No. 791,610. PATENTED JUNE 6, 1905.

R. & B. CRAIN.

SELF FEEDER FOR THRESHING MACHINES.

APPLICATION FILED DEC. 10, 1903.

4 SHEETS—SHEET 1.

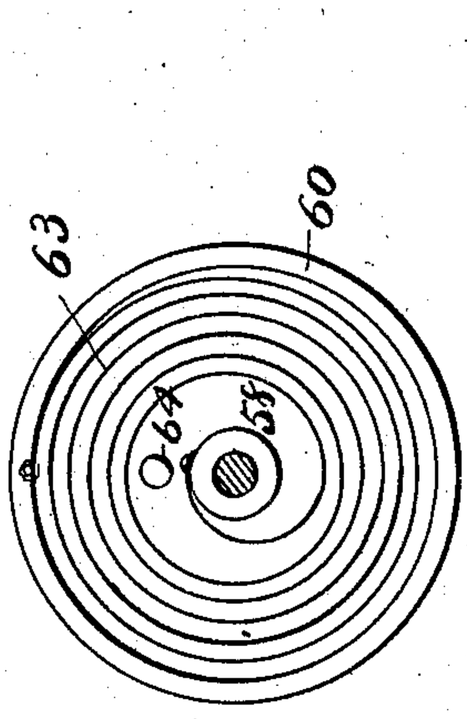

Fig. 8.

Fig. 6.

Fig. 7.

Witnesses

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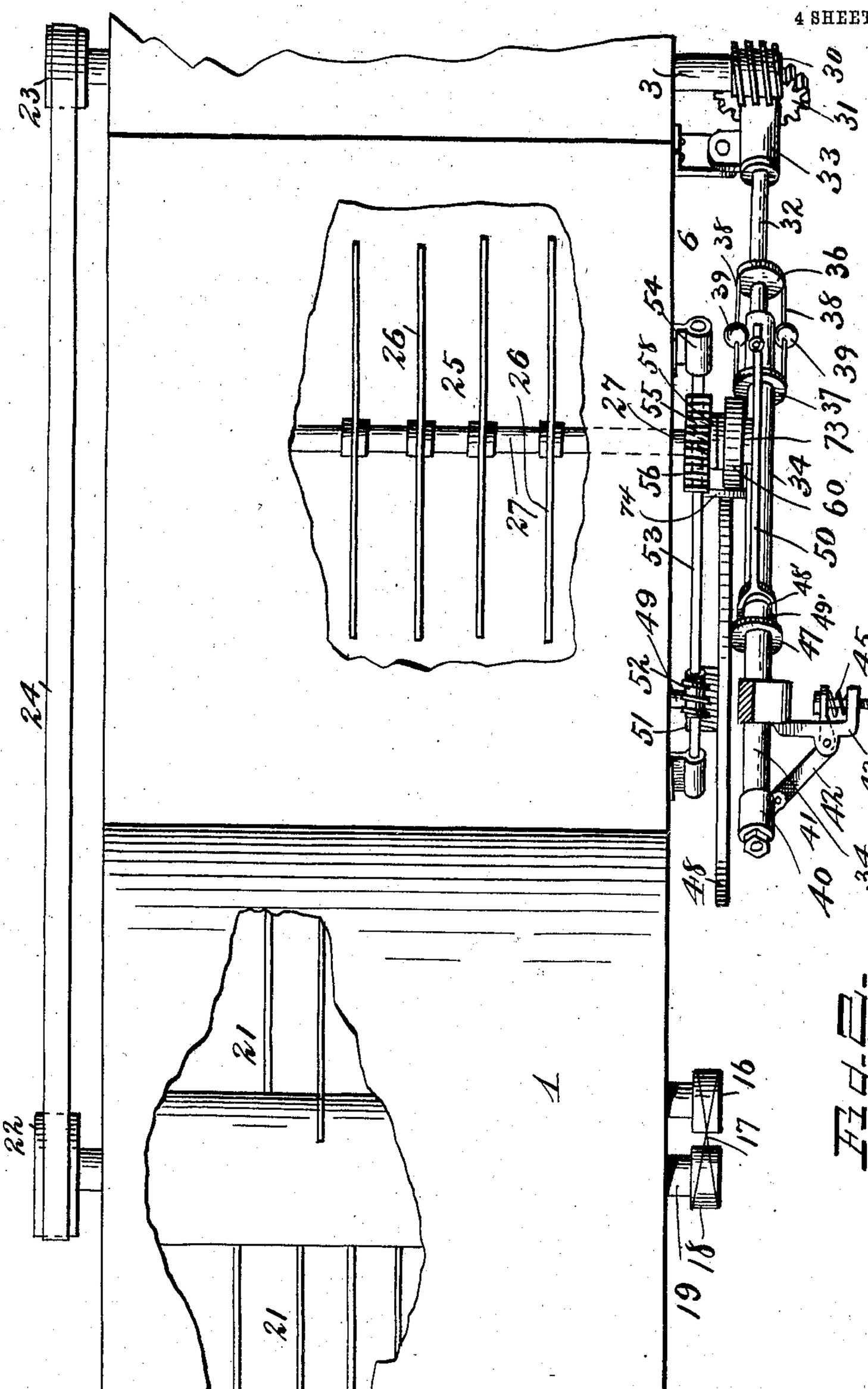

Fig. 2.

Witnesses
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[illegible]

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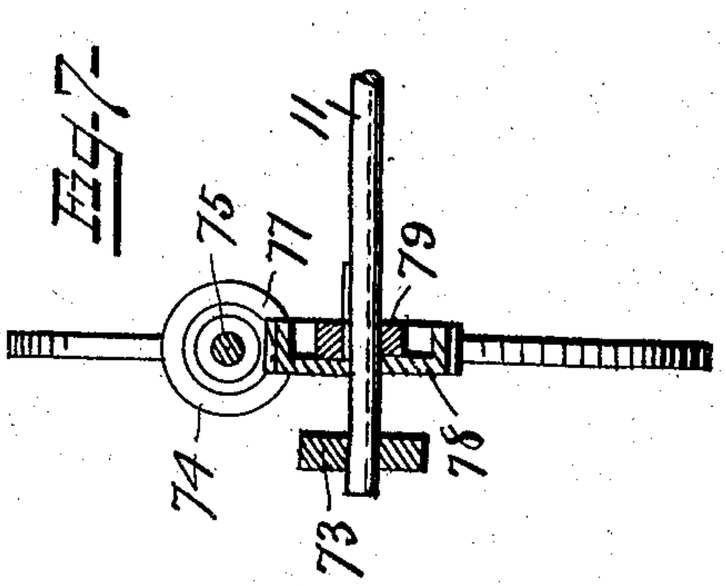

FIG. 4.

FIG. 3.

FIG. 5.

Witnesses
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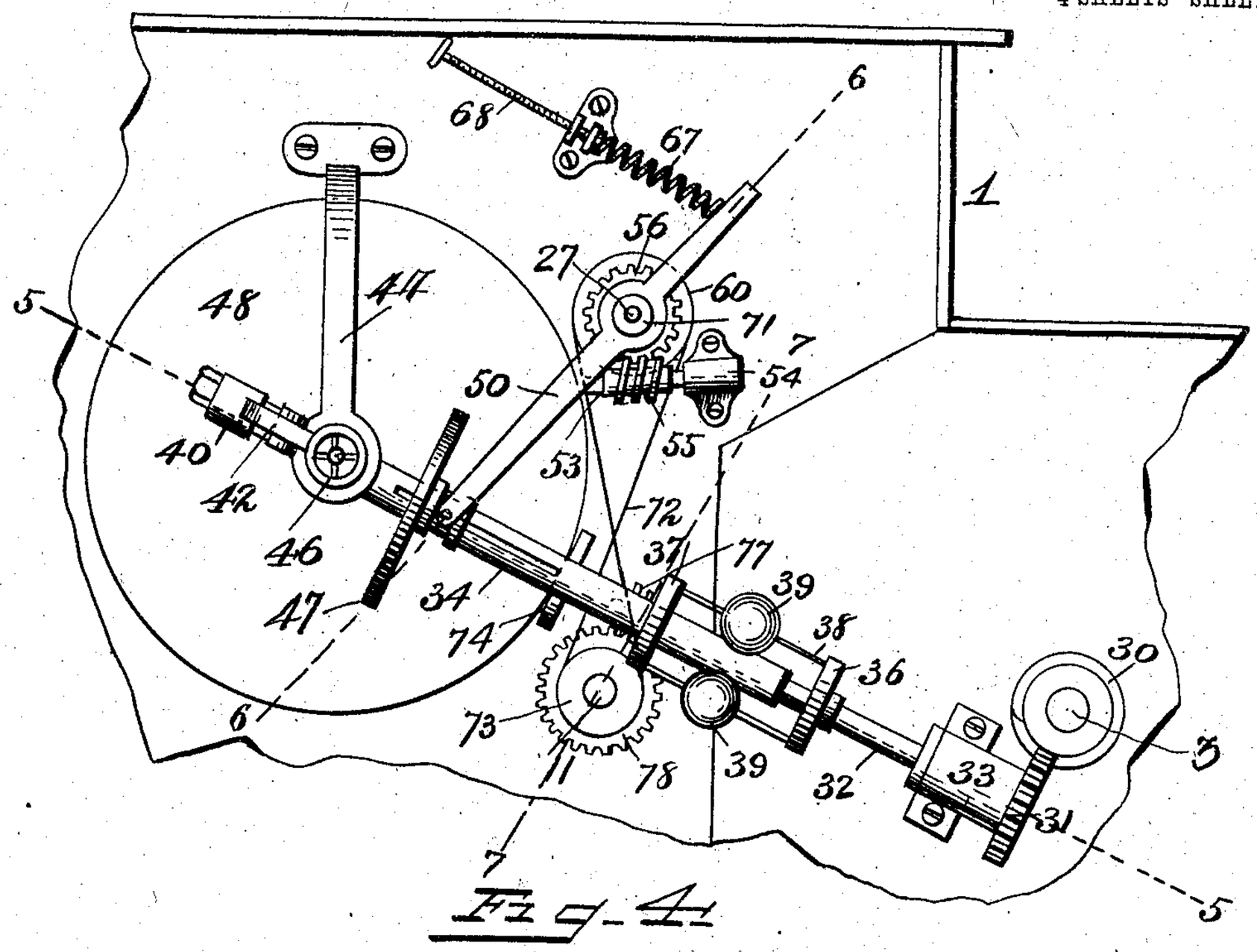

Fig. 4.

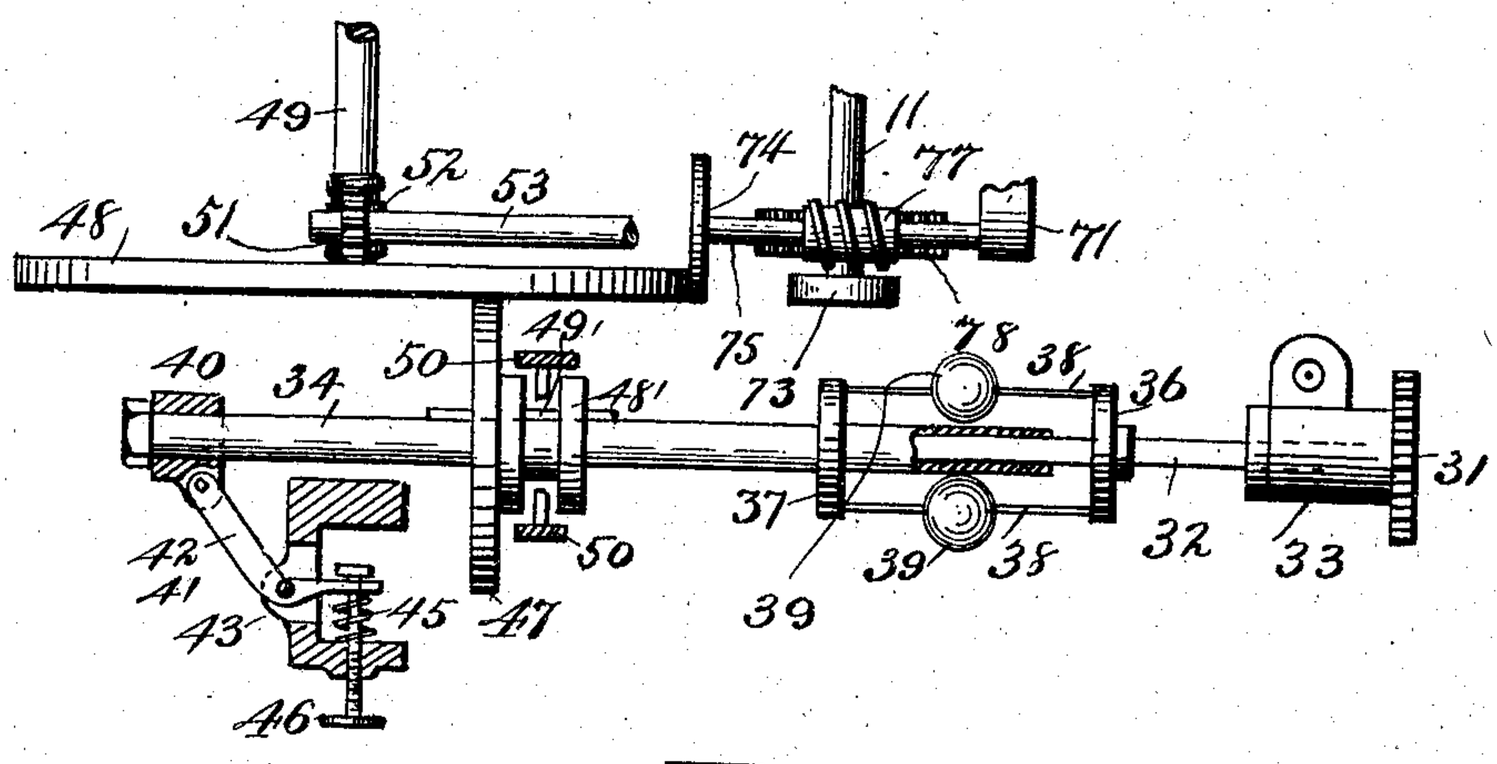

Fig. 5.

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No. 791,610. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

ROLLIE CRAIN AND BENJAMIN CRAIN, OF MARION, ILLINOIS.

SELF-FEEDER FOR THRESHING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 791,610, dated June 6, 1905.

Application filed December 10, 1903. Serial No. 184,622.

To all whom it may concern:

Be it known that we, ROLLIE CRAIN and BENJAMIN CRAIN, citizens of the United States, residing at Marion, State of Illinois, have invented certain new and useful Improvements in Self-Feeders for Threshing-Machines; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in threshing-machines, and more particularly to an automatic self-feeding mechanism for such machines.

The object of our invention is to provide a mechanism of this character in which the feed of grain to the thresher-cylinder will be regulated by the amount and the condition of the grain upon the feeding-conveyer or similar device, or, in other words, the amount of grain fed to the cylinder which is rotated at a constant speed is varied automatically by our improved feeding mechanism according to the condition of the grain—that is, whether it is wet, matted, tightly compact, &c.

Another object of our invention is to provide a feeding mechanism of this character which will automatically start when the cylinder has reached its proper or normal speed and stop when the speed of the cylinder lowers.

A further object of our invention is to provide an extremely sensitive feeding mechanism of this character which will be of simple, durable, and compact construction and very steady and efficient in operation.

With these and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation of a portion of a threshing-machine, showing the application of our invention thereto. Fig. 2 is a top plan view of the same, parts being broken away to more clearly illustrate the construction. Fig. 3 is a vertical longitudinal section. Fig. 4 is an enlarged elevational view of our improved feeding mechanism. Figs. 5, 6, and 7 are sectional views taken, respectively, on the lines 5 5, 6 6, and 7 7 of Fig. 4. Fig. 8 is a sectional view taken on the line 8 8 of Fig. 6. Fig. 9 is a detail view of one of the gears.

Referring to the drawings by numerals, 1 denotes a portion of the frame of a threshing-machine in which the usual thresher-cylinder 2 is mounted upon a shaft 3 to coact with the usual cylinder-concave 4. Grain of any kind which is to be threshed is thrown upon the outer portion of an endless conveyer or other suitable feeding device 5, which is mounted in a projecting portion 6 of the frame 1 and is adapted to convey and feed the grain to said cylinder and concave. Said conveyer is preferably in the form of an open raddle or rake comprising endless bands 7, passed around rollers 8 and connected by cross-slats 9, which are provided with angular projecting pins or teeth 10. The innermost roller 8 is keyed or otherwise secured to a shaft 11, which is rotated as hereinafter described to impart motion to the conveyer.

Fixed to the frame 6 beneath the upper stretch of the conveyer are platform-boards 12, and mounted below the inner portion of the lower stretch is an oscillating shoe 13, which is adapted to catch all the loose kernels of grain and discharge the same into the cylinder-concave. Said shoe has its inner end suspended by hangers 14 and its outer end pivotally connected to cranks formed upon a shaft 15, one of the outer ends of which is provided with a pulley 16, which is connected by a crossed belt 17 to a pulley 18, secured upon a shaft 19, journaled in bearings 20 in the sides of the frame 6 above the central portion of the conveyer. Secured upon said shaft 19 is a series of curved cutting-blades 21, which are adapted to cut the bands of the bundles of grain as they are fed beneath the same on the conveyer 5. The band-cutter shaft 19 is rotated, preferably, by connecting a pulley 22, secured upon one of its outer ends, to a pulley 23 upon the cylinder-shaft by means of a band 24, as seen in Fig. 2.

Mounted in advance of the thresher-cylinder and above the inner portion of the endless feeding-conveyer is a grain-separating and speed-regulating device 25, which, as

shown, is in the form of a rotary cylinder composed of a series of pointed or fingered wheels 26, keyed upon a shaft 27, mounted in bearings in the frame 6. The parts of the gearing are of such size that under normal conditions—that is to say, when the grain is dry and the bundles are of the proper size and not too compact -the separator 25 is rotated in the same direction as the conveyer 5, but at a greater rate of speed, thereby causing the bundle or the quantity of grain between said conveyer and separator to be torn apart and forced positively to the cylinder and concave. Since wet, matted, and tightly-compact grain is much harder to tear apart or separate than loosely-bundled dry grain, the grain which is being threshed will, according to its condition, offer a greater or less resistance to the rotation of the separating device 25. Owing to the peculiar construction of the mechanism hereinafter described, this resistance to the rotation of the separator retards its rotation, and thereby actuates certain mechanism which regulates the speed of the separator and also that of the feeding-conveyer to thus automatically control the amount of grain passing to the cylinder.

Upon one of the outer ends of the cylinder-shaft 3 is secured a worm 30, which engages a worm-wheel 31 upon one end of a shaft 32, mounted in a bearing 33 upon the outer side of the machine-frame 1. The opposite end of said shaft 32 is telescoped by one end of a sleeve or tubular shaft 34, which is keyed to rotate with the shaft 32, but may be slid longitudinally thereon. Its sliding movement is controlled by a governor 35, which consists of collars 36 and 37, fixed, respectively, to the shafts 32 and 34 and connected by spring-arms 38, which are provided with weights 39 at their centers. It will be seen that when said shaft 32 is rotated the weights 39 will fly outwardly by centrifugal force, bowing or bending the spring-arms 38 and drawing the shaft 34 upon the shaft 32. The opposite end of the shaft 34 is journaled to rotate in a movable bearing-block 40, which is pivotally secured upon one end 41 of a lever or hanger 42. Said lever or hanger is pivoted at about its center between lugs or ears 43 upon a bracket 44. The other end of the lever or hanger 42 is engaged by a coil-spring 45, the tension of which is regulated by a hand-screw 46. Said spring is adapted to force the end 41 of the lever or hanger 42 outwardly to hold a friction drive-wheel 47 upon the shaft 34 out of contact with a friction-disk 48, loosely mounted upon a stub-shaft 49, which is secured in the side of the frame 6. Said friction-wheel 47 is slidably mounted upon the shaft 34, but keyed to turn with the same, and it is formed with a collar or sleeve 48′, having an annular groove 49, which is engaged by the forked end of a shifting-lever 50. It will be seen upon reference to Fig. 5 that when the governor 35 draws the shaft 34 longitudinally upon the shaft 32 the outer end of the shaft 34 will be swung inwardly, owing to the manner in which it is mounted, and will move the friction-wheel 47 into engagement with the friction-disk 48. Secured to the inner face of the disk 48 and revolving upon said shaft 49 is a worm 51, which engages a worm-gear 52, secured upon one end of a shaft 53, mounted in bearings 54 upon the side of frame 6 and having adjacent to its opposite end a worm 55, which engages a worm-gear 56, loosely mounted upon the outer end of the separator-shaft 27, as clearly shown in Fig. 6. The inner face of said gear 56 is formed with a hub or sleeve 57, having a cam end 58, which coacts with the similar-shaped end of the hub 59 of a pulley 60, secured upon the shaft 27 by a set-screw or other suitable fastening means 61. The inner face of said gear 56 is also provided with a projecting pin or stud 62, to which the inner end of a spiral spring 63 is secured, the outer end of said spring being secured upon the inside of the rim of the pulley 60. It will be seen that when the gear 56 is rotated by the worm 55 the shaft 27 will be rotated, owing to its connection with said gear, by means of the pulley and spring. When the grain which is being separated offers a great amount of resistance to the separator-fingers 27, the spring connection 63 will permit the gear 56 to travel faster than the pulley and shaft, and thereby cause the cam 58 and the gear to ride upon the cam-hub 59 of the pulley, and thus force or slide the said gear longitudinally upon the shaft 27. A stop pin or stud 64 is provided upon the pulley and projects into the path of the pin 62 to be engaged thereby, and hence lock the pulley to the gear and prevent the gear 56 from turning more than one revolution without operating the pulley and shaft.

The outer face of the gear 56 is provided with a friction hub or surface 65, which is engaged by a similar hub 66, formed upon the shifting-lever 50 intermediate its ends. As previously stated, the lower forked end of said lever 50 engages and operates the friction-wheel 47, and its opposite end is engaged by a coil-spring 67, the tension of which is controlled by a hand-screw 68, as clearly shown in Fig. 4. The outer face of the hub portion 66 of the lever 50 is engaged by a friction-washer 69, which is held against said lever by a coil-spring 70, confined upon the shaft 27 between said washer and a hand-nut 71, which is screwed upon the threaded end of the shaft 27. The tension of the spring 70 is regulated by the nut 71, so as to permit the lever to remain stationary when the gear 56, the shaft 27, and its attached parts are rotating at their normal speed; but when the grain offers a great amount of resistance to the ro-

tation of the separator and the gear 56 is thereby moved longitudinally upon the shaft, as previously explained, the friction upon the lever 50 is increased and causes the same to turn or make a partial revolution with the shaft against the tension of the spring 67 to move or shift the friction drive-wheel 47 toward or from the center of the friction-disk 48, thereby varying the speed of rotation of the said disk 48, as will be readily understood.

In order to drive the feeding-conveyer, a crossed belt 72 connects the pulley 60 with a pulley 73, secured upon the outer end of the shaft 11. The shaft 11 may also be driven, but at a very much lower rate of speed, by the lever 50 moving the friction-wheel 47 from the outer edge of the friction-disk 48, so as to disengage the latter, and into engagement with a small friction-wheel 74, disposed in a plane at right angles to the plane of said disk 48 and secured upon one end of a shaft 75, which is mounted in bearings 76 upon the frame of the machine. Said shaft 75 is also provided with a worm 77, which engages a worm-gear 78 upon the shaft 11. Said gear is loose upon the shaft 11, but, as seen in Fig. 9, is locked to turn with the same in one direction by keying upon the shaft a disk 79, having a pivoted spring-actuated clutch 80, which frictionally engages the inner surface of the rim of the gear-wheel. It will be seen that when the gear is rotated in one direction it will turn the shaft 11, and when rotated in the opposite direction it will slip over said shaft, or the shaft may be rotated without turning the gear.

The operation of the machine is as follows: The motion of the cylinder-shaft is imparted to the band-cutter by means of the belt 24, and the motion of the band-cutter is in turn imparted to the grain-shoe by the belt 17. The motion of the cylinder-shaft is also imparted to the shaft 32 by means of the worm-gearing 30 31, and said shaft 32 will rotate the shaft 34 and the governor 35. After the cylinder-shaft and the shaft 32 have acquired a predetermined speed the governor will move the shaft 34 longitudinally to swing the friction-wheel 47 into engagement with the disk 48 to drive the same. The speed of rotation of the disk varies as its drive-wheel 47 is moved toward or from its center, and by means of the hand-screw 68 and spring 67 the lever 50 may be adjusted to hold the wheel 47 at any desired point on the disk under normal conditions. The motion of the friction-disk is imparted to the gear 56 on the separator-shaft 27 by means of the shaft 53 and the connecting worm-gearing previously described. Owing to the spring connection of said gear 56 to the shaft 27, the latter will be rotated with the former at the same speed when the grain which the separator is working upon is in its normal condition, or, in other words, in the condition that the parts of the machine are adjusted for. When, however, a bundle of grain is very thick or tightly packed or when the grain is wet and matted, the resistance which it offers to the action of the separator is so great that the rotation of the same will be slightly retarded and will force the gear 56, owing to the cams previously described, longitudinally on the shaft to increase the friction upon the shifting-lever 50, thereby operating said lever to move the friction-wheel away from the center of its friction-disk and reducing the speed of the separator, and consequently the speed of the feeding-conveyer, since the latter is driven by the crossed belt 72, as previously explained. Should the cylinder become clogged or should the separator be retarded to such an extent that the drive-wheel 47 is moved into engagement with the friction-wheel 74, the latter through the worm-gearing 77 and 78 will rotate the drive-shaft 11 of the conveyer, and the motion of said shaft will be imparted, through the belt 72, to the separator-shaft. When the latter-mentioned gearing drives the conveyer and separator, the former-mentioned gearing will not assist the latter, and the speed of the conveyer and separator will be very much reduced. When the resistance to the rotation of the separator decreases, the springs previously described will return the parts to their normal position, and should the cylinder be stopped or its speed decreased the governor 35 will automatically move the friction drive-wheel 47 away from the friction-disk 48 to stop the motion of the conveyer and separator.

By adjusting the various springs and other parts the machine may be set or adjusted for working upon any kind or any condition of grain, and it will automatically adjust itself to any conditions of the grain other than those for which the parts are set.

It will be seen that we have provided a feeder which is extremely sensitive to all conditions of grain and that it will feed slow or fast, according to the capacity of the cylinder. The cylinder is permitted to run constantly at its normal rate of speed, and the feeder will feed a small or a large amount of grain, according to the condition of the grain, so that the cylinder may thoroughly thresh the same. It will be further noted that the separator will not only separate the grain upon the conveyer and feed a proper amount of it positively to the cylinder, but it will also retard the feed of the grain and prevent it from being jerked or drawn into the cylinder in large bunches, especially when the grain is wet and matted.

Should it not be desirable to drive the shaft 32 from the cylinder-shaft, it may be geared to the band-cutter shaft 19 or to any other suitable shaft.

Various other changes in the form, proportion, and the minor details of construction

may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

From the foregoing description, taken in connection with the accompanying drawings, the construction, mode of operation, and the advantages of our invention will be readily understood without requiring a more extended explanation.

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

1. In combination with a threshing-cylinder, a band-cutter driven thereby, a laterally-movable shaft also driven thereby, a centrifugal governor operated by the shaft, means actuated by the governor to move the shaft laterally, a gear element driven and movable laterally by the shaft, a separating mechanism, a feeding mechanism driven by said separating mechanism, and a gear element to drive the latter, said last-mentioned gear element being engaged with and disengaged from the first-mentioned gear element, by the lateral movement of the said shaft, substantially as described.

2. In combination with a threshing-cylinder, a laterally-movable shaft driven thereby, a movable bearing for said shaft, a spring-pressed lever connected to said bearing to move said shaft in one direction, a centrifugal governor to move said shaft in the reverse direction, a gear element movable laterally and driven by said shaft, a separating mechanism, a feeding mechanism driven by the separating mechanism, and a gear element to drive the latter, the last-mentioned gear element being engaged with and disengaged from the first-mentioned gear element, by the lateral movement of the said shaft, substantially as described.

3. In combination with a threshing-cylinder, a laterally-movable shaft driven thereby, a movable bearing for said shaft, a lever connected to said bearing to move said shaft in one direction, a spring engaging said lever, means to vary the tension of said spring, a centrifugal governor to move said shaft in the reverse direction, a gear element movable laterally and driven by said shaft, a separating mechanism, a feeding mechanism driven by the separating mechanism, and a gear element to drive the latter, the last-mentioned gear element being engaged with and disengaged from the first-mentioned gear element, by the lateral movement of the said shaft, substantially as described.

4. A machine of the class described having a threshing-cylinder, a feeder, a separator, connections between said feeder and separator, to drive either by the other, and each having an independent driving element, a driving element driven by the cylinder and automatic means, controlled by variations in the speed of the separator to engage said last-mentioned driving element successively with the first-mentioned driving elements, substantially as described.

5. A machine of the class described having a threshing-cylinder, a shiftable driving-gear driven thereby, a separator, means, including a variable-speed disk, to drive the separator, a feeder, connections between the separator and feeder whereby either may be driven by the other, a gear to drive the feeder, and automatic means controlled by variations in the speed of the separator, to shift the shiftable driving-gear on the variable-speed gear, and to successively engage said shiftable driving-gear with the variable-speed gear and with the gear which drives the feeder, substantially as described.

6. The combination of a threshing-cylinder, a feeder, a separator, connections between the feeder and separator whereby one is driven by the other, a variable-speed gear, one element of which is driven by the cylinder, a shifter for said element, means, including an independently-movable element, connecting another element of the variable-speed gear to the separator, to drive the latter, and means, actuated by the movement of the independently-movable element, to cause the latter to operate the shifter, and hence change the speed of the separator and feeder, substantially as described.

7. The combination of a threshing-cylinder, a feeder, a separator, connections, between the feeder and separator, whereby one is driven by the other, a variable-speed gear, one element of which is driven by the cylinder, a shifter for said element, means, including an independently-movable spring-cushioned element, connecting another element of the variable-speed gear to the separator, to drive the latter, and means, actuated by the movement of the independently-movable element, to cause the latter to operate the shifter and hence change the speed of the separator and feeder, substantially as described.

8. The combination of a threshing-cylinder, a feeder, a separator having a revoluble shaft, connections between said shaft and the feeder, to drive the latter and the separator simultaneously, said connections including an element fast on the separator-shaft, a variable-speed gear, one element of which is driven by the cylinder, a shifter for said element, pivoted on the separator-shaft, means, including a revoluble element, loose on said shaft, connecting another element of the variable-speed gear to the separator-shaft, to drive the latter, means to limit the independent revoluble movement of the loose element on the separator-shaft, and coacting means with which the loose and fast elements on the separator-shaft are provided to engage the former with the shifter, to actuate the latter, when

the speed of the separator-shaft is retarded by an increase of load, substantially as described.

9. The combination of a threshing-cylinder, a feeder, a separator having a revoluble shaft, connections between said shaft and the feeder, to simultaneously drive the latter and the separator, said connections including an element fast on the separator-shaft, a variable-speed gear, one element of which is driven by the cylinder, a shifter for said element, pivoted on the separator-shaft, means including a revoluble element, loose on said shaft, connecting another element of the variable-speed gear to the separator-shaft, to drive the latter, means to limit the independent revolution of the loose element on the separator-shaft, a spring to cushion such movement, and coacting means with which the loose and fast elements on the separator-shaft are provided, to frictionally engage the former with the shifter, to actuate the latter, substantially as described.

10. In a self-feeding mechanism for threshing-machines, the combination of a threshing-cylinder, a band-cutter driven thereby an endless conveyer, a revolving separator-wheel coacting with said conveyer and adapted to be retarded in its rotation by the resistance offered it by the grain upon said conveyer, a drive-shaft driven by the threshing-cylinder, variable-speed gearing between said drive-shaft and said separator-wheel, a governor adapted to throw said variable-speed gearing into and out of operation, drive-gearing between said separator-wheel and said conveyer, and an operating element operated by said separator-wheel when its motion is retarded and adapted to control said variable-speed gearing, substantially as described.

11. In a self-feeding mechanism for threshing-machines, the combination of an endless feeding-conveyer, a revolving separator coacting with said conveyer and adapted to be retarded in its rotation by the resistance offered it by the grain upon said conveyer, a drive-shaft, a friction drive-wheel slidably mounted upon said shaft, a friction-disk, means for automatically connecting and disconnecting said friction drive-wheel and said friction-disk, gearing between said friction-disk and said separator, a lever actuated by said separator when its motion is retarded and adapted to move said friction drive-wheel upon said friction-disk to vary the speed of the latter, and drive-gearing between said separator and said conveyer, substantially as described.

12. In a self-feeding mechanism for threshing-machines, the combination of an endless feeding-conveyer, a revolving separator coacting with said conveyer and adapted to be retarded in its rotation by the resistance offered it by the grain upon said conveyer, a drive-shaft, a tubular shaft having one of its ends telescoped to slide upon said drive-shaft and its other end mounted in a movable bearing, a friction-disk, a governor connecting said drive-shaft and said tubular shaft and adapted to move said tubular shaft toward and from said friction-disk, a friction drive-wheel slidably mounted upon said tubular shaft to coact with said friction-wheel, drive-gearing between said friction-disk and said separator, a lever actuated by said separator when its motion is retarded and adapted to shift said friction drive-wheel and drive-gearing between said separator and said conveyer, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

ROLLIE CRAIN.
BENJ. CRAIN.

Witnesses:
W. I. GRAY,
J. H. NORMAN.