No. 824,238. PATENTED JUNE 26, 1906.

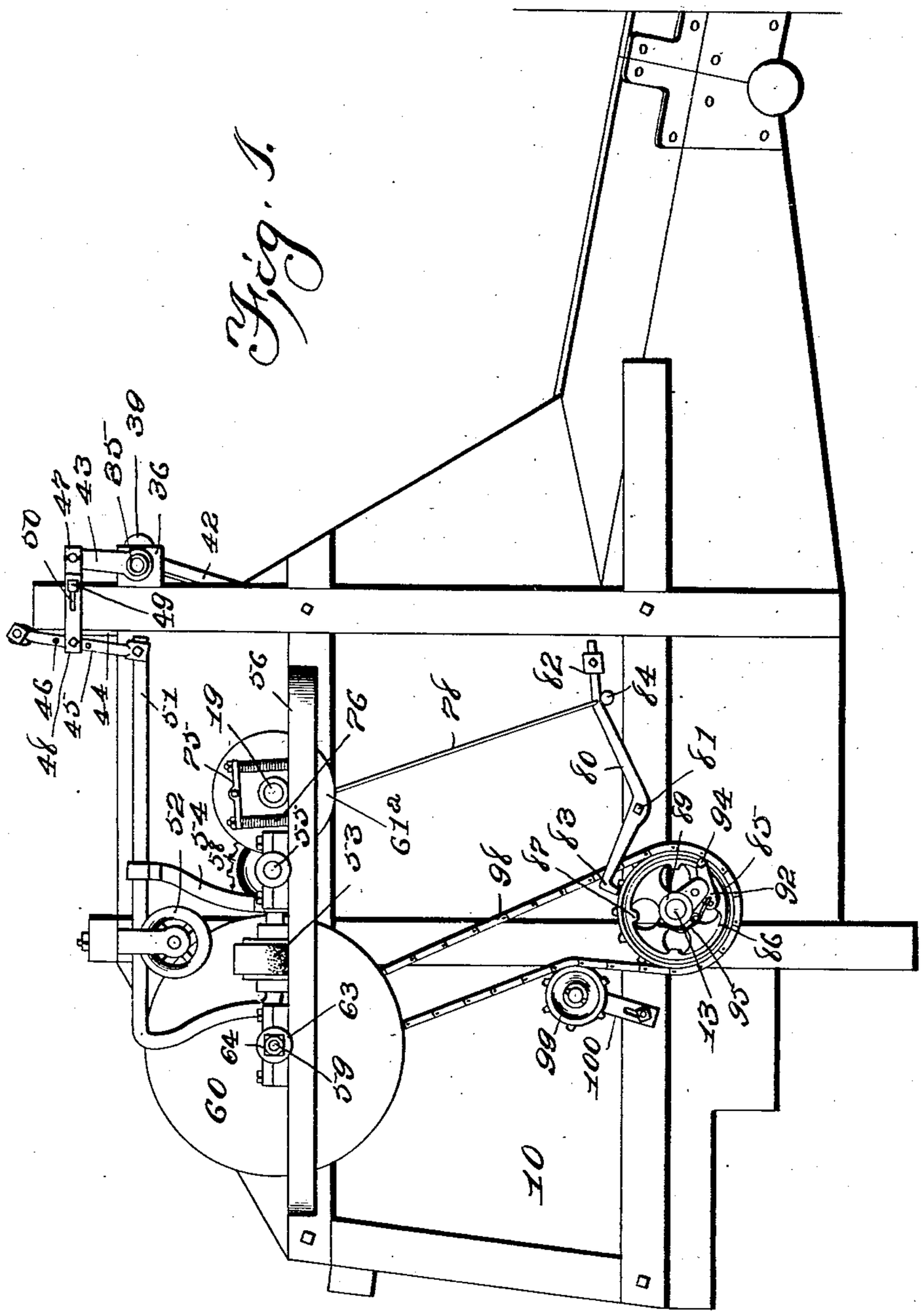
S. DUNKELBERGER.

BAND CUTTER AND FEEDER.

APPLICATION FILED OCT. 11, 1902.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
H. B. Owig.
Henry Munger.

Inventor Samuel Dunkelberger
by Owig & Lane Attys.

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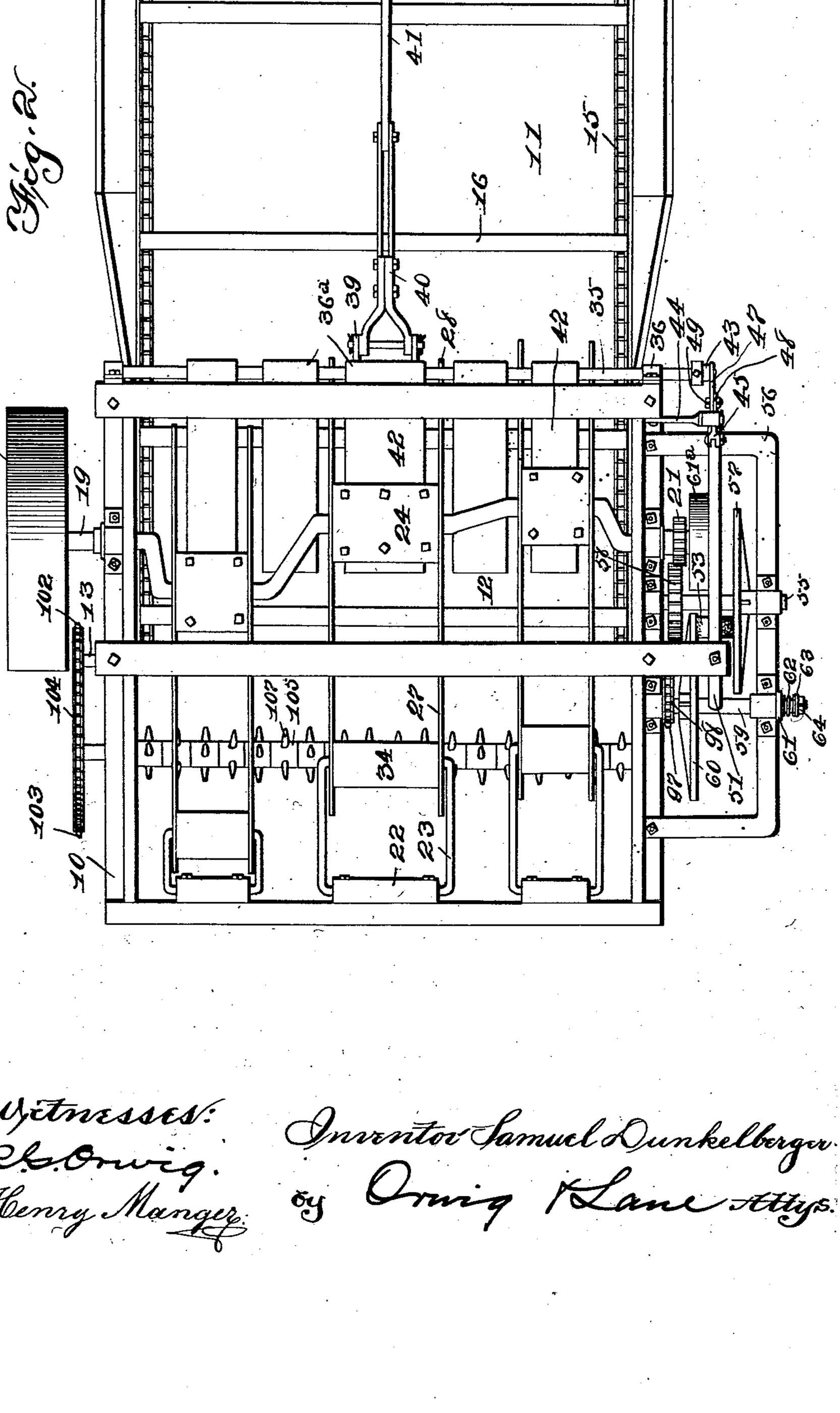
5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 3.

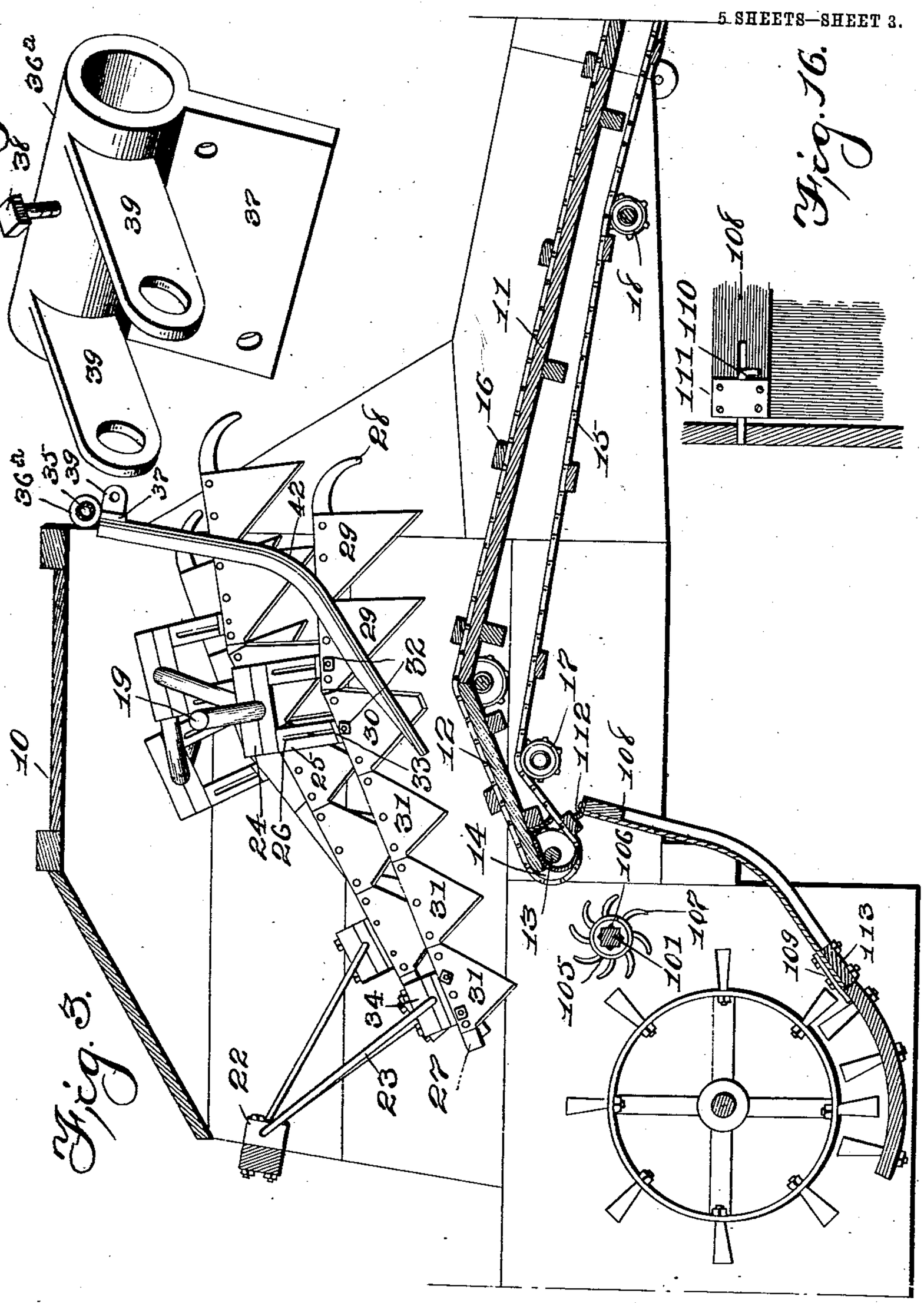

Fig. 16.

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6 SHEETS—SHEET 4.

Fig. 6.

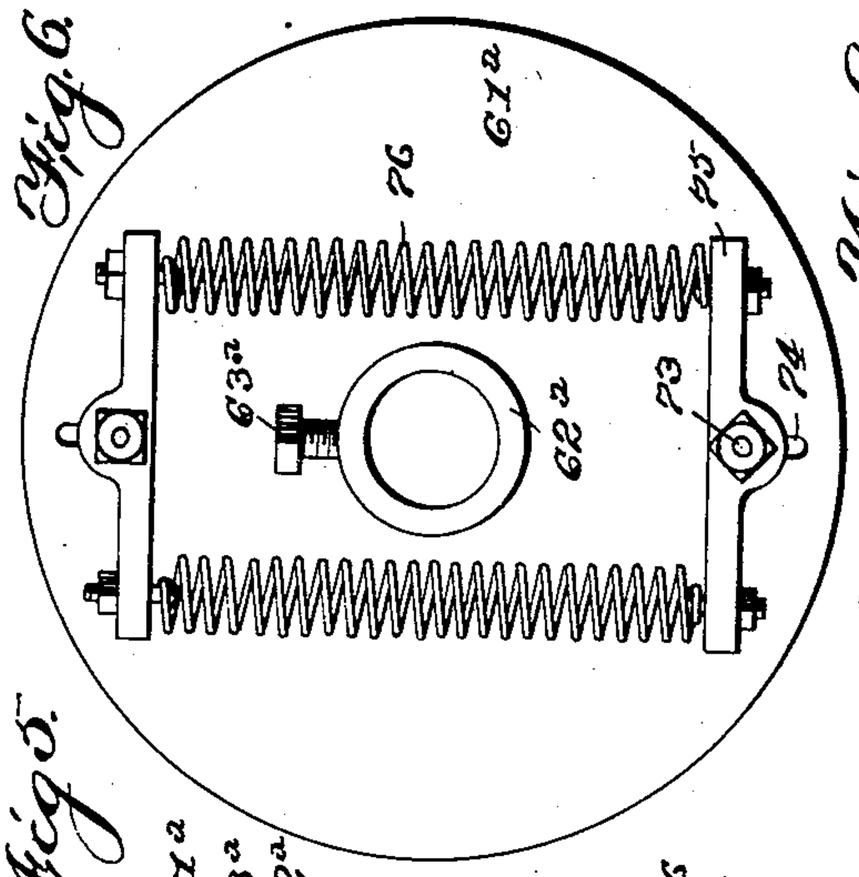


Fig. 9.

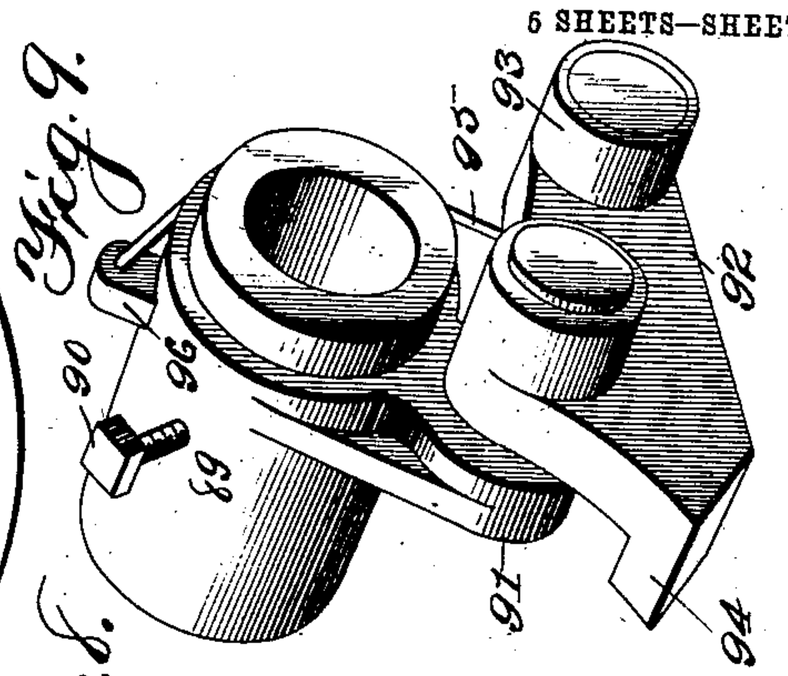


Fig. 5.

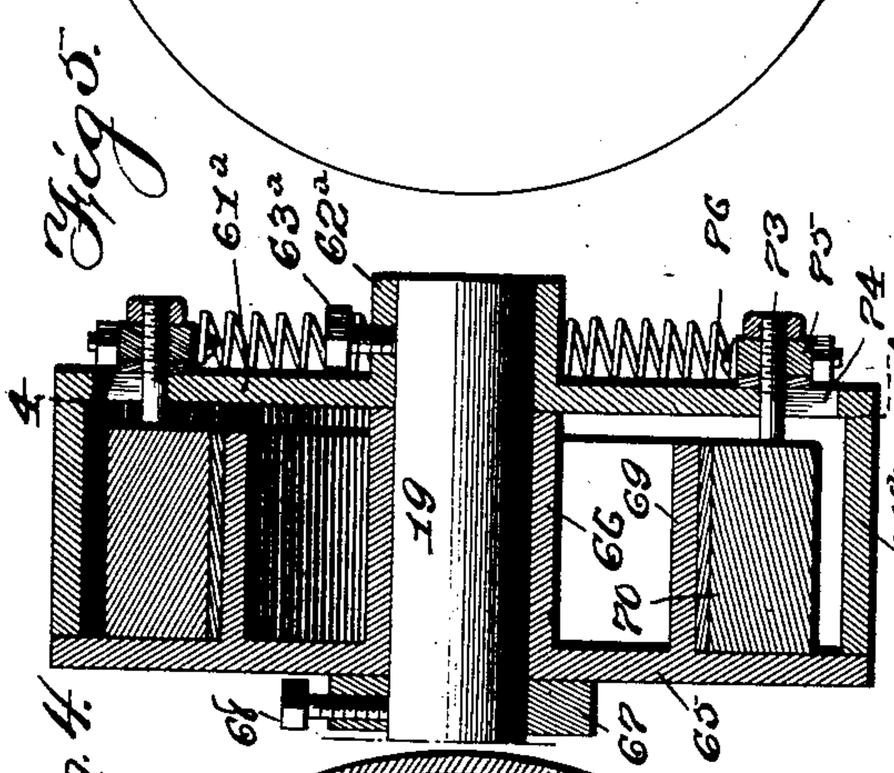


Fig. 8.

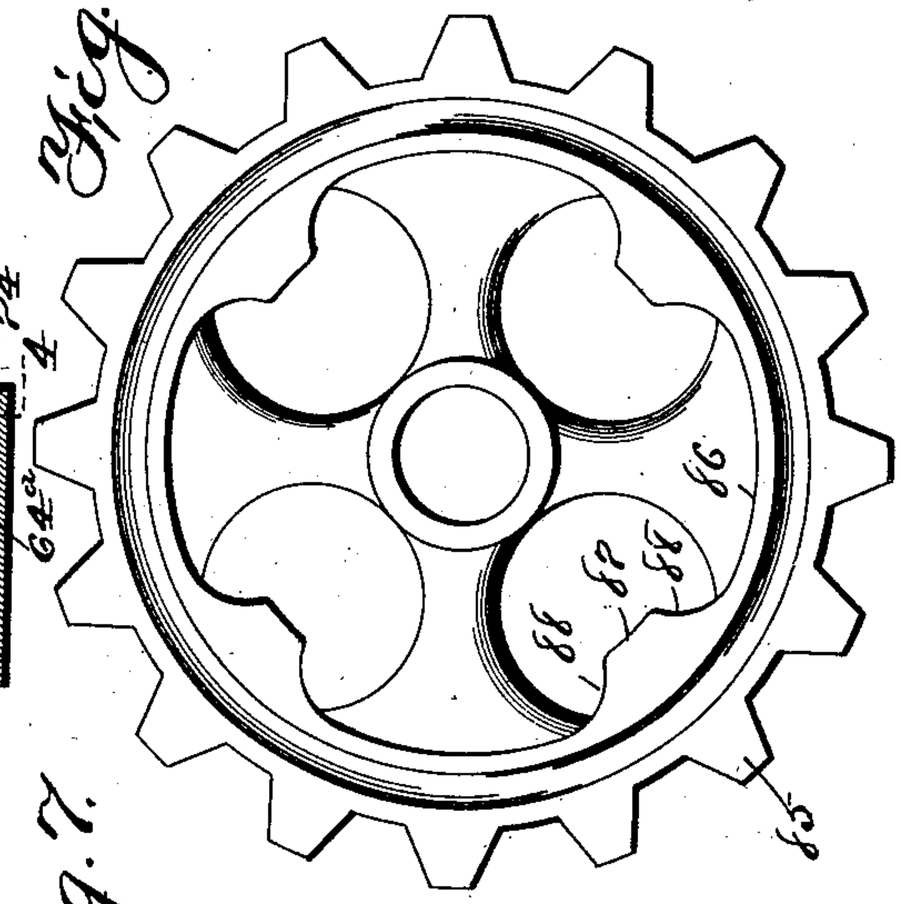


Fig. 4.

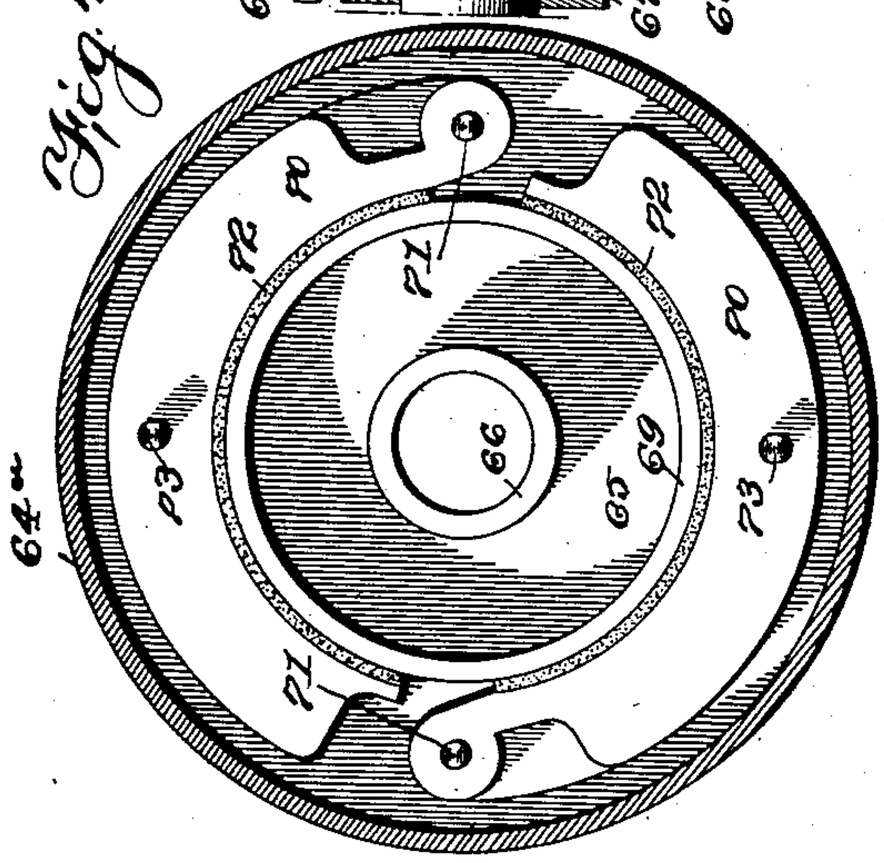
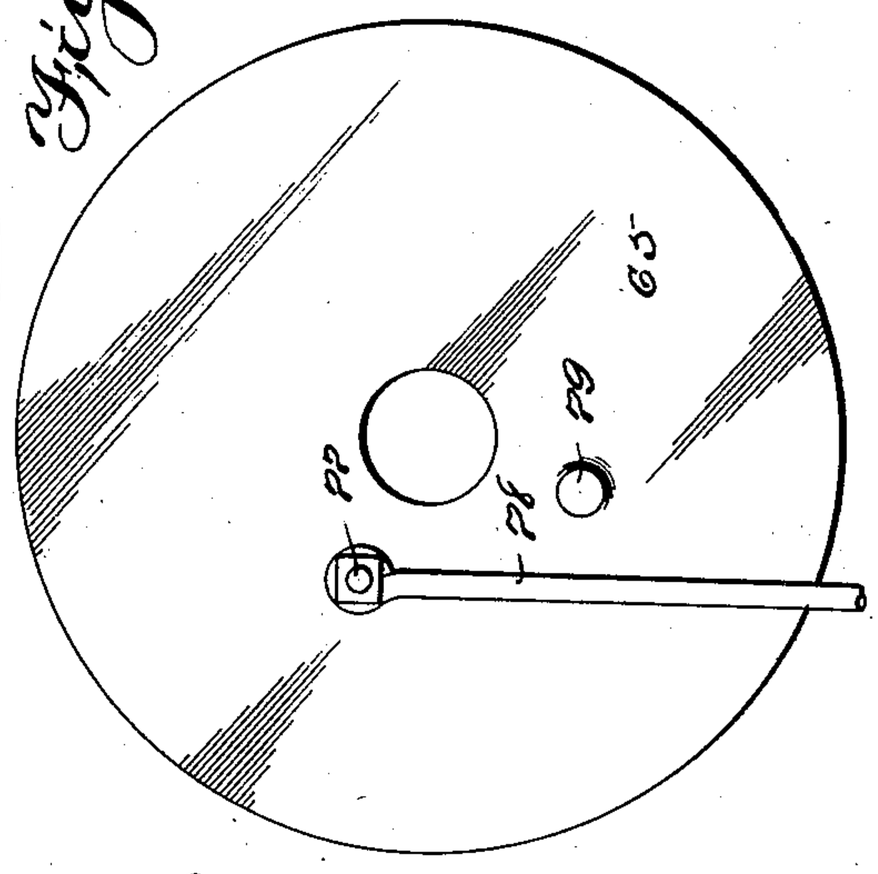


Fig. 7.



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5 SHEETS—SHEET 5.

Fig. 10.

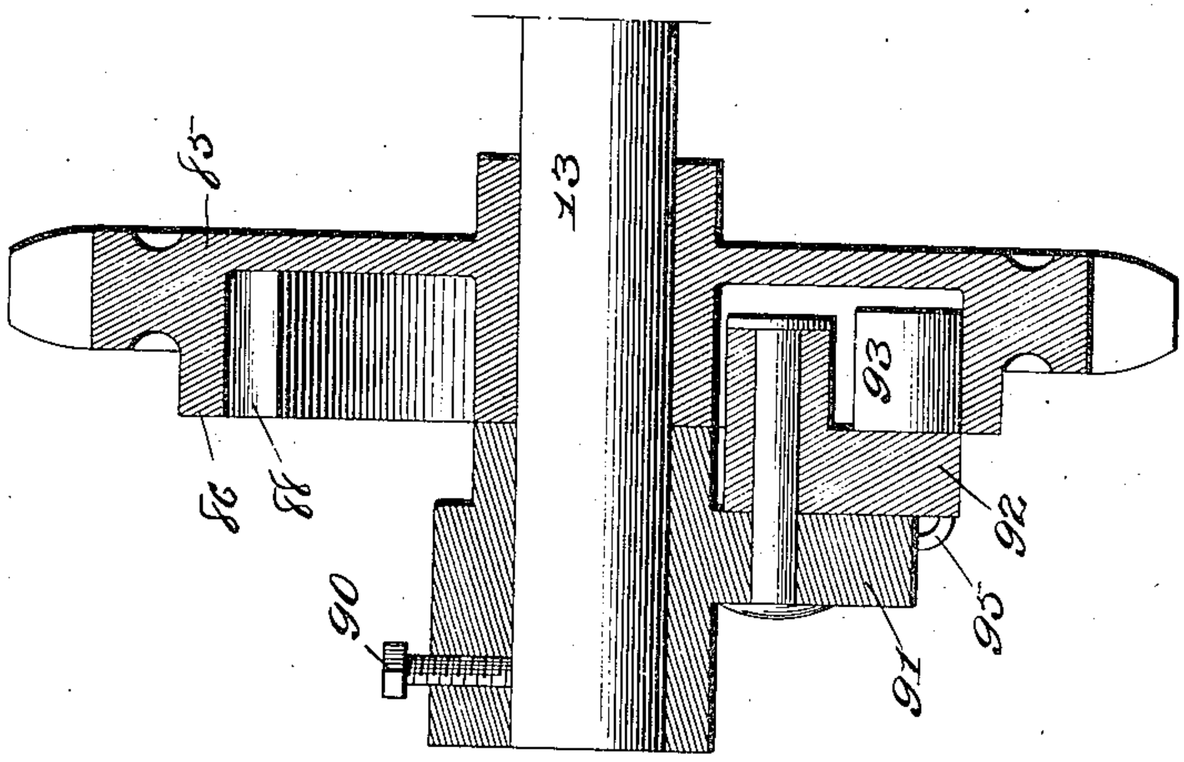


Fig. 12.

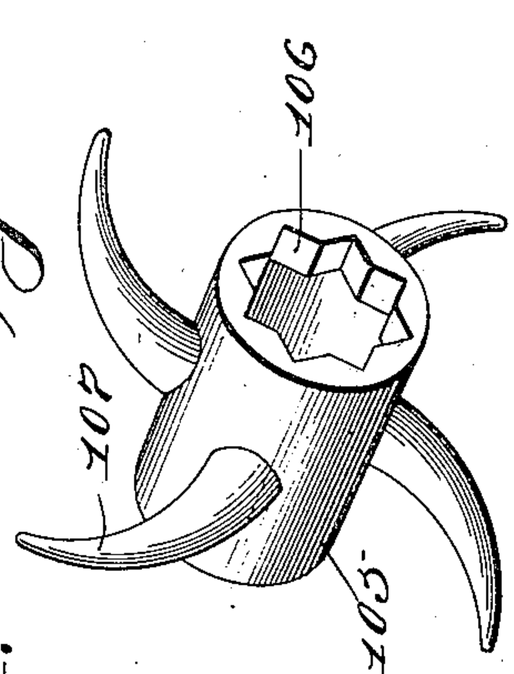


Fig. 11.

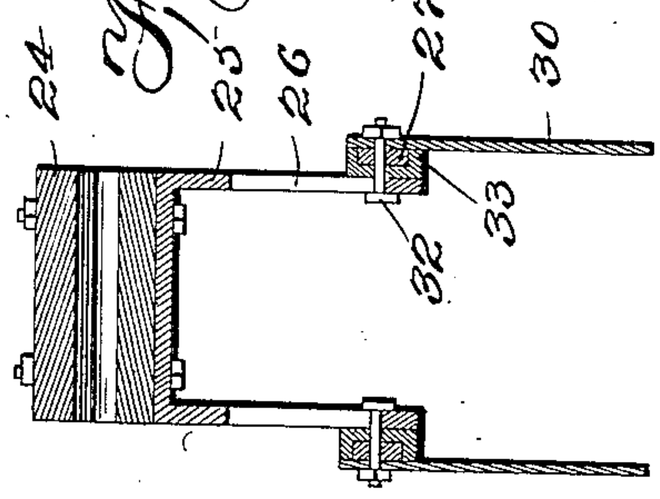


Fig. 13.

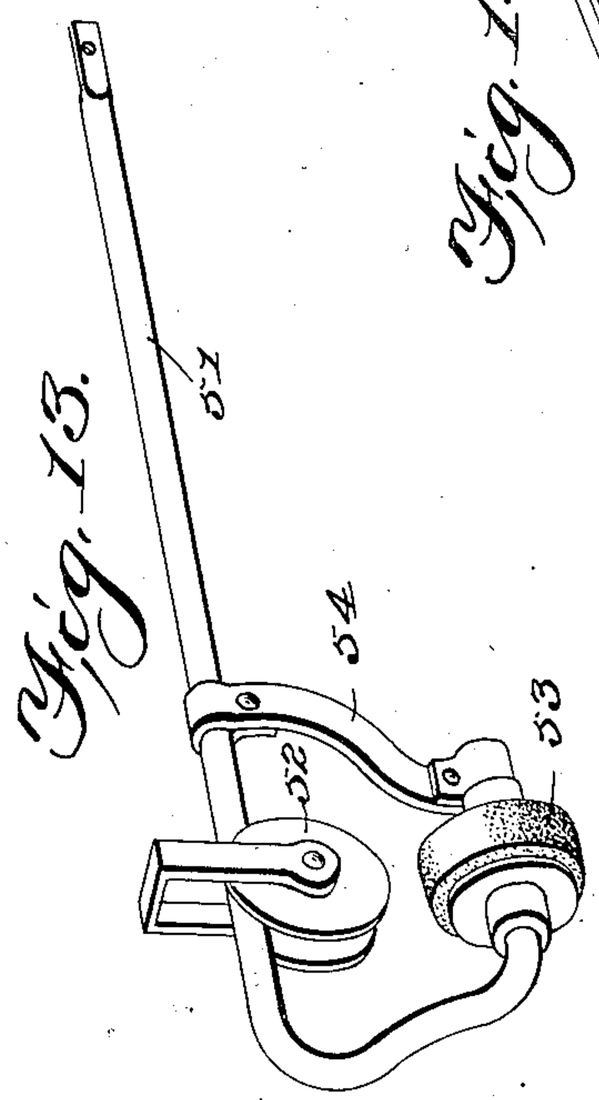
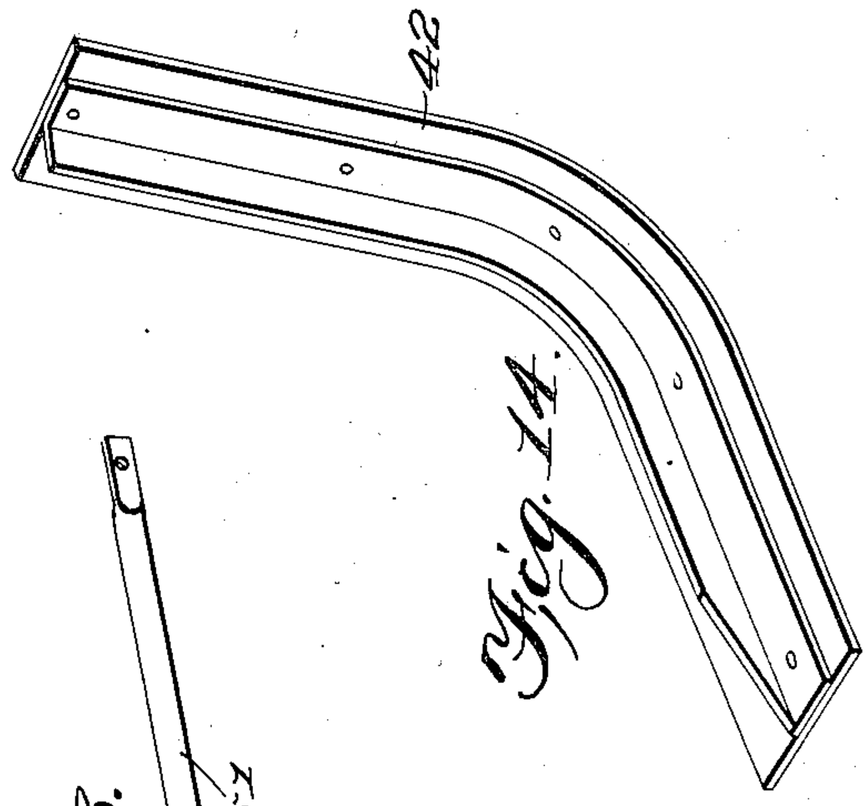


Fig. 14.



Witnesses:

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Henry Manger.

Inventor: Samuel Dunkelberger

by Owig & Lane Attys.

UNITED STATES PATENT OFFICE.

SAMUEL DUNKELBERGER, OF NEWTON, KANSAS.

BAND-CUTTER AND FEEDER.

No. 824,238. Specification of Letters Patent. Patented June 26, 1906.

Application filed October 11, 1902. Serial No. 126,959.

To all whom it may concern:

Be it known that I, SAMUEL DUNKELBERGER, a citizen of the United States, residing at Newton, in the county of Harvey and State of Kansas, have invented certain new and useful Improvements in Band-Cutters and Feeders, of which the following is a specification.

This invention relates to that class of band-cutters and feeders having means for varying the feed of the material according to the capacity of the threshing-cylinder. The great objection to this class of machines is that the controlling mechanism has heretofore been so arranged that to overfeed has either effected the complete stoppage of the conveyer, a very objectionable action, or the band-cutting and feeding means *per se* has been so arranged with respect to the controlling means that its action has been a hindrance rather than a help to the proper feed of the banked material to the threshing-cylinder.

One of the principal objects of the present invention is to provide a combination of features which will effectively secure the proper amount of grain being fed to the cylinder without regard to the amount placed on the conveyer and will efficiently take care of an oversupply by limiting the accretion thereto, at the same time cutting the bands and properly feeding the material banked upon the feeder until the abnormal amount has been disposed of. Moreover, these actions are accomplished without undue strain upon the machinery and without overtaxing any of the parts of the same.

A further object is to provide novel means which will effect the starting or stopping of the feeder when the threshing-cylinder reaches a predetermined speed or upon its falling below the same, said means being entirely efficient, very simple, and by avoiding a great deal of friction prevents the wear consequent therefrom upon the elements making up this structure.

Other features, which it is believed to be unnecessary to outline herewith, are set forth in the following specification and the claims appended thereto.

In the embodiment of the machine shown in the accompanying drawings, Figure 1 is a side elevation of the complete machine, part of the conveyer-frame being broken away and one of the feed-governor disks omitted. Fig. 2 is a top or plan view of the complete machine with its cover removed and parts of the conveyer-frame omitted, the deflector also being omitted from this view. Fig. 3 is a vertical longitudinal sectional view of the complete machine with parts of the conveyer omitted, the deflector being also omitted from this view. Fig. 4 is an enlarged detail sectional view illustrating the speed-governor, taken on the line 4 4 of Fig. 5. Fig. 5 is a central vertical sectional view of the speed-governor. Fig. 6 is an enlarged detail view of the outer plate and counterbalancing-springs of the speed-governor. Fig. 7 is an inner face view of the speed-governor. Fig. 8 is an enlarged detail outer face view of the sprocket-wheel for driving the conveyer-shaft and illustrates the projections on its inner periphery. Fig. 9 is an enlarged detail perspective view of the spring-actuated dog that is fixed to the conveyer-shaft and coöperates with the sprocket-wheel shown in Fig. 8. Fig. 10 is a vertical transverse sectional view of the parts illustrated in Figs. 8 and 9, assembled on the conveyer-shaft. Fig. 11 is a detail sectional view illustrating the means for adjustably connecting the crank-shaft with the band-cutting-knife bars. Fig. 12 is a perspective view of one of the retarder-sections. Fig. 13 is a perspective view of the small friction-wheel for transmitting power from the crank-shaft to the conveyer-shaft and the means for supporting and moving said wheel. Fig. 14 is a perspective view of one of the combined feed-governing float-arms and band-cutting-knife guards or strippers. Fig. 15 is a perspective view of the device for supporting the central float and knife-stripper arm and also for supporting the dividing-board, and Fig. 16 is a detail view illustrating the means for connecting the cylinder-guard board with the sides of the machine-frame.

Referring to the accompanying drawings, the reference-numeral 10 is employed to indicate the machine-frame, which is of the usual construction except that it is arranged to connect with the threshing-machine in such manner as to deliver grain to a point higher relative to the cylinder than is the ordinary machine-frame of this class. The machine-frame has a solid bottom 11, having near its discharge end a short downwardly-inclined portion 12. Directly beneath the discharge end of the bottom piece 12 is a shaft 13, and mounted upon the shaft 13 are the sprocket-wheels 14, around which the sprocket-chains 15 are arranged to travel.

These sprocket-chains are provided with cross pieces or slats 16, which travel toward the delivery end of the machine-frame over the fixed bottom 11 and 12. The sprocket-chains 15 are supported in their return movement upon the idlers 17 and 18.

Mounted in the sides of the machine-frame directly above the highest point in the fixed bottom is a crank-shaft 19, having at one end a pulley 20, which is preferably driven in the ordinary manner by a belt connected with the threshing-cylinder. This crank-shaft is provided with a plurality of crank-arms, preferably all of the same length and extending radially from the axis of rotation of the shaft in opposite directions at angles equidistant from each other. On the opposite end of this crank-shaft 19 is a pinion 21 to impart motion to the feed-governing mechanism, as hereinafter appears. Near the delivery end of the machine-frame and at a point in about the same horizontal plane as the crank-shaft are a plurality of blocks 22, which blocks pivotally support hanger-links 23, said hanger-links being in line with the crank-arms of the crank-shaft 19. Mounted upon each of the crank-arms of the crank-shaft 19 is a bearing-block 24 of the ordinary construction, the central one of said blocks being preferably longer than the outer ones. Secured to each bearing-block 24 is a bracket which, as shown in Fig. 11, has spaced depending terminal arms 25 located at the opposite sides of the box, said arms having vertically-disposed slots 26 therethrough. The band-cutting knives are attached to gyratory bars 27, which are clearly illustrated in Fig. 3, each having a forward part arranged in a substantially horizontal plane and a rearward part inclined downward and toward the delivery end of the machine. By the term "gyratory" is meant more particularly the movement imparted to the above-described type of bars wherein certain portions are carried about in substantially circular vertical paths without, however, being revolved, while other portions are movable back and forth. The front end of each of these bars 27 is in the form of a depending hook 28, and attached to the horizontal forward part of each bar are two cutter-blades 29, having their front edges smooth and arranged substantially at right angles to the bar 27, the rear edges being sharpened and serrated and inclined in a direction from their lower ends upwardly and toward the delivery end of the machine-frame. Immediately in the rear of the blades 29 is a blade 30, which normally stands directly above the highest point of the solid bottom of the machine-frame and is secured to the bar just in rear of its bend. This blade 30 has both its front and rear edges sharpened and serrated, and both edges are arranged at about the same angle relative to the rear portion of the bar 27. Immediately at the rear of the blade 30 are three other blades 31, the front edges of which are smooth and extend from the bar downwardly toward the front end of the machine-frame. These bars having the various blades attached are arranged to operate in pairs, and one pair of bars is adjustably connected with a pair of the brackets 25 by means of bolts 32. Bearing-plates 33 are interposed between the brackets 25 and the bars 27. The rear ends of each pair of bars 27 are connected by a bearing-box 34, and the lower ends of the hanger-links 23 are journaled in said bearing-boxes. By these means it is obvious that the rotation of the shaft 19 will operate the knives in an elliptical path of travel. When one of the knives is at its lower limit of movement, the other knives will be at different points of elevation, as clearly illustrated in Fig. 3. Furthermore, the hooks 28 at the forward ends of the knife-supporting bars will tend to draw grain downwardly under the knives, and if two or more bundles are placed upon the conveyer one on top of the other the hooks will tend to draw the upper bundle off of the lower one, and even in failure of this the knives 29 are long enough to cut through the uppermost bundle and sever the band of the lower one. The central knife 30 is sharpened on both sides, because in its movement it comes close to the highest part of the solid bottom, and both of its edges may operate to sever bands. The front edges of the blades 31 are made smooth, so that they will not be caught in the grain and tend to carry the grain up with them as they move upwardly and forwardly. These knives when in use operate at such speed as to not only sever the bands, but to advance the upper layer of grain upon the conveyer faster than the lower layer of grain is being advanced by the conveyer, thus tending to more thoroughly separate and spread the grain over the entire conveyer. If it is desired to permit a comparatively thick layer of grain to pass between the knives and conveyer, the forward ends of the knives may be elevated by suitably adjusting the bolts 32.

Mounted upon the forward end of the machine-frame in advance of the knife-bar shaft is a rock-shaft 35, supported in bearing-boxes 36. This rock-shaft constitutes a part of the feeder-controlling mechanism and carries means which is engaged by the grain to operate the same. Said grain-engaging means is shown in the form of a float and is constructed as follows: Mounted upon the shaft 35 is a series of collars 36^a, each having integral downwardly-projecting lugs 37 and each being fixed to the shaft 35 by means of a set-screw 38. On the central one of these collars 36^a are two integral forwardly-projecting lugs 39 to support the bracket 40 of the central division-board 41 above the con-

veyer. Fixed to each of the lugs 37 is a combined float and band-cutting-knife-stripper arm, which, as clearly illustrated in Fig. 14, comprises a flat plate 42, the upper end of which is permanently fixed to the lug 37, said plate projecting downwardly and being curved at or near its central portion so that its lower portion extends rearwardly and downwardly between the knife-bearing bars 27. The edges of each of the combined float and stripper arms are arranged close to the sides of the band-cutting knives, and one is preferably located between each pair of knives, so that on both sides of each knife-bearing bar, except the outer ones, there is disposed means for stripping the grain from the knives. On one end of the rock-shaft 35 is a crank-arm 43, and the feed-governor mechanism is connected with this crank-arm. Obviously when the layer of grain upon the conveyer is thick enough to engage one or more of the float-arms the said float will be elevated and the crank-arm 43 will be partly turned, so that the movement of this crank-arm controls the movements of the conveyer, as is hereinafter explained.

The numeral 44 indicates an arm fixed to the machine-frame and supporting a pivoted lever 45. This lever is provided near its central portion with a longitudinal series of openings 46. The crank 43 and the lever 45 are connected by means of a link comprising two flat sections 47 and 48, the former being pivotally connected to the crank 43 and the latter pivotally attached to the lever 45 by a connection which can be placed in any of the openings 46 of said lever 45. The sections 47 and 48 are adjustably connected with each other by a bolt 49, fixed in the bar 47 and passed through a slot 50 in the bar 48, thereby providing means for extending or contracting the link. Pivotally connected with the lower end of the lever 45 is a rod 51. The rear end portion of the rod is slidingly supported upon a sheave 52, and beyond the sheave 52 the bar 51 is bent downwardly and then forwardly to form a journal upon which a friction-wheel 53 is rotatably mounted. A bar 54 connects the extreme end of the rod 51 with the central portion of said rod in front of the sheave 52 to serve as a brace.

From the foregoing description it is obvious that a slight up and down movement of the floats will operate to move the friction-wheel 53 forwardly and rearwardly in a horizontal plane. By adjusting the sections 47 and 48 relative to each other the position of the floats relative to the conveyer may be adjusted without changing the position of the friction-wheel 53, or if the section 48 is adjusted vertically with respect to the lever 45 the relative movement of the friction-wheel 53 to that of the floats will be changed. If the section 48 is pivotally connected with the upper portion of the lever 45, the friction-wheel will move a comparatively great distance relative to the up and down movements of the float, or if the section 48 is connected with the lower portion of the lever 45 the friction-wheel 53 will be moved a less distance relative to the up and down movement of the float. Mounted upon the side of the machine-frame adjacent to the said friction-wheel is a shaft 55, the outer end of which is supported in a metal bracket 56, and geared to the shaft 55 is a large friction-wheel 57, arranged in a vertical plane and having its smooth face toward the side of the machine-frame. This shaft 55 is driven by means of a cog-wheel 58, fixed to it and meshed with the pinion 21, carried by the crank-shaft 19, thereby forming reversing-gearing. The said cog-wheel 58 is materially larger than the pinion, so that the shaft 55 is speeded lower than the shaft 19. The numeral 59 indicates a shaft parallel with the shaft 55 and adjacent thereto. Keyed to the shaft 59 is another friction-wheel 60, similar to the wheel 57, its smooth face being toward the smooth face of the wheel 57, and these friction-wheels are so arranged and proportioned that the periphery of one runs close to the shaft that carries the other. The said shaft 59 is mounted in bearings that not only permit of its rotation, but will permit of a slight longitudinal movement, and arranged on the shaft 59 in its outer bearing-box is a collar 61. This collar is engaged by an expansible coil-spring 62, also mounted on the shaft, and a washer 63 is placed on the shaft to engage the outer end of the spring, which washer is adjusted on the shaft by means of a nut 64. Obviously the spring 62 yieldingly urges the friction-wheel 57 outwardly, and an adjustment of the nut 64 will vary the tension of said spring. The small friction-wheel 53, before described, is interposed between and is in frictional engagement with the adjacent friction-wheels 57 and 60, and obviously if the friction-wheel 53 is in position near the center of the driving-wheel 57 it will of necessity be near the periphery of the driven wheel 60, so that the shaft 59 will be rotated at a much less rate of speed than the shaft 55. On the other hand, if the friction-wheel 53 is moved to a position near the center of the driven friction-wheel 60 it will approach the periphery of the driving friction-wheel 57, and the former will be operated at a greater speed than the latter. Hence a comparatively large range of difference between the speeds of the two shafts is obtained by comparatively short movements of the friction-wheel 53, and no matter what the position of the wheel 53 relative to the other may be motion will be transmitted from the driving-wheel 57 to the driven wheel 60. As is hereinafter set forth, the conveyer is driven from the shaft 59, hence the advantage of this particular form of speed-controlling mechanism.

There will next be described the mechanism by which the motion of the conveyer-driving shaft is automatically stopped when the speed of the crank or knife shaft 19 falls below a certain predetermined rate, as follows: The reference-numeral 61ª indicates a disk having a central hub 62ª fixed to the shaft 19 of the band-cutting knives by means of a set-screw 63ª. At the periphery of the disk 61ª is an annular rim 64ª. The reference-numeral 65 indicates a disk having a central hub 66 surrounding the shaft 19 and rotatable thereon, said hub 66 projecting forwardly far enough to engage the rear face of the disk 61ª. This disk 65 is held in position on the shaft by means of a collar 67, clamped to the shaft by a set-screw 68. Cast integral with the disk 65 is an annular flange 69 larger in diameter than the hub 68 and projecting forwardly toward the disk 61ª, leaving a considerable space between the rim 64ª of the disk 61ª and the flange 69 of the disk 65. Located between the rim 64ª and the flange 69 are two segmental weights 70, each being connected with the disk 61ª by means of a pivot-bolt 71. These weights are preferably provided in their inner faces with leather cushions 72, which cushions engage the flange 69 when the crank-shaft 19 is at rest or moving below a predetermined rate of speed. The following means are provided for maintaining these weights upon the flange 69 and against the action of a predetermined amount of centrifugal force, but permitting the weights to swing apart and release the flange 69 when the speed of the shaft 19 reaches said predetermined rate of speed. Fixed to the central portion of each of the weights 70 is a pin 73. These pins project outwardly through radial slots 74 in the disk 61ª. Connected with each pin 73 is a cross-head 75, and the ends of these cross-heads are connected by two coiled springs 76, located on opposite sides of the shaft 19. Hence the weights 70 are normally held by the resiliency of the springs 76 against the flange 69, and obviously when the speed of the shaft 19 becomes great enough the weights will be thrown outwardly against the force of the springs 76, so that they will be out of engagement with the flange 69, and therefore the disk 65 will not be affected by the rotation of the shaft 19.

On the outer face of the disk 65 is a projection 77, to which a rod 78 is pivoted. On the same face is a pin 79 below the shaft 19 and in such position that when the weights 70 are in engagement with the flange 69 and the shaft 19 is rotated in the direction required for cutting bands the disk 65 will be turned so that the rod 78 moves upwardly until it is engaged by the pin 79, whereupon the disk 65 is stopped and held in this position. Thus when the speed of the shaft 19 becomes rapid enough so that centrifugal action throws the weights 70 outwardly the flange 69 will be released and the rod 78 may move downwardly. The effect of this up and down movement of the rod 78 will be next described.

The reference-numeral 80 indicates a detent-lever fulcrumed at 81 to the machine-frame. One end of the lever projects forwardly and is provided with an adjustable weight 82, and the rod 78 is connected with this end of the lever 80. The other end of the lever 80 projects rearwardly and is provided with a hook 83, and said weight 82 is sufficient to normally hold the rod 78 downwardly, so that the disk 65 is in the position shown in Fig. 7, the further downward movement of the lever 80 being limited by a stop 84, fixed to the machine-frame. As already stated, the reference-numeral 13 indicates the shaft which drives the conveyer. Loosely mounted upon the shaft 13 is a sprocket-wheel 85, having an inwardly-projecting annular flange 86, the inner periphery of said flange 86 being provided with a number of inwardly-projecting teeth 87, having inclined sides 88. Keyed to the shaft 13 adjacent to the outer face of the sprocket-wheel 85 is a sleeve 89, held in place by a set-screw 90. Formed integral with the sleeve 89 is an arm 91, to which a dog 92 is pivoted. One end of the dog 92 carries an inwardly-projecting roller 93, and on the other end of the dog is an outwardly-projecting arm 94. The lower end of the dog is normally held outwardly from the sleeve by means of a spring 95, one end of which is attached to an integral lug 96 on the sleeve 89. The arm 94 normally projects outwardly, so that during its travel it will just escape contact with the hook end 83 of the lever 80. When, however, the said end of the lever 80 is moved downwardly, it will be located in the path of movemnt of the end 94 of the dog 92, which, engaging it, will stop the rotation of the sleeve 89, and consequently the conveyer-shaft 13. Simultaneously with this action the dog will be swung upon its pivot, and the roller 93 being thereby moved inwardly out of engagement with the teeth 87 will permit the sprocket-wheel 85 to rotate freely on the shaft 13. However, at other times when the lever 80 is held out of engagement with the dog 92 the roller 93 engages behind one of the teeth 87 and locks the sprocket-wheel 85 to the shaft 13, causing the latter to rotate, so that the conveyer is normally driven except when the dog is held inoperative by the lever 80. The driven shaft 59, already described, has secured thereto a sprocket-wheel 97, and a chain 98 connects the wheels 97 and 85. A chain-tightener 99 is mounted on a pivoted arm 100 and is capable of being brought into engagement with the chain 98 to adjust its tension.

Retarding means are also employed for

temporarily supporting and holding the grain between the discharge end of the conveyer and the threshing-cylinder, so that the cylinder may comb out bundles of wet tangled masses of grain before permitting it to pass about the concave. This mechanism comprises a square shaft 101, having bearings at the sides of the machine-frame and connected with the conveyer by means of a sprocket-wheel 102 on the conveyer-shaft, a large sprocket-wheel 103 on the shaft 101, and a chain 104, connecting the wheels. By this means it is obvious that the shaft 101 is rotated with the conveyer and is stopped and started and its speed regulated the same as that of the conveyer, and by reason of the difference in the size of the sprocket-wheels 102 and 103 the shaft 101 rotates at less speed than the conveyer-shaft. The shaft 101 carries the retarding means made up of sections detachably fitted on the shaft. Referring to Fig. 12 of the drawings, one of the grain-retarder sections will be seen in perspective. Each of these sections comprises a hollow hub 105, having inwardly-projecting rims at its ends, said rims being provided with notches 106 on their inner peripheries, which notches are arranged to receive the corners of the square shaft, and inasmuch as there are eight notches provided it is obvious that the hubs may be arranged in staggered positions. Formed integral with the hub is a series of curved tapering retarder-arms 107, the outer ends of said arms being curved with respect to a radial line and in a rearward direction relative to the path of travel of the retarder-arms. Obviously when these sections are placed on the shaft 101 and in a staggered position, as indicated, they will receive grain from the discharge end of the conveyer and carry it toward the threshing-cylinder. Preferably the retarder is placed in such position that its curved arms will run closer to the threshing-cylinder than to the conveyer, and inasmuch as the arms 107 move at a much less rate of speed than the cylinder-teeth the retarder will act in conjunction with the cylinder somewhat on the same principle as the concave teeth act, and between the retarder and cylinder the grain will be combed out and wet or tangled masses of grain will be torn apart and thoroughly separated, thus avoiding the possibility of choking or clogging the cylinder. Furthermore, the speed of the retarder will increase and diminish with the speed of the conveyer, and hence if an excessive amount of grain is on the conveyer and retarder they will both move so slowly as to permit grain to pass to the cylinder only in a normal quantity. On the other hand, if a very thin layer of grain is on the conveyer and retarder the speed of both will be accelerated to such an extent as to feed a normal quantity of grain to the cylinder, or in the event that the retarder should be stopped when a large quantity of grain is placed upon it all of the grain resting thereon will be held thereby and cannot pass to the threshing-cylinder until the said retarder is again started.

As will be noted by reference to Fig. 3 of the drawings, there is a suitable space between the discharge end of the conveyer and the front of the concave, and I have provided means whereby grain is prevented from being thrown from the cylinder in a direction under the feeder-frame, and such grain as passes between the retarder and cylinder is directed between the cylinder and concave, said means comprising a curved board 108, having at its lower end two downwardly-projecting straps 109, one at each corner, said straps being designed to pass on the upper and lower sides of the edge of the concave, and thus securely hold the board 108 in position in alinement with the concave. At the upper corners of the board 108 are two slide-bolts 110, passing through holders 111 to enter openings in the sides of the band-cutter and feeder frame. By this means the said board is detachably and securely held in its fixed position. Fixed to the top edge of the board 108 is a flexible strip 112, which strip has its upper free end in the path of travel of the cross-pieces of the conveyer, and secured to the fixed bottom 12 of the conveyer is a cross-piece 113, having a flexible strip 114 secured thereto and extending downwardly so that its free lower end engages the top edges of the cross-pieces of the conveyer directly above the point where the strip engages the bottom edges of the same cross-pieces. By means of these flexible strips the cross-pieces of the conveyer are kept free from straw, and threshed grain will be prevented from passing through the opening through which the conveyer travels.

In practical use and assuming that the belt-wheel 20 is connected by a belt with the threshing-cylinder, it is obvious that the knife-shaft 19 will be rotated at high speed during the operation of the threshing-cylinder. Assuming, however, that the machine is at a state of rest and that a number of bundles of grain have been thrown upon the conveyer, as soon as the machine starts the knife-shaft will begin to rotate. This will rotate the driving-shaft 55, and through the medium of the friction-wheel the driven shaft 59, causing the rotation of the sprocket-wheel 85 through the connecting-chain 98. This movement of said sprocket-wheel, however, does not affect the rotation of the shaft 13, for, as has heretofore been explained, the jaws 70 are normally in engagement with the flange 69 of the disk 65. Therefore, when the machine starts the disk 65 will be partially revolved, and the lever 80, connected thereto, will be swung into the path of movement of the dog 92. Consequently said dog will be disengaged from the said sprocket-

wheel 85. As soon as the shaft 19 reaches the necessary rate of speed, however, the jaws 70 will fly outwardly, and thereby release the disk 65. At once said disk will have a retrograde movement, permitting the lever to swing so as to disengage the dog 92. Immediately upon its release the said dog, impelled by the spring 95, will be moved to bring the roller 93 into coaction with one of the teeth 87, and the wheel and shaft being thereby locked together, both will rotate. Thus the conveyer or apron will be driven as long as the proper speed of the governor is maintained.

It is to be noted that not only is the weight of the combined float and stripper sufficient to normally hold it in its lowest limit of movement, but the tendency of the friction-wheel 53 is to run to the periphery of the driving-disk. Thus under ordinary conditions the friction-wheel 53 maintains its limit of movement toward the center of the driven friction-wheel 60 and the periphery of the driving friction-wheel 57, driving the friction-wheel 60 at its maximum speed, which of course drives the conveyer very rapidly. As soon, however, as the thickness of the layer of grain of the conveyer elevates the float the friction-wheel 53 will move forwardly toward the periphery of the driven friction-wheel 60, thus immediately reducing the speed of the conveyer. The movement of the friction-wheel 53 is consequently controlled by the thickness of the layer of grain upon the apron, as already explained, and therefore the grain will be fed to the threshing-cylinder at a uniform and normal flow, regardless of the manner in which the grain is pitched upon the conveyer. The endwise movement of the friction-wheel is limited by its journal striking the driving and driven shafts, thereby preventing said wheels running off the peripheries of the friction-disk and likewise preventing the float-arms rising into the path of movement of the crank-arms or dropping low enough to engage the conveyer or draper. Attention is directed to the fact that the friction-wheel 53 is mounted upon the rod which is supported in such a manner as to be capable of free longitudinal movement and slight swinging movement laterally, and by placing this friction-wheel between two large friction-wheels, one of which is held toward the other by a yielding spring, it is obvious that the necessary frictional engagement between the several wheels is maintained by said spring and that there is practically no friction between the rod and the bearings supporting the same. Moreover, the roller-support avoids the use of sliding bearings for the rod 51, which being in a dusty place would, if such bearings were employed, soon clog up and operate with difficulty.

Particular attention is invited to the combination whereby the feed to the cylinder is kept normal with respect to the amount of grain placed upon the conveyer-apron. When the material banks against the float, the speed of the apron is reduced, as already described; but the cutters are so arranged that they will be driven at their ordinary speed, and, operating through the float, will still cut the bands and act in their usual feeding capacity to carry their usual supply over the rear end of the bed. During this movement, however, it will be noted that the draper is not stopped entirely, but the speed thereof is greatly increased or diminished, accordingly as the material engages the float-arms. This variation of the speed is accomplished without the necessity of causing abnormal strains on the driving means, as there are no parts to be started from a state of rest. Moreover, it will be observed that the mechanism is separate from that which causes the entire stoppage of the feeder.

It will be noted that the curvature of the float-arms follows to a marked degree the path of travel of the front knife-blades. This is important, as it secures a more even engagement of the said blades with the grain throughout their movements in advance of the arms. Another point is the peculiar relation of the retarder with respect to the cylinder, the rear end of the conveyer, and the rear ends of the cutter bars and knives. The surplus grain, as already described, is stopped by the float and the upper portion thereof is cut and passed beneath said float by the knives; but the knives further than this carry such material to and upon the retarder. The retarder, running at lower speed than the cylinder and having its teeth in close proximity to the same, holds solid wads or masses of tangled grain against the passing high-speed-cylinder teeth, allowing such grain to be torn and combed out into a thin even sheet before reaching the concave. Moreover, the front knives cut close to the conveyer, while the rear ones cut the bands over the retarder, besides pushing the grain into the retarder-teeth, thereby causing the retarder to hold the grain better, as solid or baked bundles do not engage or become pierced by the retarder freely without assistance. Consequently the knives cut and push the bundles of grain into the retarder-teeth in order to prevent the cylinder from jerking whole bundles into the concave, thereby avoiding the slugging of the cylinder.

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

1. In a band-cutter and feeder, the combination with a driving-shaft, of a separate driven shaft, friction-disks carried by the shafts and disposed in overlapping relation, one of said disks being movable toward and from the other, a yielding pressure device for urging the movable disk toward said other

disk, a longitudinally-movable support located transversely of the shafts and having a swinging movement on its longitudinal axis, a friction-wheel journaled on the support and swinging therewith, being interposed between and having frictional engagement with the disks, said wheel having its axis disposed in angular relation to the axes of the disks and being urged into frictional engagement with one of the disks by pressure against it of the spring-pressed movable disk, a conveyer driven from the driven shaft, and means located over the conveyer for moving the friction-wheel toward and away from the axes of the shafts.

2. In a band-cutter and feeder, the combination with a suitable frame, of a bracket secured to one side of the frame, substantially parallel shafts arranged between and journaled upon the bracket and frame, friction-disks carried by the shafts, means for driving one of said shafts, a conveyer having a connection with the other shaft, a longitudinally-movable supporting-rod arranged in a plane between the disks and carrying a depending journal, a friction-wheel mounted on the journal and having frictional engagements with the disks, a rock-shaft journaled over the conveyer and having a crank-arm, adjustable connections between the crank-arm and supporting-rod, and depending arms secured to the rock-shaft and disposed over the conveyer.

3. In a band-cutter and feeder, the combination with a conveyer, of means for driving the conveyer, speed-varying mechanism interposed between the driving means and the conveyer and connected therewith for securing the continuous movement of the conveyer at varying rates of speed, a movable actuating device for operating the speed-varying mechanism, located over the conveyer and having a connection with said mechanism, said device comprising depending spaced arms located over the conveyer in advance of its rear end and in the path of movement of abnormal amounts of grain carried thereby, and band-cutting mechanism including gyratory knife-bars carrying knives, certain of said knives operating between the arms downwardly in advance thereof and beneath the lower ends, of said arms and others having gyratory paths of movement in rear of the lower ends of the arms and directly adjacent to the rear end of the conveyer.

4. In a band-cutter and feeder, the combination with a conveyer, of means for driving the conveyer, speed-varying mechanism interposed between the driving means and the conveyer and connected therewith for securing a continuous movement of the conveyer at varying rates of speed, a movable actuating device for operating the speed-varying mechanism, located over the conveyer and having a connection with said mechanism, said device comprising a rock-shaft having a connection with the speed-varying means, spaced depending rearwardly-curved arms having their lower ends spaced above the conveyer in advance of its rear end, a crank-shaft journaled above the lower ends of the arms, and gyratory knife-bars connected with the crank-shaft and having depending cutter-blades, certain of said blades operating between the arms downwardly in advance of the same and beneath the lower ends of said arms in proximity to the conveyer, and others operating over the rear end of the conveyer entirely in rear of the arms.

5. In a band-cutter and feeder, the combination with a bed comprising an upwardly-inclined front portion and a downwardly-inclined rear portion forming an apex, of an endless conveyer apron movable over the downwardly and upwardly inclined portions, means for driving the conveyer including speed-varying mechanism, a float suspended above the conveyer and connected with the speed-varying mechanism, said float including downwardly and rearwardly inclined spaced arms extending over the apex of the bed, the lower ends of said arms being disposed above the downwardly-inclined portion of the bed contiguous to its upper end, and band-cutting mechanism supported above the lower ends of the float-arms and including cutters that move between the arms downwardly in advance of the same and rearwardly at the lower ends of said arms, said cutters extending over the apex of the bed and coöperating with both the upwardly and downwardly inclined portions thereof.

6. In a band-cutter and feeder, the combination with a crank-shaft, of a driving-shaft geared to the crank-shaft, a driven shaft disposed alongside the driving-shaft, a conveyer including a shaft, a connection between the driven shaft and conveyer including a clutch, a speed-governor carried by the crank-shaft for effecting the operation of the clutch, overlapping friction-disks carried respectively by the driving and driven shafts, a friction-wheel interposed between and in frictional engagement with the adjacent faces of the disks, said wheel being movable toward and from the axes of movement of the disks, means for effecting the movement of said friction-wheel including a plurality of depending float-arms disposed over the conveyer, and band-cutting mechanism including gyratory cutter-bars secured to the crank-shaft and having knives operating through the spaces between and also below the depending arms.

7. In a band-cutter and feeder, the combination with a crank-shaft, of bearing-boxes journaled on the crank-shaft, a bracket fixed to each bearing-box and having spaced depending arms provided with longitudinal slots, a pair of knife-bars for each bracket extending transversely of the arms, and bolts

passing through the bars and through the slots in the arms for adjustably connecting the knife-bars with the bearing-boxes.

8. In a band-cutter and feeder, the combination with a conveyer-belt having an upwardly-inclined front portion and a downwardly-inclined rear portion, of a threshing-cylinder located in rear of, below, and spaced from the said downwardly-inclined portion, a rotary retarding device journaled between the said downwardly-inclined portion of the belt and the threshing-cylinder in spaced relation thereto and in substantial alinement therewith, and gyratory band-cutting means operating over the conveyer-belt and the retarder and having its rear portion inclined downwardly to correspond substantially to the path of travel of the material over the rear portion of the belt and retarder, the front portion of said gyratory band-cutting means being set at an inclination and operating over the upwardly-inclined front portion of the conveyer-belt.

9. In a band-cutter and feeder, the combination with a machine-frame, of a conveyer-platform extended upwardly and rearwardly and then downwardly and rearwardly, a conveyer traveling over said platform, a shaft above the platform having a number of crank-arms thereon extended in different directions, a bearing-box on each crank-arm, a bracket having slotted sides fixed to the under surface of each pair of blocks, a pair of knife-bars for each pair of brackets extended longitudinally of the machine-frame, their forward end portions being substantially horizontal and their rear ends inclined downwardly and rearwardly substantially parallel with the downwardly and rearwardly inclined portion of the platform, bolts passing through the bars and through the slots in the brackets for adjustably connecting the knife-bars with the bearing-blocks, one or more knife-blades at the forward end of each knife-bar, said blades having smooth front edges substantially at right angles to the knife-bar and sharpened rear edges inclined downwardly and forwardly from the knife-bar, a knife-blade on each knife-bar at a point substantially above the highest part of the platform, said knife having its edges tapered toward each other and both edges being sharpened, one or more knives on the downwardly and rearwardly inclined portion of each knife-bar having smooth front edges inclined downwardly and forwardly, and hangers for supporting the rear ends of each pair of knife-bars.

10. In a band-cutter and feeder, the combination with a threshing-cylinder, of a conveyer having a downwardly-inclined rear end that is located in advance of the upper portion of the cylinder, a shaft for operating the conveyer, a driving-shaft, means for transmitting motion from the driving-shaft to the conveyer-shaft, a speed-governor for varying the speed of the conveyer-shaft with respect to that of the driving-shaft while both are in motion, a rotary retarder located between the conveyer and cylinder, below the rear end of said conveyer and in advance of the upper portion of the cylinder, said retarder comprising a shaft extending transversely of the machine and rotating in the same direction as the conveyer, said shaft having a number of outwardly-projecting arms receiving the material from the conveyer and delivering it to the cylinder, means for operatively connecting the retarder with the conveyer, and gyratory cutter-bars extending over the conveyer and retarder.

11. In a band-cutter and feeder, the combination with a driving-shaft, of a conveyer, a shaft for operating the conveyer, a float above the conveyer, a friction-wheel operatively connected with the conveyer-shaft, a small friction-wheel in engagement with the aforesaid friction-wheel and operatively connected with the driving-shaft, and means controlled by the float for moving the small friction-wheel to and from the central portion of the large friction-wheel for varying the speed of the conveyer-shaft relative to that of the driving-shaft while both are in motion, a retarder beneath the discharge end of the conveyer comprising a shaft extending transversely of the machine and rotating in the same direction as the conveyer, said shaft having a number of outwardly-projecting arms, and means for operatively connecting the retarder with the conveyer.

12. In a band cutter and feeder, the combination with a threshing cylinder and concave, of a band-cutter and feeder-frame located at some distance above the concave, a curved board detachably connected to the concave at one end and detachably connected with the feeder-frame, a flexible strip at its other end, an endless conveyer on the band-cutter and feeder-frame, said conveyer having cross-pieces which during their return movement engage said flexible strip, a stationary cross-piece above the lower portion of the conveyer, and a flexible strip thereon extending downwardly to engage the upper surface of the lower portion of the conveyer directly above the first-mentioned flexible strip.

13. In a band-cutter and feeder, the combination with a conveyer, of driving and driven shafts, a connection between the driven shaft and the conveyer, friction-disks carried by the shafts, a friction-wheel movable between and in frictional engagement with the disks, a movable support for the friction-wheel, said driving and driven shafts being in the line of movement of the support, a roller-bearing for the support, and a movable float located over the conveyer and having connections with the friction-wheel support.

14. In a band-cutter and feeder, the combination with a threshing-cylinder, of a feeder-bed arranged in advance of the cylinder and having a downwardly-inclined rear end, a conveyer-apron movable over the bed, a revoluble retarding device interposed between the rear end of the bed and the cylinder and having teeth located in proximity to the teeth of said cylinder, gyratory cutter-bars having downwardly-inclined rear portions that extend over the downwardly-inclined portion of the bed and over the retarder, and cutter-blades secured to the bars.

15. In a band-cutter and feeder, the combination with a crank-shaft, of bearing-blocks journaled on the crank-shaft, a bracket having slotted sides fixed to the under side of each bearing-block, a pair of knife-bars for each bracket, and bolts passing through the bars and through the slots in the bracket for adjustably connecting the knife-bars with the bearing-blocks.

16. In a band-cutter and feeder, the combination with a bed provided with a front upwardly-inclined portion and a rear downwardly-inclined portion, forming at their adjacent ends an apex, of a conveyer-belt movable over said bed, crank-arms arranged substantially over the apex of said bed, links pivotally supported in rear of the crank-arms, continuous rigid cutter-bars having connections with the crank-arms and links, said bars having intermediate bends disposed above the apex of the bed, and cutter-blades secured to the bars, the lower ends of said blades being located in lines substantially parallel with the inclination of the bed.

17. In a band-cutter and feeder, the combination with a bed provided with a front upwardly-inclined portion and a rear downwardly-inclined portion, forming at their adjacent ends an apex, of a conveyer-belt movable over the upwardly and downwardly inclined portions of the bed, crank-arms arranged substantially over the apex of said bed, links pivotally supported in rear of the crank-arms, continuous rigid cutter-bars having connections with the crank-arms and links, said bars having intermediate bends at the crank-arms and disposed above the apex of the bed, and cutter-blades rigidly secured directly to the bars and located on opposite sides of the apex, the lower ends of said blades being located in lines substantially parallel with the inclination of the bed, and the blades in rear of the apex having cutting edges.

18. In a band-cutter and feeder, the combination with a conveyer-belt, of a threshing-cylinder, a concave located in rear of and spaced from the belt, said cylinder having teeth, downwardly-extending grain-directing means bridging the space between the rear end of the conveyer and the concave, a rotary retarding device journaled between the belt and threshing-cylinder and having rotary teeth, said rotary teeth coacting directly with the teeth of the cylinder at the rear side of the retarder and delivering the material from the conveyer-belt to the cylinder, and said retarder being disposed above the horizontal plane of the center of the cylinder and wholly above the grain-directing means, and gyratory band-cutting means having knives operating over the rear portion of the belt and over the retarder.

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Witnesses:
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