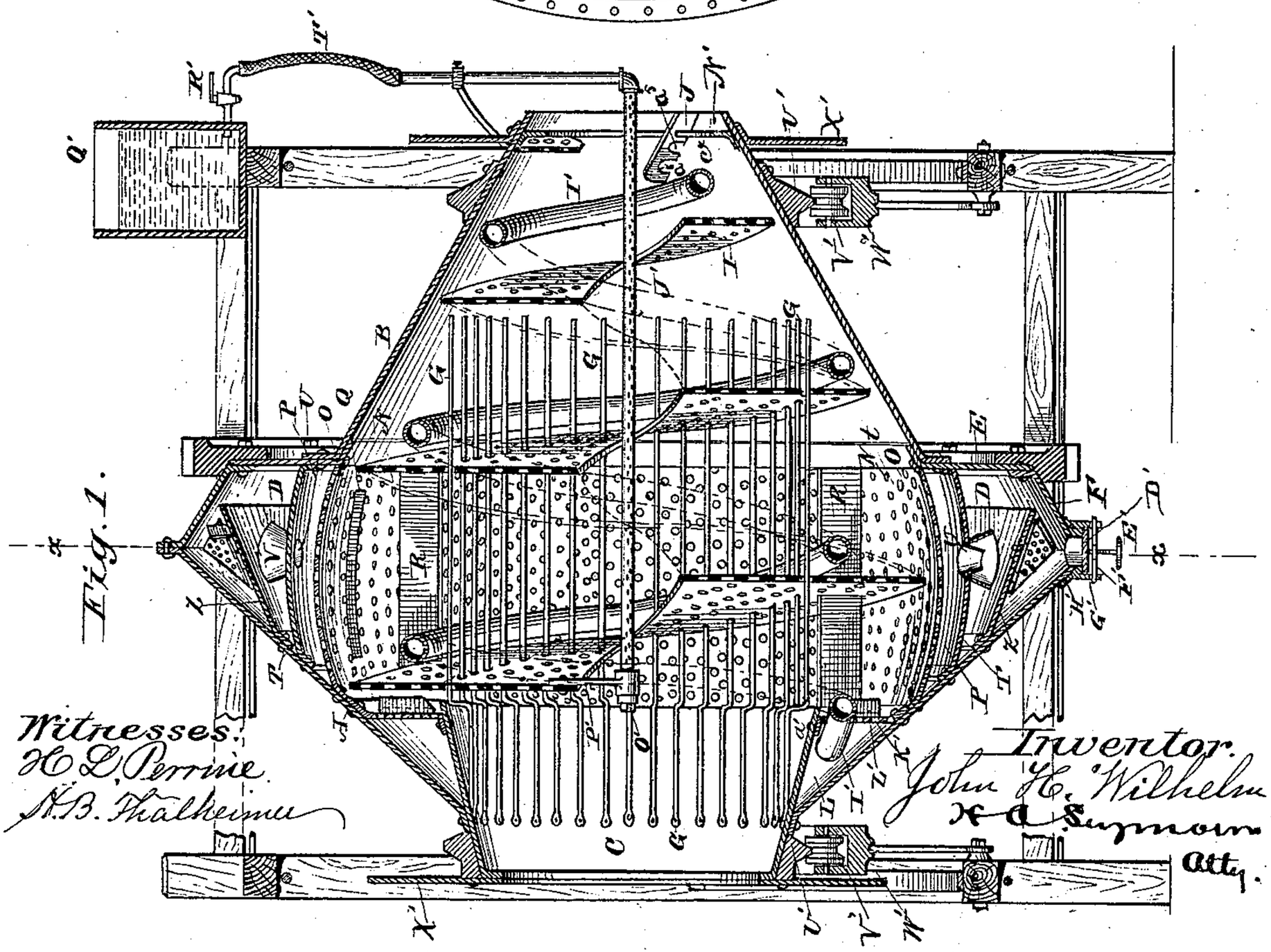


Fig. 1.



Witnesses:
H. L. Perrine.
N. B. Thalheimer.

Inventor.
John H. Wilhelm
by A. Seymour
Atty.

(No Model.) 2 Sheets—Sheet 2.

J. H. WILHELM.

ORE SEPARATOR.

No. 256,183. Patented Apr. 11, 1882.

Fig. 4.

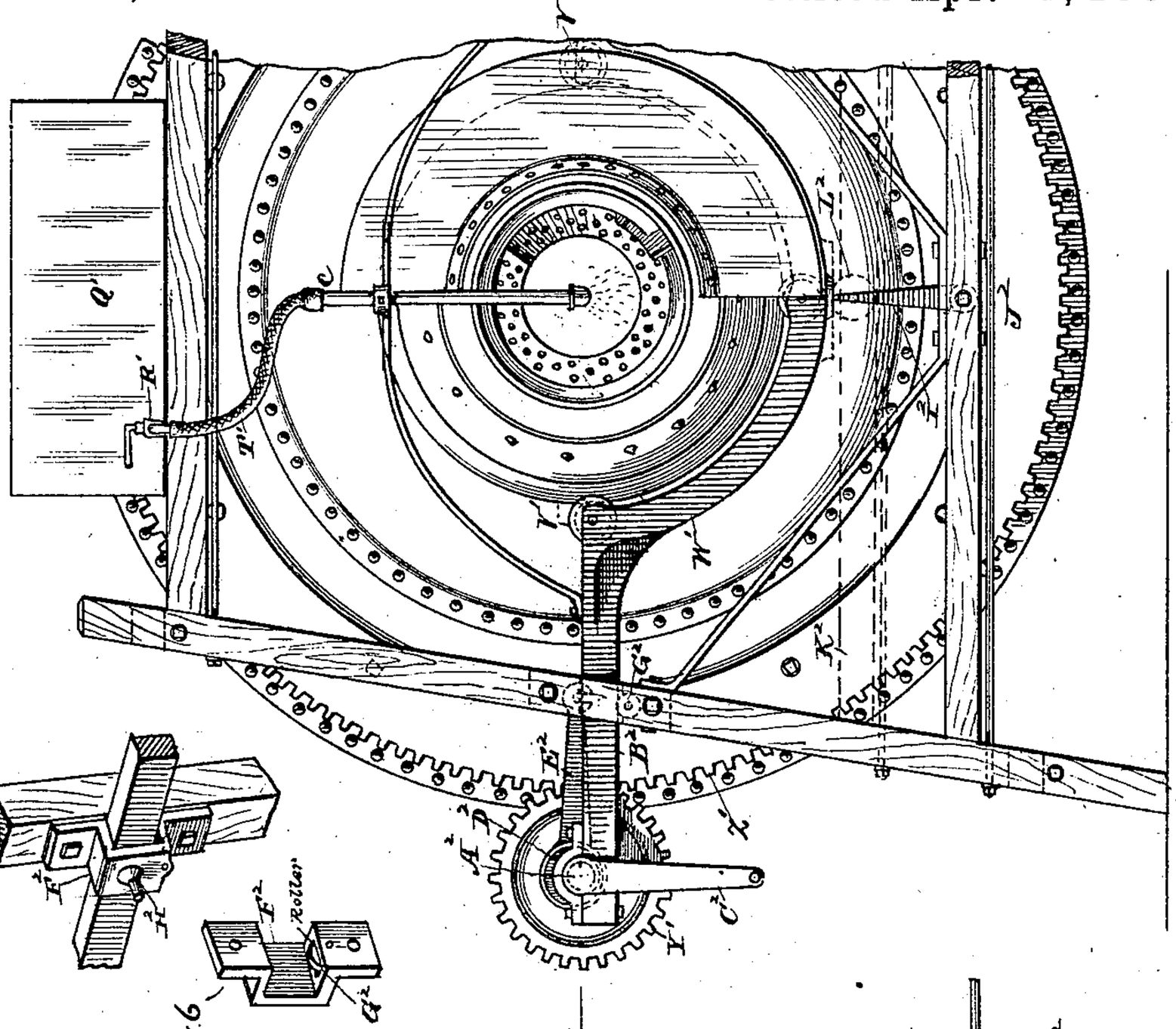
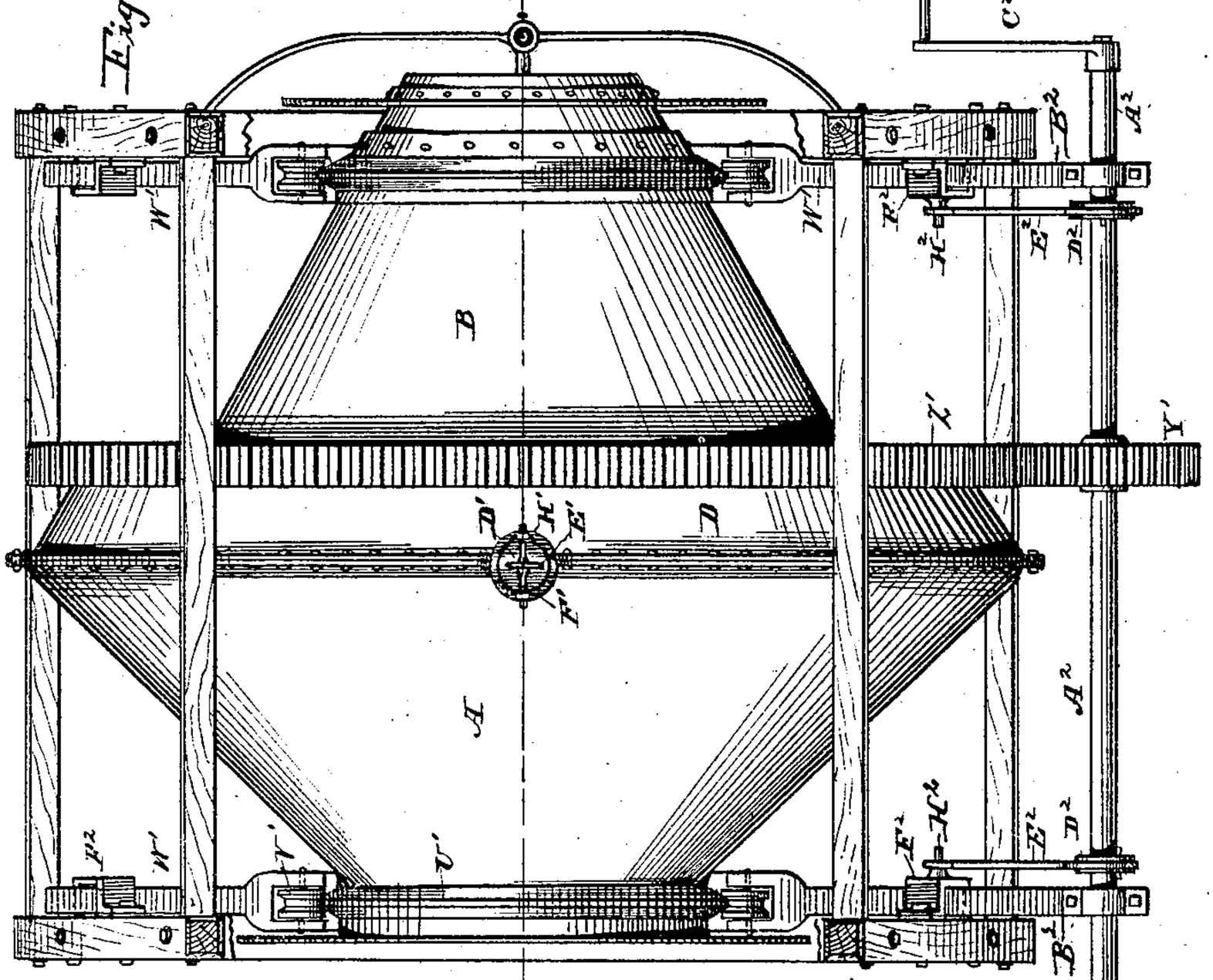


Fig. 5.

Fig. 6.

Fig. 3.



Witnesses:
H. L. Perrie,
H. B. Thalheimer

Inventor.
John H. Wilhelm
by A. Simmons Atty.

UNITED STATES PATENT OFFICE.

JOHN H. WILHELM, OF DENVER, COLORADO.

ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 256,183, dated April 11, 1882.

Application filed October 24, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. WILHELM, of Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Ore-Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to that class of separators the operation of which is based upon the fundamental principle of gravitation, and which are designed to be employed in the extraction of mineral from the auriferous débris of placer-mines, and from all classes of pulverized free-milling ores.

The operation of separating mineral upon the gravity principle from débris or ore would be a comparatively simple one if all the particles thereof were independent of each other and equal in size. In practice, however, this condition of affairs is never found, for the different particles not only vary in size, but also they are often bound together in small masses, which must be disintegrated before the particles of mineral contained in them can be eliminated and saved; and inasmuch as particles having different atomic densities, but which are equal in mass-weight, fall together and arrange themselves in the same strata, it must be apparent that an apparatus designed to automatically effect the stratification of débris or ore according to the atomic density of the constituent particles thereof must be adapted both to so agitate and break it up that every particle will be free to fall independent of all other conditions than its density, and to mechanically stratify such particles according to their density and without regard to their mass-weight. It therefore follows that a device for extracting mineral designed to operate on this principle and to perform all necessary manipulations automatically must partake both of the characteristics of a separator and of a concentrator.

The object of the present invention, which embodies features of both of the above-named devices, is to provide an apparatus which shall combine simplicity of construction, ease and efficiency of operation, and durability in use with an adaptability to be successfully and economically operated with or without the aids of water, mercury, steam, or such other agencies as changing circumstances and conditions may demand, and which shall have a capacity for the treatment of a large quantity of débris or ore per diem.

With these ends in view my invention consists in the combination, with a circular chamber, of a conveyer located within said chamber and consisting of a spirally-coiled perforated plate.

My invention further consists in the combination, with a circular chamber, of a cage of rods extending horizontally through it, and a conveyer winding spirally through the chamber and provided with perforations adapted to receive the rods of the cage and hold them in position.

My invention further consists in the combination, with a circular chamber, of a conveyer consisting in a flat metallic plate coiled to form a conical structure within the chamber.

My invention further consists in the combination, with a circular chamber consisting of two conical shells, of a mineral-receptacle located between said shells, and a screen adapted to isolate the circular chamber from the mineral-receptacle, and consisting in a perforated concaved annular plate provided with elongated slots extending from its central portion toward each edge.

My invention further consists in the combination, with a circular chamber consisting of two conical shells, of a concaved screen joining said shells and a series of horizontal dashers located just over it.

My invention further consists in the combination, with a circular chamber consisting of two conical shells, of a mineral-receptacle located between said shells, an annular plate dividing the said receptacle into two chambers, and a screen consisting of a perforated annular plate provided with elongated slots and adapted to isolate the mineral-receptacle and circular chamber, and elevators consisting of plates secured to the outer peripheral face of the said screen.

My invention further consists in the combination, with a mineral-receptacle, of a plate dividing it into two chambers, conical passages inserted in said plate and adapted to admit

mineral and débris from the apparatus into the mineral-receptacle and to return débris only into the apparatus, and an inclined plate located below said passages.

My invention further consists in the combination, with a mineral-receptacle, of an annular plate secured to one wall of the said receptacle and extending in downward inclination to the opposite wall thereof.

My invention further consists in the combination, with a mineral-receptacle, of an annular plate secured to one wall of the said receptacle and extending in downward inclination to the opposite wall thereof, and alternating perforated flanges and stirrers secured to the under face of said plate.

My invention further consists in the combination, with a circular chamber consisting of two conical shells, of a water-chamber located adjacent to one of said shells.

My invention further consists in the combination, with a circular chamber consisting of two conical shells, of a water-conduit consisting of a pipe coiled into the form of a cone, the base of which is placed adjacent to one of the shells of the said chamber.

My invention further consists in the combination, with semicircular bearings provided with horizontal arms, of brackets to receive the latter, secured to the frame-work in which the apparatus is mounted, a shaft journaled in the outer ends of the said arms, and an eccentric and straps, or the equivalent thereof, connecting said shaft and brackets.

My invention further consists in certain details of construction and combinations of parts, as will hereinafter be more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical section of an ore-separator constructed in accordance with my invention. Fig. 2 is a sectional view taken through line X X of Fig. 1 and looking toward the mouth of the apparatus, the pipes V shown in this figure being in elevation, with the exception of two, which are represented in section. Fig. 3 is a plan view. Fig. 4 is a view in end elevation; and Figs. 5 and 6 show detached views of the brackets in which the horizontal arms of the bearings are supported.

A and B represent truncated cones, the bases of which are adjacent to each other, the receiver thereof being formed by the cone C, located within and projecting from the smaller end of the cone A.

A mineral-receptacle, D, situated between the cones A and B, is formed by the appropriation of a portion of the base of the cone A, and by an angular chamber formed by the plates E and F, bolted together and to the flanged bases of the said cones.

The first gradation or sizing of the débris or ore is effected by a cage of rods, which extends horizontally through the center of the apparatus from a point within the receiver C to about midway of the length of the cone B, and which is adapted to retain only the largest bowlders associated with the material being treated. The forward ends of the rods G composing the said cage are attached to the inner peripheral face of the receiver C, while their central and rear portions are inserted in perforations H formed at or near the center of the spirally-coiled plate constituting the conveyer I, the office of which is twofold in this capacity, for it not only sustains the said rods in their proper relative positions, but also performs the function of a vehicle in transporting the bowlders through the said cage and in discharging them upon the plane of the cone B. After reaching this point the transit of the bowlders through the apparatus is completed without the action of the conveyer, which carries them to the discharge end of the cone B, where they are ejected from the machine by the ejector J; but, if desired, the rods may be converged and the cage extended to the said discharge end of the cone B. The said ejector J is cut away on its lower face, as shown at a^5, the object of this configuration being to adapt the ejector to exercise a screening function as it lifts the débris over the ledge N′. The said conveyer I consists of a flat metallic plate coiled to form a cone-shaped structure, having a cylindrical aperture, K, extending axially through it. It is sustained in position with its base adjacent to the base of the receiver C by attachment to the water-conduit and to the inner peripheral faces of the cones A and B, from which latter it should be slightly elevated to permit the gravitation of all of the finer particles of débris or ore toward the mineral-receptacle D, and to allow the water or other fluid aid to the process of the machine, when such auxiliary agencies are used, to flow toward the chamber L. This result may be effected by mounting the conveyer in low stools or supports secured to the inner faces of the cones, or by cutting sections of its edge away, leaving occasional flange-like projections adapted to be bolted directly thereto. As an additional feature of construction, permitting the free circulation of water through the apparatus, the conveyer is provided with numerous small perforations, M, which extend a short distance above its water-mark. In the drawings the whole width of the conveyer-plate is shown as being perforated, and although such a construction is not necessary, in the event of the employment of steam it will perhaps effectuate its more perfect distribution throughout the machine, and thus exercise a salutary influence over its operation.

The second gradation of the débris or ore is effected by the screen N, which consists of an annular concaved plate arranged to isolate the mineral-receptacle D from the chamber in which the other devices directly connected with the gradation of the débris are located. The said screen is provided with numerous perforations, O, adapted in size to prevent the coarser gravel with which the mineral is asso-

ciated from passing through them into the chamber P next below. It is also provided with several elongated slots, Q, which extend from its concaved center toward each edge, and which are designed to admit to the chamber nuggets of mineral too large to pass through the perforations O. These slots, however, are not large enough to allow the passage through them of gravel or massed débris.

Broad dashers R, located at right angles to and just above the screen, are situated in the chamber formed between it and the cage of rods. The function of these dashers is to agitate the water and débris or ore, and to force the finer and denser particles thereof through the screen. In instance of the use of an amalgamator they will be found particularly efficient in bringing every particle of mineral in contact with it.

Small elevators S, secured to the outer face of the periphery of the screen N, are designed to restore to the chamber above it all of the gravel and other similarly light particles of débris which fall through the numerous perforations, O, of the said screen and into the mineral-receptacle. These elevators are equal in length to the length of the slots Q, with the rear walls of which they coincide. In width they should be broad enough to extend sufficiently far into the chamber P and its contents to disengage the light upper strata of gravel from the underlying strata of mineral without disturbing the latter. As the apparatus revolves in the direction of the arrow *a* the surface material gathered by the said elevators will pack up in front of them and rise through the slots Q into the chamber above the screen N, and thence be carried by the conveyer I up the plane of the cone B and discharged from the smaller end thereof.

The lower wall of the chamber P consists of a concaved plate, T, concentric with the screen N. It is imperforate, save only at points near its center, where it is provided with holes U, adapted to receive the smaller ends of a series of conical pipes, V, tangentially inclined to its periphery, and projecting downwardly into the mineral-chamber D, one function of the said passages being to continually agitate the contents of the said chamber. Inclined or conical rims X, located within the conical passages U, are designed by producing a strong downward current of the water to draw the rich underlying strata in the chamber P into the chamber D, constituting the mineral-receptacle proper. Irrespective of this function, however, these rims do valuable work in preventing the escape of mineral from its final repository by forming, in conjunction with the conical passages V, pockets Y, into which any of the particles of mineral associated with the gravelly portions of the débris or ore being ejected from the said chamber through the said rims gravitate, and hence descend into the lower portion of the chamber D; but by far the most efficient safeguard against the escape of mineral from this chamber is formed by the inclined plate Z, which is concentric with the screen N and plate T, and which has its elevated end secured to the cone A. Its free end extends in downward inclination nearly to the opposite wall of the chamber, leaving only a small passage-way to the apartment beneath it, from which compartively little mineral escapes. In order, however, to eject any débris or ore which may so far elude the process of the apparatus as to reach this low point, ejecting devices consisting of alternate perforated flanges B′ and stirrers C′ are secured to the under face of the plate Z. The flanges B′ are of triangular form, and secured and so arranged with reference to the said plate that they form inclined planes adapted to elevate the débris over the edge of the plate Z, and thus bring the débris within the influence of the conical passages V, one office of which is, as before described, to gather the surface material which has gravitated into the mineral-receptacle and return it to the chamber P, from which it is lifted into the chamber within which are arranged the dashers R by the elevators S. The object of providing these flanges with perforations is to allow the water in the chamber D to pass them without being greatly agitated thereby, thus accelerating the subsidence of the float-gold and scum ore which it holds in suspension.

The stirrers C′ are designed to prevent the débris from packing in the mineral-chamber. They also act in concert with the flanges B′ in aiding them to effect the final gravitation or separation of mineral from the débris, as just above described. The door through which the mineral is withdrawn from the apparatus may be of any suitable construction, and, if circumstances render it necessary, it may be provided with a lock. In the drawings it is shown as being located at the lowest point of the mineral-receptacle, and as consisting of a disk, D′, held in position by a set-screw, E′, working in a removable plate, F′, the opposite ends of which are adapted to be received in slots G′ formed in the depending lugs H′.

Having thus described the different devices by means of which the débris or ore is graded or sized and those by which its mineral is eliminated, I will now turn to the consideration of those devices which are designed with especial reference to the employment of water, steam, mercury, or other aids to the operation of my improved apparatus.

It is here proper to observe that although my apparatus is eminently adapted to be used in prosecuting the strictly dry process, granting, of course, that the material treated is perfectly free from moisture, I prefer to employ water when it can be obtained, for the reason that the particles of mineral which tenaciously adhere to the débris can be more readily separated therefrom by the aid of water than without it. The wet process has not, however much more preferable, always been practica-

ble on account of the great quantity of water required to carry it on. Again, when the water-supply is amply abundant, it is seldom available in working quantities, unless stored in expensive reservoirs, excepting during the wet season. In surmounting these difficulties I have perfected a plan of making a small quantity of water suffice for the treatment of a large quantity of material. It consists in using the same water over and over, supplying to it only such small quantities as are needed to compensate for that which is absorbed and carried away by the débris. In this way I am not only enabled to employ the wet process at a comparatively light expense for water, but in view of the small quantity used I can readily heat it, and thus increase the efficiency of the machine and continue its operation during the greater part of the winter season. Aside from these important considerations, there is yet another, in that by avoiding any direct discharge of water from the machine I save the scum and float mineral, which generally eludes the processes of ordinary ore-separating apparatus, as it requires in being saved not only special devices therefor, but also more than ordinary time for its subsidence.

The three most prominent elements in my water system consist of a water-chamber, L, a water-conduit, I′, and a supply-pipe, J′.

The water-chamber aforesaid is formed by a screen, K′, which consists of a perforated annular plate, and which connects the inner end of the cone C with the cone A. To give the greatest possible protection to the said screen, it is desirable to have the extreme inner end of the cone C extend beyond it for a suitable distance. Dashers L′, secured to and at right angles with the screen, operate when the apparatus is revolved to create a channel in the débris, and thus allow the water to flow freely through it toward the screen, and also to prevent the latter from becoming clogged.

The water-conduit I′, consisting of a hollow metallic pipe coiled, like the conveyer I, in an opposite direction from that in which the apparatus is rotated, extends rearward from the water-chamber, into which one end is inserted, to any desirable point within the cones, the same being fixed by particular circumstances. In the accompanying drawings it is shown as extending very nearly to the discharge end of the apparatus, where it is arranged to project a stream of water onto the ascending plane of the cone B. This current of water will meet and oppose the débris being elevated by the conveyer I, and will wash the same back to the screen N. The water-chamber L, being located below the water-line of the apparatus, is kept constantly full, so that the conduit will take up a new supply from the chamber and discharge it, as described, once in every complete revolution of the machine, thus repeatedly reusing the water. Again, this stream of water being projected from the rear end of the conduit with considerable force will give additional impulse to the rotary water-current produced by the motion of the apparatus.

The annular ledge N′, in which the ejector J is mounted, is located very near the smaller end of the cone B, and fulfills the twofold function of preventing water from splashing out of the apparatus and of retaining therein the finer portion of the débris until an opportunity has been given to any particles of mineral contained in it of gravitating back to the screen N.

The conduit exercises an important function in saving float-gold, in that by slightly depressing the forward end of the apparatus such floating mineral will readily find its way into the water-chamber L, when it will be taken up by the conduit and carried rearward and discharged into the machine, and a portion of it at least precipitated into the mineral-receptacle. If the mineral is especially difficult to save, the conduit should be arranged to discharge the water directly upon the screen N, thus projecting the mineral into the chamber D with considerable force. In this last-mentioned position of the conduit the action of the water in cleansing the mineral-receptacle of surface material will be particularly valuable in treating many kinds of débris and ore.

In view of the impulse given to the circulation of the water by the conduit, it will greatly favor the amalgamating process by bringing all of the lighter particles of mineral, and particularly float-gold and scum ore, in contact with the mercury when the latter is used. The said conduit may be sustained in position in any desired manner. In the drawings it is represented as encircling the cage of rods.

The construction within described may be simplified by dispensing with the screen L′ where the size of the machine permits a sufficient surface on the end of the conduit adjacent to the water-chamber to be perforated and lie in the water above the débris, so as to collect and conduct to the rear of the apparatus comparatively clean water. In this case a screen should inclose the extreme end of the conduit. Still more radical changes may be effected by providing the conveyer itself with a closed spiral chamber adapted to perform all of the functions of the conduit.

Water in sufficient quantities to compensate for that absorbed and lost in the débris is supplied to the apparatus through the perforated pipe J′, the outer end of which is secured to a fixed support located at a suitable point without the cones. Its inner end, which is projected to any desired distance into the aperture K, formed, as before described, in the center of the conveyer-spiral, is supported in the ring O′, fastened to or made integral with the rod, P′ secured to the conveyer, or to any other point within the apparatus. The outer end of the said pipe is connected to the water-reservoir Q′ by a suitable conduit, in which a stop-cock, R′, regulating the amount of water supplied to the pipe J′, is located.

When the apparatus is adapted to have a

horizontal as well as a rotary movement imparted to it the outer end of the perforated pipe should be supported by devices fastened to some part of the machine which moves horizontally only, and, further, the said pipe should be connected with the reservoir Q′ by a flexible conduit, T′, as shown in Figs. 1 and 4 of the drawings.

The pipe J′ is adapted to be used not only for the introduction of water into the apparatus, but to introduce steam thereinto also. When used for the latter purpose its conduit should be detached from the water-reservoir and connected to a generator of steam. The pipe J′ also suffers some slight variation in form in changing from one of its twofold uses to the other. If employed to supply water to the apparatus, its perforations should be confined chiefly to its rear end, while on the other hand, if it is to serve as a conduit for steam, its lower face should be pierced throughout its entire length.

The smaller ends of the cones A and B are encircled by guide-rings U′, which have bearings in deeply-grooved rollers V′, journaled at suitable points in the semicircular bearings W′.

Annular flanges X′, secured to the extreme ends of both cones A and B, serve to guard the bearings W′ and prevent débris from falling into and clogging them.

Rotary motion is imparted to the apparatus through a pinion, Y′, meshing with a pinion, Z′, encircling the mineral-chamber. The pinion Y′ is mounted upon a shaft, A^2, journaled in the extreme ends of the horizontal arms B^2 of the bearings W′. Motion may be imparted to the said shaft through handles C^2, or it may be actuated by power transmitted to it from any suitable motor.

In order to augment the effectiveness of the machine, and to aid in particular its action where the strictly dry process is being employed, and when the character of the mineral or débris, or both, renders their separation extremely difficult, I provide each machine with devices adapted to impart to it a horizontal movement in addition to its rotary motion, and to be used or not as circumstances may dictate. The devices consist in eccentrics D^2, attached to the shaft A^2, in straps E^2, and in brackets F^2, provided with rollers G^2 and secured to the frame-work of the machine. The horizontal arms B^2 of the bearings W′ are received within and rest upon the rollers of the said brackets, which brackets are also provided with projecting pins H^2, adapted to be engaged with the forward ends of the eccentric-straps E^2. When these connections are effected and the shaft A^2 is actuated the cones will not only be revolved in their bearings, but also moved horizontally by reason of the reciprocation of the latter in the brackets F^2, caused by the rigid connection between them and the eccentrics. The value of this horizontal movement lies in the fact that by jarring the cones it accelerates the subsidence and stratification of the débris or ore within them, and by thus enabling the machine to be actuated more rapidly increases its facility for treating material, which is, on account of the comparatively small amount of mineral contained in a cubic yard of the débris, a very important feature of my apparatus.

The pivotal arms I^2, only one of which is shown in the drawings, are designed to support the bearings W′ in the rotary as well as in the horizontal movement of the cones. They may be attached to the cross-pieces J^2, as shown, and play in the lower faces of the said bearings, or, instead, they may be attached to the same and play in the cross-pieces. The former method is the more favorable to transportation; but the latter is preferable, for after the machine is set up the said arms can be more readily oiled than if attached to the bearings.

As a substitute for the arms, a cross-beam, K^2, and a roller, L^2, (indicated in the drawings by dotted lines,) may be employed. Either of these devices may be resorted to when the bearings, by reason of great weight within the cones, require additional support.

Inasmuch as the description of my improved separator has been fully interspersed with its *modus operandi*, an exposition thereof will not be necessary, save only to remark that when the machine is being operated the inflow from the perforated supply-pipe should be sufficient to sustain the water at a level several inches above the level of the material being treated. If mercury is employed, it may be thrown into the mouth of the cylinder, or it may be introduced thereinto through the water-supply pipe J′, or one of similar construction.

The peculiar adaptation of the apparatus to the successful prosecution of the gravity process by automatic mechanism is clearly apparent from the drawings.

The devices for grading the débris and for immediately discharging the larger portions thereof from the cones greatly facilitate the operation of subjecting the finer and gold-containing portions to repeated agitation.

The converging inclined planes of the cones A and B, the concaved form of the screen N and the plate T, and the position of the mineral-receptacle D and the character of the devices inclosed in it are all particularly adapted to save every particle of mineral. The current from the rear end of the water-conduit, which meets and opposes the mass of débris ascending toward the discharge end of the cylinder, will also save any mineral that tends to escape.

The relative disposition of the dashers also deserves attention. Their particular function is to throw up the débris and ore to obtain the most perfect stratifications of it, according to the density of its particles, that is possible. The dashers also, by disturbing the débris, operate to facilitate the percolation of water through it. In order to obtain the best results they are

sufficiently separated to insure an interval between their successive actions long enough to permit the débris to subside after being thrown up by one dasher before it is disturbed by the one next behind it.

The machines should be rotated as rapidly as consistent with their effective operation in saving mineral, which will depend to a great degree upon the character of the material being treated.

The machine may be constructed of cast or of sheet iron, or both combined; but I prefer, especially for the devices in the mineral-receptacle, malleable cast-iron. When chemicals are used that are liable to corrode the iron those parts of the machine which are exposed to such corrosive action may be made of glass or of other suitable material.

Aside from those changes which must be allowed for to meet the requirements caused by the oscillation of the ordinary practical conditions, there are many other changes which will be often necessary to adapt the machine to treat different kinds of débris or ore. If the character thereof renders the elimination of its mineral easy, and water can be obtained, the devices in the mineral-receptacle can be for the most part dispensed with. On the other hand, if the débris is in a very finely comminuted state, the cage of rods and the screen N will be unneccessary.

In machines designed particularly for use in placer-mining districts, where nuggets of mineral occur in the débris too large to pass through the elongated apertures in the screen N, the latter should be provided with suitable doors for the withdrawal of the same. In such cases, also, the location above the screen N of an inclined plate similar to the plate Z will give additional security against the escape of mineral.

Again, I do not wish to confine myself to any particular construction of conical passages or rims, or to any one method of securing them together, as I consider any structure having essentially the same form or characteristics as that shown in the drawings as falling within my invention. I would therefore have it understood that I do not limit myself to the exact construction shown and described, but hold myself at liberty to make such slight changes and alterations as fairly fall within the spirit and scope of my invention.

I do not claim in this application the combination of two cylinders whose inclined planes converge to form a central or interposed chamber; nor do I claim broadly the combination, with two conical shells, of dashers arranged within said shells. These features of construction, together with many details of form and arrangement, are embodied in a separate application filed by me June 24, 1881. The latter covers a separator constructed and operated upon substantially the same plan as the hereinbefore-described machine. I therefore wish to be understood as retaining to myself the exclusive right to all parts shown, but not claimed in the said application filed June 24, 1881, but claimed in the present application.

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

1. In a mineral-separator, the combination, with a circular chamber, of a cage of rods extending horizontally through it, and a conveyer winding spirally through the chamber and provided with perforations adapted to receive the rods of the cage and hold them in position, substantially as set forth.

2. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a conveyer consisting of a flat metallic plate coiled to form a conical structure, which is placed with its base adjacent to one of said shells, substantially as set forth.

3. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a conveyer consisting of a perforated metallic plate coiled to form a conical structure, having an open cylindrical aperture extending axially through it, said structure being placed with its base adjacent to one of said shells, substantially as set forth.

4. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a mineral-receptacle located between said shells, and a screen adapted to isolate the circular chamber from the mineral-receptacle, and consisting in a perforated concaved annular plate provided with elongated slots extending from its central portion toward each edge, substantially as set forth.

5. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a concaved screen joining said shells and a series of horizontal dashers located within the screen, substantially as set forth.

6. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a mineral-receptacle located between said shells, an annular plate dividing the said receptacle into two chambers, a screen consisting of a perforated annular plate provided with elongated slots and adapted to isolate the mineral-receptacle and circular chamber, and elevators consisting of plates secured to the outer peripheral face of the said screen, substantially as set forth.

7. In a mineral-separator, the combination, with a mineral-receptacle, of a plate dividing it into two chambers, conical pipes inserted in said plate and adapted to admit mineral and débris from the apparatus into the mineral-receptacle and to return débris only into the apparatus, and an inclined plate located below said cones, substantially as set forth.

8. In a mineral-separator, the combination, with a mineral-receptacle, of an annular plate secured to one wall of the said receptacle and extending in downward inclination toward the opposite wall thereof, substantially as set forth.

9. In a mineral-separator, the combination,

with a mineral-receptacle, of an annular plate secured to one wall of the said receptacle and extending in downward inclination toward the opposite wall thereof, and a series of flanges secured to the under face of said plate, substantially as set forth.

10. In a mineral-separator, the combination, with a mineral-receptacle, of an annular plate secured to one wall of the said receptacle and extending in downward inclination toward the opposite wall thereof, and alternating perforated flanges and stirrers secured to the under face of said plate, substantially as set forth.

11. In a mineral separator, the combination, with a circular chamber consisting of two conical shells, of a water-chamber located adjacent to one of said shells, substantially as set forth.

12. In a mineral-separator, the combination, with two cones having their bases joined together, of a receiving-cone located within the smaller end of one of the said cones, and a screen adapted to form a water-chamber with the inner end of the receiving-cone and the wall of the cone in which the same is located, substantially as set forth.

13. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a water-chamber located adjacent to one of said shells, a screen forming the front wall of said water-chamber, and dashers attached to the outer face of the screen, substantially as set forth.

14. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a water-conduit consisting of a pipe coiled into the form of a cone the base of which is placed adjacent to one of said shells, substantially as set forth.

15. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a water-chamber located adjacent to one of said shells and a water-conduit consisting of a pipe coiled into the form of a cone, that end of the pipe which terminates at the base thereof being inserted in the water-chamber, substantially as set forth.

16. In a mineral-separator, the combination, with a circular chamber consisting of two conical shells, of a conveyer consisting in a perforated plate coiled to form a conical structure, the base of which is placed adjacent to one of said shells, and a water-conduit consisting of a pipe coiled to follow the path of the conveyer, substantially as set forth.

17. In a mineral-separator, the combination, with a circular chamber, of a cage of rods, a conveyer consisting of a coiled metallic plate centrally pierced to receive the said rods, and a water-conduit consisting of a pipe coiled around the said cage of rods, substantially as set forth.

18. In a mineral-separator, the combination, with two truncated cones having their bases joined together, of a ledge located just within the end of the cone which constitutes the discharge end of the apparatus, and an ejector mounted in said ledge and having its lower edge cut away, substantially as shown and described.

19. In a mineral-separator, the combination, with semicircular bearings provided with horizontal arms, of brackets to receive the latter, secured to the frame-work in which the apparatus is mounted, a shaft journaled in the outer ends of the said arms, and an eccentric and strap, or the equivalent thereof, connecting said shaft and brackets, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN H. WILHELM.

Witnesses:
ROBT. D. THOMPSON,
M. S. BAILEY.