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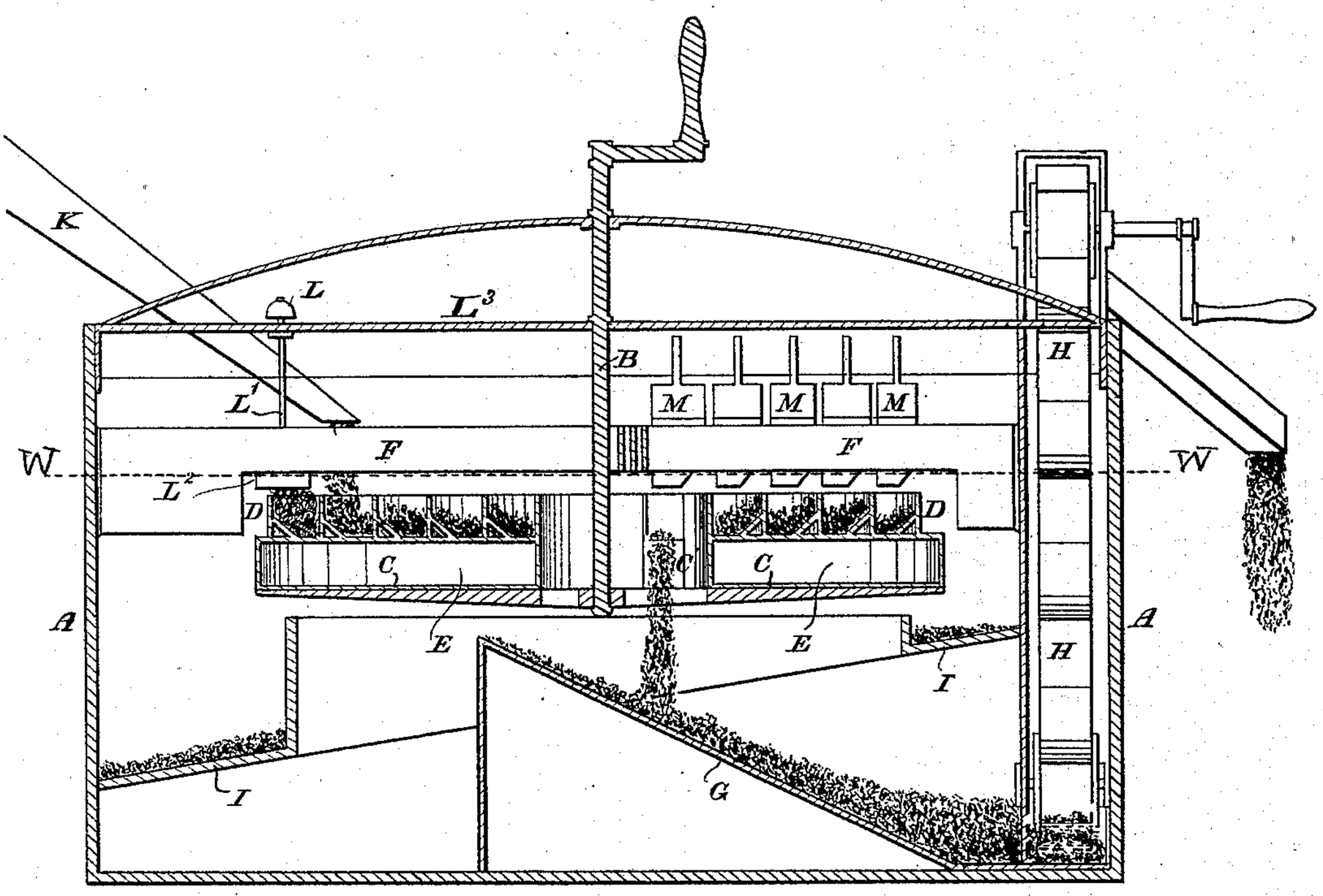
APPARATUS FOR SORTING MINERALS.

No. 413,188. Patented Oct. 22, 1889.

Fig. 1.



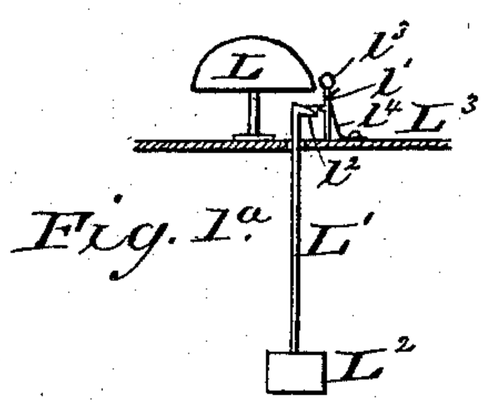


Fig. 1ª.

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Fig. 2.

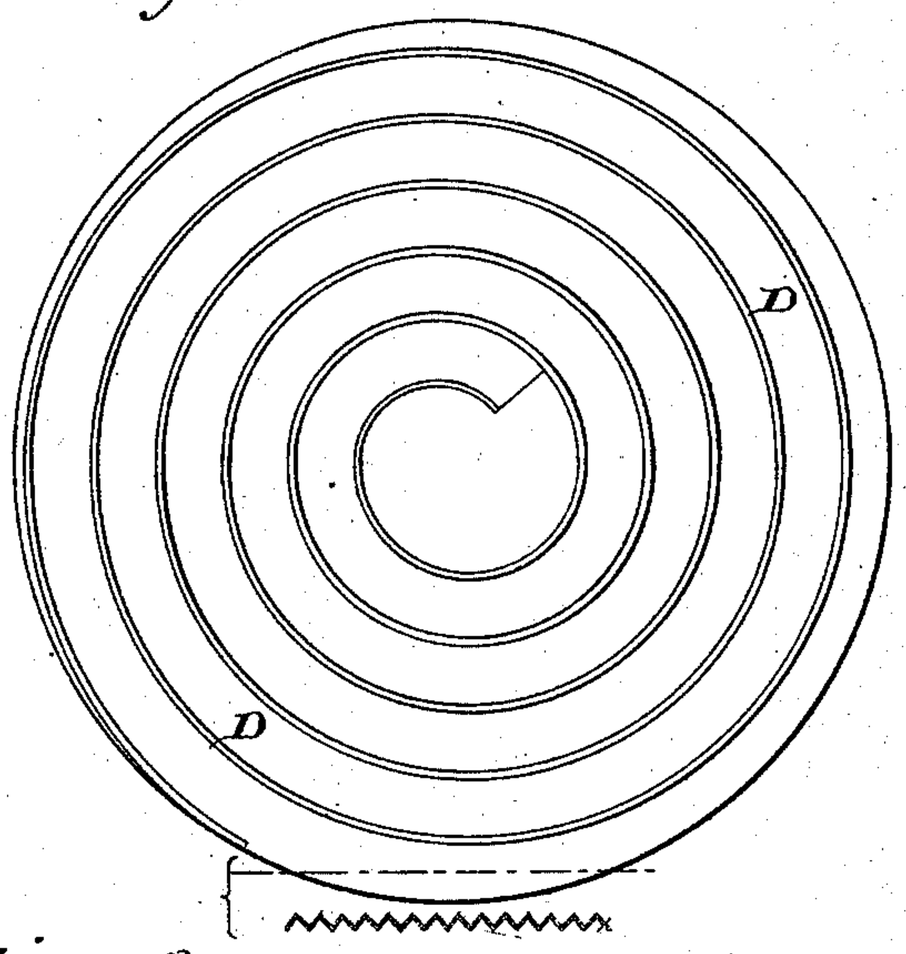


Fig. 3.

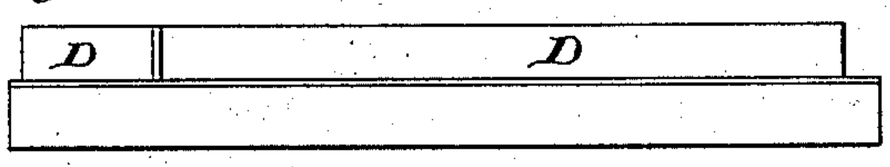


Fig. 4.

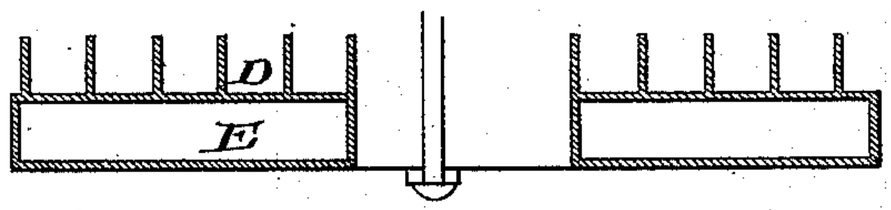


Fig. 5.

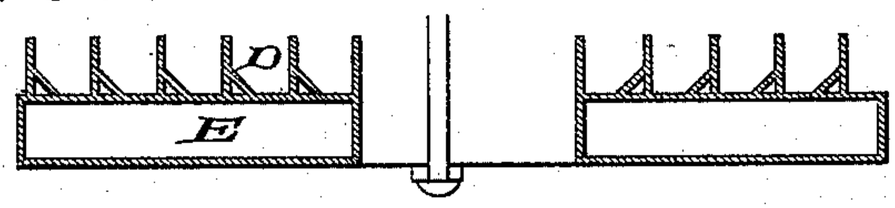


Fig. 6.

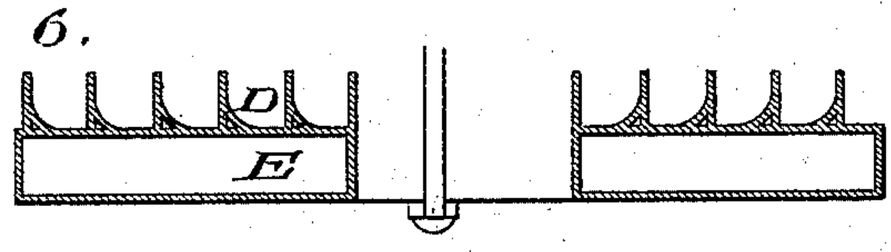
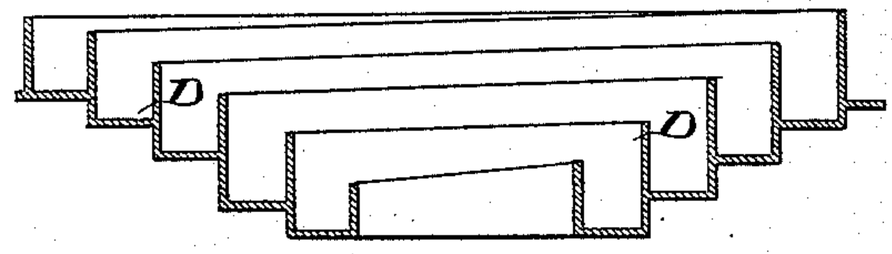


Fig. 7.



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APPARATUS FOR SORTING MINERALS.

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Fig. 8.

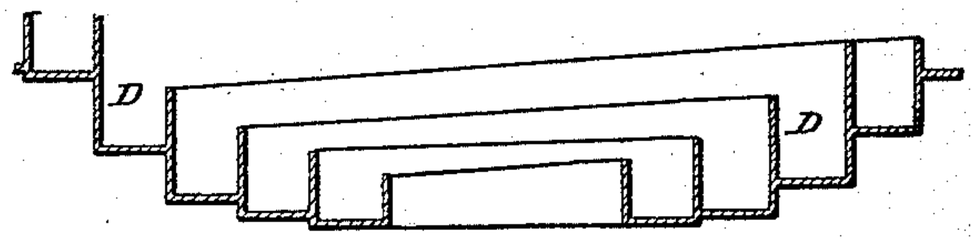

Fig. 9.

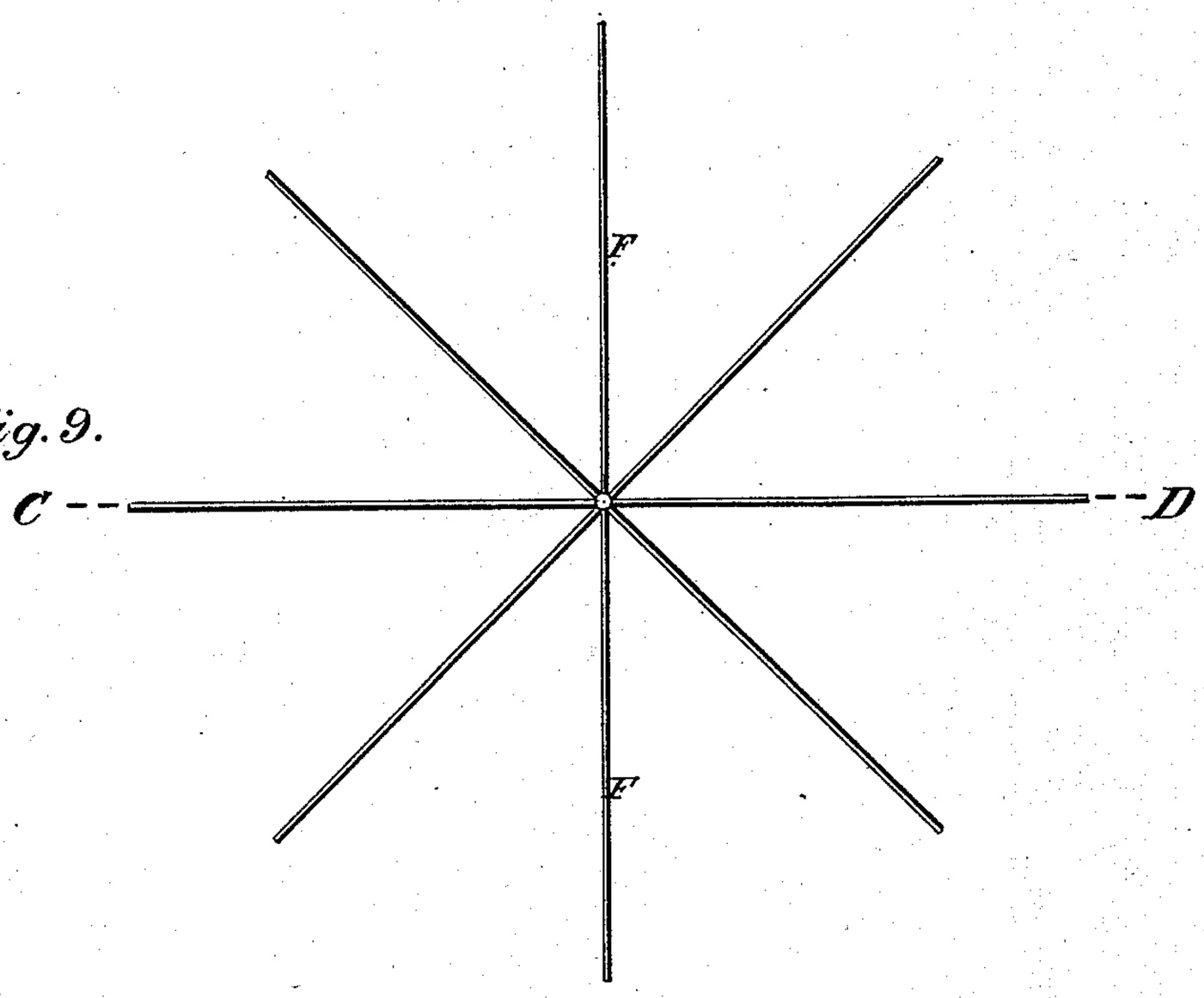

Fig. 10.

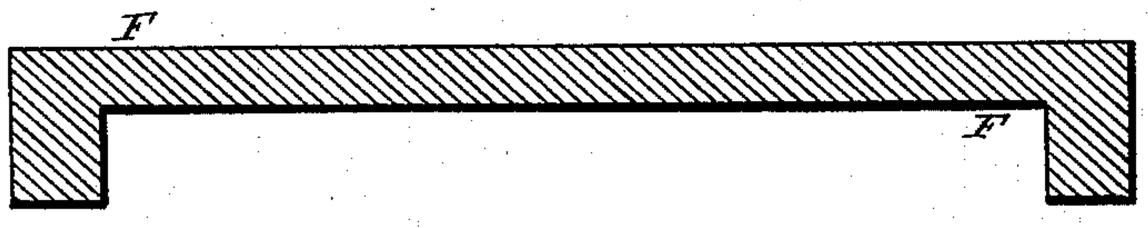

Fig. 11.

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APPARATUS FOR SORTING MINERALS.

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Fig. 12.

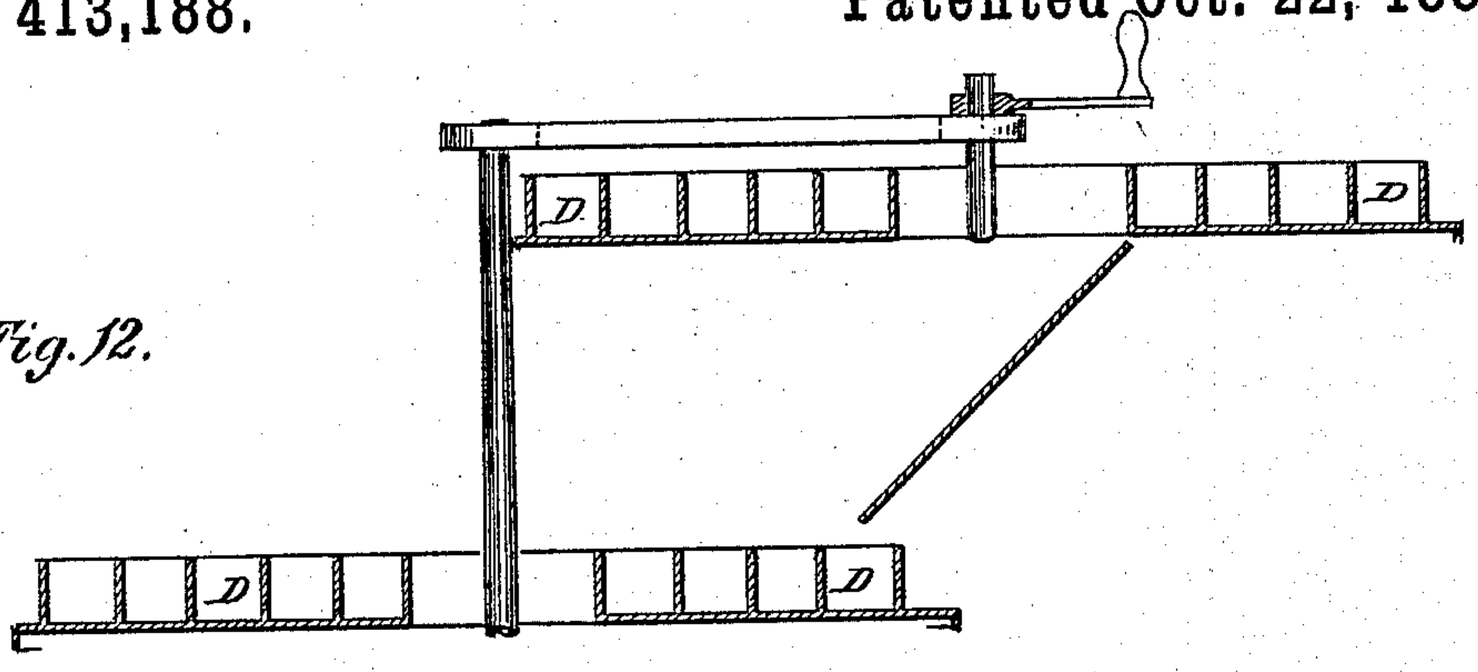
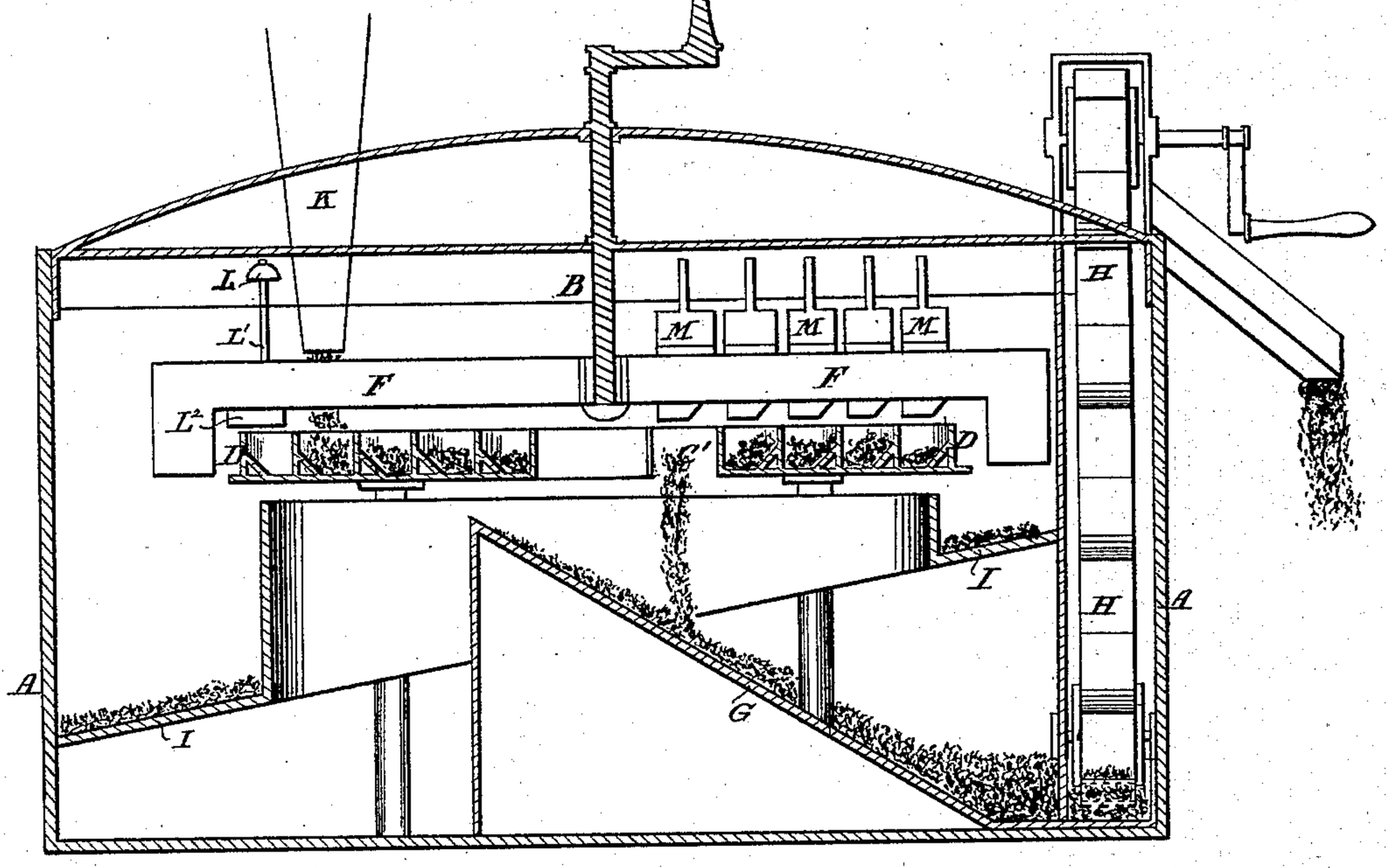


Fig. 13.



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UNITED STATES PATENT OFFICE.

GEORGE KILGOUR, OF WESTMINSTER, ENGLAND.

APPARATUS FOR SORTING MINERALS.

SPECIFICATION forming part of Letters Patent No. 413,188, dated October 22, 1889.

Application filed February 7, 1889. Serial No. 299,069. (No model.)

To all whom it may concern:

Be it known that I, GEORGE KILGOUR, civil engineer, a subject of the Queen of Great Britain, residing at 2 Victoria Mansions, Victoria Street, in the city of Westminster, England, have invented certain new and useful Improvements in Apparatus for Sorting Minerals or other Bodies, of which the following is a specification.

My invention relates to that class of apparatus in which the material to be treated is subjected to the frictional action of water in a closed vessel, in such manner that the material is sorted according to its specific gravity.

The object of my improvement is to secure a compact, simple, and efficient machine; and my improvements consist in certain novel combinations and organizations of instrumentalities hereinafter described, and specifically designated in the claims at the end of this specification.

In order to carry out my invention I mount upon an axis substantially vertical a rotating disk, provided on its upper side with a spiral channel leading from its periphery to its center, with an opening in the disk near its axis, so that the material to be sorted is gradually fed from the circumference to the center. This disk is immersed in a tank or vessel supplied with water, and is provided with check-boards or other means of causing the disk and the fluid in which it is immersed to traverse relatively to each other. The weight of the disk and material thereon is partially counterbalanced by combining a float with the disk. When the channel becomes full of material, it is cleansed by reversing the rotation of the disk, the check-boards then acting as scrapers to remove the material therefrom. An automatically-operated signal gives warning when the channel is full. After being discharged from the disk or channel the material may be conveyed to any suitable point desired for further treatment.

The accompanying drawings represent all my improvements as embodied in one apparatus in the way best known to me now. Some of them, however, may be used without the others, and in apparatus differing in details of construction from that herein shown.

In the accompanying drawings, Figure 1 represents a vertical central section through so much of a hand-machine embodying my improvements as is necessary to illustrate the subject-matter claimed. Fig. 1ª is a detail view showing one way of sounding an alarm. Fig. 2 shows a diagram plan view of the spiral channel; Fig. 3, a side elevation of the disk-channel, the air-chamber or float detached. Figs. 4, 5, 6, 7, and 8 represent, diagrammatically, cross-sections of various modifications of the form of the channel. Fig. 9 is a diagrammatic plan view of the radial blade which carries the check-boards. Fig. 10 is a vertical section therethrough on the line *c d* of Fig. 9; Fig. 11, a side elevation of radial blades adapted to impede the revolution of the water with the disk. Fig. 12 is a diagrammatical vertical axial section showing how a series of disks may be arranged in different vertical planes and operating successively on the material. Fig. 13 represents a vertical central section through a modified form of the apparatus in which the water is made to revolve while the channel remains quiescent.

The drawings show a tank or vessel A of circular or other suitable form with a substantially vertical shaft or spindle B journaled in suitable bearings in the cover or frame-work thereof and carrying a horizontal disk C, provided on its upper surface with a spiral channel D, and having underneath it an air-chamber or float E, to counterbalance the weight carried by the spindle.

In large machines provision might be made for pumping more air into the air-chamber or allowing a certain amount to escape therefrom according to the weight of ore carried by the disk. In such machines the spindle would be driven by power in suitable well-known ways.

Radial blades F, as shown in Fig. 1, are fixed in the tank above the spiral channel to prevent the water in the tank from revolving with the disk.

The water-level is indicated by the line W W in Fig. 1.

The crushed ore is fed through a chute K into the spiral channel near the periphery of the disk as it rotates. This material is gradually conveyed to the center of the machine, where the refuse tailings are discharged through a central opening C′ in the disk into a chute G, inclined toward the circumference

of the tank, which chute delivers them near the side of the tank, from whence they are conveyed either continuously or intermittently by an endless-chain elevator H, operating in usual well-known ways, which discharges them at any desired point. The material containing the heavy metallic particles is discharged over the periphery of the spiral channel upon an annular inclined chute I, from whence it may be removed by another endless elevator similar to the one H above described, or in any other suitable manner. When the channel has become filled with solid material which must necessarily be removed, warning is given by means of a bell L, operated by an endwise-moving lever or spindle L′, the lower extremity of which carries a knob or blade L^2, which at the proper time is raised by coming in contact with the solid material in the channel.

The bell may be sounded in various ways by well-known apparatus forming no part of the subject-matter herein claimed. One way of operating the bell is shown in Fig. 1ª, in which a bell L, of ordinary construction, is mounted on the frame L^3. The hammer consists of a shank l' and a head l^3, the shank being secured to the frame L^3 and normally pressed toward the bell by a spring l^4. The spindle L′, which moves vertically in the apparatus, is formed with an inclined head, which engages with an inclined knob or detent on the shank l'. When the spindle is elevated by the material, the head of the spindle is removed from the knob on the bell-hammer, and the hammer is then made to strike the bell by means of the spring l^4.

The channel may be cleaned, when desired, by lowering into it a scraper or series of check-boards or scrapers M, mounted in well-known ways upon one or more of the radial blades F F, so as to be capable of sliding longitudinally thereon to accommodate the varying distance of the channel from its axis of motion. The disk ordinarily revolves in such direction as to cause the material to be fed from the circumference to the center. This motion of course is reversed in cleaning the channel, as the material therein has to be fed from the center to the circumference. This cleaning may also be effected without the use of scrapers by reversing the revolution of the disk when immersed in the water, as will readily be understood. The material may be subjected to longer treatment or a greater range of velocity by placing a series of disks one below the other.

Fig. 12 shows a diagram of two disks arranged in different horizontal planes and with their axes in different vertical planes, by which means one may be driven with a greater velocity relatively to the other by usual well-known means.

The channel is shown in Figs. 4 and 12 as made with a horizontal bottom rectangular in cross-section. I prefer, however, to make the bottom somewhat higher on its outer than on its inner side, as shown in Figs. 1, 5, 6, and 13, as this construction counteracts the tendency of the centrifugal action to deposit material on that side. The bed of the channel, instead of being horizontal from center to circumference, as shown in the above-mentioned figures, may be made to slope to any angle to the horizontal, or be curved upward or downward, thus increasing or diminishing the action of gravity. For example, in the construction shown in Fig. 7 the differential effect will be lessened, while in that shown in Fig. 8 it will be increased. The bottom of the channel may in some cases advantageously be corrugated or serrated, as shown in Fig. 2, in order to catch the finer particles more readily, as is well understood.

Instead of keeping the water still and revolving the disk, the latter may be kept still and the water be made to revolve. To do this it is only necessary to mount the blades F on the spindle B so as to revolve therewith, as shown in Fig. 13. The blades might be made to revolve in one direction while the channel revolved in the other in well-known ways.

My improved apparatus can also be used in treating auriferous crushed stuff directly from the mill in lieu of ordinary mercury wells and plates, in which event the disk should be made of copper with the surface amalgamated in the usual manner.

The cleaning of the amalgam from the channel will be effected by lowering therein a cleaner fitted to it, as previously described, to sweep out the ore, amalgam, &c., to the outer end of the channel, where it will be caught in a receptacle provided for the purpose; or the disk may be rotated in mercury.

The operation of the apparatus will readily be understood from the foregoing description.

Having thus fully described the organization and operation of my improved apparatus, what I claim as new and of my own invention is—

1. The combination, substantially as hereinbefore set forth, of a tank or vessel, a spiral channel extending from its circumference to its center, blades or check-boards overlying the channel, and mechanism, substantially such as described, for traversing the blades and water in the tank relatively to each other, to feed the refuse material from the circumference to the center of the channel and discharge it there while the valuable material is retained in the channel.

2. The combination, substantially as hereinbefore set forth, of a tank or vessel, a spiral channel extending from its circumference to its center, a shaft or spindle on which the channel rotates, and blades or check-boards which prevent the rotation of the water in the tank with the channel, whereby the material is fed from the circumference to the center against the counteracting friction of the water and of its own centrifugal force.

3. The combination, substantially as hereinbefore set forth, of a tank or vessel, a disk rotating on a vertical shaft or spindle therein, a spiral channel extending from the circumference to the center of the disk, a central opening in the disk and channel, and radial blades or check-boards obstructing the flow of the water in the tank.

4. The combination, substantially as hereinbefore set forth, of the spiral channel, its radially-movable scrapers, and mechanism, substantially such as described, for rotating one relatively to the other to discharge the deposit circumferentially from the channel.

5. The combination, substantially as hereinbefore set forth, of a tank or vessel, a disk rotating on a vertical shaft or spindle therein, a spiral channel above the disk, and an air-chamber counterbalancing the weight of the disk and channel.

6. The combination, substantially as hereinbefore set forth, of a tank or vessel, a disk rotating therein, a spiral channel on the disk, an air-chamber or float counterbalancing the weight of the disk and channel, and blades or check-boards opposing the tendency of the water to rotate relatively to the disk.

7. The combination, substantially as hereinbefore set forth, of a rotating disk, its channel, and an alarm provided with a vertically-moving spindle having a plate or knob on its lower end, against which the material in the channel strikes when the channel is full and causes the alarm to be sounded.

8. The combination, substantially as hereinbefore set forth, of a tank or vessel, a spiral rotary channel therein, a circumferential feed-chute, a central tailings-discharge opening, and a circumferential discharge-chute through which the material escapes from the channel.

9. The combination, substantially as hereinbefore set forth, of a tank or vessel, a disk revolving on an axis therein, a spiral channel extending from the circumference to the center thereof, radially-movable scrapers, and a circumferential discharge-chute into which the material is discharged from the channel by the scrapers.

10. The hereinbefore-described sorting apparatus, consisting of the combination, substantially as hereinbefore set forth, of a tank or vessel, a disk revolving on a vertical axis therein, a spiral channel on the disk, having a central discharge-opening, a counterbalancing air-chamber, radial blades, radially-movable scrapers thereon, a circumferential feed-chute, a central tailings-discharge chute, and a circumferential discharge-chute for the material scraped from the channel.

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