

2 Sheets—Sheet 1.

No. 250,983.

Patented Dec. 13, 1881.

Fig. 1

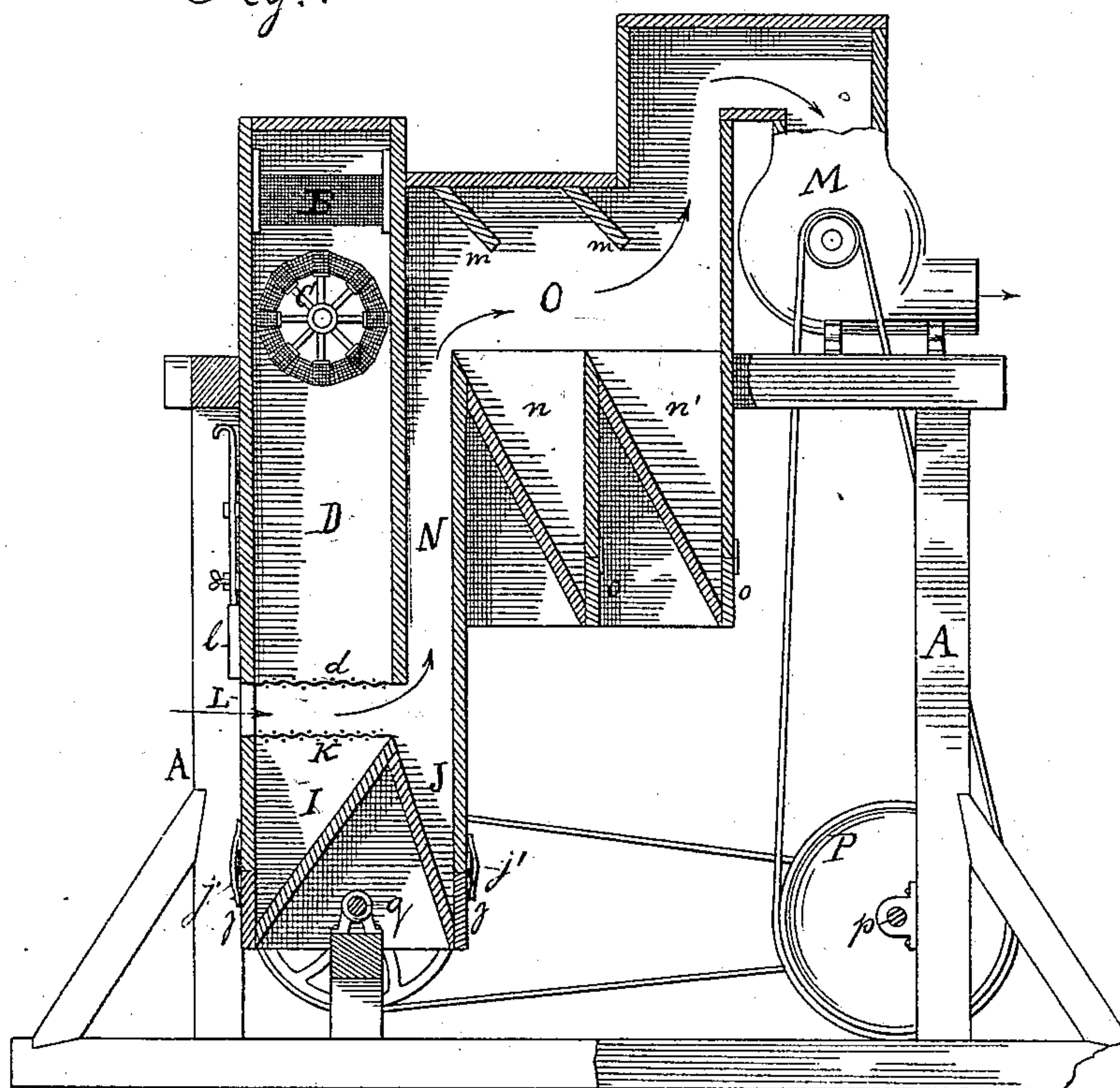


Fig 2

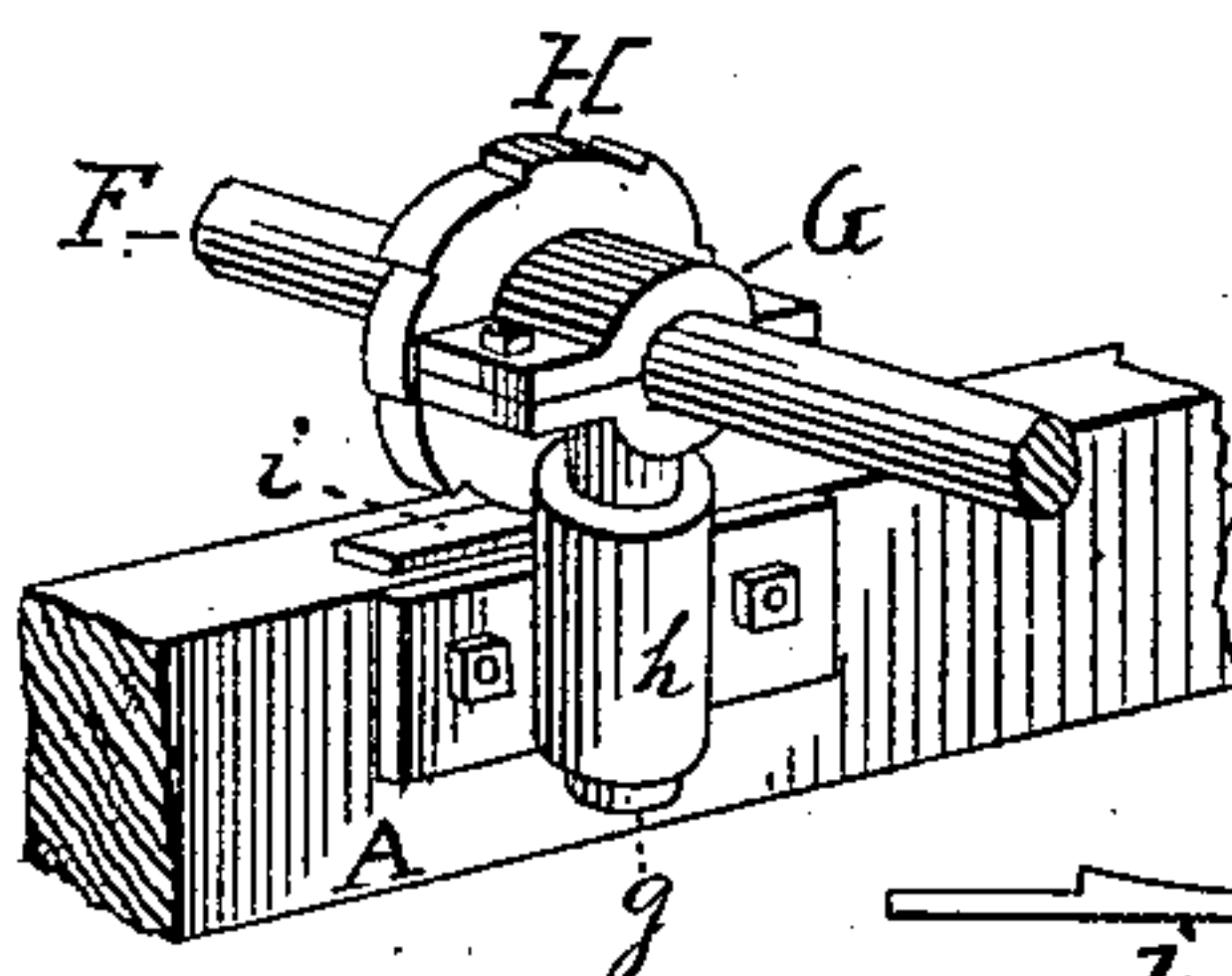
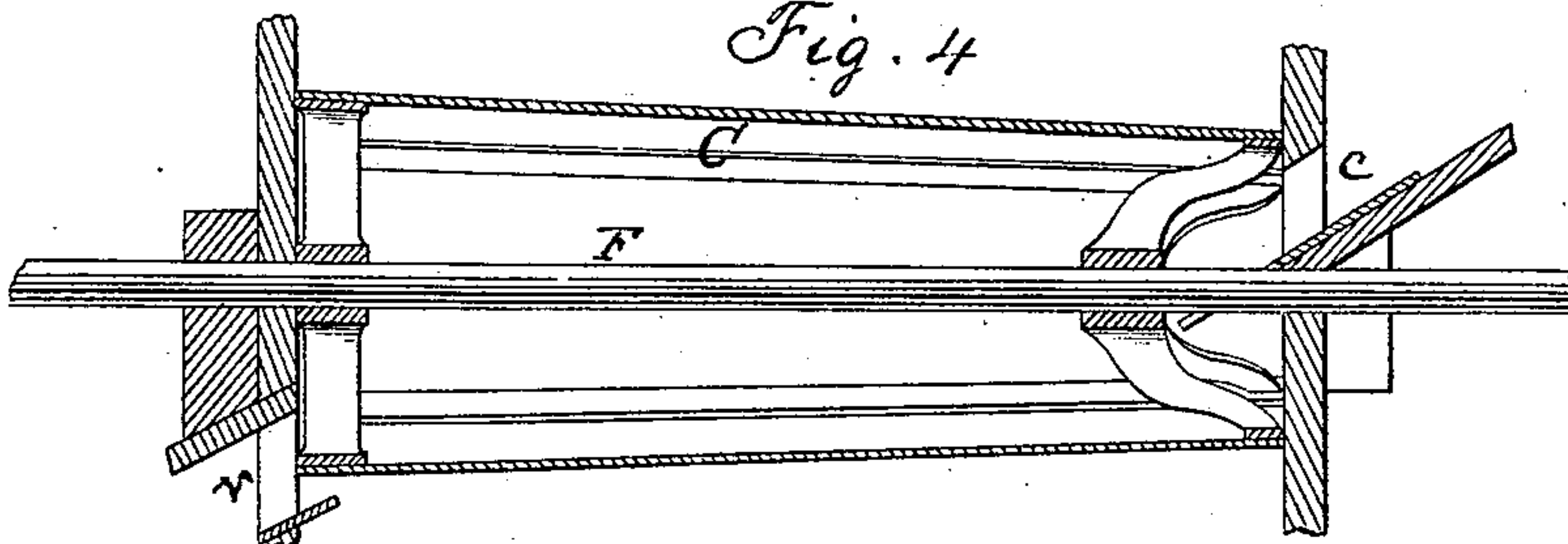


Fig. 3

Fig. 4



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(No Model.)

2 Sheets—Sheet 2.

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MACHINE FOR SEPARATING ORES.

No. 250,983.

Patented Dec. 13, 1881.

Fig. 5.

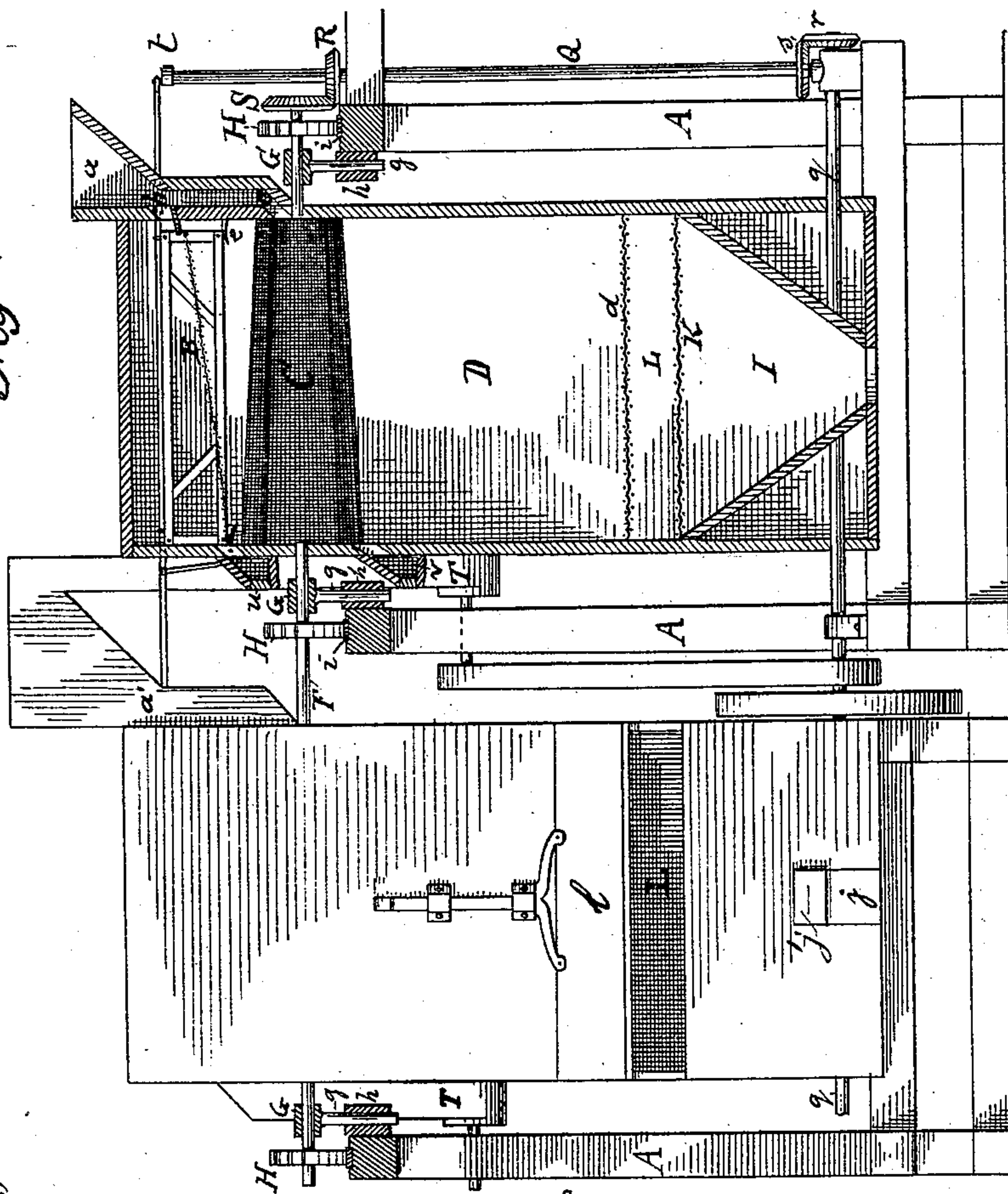
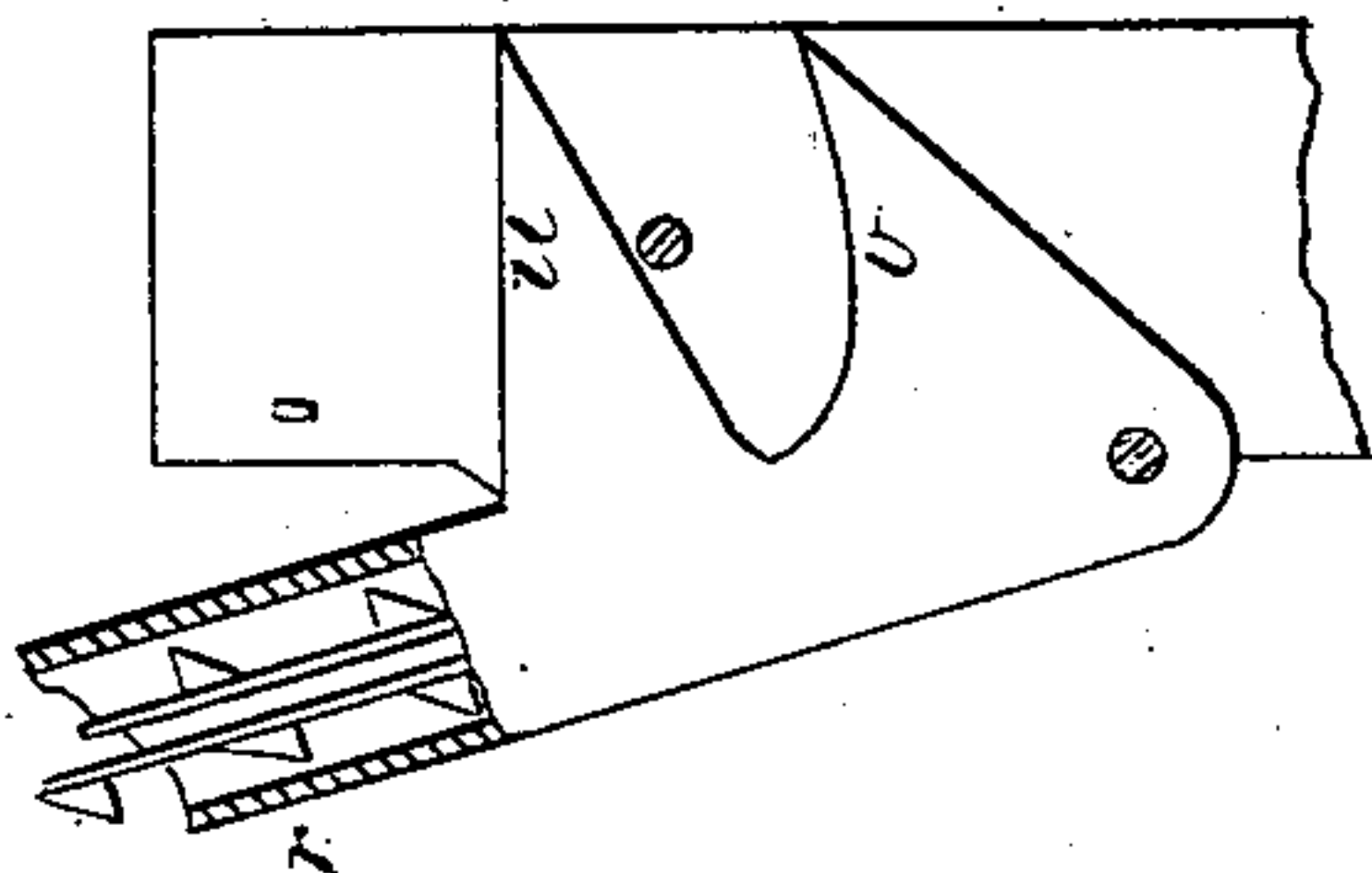


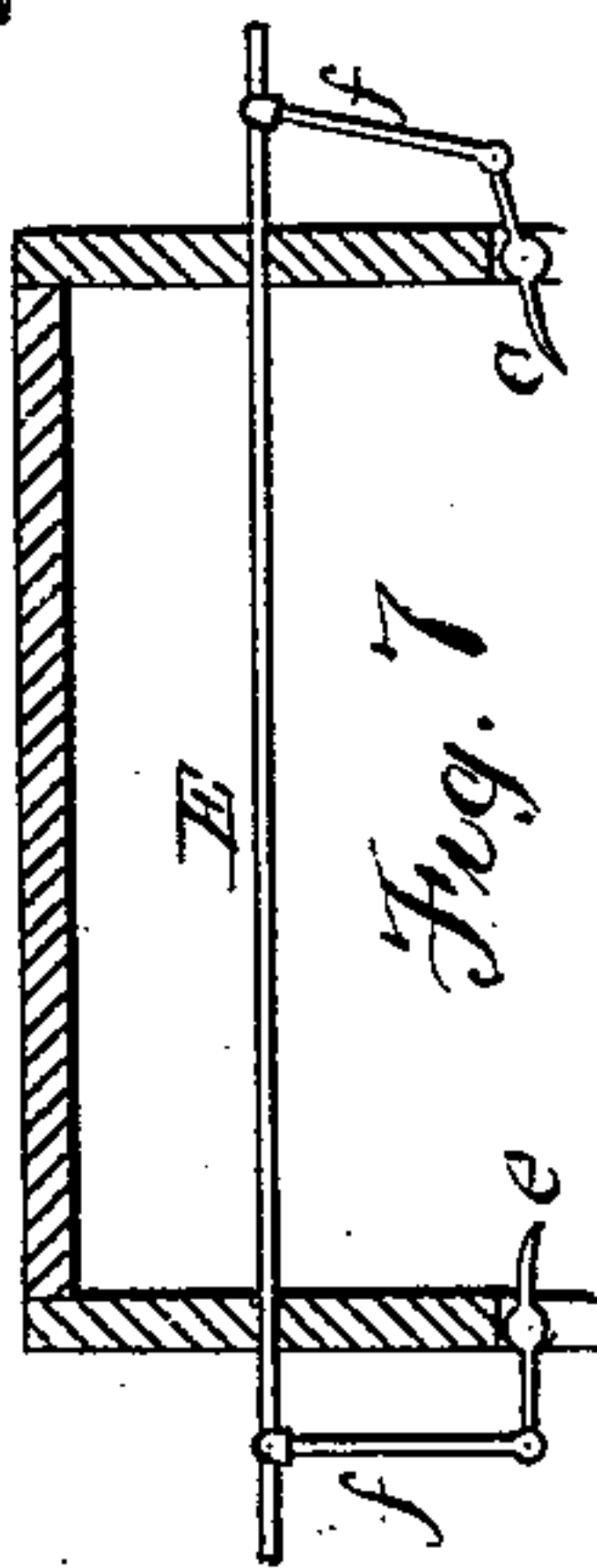
Fig. 6.



Witnesses:

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Fig. 7.



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# UNITED STATES PATENT OFFICE.

DELOS CAR SKADEN, OF CHICAGO, ILLINOIS.

## MACHINE FOR SEPARATING ORES.

SPECIFICATION forming part of Letters Patent No. 250,983, dated December 13, 1881.

Application filed August 4, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, DELOS CAR SKADEN, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Machines for Separating Ores, of which the following is a specification.

This invention relates to machines by which gold or other minerals can be separated from the earth or its accompanying gangue without the use of water, and by means of a suction-blast in connection with screens for sizing the earthy particles or the crushed quartz carrying the minerals or mineral-bearing rocks.

It is a well-known fact that the difference in specific gravity between the earthy particles or gangue and the accompanying mineral is so great that with proper sizing the separation or concentration of the mineral particles by either air or water, if properly distributed and manipulated, is very practical.

Reference is herewith made to Letters Patent No. 202,122, for an improvement in ore-separators, issued to De Witt C. Roberts on April 9, 1878, which describes a machine that to a certain extent accomplishes the work hereinbefore mentioned; and my invention consists in certain improvements of this class of machines, that will be hereinafter described, and pointed out by the claims, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a longitudinal vertical section through the center of my machine; Fig. 2, a detached perspective view of a journal-box and the screen-oscillating cam; Fig. 3, an elevation of the cam-plate detached; Fig. 4, a longitudinal section of the rotary screen; Fig. 5, an elevation, partly in section, of two adjacent machines as connected for a continuous operation; Fig. 6, a detached elevation, partly in section, of the lower end of the elevator as connected to the machine; and Fig. 7, a sectional view of a screen-shaking mechanism.

Like letters designate corresponding parts in all the figures.

A denotes the frame, made in any convenient and substantial shape, for supporting the machinery.

a is the hopper, into which the mineral-bearing earth or rock or crushed quartz is fed by

any suitable means. This hopper *a* has two openings, *b* and *c*, at different elevations, either one or both of which may be provided with suitable slides for regulating or entirely shutting off the feed. The upper opening, *b*, leads upon an inclined sifter, B, and the lower opening, *c*, into a rotary sifter, C, of a tapering octagonal shape, and both these sifters are arranged within the distributing-chamber D, that is closed air-tight on top, and has a coarse screen, *d*, at its bottom. The screenings from the upper screen, B, first drop upon the lower screen, C, from whence they are carried by the rotation of the same to the side, over which they drop to the distributing-chamber D, there being plenty of space between the sides of said screen C and the sides of the chamber D to admit of their ready passage. The frame of the sifter B rests upon the ends of four vibrating levers, *e*, that project into the distributing-chamber through slots in the wall of the same, and are actuated from reciprocating bars *F* and from connecting-rods *f*, so as to move in pairs alternately in opposite direction, and to keep the screen in a jolting motion. The octagon sifter C is mounted upon a shaft, *F*, that is journaled in bearings *G*, which bearings are provided with cylindrical stems *g*, guided in boxes *h*, so as to have a free vertical movement therein produced by the cam-wheels *H*, mounted upon shaft *F*, resting upon cam-plates *i*. The cam-wheels *H* raise the sifter and allow it to drop suddenly while it is rotated, whereby the material passing through the sifter C is constantly kept agitated, and the small particles are discharged through its meshes.

Below the distributing-chamber D is arranged a receiving-hopper, I, and behind it a pocket, J, each provided with a gate, *j*, that is resisted sufficiently by a suitable spring, *j'*, so as to be opened by the gravity of the minerals after the hoppers are filled to a certain extent. The receiving-hopper I at its top is closed by a coarse meshed screen, K, a sufficient space being left between screens *d* and K for a current of air to pass through, which is admitted through an opening, L, and is regulated by a sliding gate, *l*.

M is an exhaust-fan that creates a strong draft through opening L and through the space between the screens *d* and K, thence through



vertical duct N, and thence through a horizontal chamber, O, which latter has deflecting-boards *m* and receiving-hoppers *n* and *n'*, which are also each provided with a gate, *o*, that will be opened by the gravity of the material deposited therein, so as to discharge the same as it accumulates. The exhaust-fan M is driven from a pulley, P, on the main shaft *p* by a belt, and a counter-shaft, *q*, is also driven from said main shaft by suitable pulleys and a belt. Upon one end of this counter-shaft *q* is mounted a miter or bevel wheel, *r*, matching another similar wheel, *s*, mounted upon an upright shaft, Q, which carries a bevel-pinion, R, engaging with a bevel-wheel, S, mounted upon the end of screen-shaft F, and giving motion thereto. The upper extremity of shaft Q has a crank, *t*, which transmits a reciprocating movement to bar E for jolting the sifter B.

The material that is too coarse to pass through the sifter or screen B of the first machine passes into the pocket *u*, while that material that is too coarse to pass through the screen C will pass into the pocket *v*. From these pockets the material drops or slides into the bottom of the boot of the elevator T, and from thence it is hoisted and delivered into the hopper *a'* of the next adjacent machine. This elevator T is secured against the side of the machine, as shown in Fig. 5. The pockets *u* and *v* are shown in detail in Fig. 6 and their application in Fig. 5. This elevator T is driven by a belt from the counter-shaft *q*.

These machines are arranged consecutively, with sieves having coarser meshes. A certain portion of the material, which is as near as possible of uniform grade as to size, is separated in each machine in succession, until from the last machine only such material is discharged from the end of the screens as is coarse enough to be again reduced in the crusher or stamping-mill.

The operation of the machines is as follows: The quartz or mineral-bearing rock, after having been crushed to a sufficient fineness to separate or cause a clearance between the gangue and mineral, (and in auriferous earth a screen is used for first freeing the earth of boulders or rocky substance of any considerable size,) is elevated into the receiving-hopper *a*. From hopper *a* it passes through either or both the openings *b c* onto the inclined screen B, or into the rotary sifter C, or both. The particles that will pass through the screen or screens are delivered into the chamber, through which they fall into the channel of the air-current, the force or power of the said air-current being gaged by the air-gate sufficiently to carry up and over the quartz or earthy matter through the air-duct N, but not sufficiently forcible or powerful to carry over particles of great specific gravity. The mineral is deposited proportionally to its gravity into either the hopper I or pocket J, from whence, by its own weight, it seeks an outlet through the self-acting gates *j*. The object of thus delivering

into the air-current from screens arranged as mentioned is twofold: first, to avoid the delivery of the finer material direct from a hopper into an air-current, because the tendency of cohesion by affinity is so great that the separation of each and every particle, one from the other, is very imperfect, whereas by this arrangement each and every particle, through the action of the screens, is delivered separately and of the same size, direct through the chamber into the air-current below, and at the same time the oscillating movement of the screens not only keeps their meshes from filling up, but also causes a feed into the air-current through the chamber of an intermittent nature, whereby a certain amount of the crushed material is delivered into the air-current at each pulsation or oscillation; second, the mineral, being of a greater weight than the gangue, passes into and through the air-current first, while the gangue or earthy matter, being lighter, falls more slowly into the air-current, and, on account of its greater susceptibility, is carried along by the force of the current produced by the exhaust-fan up and over, when it falls into the receptacles *n n'*.

As it is necessary that the air in the distributing-chamber D should not be disturbed by the action of the exhaust-fan, and that a perfect air-current should be produced between the opening L and the air-duct N, a coarse-meshed screen, *d*, is stretched under the mouth of the distributing-chamber, and another similar screen, K, over the mineral-receiving hopper I, which are sufficiently coarse to allow all material from the sizing-screens to pass through without impediment. As the current of air produced by the exhaust-fan has a tendency to form an air-wall on each side of the channel, the assistance which the coarse-meshed screens render for all practical purposes makes perfect and absolute walls, between which the air of the current may pass without any perceptible influence on the air of the chamber above or hopper below the said walls. Much of this crushed material, being too coarse to pass through the screens of the first machine, passes along and through the spouts *u* and *v* into the elevator, which will hoist and deliver it into the hopper *a'* of the next machine, where the same process is performed, as heretofore recited, and so on until all the material passes through the different-sized screens.

The elevator T may be dispensed with in locations where it is convenient to place the machines on an incline, one below the other, when the surplus material of one machine may be fed into the next machine below by its own gravity.

What I claim as my invention is—

1. In an ore-separator, the vertical distributing-chamber containing one or more sifters, B or C, and the receiving-hopper I, arranged vertically below said distributing-chamber, and having automatically-operating spring-gate *jj'*, in combination with the intermediate air-inlet,



L, and the exhaust-fan M, substantially as and for the purpose set forth.

2. In an ore-separator, the distributing-chamber D, having screen *d*, and the receiving-hopper I, having screen K, in combination with the air-inlet L and exhaust-fan M, all substantially as and for the purpose set forth.

3. In an ore-separator, the distributing-chamber D, containing a sifter or sifters and having screen *d*, and the receiving-hopper I, having screen K, in combination with the air-inlet L and exhaust-fan M, all substantially as and for the purpose set forth.

4. In an ore-separator, the distributing-chamber D, having screen *d*, and the receiving-hopper I, having screen K, in combination with the air-inlet L, air-duct N, air-chamber O, and exhaust-fan M, all constructed and arranged substantially as and for the purpose set forth.

5. In an ore-separator, the distributing-chamber D, containing sifters B C and having screen *d*, and the receiving-hopper I, having screen K, in combination with the air-inlet L, air-duct N, air-chamber O, and exhaust-fan M, all constructed and arranged substantially in the manner and for the purpose set forth.

6. In an ore-separator, an inclined sifter, B, and, in combination therewith, the vibrating levers *e* and the reciprocating bar E, substantially as and for the purpose set forth.

7. In an ore-separator, and in combination therewith, the rotating sifter C, the shaft F, journaled in bearings G, having stems *g*, boxes *h*, cams H, also mounted upon shaft F, and cam-plates *i*, all substantially as and for the purpose specified.

8. In an ore-separator, the combination of the distributing-chamber D, containing sifters B C and having screen *d*, the receiving-hopper I, having screen K, the pocket J of the air-inlet L, air-duct N, air-chamber O, with hopper *n n'*, and the exhaust-fan M, all constructed and arranged substantially as and for the purpose set forth.

9. The combination of two or more ore-separators, each having a distributing-chamber, D, with screen *d*, a receiving-hopper, I, with screen K, an air-inlet, L, air-chamber O, and exhaust-fan M, and each provided with a sifter or sifters, B C, the meshes of which in adjacent machines increase in size consecutively, and are adapted to transfer the surplus material of one machine to the next adjacent machine, and the shafts F and *g*, connecting said adjacent separators together, substantially as set forth.

10. The combination of two or more ore-separators, each having a distributing-chamber, D, containing one or several sifters, B C, the meshes of which in adjacent machines consecutively increase in size, and having screen *d*, a receiving-hopper, I, having screen K, air-inlet L, air-chamber O, and exhaust-fan M, with an intermediate elevator, T, for transferring the surplus material from one of two adjacent machines to the other, all substantially as and for the purpose set forth.

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Witnesses:

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