(No Model.)

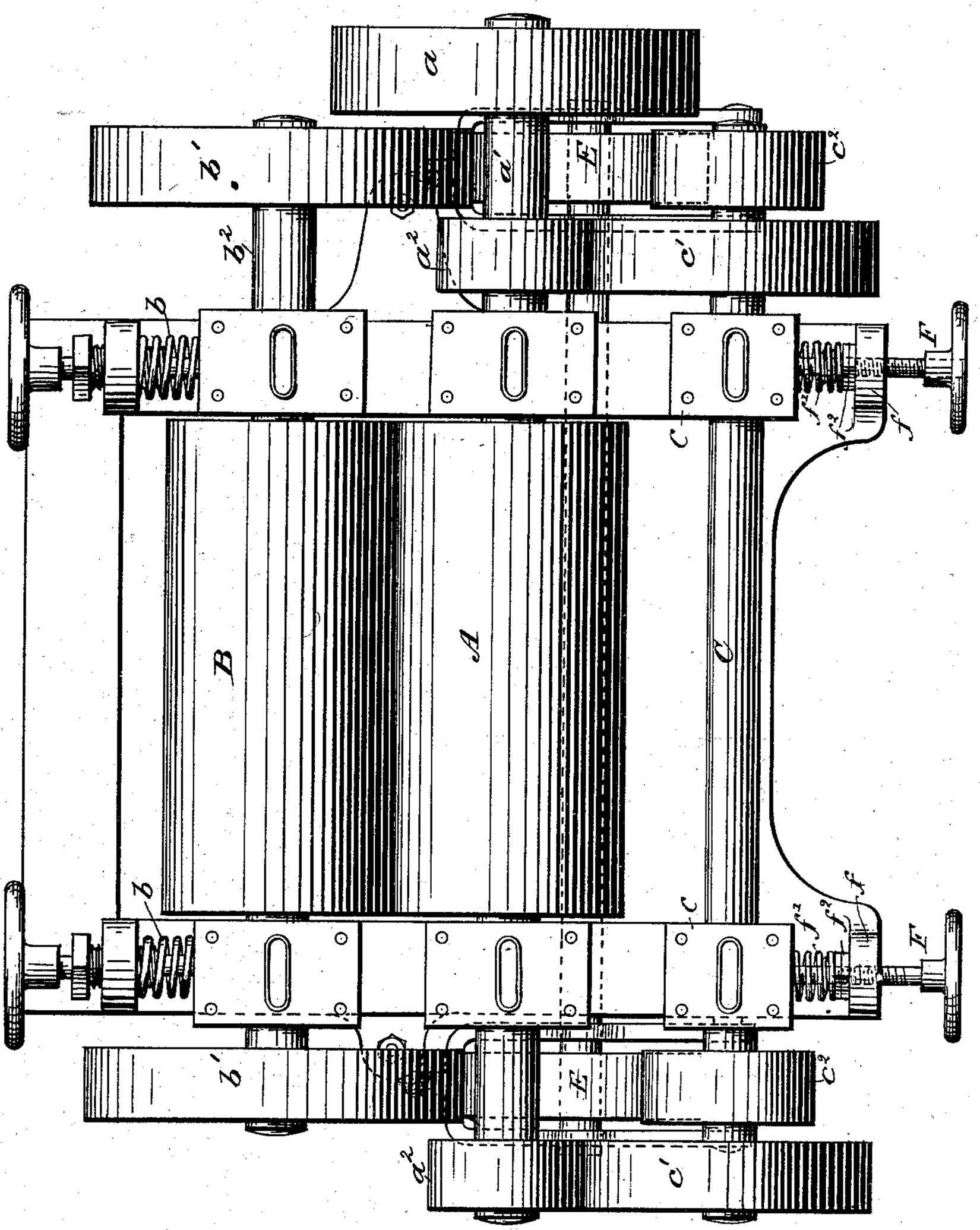
2 Sheets—Sheet 1.

J. R. DAVIS, Jr.

ROLLER MILL.

No. 258,027. Patented May 16, 1882.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

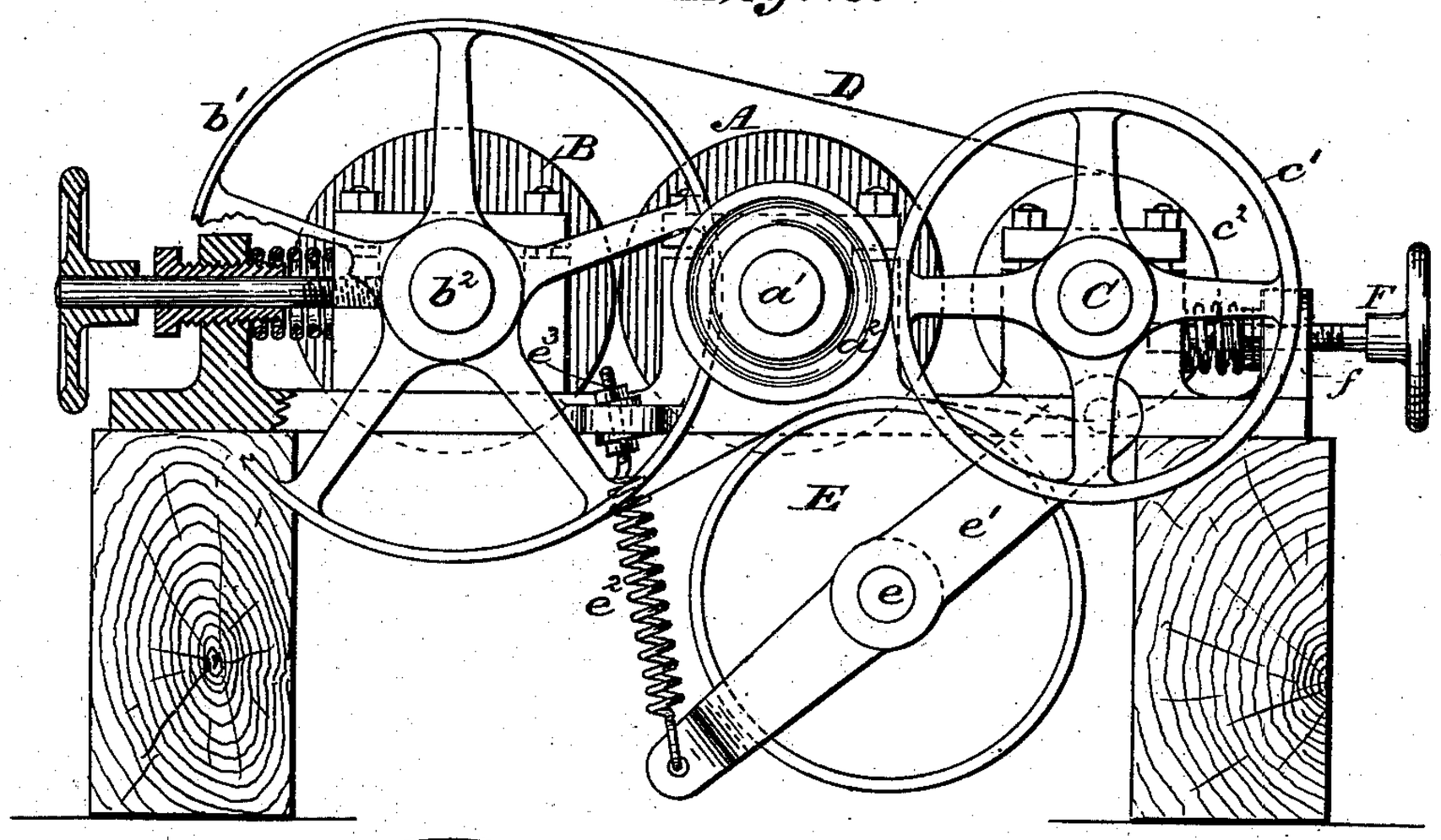


Fig. 3.

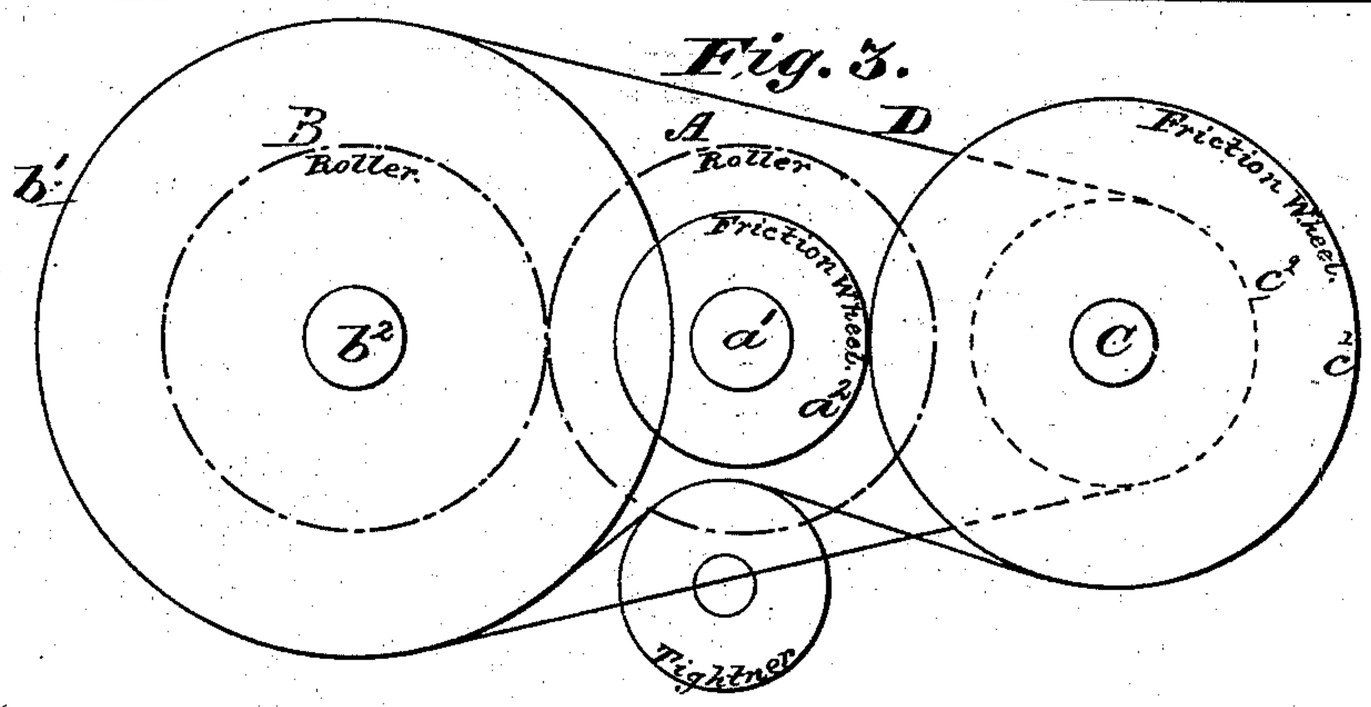
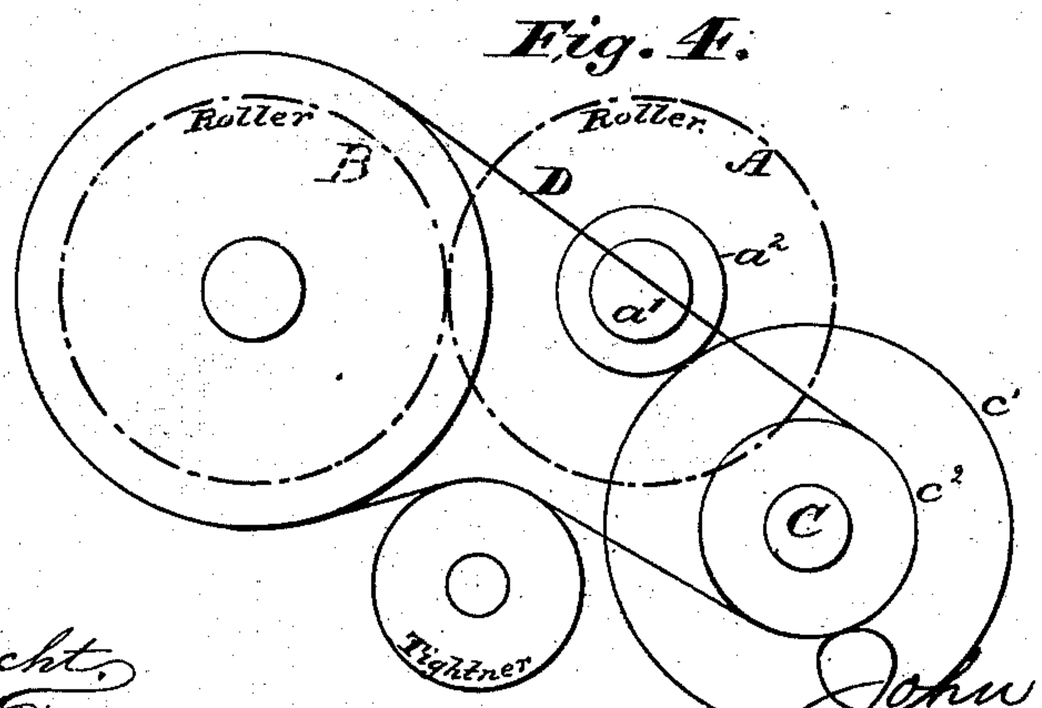


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN R. DAVIS, JR., OF NEENAH, WISCONSIN.

ROLLER-MILL.

SPECIFICATION forming part of Letters Patent No. 258,027, dated May 16, 1882.

Application filed February 25, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. DAVIS, Jr., of Neenah, in the county of Winnebago and State of Wisconsin, have invented certain new and useful Improvements in Roller-Mills for Grinding Grain and other Purposes, of which the following is a specification.

Mills of this description for crushing, compressing, grinding, or pulverizing material commonly have one roll of a pair arranged in fixed bearings and the other in movable bearings, so that it may be adjusted in relation to or allowed to yield from the former. The gearing driving these rolls has been so arranged that the lateral thrust due to their pressure-contact with each other, or the amount or nature of the material passing through, has been taken up by the bearings in the shape of friction, and the greater the amount of material going between them or the closer they were set together the greater would be this friction and the greater the power necessary to overcome it.

My invention consists primarily in means to take up or obviate the friction due to this lateral thrust and restore it to the driving-power, and, secondarily, in a combination of friction-wheels and belts as a substitute for gearing for driving the rolls of a set at equal or differential speeds.

It will be sufficient to a proper understanding of the mode in which it is put into practice to explain the invention in connection with a mill wherein the rolls are driven at differential speeds.

In the drawings, Figure 1 is a plan view of a roller-mill of the latter description embodying the principles of my invention. Fig. 2 is a side elevation thereof; and Figs. 3 and 4 are diagrams to illustrate the arrangement of the rolls and friction-wheels and the course of the belts.

A is the roll in the stationary boxes, is driven from the main belt by means of the drum or pulley *a* on the end of its shaft *a'*, and is the fast roll. Opposed to this is the slow roll B, mounted in movable bearings, which preferably yield against springs *b*, and are also provided with adjusting mechanism, either for their positive adjustment or for limiting their advance and retreat—such, for instance, as shown in Patent No. 240,282, granted to John Stevens on the 19th day of April, 1881. Upon the shaft *a'* of the fast roll, at or near each end thereof, are arranged friction-wheels a^2, and upon a shaft, C, hereinafter called the "friction-shaft," mounted in bearings C on the frame beyond said roll, are opposing friction-wheels *c'*, driven thereby, which may be of the same diameter, or may be enlarged, as seen fit, to slow down the motion of the latter shaft. Pulleys c^2 are also arranged near each end of the friction-shaft, outside the frame-work, opposite to other pulleys, *b'*, on the shaft b^2 of the slow roll, and over each opposing pair is thrown a belt, D, whereby the slow roll is driven. These pulleys enable a further reduction of speed, the pulleys on the slow roll being for that purpose larger than those on the friction-shaft. The bearings of the friction-shaft are allowed to slide toward and from the fast roll, and to each belt I apply a tightener-pulley, E, which, by its pressure, draws said shaft and bearings inward and holds the friction-wheels in biting contact with each other, so that the fast roll as it is driven by the main belt shall certainly drive back onto the friction-shaft and the latter return to the slow roll. By this arrangement the lateral thrust of the fast roll is opposed through the friction-wheels and belt to the lateral thrust of the slow roll, and is converted into, or rather not subtracted from, driving-power, and the friction in the bearings is reduced to practically that which arises from the weight of the rolls.

I prefer to make the tightener-pulleys adjustable, so that while straining the belts they can at the same time be made to take more or less of the pressure off of the bearings. The tighter the belts are made the more the material is crushed or compressed by the rolls forced together by their tension, leaving the journals to run more lightly in their bearings—that is, if the same pressure is brought against the friction-wheels on the fast roll as is produced against the faces of the two rolls by the material passing between them, then the friction in the bearings of said rolls will be no more than if they were running empty. Each tightener may be independently adjustable, so as to offset any difference in the length of the belts; but in the present instance I have shown both,

for convenience, carried by a common shaft, *e*, mounted in a swinging frame, *e'*, and held toward the belts by a coiled spring, e^2, which is adjustable to increase or decrease the pressure by means of nuts e^3. Instead of these nuts, a lever and rack may be employed. The friction-shaft can be pressed toward the fast roll by means of screws F, threaded into and through lugs *f* on the frame and abutting against or taking into sockets in the bearing-boxes of said shaft. Springs *f'* are advisably interposed between the screws and the bearings, each spring being seated at one end against a collar or jam-nut upon its respective screw and at the other against the body of the corresponding bearing. If the springs are omitted, the screws will act in direct contact with the bearings, and the pressure will be positive instead of elastic. This device may either supplement or supersede the tighteners. The latter, however, I deem most beneficial, as they serve a dual function in both taking up stretch and increasing the tension or binding the friction-wheels together.

Should it be only desirable to drive the slow roll without the use of gears, and not to get any or all of the benefits above set forth upon all of the bearings, the friction-wheels and pulleys at that end at which the fast roll is driven may be dispensed with, excepting, of course, the main pulley. This will still give the advantage of reduced friction at the other end of the rolls, and also of the employment of a long belt, which is much more certain in operation than a short one.

The friction-shaft can be dropped somewhat below the plane of the roller-shafts, as in Fig. 4, to economize room in the mill-frame and casing, and so far as the differential motion is concerned this will have no bad effect. It will, however, fail to relieve the friction in measure with the departure from that plane, since the advantage of having all three shafts in line with each other is that the tension force is directly against the material being crushed—that is to say, the material passing between the rolls presses them directly away from each other, and if the friction-shaft is in line the tension will be directly against this outward pressure.

I claim as my invention—

1. The combination of the driven roll, having a friction-wheel on its shaft, a shaft on one side thereof, mounted in movable bearings and carrying an opposing friction-wheel and a pulley, a companion roll on the other side, having also a pulley on its shaft, and a belt connecting the pulleys.

2. The combination of the driven roll, having friction-wheels at or near each end of its shaft, the friction-shaft on one side thereof, mounted in movable bearings and carrying opposing friction-wheels, and having pulleys at its ends, the companion roll on the other side, having also pulleys on its shaft opposite to those on the friction-shaft, and belts connecting said pulleys.

3. The combination of the driven roll, the friction-shaft on one side thereof, the companion roll on the other, the friction-wheels connecting the driven roll and friction-shaft, the pulleys and belts connecting friction-shaft and companion roll, and the tightener acting upon said belts.

4. The combination of the driven roll, the friction-shaft on one side thereof, the companion roll on the other, the friction-wheels connecting driven roll and friction-shaft, the pulleys and belts connecting friction-shaft and companion roll, the tightener acting upon said belts, and means for adjusting said tightener as to the pressure it exerts.

5. The combination of the driven roll, the friction-shaft on one side thereof, the companion roll on the other, the friction-wheels connecting driven roll and friction-shaft, the pulleys and belts connecting friction-shaft and companion roll, and screws or equivalent devices arranged to move the bearings of the friction-shaft toward the bearings of the driven roll.

6. The combination of the driven roll, the friction-shaft on one side thereof, the companion roll on the other, the friction-wheels connecting driven roll and friction-shaft, the pulleys and belts connecting friction-shaft and companion roll, the screws arranged behind the bearings of the friction-shaft, and springs interposed between said screws and bearings.

7. The combination of the driven roll, the friction-shaft on one side thereof, the companion roll on the other, the differential friction-wheels connecting driven roll and friction-shaft, and the pulleys and belt connecting friction-shaft and companion roll.

8. The combination of the driven roll, the friction-shaft on one side thereof, the companion roll on the other, the differential friction-wheels connecting driven roll and friction-shaft, and the differential pulleys and belt running thereon, connecting friction-shaft and companion roll.

9. The combination of the driven roll, mounted in stationary bearings, the friction-shaft mounted in sliding bearings on one side thereof, the companion roll mounted in sliding bearings on the other side thereof, the friction-wheels connecting the driven roll and friction-shaft, the pulleys and belt connecting friction-shaft and companion roll, and the tightener acting upon the belt to draw both sets of movable bearings toward the bearings of the driven roll.

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