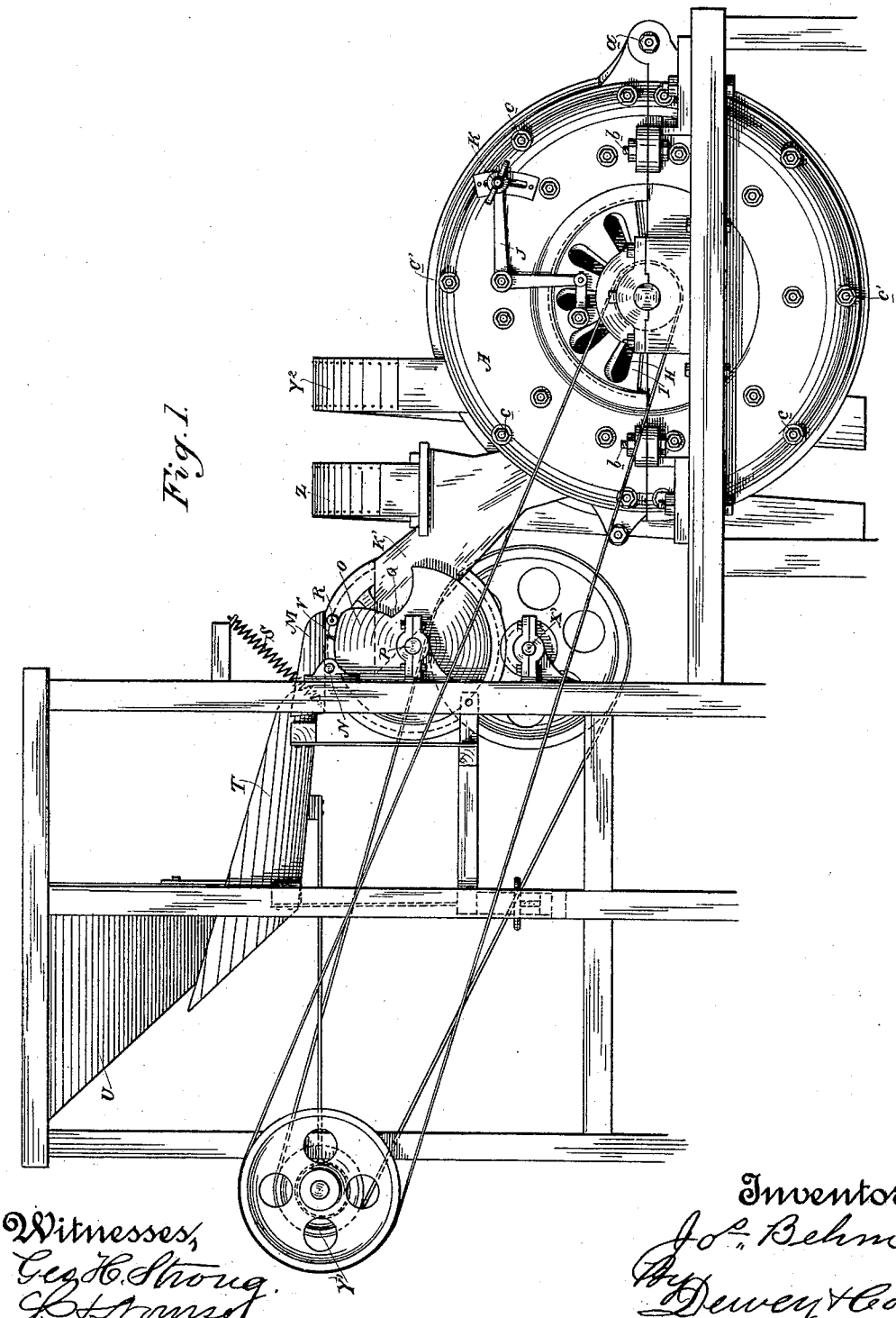
(No Model.) 3 Sheets—Sheet 1.

J. BEHM.

CENTRIFUGAL PULVERIZER.

No. 392,488. Patented Nov. 6, 1888.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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CENTRIFUGAL PULVERIZER.

No. 392,488. Patented Nov. 6, 1888.

Fig. 3.

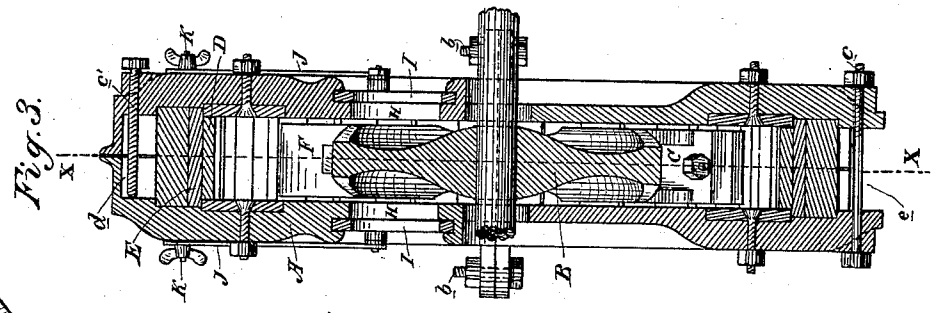
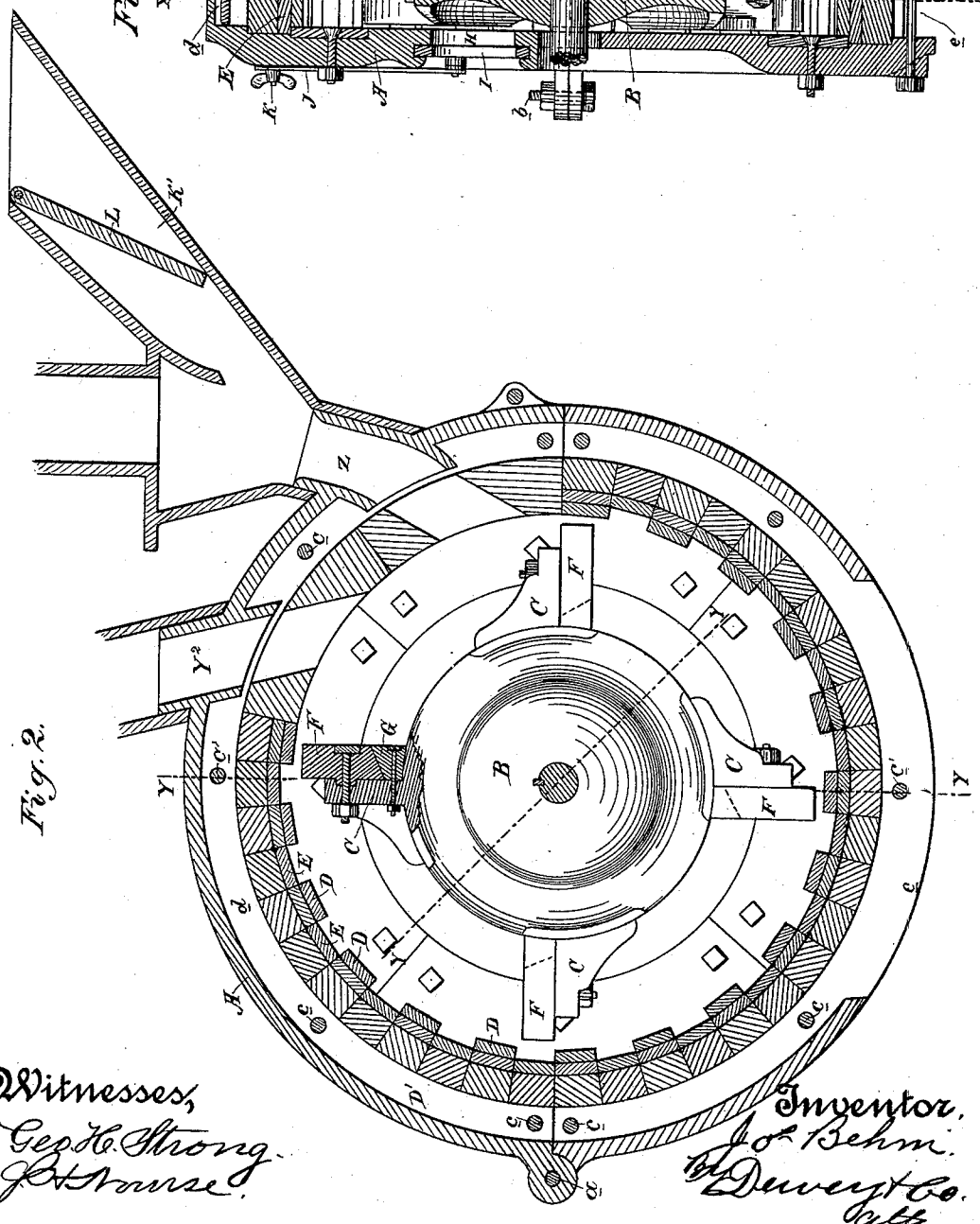


Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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CENTRIFUGAL PULVERIZER.

No. 392,488. Patented Nov. 6, 1888.

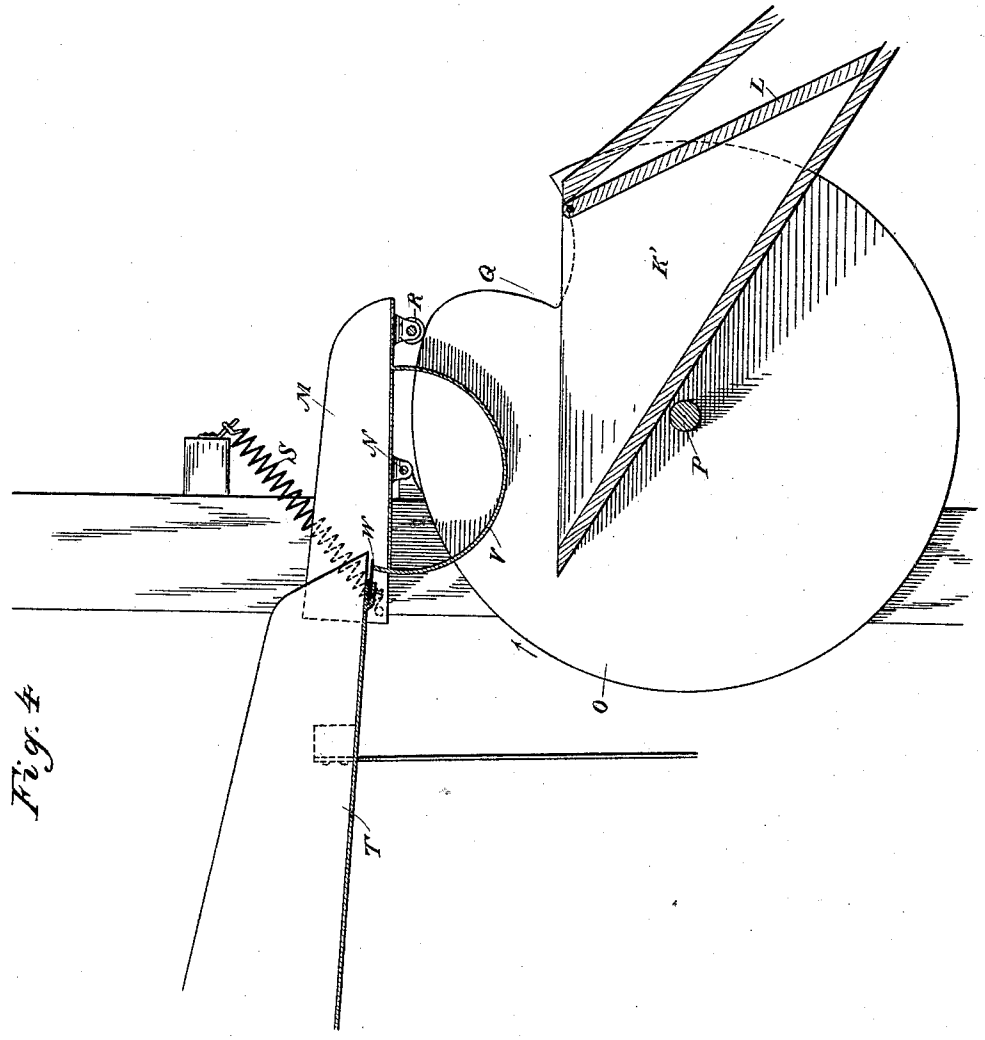

Fig. 4.

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UNITED STATES PATENT OFFICE.

JOSEPH BEHM, OF WEST POINT, CALIFORNIA.

CENTRIFUGAL PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 392,488, dated November 6, 1888.

Application filed February 8, 1888. Serial No. 263,426. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH BEHM, of West Point, Calaveras county, State of California, have invented an Improvement in Centrifugal Pulverizers; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to certain improvements in rotary pulverizers; and it consists in the constructions and combinations of devices which I shall hereinafter fully describe and claim.

Figure 1, Sheet 1, is an exterior side elevation of the machine and feeder. Fig. 2, Sheet 2, is a vertical section taken through X X of Fig. 3. Fig. 3, Sheet 2, is a vertical section taken through Y Y, Fig. 2. Fig. 4, Sheet 3, is an enlarged vertical section of the feed-chute, gate, and means for supporting the ore in changes at regular intervals.

A is the case, within which revolves a disk, B, carrying the arms C. The case A is made in two halves, which are hinged together horizontally at *a*, so that the upper half of the case may be opened about the hinge-joint to allow an inspection of the interior or the adjustment of the shoes and dies. When closed, the two halves are firmly clamped together by bolts *b*, passing through lugs upon the sides, as shown. The two halves of the case are also divided vertically in a plane transverse to the axis, and the meeting edges of all the joints are packed to prevent the escape of dust. Within the case, around its inner periphery, are fixed the dies D and E, and they are held in place by the end compression caused by drawing the sections together by the bolts *c*. When these bolts are loosened, the dies may be removed or adjusted at will. In order to separate the sides of the case after the bolts *c* are loosened, I employ screws *c'*, which screw into one side of the case, and their ends abut against the other side, so that when turned they will act to force the sides apart. After the proper changes or adjustments are made, these pressure-screws are turned back, and the nuts upon the bolts *c* are again tightened. The dies D, I call the "wearing-dies," and the dies E are the "protection-dies." These dies fit in grooves or channels made around the inner sides of the case, and the dies D project alternately, so that the interior presents a corrugated surface, and the ore is pulverized by being forcibly thrown against these corrugations by the rotary arms. The dies are all made reversible, so that when the projecting edges on one side are worn off the dies may be turned and the opposite edges brought into service. The arms C have shoes F bolted to them and projecting radially toward the interior of the case, and these shoes are also reversible when the outer ends have been worn off too short for efficient service. When thus reversed, the spaces between the periphery of the disk and the inner ends of the shoes are filled by blocks G, which are bolted in place, as shown. The shoes F have projecting lugs, which fit into corresponding depressions in the arms C, and the fastening-bolts pass through these lugs. This gives sufficient strength without making the bolts too large. Radial openings H are made in the sides of the case surrounding the center, and corresponding blinds I slide in channels or guides, so as to close or open these spaces. The blinds are moved by a bell-crank lever, J, fulcrumed to the side of the case, and a clamping-screw, K, holds it at any desired point. The openings H allow air to enter the case, the rapid rotation of the arms or beaters acting like a fan-blower, and the air thus admitted serves to discharge the ore when sufficiently pulverized. By opening or closing the blinds more or less air is admitted and the ore will be discharged more or less rapidly. The longer it is retained the finer it will be crushed. The disk B has its sides curved inwardly opposite the air-inlet openings H, so as to admit the air freely and direct it outwardly toward the periphery of the case and the discharge-opening.

The ore is fed into the apparatus as follows: K' is a chute which opens into the casing A, and is provided with a flap or gate, L, which closes by gravitation, but is raised to permit ore to pass beneath it. This chute is supplied with ore intermittently by means of a dumping-box, M, which is supported upon a shaft, N, above the chute. Upon each side of the chute K' are disks or flanges O, which are secured to a shaft, P, and these flanges have segments or cams cut out at Q. When the cam-disks turn, so as to bring these openings be-

neath the box, the latter will be tilted downward and discharge its contents into the chute. Upon each side of the front of the box are rollers R, which turn upon the rims of the cam-disks O, and thus support the front of the box until the cam portion arrives beneath the rollers. A spring, S, has one end attached to the box and the other end to some part of the frame, and this spring acts to dump the box promptly at the proper time. The box M is supplied with ore from an inclined oscillating table, T, upon which the ore is delivered from a hopper, U. The forward-and-back movement of the table T gradually advances the ore and delivers it into the box M. A curved segment, V, is secured to the box, and when the latter tilts this segment moves up in front of the table T and temporarily stops the flow of ore therefrom.

In order to have sufficient space between the table and the boxes for the oscillations of the table, I fix a strip of rubber or other elastic material, W, to the edge of the table. When the dumping-box is in position to receive ore from the table, the edge of this elastic strip projects over the rear edge of the segment V, the curve of which lies beneath the box; but when the box is tilted to discharge its load the curved segment moves up and the edge of the elastic strip, yielding to its pressure, is turned upward against the outside of the segment. The space between the edge of the oscillating table and the back of the segment is sufficient to allow the table to continue its oscillations without striking the segment, and at the same time the ore will be temporarily retained upon the table until the tilting box returns to its horizontal position again.

The shaft P, upon which the cam disk or flanges O are secured, is driven by gearing from the driving-shaft X′, and this shaft is driven by a belt passing from the pulley Y′. Another belt passing from the shaft Y′ over a pulley upon the shaft of the rotary crushing-disk drives the latter. The journal-boxes of the shaft, upon which the disk B is secured, are supported upon suitable bearings outside the casing A, the shaft passing into its casing through openings which are slightly larger than the diameter, and as the centrifugal action of the beaters tends to draw air in through these openings there will be no discharge of dust at this point, which would get into the bearings and wear them. I have shown two forms of discharge in my apparatus. In one of these forms, which I have illustrated in Figs. 1 and 2, I employ discharge-pipes Y^2 and Z, which connect the openings between the dies D and lead directly to the interior of the case. One of these discharge-passages opens into the case at the same point with the feed-chute K′, but curves away from it slightly, so that the discharge will not be thrown backward and out of the chute. The other opening is situated just behind the first one and nearer the top of the case. Around the interior of the case and outside the dies D and E is a canal or channel, *d*, which extends all the way around and opens beneath the apparatus at *e*. When it is desired to crush the ore finely, the dies are set close together, so as to cut off the channel *d* from the interior of the case, and the discharge then takes place through the passages Y^2 and Z, above described, the rapidity of the discharge and the consequent fineness of the ore depending, as above stated, upon the amount of the opening given to the air-inlets H. When it is desired to discharge the ore more rapidly and in a coarser condition, the bolts *c* may be loosened and the dies D and E separated, so as to leave spaces between them, one or more of the dies being removed for this purpose, the sides of the case being afterward clamped together to hold the dies in place by compression, and the discharge may take place between them. If desired, one of the blocks through which the discharge-passages Y^2 and Z are made may be moved so as to open into the canal, while the dies D and E are placed so as to close the original discharge-opening with which it previously connected.

The operation of my machine will then be as follows: The disk B is set in rapid rotation by means of power applied through the pulley upon the end of the shaft, and ore is fed into the apparatus at intervals, as previously described. The rapid rotation of the beaters acts to crush the ore by striking the particles and also by their attrition with each other and by forcing them against the projecting angles of the stationary dies D within the casing, the discharge taking place through the discharge-openings Y^2 and Z or through the canal *d* at will.

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

1. The disk B, having the radial arms and adjustable reversible shoes secured thereto, in combination with the wedge-shaped filling pieces or blocks G, substantially as herein described.

2. The exterior casing, A, having the adjustable dies, in combination with the disk B, having the radial arms, the adjustable reversible shoes secured thereto, the wedge-shaped filling pieces or blocks G, and means for rotating the disk, substantially as herein described.

3. The rotary crusher having the exterior casing with the discharge-openings, as shown, in combination with the feed-chute, the hinged tilting box receiving the ore from the oscillating table, and means, comprising the cam-disks, whereby the box discharges the ore into the chute, substantially as herein described.

4. The feed-chute and the cam-disk mounted upon each side of said chute, in combination with a box receiving ore from an oscillating table, said box being mounted upon a shaft journaled above the feed-chute and having

rollers R, which travel upon the edges of the disk O and allow the box to discharge its load when the cut-away segments pass beneath the rollers, substantially as herein described.

5. The combination of the box for receiving the ore, the oscillating table having the rollers traveling upon the edges of the cam-disk O, whereby the box is permitted to tilt, and the spring S, attached to the box so as to insure its tilting at the proper time, substantially as herein described.

6. The combination of the dumping-box receiving ore from the oscillating table and the mechanism whereby it is tilted at intervals, the cylindrical segment secured to the bottom of the box, and the elastic tongue or strip attached to the edge of the oscillating table, whereby the movement of the ore is temporarily stopped during the movement of the tilting table, substantially as herein described.

7. The rotary disk and the sectional exterior casing having the dies fitted thereto, in combination with the bolts *c* and nuts by which the sections of the case are secured together and the bolts *c'* and nuts by which said sections are forced apart, substantially as described.

In witness whereof I have hereunto set my hand.

JOSEPH BEHM.

Witnesses:
S. H. NOURSE,
H. C. LEE.