(No Model.)

J. D. MAWHOOD.

GRINDING MILL.

No. 453,981. Patented June 9, 1891.

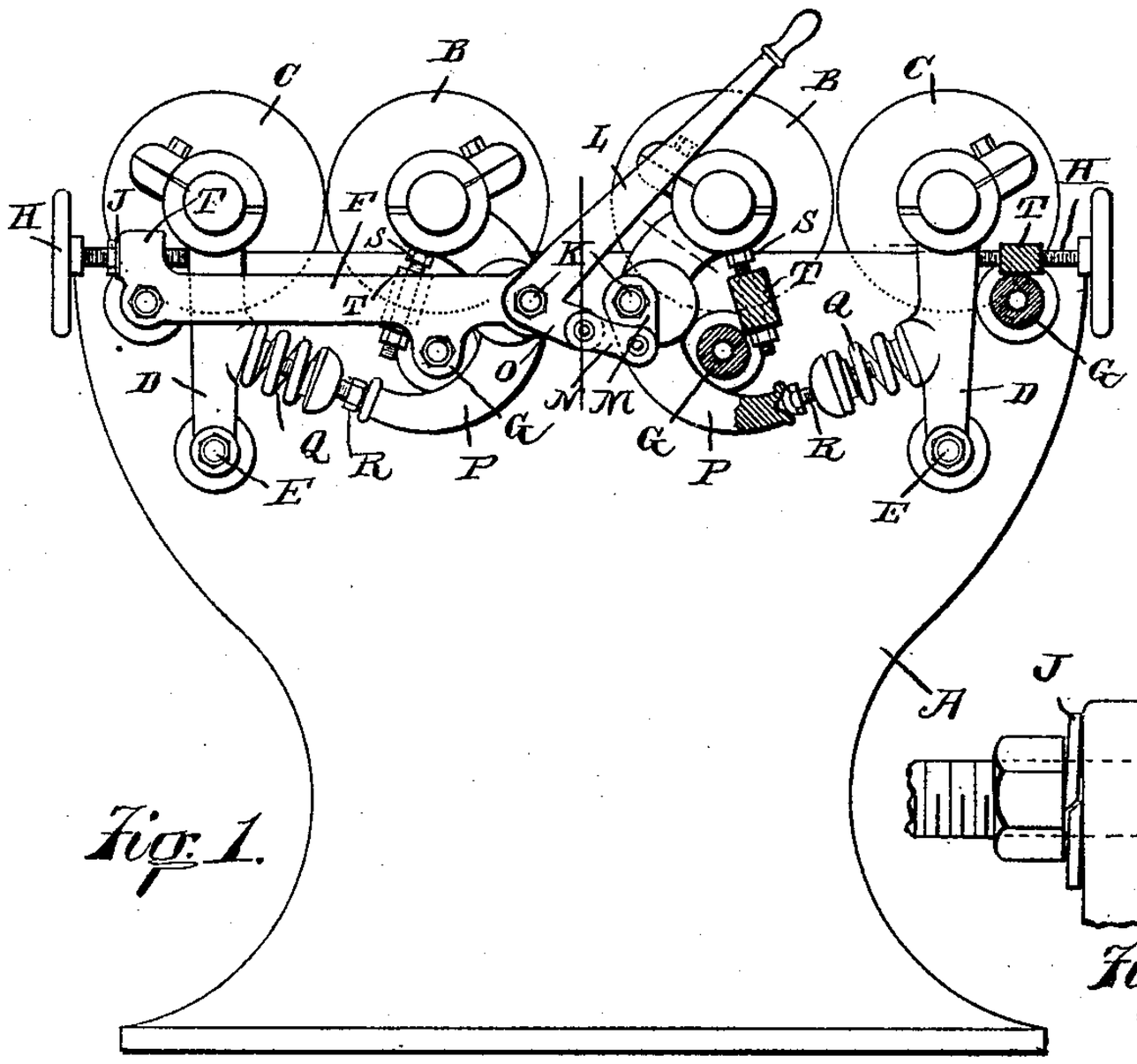

Fig. 1.

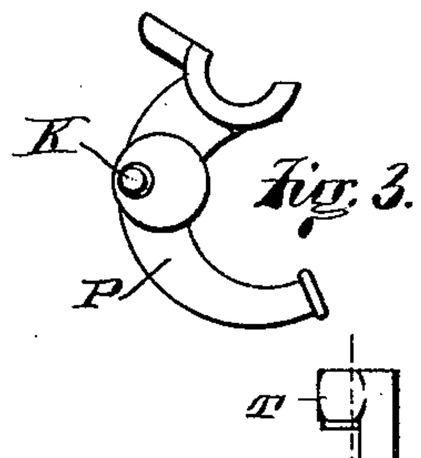

Fig. 3.

Fig. 6.

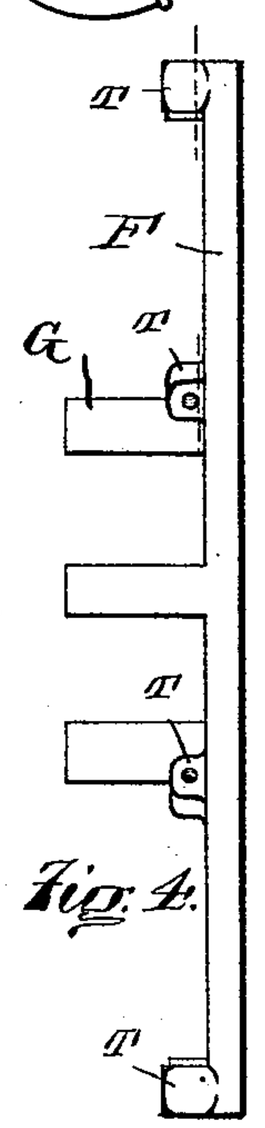

Fig. 4.

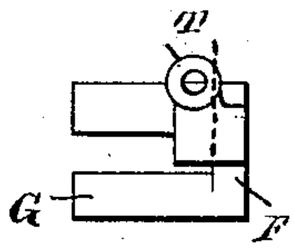

Fig. 5.

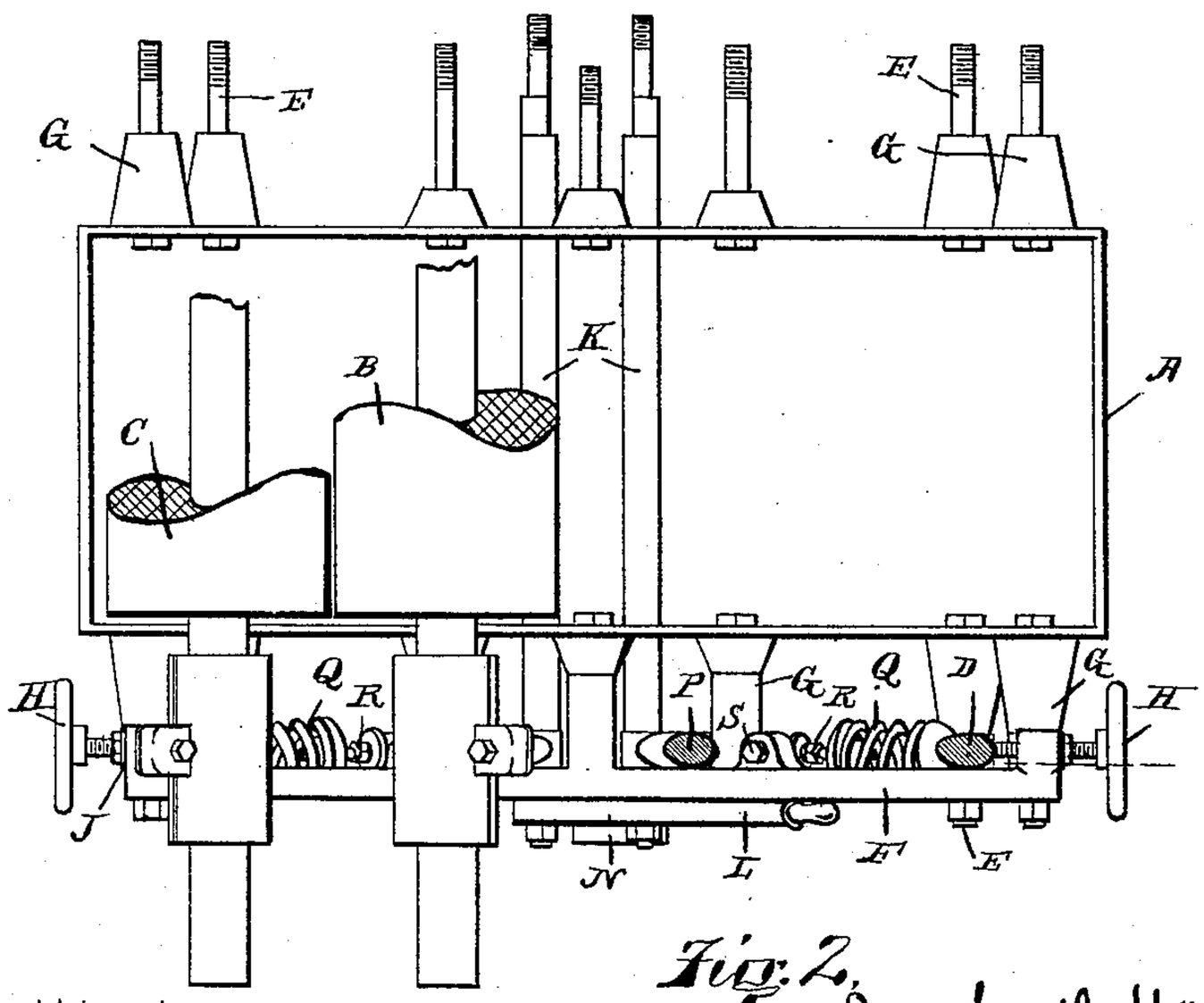

Fig. 2.

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

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 453,981, dated June 9, 1891.

Application filed August 22, 1889. Serial No. 321,682. (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 Grinding-Mills, of which the following is a specification.

This invention pertains to improvements in that class of grinding-mills known as "roller-mills," and relates particularly to the hanging and mounting of the rolls.

My improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of such portions of a double-roller mill as are necessary to an understanding of my present improvements, the tie-bar F being omitted at the right of the central line in this figure, and the lugs T of that portion of the bar appearing in vertical section; Fig. 2, a plan of the same showing only portions of one pair of rolls, the mountings at the rear side of the mill being entirely omitted and the levers on the front side at the right appearing in horizontal section; Fig. 3, a side elevation of one of the levers of one of the inner rolls, (shown detached;) Fig. 4, a plan of one of the tie-bars F; Fig. 5, an end elevation of this bar; and Fig. 6 a side elevation, the same as at the left of Fig. 1, but enlarged, of the end of one of the bars F, showing the adjusting-screw H and its friction arrangement.

In the drawings, A indicates the body or frame of a double roller-mill; B, the inner rolls; C, the outer rolls; D, the levers or arms carrying at their upper ends journal-boxes for the outer rolls, the lower ends of these levers being pivoted to lugs projecting out from the sides of the frame; E, the pivots at the lower ends of these levers; F, a bar disposed horizontally alongside each side of the mill-frame and parallel with the side thereof and outside the levers D, these tie-bars being rigidly bolted to the sides of the frame, bosses or stretcher-blocks being interposed between the bars and the sides of the frame to give the proper distance between the bars and the frame; G, the bosses or stretcher-blocks just referred to, these bosses being preferably cast upon either the frame or the tie-bars or a portion on each; H, the adjusting-screws provided with handles screwing inwardly through lugs at the outer ends of the tie-bars, the inner ends of these screws bearing against the outer surfaces of the levers D, these screws thus serving as means for adjusting the outer rolls to and from the inner ones, the screws being provided with lock-nuts to act in conjunction with the lugs which the screws engage; J, spring-washers interposed between said lock-nuts and lugs, these washers being radially slitted and so sprung that they present a tooth, so to speak, to the face of the lock-nut, and another tooth to the face of the lug, the direction of resistance of these teeth being such as to prevent the unscrewing of the lock-nut; K, a pair of shafts disposed across the mill-frame between and parallel with the inner rolls, these shafts being journaled in the tie-bars and having at each end of each shaft an eccentric portion disposed just inwardly beyond the tie-bars; L, a hand-lever secured to the end of one of these eccentric-shafts and serving as a means by which that shaft may be rotated, such a lever being provided at each side of the mill—that is, front and rear, if desired—so that the eccentric-shaft may be operated from either side of the mill; M, a short crank secured to the other one of the eccentric-shafts; N, a link connecting this crank with a similar crank projecting from the lever L; O, the crank just referred to as projecting from the lever L, the two cranks being so disposed with reference to the eccentrics of the shafts that when both eccentrics occupy their outermost positions the two cranks M and O will be substantially at right angles to each other, as indicated in Fig. 1; P, levers supporting the inner rolls, these levers having the journal-boxes for the inner rolls formed at their upper ends and being pivoted on the eccentrics of the shafts K at a point midway of the length of the levers; Q, springs, one engaging between each pair of levers D P, the spring acting inwardly against the lower end of the lever P and outwardly against the intermediate portion of the lever D; R, an adjusting-screw for each of these springs,

serving as a means by which the strength of the spring may be adjusted; S, set-screws, one for each journal-box of each inner roll, these set-screws screwing into lugs in the tie-bars and projecting upwardly therefrom and presenting their upper ends under the journal-boxes of the inner rolls; T, lugs on the tie-bars F, adapted to receive the screws H and S.

The tie-bars F, when bolted in position, form, in connection with the frame-slots outside the mill-frame, which slots contain the general roll mountings. These tie-bars take the tensional strains and introduce features of strength exterior to the roll-levers. They furthermore permit of a peculiar economical and accurate system of manufacture. These bars being properly fitted up and their contiguous motion parts attached to them, the parts may be readily supported contiguous to the frame by means of a proper templet corresponding with the four roll-shafts. The bolts which are to secure the tie-bars to the frame may then be put in place, but not screwed up tightly. The bosses G are to be of such length that when the parts are thus temporarily mounted there will be a space between the ends of the bosses and the parts which attach to them. Soft metal, as Babbitt metal, is then poured in these spaces, after which the bolts are permanently tightened. An interchangeable system of construction is thus provided independent of irregularities in the casting of the heavy frame.

By inspecting Fig. 1 it will be noticed that the tendency of the springs G is to press the outer rolls outwardly. The screws H serve in adjusting the grinding relation of the rolls, and the springs thus keep the levers D outwardly against the screws. The adjustment effect by the screws H is a delicate one, and the jarring of the mill in running might tend to disturb the adjustment. The use of lock-nuts on these screws as lock-nuts are ordinarily used would not be permissible, because the adjustment requires to be made often and easily and accurately. Ordinary lock-nuts would require to be loosened before the screws could be turned, and the tightening up of the lock-nuts would put a strain on the screws which would disturb the accurate adjustment. Furthermore, the unscrewing of the screws would slacken the lock-nuts and defeat their object. I introduce the toothed spring-washers between the lock-nuts and the lugs. These washers produce an outward pressure on the lock-nuts and thus create a friction on the thread of the screw, and this friction is sufficient to prevent accidental displacement of the screws without interfering with the screws being turned properly in either direction by hand. The frictional effect may be increased by tightening up the lock-nuts a trifle, thus causing the spring-washers to act with greater force. If the lock-nuts be screwed up so tightly as to become lock-nuts in fact, then the device will become inoperative for the purposes desired. The device thus differs in construction and mode of operation from that numerous class of lock-nuts in which a non-rotary screw has its nut prevented from rotation by means of a tooth acted on by a spring. It is essential to this particular feature of my invention that the screw be a rotatable one and a lug through which it screws a non-rotatable element. The inner rolls are held toward the outer rolls by the action of the springs inwardly against the lower ends of the levers P. A hard substance accidentally reaching the rolls will cause the inner rolls to swing inwardly, the springs yielding to permit this, and upon the passage of the substance the springs will restore the rolls to their normal position. The same spring at one end of one pair of rolls therefore serves in furnishing the inner roll with the quality of yielding upon the passage of a hard substance and furnishes the outer roll with an outward elastic pressure, against which the inward adjustment for grinding distance may be made by means of the screw H. The roll B approaches and recedes from roll C in yielding to hard substances with a more or less vertical motion. The weight of roll B tends to urge it toward roll C, and the tendency in action might be to jam the two rolls together. While it is desirable to utilize the weight of roll B to produce the grinding pressure supplemented by springs Q, it is of importance to prevent the improper descent of roll B.

In order to prevent roll B from being jammed together with the roll C, the set-screws S are arranged under the bearings of roll B. These set-screws serve in determining the angle of approach as the roll B descends, thus regulating the grinding pressure due the weight of roll B, and they also serve in determining the relative descent of the two ends of the roll B, thus providing for insuring that the rolls B C shall at all times be parallel to each other. It will be found that by arranging the rolls perfectly parallel to one another a great saving in power will be effected and the wear of the rolls lessened. The set-screws S and their performance in conjunction with roll B, carried in levers pivoted on eccentrics, are old and well known, (see English Patent No. 3,328 of 1887,) and I therefore claim no novelty for these matters.

The levers P are pivoted on the eccentrics of the shafts K, but in the ordinary working of the mill these shafts are stationary shafts, and the eccentrics then act merely as pivots on which the levers P may rock in case a foreign body passes the rolls; but by operating the hand-lever L in an obvious manner the eccentrics will rotate, and the pivots are thus moved farther inwardly, thus opening the rolls. The cranks M and O and link N serve in communicating rotary motion between the two eccentric-shafts, and the relation of the two shafts to each other is such that when the eccentric-shafts are in normal working position

they will practically be locked. There is of course to be a stop to determine the normal working position of the hand-lever L. Such a stop is furnished in the exemplification by the journal-box of one of the inner rolls, against which the hand-lever rests. When the inner rolls are moved inwardly by the action of the eccentric-shafts, the journal-boxes of these rolls slide on the heads of the screws S, and the springs are thus prevented from neutralizing the opening effect of the eccentrics.

The drawings illustrate the mountings upon one side of the mill only. It will be understood, of course, that the mountings at each end of the rolls are the same. Some of the features referred to are of course applicable to mills having but a single pair of rolls.

I claim as my invention—

1. In a roller-mill, the combination, substantially as set forth, of a mill-frame, an inner and an outer roll, pivoted levers carrying the journal-boxes of said rolls and disposed exterior to the mill-frame, a tie-bar secured to and parallel with the mill-frame and exterior to said levers, and an adjusting-screw for adjusting the position of each journal-box lever of one of said rolls, said adjusting-screw and the supporting-pivot of the journal-box lever of the other roll being supported by said tie-bar.

2. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of rolls, journal-boxes for the rolls, those for one of the rolls being movable to and from the other roll, a threaded lug supported by the mill-frame, a screw provided with a handle and screwing through said lug and serving as a means for adjusting the appropriate one of said movable roll-boxes, a nut on said screw contiguous to said lug, and an elastic toothed washer interposed between said lug and nut.

3. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of rolls, a lever at each end of one of said rolls carrying at its upper end a journal-box and having its lower end pivoted to the mill-frame, a screw for adjusting said lever to and from the opposing roll of the pair of rolls, a lever at each end of the other roll carrying a journal-box at its upper end and supported on a pivot intermediate of its length, and a spring acting between the lower end of said lever and the intermediate portion of said first-mentioned lever.

4. In a roller-mill, the combination, substantially as set forth, of a mill-frame, two pairs of rolls, journal-box levers P for the support of the inner rolls, eccentric-shafts K, forming the pivots for said levers, hand-lever L for giving rotation to one of said eccentric-shafts, cranks M and O, secured to said eccentric-shafts substantially at right angles to each other, and link N connecting said cranks.

5. In a roller-mill, the combination, substantially as set forth, of a mill-frame, a pair of rolls, pivoted journal-box levers for the support of said rolls, means for adjusting the grinding distance between the rolls, and a spring acting between the levers of the two rolls and serving to resist the inward movement of one roll and the outward movement of the other roll.

JONATHAN D. MAWHOOD.

Witnesses:
A. C. ROGERS,
J. W. SEE.