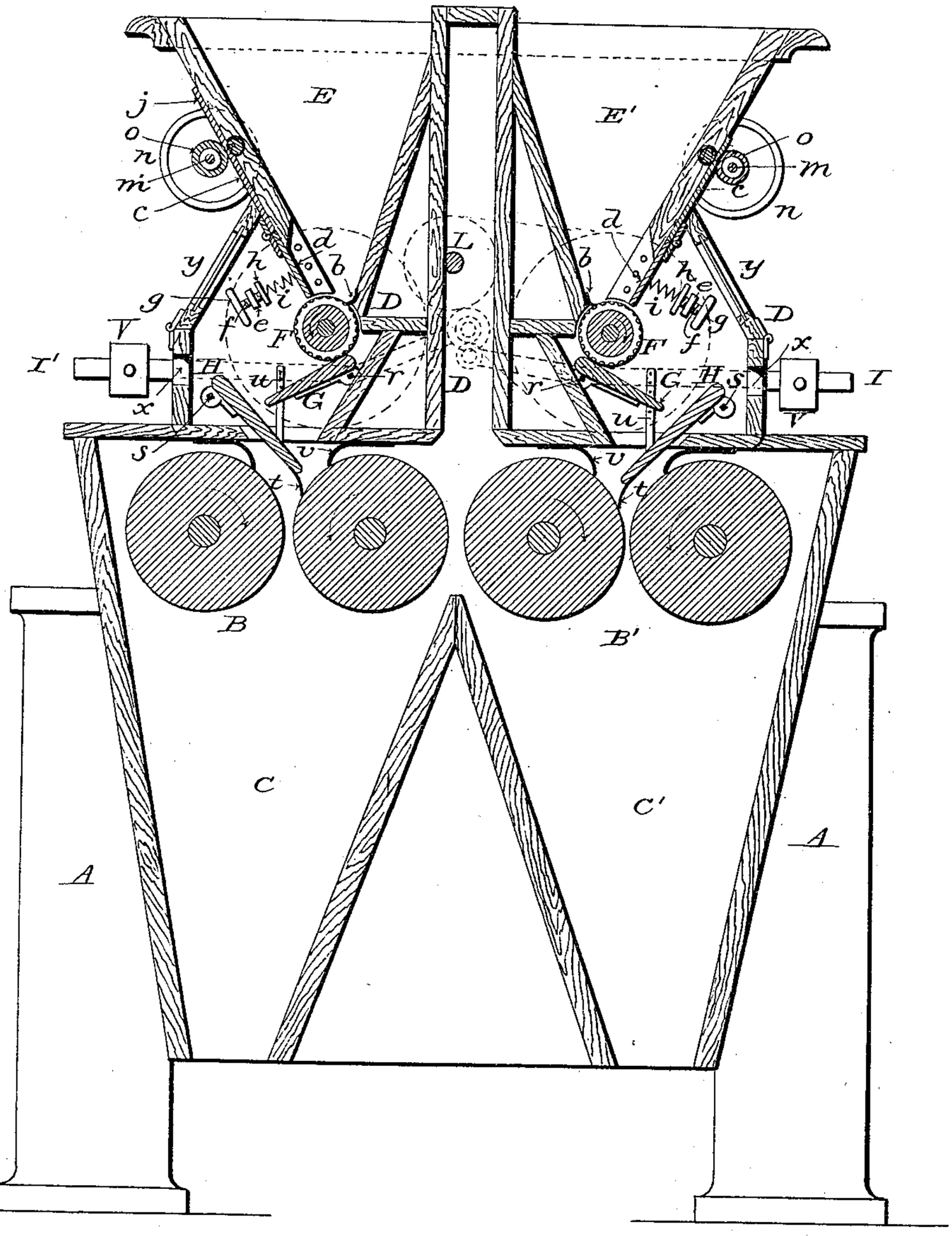
(No Model.) 3 Sheets—Sheet 1.

P. VAN GELDER.

FEED MECHANISM FOR ROLLER GRINDING MILLS, &c.

No. 335,257. Patented Feb. 2, 1886.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

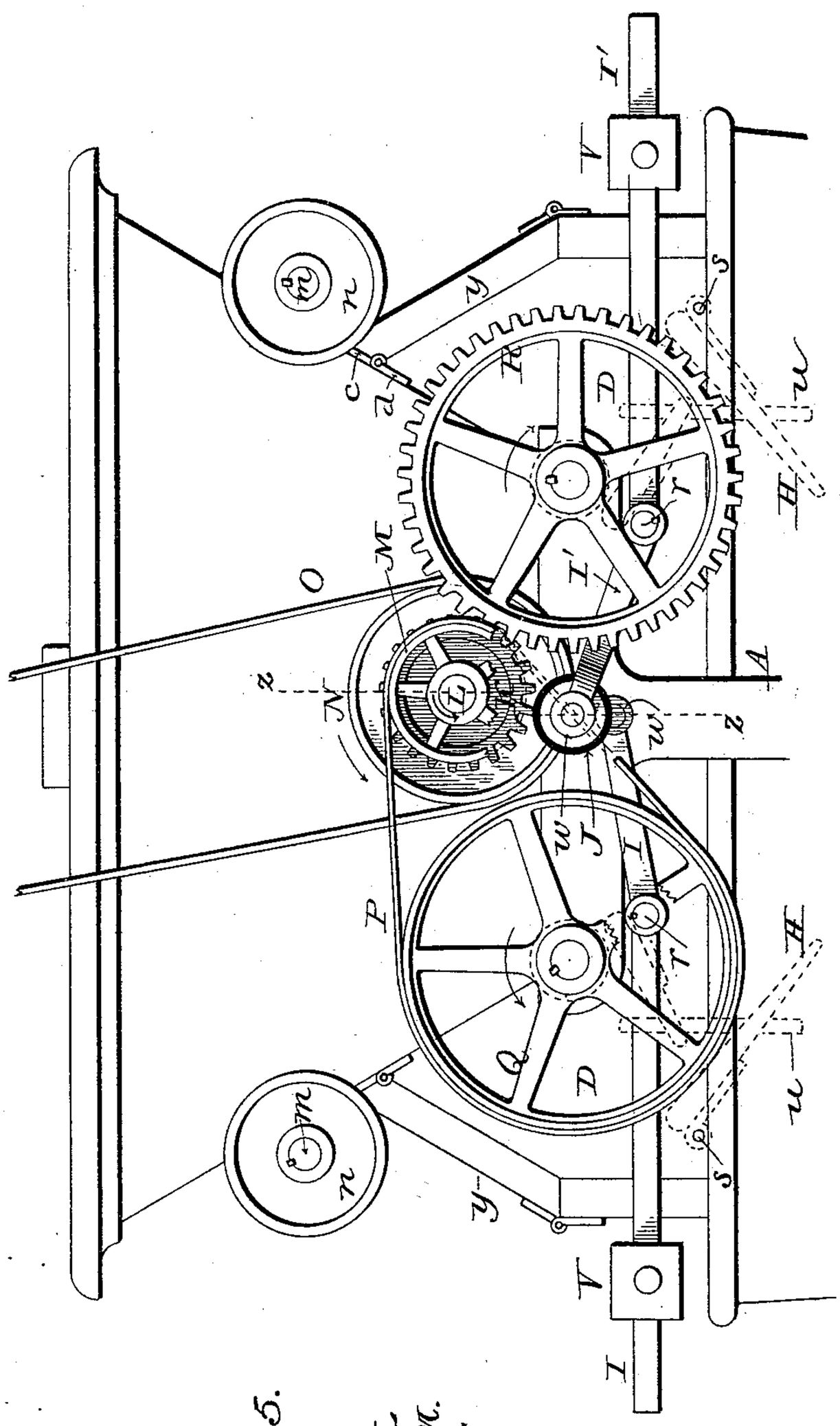
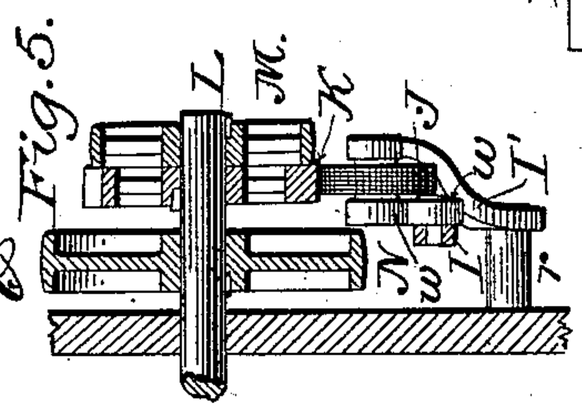


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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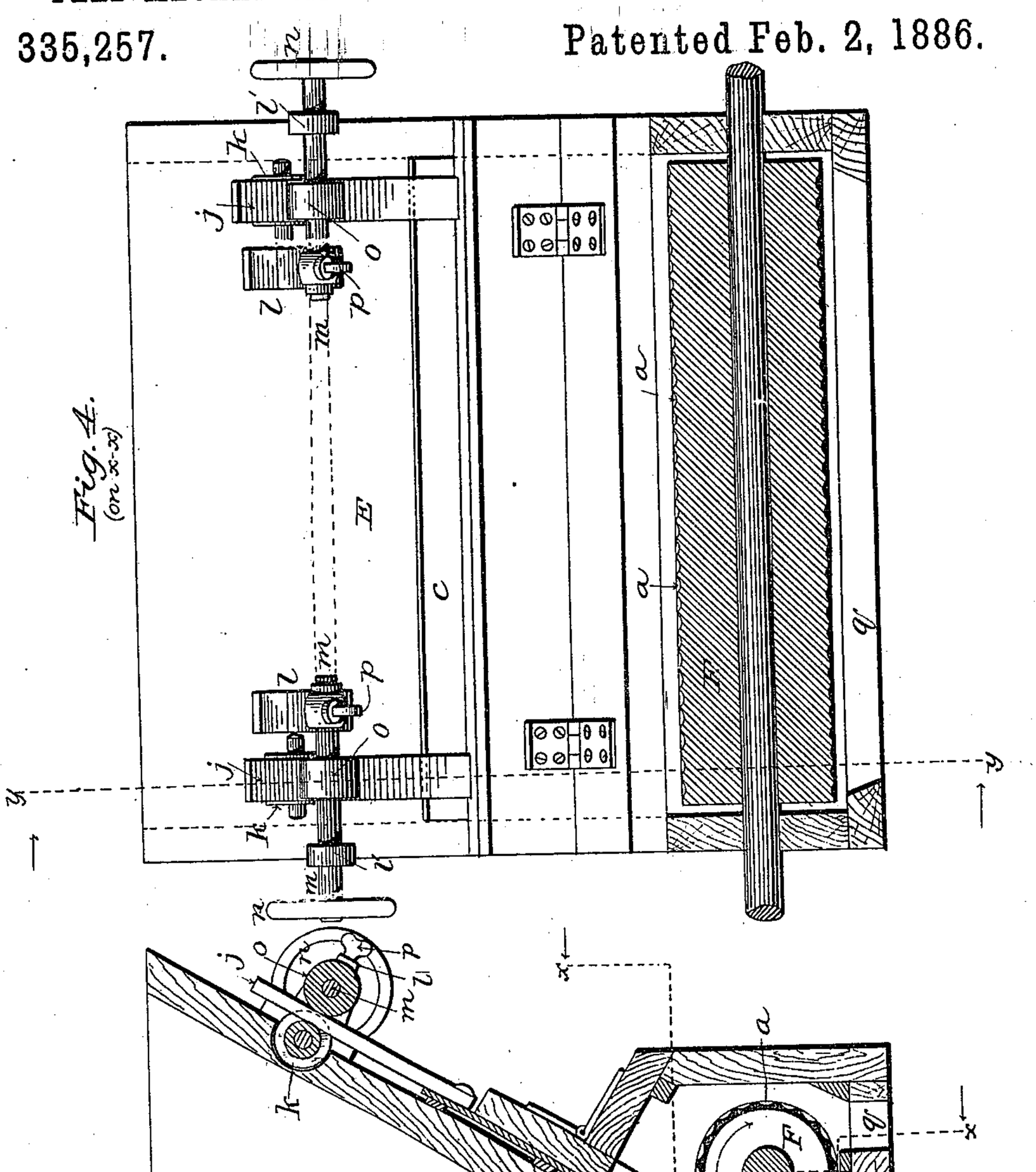

Fig. 4. (on x-x)

Fig. 3. (on y-y)

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UNITED STATES PATENT OFFICE.

PIETER VAN GELDER, OF SOWERBY BRIDGE, COUNTY OF YORK, ENGLAND.

FEED MECHANISM FOR ROLLER GRINDING-MILLS, &c.

SPECIFICATION forming part of Letters Patent No. 335,257, dated February 2, 1886.

Original application filed December 9, 1884, Serial No. 149,882. Divided and this application filed March 31, 1885. Serial No. 160,771. (No model.) Patented in England October 29, 1884, No. 14,277; in France November 26, 1884, No. 165,607; in Belgium November 28, 1884, No. 67,041, and in Austria-Hungary March 7, 1885, No. 44,891 and No. 11,345.

To all whom it may concern:

Be it known that I, PIETER VAN GELDER, a subject of the King of Holland, residing at Sowerby Bridge, county of York, Kingdom of England, have invented certain new and useful Improvements in Feed Mechanism for Roller Grinding-Mills and Similar Machines, (for which I have received Letters Patent in Belgium, dated November 28, 1884, No. 67,041; in England, dated October 29, 1884, No. 14,277; in France, dated November 26, 1884, No. 165,607, and in Austria-Hungary, dated March 7, 1885, No. 44,891 and No. 11,345,) of which the following is a specification.

This application is a division of another filed by me on the 9th day of December, 1884, Serial No. 149,882.

The object of the invention is to provide a continuous, even, and regular feed of the material to be operated upon; and to this end it consists in various features and details hereinafter set forth.

In the annexed drawings, Figure 1 is a vertical section of a mill provided with my improved feeding devices; Fig. 2, a side elevation of the same; Fig. 3, a vertical cross-section of a slightly-modified form of the hopper on the line *y y* of Fig. 4; Fig. 4, a longitudinal section of the same on the line *x x* of Fig. 3, and Fig. 5 a section on the line *z z* of Fig. 2.

A indicates the framing of the mill, provided with two sets of rolls, B B′, separate discharge-spouts C C′, casing D, and the hoppers E E′, as shown in Fig. 1, said hoppers having their sides inclined and the lower edge of one side cut away to form an outlet or discharge opening for the grain. Each hopper is provided with a feed-roll, F, at its bottom. As shown in Figs. 1, 3, and 4, the roll F is pitted—that is to say, is provided with depressions or pockets *a* in its face—in order to cause a uniform and positive feed of the material from the hopper onto the shaking-boards in the casing D, hereinafter described.

As shown in Fig. 1, the rear boards of the hoppers are each provided with a strip of india-rubber, *b*, which bears upon the roller F and prevents the escape of the material behind the roller.

In order to regulate the supply of material discharged by the feed-roll, I provide the front side of each hopper with a sliding gate or cut-off, *c*, the lower edge of which is provided with a swinging or pivoted gate, *d*, which approaches close to the upper forward face of the roller F, as in Fig. 1.

Within the casing D, near the lower end of the cut-off *c*, is an arm or bracket, *e*, through which passes a screw-stem, *f*, provided at one end with a small hand-wheel, *g*, and at the other end with a disk, *h*, while between the pivoted gate *d* and the disk *h* is a spiral spring, *i*, which serves to hold the pivoted gate *d* up to its place.

It will be seen that by turning the screw in one or the other direction and compressing or allowing the spring to expand the variation in the feed can be accurately and easily made.

In order to raise or lower the gate *c d*, I adopt the construction shown in Figs. 1, 3, and 4. The upper edge of the sliding gate *c* is provided with flat arms *j*, preferably of metal—one near each end—said arms *j* resting each upon a flanged roller, *k*, seated in the face of the hopper, as clearly shown in Figs. 3 and 4.

l l′ are brackets secured to the outer face of the hopper at or near each end or side, and in which are mounted shafts *m*, provided with hand-wheels *n* and with india-rubber or other friction-wheels, *o*. The wheels or rollers *o* bear upon the arms *j* of the sliding feed-gate *c*, and serve to raise the latter as the wheels *o* are rotated, and in order to retain the wheels *o* and the feed-gates in any desired position I provide the brackets *l* each with a thumb-screw, *p*, which bears upon the shaft *m*, as shown in Figs. 3 and 4. Instead of using two separate short shafts, *m*, a continuous shaft (represented by dotted lines in Fig. 4) may be used, so that the gate may be operated from either side.

It will be apparent that instead of using two sets of raising devices—one set at each edge of the valve—one set only may be used.

In such case they will be placed about midway between the ends of the shaft, and the arm *j* of the gate will extend from the middle instead of from the edges of the gate.

Immediately below the feed-roll F is an inclined shaking-board, G, carried at its inner edge by a rocking shaft, *r*, said board G delivering the grain onto a similar board, H, carried by a shaft, *s*, the board H inclining in a reverse direction to board G and delivering the grain onto the surface of one of the grinding-rolls, as shown in Fig. 1. The lower edge of the board H is provided with a strip, *t*, of india-rubber or similar material, which bears lightly upon the grinding-roll and yields when the board is shaken. The boards G H, as shown in Fig. 1, are connected within the casing D by an arm or rod, *u*, said rod being adjustable in relation to one or both of the boards, so as to vary the distance apart at which they are held, and said rod serves to impart motion from one to the other, as will be readily seen.

It will be noticed that the strip *t* in the lower edge of board H delivers the grain upon the inner roll of each pair, and in order to prevent the grain from being thrown over the rear side of the roll I provide the casing D with a strip, *v*, of some elastic or pliable material, preferably india-rubber, which rests upon the upper side of the roll, as shown in Fig. 1, and effectually prevents the material from escaping from that side.

Firmly secured to the rock-shafts *r* are elbow-levers I I′, the longer arms of which are provided near their ends with adjustable weights V, while the shorter inner arms are provided with rollers *w*, as shown in Fig. 2, the lever I′ terminating immediately above the lever I, and its roller *w* resting upon the roller of lever I. The shorter arm of lever I′ is provided with a wheel or roller, J, whose periphery is covered with rubber, leather, or other suitable material, said roller J bearing upon the lower face or edge of a gear-wheel, K, secured upon a shaft, L, mounted in the space between the two hoppers. The shaft L is also provided with band-wheels M N, and receives motion from any convenient source through a belt, O, passing about pulley N, as shown in Fig. 2, the motion thus secured being transmitted by a belt, P, from wheel M to band-wheel Q, secured upon the shaft of one of the feed-rolls F, as shown in Figs. 2 and 5. The other feed-roll is provided with a gear-wheel, R, which meshes with the gear-wheel K on shaft L, and as the wheels Q R and K M are the same diameter, the rolls will revolve at equal speeds and in proper directions.

The weight V at the outer end of lever I′ serves to keep the roller J up against the teeth of gear-wheel K, and the weight V on the end of lever I exerts a similar tendency to keep the wheels *w* in contact. Motion being imparted to the shaft L causes the gear-wheel K to revolve quite rapidly, and its teeth knocking against the roll J depresses that end and raises the outer end of lever I′, rocking said lever with its shaft *r;* but as the outer or longer arm of the lever I′ is heavier than its inner end, its tendency is to resume its former position, and in this way a vibrating or shaking motion is given to the lever I′ and its shaft *r*. The rocking motion thus given to shaft *r* causes the board G to swing through a short arc of a circle with the shaft *r* as a center, and as the board G is connected to the board H the latter is caused to take an equal and similar movement upon its shaft *s*. As the inner shorter end of the lever I′ is depressed, as above stated, the hub or wheel *w*, bearing on the hub or wheel *w* of lever I, depresses the latter in a like manner. Thus it will be seen that both sets of feeding devices are operated from the same shaft.

The motion imparted to the feed-roll F is comparatively slow, while the jarring or vibrating action of the boards G and H is quite rapid.

The material being placed in the hoppers E E′ is fed therefrom by the rollers F, and as the surfaces of these rollers are uniformly pitted, the material is delivered onto the first set of shaking-boards, G, in an even continuous stream, and as the boards G are inclined and vibrate rapidly, the material is shaken considerably and delivered upon the second set of shaking-boards, H, where it goes through the same operation and is delivered to the rolls B B.

In order to assist in spreading the material as it passes over the boards G H, the casing D is provided with air inlets or openings *x*, (shown in Fig. 1,) through which air enters and passes through the grain as it falls from the feed-roll to the boards, the rapid rotation of the rolls B B and B′ B′ toward each other inducing a current of air downward between them. The strip *t* on the edge of the lower board, H, is flexible enough to allow the board to be shaken without the edge of the strip breaking contact with the roll on which it rests. The casing D is provided with doors *y*, through which access may be had to the adjusting and shaking mechanism.

While I have shown the invention applied to a four-roll grinding-mill, it is apparent that it can be equally well applied to mills using a less number, it being only necessary that one half or side of the hopper be removed and the shaft L and wheel K be retained; and it is also apparent that the invention is applicable to other machines than roller-mills.

In Figs. 3 and 4 I have shown a slightly-differing form of hopper, which is employed when absolute accuracy of feed is not deemed essential, and generally for the first break. The slide or gate *c* in this case passes behind the feed-roller F instead of to the upper forward side thereof, as in Fig. 1, the pivoted gate *d* being omitted and the lower end of the

hopper enlarged, so as to form a box or chamber for the feed-roll F, which latter is set to one side of the center of the hopper, and discharges the material through an opening, *q*, as indicated in Figs. 3 and 4. In the subsequent breaks, where accuracy of feed is absolutely necessary, the construction shown in Fig. 1 is adopted.

It is apparent that springs may be used in place of the weights V on the levers I I′, and in some respects they are to be preferred, as they prevent the levers being tipped up too far. It will also be seen that the roller *w* of either or both the elbow-levers I and I′ may be omitted without changing the operation or the principle of the construction. It is preferred to use both rollers, as they reduce the friction of the parts, and to that extent improve the action of the mechanism.

I am aware that it has been proposed to operate the cut-off or gate of a mill by means of a rack and pinion, and such construction I do not claim.

My plan I deem better than that referred to, as it is lighter and cheaper and less liable to become disarranged and avoids openings for the rack-bars, through which openings dust and dirt might enter.

Having thus described my invention, what I claim is—

1. In combination with a hopper having a discharge-opening, a feed-roll, a roller seated in the face of the hopper, a vertically-moving slide or gate moving over said roller, and a shaft journaled in brackets upon the hopper and carrying a friction-wheel to bear upon the gate and raise and lower the same.

2. In combination with a hopper having a discharge-opening, a feed-roll, a roller seated in the face of the hopper, a vertically-moving slide or gate, a shaft journaled in bearings on the hopper and carrying a friction wheel to bear upon the gate to raise and lower the same, and a set-screw adapted to secure said gate in any desired position.

3. In combination with hopper E, roll F, flanged rollers *k*, gate *c*, provided with arms *j*, brackets *l l′*, shafts *m*, provided with hand-wheels *n* and elastic wheels *o*, and set-screws *p*, all arranged as shown.

4. In a feeding mechanism, the combination of hopper E, feed-roll F, sliding gate *c*, hinged gate *d*, stud *e*, screw *f*, and spring *i*, all arranged as shown.

5. In a feeding mechanism, the combination of a hopper, a feed-roll, a gear-wheel mounted on the hopper, a shaking-board below the feed-roll, and an arm carried by or attached to said board and bearing upon the gear-wheel, whereby said arm and its board may receive motion from the wheel, as shown.

6. In combination with a hopper, a feed-roll provided with a driving-wheel, a shaft journaled in the hopper and carrying a gear-wheel adapted to impart motion to the feed-roll, a shaking-board below the feed-roll provided with a counterweighted lever, one end of which bears against and receives motion from the gear-wheel on the shaft, and a second board below and connected with the first one and adapted to receive motion therefrom, as set forth.

7. In combination with hopper E, feed-roll F, provided with wheel R, shaft L, wheel K, carried by said shaft and meshing with wheel R, lever I′, provided with wheel J, and board G, as and for the purpose set forth.

8. In combination with hopper E, roll F, provided with wheel R, shaft L, provided with wheel K, shaking-board G, provided with lever I′, roll J, carried thereby, board H, and link or bar *u*, connecting boards G H, as set forth.

9. In a feeding mechanism, the combination of hopper E, feed-rolls F, provided with wheels Q R, shaft L, provided with wheels K M, band P, boards G H, and levers I I′, the former provided with roller *w* and the latter with wheel J, as and for the purpose set forth.

10. In combination with a hopper having a discharge-opening, a feed-roll mounted therein and having its surface uniformly pitted, a shaking-board below said feed-roll, and mechanism for imparting motion to the roll and the shaking-board.

11. In a roller grinding-mill and in combination with a feeding mechanism, substantially such as shown and described, the shaking-board H, provided at its edge with a strip, *t*, of india-rubber, and resting upon one of the rolls, as shown.

12. In a feeding mechanism, the combination of a hopper, a slide or gate, a friction device for operating said gate, a feed-roll, a gear-wheel mounted upon the hopper, a shaking-board below the feed-roll, and an arm attached to said board and bearing against the gear-wheel, as and for the purpose set forth.

13. In a feeding mechanism, the combination, with a hopper, of a feed-roll, a slide or gate, a shaking-board below said feed-roll independent of the slide or gate, and mechanism, substantially such as described, for causing a rotation of the roll and a reciprocation of the board.

14. In combination with a double hopper having discharge-openings, a feed-roll located in each of said hoppers, a cut-off or gate for controlling the feed, a shaking-board below each of the feed-rolls, and an arm attached to one of said boards and serving to operate the other one.

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

PIETER VAN GELDER.

Witnesses:
I. OWDEN O'BRIEN,
JOSEPH J. ROYDEN.