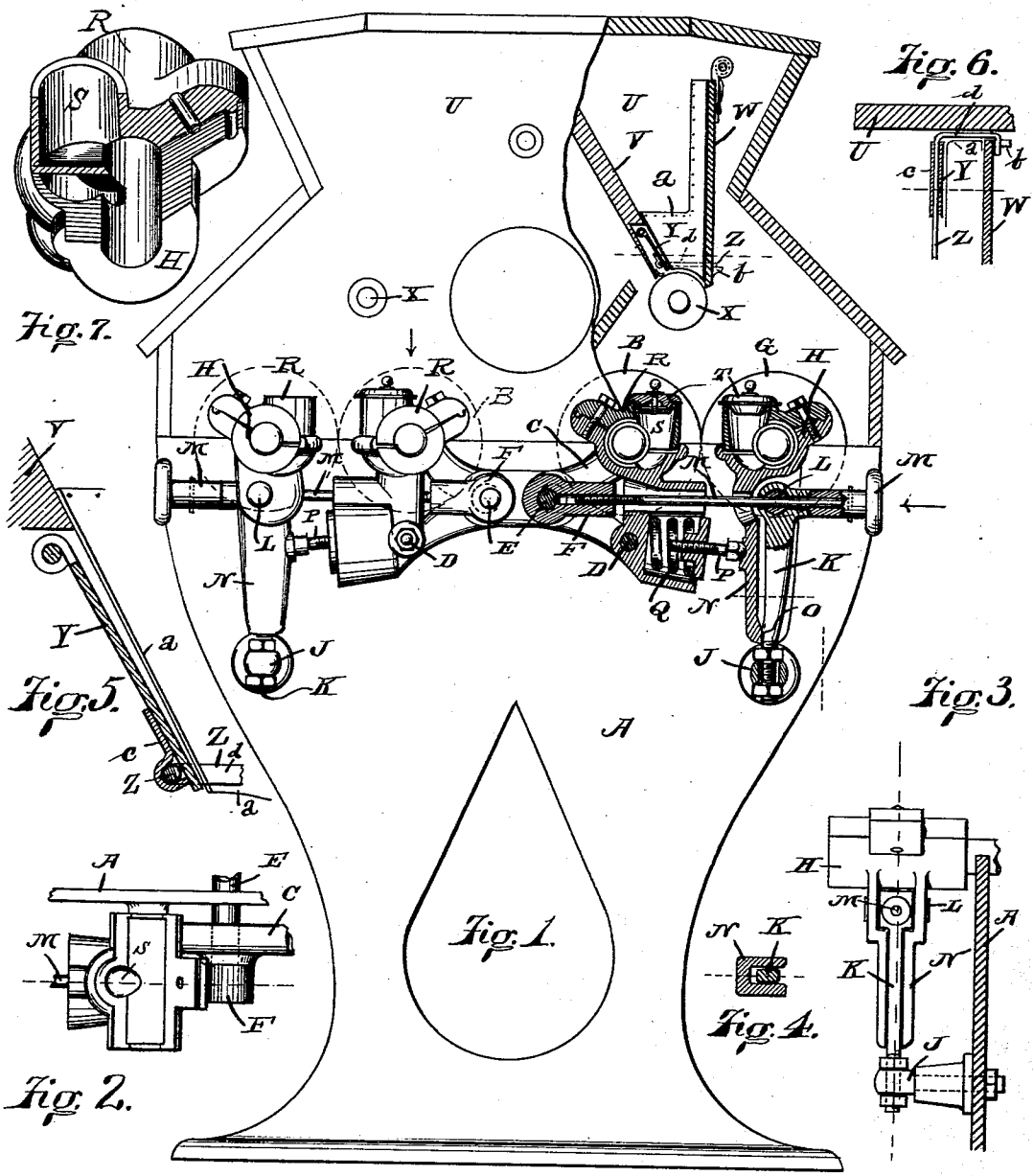
(No Model.)

J. D. MAWHOOD.

ROLLER MILL.

No. 398,339. Patented Feb. 19, 1889.



Witnesses.
Carl Spengel
W. Seward.

Jonathan D. Mawhood
Inventor

By his Attorney James N. Dee

N. PETERS. Photo-Lithographer. Washington, D. C.

UNITED STATES PATENT OFFICE.

JONATHAN D. MAWHOOD, OF RICHMOND, INDIANA, ASSIGNOR TO THE RICHMOND CITY MILL WORKS, OF SAME PLACE.

ROLLER-MILL.

SPECIFICATION forming part of Letters Patent No. 398,339, dated February 19, 1889.

Application filed April 2, 1888. Serial No. 269,311. (No model.)

To all whom it may concern:

Be it known that I, JONATHAN D. MAWHOOD, of Richmond, Wayne county, Indiana, have invented certain new and useful Improvements in Roller-Mills, of which the following is a specification.

This invention pertains to improvements in roller-mills, and will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of a double roller-mill, illustrating my improvements, this view exhibiting certain roll-housing parts in vertical section in a plane corresponding with the center of length of the roll-journals, and also a vertical section through certain of the hopper portions; Fig. 2, a plan of one of the fixed roll-boxes, the cap of the box being removed; Fig. 3, a front elevation of one of the movable-roll hangings, the hand-wheel of the screw M being omitted; Fig. 4, a horizontal transverse section of one of the movable-roll hangings; Fig. 5, a vertical transverse section of the agitator Y, this section corresponding to the similar section appearing in Fig. 1, except that Fig. 5 is upon a very much larger scale; Fig. 6, a horizontal section of a portion of the feed-gate W and agitator Y, and Fig. 7 a perspective sectional view of portions of one of the roll-boxes and its cap.

The drawings illustrate but one side of the roller-mill. The other side, if shown, would appear the same. It is therefore to be understood that the parts appearing in the drawings and often mentioned in the description in the singular number will in practice be duplicated upon the other side of the mill.

Many parts practically needed in a roller-mill are omitted from the drawings and description as not being specially pertinent to the present improvements. Such parts may, of course, be of any usual or suitable construction.

I illustrate my improvements in connection with a double roller-mill—that is to say, a mill having two pairs of rolls; but the improvements are applicable to mills having but a single pair of rolls.

In the drawings, A indicates the usual mill-frame; B, the fixed or non-adjustable roll; C, the fixed-roll housing, secured against the outside of the mill-frame and carrying the journal-boxes of the two fixed rolls; D, the bolts securing this housing against the side of the frame; E, a pair of shafts passing across the mill-frame and journaled in the fixed-roll housings and provided at their outer projecting ends with eccentrics, this being common construction, the intention being, as usual, that these shafts shall be provided with hand-levers or the like, by which they may be turned to effect the quick opening and closing of the rolls; F, swing-nuts journaled upon these eccentrics; G, the movable rolls; H, the journal-boxes of the movable rolls; J, wrists pivoted to the mill-frame some distance below the movable rolls; K, levers having their lower ends adjustably secured to these wrists, a threaded shank on the lever passing through the wrist and being engaged by a nut above and below the wrist, so that the lever may be lengthened or shortened, the wrist forming the pivot of oscillation of the lever; L, a trunnion-pin journaled in a bearing across the top of the lever K and projecting therefrom at each side, the axis of this trunnion-pin being parallel with the axes of the rolls and of the wrist J; M, an adjusting-screw passing through and journaled in the trunnion-pin at right angles to the axis of the trunnion-pin and passing through suitable apertures in the upper end of the lever K, the outer end of this screw being provided with a hand-wheel and with a shoulder engaging against the outer face of the lever, the inner end of the screw passing to and engaging the appropriate swing-nut F; N, a lever disposed substantially parallel to the lever K and pivoted upon the outer projecting ends of the trunnion-pin L, this lever N being of a hollow construction, so as to neatly inclose the lever K, and carrying upon its upper end the movable-roll box H; O, a point of contact between the lower end of the lever N and a portion of lever K; P, a spring-screw with its head abutting against the inner side of the lever N, and with its threaded portion engaging a nut; Q, a spring disposed in a cup formed upon the fixed-roll housing and opening outwardly, this spring abutting against the back of the cup and presenting

outwardly against the rear face of the nut upon the spring-screw; R, the caps of the roll-boxes, each of these caps joining its box in a plane disposed horizontally at one side of the journal and at the other side of the journal in a plane disposed at an angle of about thirty degrees to the other plane; S, a large open-top chamber formed in the box-cap R and passing vertically entirely through the same and terminating in a pit in the journal-box, this chamber being disposed to one side of and tangent to the bore of the journal-box, so as to be intersected thereby; T, a cover for each of these chambers, the cover resting upon top of the chamber-wall and making a dust-tight joint therewith through the medium of a soft gasket secured to the cover by means of a screw passing centrally through the cover into a frustum-shaped nut upon the under side of the cover; U, the end walls of the usual hopper structure; V, the usual inclined rear wall of one of the hoppers, "one of the hoppers" meaning the hopper pertaining to one of the pairs of rolls; W, the usual automatic gate, forming in the illustration the front wall of the hopper, the lower free edge of this gate being contiguous to the feed-roll and its upper edge being pivoted to the hopper; X, the usual feed-roll, forming substantially a closure of the bottom of the hopper formed by the hopper-back V and gate W; Y, a swinging agitator consisting of a strip of metal disposed across from end to end of the hopper and hung at its upper edge to the hopper-back V and having its lower edge contiguous to the periphery of the feed-roll, this agitator being disposed within a facial rabbet in the lower inner edge of the hopper-back V and forming substantially an articulated lower edge for the hopper-back; Z, a wire disposed along behind the agitator, near the lower edge thereof, and at the ends of the agitator extending forwardly to and beyond the feed-gate W, and there bent inwardly to engage the outer surface of the feed-gate; *a*, a flexible packing, as of rubber, secured against the inner ends of the hopper and turned inwardly to form angles lying against the inward faces of the feed-gate and agitator at their ends, and extending a short distance along the inner faces of gate and agitator, and preferably secured to those faces, this packing descending to very near the periphery of the feed-roll; *b*, lugs or brackets projecting outwardly from the feed-gate near its ends to serve as rests for the extremities of the wire Z; *c*, (see Fig. 5,) a clip-strip secured to the back of the agitator and extending the entire length thereof and engaging the wire Z, and serving as a means for stiffening the agitator and for securing the wire in a hinge-like manner to the agitator; and *d*, those portions of the wire Z which reach transversely across the hopper from agitator to feed-gate and form connecting-rods for transmitting motion from the feed-gate to the agitator.

The lever K is neatly boxed within the lever N, and the two levers, under certain conditions, form practically one lever oscillating upon the wrist J. If we imagine the screw M as being absent, we can see that the combined lever K N would freely oscillate upon the axis of the wrist J, and thus carry the movable roll to and from the fixed roll. It will also be seen that the nuts upon the foot of the lever K may be adjusted so as to raise or lower the movable-roll boxes, and thus serve in adjusting the movable roll into parallelism with the fixed roll. The tendency of the spring and spring-screw is to press the combined lever outwardly and keep the movable roll away from the fixed roll. Now, looking still at the two levers K N as forming practically a single lever, it will be seen that the screw M, acting tangentially, serves to prevent the outward movement of the lever, and also serves as a means by which the movable-roll boxes may be adjusted toward the boxes of the fixed roll, the spring and spring-screw tending to press the lever outwardly as far as the shoulder of the adjusting-screw will permit. If we turn the adjusting-screw M in one direction, we force the movable roll toward the fixed roll, and if we turn the screw in the other direction we permit the spring to force the movable roll away from the fixed roll. In this manner we may adjust the grinding distance between the rolls. The spring-pressure is adjusted by the screw P.

The rotation of the eccentric-shafts E serves in the ordinary manner to move the adjusting-screw M endwise when the rolls are to be quickly opened, and when this is done the springs force the rolls open. When the rolls are to be closed again, the eccentrics pull inwardly upon the screws against the force of the springs. An admirable and simple provision is thus made for adjusting the grinding distances and for the quick opening and closing of the rolls; and particular attention should be called to the dual duty of each spring, due to the fact that when the eccentrics are operated to permit the rolls to open the springs furnish the roll-opening force, and that when the rolls are at work the springs, acting upon the levers at points intermediate between the adjusting-screws M and the pivot-wrist J, tend to press the levers outwardly against the shoulders on the adjusting-screws and against the outer surfaces of their foot-pivots, and thus take up all lost motion and prevent chattering of the movable-roll hangings, the tendency of the springs being to press the levers in the direction of the working strain and to prevent the reaction of the levers when the working strains are lessened.

It is important in roller-mills that the movable rolls should be capable of automatically opening when subjected to extraordinary strain, as when a foreign substance enters the mill. Provision for this is usually made by means of springs, which hold the movable-roll hangings to normal position, the springs

yielding under extraordinary strain and permitting the rolls to open. I also make this provision in a similar general manner, while supporting the roll-levers on close-fitting pivots. I utilize for this purpose the same spring which tends to press the movable roll outwardly. It will be remembered that the spring and spring-screw act outwardly upon the so-called "combined lever" and tend to press the movable roll away from the fixed roll, and that this tendency is resisted by the shoulder on the adjusting-screw. This spring, which tends to press the movable roll outwardly, also serves to resist the outward movement of the roll and yield only in case of excessive outward strains upon the rolls.

By inspecting the right-hand portion of Fig. 1 it will at once be seen that outward force applied to the movable roll will cause the outer lever, N, to oscillate upon the trunnion-pin, the lower end of the lever N moving inwardly and compressing the spring. In short, the adjustable roll is carried by a composite lever, which lever is a lever of the second order when viewed as a means for permitting the automatic opening of the roll. In the first case the combined lever oscillates upon the wrist J, and in such oscillation the trunnion-pin L is carried along with the lever. In the second case the wrist is without office as a pivot and the trunnion-pin L keeps a fixed position, and the lever N oscillates upon the trunnion-pin.

The cap R is held to its journal-box by a single bolt engaging the usual ears upon that side of the box which is subjected to the wearing strains under motion, and the line of parting between cap and box at this side of the box is at an angle, so that the parting-line in the bore does not present itself directly in the most useful part of the bearing-surface, the parting-line being considerably elevated above the center of the bearing. The other side of the bearing, not being subjected to wearing strains, I cut away quite freely at the center and form the large chamber S partly in cap and partly in box. The parting-space between cap and box on this side of the journal I leave considerably open, and I fill the space with a laminated gasket formed, preferably, of separate sheets of paper made up into pasteboard. This pasteboard serves in packing the parting-joint and in distributing the lubricant placed in the chamber above it, and as a means for permitting a greater closing of the cap upon the box by simply thinning the gasket by the removal of one of its layers. The parting-joint between cap and box at the other side of the journal is not formed by parallel surfaces; but the joint is left open near the journal and closed at the outside beyond the cap-bolt. The cap is thus a lever of the second order acted upon by the bolt between its fulcrum-point outside the bolt and the gasket on the other side of the journal, while the joint-crack on the bolt side of the box is above the level of the gasket, and thus less liable to cause leakage of lubricant. The cover T of the chamber S has a gasket of felt or similar soft material clamped between it and a frustum-shaped nut below it. The frustum-shaped nut serves as a means for clamping the gasket and as a means for directing and holding the cover to place.

The automatic feed-gate W is to be arranged with an adjustable spring, tending to press its lower edge against the feed-roll. A preferred construction and arrangement of this gate is found fully set forth in my patent, No. 373,408, of November 15, 1887.

Material flowing in the usual manner into the hopper strikes the automatic feed-gate and causes it to properly open and furnish an outlet-slot along the feed-roll, through which the material flows to the mill-rolls. This material under ordinary circumstances and construction of hoppers often tends to clog at the ends of such hoppers and along the foot of the hopper-back, thus interfering with the performance of the feed apparatus in causing the delivery of material to take place in a thin stream uniform throughout its length along the feed-roll. The material striking the gate W gives to that gate a vibratory motion. The agitator Y, free to oscillate upon its suspension-pivots, is connected to the gate W by the connecting-rod portions *d* of the wire Z. The consequence is that the vibratory motion of the gate will be communicated to the agitator Y, which will cause a shaking down of material otherwise tending to clog upon the lower portion of the hopper-back. The ends of the lower portion of the hopper and the corners joining the ends and the other wall portions are formed by the flexible packing, *a*. This packing prevents the leakage of material past the ends of the gate and agitator; but that is not the main office of the packing. The angles of the packing, being in contact with the feed-gate and agitator, receive motions from those parts, and the consequence is that the lower end walls of the hopper and the corner angles of the same are always undergoing more or less vibrations, which will shake down the material and prevent clogging. The packing, *a*, may be formed of rubber or cloth, or other flexible fabric, and it should be secured to place loosely, so as to freely permit the requisite vibratory motions.

It is of course not essential that the adjusting-screw M should pass through the trunnion-pin, each of these two parts having separate offices.

I claim as my invention—

1. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a housing for the fixed roll, a lever pivoted to the frame and carrying a trunnion-pin, an adjusting-screw for adjusting such lever upon its pivot and altering the position of said trunnion-pin, a lever carrying a box for the movable roll and pivoted upon said trunnion-pin, and a spring arranged to act upon said levers at a point intermediate

between said trunnion-pin and the pivot of said first-mentioned lever.

2. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a housing for the fixed roll, a lever pivoted to the mill-frame and carrying at its upper end a trunnion-pin, means, substantially as described, for adjusting the distance between the pivot of said lever and its trunnion-pin, an adjusting-screw for adjusting such lever, a lever pivoted upon said trunnion-pin and carrying a box for the movable roll, and a spring acting upon both said levers.

3. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a housing for the fixed roll, a lever pivoted to the mill-frame and carrying a trunnion-pin, a lever pivoted upon said trunnion-pin and carrying a box for the movable roll, a spring acting upon both said levers, a nut, and an adjusting-screw engaging said first-mentioned lever and said nut to move said trunnion-pin toward said nut against the resistance of said spring.

4. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a housing for the fixed roll, lever K, pivoted to the mill-frame, trunnion-pin L, journaled in said lever, adjusting-screw M, engaging said lever and a nut, lever N, provided with box H and pivoted to said trunnion-pin, spring Q, and spring-screw P.

5. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a housing for the fixed roll, lever K, pivoted to the mill-frame and carrying a trunnion-pin, an adjusting-screw for adjusting said lever, hollow lever N, inclosing said first-mentioned lever and pivoted thereto and carrying a box for the movable roll, and a spring arranged to act upon both said levers.

6. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a housing for the fixed roll, a wrist, J, in the mill-frame, lever K, carrying a trunnion-pin and provided at its foot with nuts engaging said wrist, an adjusting-screw to serve in adjusting said lever and altering the position of said trunnion-pin, lever N, carrying box H and pivoted to said first-mentioned lever, and a spring acting on both said levers.

7. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a fixed-roll housing, C, secured to the mill-frame and carrying a box for the fixed roll, and an outwardly-open cup, a pivoted lever supported by the mill-frame and carrying a box for the movable roll, an adjusting-screw connecting said lever and a nut at the fixed-roll housing, spring Q, seating in said spring-cup, and spring-screw P, reaching from said spring to said lever.

8. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, boxes for said rolls provided with cap-receiving surfaces arranged in horizontal planes upon the non-wearing side of the journals and in angular planes upon the wearing side of the journals, caps secured to said boxes and engaging said surfaces, and tangential chambers S, extending through the caps and past the non-wearing side of the journals into the boxes and below the level of the bottom of the journals.

9. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, boxes for said rolls provided with cap-receiving surfaces arranged in horizontal planes upon the non-wearing side of the journals and in angular planes upon the wearing side of the journals, caps secured to said boxes and engaging said surfaces, tangential chambers S in said caps and boxes at the non-wearing side of the bearing, and gaskets interposed in the horizontal joints between said boxes and caps and across said chambers.

10. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a feed-roll, a hopper, a spring-pressed feed-gate forming a wall of the hopper and arranged to have its edge act in conjunction with said feed-roll, a hopper-back, an agitator pivoted to such hopper-back and having its lower edge contiguous to said feed-roll, and connecting-rods engaging said agitator and feed-gate.

11. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a hopper, a feed-roll, a hopper-back, a feed-gate with its lower free edge contiguous to said feed-roll and with its upper edge pivoted to the hopper, and a flexible packing at the ends of the hopper engaging the feed-gate and extending at the foot of the feed-gate from said feed-gate to said hopper-back.

12. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of mill-rolls, a hopper, a feed-roll, feed-gate W, hopper-back V, agitator Y, wire Z, engaging said agitator and feed-gate, and clip *c*, engaging such agitator and wire.

JONATHAN D. MAWHOOD.

Witnesses:
S. E. SWAYNE,
H. E. ROBINSON.