(No Model.) 4 Sheets—Sheet 1.

H. A. BARNARD.

ROLLER MILL.

No. 382,583. Patented May 8, 1888.

Fig. 2.

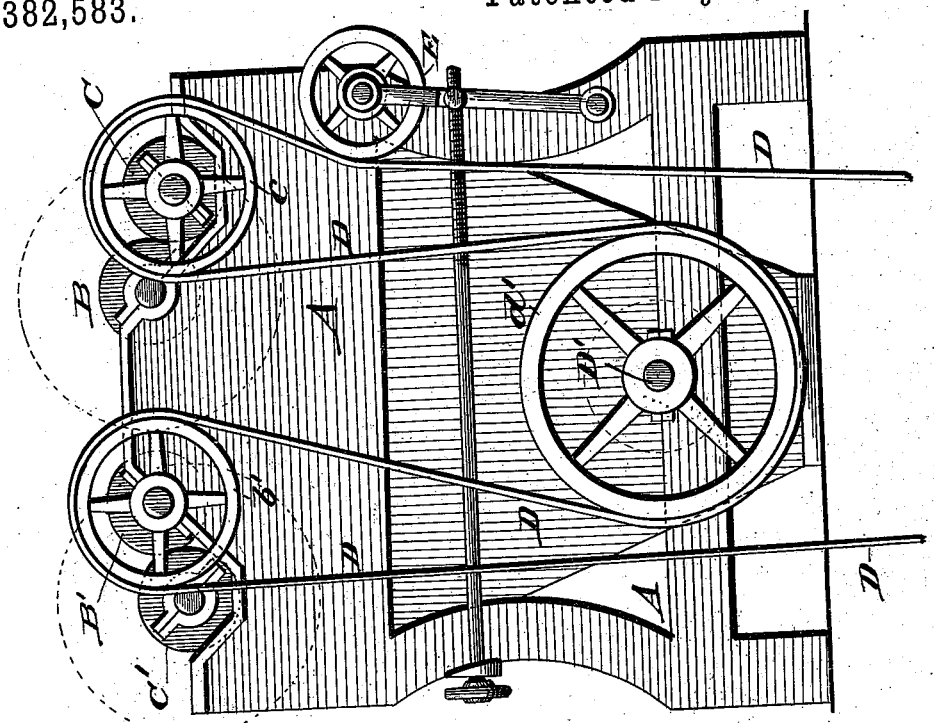
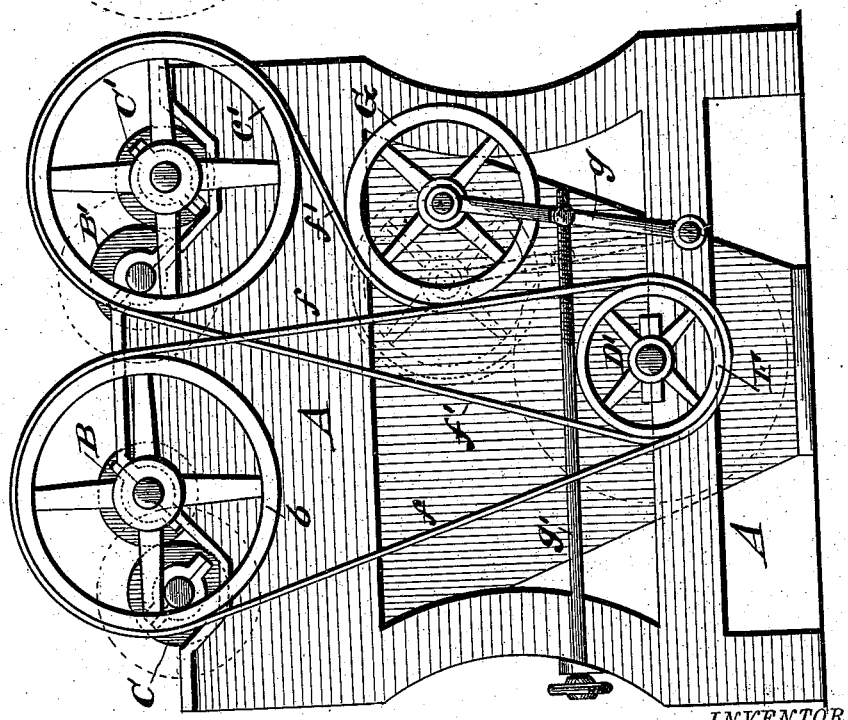


Fig. 1.



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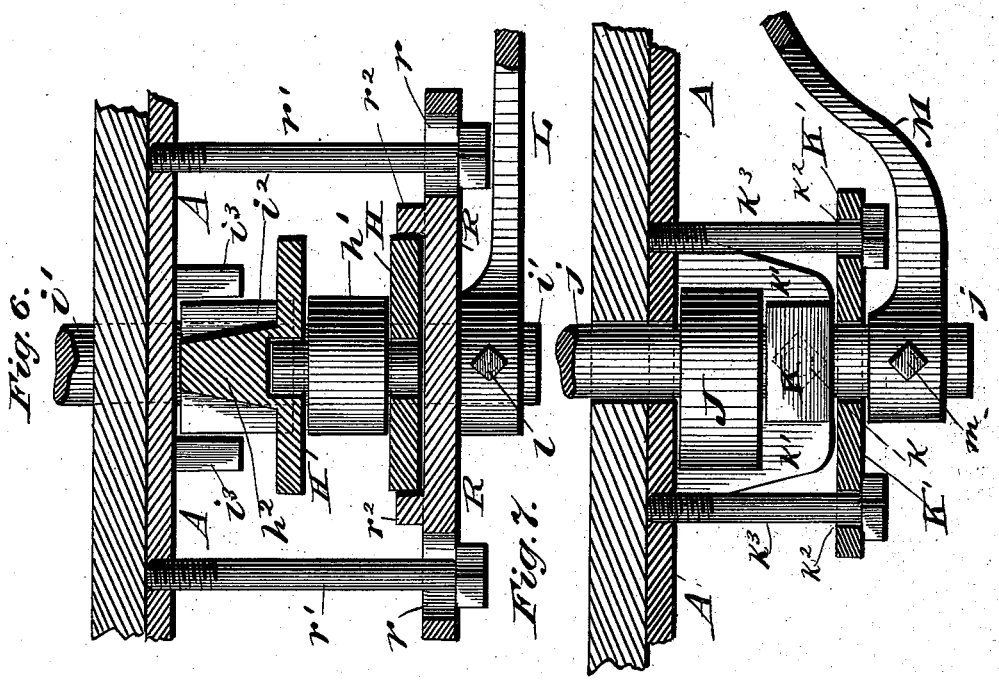

Fig. 6.

Fig. 7.

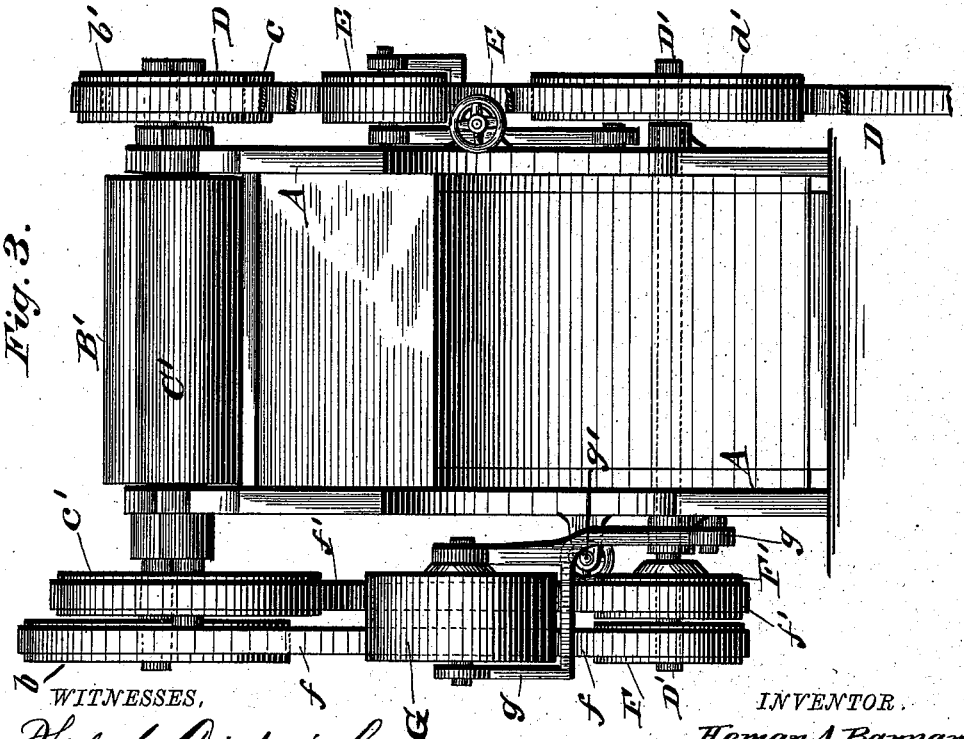

Fig. 3.

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(No Model.) 4 Sheets—Sheet 3.

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ROLLER MILL.

No. 382,583. Patented May 8, 1888.

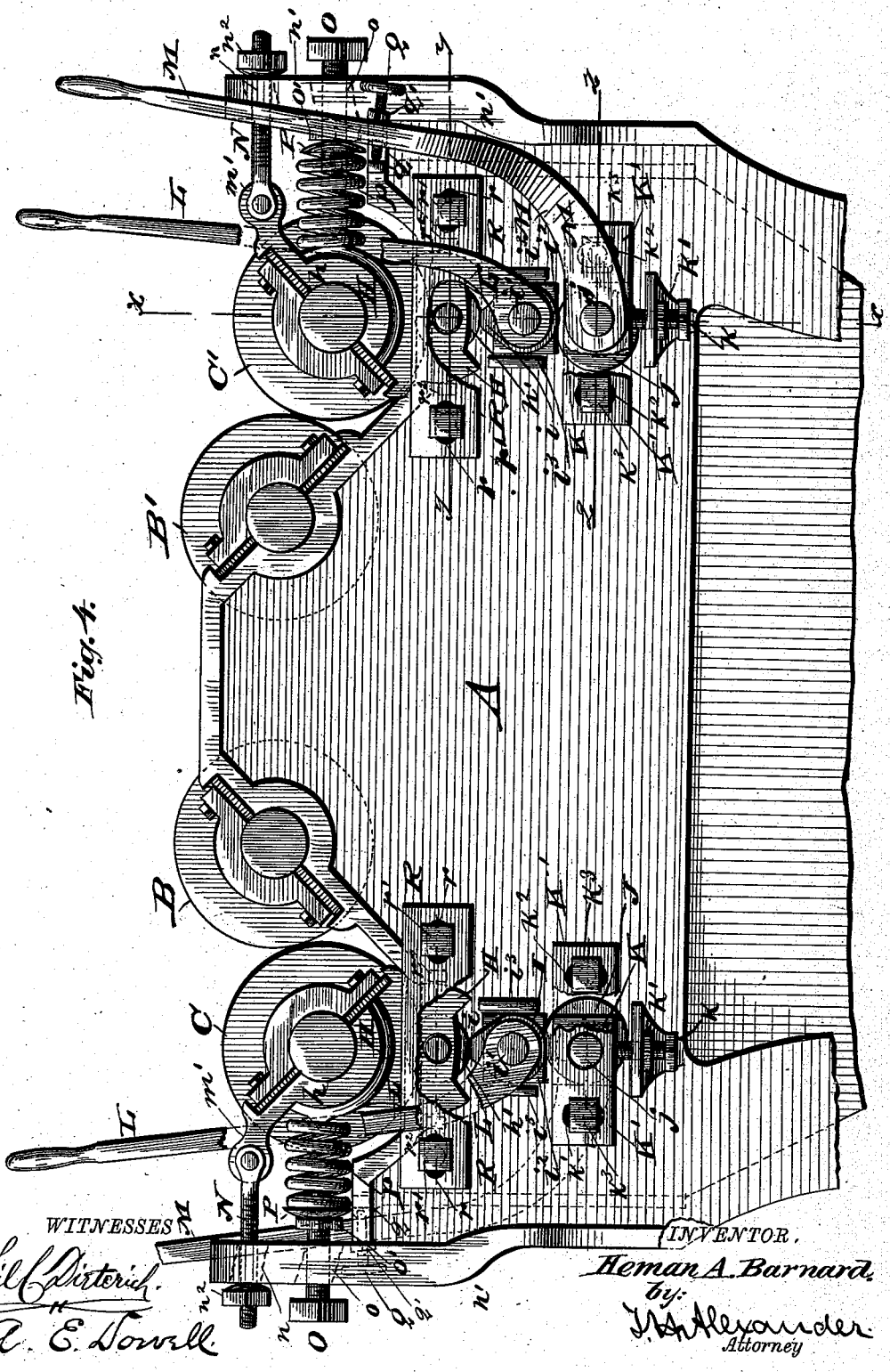

Fig. 4.

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ROLLER MILL.

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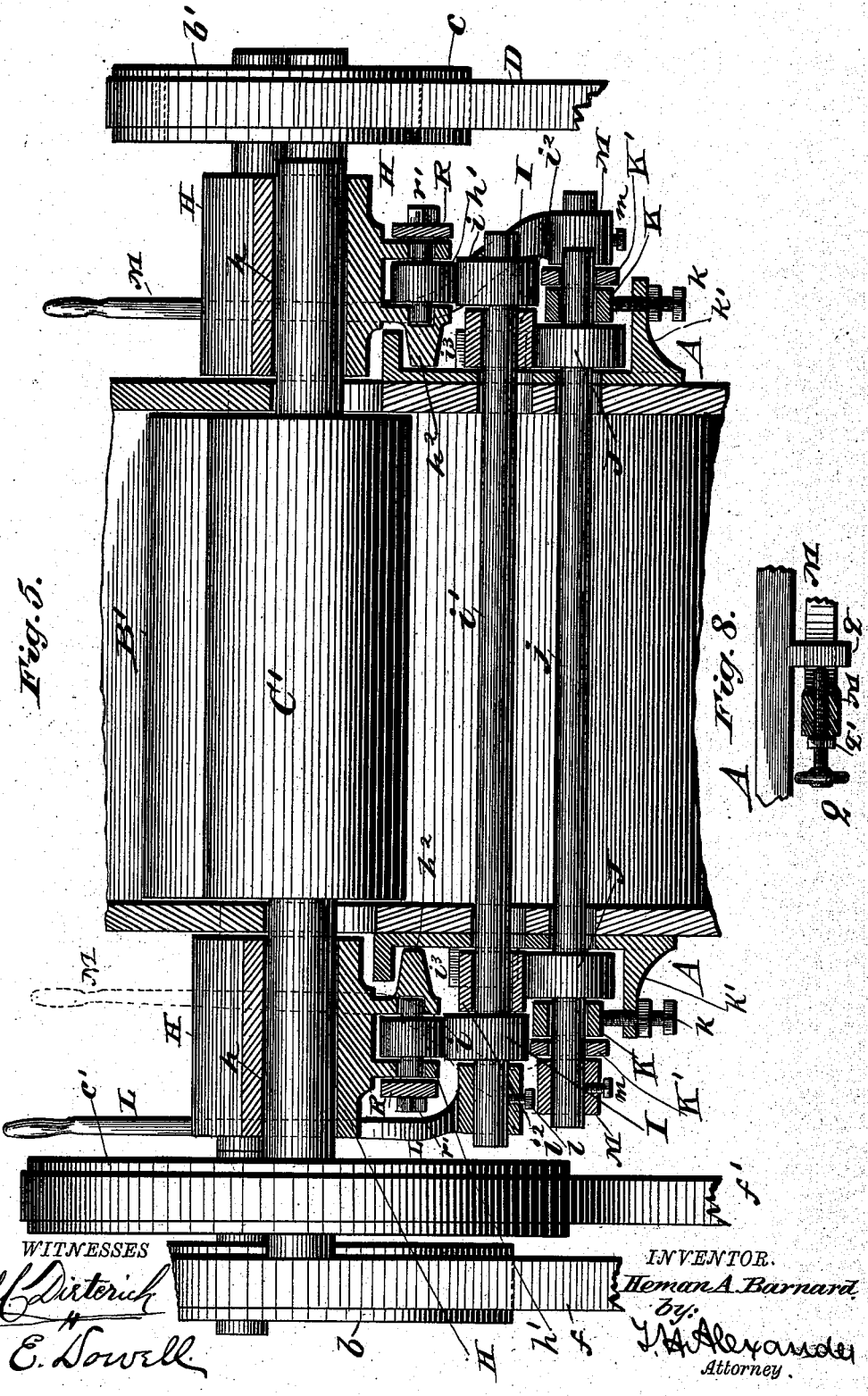

Fig. 5.

Fig. 8.

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UNITED STATES PATENT OFFICE.

HEMAN A. BARNARD, OF MOLINE, ILLINOIS, ASSIGNOR TO THE BARNARD & LEAS MANUFACTURING COMPANY, OF SAME PLACE.

ROLLER-MILL.

SPECIFICATION forming part of Letters Patent No. 382,583, dated May 8, 1888.

Application filed October 27, 1886. Renewed December 19, 1887. Serial No. 258,301. (No model.)

To all whom it may concern:

Be it known that I, HEMAN A. BARNARD, of Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Roller-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is an elevation of one side of a roller-mill, showing the drive, the adjusting devices for the grinding-rolls being omitted. Fig. 2 is a similar view showing the reverse side of the mill and the other drive. Fig. 3 is an end elevation of the same, showing the belt-tightening pulley. Fig. 4 is an enlarged side elevation, partly broken away, of a roller-mill, showing the adjusting mechanisms for the grinding-rolls. Fig. 5 is a vertical transverse part section of Fig. 4, taken on line *x x* thereon. Fig. 6 is an enlarged horizontal sectional detail taken on line *y y*, Fig. 4. Fig. 7 is a similar section taken on line *z z* of Fig. 4. Fig. 8 is a detail.

My invention has for its objects, first, to so arrange the two belts on one side of the machine with relation to the belt-tighener on the side of the roller-mill that the said two belts will converge until both impinge against the belt-tightener on their slack sides, thus enabling both to be simultaneously tightened or slacked; second, to provide means whereby the several adjustments of the moving roll with relation to the stationary roll may be easily and quickly effected; and to these ends my invention consists in the combination and novel arrangement of parts, hereinafter more fully set forth and claimed.

Referring to the accompanying drawings, A designates the main frame of a four-roller mill, upon which are made the fixed bearings for the inner roll of each pair. The said rolls are designated by B B′, respectively, and the journal-bearings of the rolls B B′ have inclined faces, and their caps are inclined at the same angle, preferably of about forty-five degrees.

C C′ are the outer rolls, which correspond to and form pairs with the rolls B B′, respectively.

The rolls C C′ are not journaled in the main frame, but in bearing-blocks, hereinafter described.

c and *b′* are pulleys on the extended ends of the journals of the rolls C and B′, respectively.

D is the main belt, which passes around the driving-pulley on a driving-shaft. (Not shown in the drawings.) The belt D passes over the pulley *b′*, then down under the pulley *d′* upon the transverse counter-shaft D′, journaled in the main frame. The belt runs thence up and over the pulley *c*, whence it descends to the driving-pulley.

E is a belt-tightening device similar to that shown in my application filed April 21, 1886, and numbered serially 199,675.

F F′ are two similar pulleys of equal size on the extended end of the shaft D′ on the side opposite the pulley *d′*.

f is a belt running around the pulley F and a pulley, *b*, on the extended journal of roll B.

f′ is a belt running around the pulley F′ and a pulley, *c′*, on the extended journal of roll C′.

G is a belt-tightening pulley having its shaft journaled in a bifurcated bracket, *g*, the arm of which is pivoted upon the main frame, as shown in Fig. 3. The face of the said pulley impinges upon both belts *f f′*, and the bracket is moved by the threaded rod *g′*, so as to regulate the pressure of the pulley G upon said belts.

The belt *f*, it will be noticed, runs from the pulley F to the pulley *b* in an inclined direction, and the belt *f′* runs from the pulley F′ to the pulley *c′* in an oppositely-inclined direction, so that the belts converge from the upper pulleys to the pulleys F F′, and their slack sides converge from said upper pulleys to their points of impingement upon the periphery of the pulley G. Thus the latter pulley will simultaneously either tighten or loosen the belts. The pulley G is made of sufficient width to bear upon both belts.

The above is the description of the actuating mechanism of the mill.

The following is the description of the means by which the movable rolls are adjusted in relation to the stationary rolls. Each of the movable rolls, being actuated by a similar mechanism, the description of one of said mechanisms only is necessary. The roll C' has its shaft journaled in bearings *h h*, made on the bearing-blocks H, Figs. 4 and 5, one of which supports each journal of the roll outside of the main frame. Each bearing-block H has pivoted in a bifurcation on its lower side a friction-roller, *h'*, which rests upon the periphery of a cam-disk, I, having the projecting portion *i*, the edge of which is made on the arc of a circle concentric with the periphery of the remaining portion of the disk. The cam-disk I is secured upon a transverse shaft, *i'*, which passes through slotted openings in the sides of the main frame and has bearings in rectangular bearing-blocks i^2, which have vertical motion between the two guide-ribs i^3 i^3, secured to the outer surface of the main frame. Each bearing-block has a conical projection, h^2, standing inward from the bifurcated portion on its under side, which has a flat end that impinges against the side of the main frame and prevents the bearing-blocks from vibrating laterally. The bearing-block i^2 on each side rests upon an eccentric disk, J, secured upon a shaft, *j*, passing through a slotted opening in the side of the main frame and turning in bearing-blocks K, which each rest upon the point of an adjusting-screw, *k*. The said screw passes through a threaded opening in a projection or bracket, *k'*, secured to the main frame, as shown in Figs. 4 and 5. By means of the screws *k* either or both ends of the shaft *j* may be raised or lowered, and by means of the eccentric disks J the cam-disks I and friction-rollers *h'* can be raised or lowered, thereby similarly moving the bearing-blocks H, and with them the adjustable roll, as is evident.

The bearing-blocks K K are attached to the sides of the main frame by means of the plates K', having the slots k^2 and the screws k^3, passing through said slots, so that they can be adjusted vertically.

L L are levers having their hubs secured by set-screws *l* upon the ends of the shaft *i'* outside of the cam-disks I. The said levers are so situated on their respective shafts *i'* at each end of the machine that they will come adjacent to and be operated by the right hand of the person operating the machine.

M M are levers having their hubs secured by set-screws *m* upon the ends of the shafts *j*, and so situated that the operator of the machine will pull them with the left hand. By turning the lever M on one end of the machine the corresponding adjustable roll can, by means of the eccentric disks J, be moved up to or from the stationary roll of the same pair, and by means of the lever L on either end of the machine the cam-disks can be so turned on that end as to allow the bearing-blocks H to fall and disengage the adjustable roll from the stationary roll. By means of the screws *k* the shafts *j* are raised, and, as hereinbefore described, the adjustable roll is made parallel with the stationary roll.

Each bearing-block H has a projection, *m'*, standing outward from its periphery, and upon said projection is pivoted the flattened inner end of a bolt, N, which passes through an opening, *n*, in a part, *n'*, of the main frame, and has a nut, n^2, engaging its threaded outer end. The opening *n'* has a diameter sufficiently larger than that of the bolt N to allow the latter to turn up and down therein. By means of the said bolt and nut the bearing-block on one side, and consequently the adjustable roll, can be moved outward from the stationary roll, so as to give more clearance between said rolls. The side of the nut n^2 which rests against the part *n'* of the main frame is rounded, so as to allow the bolt N to turn up and down or rock in the opening, and thus accommodate itself to the motion of the bearing-block H.

O is a bolt passing through an opening, *o*, in the part *n'* of the main frame at a point a suitable distance below the opening *n*, and *o'* is a nut which engages the stem of said bolt on the inner side of the opening *o*.

P is a washer on the bolt O, and *p* is a coiled spring surrounding the inner end of the bolt O, and with its outer end bearing against the said washer and its inner end bearing against the inner end of the adjacent block H. The washer P also has its surface that rests against the nut *o'* rounded for the same purpose as the nut n^2.

Q Q are screw-arms passing through threaded openings in the lever-arms M. The point of each of the said screws bears upon the projection *q*, or an outstanding part of the main frame, and each screw has upon it a jam-nut, *q'*, which holds it in place in the lever.

R R are rectangular plates attached to the sides of the main frame. Each of the said plates stands outside of one of the bearing-blocks H, at the lower part of the latter, so as to hold the block in place upon the frame. Each plate R is provided with inwardly-standing lugs r^2, which keep the roll-journals vertical, and with the longitudinal slots *r*, by means of which and the bolts *r'* the position of the plate is adjusted, the bolts passing through said slots and engaging in threaded recesses in the main frame, or in brackets secured thereto, Figs. 4 and 6.

It is evident from the foregoing that by means of the screws *k*, the intervening shafts, cam-disks, and eccentric disks, the lower or adjustable roll can be paralleled with the stationary roll; that by means of the eccentric disks the movable or adjustable roll can be adjusted near to or farther from the stationary roll; that by means of the cam-disks the adjustable roll can be dropped down so as not to engage in the grinding with the stationary roll; that by means of the springs and attachments the adjustable roll is kept up to the stationary roll, and can move away from the

latter should any large or hard substance fall between the rolls, and that by means of the bolts attached to the bearing-blocks H the adjustable roll is moved outward from the stationary roll. It is also evident that the different parts of the mechanism will readily adjust themselves to the bearing-blocks H, as the various bolts have sufficient clearance at the points where they pass through the openings in the main frame.

Having described my invention, I claim—

1. The combination, in a roller-mill, of the pairs of rolls B B′ C C′, the rolls B C′ having pulleys on their extended journals on the same side of the mill, a counter-shaft journaled in the main frame and driven by the main belt at one end, endless belts *f f′*, unequal in length, connecting said counter-shaft at its other end with rolls B C′, and a belt-tightening pulley located outside of belts *f f′*, and adapted to be engaged against the outer portion of one belt and the inner portion of the other belt, whereby both belts can be tightened simultaneously, or to be entirely released from the belts, substantially as and for the purpose specified.

2. The combination of the four rolls, a counter-shaft having two pulleys on the same end thereof, the pulleys on the journals of one roll of each pair of rolls, the belts *f f′*, of unequal length, converging from the pulleys on the roll-journals to the pulleys on the counter-shaft, with the idler-pulley journaled in a bifurcated bracket pivoted on the main frame to one side of the belts and counter-shaft, and the adjusting screw-rod, whereby the bracket can be shifted to cause the idler-pulley to impinge against the adjoining sides of the belts at one point of its periphery and regulate the tension of both belts simultaneously, substantially as and for the purpose described.

3. The combination of the counter-shaft provided with a pulley at one end rotated by the main driving-belt, the two equal-sized pulleys on the other end of the counter-shaft, the two pairs of rolls, the two equal-sized pulleys, one on the end of an adjustable roll of one pair of rolls and the other on the adjacent end of the stationary roll of the other pair, the belts *f f′*, of unequal length, actuating each of said pulleys from one of the pair of pulleys on the counter-shaft, with the belt-tightening device comprising a bracket, *g*, pivoted to the main frame on the side of and below the larger belt, *f′*, the idler-pulley G, and the adjusting screw-rod *g′*, engaging said bracket and an arm of the main frame, and adapted to adjust the bracket and cause the idler-pulley G to impinge against the slack outer portion of belt *f′* and against the slack inner portion of belt *f* at the same point of its periphery, whereby both belts can be simultaneously tightened thereby, all substantially as and for the purpose described.

4. The combination of the main frame, the stationary roll journaled upon the main frame, the adjustable roll, the bearing-blocks for the adjustable roll, the friction-rollers journaled in said bearing-blocks, blocks sliding vertically on the main frame, the cam-disks with their peripheries bearing on the peripheries of said rollers, shafts carrying said cam-disks and journaled in said blocks, and a lever-handle secured to said shaft, whereby the cam-disks can be partially rotated to raise or lower the adjustable roll, all substantially as specified.

5. In a roller-mill, the combination of the stationary roll, the adjustable roll, the bearing-blocks for the latter, the friction-rollers journaled in said blocks, the vertically-sliding cam-disks and lever-handle on the shaft thereof, the eccentric disks supporting the cam-disks, and the lever-handle on the shafts of the eccentric disks, whereby the same can be rotated to raise or lower the cam-disks, and consequently the adjustable roll, all substantially as specified.

6. In a roller-mill, the combination of the stationary roll, the adjustable roll, the bearing-blocks for the latter, the friction-rollers journaled in said blocks, the vertically-sliding cam-disks and lever-handles on the shaft thereof, the eccentric disks and lever-handle on the shaft thereof, the brackets *k′*, secured to the main frame, and the vertical adjusting-screws passing through threaded openings in said brackets, and with their ends impinging upon and supporting the bearings of the shaft of the eccentric disks, whereby the adjustable roll can be brought parallel to the stationary roll by turning the said vertical screws, all substantially as set forth.

7. The combination of the main frame having an arm, *n′*, the stationary roll, the adjustable roll, the bearing-blocks having projections extending out from their peripheries, the bolts having their inner ends pivoted to said projections and engaging with arm *n′*, the adjusting-nuts on said bolts, and the springs bearing against the bearing-blocks and the arm *n′* and their adjusting-nuts, the whole arranged to operate substantially to adjust the rolls.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

HEMAN A. BARNARD.

Witnesses:
W. H. HILLHOUSE,
J. S. LEAS.