No. 838,646. PATENTED DEC. 18, 1906.

C. H. & A. J. RICHARDS.

FEED GOVERNOR FOR MILLS, &c.

APPLICATION FILED MAY 16, 1903.

2 SHEETS—SHEET 1.

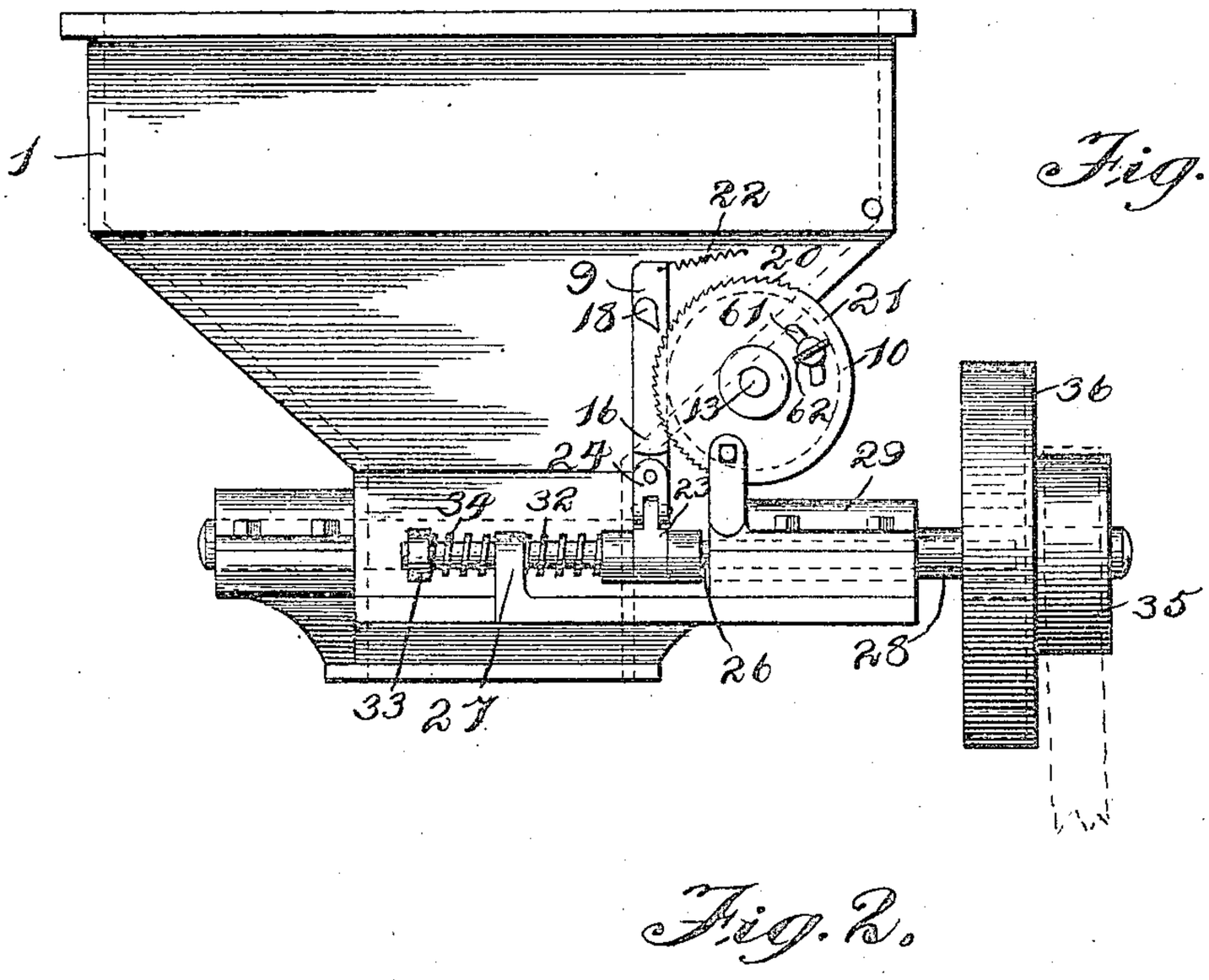

Fig. 1.

Fig. 2.

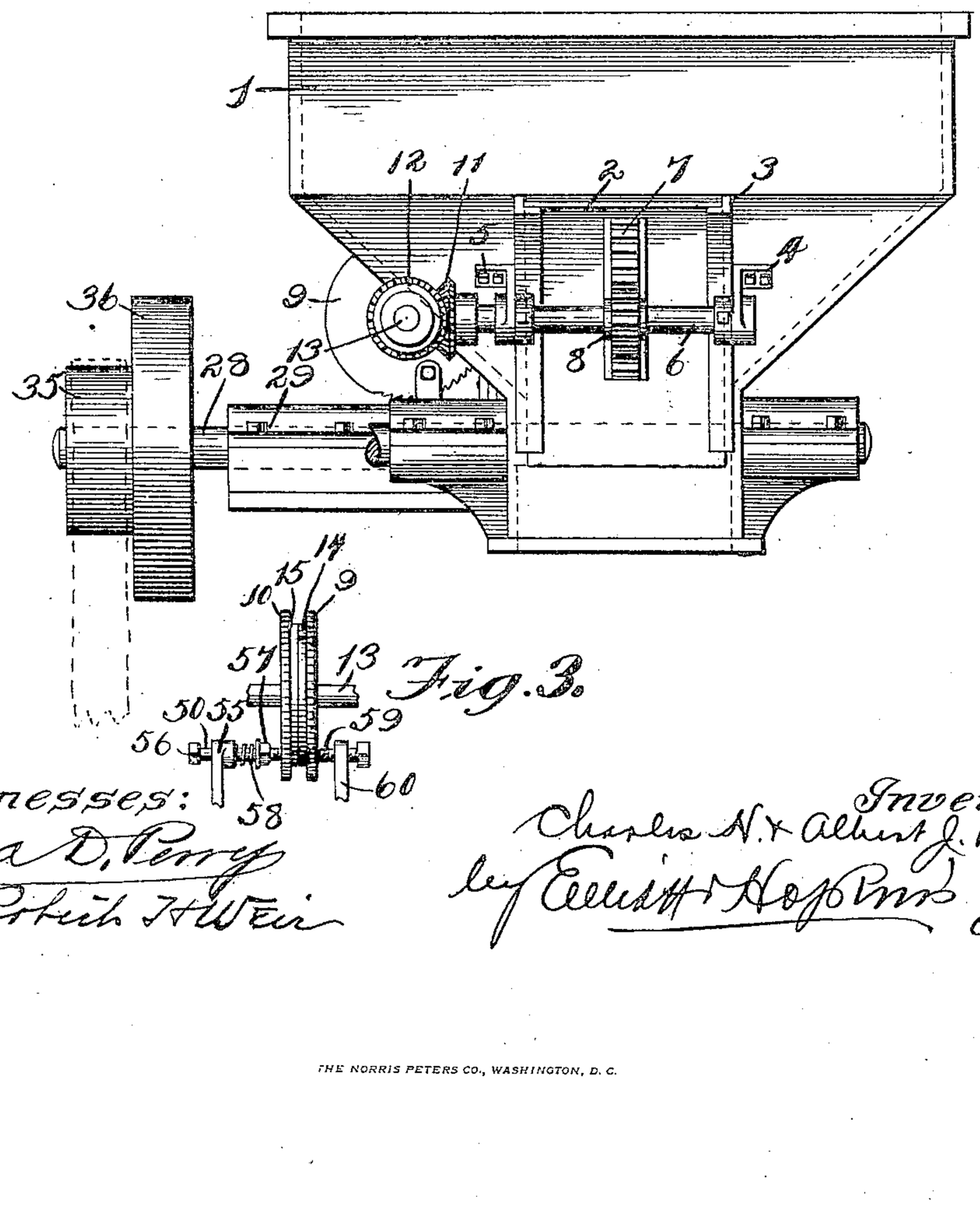

Fig. 3.

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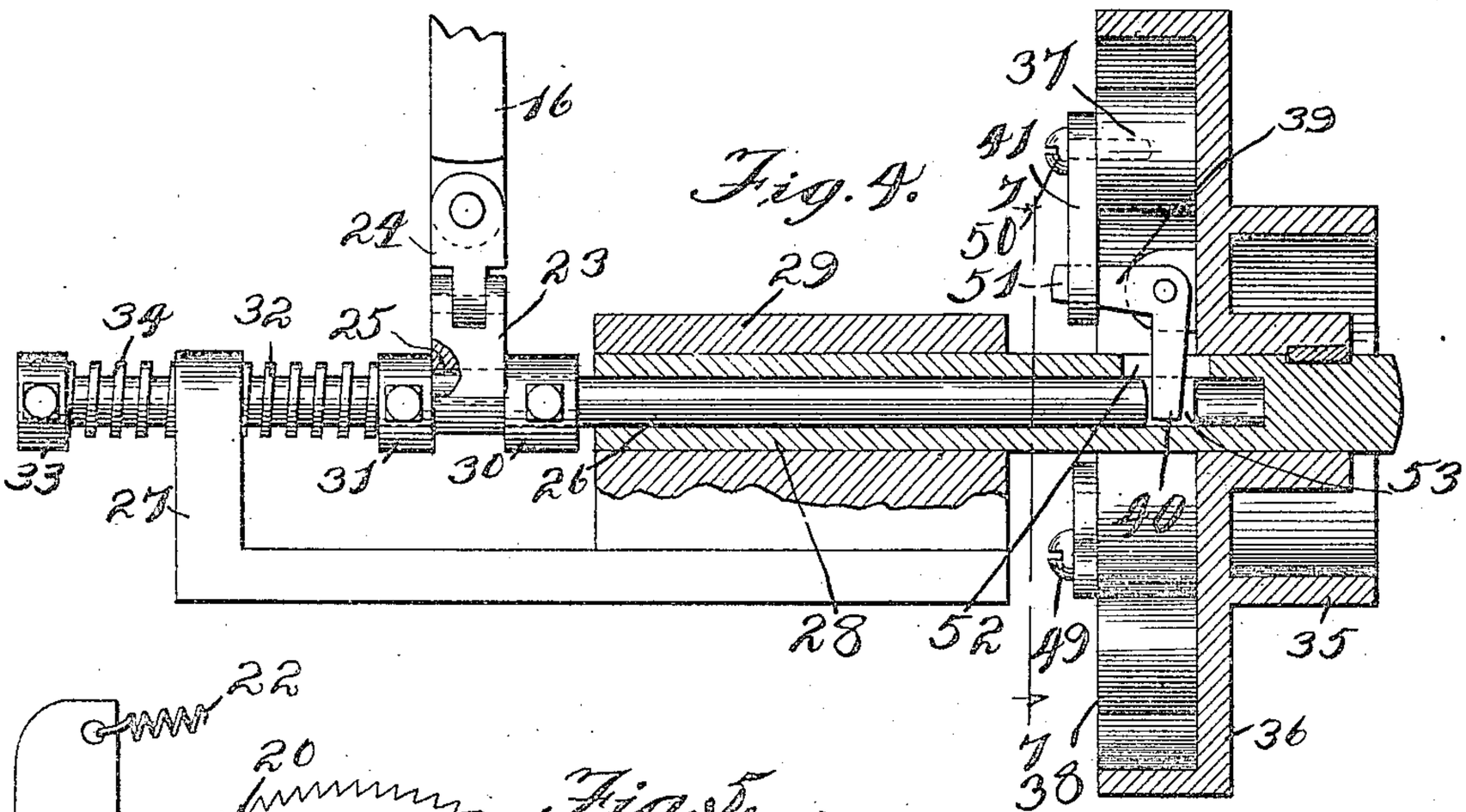

Fig. 4.

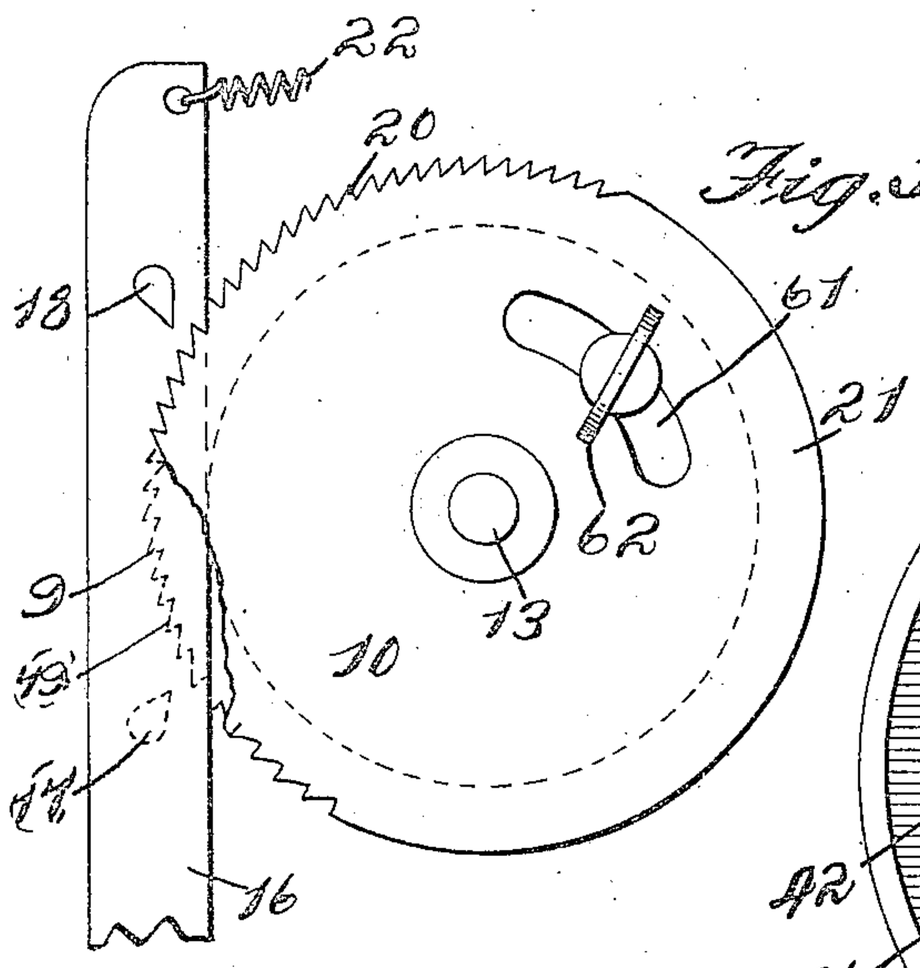

Fig. 5.

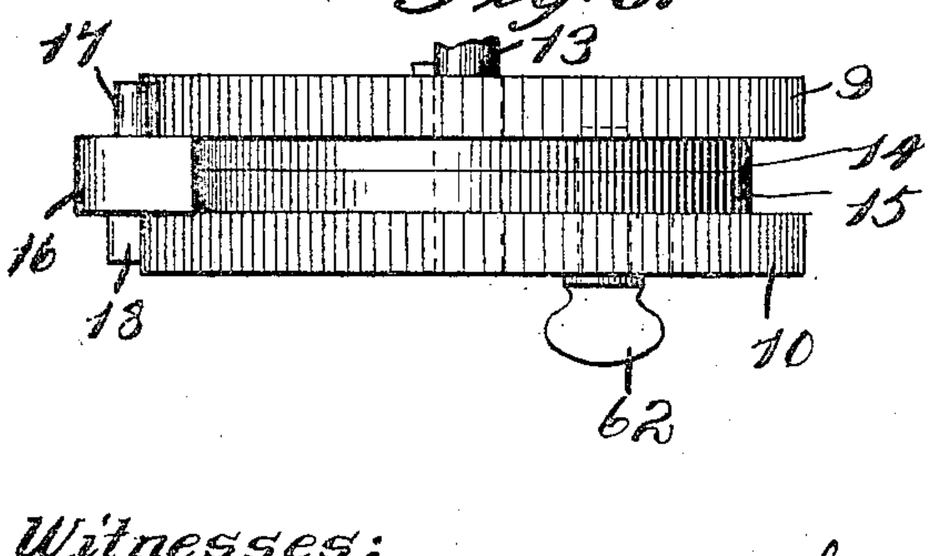

Fig. 6.

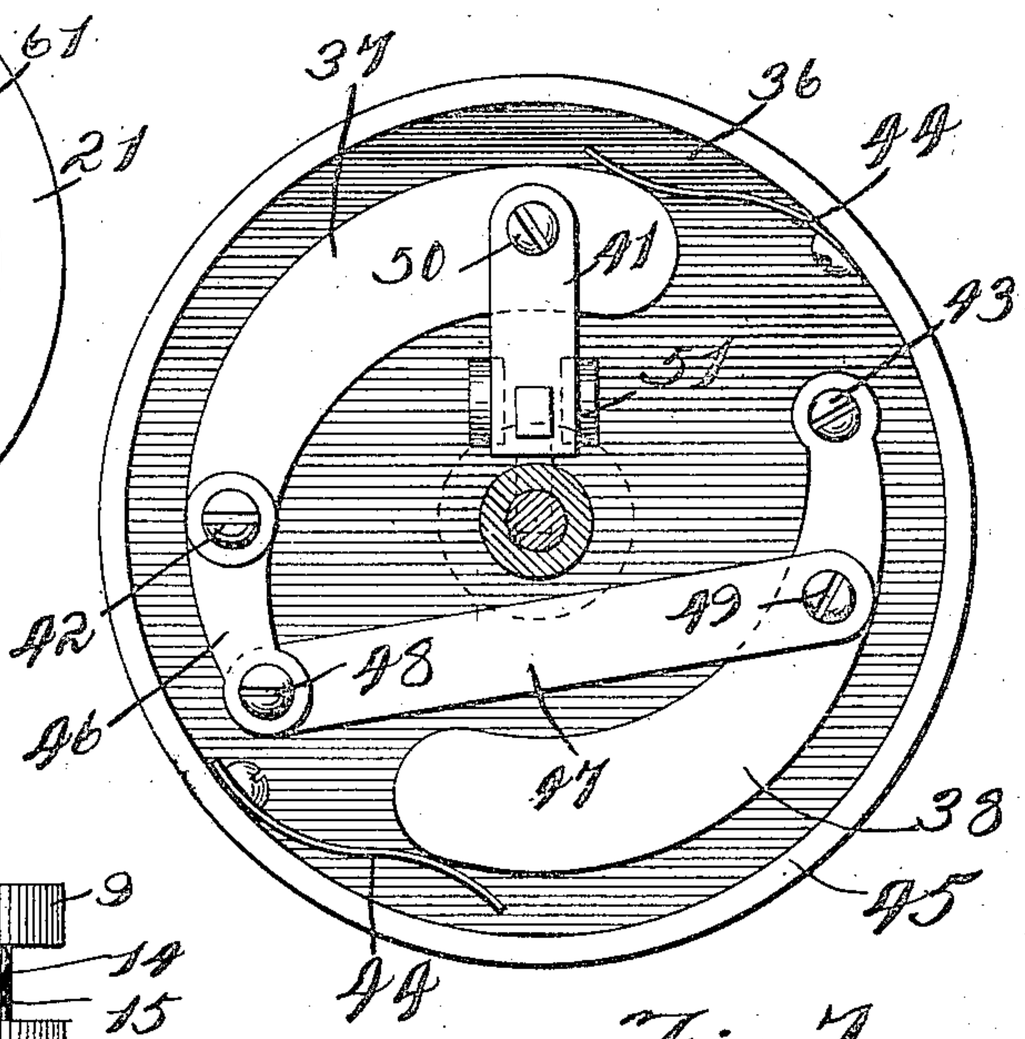

Fig. 7.

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UNITED STATES PATENT OFFICE.

CHARLES H. RICHARDS AND ALBERT J. RICHARDS, OF ELGIN, ILLINOIS.

FEED-GOVERNOR FOR MILLS, &c.

No. 838,646. Specification of Letters Patent. Patented Dec. 18, 1906.

Application filed May 16, 1903. Serial No. 157,364.

To all whom it may concern:

Be it known that we, CHARLES H. RICHARDS and ALBERT J. RICHARDS, citizens of the United States, residing at Elgin, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Feed-Governors for Mills, &c., of which the following is a full, clear, and exact specification.

This invention relates to means for automatically governing the feed of grist-mills or other apparatus where it is desirable that the feed be in proportion to the power, whereby the power may not be overtaxed by excessive feed on the one hand nor wasted by insufficient feed on the other hand; and the invention has for its primary object to provide an improved and simple governing mechanism for the described purpose which shall automatically retard or accelerate the feed according to the speed of the crushing-rolls or other devices which act on the material as it comes from the feeder; and the present invention relates more particularly to the features of novelty not set forth and claimed in Letters Patent No. 810,978, issued to me January 30, 1906.

With these ends in view the invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described with reference to the accompanying drawings and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a side elevation of a feed-hopper provided with this invention. Fig. 2 is a similar view of the opposite side thereof. Fig. 3 is a detail edge view of the ratchet-wheels and friction device looking from the right in Fig. 1. Fig. 4 is an enlarged detail sectional view of the governor and attached parts. Fig. 5 is an enlarged detail view of the ratchet-wheels and a ratchet-bar, partially broken away, showing the wheels in side elevation. Fig. 6 is a plan view thereof, and Fig. 7 is a detail section on the line 7 7, Fig. 4.

1 represents an ordinary feed-hopper, preferably provided with a sloping bottom, as usual, and having a feed-slide 2, arranged in suitable guides 3, for controlling the discharge of material from the bottom of the hopper in a well-known manner. Extending across the slide 2 and journaled in suitable bearing-brackets 4 5 is a shaft 6, which is operatively connected with the slide 2 by some suitable means, such as a rack-bar 7 on the back of the slide and pinion 8 on the shaft 6. The shaft 6 is operatively connected with a pair of ratchet-wheels 9 10 in any suitable way—such, for example, as by means of miter-gears 11 12, secured on the shaft 6 and another shaft 13, respectively, extending at an angle to shaft 6 along the side of the hopper 1 and having the ratchet-wheel 9 suitably secured thereto. The ratchet-wheel 10 is also mounted upon the shaft 13; but it has no direct connection therewith excepting through the intermediary of the wheel 9 by means which will be presently described. The inner faces of the ratchet-wheels 9 10 are provided with flanges or hubs 14 15, respectively, which fit together in the manner shown in Fig. 6 and are of less diameter than the main portions of the wheels, so as to constitute a groove in which fits a ratchet-bar 16, which stands in a vertical position, as better shown in Figs. 1 and 5, and is fulcrumed against the two flanges 14 and 15. This bar 16 is provided on opposite sides with dogs or pawls 17 18, which respectively engage the ratchet-wheels 9 10, whose peripheries are provided with ratchet-teeth 19 20, respectively, extending about half-way around each, so as to leave a plain surface 21 on the periphery of each wheel throughout a considerable extent thereof.

The bar 16 is held yieldingly against its fulcrumed point on the flanges 14 15 by means of a spring 22 or other suitable device attached to the upper end thereof and to the side of the hopper 1, while the lower end of the bar is connected to an eccentric-strap 23 by any suitable means which will permit the bar to oscillate in a plane parallel with the planes of the ratchet-wheels 9 10 and will allow the eccentric-strap 23 to oscillate at right angles to such plane. A convenient expedient for accomplishing this consists of a double knuckle-joint 24, one pivot of which passes through the bar 16 and the other through the strap 23. Within the strap 23 works an eccentric 25, which is keyed to a longitudinally-movable shaft or spindle 26, so that as the shaft 26 rotates the bar 16 will be raised and lowered, causing the pawls or dogs 17 18 to alternately approach and recede from their respective ratchet-wheels 9 10, and as the shaft 26 undergoes longitudinal

movement or reciprocation the bar 16 will be rocked in a vertical plane on its fulcrum against the flanges 15 14 and if moved a sufficient distance will bring one or the other of the pawls 17 18 close enough to its ratchet-wheel to cause the same to engage therewith as the bar is raised or lowered by the rotary movement of the eccentric. The ratchet-teeth 19 20 being turned or pitched in opposite directions, as indicated in Fig. 5, it will therefore be understood that this alternate engagement of the ratchet-wheels by the pawls 17 18 will impart corresponding up-and-down movements to the slide 2 through the intermediary of the gears 11 12, shafts 6 13, and rack and pinion 7 8 before described, and the extent of these up-and-down movements of the slide 2 will of course depend upon the degree of inclination imparted to the bar 16 while the pawls thereon are engaging with the ratchet-teeth, and that when the bar 16 is held in a strictly perpendicular position the pawls thereon do not engage either of the ratchets, and as a consequence under this latter condition the slide 2 remains stationary.

The described movements are imparted to the shaft 26 by a pulley and governor, which will now be described. One end of the shaft 26 is journaled in a bearing 27 and the other end is journaled in a sleeve or hollow shaft 28, mounted in a bearing 29. On one side of the eccentric-strap 23 is arranged a collar 30, which is rigidly secured to shaft 26, so as to serve the twofold purpose of holding the eccentric and its strap in place on shaft 26 and imparting the movement of the shaft to the eccentric. On the other side of the eccentric-strap 23 is arranged a sliding collar 31, between which and the bearing 27 is interposed a coil-spring 32, while on the outer extremity of the shaft is rigidly secured a collar 33, between which and the outer side of bearing 27 is located a coil-spring 34. These two springs 32 34 therefore serve to prevent sudden or jerky motion of the shaft 26, and spring 32 serves to return the shaft to the limit of its movement toward the right or to that position in which the bar 16 is inclined and pawl 17 inactive on the ratchet 9. Upon the hollow shaft or sleeve 28 is keyed a pulley 35, which may be driven in unison with the power provided for operating the crushing-rolls or other devices to which the hopper 1 supplies the material, and secured to or formed on this pulley 35 is a governor comprising a disk 36, two governor weights or balls 37 38, a lever having two arms 39 40, and a link 41, connecting one of the weights with arm 39 of said lever. The weights 37 38 are pivoted at 42 43, respectively, to the disk 36, and their opposite ends are pressed inwardly by suitable springs 44, secured to a flange 45 or other convenient part of disk 36, and one of the weights 37 has a tailpiece 46, connected by a link 47 with the other weight 38, the pivots 48 49, which connect link 47 to 38 and 46, being equidistant from centers 42 43. The link 41 is secured by pivot 50 to weight 37, and the attachment thereof to the arm 39 is effected by passing the arm loosely through the inner end of the link. The lever 39 40 is pivoted in a pair of ears 51 on disk 36, and the arm 40 of said lever passes through a slot 52 in sleeve 28 and engages in a slot or bifurcation 53 in the end of shaft 26, so that as pulley 35 speeds up and the centrifugal force throws the weights 37 38 apart the lever 39 40 will be rocked on its pivot and the shaft 26 forced endwise to bring the upper pawl 18 into engagement with teeth 20, and as the speed decreases the springs 32 34, assisted by the springs 44, force shaft 26 in the opposite direction to bring pawl 17 into engagement with ratchet-teeth 9, thus alternately operating shaft 6 in opposite directions and raising and lowering slide 2. This rotation of shaft 6 of course continues as long as the lever is held in an inclined position; but in order that the slide 2 may not be moved beyond certain limits, the plain peripheries 21 on the ratchets are provided, it being understood that when these plain surfaces are reached, or rather when they reach the pawls, the movement of slide 2 ceases—that is to say, when the plain periphery 21 comes under pawl 18 the slide remains at the limit of its upward movement until the bar 16 is drawn inwardly at its lower end to cause the pawl 17 to engage the teeth 19 of the other ratchet, and thereby lower the slide. In order that the slide may thus remain where placed until moved by the ratchet mechanism, it is provided with some suitable friction device for supporting it against the action of gravity. This device may be best applied to the flat faces of the ratchet-wheels 9 10, as better shown in Fig. 3, and it preferably consists of a pin 54, slidably mounted on a standard 55 and having a head 56 on one end and a nut 57 threaded on the other end, with a spiral spring 58 interposed between said nut and the standard 55, and thereby forcing the pin 50 against the ratchet-wheel 10. In order to resist the thrust of this friction device against the ratchet-wheels, it is desirable to provide another pin 59 on the opposite side, so as to bear against the face of wheel 9. This pin, however, is threaded in its supporting-standard 60, a spring, such as 58, being unnecessary.

As before mentioned, one of the ratchet-wheels 9 10 is loose and the other fixed on the shaft 13, the wheel 9 for illustration being fixed, so that by turning the wheels relatively and then securing them against further relative rotation the initial position of the slide or valve 2 may be varied or adjusted regardless of the movement produced by the pawls 17 18. To these ends the

wheel 10 is provided with a curved slot 61, through which passes a set-screw 62, which is threaded in the wheel 9 and adapted to clamp the two wheels together. For some forms of material it is desirable that the slot or valve 2 have a wider initial opening or be arranged farther from the lower extremity of its movement under the action of the pawl 17 than for other forms. For example, should it be desirable to so set the valve or slide 2 that it will never reduce the opening less than half an inch the wheels 9 10 would be turned until the opening is a half of an inch wide, and then the wheel 10 would be turned by hand relatively to the wheel 9 until the plain periphery 21 at the upper end of the series of teeth is opposite the pawl 18, so that should the pawl be thrown into engagement with the ratchet-wheel it will engage the plain surface and not the teeth, and consequently would not act to further lower the slide.

Having thus described our invention, what we claim as new therein, and desire to secure by Letters Patent, is—

1. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, axially-alined ratchet-wheels operatively connected with said valve for moving it in opposite directions and having oppositely-turned teeth, pawls for engaging said ratchet-wheels respectively, means for moving said pawls toward and from their respective ratchet-wheels, and a governor for throwing said pawls into and out of action, operatively connected with the mill.

2. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, axially-alined ratchet-wheels connected with said valve for moving it in opposite directions and having oppositely-turned teeth, an oscillatory bar, pawls or dogs on said bar presented in opposite directions for engaging said wheels respectively, means for reciprocating said bar and actuating said pawls, and a governor for oscillating said bar, operatively connected with the mill.

3. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, a wheel operatively connected with said valve for moving it, a longitudinally-movable rotating shaft, a governor for moving said shaft longitudinally, operatively connected with the mill, and oscillatory and reciprocatory means connected with said shaft for rotating said wheel.

4. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, a wheel operatively connected with said valve, a rotary longitudinally-movable shaft, a governor for moving said shaft longitudinally, operatively connected with the mill, an eccentric on said shaft, and a bar connected thereto and carrying means for engaging and rotating said wheel, connected to said eccentric.

5. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, a wheel operatively connected with said valve, a rotary longitudinally-movable shaft, a governor for moving said shaft longitudinally, operatively connected with the mill, an eccentric on said shaft, a bar carrying means for engaging and rotating said wheel, and a universal joint connecting said bar and eccentric.

6. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, a pair of relatively adjustable wheels, one of which is operatively connected with said valve, means for rotating said wheels in opposite directions alternately, and a governor for controlling said means, operatively connected with the mill.

7. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, a ratchet-wheel operatively connected with said valve, and having a portion of its periphery plain, means for engaging and rotating said ratchet-wheel, and a governor controlling said means, operating in unison with the mill.

8. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, a pair of ratchet-wheels arranged face to face, and having their inner faces flanged, means operatively connecting said wheels to said valve, a bar arranged between said wheels and fulcrumed against said flanges, yielding means for holding said bar against said flanges, pawls on said bar for engaging said wheels respectively, means for reciprocating said bar, and means for oscillating said bar according to the speed of the mill.

9. In a feed-governor for mills, &c., the combination of a variable feed comprising a movable valve, a rotary longitudinally-movable shaft, a governor for imparting longitudinal movement to said shaft operating in unison with the mill, yielding means for resisting the longitudinal movement of said shaft, a ratchet-wheel operatively connected with said valve, a pawl for actuating said wheel, and means on said shaft operatively connected with said pawl for bringing it into engagement with said wheel.

10. In a feed-governor for mills, &c., the combination of a valve, rotary means for moving said valve in one direction, rotary means for moving said valve in the opposite direction, means for yieldingly connecting said valve and first means, whereby the first means may rotate in either direction independently of the valve when the valve meets an abnormal resistance, and a governor for controlling the direction of rotation of said first means.

11. In a feed-governor for mills, &c., the

combination of a valve, means for moving said valve in either direction, comprising a shaft, oppositely-rotatable means on said shaft having two series of ratchet-teeth turned in opposite directions, pawls for engaging said ratchet-teeth respectively and means for actuating said pawls, and a governing mechanism for throwing said pawls alternately into action according to the speed of the mill.

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