(No Model.) 4 Sheets—Sheet 1.

D. W. MARMON & J. WARRINGTON.

ROLLER MILL.

No. 275,055. Patented Apr. 3, 1883.

Fig. 1.

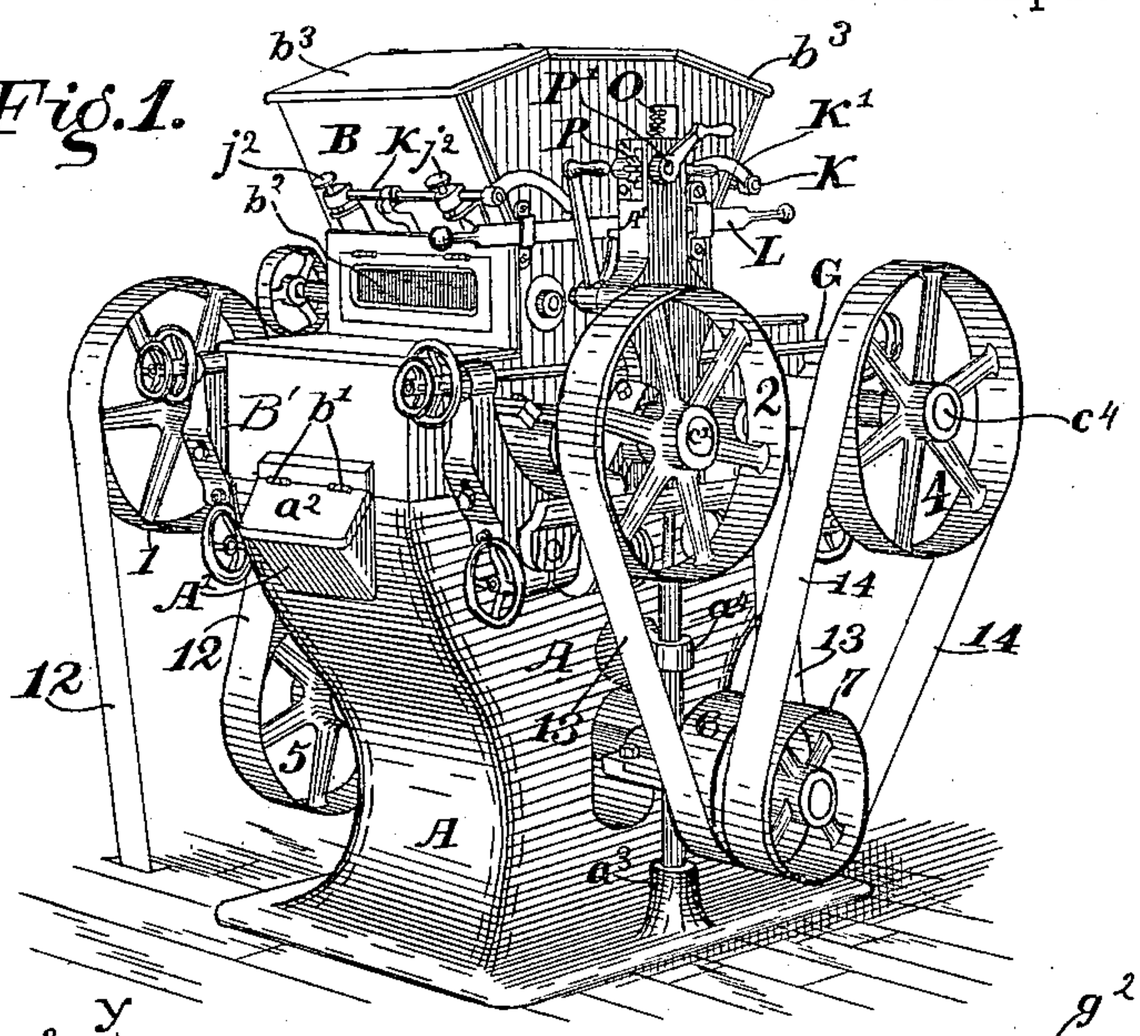
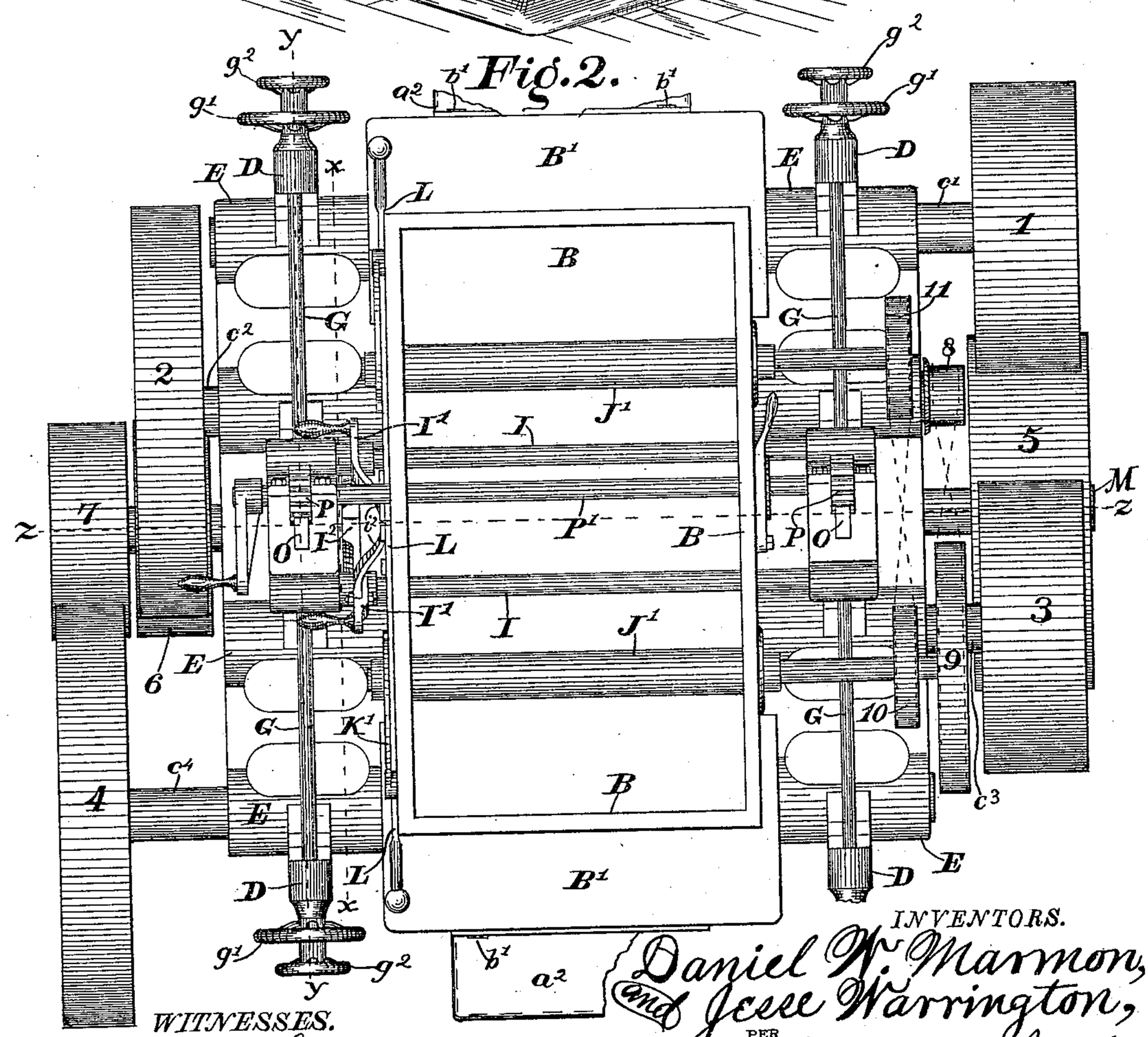


Fig. 2.



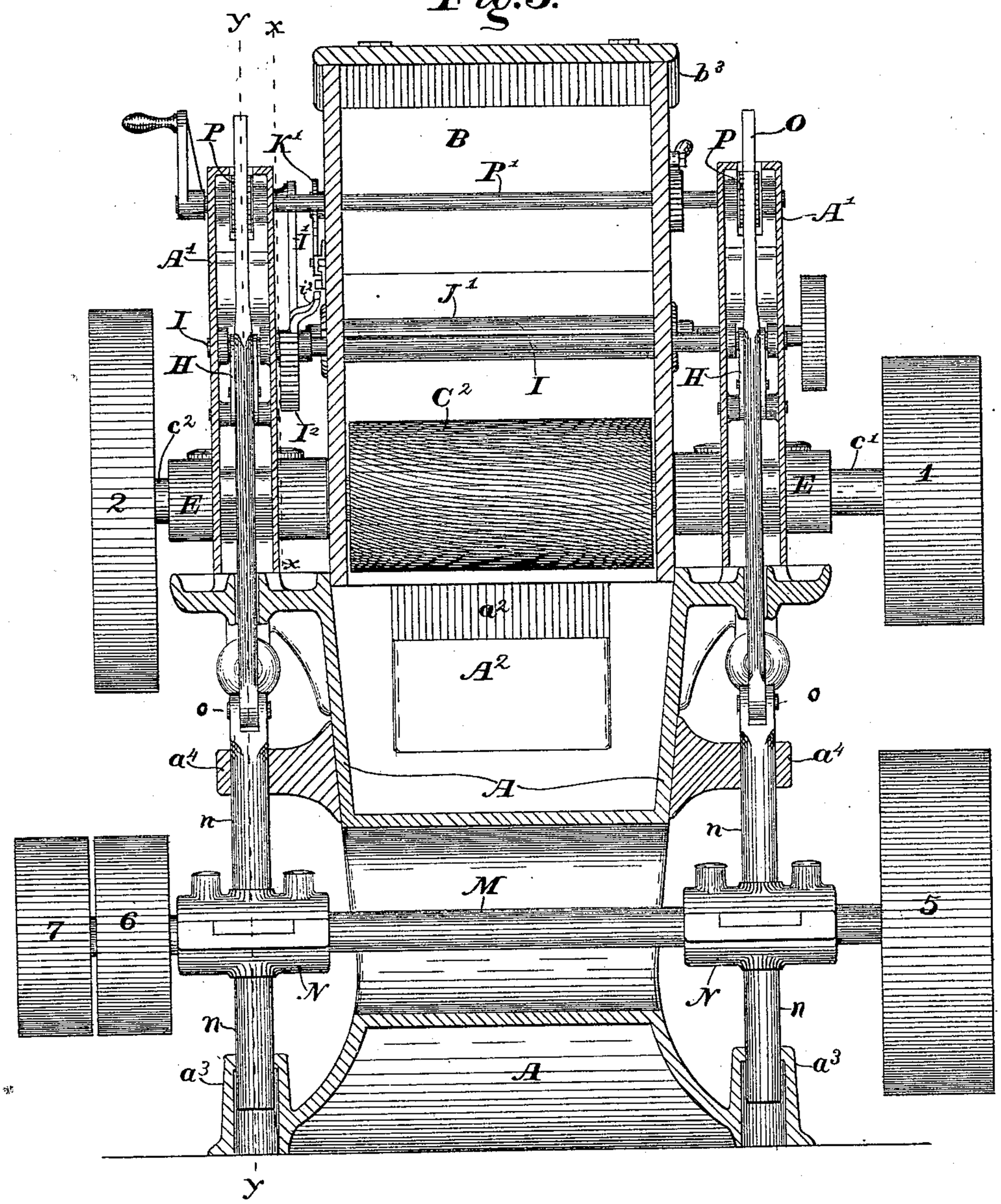
(No Model.) 4 Sheets—Sheet 2.

D. W. MARMON & J. WARRINGTON.

ROLLER MILL.

No. 275,055. Patented Apr. 3, 1883.

Fig. 3.



WITNESSES.

Chas. A. Leonard,

E. W. Bradford

INVENTORS.

Daniel W. Marmon,

and Jesse Warrington,

PER

C. Bradford.

ATTORNEY.

(No Model.)

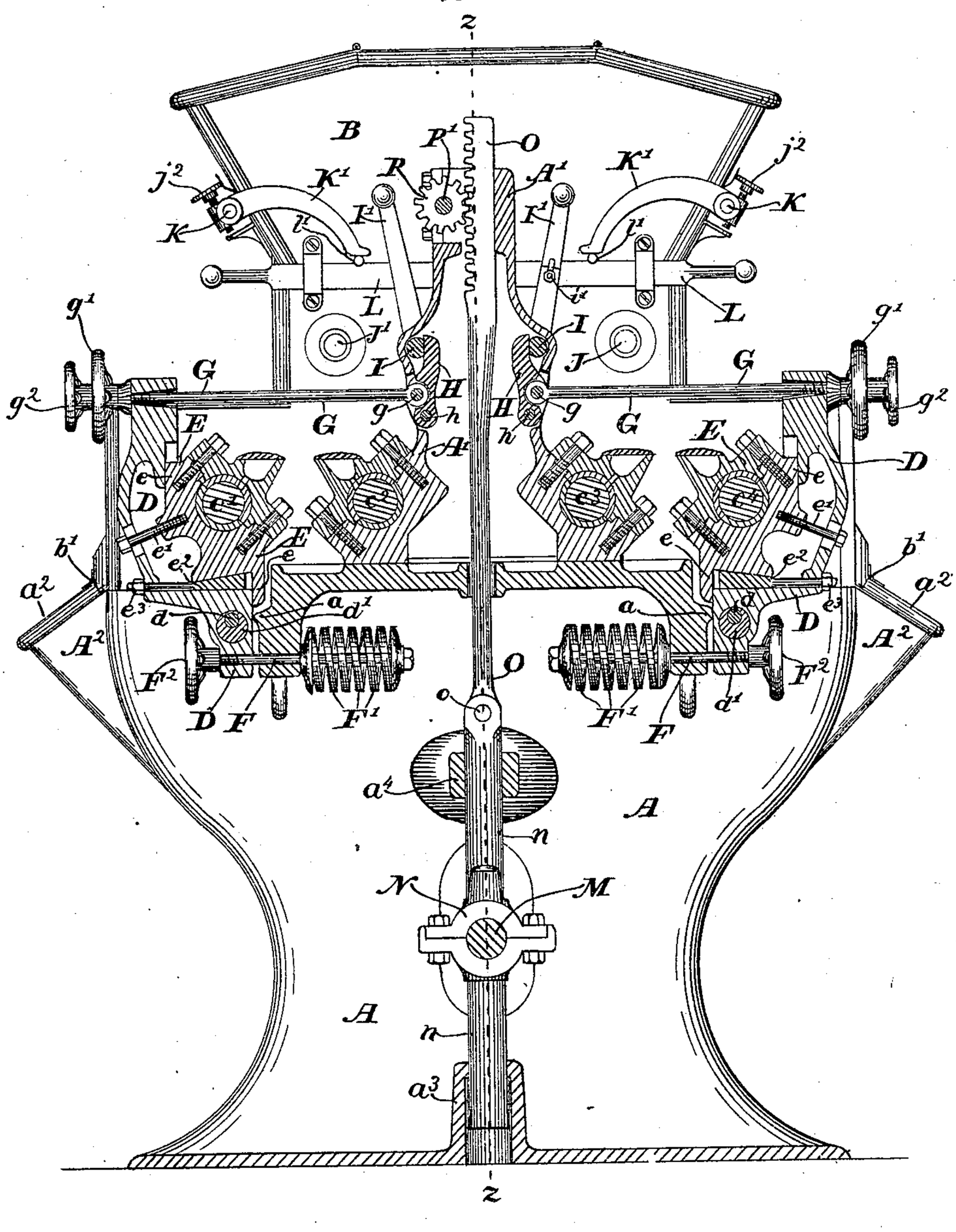
4 Sheets—Sheet 3.

D. W. MARMON & J. WARRINGTON.

ROLLER MILL.

No. 275,055. Patented Apr. 3, 1883.

Fig. 4.



WITNESSES.

Chas. A. Leonard.

E. W. Bradford.

INVENTOR.

Daniel W. Marmon,

and Jesse Warrington,

PER

C. Bradford.

ATTORNEY.

(No Model.) 4 Sheets—Sheet 4.

D. W. MARMON & J. WARRINGTON.

ROLLER MILL.

No. 275,055. Patented Apr. 3, 1883.

Fig. 5.

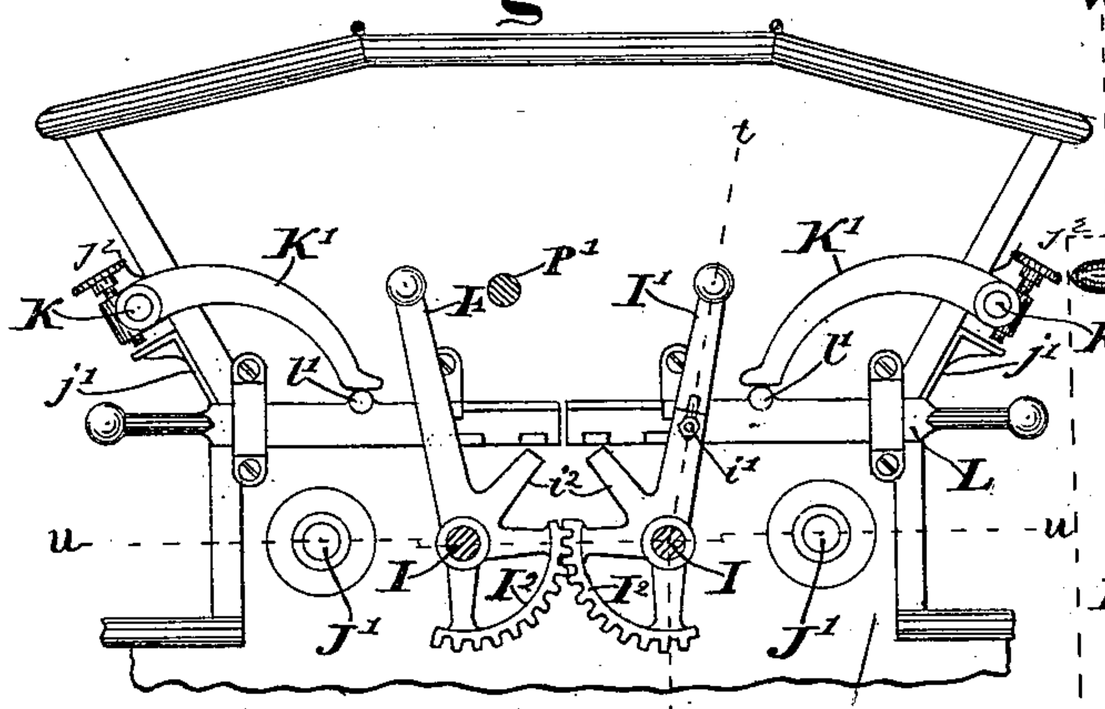


Fig. 6.

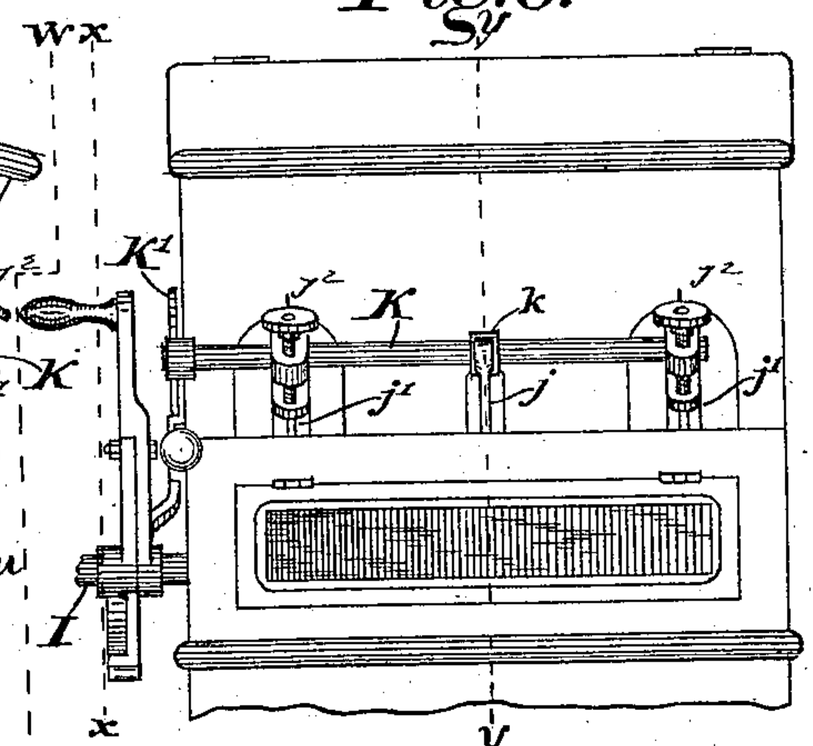


Fig. 7.

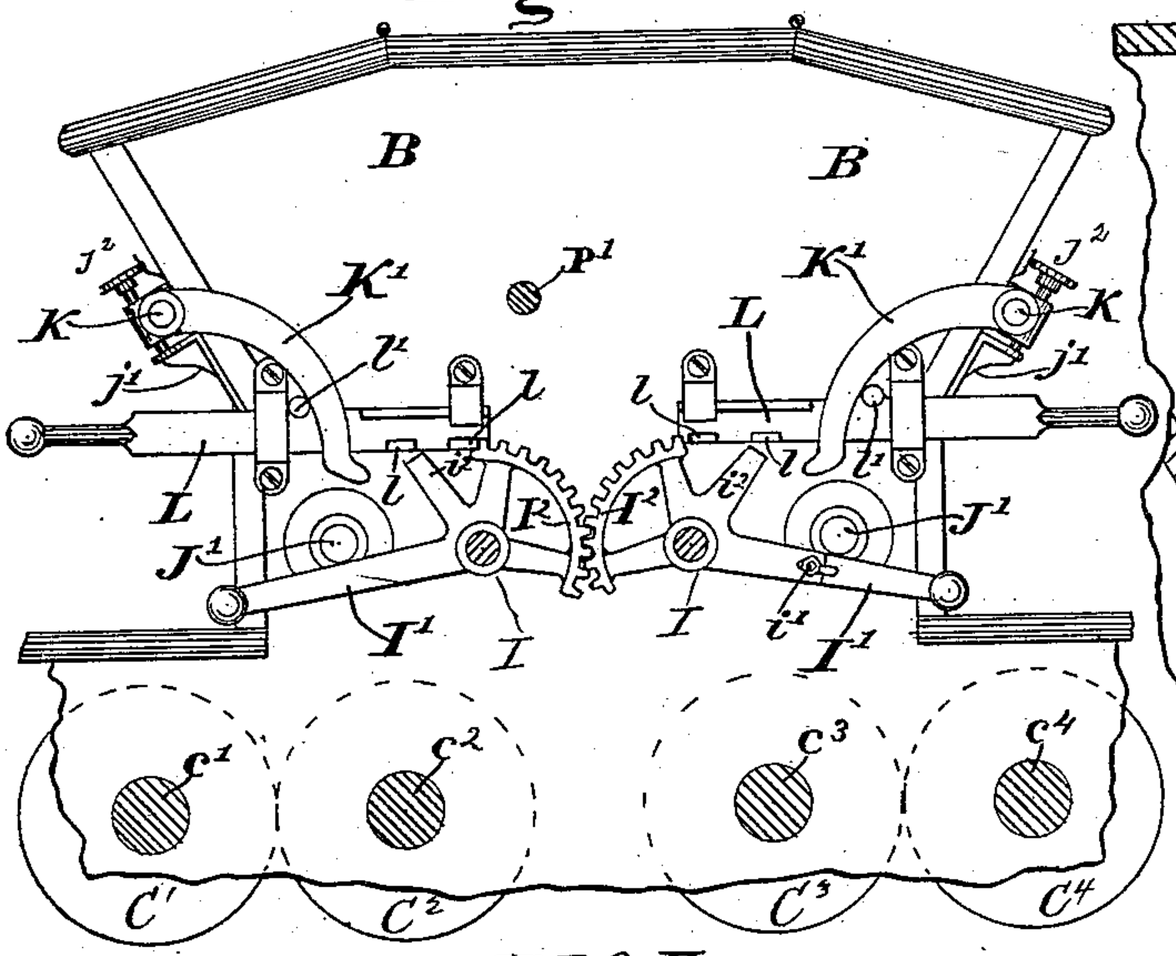


Fig. 8.

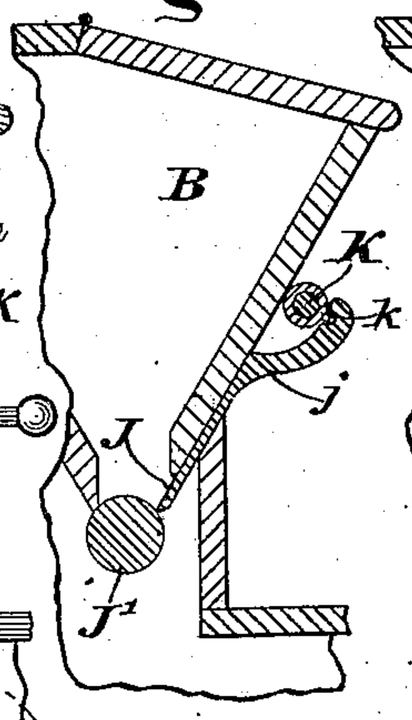


Fig. 9.

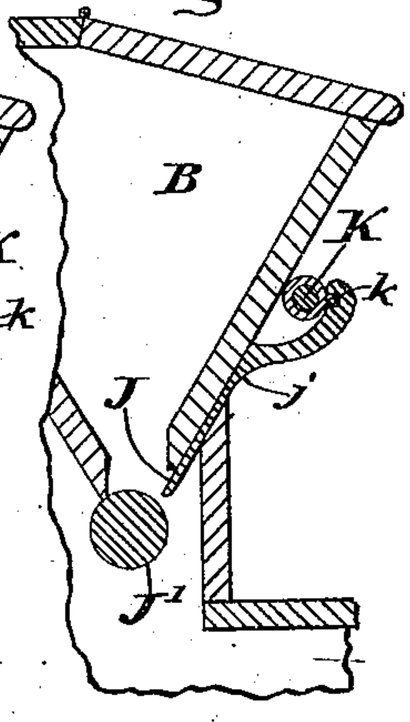


Fig. 10.

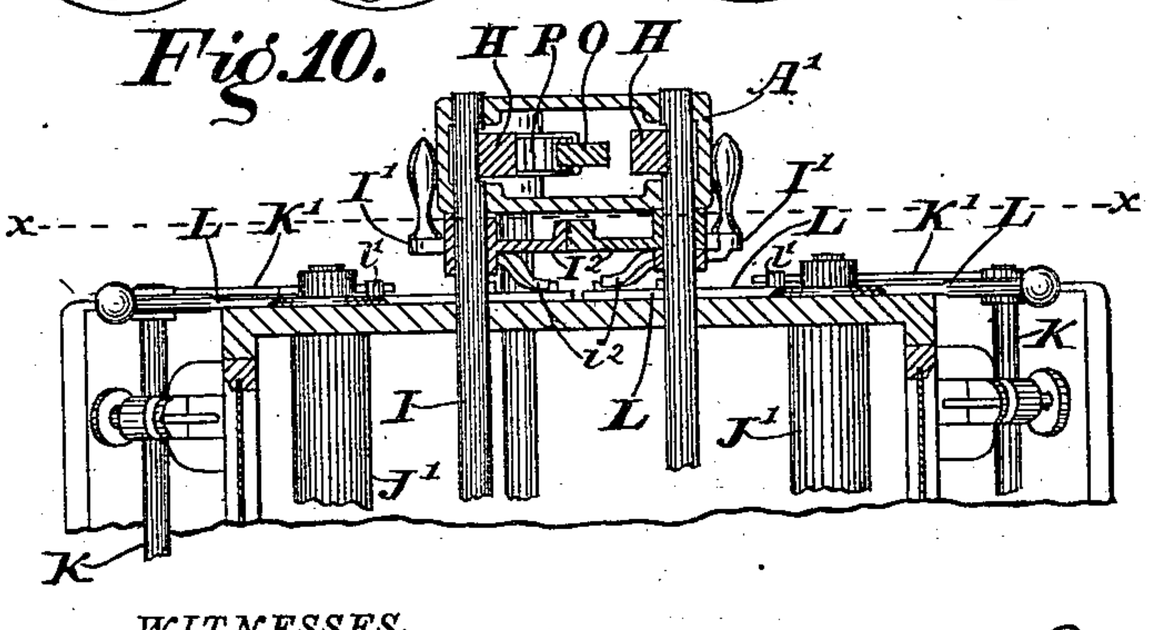
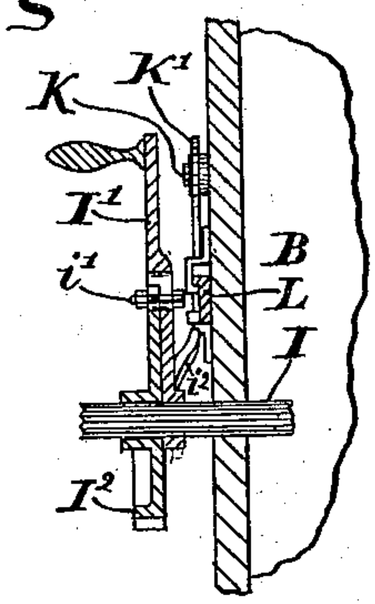


Fig. 11.



WITNESSES,

Chas. N. Leonard,

E. W. Bradford

INVENTORS.

Daniel W. Marmon,

and Jesse Warrington,

PER

C. Bradford,

ATTORNEY.

UNITED STATES PATENT OFFICE.

DANIEL W. MARMON AND JESSE WARRINGTON, OF INDIANAPOLIS, IND., ASSIGNORS TO THE NORDYKE & MARMON COMPANY, OF INDIANA.

ROLLER-MILL.

SPECIFICATION forming part of Letters Patent No. 275,055, dated April 3, 1883.

Application filed October 31, 1882. (No model.)

To all whom it may concern:

Be it known that we, DANIEL W. MARMON and JESSE WARRINGTON, of the city of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Roller-Mills, of which the following is a specification.

Our said invention consists in certain improvements in the construction and arrangement of parts in that class of machinery for the reduction of grain known as "roller-mills," whereby a machine is produced having many new and desirable features, as will hereinafter be more fully set forth.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a perspective view of a machine embodying our invention; Fig. 2, a top or plan view of the same; Fig. 3, a longitudinal vertical sectional view, looking upwardly from the dotted line *z z* in Fig. 2, and to the left from said line in Fig. 4; Fig. 4, a transverse vertical sectional view, looking to the right from the dotted line *y y* in Figs. 2 and 3; Fig. 5, a view looking toward the end of the upper portion of the machine from the dotted line *x x* in Figs. 2, 3, 6, and 10; Fig. 6, a front elevation of so much of the machine as is shown in Fig. 5, as seen from the dotted line *w w* at the right thereof; Fig. 7, a view similar to Fig. 5, except that the mechanism is shown in the position it occupies when in operation; Fig. 8, a sectional view on the dotted line *v v* in Fig. 6; Fig. 9, a similar view, except that the parts are in the position shown in Fig. 7; Fig. 10, a horizontal sectional view, looking upwardly from the dotted line *u u* in Fig. 5; and Fig. 11, a sectional view, looking to the left from the dotted line *t t* in Fig. 5.

The several Figs. 1, 2, 3, 4, 5, 6, 8, 10, and 11 show the machine as when at rest, the grinding-rolls parted, and the feed-gates closed. Figs. 7 and 9 show the parts as when in operation, the rolls in grinding relation, and the feed-gates open.

In said drawings the portions marked A A′ represent the supporting frame-work of the mill; B B′, the hopper and other covering portions; C′ C^2 C^3 C^4, the grinding-rolls; D, swinging arms, in which one of each pair of rolls is mounted; E, adjustable boxes mounted on said arms; F, tempering rods or screws for adjusting the maximum force of the grinding-pressure; G, distance or adjusting rods for regulating the position of the arms; H, pivoted levers, to which said rods are attached; I, cam-faced shafts for operating said arms; J, the feed-gates; K, the shafts for operating them; L, bars for operating said shafts; M, a counter-shaft; N, the journal-boxes therefor; O, rods connected to said journal-boxes, whereby they can be raised and lowered; P, pinions, whereby said rods can be moved up and down, and said counter-shaft thus raised and lowered, and the numerals 1 to 14, inclusive, the several pulleys and belts by which the machine is driven.

The frame A A′ is mainly a large hollow casting, adapted to support the machinery of a roller-mill. In general outline it is substantially a well-known form, but has some peculiar features. The openings into the sides, which are usually simply holes in the perpendicular sides of the frame, are in this mill formed by forming thereon or attaching thereto spout-like projections A^2, the tops of which are near enough to horizontal to insure that all of the ground material, which is thrown against and adheres to the covers a^2 thereof may, when said covers are raised, be caused to fall inside the frame instead of scattering about outside the mill upon the floor. It also forms a receptacle adapted to catch and return into the machine the ground material which the miller drops from his hands while feeling of said material, to ascertain whether or not it is of proper fineness, thus avoiding any scattering on the floor from this cause also. This is not only a considerable saving, but keeps the mill much neater and cleaner.

Projections a^3 a^4, formed upon or attached to the frame, serve as bearings in which the extensions *n* of the boxes N rest and slide.

The hopper and covers B B′ are preferably constructed of wood. The main portion B is intended to be substantially stationary, and should have doors b^2 and covers b^3. Said doors b^2 should be constructed partly of glass, so that the inside of the mill may be seen with-

out opening them. The side portions, B′, are removable, so that the grinding-rolls may be removed without disturbing the hopper or main portion B. The covers a^2 of the openings into the sides of the mill are connected to the sides of these portions B′, or to strips attached thereto by hinges b'.

The several rolls C′ C^2 C^3 C^4 are the crushing or grinding rolls common to roller-mills. They are respectively mounted upon the shafts c' c^2 c^3 c^4, and are driven by the pulleys 1 2 3 4, the first and third by the main belt 12 running under the pulley 5 on the counter-shaft M, and the second and fourth by separate belts running from the pulleys 6 and 7 on said counter-shaft. It is essential that the two rolls of each pair have their axes in the same plane; but from unequal wear of journals, journal-boxes, or other causes, they may, after use, vary from this plane. To correct this variation from a common plane, we raise or lower the journal-boxes of either one or the other roll. As the arms D have only a movement substantially to or from the fixed roll, the boxes E are secured to them, so as to move the roll up or down on this arm, as will be presently more fully described. Preferably we move the journal box or boxes of the roll supported on the swinging arms D, but do not confine ourselves to the adjustment of these boxes, as we may arrange to adjust the boxes of the fixed roll.

The arms D are mounted upon pins d, which pass through their lower ends and through lugs or bosses on the frame A. The holes in these arms through which said pins pass are enlarged, (see particularly Fig. 4,) and said pins are surrounded by eccentric-sleeves d', which will revolve therein and thus permit a variation in the positions of the arms; or, in other words, permit the lower ends of said arms to be crowded outwardly somewhat by the roll supported thereby, when necessary, as in case a substance too hard to be crushed or ground should come between said roll and its fellow.

The boxes E have bearing-surfaces e, which rest against similar surfaces on the arms D. They are secured in position by the bolts e', which should be set at an angle, as shown, and are adjusted vertically by the wedges e^2, which rest between suitable surfaces on the arms and boxes, and are provided with nuts e^3, by which they are drawn to the required position. When the adjustment is completed the box is securely held in position by tightening up the bolt e', which forces the box tightly against its seat and also against the wedge e^2. The portions of the casting A′ which form the boxes for the inner roll-journals might have a formation similar to that of the faces of the arms D, in which case said boxes might be like the boxes E and be adjustable in the same manner. In this latter case the boxes on the arms D might be solid or rigid therewith, and thus the arrangement shown would be simply transposed. We regard such an arrangement as clearly an equivalent of that shown, and as fully comprehended in our invention.

The tempering-rods F pass through the lower ends of the arms D, below or beyond their pivots, through a lug or projection on the casting A, and through a coiled spring, F′. One end of each of said rods is screw-threaded, and some sort of nut (preferably a hand-wheel, F^2,) is placed thereon. These hand-wheels are turned up until the desired amount of strain for an effective grinding-pressure is brought on the arms, which holds the rolls in proper position, the tension of the springs being at all times greater at the pivots or fulcrums in one direction than the grinding resistance is in the other direction, except when a hard substance passes between the rolls, in which case the hard substance parts the rolls, forcing a further compression of the springs, the arms being permitted to move on their pivots d by reason of the eccentric sleeves on said pins. After the hard substance is discharged the return travel of the arms is stopped by said arms coming in contact with the fixed stops a, as shown most plainly in Fig. 4. The springs, while acting to draw the lower ends of the arms supporting the movable roll inwardly toward the fixed roll of the pair, (until the arms come in contact with the fixed stops a,) also operate to hold said movable roll away from said fixed roll by reason of being on the opposite sides of the fulcrums or fixed stops from said movable roll. This spring force on the arms D, which moves their upper or roll-bearing ends away from the fixed roll, acts in the same direction as the force exerted by the resistance of the material passing between the rolls. Thus the tension on the adjusting-rods G is always in the same direction, and all "lost motion" or play in the joints of the swinging arms, adjusting-rods, &c., is taken up in the same direction both by the action of the machine itself and the grinding-strain.

The adjusting-rods G are for the purpose of moving the upper ends of the arms D back and forth, and thus bringing the individual rolls of the pairs nearer to or farther from each other. Each is preferably pivoted at its inner end to a lever, H, by a pivot, g, and thus, as said levers are swung back and forth, said rods are drawn in and out.

Each rod should be provided with a hand-nut, g', and a hand lock-nut, g^2, by which the arms may be adjusted to proper position and there secured from accidental variation. The grinding-rolls supported by said arms are thus positioned nearer to or farther from their fellows or brought into parallelism therewith.

The levers H are pivoted to the frame portion A′ by pivots h, and are adapted to be moved back and forth by the partial rotating of the shafts I. As they move they draw the rods G, and with them the top ends of the arms D, toward the center of the machine, or permit them to fall back, and thus force the movable rolls into grinding relation with their

fellows, or permit them to part, so as to be in less close relation.

The rods I extend through the machine from end to end, and are in contact with the levers H. At the points of said contact one side of each of said rods is flattened or otherwise fitted to operate as a cam, whereby the turning of the flattened or lesser sides toward the levers H permits said levers, the rods G, and the arms D to drop back, and the rolls to separate from grinding relation; and the turning of the round or greater side toward said levers draws them, the rods G, and arms D toward the center of the machine, and brings the rolls into grinding relation, as before.

Levers or handles I′ are mounted upon the shafts I, and there fixedly secured by splines, set-screws, or in any desired manner as a convenient means of operating them, and these levers are extended into segments of gear-wheels I^2 at their lower or inner ends, which mesh into each other, whereby a simultaneous movement of both is secured. One of said gear-segments may be separated and move independently from its lever or handle in case it is desired to operate the various devices upon one side of the machine and not those upon the other. This is effected by splitting the handle, as shown most plainly in Fig. 11, and forming a slot in both portions to receive a bolt, i'. When it is desired that the two sides be fastened together the bolt i' is slipped to the bottom of the slot, as shown, and there fastened, which makes the handle and segment practically one piece and causes the handles and segments to operate together. When it is desired to operate but one side of the machine the bolt i' is moved to the top of the slot, and the handle and segments are then independent. This segment being loosely mounted on the shaft, the opposite handle can be moved without moving the shaft this segment is on.

By means of the arrangement of mechanism just described either or both of the pairs of rolls can be parted from grinding relation, and then restored to exactly their former relation, without the trouble and delay incident to a readjustment of the machine.

Upon the lower ends of the levers I′ are projections i^2, which, as said levers are thrown back and forth, engage with the lugs l l on the bars L, and thus operate said bars, and through them the arms K′, and shafts K the feed-gates. As will be readily understood, when the levers or handles I′ are divided, and thus adapted to operate separately, they operate the bars L and the feed-gates separately, as well as the rolls.

The feed-gates J are thin blades, which run along near the feed-rolls J′, and each has upwardly-projecting arms j and j'. One of these amrs, j, on each gate engages with a projection, k, on the corresponding shaft K, (see Figs. 8 and 9,) and the gate is thus raised and lowered by the partial rotation of said shaft. The other arms, j', are arranged to come in contact with stops j^2, and the gate is thus thereby prevented from opening too far. These stops j^2 are preferably in the form of thumb-screws, as shown, so that the distance to which the gates may open may be adjustably regulated. The feed-rolls J′ are driven toward the feed-gates by the arrangement of belts shown by the dotted lines at the right in Fig. 2, and hereinafter described.

The shafts K have upon them, preferably at or near their centers, the projections k, which engage with the arms j on the feed-gates, and are thus adapted to open or close said feed-gates as said shafts are partially rotated in one or the other direction. These shafts have arms K′, the weight of which operates to rotate the shafts in one direction. Said shafts are rotated in the other direction through the medium of the lugs l' l' on the bars L, which lift the arms K′ as said bars are moved, so that said lugs come in contact therewith.

The bars L are the mediums by which the shafts K are rotated in one direction, and the feed-gates thereby closed. When it is desired that the feed-gates shall be closed the bars L are moved so that the projections l' shall come in contact with the arms K′, which raise the latter, thereby partially rotating the shafts K and causing the feed-gates to descend, as shown particularly in Figs. 5 and 8. When it is desired that the feed-gates shall be open the bars L are moved in the reverse direction, and the weight of the arms K′ partially rotates the shafts K in the other direction and opens the gates. (See Figs. 7 and 9.) As hereinbefore stated, the levers I′ preferably have projections i^2, which come in contact with the lugs l l on these bars, whereby the feed-gates are opened or closed by the same movement that throws the grinding-rolls toward or from each other. In order that this operation shall not be prevented by the independent working of the bars L, the projections i^2 are arranged in such relation to the lugs l that they will only engage with said lugs when they are moving from one of the positions where they are at rest to the other. The bars L are so supported that their ends will raise somewhat, and if, in moving from side to side, a projection, i^2, should come in contact with a lug, l, it would raise said bar and pass under said lug to a position between it and the other lug of the pair, and in its further movement would come in contact with said other lug and force the bar to the proper position therefor when at rest. When the levers or handles I′ are swung to the limit of their movement in either direction (see Figs. 5 and 7) the projections i^2 are entirely free from the lugs l, and the bars L can be moved back and forth entirely independently thereof. It will be readily understood that either of the bars L can be moved independently of the other, and either feed-gate thus opened or closed without disturbing the other gate.

The counter-shaft M is mounted in boxes N. When this shaft is raised or lowered it loosens or tightens the several belts employed to run the grinding-rolls, as will be readily under-

stood by an examination of the drawings. As will also be readily understood, this counter-shaft runs in the opposite direction from that in which the rolls C′ C³ run, and thus drives the rolls C² C⁴ also in the opposite direction to said rolls C′ C³. This causes the adjacent faces of the individual rolls forming each pair to run in the same direction instead of oppositely, as would be the case if the rolls themselves ran in the same direction.

The boxes N are provided with extensions *n*, which pass through bearings in the lugs a^3 a^4 on the frame A, and are adapted to slide therein.

The rods O are attached to the upper extensions of the boxes N by pivots *o*, and pass up through bearings in the frame A A′ to near the top of the machine, and are formed at their upper ends into rack-bars.

The gear-wheels P are mounted on the shaft P′ and mesh into the rack-bar portions of the rods O, and are thus adapted to raise and lower said rods, and through them the counter-shaft M.

The means of adjusting the counter-shaft shown and described is not herein claimed, but is made the subject-matter of another application by the proper inventor.

The several pulleys and belts operate as follows: The main belt 12 drives the pulleys 1, 3, and 5, and thus the rolls C′ and C³, in one direction and the counter-shaft M in the other direction. The counter-shaft, through the pulleys 6 and 7, and belts 13 and 14, running therefrom to the pulleys 2 and 4, drives the rolls C² and C⁴ in the opposite direction to that in which the rolls C′ and C³ are driven. The roll C² has on its shaft the small pulley 8, which, through a belt, drives the pulley 9, one of the feed-rolls J′, and the pulley 10 on the same shaft therewith, and this pulley 10, through a belt, drives the pulley 11 and the other feed-roll. The belts running between the pulleys 8 and 9 and 10 and 11, respectively, are not shown; but their positions are clearly indicated by dotted lines in Fig. 2.

The various principal operations of our said invention may be recapitulated as follows: The grain is fed through the hopper by means of the feed-gates J and feed-rolls J′ to the grinding-rolls, which reduce or grind it in the ordinary manner. These rolls are adjusted vertically by the movement of the boxes E on the arms D and laterally by the adjusting-rods G. When it is desired to vary the relations of the rolls, it may readily be accomplished by turning either the nuts e^3 or the hand-nuts g^2, or both, according to the variation desired. When it is desired to temporarily part the rolls (thus stopping the grinding) and shut off the feed, it is done by moving the shafts I by means of the handles I′, which operate the levers H, which in turn operate the rods G, and thus permit the arms D to move back and the rolls to part. The projections i^2 on the handles I′ at the same time operate the rods L, which lift the arms K′, thus partially rotating the shafts K and causing the gates J to close down against the feed-rolls J′ and shut off the flow of grain. A reversing of this motion brings all of said parts back into exactly their former positions, and the grinding proceeds.

Having thus fully described our said invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination of the swinging arms D, adjusting-rods G, levers H, horizontal rock-shaft I, having one side recessed or flattened at each end, and lever I′ on said shaft, substantially as set forth.

2. The combination of the swinging arms D, adjusting-rods G, levers H, shafts I, having recessed or flattened sides, levers I′, and gears I^2 on said shafts, substantially as set forth.

3. The combination of the swinging arms D, rods G, shafts I, levers I′, and gears I^2, mounted on said shafts, and means whereby one of said gears can be alternated from a fixed to a loose mounting, thus causing both the movable rolls to open when either of said levers is operated, when fixed, or permitting one to remain stationary, when loose, substantially as set forth.

4. The combination of the handles or levers I′, having projections i^2, the bars, L, having lugs *l l′*, the arms K′, the shafts K, and the feed-gates, substantially as set forth.

5. The combination, in a double-roller mill, of two separate bars, L, each having a lug, *l′*, the two arms K′, the two shafts K, and the two feed-gates, said bars being adapted to work separately or together, whereby the feed can be shut off from both sides of the mill successively or simultaneously, substantially as set forth.

6. The combination of the swinging arms D, the pivot-pins *d*, the boxes E, the tempering-rods F, the fulcrums or fixed stops *a*, the adjusting-rods G, the levers H, the shafts I, having flattened or cam surfaces at the points of contact with said levers, and handles or levers for operating said shafts, substantially as set forth.

7. The frame A of a roller-mill, provided at a point below the grinding-rolls with spout-like projections A^2, having covers a^2, substantially as described, and for the purposes specified.

In witness whereof we have hereunto set our hands and seals at Indianapolis, Indiana, this 28th day of October, A. D. 1882.

DANIEL W. MARMON. [L. S.]
JESSE WARRINGTON. [L. S.]

In presence of—
C. BRADFORD,
E. W. BRADFORD.