(No Model.)

J. D. MAWHOOD.

ROLLER MILL.

No. 385,420. Patented July 3, 1888.

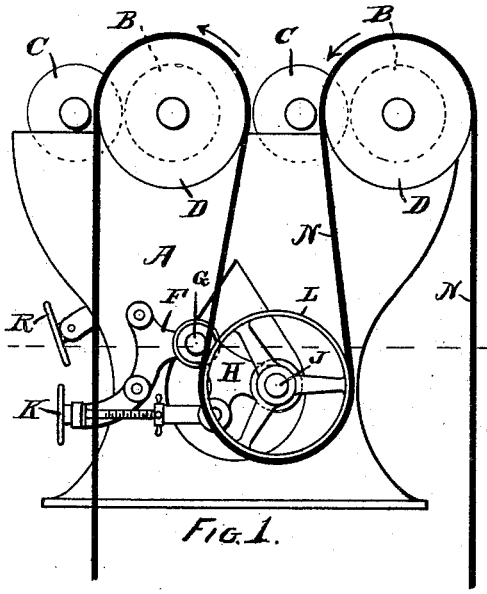

FIG. 1.

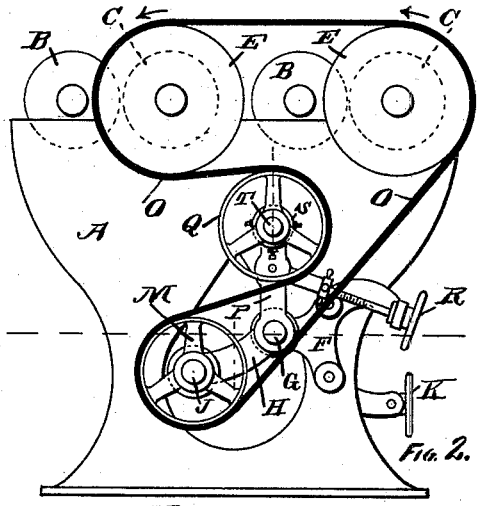

FIG. 2.

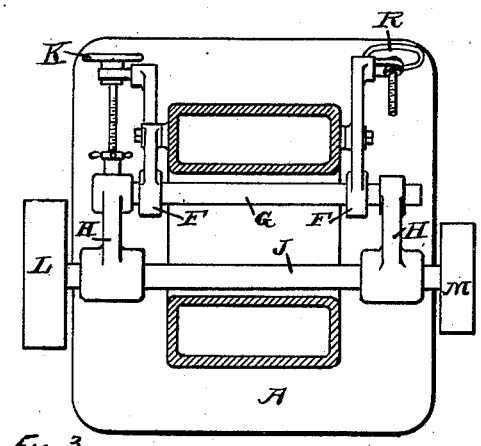

FIG. 3.

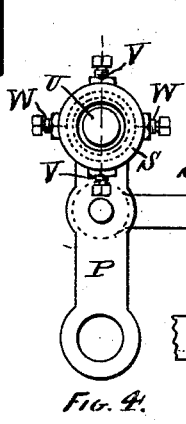

FIG. 4.

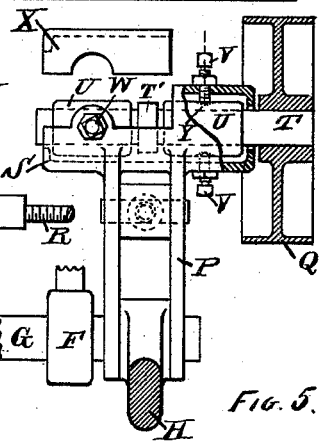

FIG. 5.

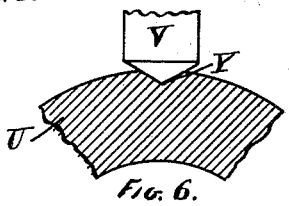

FIG. 6.

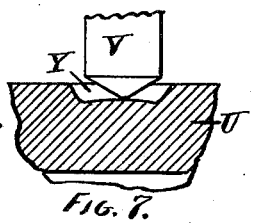

FIG. 7.

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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. 385,420, dated July 3, 1888.

Application filed April 4, 1887. Serial No. 233,571. (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 double roller-mills, in which two pairs of rolls are driven by belting, one roll of each pair revolving at a higher rate of speed than its fellow roll. The rolls that are to revolve at the higher rate of speed will be herein spoken of as the "fast" rolls, and the other rolls will be spoken of as the "slow" rolls. The faces of the mill structure corresponding with the ends of the rolls will be called the "sides" of the mill. The fast rolls are driven by a belt at one side of the mill, and this side will be spoken of as the "fast" side of the mill. The slow rolls are driven by belt at the other side of the mill, and that side will be spoken of as the "slow" side.

The adjective "slow" as herein used, except as referring to the rolls themselves, may have reference to details pertinent to the slow side of the mill; and the adjective "fast" may be used in an appropriate analogous manner.

My improvements pertain to the driving system, and will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is an elevation of the fast side of a roller-mill embodying my improvements; Fig. 2, an elevation of the slow side of the same; Fig. 3, a plan of the counter-shaft and pertinent details, with the mill-frame appearing in horizontal section, the fast side of the mill being at the left; Fig. 4, a side elevation, upon an enlarged scale, of the tightener-arm employed upon the slow side of the mill; Fig. 5, a rear view of the same, the rear of the mill corresponding with the right hand of Fig. 1 and the left hand of Fig. 2; and Figs. 6 and 7, respectively, transverse and longitudinal sections of portions of one of the boxes of the tightener-arm.

In the drawings, A indicates the usual mill-frame; B, the fast rolls of the two pairs of mill-rolls; C, the slow rolls; D, pulleys on the shafts of the fast rolls; E, pulleys on the shafts of the slow rolls, on the side of the mill opposite to that on which are the pulleys D; F, brackets secured to the sides of the mill-frame and carrying bearings whose axis is disposed below the rolls and preferably about horizontally midway between the two slow rolls; G, a pivot shaft journaled therein; H, counter-shaft bearing-arms rigidly secured to the opposite ends of the pivot-shaft, the free ends of these arms carrying bearings for the counter-shaft; J, the counter-shaft journaled in these bearings; K, an adjusting-screw, illustrated as being upon the fast side of the mill, engaging one of the counter-shaft bearing-arms and serving as a means by which these arms may be oscillated, the adjusting-screw moving one of the arms and the pivot-shaft, and consequently the opposite arm; L, a pulley fast on the fast end of the counter-shaft in the same plane with the pulleys D, so that a single belt may engage the three pulleys; M, a pulley on the slow end of the counter-shaft, in the same plane with the pulleys E, so that a single belt may engage the three pulleys; N, the fast belt, this belt leading upward from a suitable pulley on the driving-shaft, presumed to be located below the mill and engaging the pulleys D of the fast rolls, the belt between the two pulleys D being brought down and around the pulley L on the fast end of the counter-shaft, whereby the belt gives motion to the fast rolls and to the counter-shaft; O, the slow belt, this belt engaging the pulleys E of the slow rolls and the pulley M on the slow end of the counter-shaft, whereby motion is imparted to the slow-rolls from the counter-shaft which is driven by the fast belt; P, a tightening-arm pivoted on the pivot-shaft on the slow side of the mill; Q, a tightener for the slow belt, supported by the upper end of the tightener-arm; R, an adjusting-screw serving to rock the tightener-arm, and thereby adjust the tightness of the slow belt; S, a tray formed at the upper end of the tightener-arm and containing bearings for the shaft of the tightening-pulley; T, the shaft of the tightening-pulley, fast in the pulley; T′, a collar fast on this shaft to limit end motion thereof; U, the bearings for the shaft T, supported in opposite ends of the tray, the tightening-pulley Q being upon an overhanging end of the shaft

projecting from the bearings; V, a pair of set-screws held by the tray in a common axis at right angles to the tightener-shaft, their points engaging short longitudinal grooves in the periphery of that one of the bearings U nearest the tightening-pulley; W, a similar pair of set-screws with their common axis arranged at right angles to the axis of the set-screws V, their points engaging grooves in that one of the bearings U farthest from the tightening-pulley; X, a cover for the tray, the same when applied serving to form the tray into a complete inclosure for the bearings for the tightener-shaft; and Y, the grooves in the bearing U to receive the points of the set-screws, these grooves being longitudinally disposed in the outer periphery of the bearings, the width of the grooves being such as to be filled by the points of the set-screws, so that the bearings will be held against rotation by the set-screws, the length of the grooves being such as to permit the bearings to shift endwise somewhat with relation to either of the set-screws supporting a bearing.

The general arrangement of the rolls and all the pulleys and belts is substantially as is usual and well known. It is to be understood, of course, that the pulleys are to be so proportioned that the slow rolls will revolve at a slower peripheral rate of speed than the other rolls.

When the fast belt is to be tightened, the adjusting-screw is manipulated in an obvious manner, so as to lower the counter-shaft and the pulley L. This is a common arrangement. As the counter-shaft is thus lowered in tightening the fast belt, it is obvious that the pulley on the slow end of the counter-shaft will also be lowered. In the common arrangement such bodily raising and lowering of the counter-shaft tightens the belts at both ends of the counter-shaft at once. This is a very undesirable result, as the belts may not need tightening at one time, and if they should it is seldom that the same adjustment of tightening will answer for the belts at each end of the counter-shaft, thus generally resulting in an overstraining of one belt in order to secure the proper tightening of another belt.

In my device, when the counter-shaft, and simultaneously with it the counter-shaft pulleys engaging both the fast and slow belts, is lowered bodily to tighten the fast roll-belt, the tension of the slow belt is not disturbed. This result is highly desirable, and is new. The result is arrived at by so locating the pulleys on the slow side of the machine to which the slow belt goes from the pulley M on the counter-shaft that the two leaves of the belt are substantially at right angles to the arc through which the axis of the pulley M moves as the counter-shaft rises and lowers. By inspecting Figs. 1 and 2 it will be seen that the counter-shaft, in being raised and lowered, does not move vertically, but moves through an arc whose tangent is inclined about forty-five degrees to the plane of the axis of the mill-rolls. The practical effect is the same as though the counter-shaft, instead of being raised and lowered in an arc, were raised and lowered in guides whose plane was disposed at about the angle indicated. This angular path of the counter shaft permits the counter-shaft to perform its office of tightening the fast belt, as the movement of the pulley L when being lowered is directly away from the pulleys D, both leaves of the belt N from the pulley L being substantially parallel to the path of the counter-shaft. On the slow side of the machine, however, the two leaves of the belt from the pulley M are substantially at right angles to the path of the counter-shaft, and therefore, when the adjusting movement of the pulley M tightens one of these leaves, it loosens the other, and vice versa. This arrangement of the belt is secured by arranging the path of the raising and lowering motion of the counter-shaft so as to be substantially at right angles to one leaf of the slow belt, and then so locating the tightener Q as to bring the other leaf of the belt substantially parallel with the first leaf. In other words, the two leaves of the fast belt which engage a counter-shaft pulley must be at such angle to the two leaves of the slow belt which engage a counter-shaft pulley that the motion of the counter-shaft which will tighten one belt will not tighten the other. By inspecting Figs. 1 and 2 it will be seen that raising and lowering the counter-shaft would loosen and tighten the fast belt and have practically no effect on the slow one, and that moving the counter-shaft sidewise would tighten or loosen the slow belt, but would have practically no effect on the fast belt.

The counter-shaft in the present case being incapable, as arranged, to tighten the slow belt, the tightener Q is employed for that purpose in an obvious manner. The pulley Q, by being mounted adjustably, as indicated, thus serves at once as a tightener for the slow belt and as a means for bringing the two leaves of the belt into desired relationship with the path traveled by the counter-shaft. If a tightening-pulley be arranged upon the slow belt upon its top leaf where it runs from the other pulley, C, as is sometimes done, the pulley Q need not have end adjustment, as it will need to perform only as an idler.

The pulley Q, whether used as a mere idler or as a combined idler and tightener, is a feature which, as commonly mounted, gives more or less trouble by losing its alignment. If the axis of this pulley be not in true relationship to the axis of the other pulleys on which the slow belt runs, trouble will ensue, and it is often extremely difficult to secure the proper relationship in the construction of the mills. Contemplated parallelism of axes of pulleys may be lost by bad workmanship, and exact parallelism of axes, as it relates to the pulley Q, may not be desirable on account of a depart-

ure from exact parallelism elsewhere among the axes. Again, the proper relationship of axes having been attained in construction, the peculiar wear of the bearing supporting the shaft T prevents the maintenance of that exact relationship, the bearing tending to wear diagonally by reason of the overhanging of the pulley and the peculiar strains upon it.

By means of the present improvement in the hanging of the pulley Q the axis of that pulley may at any time be arranged in proper relationship to the axes of the other pulleys. If the two bearings U were in one piece, forming one long bearing instead of two short ones, the axis of that bearing could be angularly adjusted sufficiently in any direction by means of the screws V and W, thus permitting proper alignment to be secured originally and maintained in spite of angular wear of the bearing; but it should be understood that when a shaft, by reason of strains imposed upon an overhanging end, begins to wear its bearing diagonally, the strains are met by diagonally-opposite ends of the bearing, the bearing tending to wear oval at both ends. Under such circumstances the only bearing-surface properly engaging the shaft are those newly-formed surfaces resulting from the diagonal wear. These surfaces are obviously very short, but continually increase in length, and attain a reasonable length about the time the bearing is worn out. At the beginning of the wear the bearing-surface is confined to a mere semi-circumferential line at each end of the bearing. In my device, instead of employing a single long bearing, which, under ordinary conditions of strain, would answer every purpose much better than the new arrangement, I divide the long bearing into two short ones, each of which is at liberty to adjust itself angularly, so that the two bearings may at all times have their axes in a common line. The set-screw and groove arrangement chosen for illustration performs in the same manner as any of the well-known universal bearing devices, such as ball-and-socket and gimbal-ring supports. By thus arranging the bearings of the tightener-shaft there are the same diagonal strains tending to produce wear; but these same strains serve to bring the two bearings in line with the shaft, and thereby bring full bearing surfaces to resist the strain. It should also be understood, in connection with the hanging of the tightener, that in cases where the tightener-arm carries a non-rotary shaft on which the tightener-pulley runs, as is a common construction, my peculiar construction of hanging arm is not applicable. It is essential to this part of my invention that the overhanging tightener-shaft T be a rotary shaft fast in its pulley.

I claim as my invention—

1. The combination of a transversely-movable counter-shaft, two pulleys thereon, two belts engaging said two pulleys, respectively, and driven pulleys engaging said belts, respectively, and so disposed with reference to the path of movement of the counter-shaft that the belt to be tightened by the movement of the counter-shaft will lead from the counter-shaft in a direction substantially parallel to the path of movement of the counter-shaft, and the other belt lead from the counter-shaft in a direction substantially at right angles to said path, substantially as and for the purpose set forth.

2. In a roller-mill, the combination of two belts, two driven shafts for each belt, rolls thereon, a pulley on one end of each of said shafts, a movable counter-shaft with a pulley on each of its ends, and a tightening-pulley, the one belt to be tightened by the movement of the counter-shaft leading from the counter-shaft in a direction substantially parallel to the path of movement of said shaft, and the other belt leading from said shaft in a direction substantially at right angles to said path, substantially as and for the purpose set forth.

3. The combination of a pair of contiguous bearings, a movable support for said bearings, devices, as set-screws V and W, connecting said bearings with said support, a shaft free to revolve in said bearings and projecting at one end outwardly therefrom, a tightening-pulley rigidly secured to said shaft projection, and a collar fast upon said shaft and engaging the end of one of said bearings, substantially as and for the purpose set forth.

4. The combination, with pulleys and a belt engaging the same, of shaft T, overhung pulley Q, tray S, bearings U, with their inner ends contiguous, and set-screws V W, in pairs at right angles to each other, engaging grooves Y in said bearings and serving to permit the bearings to automatically adjust themselves into a common axis, and as a means by which the plane of that axis can be adjusted, substantially as and for the purpose set forth.

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Witnesses:

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