(No Model.) 2 Sheets—Sheet 1.

W. D. GRAY.

ROLLER GRINDING MILL.

No. 388,661. Patented Aug. 28, 1888.

Fig. 2.

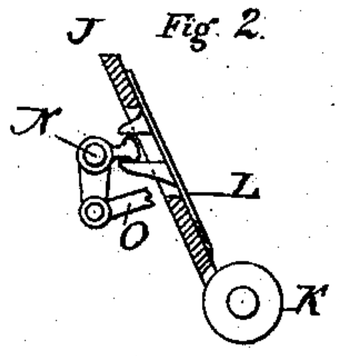


Fig 3.

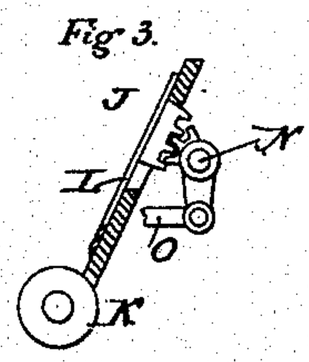


Fig 1.

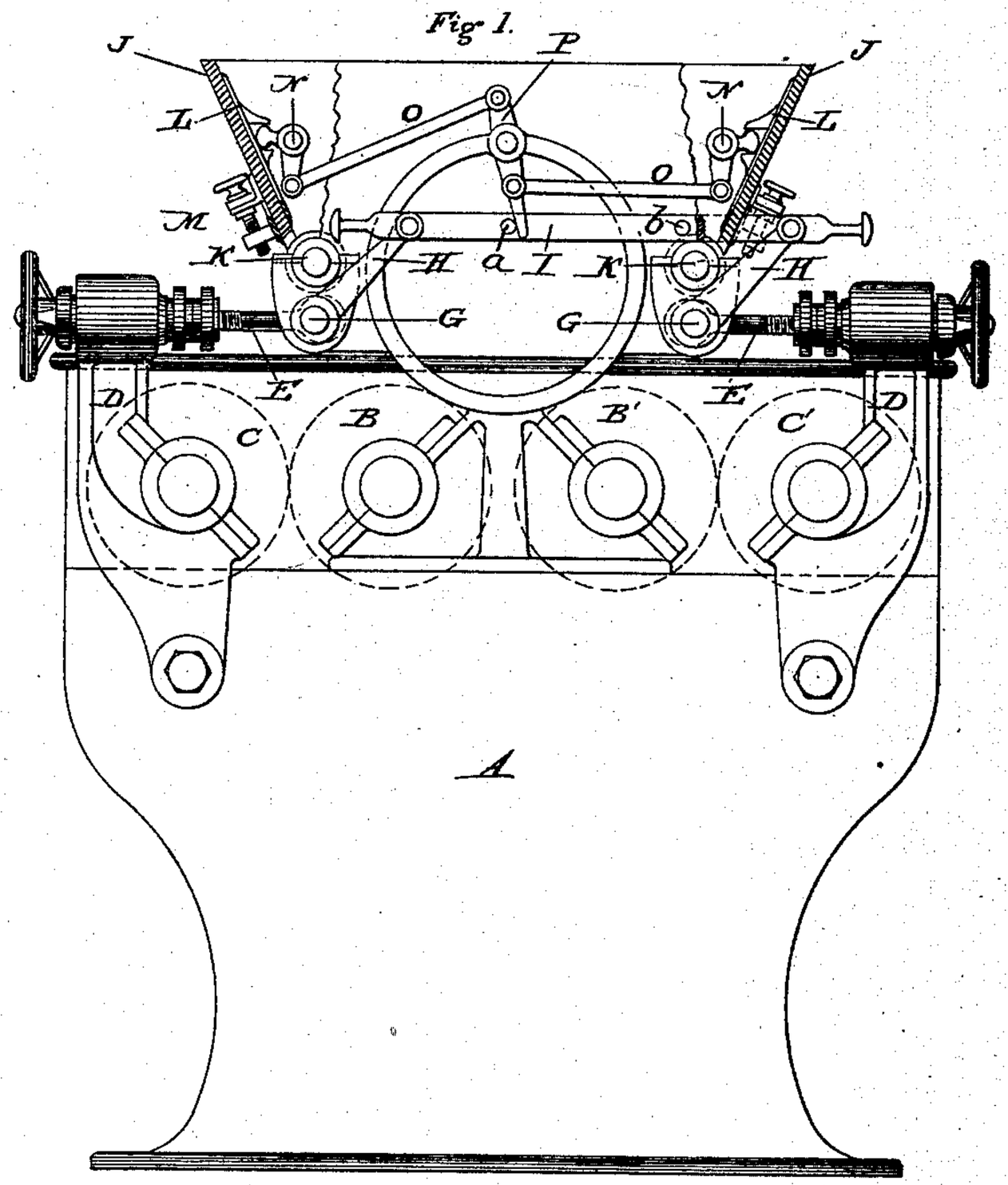
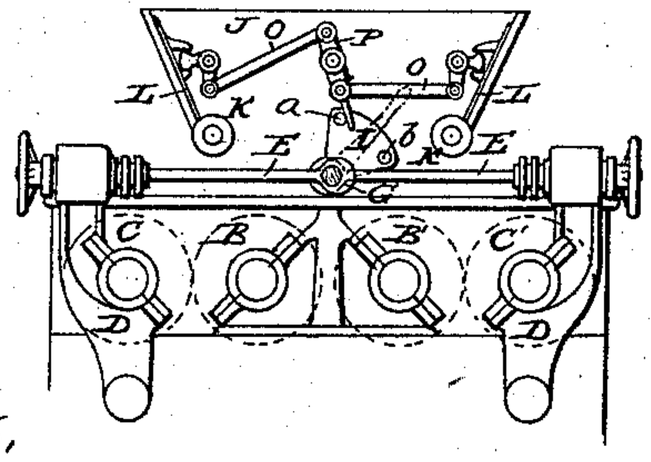


Fig. 4.



Witnesses.

D. P. Curl.

S. P. Bollingsworth.

Inventor.

W. D. Gray.

By his atty.

P. T. Dodge.

(No Model.) 2 Sheets—Sheet 2.

W. D. GRAY.

ROLLER GRINDING MILL.

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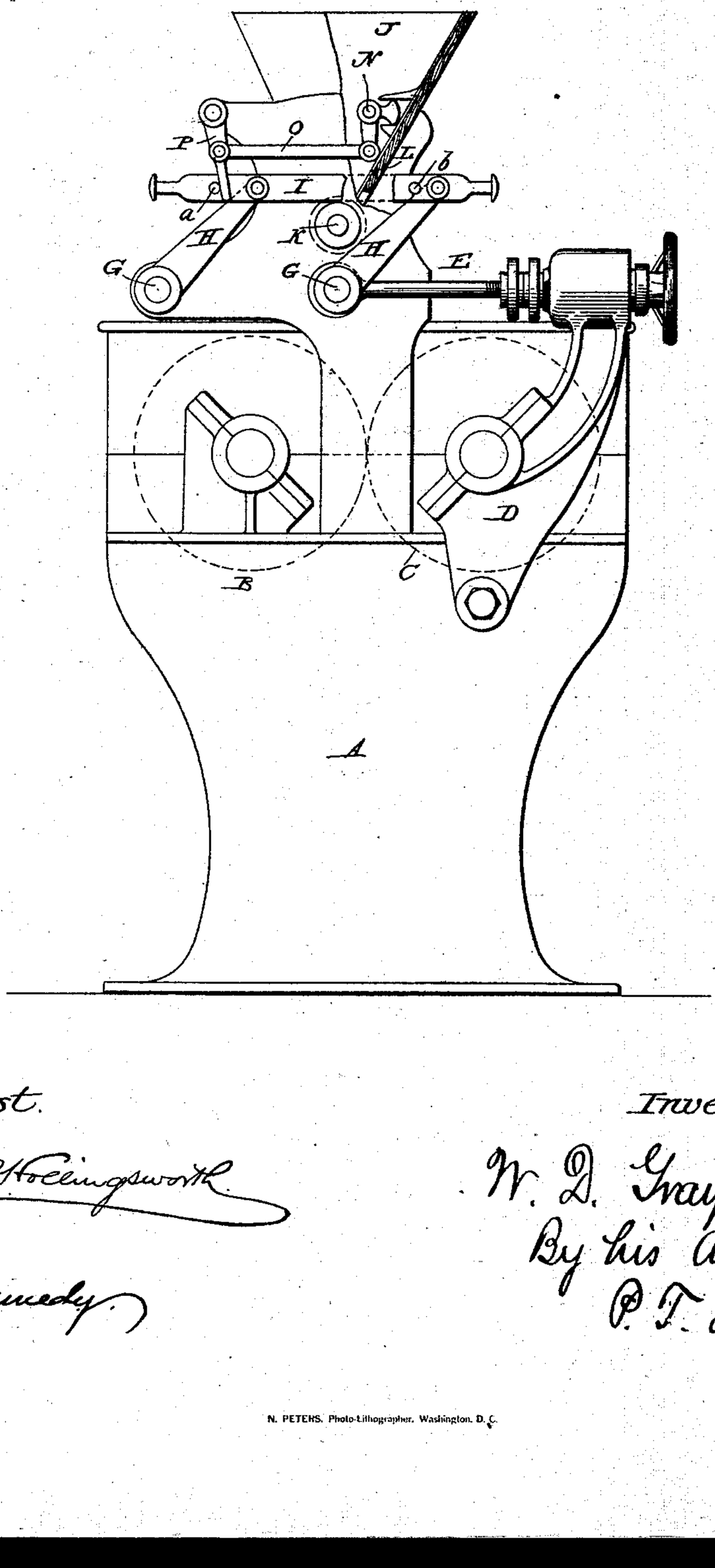
Fig. 5.



Attest.

Stanley P. Hollingsworth

Wm L. Kennedy.

Inventor,

W. D. Gray.

By his Atty.

P. T. Dodge.

UNITED STATES PATENT OFFICE.

WILLIAM D. GRAY, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO E. P. ALLIS & CO., OF SAME PLACE.

ROLLER GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 388,661, dated August 28, 1888.

Application filed July 25, 1884. Serial No. 138,781. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. GRAY, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain Improvements in Roller Grinding-Mills, of which the following is a specification.

Figure 1 represents a side elevation of a double-roller mill, or mill containing two pairs of grinding-rolls, provided with my improvements, the sides of the hopper being broken away and represented in section in order to more clearly illustrate the connection of the parts. Figs. 2 and 3 are sectional elevations illustrating slight modifications of the construction represented in Fig. 1, the gate-operating shafts being located outside instead of within the hopper. Fig. 4 is an outline elevation of the feed-controlling mechanism in a modified form. Fig. 5 is a side elevation, partly in section, showing my improvement embodied in a single mill.

Referring to Fig. 1 of the drawings, A represents the base or frame of the machine, B B′ two horizontal grinding-rolls mounted in fixed bearings therein, and C C′ the companion rolls mounted in adjustable arms D, pivoted at their lower ends in order that the rolls may be adjusted forward and backward by the pivotal motion of the arms. Each of the arms is connected at the upper end, through the medium of a screw-rod, E, to an eccentric mounted on a rock-shaft, G, lying transversely of the frame and mounted in fixed bearings thereon, so that by turning the rock-shaft the eccentrics will be caused to move the arms D forward or backward, and thus adjust the movable roll to or from its companion. Each rod E is connected with the upper end of the lever through the medium of adjusting-nuts and springs. The foregoing parts are essentially the same as those represented in mills for which Letters Patent of the United States have been granted to me, and constitute no part of the present invention.

It will be observed that there are two of the rock-shafts G, one for adjusting each of the movable rolls. The shafts are each provided at one end with a crank-arm, H, and these two arms are connected by means of a bar, I, pivoted or journaled thereto, so that by a movement of the bar the two rock-shafts and rolls may be adjusted simultaneously. The extremities of the bar will be fashioned into handles such as shown, or otherwise formed to admit of its being conveniently operated by hand from either side of the machine.

Above the frame there is mounted, as usual, a double hopper, J, having at the bottom two delivery mouths or openings, one above each pair of rolls. Beneath the respective mouths of the hopper there are mounted two horizontal feed-rolls, K, by which the discharge of the material and its delivery to the grinding-rolls beneath is effected in the ordinary manner. Above each of the feed-rolls the hopper is provided with a vertically-adjustable gate, L, by means of which the outlet-opening may be varied in size or closed, at will. Under ordinary circumstances I employ these gates simply for the purpose of closing the openings when the feed is to be stopped, separate gates M being provided on the outside of the hopper, as usual, to regulate the rate of feed by changing the size of the throats or outlets. Each of the cut-off gates L is provided on the inside with studs or lugs engaging an arm projecting from a rock-shaft, N, lying transversely within the hopper, so that by the rotation of the shaft the gate will be opened and closed.

The rock-shafts for operating the two gates are provided, as shown, with crank-arms, and these arms are connected by pitmen O to opposite extremities of a lever, P, which is pivoted centrally to the side of the hopper or frame, this combination of parts causing the two gates to be opened and closed simultaneously by the action of the lever. One extremity of this lever projects downward past the side of the roll-adjusting bar I, in position to engage alternately with two studs, *a* and *b*, thereon. On moving the bar I to the right for the purpose of throwing the rolls together—that is to say, into position for grinding—the stud *a* encounters the lever P, and through the intermediate parts opens both feed-gates. When, on the contrary, the bar is moved to the left to effect the separation of the rolls and stop the grinding action, the stud *b* encounters the lever and effects the closing of the feed-gates. The distance between the studs *a* and *b*, and the arrangement of the various parts with respect to each other, is

such that the rolls are brought together to the proper position for grinding before the stud *a* encounters the lever P, the result being that the feed-gates remain closed until after the rolls are in position to act upon the material delivered to them. The arrangement is also such that when the bar is moved to the left to effect the separation of the rolls the separation is commenced before the stud *b* encounters the lever P, whereby the gates are permitted to remain open until the separation is partly effected. Owing to the distance between the studs *a* and *b*, the lever P is permitted a certain amount of play or motion independent of the bar I. Consequently the operator is permitted to effect the adjustment of the grinding-rolls and the adjustment of the feed-gates independently of each other to a certain extent when required.

While I have illustrated in Fig. 1 the rock-shafts for operating the feed-gate located within the hopper, it is to be understood that they may, if preferred, be located outside the hopper, as represented in Figs. 2 and 3. In Fig. 2 the external shaft is provided with an arm engaging with studs on the gate, these studs being extended outward through a slot formed in the side of the hopper for the purpose. The arrangement represented in Fig. 3 is the same as that in Fig. 2, except that the rock-shaft is provided with a sector-pinion engaging a corresponding rack, which is projected outward from the gate through a slot in the side of the hopper.

It will be remembered that in Fig. 1 the movable grinding-rolls were adjusted by means of two separate shafts, G, provided with eccentrics. In certain classes of mills it is customary to mount the eccentrics for adjusting both rolls on a single shaft, as represented in Fig. 4. My invention is also applicable to this class of mills, one mode of application being that represented in said figure. The feed-gates and their operating-lever P are arranged in the same manner as in Fig. 1. The shaft G, which carries the eccentrics for operating both rolls, has fixed on one end a plate or arm having two shoulders or stops, *a* and *b*, at a suitable distance apart. The rotation of the shaft to effect the adjustment of the rolls brings the two shoulders alternately into contact with the lever P, and thus causes it to actuate the feed-gates, as in the first example.

Fig. 5 represents my improvement embodied in a mill having a single pair of rolls, commonly denominated a "single mill." In this mill the devices are practically identical with those represented in Fig. 1, except that the second pair of rolls, the second feed-gate, and the devices for adjusting one roll and gate are omitted. The reciprocating bar I is mounted on crank-arms H and provided with shoulders operating through lever P and bar O on the gate mechanism. The shaft G of one of the crank-arms is provided at each end with an eccentric connected with rod E, operating the adjacent support D of the movable roll. In this connection the second crank-arm, H, is used merely as a support for the end of the bar I.

I am aware that a roll-adjusting mechanism has been connected by intermediate devices with a feed-gate in such manner as to effect the closing of the gate simultaneously with the spreading of the rolls, and vice versa; and I am also aware that a roll-adjusting mechanism has been connected through intermediate devices with a clutch for driving the feed-roll, so that the roll was stopped subsequent to the spreading of the rolls and started previous to the closing of the rolls, and to such combinations I lay no claim.

While I have represented in the drawings the movable rolls as mounted upon swinging arms, it will be understood that my improvements may be applied with equal facility to rolls which are mounted in sliding boxes or supports and to other adjustable rolls of various classes known in the art.

I do not claim, broadly, herein the combination of roll-spreading and gate operating mechanism with an intermediate motion-retarding mechanism, whereby said parts are caused to operate successively, the same constituting the subject-matter of an application filed July 25, 1884, Serial No. 138,780.

Having thus described my invention, what I claim is—

In a roller grinding-mill, the combination of a hopper, a feed-controlling gate, a lever, P, connected by intermediate devices with said gate, a stationary grinding-roll, a movable grinding-roll, a roll-adjusting mechanism embracing a movable bar or arm, I, and widely-separated stops or shoulders *a* and *b* on said arm to actuate the gate-controlling lever, whereby the rolls are closed before the gates are opened and the rolls opened before the gates are closed.

WILLIAM D. GRAY.

Witnesses:
RICHARD HOPPIN,
RICHARD BIRKHOLZ.