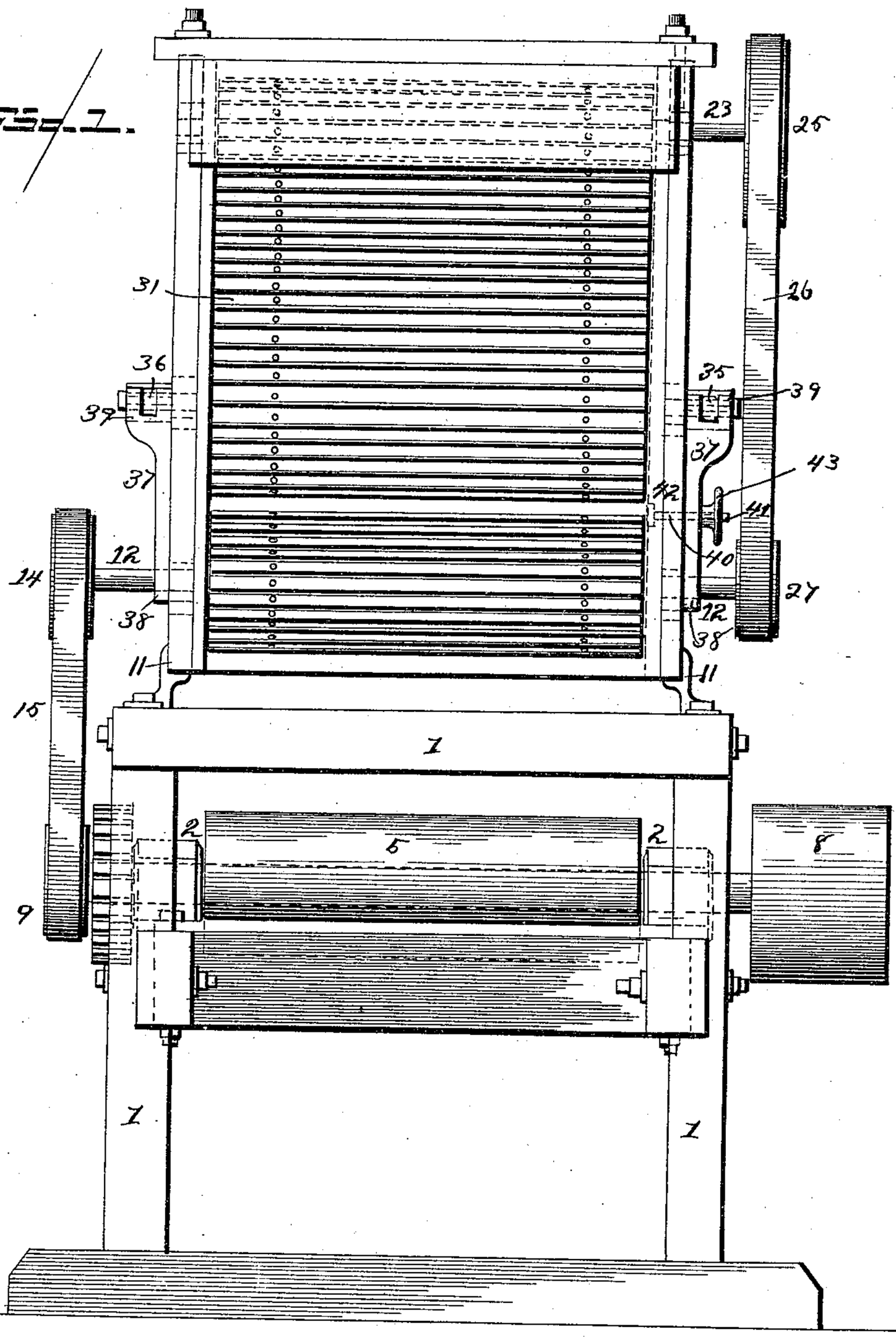
(No Model.) 4 Sheets—Sheet 1.

W. DEERING.

FEED REGULATOR FOR MILLS.

No. 467,278. Patented Jan. 19, 1892.

FIG. 1.



WITNESSES

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(No Model.) 4 Sheets—Sheet 2

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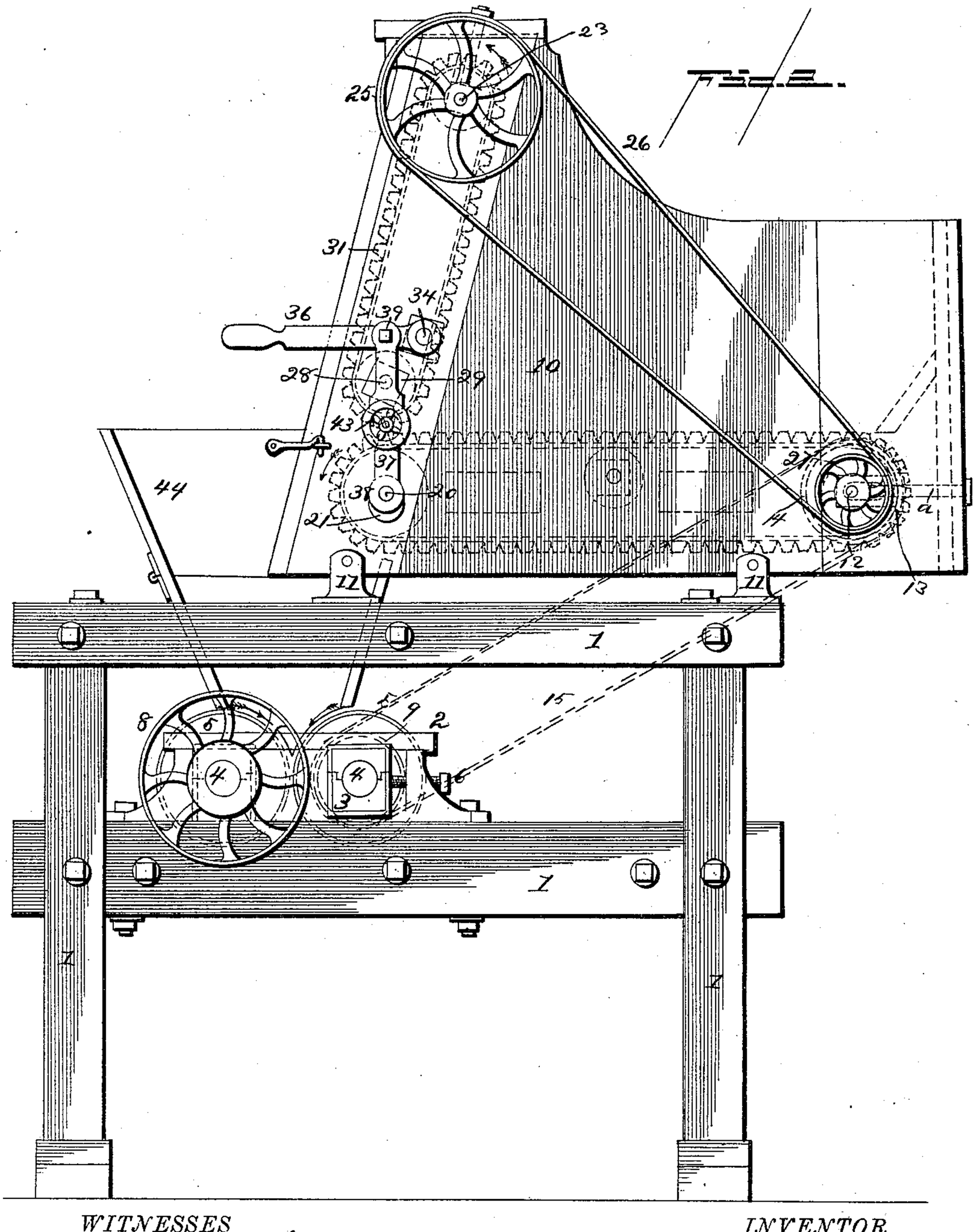

FIG. 1.

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(No Model.) 4 Sheets—Sheet 3.

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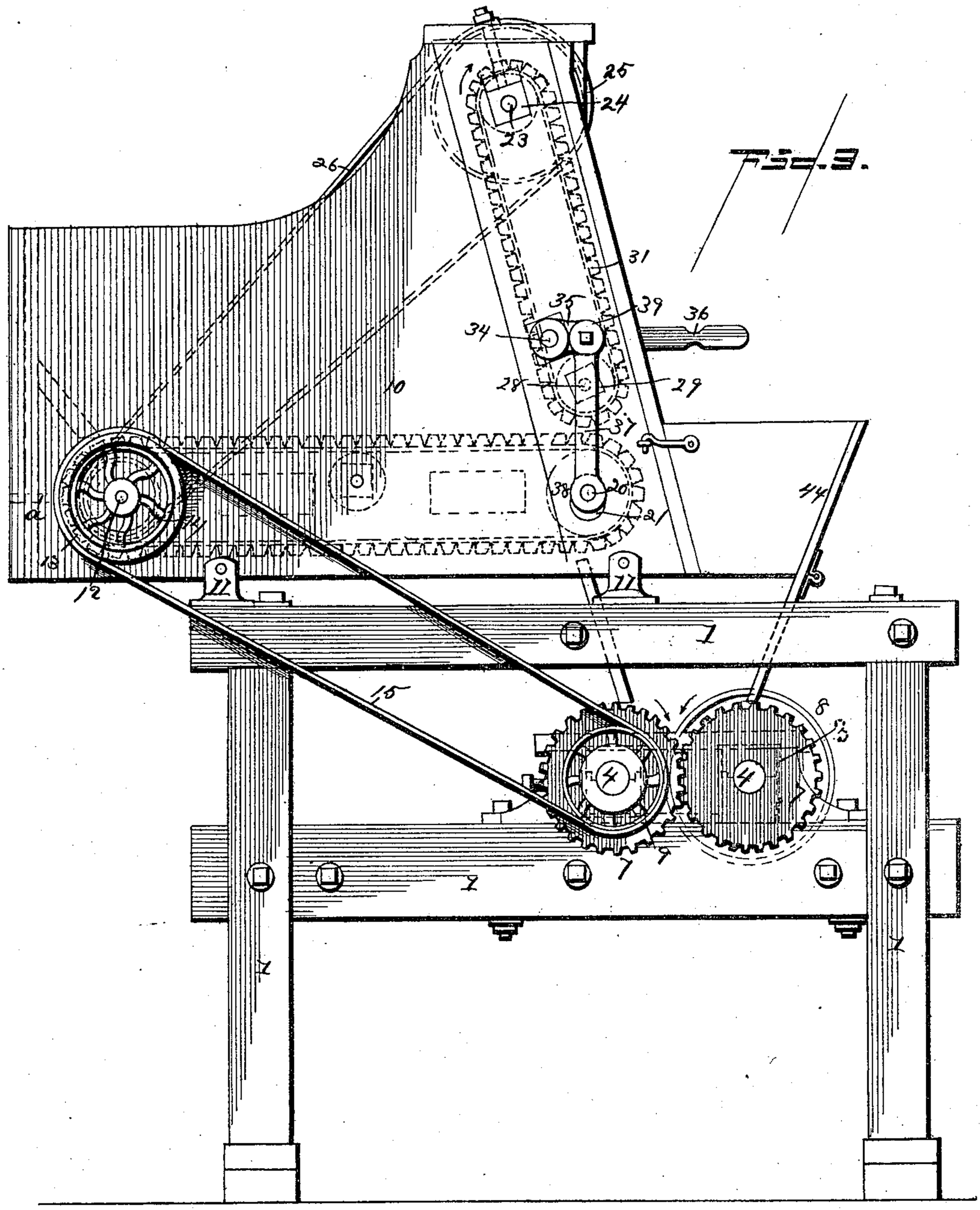

FIG. 3.

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4 Sheets—Sheet 4.

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FEED REGULATOR FOR MILLS.

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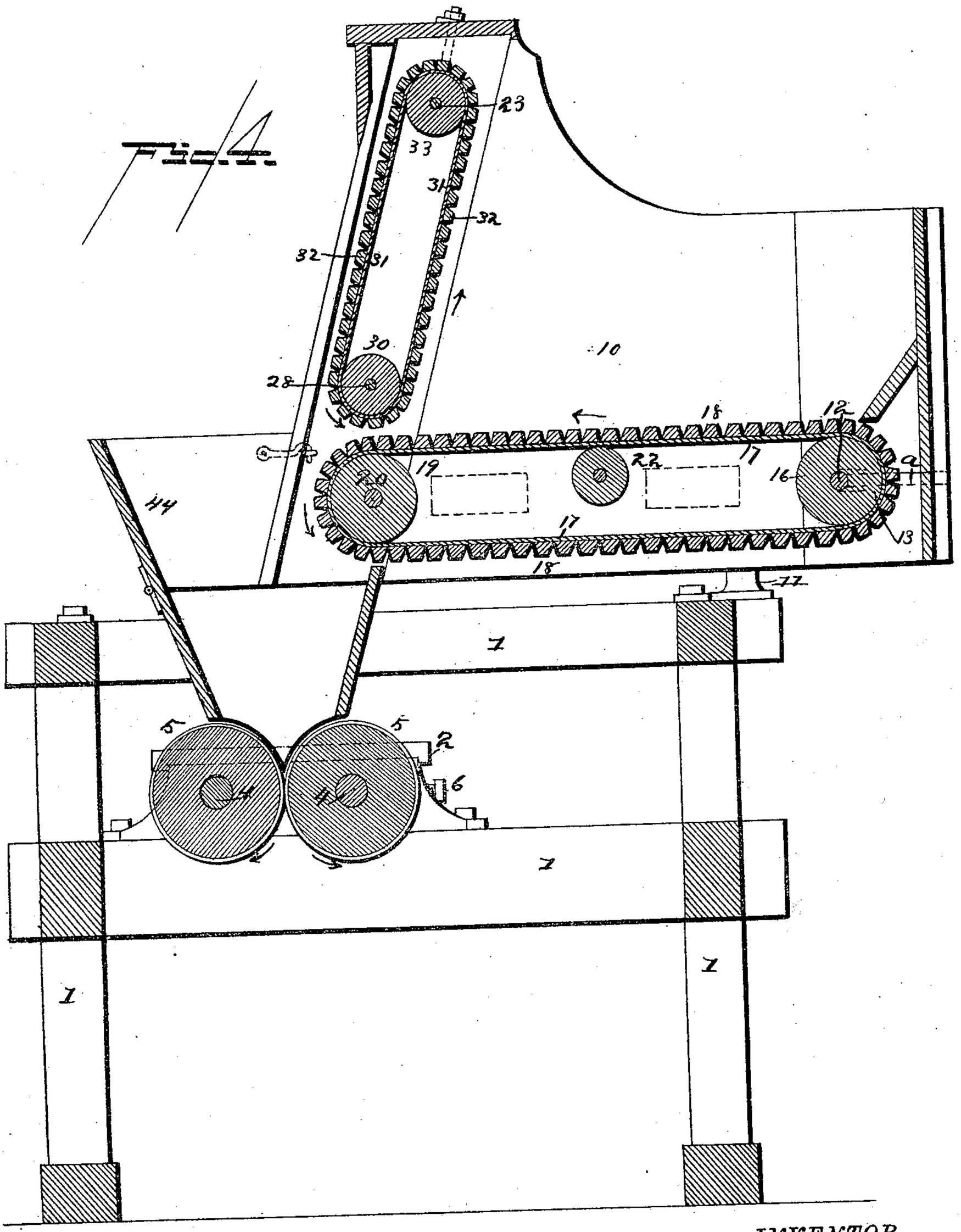
Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM DEERING, OF LOUISVILLE, KENTUCKY.

FEED-REGULATOR FOR MILLS.

SPECIFICATION forming part of Letters Patent No. 467,278, dated January 19, 1892.

Application filed June 25, 1888. Serial No. 278,097. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DEERING, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented new and useful Improvements in Feed-Regulators for Mills, of which the following is a specification.

My invention relates to feed-regulators for roller-mills; and it consists in the improved construction and arrangement of parts hereinafter fully disclosed in the description, drawings, and claims.

The object of my invention is to provide a feed-regulator for roller-mills in which the feed will be effected by the skimming or evening action of co-operating endless aprons, upon one of which the stock is fed to the rolls under the skimming action of the other moving in an opposite direction and having its skimming end arranged to act directly upon the stock with an evening action upon the surface of the feed-apron at the rear or discharge end of the hopper, at which point the skimming action takes place, just above the crushing-rolls. By my improvement provision is made for driving the feeding-apron at a speed proportional to the speed of the crushing-rolls and in connection therewith for driving the said skimming-apron at a speed proportional to the speed of the feeding-apron. Provision is also made for adjusting the skimming action of the skimming-apron upon the feeding-apron in co-operative relation to the speed of the rolls, whereby to regulate the thickness of the sheet of stock, so that it will be in just the quantity to be properly received and treated by the rolls. These are matters of prime importance, and the advantages which I shall point out are due solely to the co-operative skimming action of the aprons and the relation of such skimming action to the crushing-rolls, as I shall now more fully explain, and specifically point out my said improvement in the claims concluding this specification.

In the accompanying drawings, forming part of this specification, and in which the same reference-numerals indicate the same parts, Figure 1 represents an elevation, from the rear or discharge end or side, of a pair of crushing-rolls and of my improved feed-regulator; Figs. 2 and 3, side elevations seen from opposite sides, and Fig. 4 a longitudinal vertical section.

In the drawings the numeral 1 indicates the frame of a crusher-mill, which is formed with horizontal ways 2 in its sides. The boxes 3 for the shafts 4 of the crushing-rolls 5 slide adjustably in said ways, and set-screws 6, which are inserted through the ends of said ways, bear against the boxes of one of the rolls and serve to adjust it at the proper and desired distance from the other roller. The shafts 4 of the crushing-rolls are provided with cog-wheels 7, which mesh with each other and serve to keep said rollers revolving together and at the same speed. The shaft of one roller is provided with a belt-pulley 8, around which pulley the belt which drives the mill may be passed, and the shaft of the other roller is provided with a belt-pulley 9, of less diameter than the gear 7, and around which a belt, hereinafter described and which drives the feeding device, is passed. The hopper 10 of the feeding device is mounted upon the machine-frame by suitable brackets or standards 11, and said hopper is formed with the rear or discharge side open. A shaft 12 is journaled in bearings 13, which are, by the bolts *a*, horizontally adjustable in the sides of the hopper near the forward end of the bottom, and one end of said shaft is provided with a belt-pulley 14, around which passes a belt 15, which passes around the pulley 9 upon the roll-shaft. A roller or reel 16 is formed upon said shaft 12 and has an endless apron 17 passed around it. Said apron is preferably formed by transverse slats 18, and fits snugly with its edges against the sides of the hopper, forming a bottom for the same. The rear end of said apron passes around a roller or reel 19 upon a shaft 20 in the discharge end of the hopper, and which slides in vertical slots 21 in the sides of the hopper, and the middle of the upper half of the apron is supported by a transverse roller 22. A shaft 23 is journaled in vertically or nearly vertically adjustable bearings 24 in the upper rear corners of the sides of the hopper, and is provided with a belt-pulley 25, around which passes a belt 26, which also passes around a belt-pulley 27 upon the forward shaft 12 of the horizontal feeding-apron 17. A shaft 28

is journaled in bearings 29 in the sides of the hopper vertically above the slots 21 for the shaft 20 of the horizontal apron, and said shaft is provided with a roller or reel 30, around which an endless apron 31, which is formed with transverse slats 32, is passed. Said apron passes around a reel or roller 33 upon the upper shaft 23, and the edges of the apron fit snugly against the sides of the hopper, the apron forming the rear end or wall of said hopper. A rock-shaft 34 is journaled transversely in the hopper above the lower shaft of the upright apron 31 and passing between the halves of the same, and a short arm 35 and a hand-lever 36 are secured to the ends of said rock-shaft. Links 37, which are formed with bearings 38 for the rear shaft 20 of the horizontal apron, are pivoted with their upper bifurcated ends 39 to said arm 35 and hand-lever 36, so that said shaft 20 may be raised or lowered in the slots 21 by raising or lowering the rearwardly-projecting hand-lever. One of said links 37 is formed with a perforation 40, through which projects the screw-threaded end of a bolt 41, the headed inner end 42 of which is fitted in the side of the hopper, while said threaded outer end is provided with a hand-nut 43, which bears against the link and serves to draw the head of the bolt against the inner face of the side of the hopper. An inclined board 44 is secured at the rear end of the hopper and opposite the opening between the horizontal apron and the upright apron. As before stated, the crushing-rolls are driven by the belt or gearing connected to the pulley 8, and said rolls are revolved together at the same speed by the cog-wheels 7 upon their shafts. The pulley 9 upon the roll-shaft is of a smaller diameter than the pulley 14 upon the apron-shaft 12, and consequently said apron will be driven with a proportionately less speed than the rolls. The pulley 27 upon the other end of said apron-shaft is preferably of a less diameter than the pulley 25 upon the upper shaft 23 of the upright skimming-apron, and said upright apron will therefore be driven at a proportionally less speed than the horizontal feed-apron. The upper half of said horizontal feeding-apron will travel toward the rear or discharge end of the hopper and the inner half of the upright apron will travel upward, as indicated by arrows in the drawings, in which the direction of revolution of all the parts of the machine is indicated by arrows.

The operation of the machine is as follows: The rear end of the horizontal apron is adjusted by means of the hand-lever and links to the distance from the lower end of the upright apron equal to the thickness of the sheet of stock which is to be fed to the rolls, and is secured by means of the headed bolt and hand-nut. The stock is thereupon fed into the hopper through a chute or by any other means, and the machine is started. It will now be observed that the horizontal feeding-apron will feed the stock toward the discharge end of the hopper, and if the upright apron were not secured in said end the stock would all be dumped in a mass upon the crushing-rolls. The upright apron, however, will stop the stock, and by the upward movement of its inner side it will skim off the stock to an even sheet of the thickness of the space between the aprons, and will loosen the stock by said upward movement of its inner side, so as to prevent clogging at the outlet. The stock will be spread out into a sheet of even thickness and of the full width of the hopper, so that, said hopper being of the same width as the rolls, an even sheet of the full width of the rolls will be fed between said rolls at a speed corresponding to and regulated by the speed of said rolls. The sheet of stock will strike the inclined guide-board 44 after it leaves the aprons and will fall between the rolls and be crushed by them. The proportionate speed of the feed to the crushing-rolls may be regulated by the relative size of the pulley upon one of said rolls and upon the horizontal feeding-apron shaft; but it is usually most preferable to have the feeding-apron traveling with less speed than the crushing-rolls, the pulley upon the shaft of one of said rolls being smaller in diameter than the pulley upon the forward shaft of the feeding-apron.

From the foregoing it will be obvious that a sheet of stock of a perfectly-even width and thickness will be fed to the rolls and at a speed perfectly corresponding to the speed of said rolls, and therefore all scorching of the grain by reason of the rolls being clogged, all slipping of driving-belts by the rolls being choked and stopped, all cutting or wearing of the rolls by thinning or absence of feed, or any other trouble too well known to all persons acquainted with the art of milling to be enumerated will be avoided.

The desideratum in feed-regulators for roller-mills—viz., a sheet of stock of even width and thickness and fed to the rolls at a speed corresponding to the speed of said rolls—is attained by this feed-regulator.

The feed-regulator may be employed for feeding all kinds of stock—such as grain, seed, middlings, or similar products of grain or seed—to roller-mills of any construction or to other machines for treating grain and seed and their products, although it is principally adapted to feed stock to crushing-rolls, and especially to feed large seed, such as corn, peas, beans, or cotton-seed.

All slack in the aprons may be taken up by having the bearings for their shafts adjustable, and the horizontal feeding-apron will be prevented from sagging under the weight of the stock in the hopper by the central supporting-roller 22, and it will be obvious that all sagging or slack in the aprons must be avoided, as their edges must bear perfectly against the sides of the hopper on account of said aprons forming the bottom and rear end of said hopper.

The feeding-apron may be wire, cordage, perforated leather, or of leather stamped into protuberances.

From the foregoing it will be understood that the feeding-apron carries forward the stock and delivers it in a sheet which shall fall at a velocity less than the velocity of the surfaces of the crushing-rolls, and that the means for operating the co-operating feeding and skimming aprons and the crushing-rolls effects the speed of the skimming-apron, the speed of the feeding-apron, and the speed of the crushing-rolls in such exact conjoint relation as to regulate the quantity of the stock delivered from the feeding-apron, and effects such delivery at a less velocity than the velocity than the moving surfaces of the crushing-rolls. In this the relative speed of the moving parts is not a matter of choice or a matter of degree, but a matter producing important results, for should the surface of the feeding-apron travel in the least degree faster than the surfaces of the rolls there would ensue an instantaneous clogging, and therefore, to prevent such clogging, it is an imperative necessity to make the feeding-surface of that apron travel in quite a measurable degree slower than the surfaces of the rolls. Again, should the skimming-apron travel with the same speed as the feeding-apron it would materially lessen the quantity deliverable, and therefore would necessitate a parting of the aprons to a point that would involve an undue thickness of the quantity fed, and thereby effect a clogging. To give the skimming end of the upright apron a speed less, and for a due delivery of some substances considerably less, than the feeding-surface is therefore an imperative necessity for the proper operation of the machine.

In the drawings I have shown the aprons as formed of slats more or less V-shaped in cross-section or beveled on their joining edges, which I have found well adapted for cotton-seed, because such seed being coated with a sort of down or short fiber cannot readily deliver itself in forms of parallel undulations, such as wheat and probably corn would be delivered in if fed on such beveled slats. For smaller cereals, however, such formed slats would not answer.

The provision whereby the delivery end of the feeding-apron is made adjustable in relation to the skimming-apron renders such adjustment convenient for the hand of the attendant and requires only a simple suspending device operated by a hand-lever. The relation shown of the skimmer to the feeding-apron is such as to cause the lower end of the said skimmer to stand on the feeding-surface at a perfectly flat part thereof—that is, at a point between lines drawn vertically from the axis of the carrying-rolls of the feeding-apron, so that the surplus stock will be evenly pushed back and thinned in thickness on the flat surface before it passes on the curved delivery end of such apron, whereby the stock, both as to quantity and as to speed, is caused to be delivered to the rolls in a condition prepared on the flat surface of the feeder, as contradistinguished from the action of a spiked cylinder or spiked apron acting on the stock just at its point of delivery over the curved end of a feeding-apron.

Having thus described the construction and arrangement or combination of parts of my improved feed-regulator, its operation, and advantages, what I claim as new is—

1. In a feed-regulator, the feeding-apron and the skimming-apron arranged with their moving surfaces in the working relation to each other as described, the inner side of said skimming-apron moving upward, in combination with means for adjusting the delivery end of said feeding-apron in relation to the skimmer-apron, consisting of the transverse rock-shaft 34, having an arm 35 on one end and a hand-lever 36 on the other end, and the vertical links 37, pivoted at their upper ends to said arm and lever and having bearings at their lower ends for the journals of the roll at the delivery end of the feeding-roll, substantially as described, for the purpose stated.

2. In a feed-regulator for roller-mills, the combination, with the feeding-apron and the skimming-apron arranged with their moving surfaces in the working relation to each other as described, the inner side of said skimming apron moving upward, and the crushing-rolls, of the means, substantially as herein described, for operating the feeding-apron at a speed less than that of the rolls, which consist of the roll-connecting gear-wheels 7 7, of equal diameter, the pulley 9 on one of said rolls, of less diameter than said gear-wheels, and the feeding-apron 17, having upon its roller-shaft 12 a pulley 14, of a diameter greater than the pulley 9, and the belt engaging the said pulleys.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM DEERING.

Witnesses:
MARY C. REXTER,
WILLIAM LOTZ.