(No Model.) 9 Sheets—Sheet 1.

C. E. DONNELLAN.

STRAW BINDING HARVESTER.

No. 462,306. Patented Nov. 3, 1891.

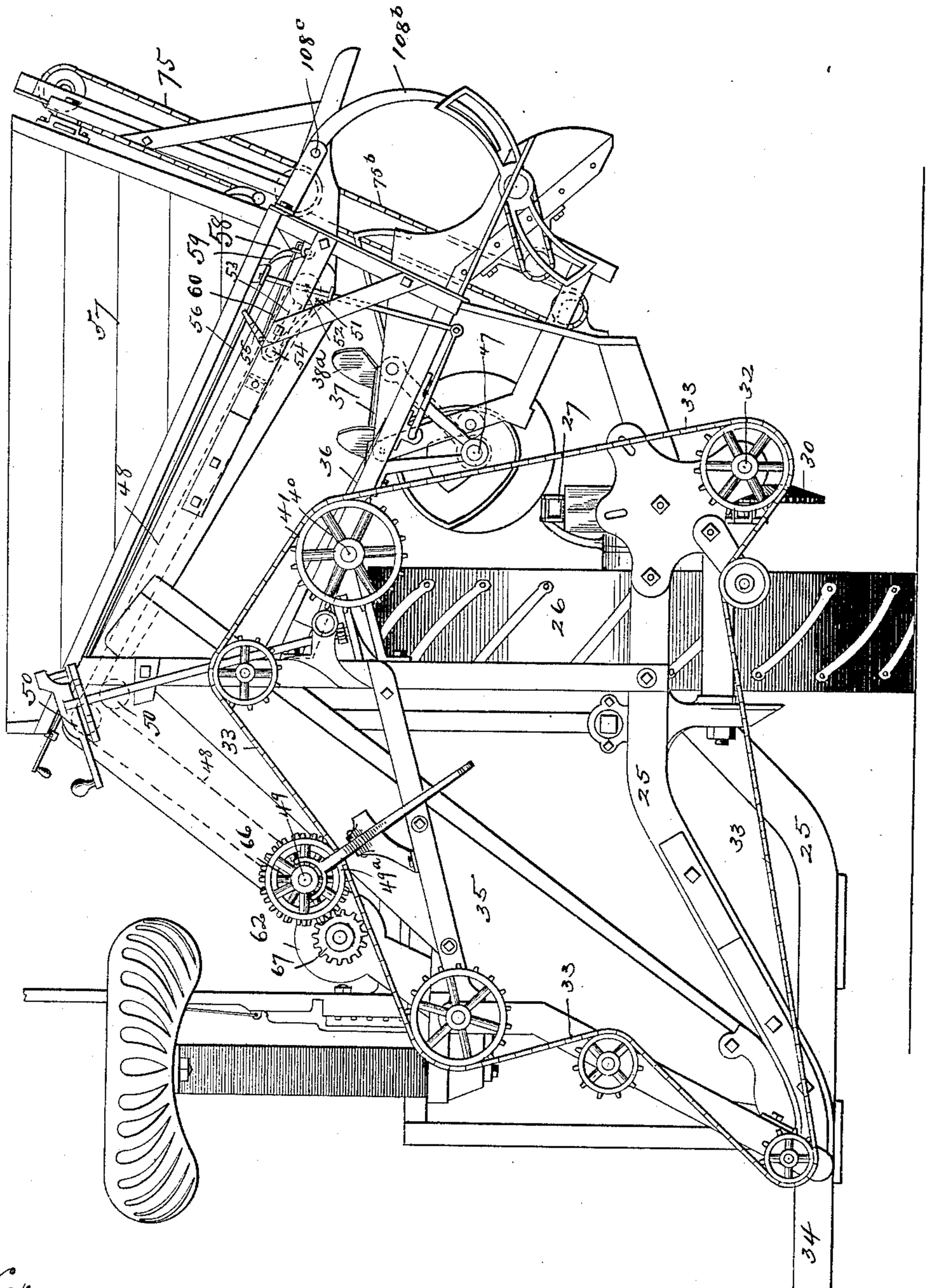

Fig. 1.

Witnesses,
D. F. Mann,
L. F. McCrea

Inventor,
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(No Model.) 9 Sheets—Sheet 2.

C. E. DONNELLAN.

STRAW BINDING HARVESTER.

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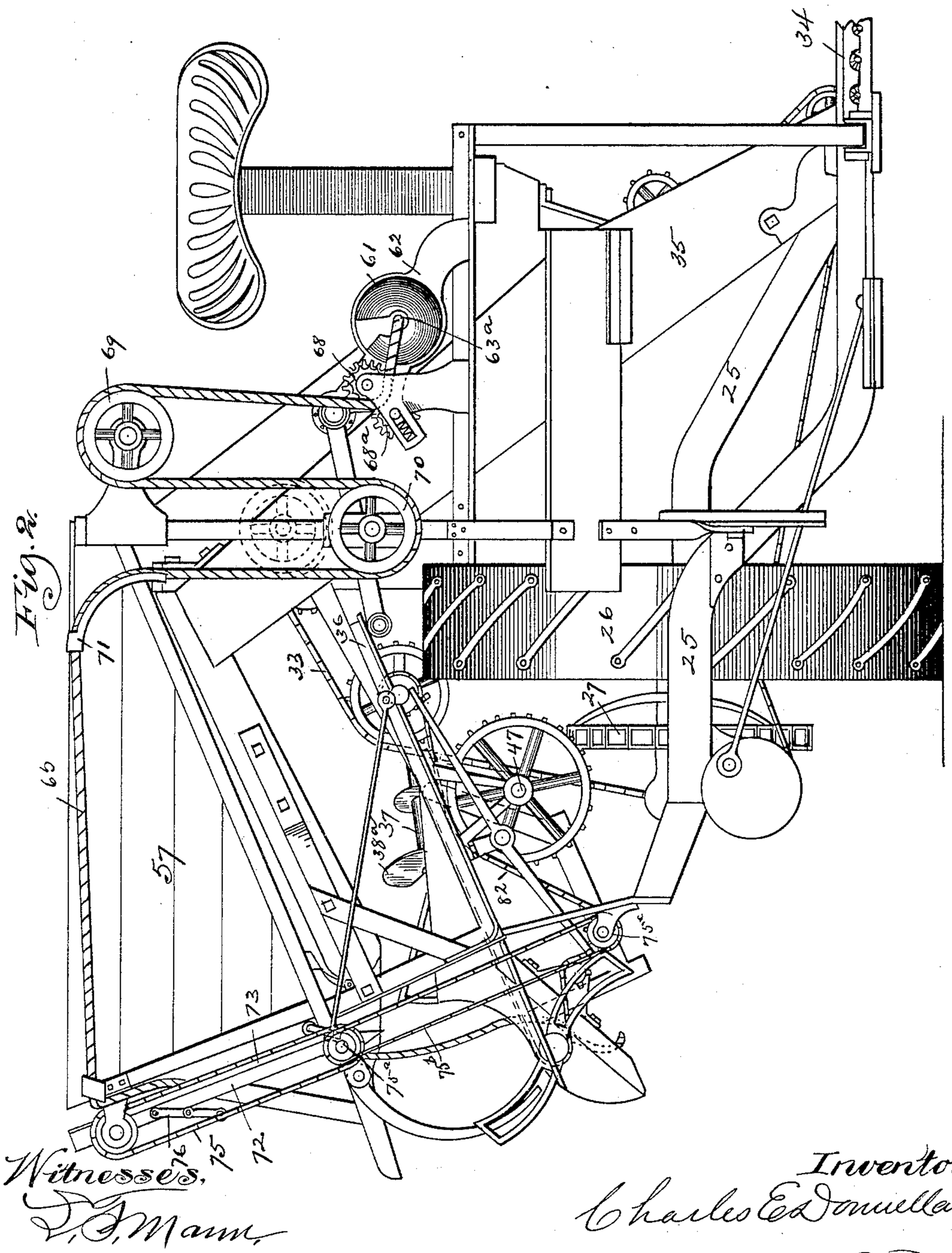

Fig. 2.

Witnesses,
F. G. Mann.
L. F. McIlvria.

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(No Model.) 9 Sheets—Sheet 3.

C. E. DONNELLAN.

STRAW BINDING HARVESTER.

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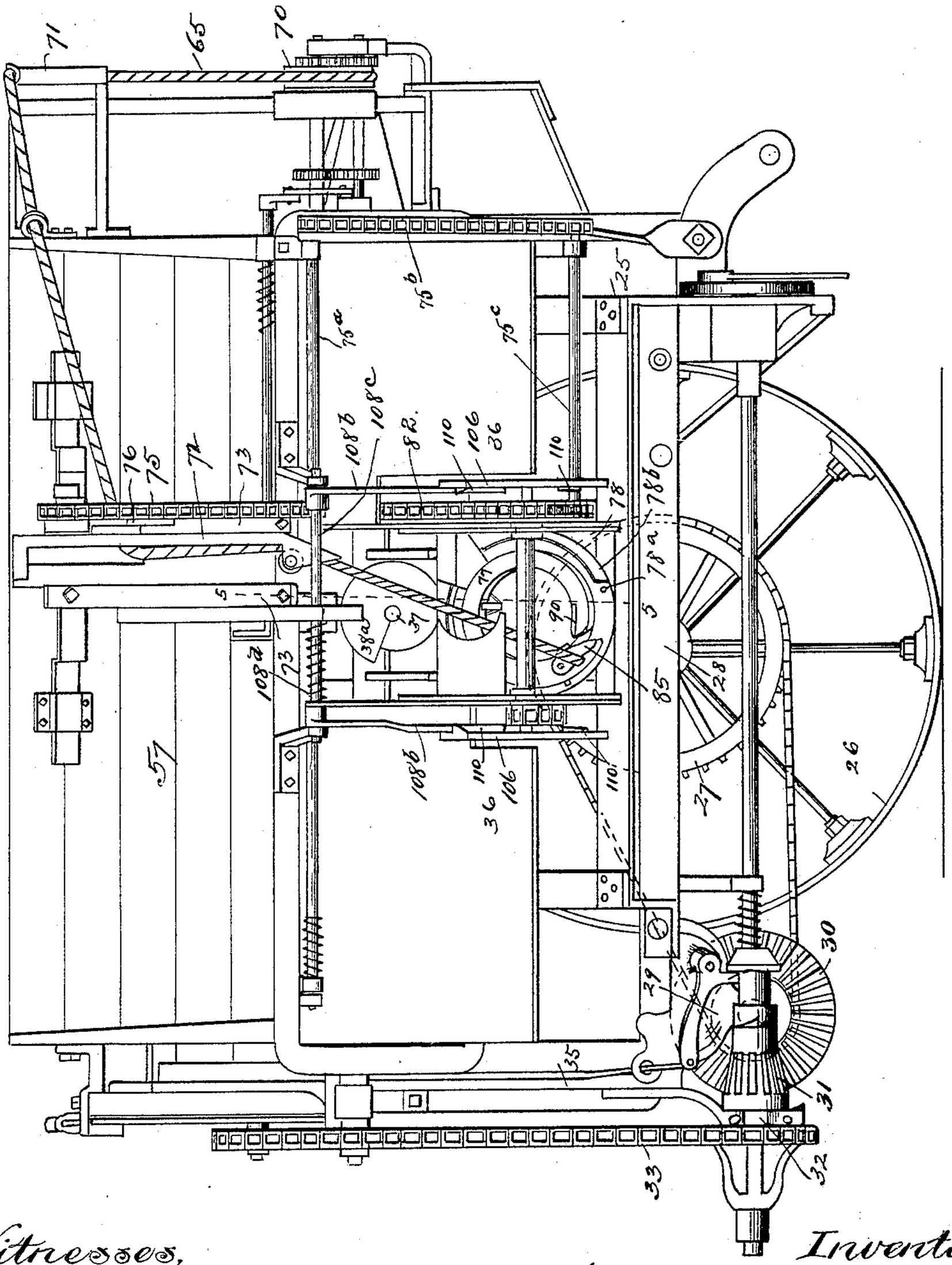
Fig. 3.



Witnesses,
F. G. Mann.
L. F. McCrea.

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By, Offield & Towle Attys.

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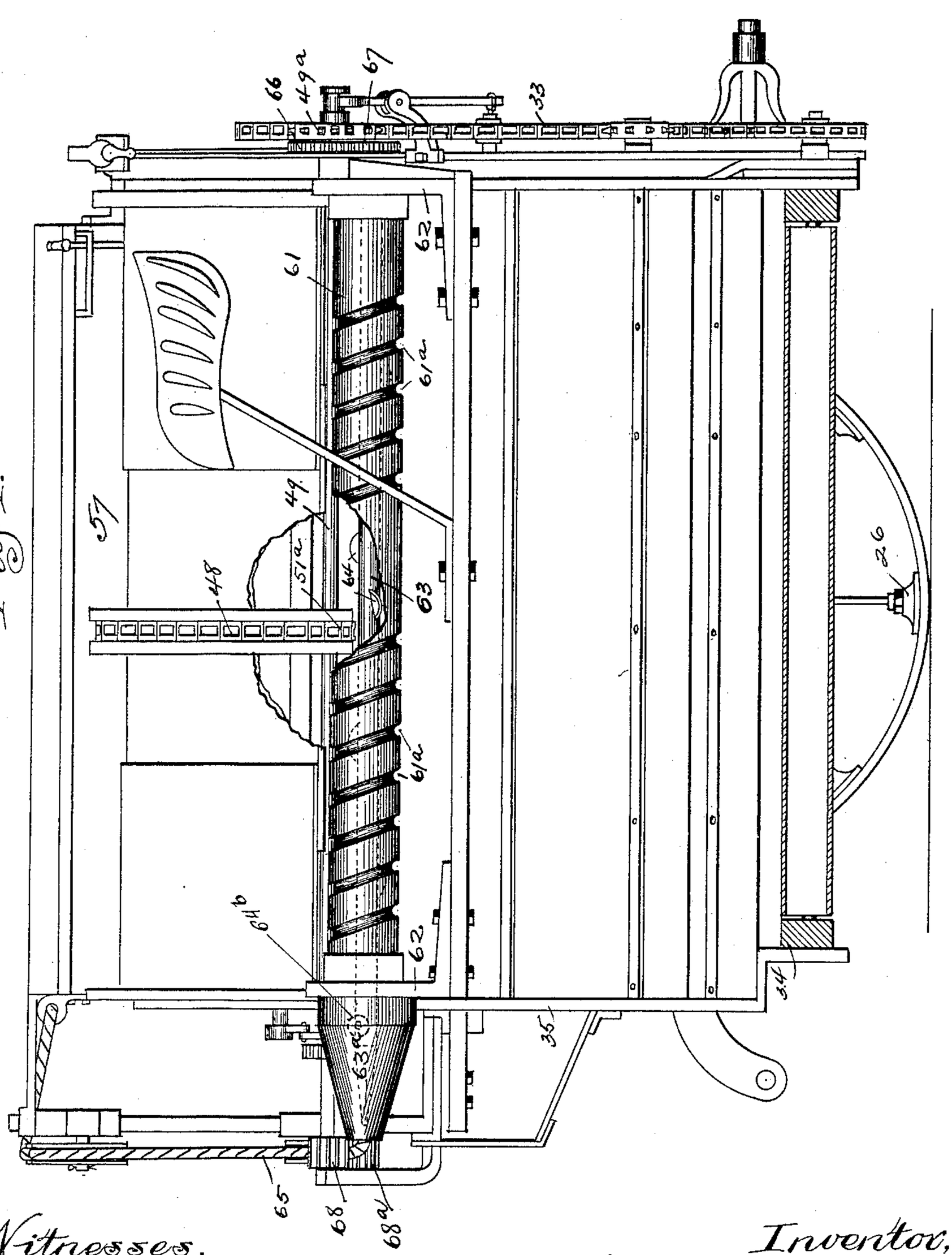
C. E. DONNELLAN.

STRAW BINDING HARVESTER.

No. 462,306. Patented Nov. 3, 1891.

Fig. 4.



Witnesses,
L. F. Mann
L. F. McCrea.

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(No Model.) 9 Sheets—Sheet 5.

C. E. DONNELLAN.

STRAW BINDING HARVESTER.

No. 462,306. Patented Nov. 3, 1891.

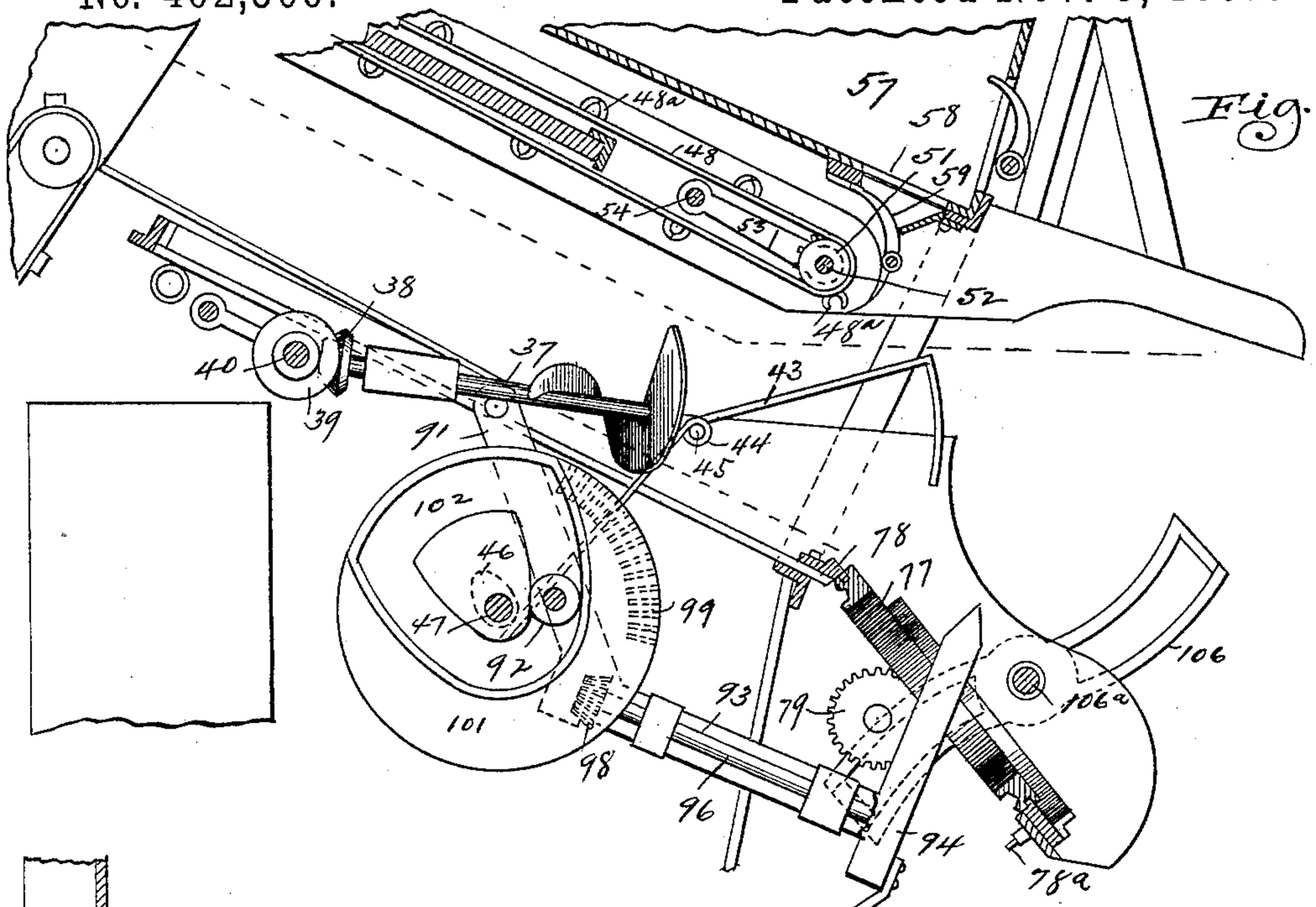
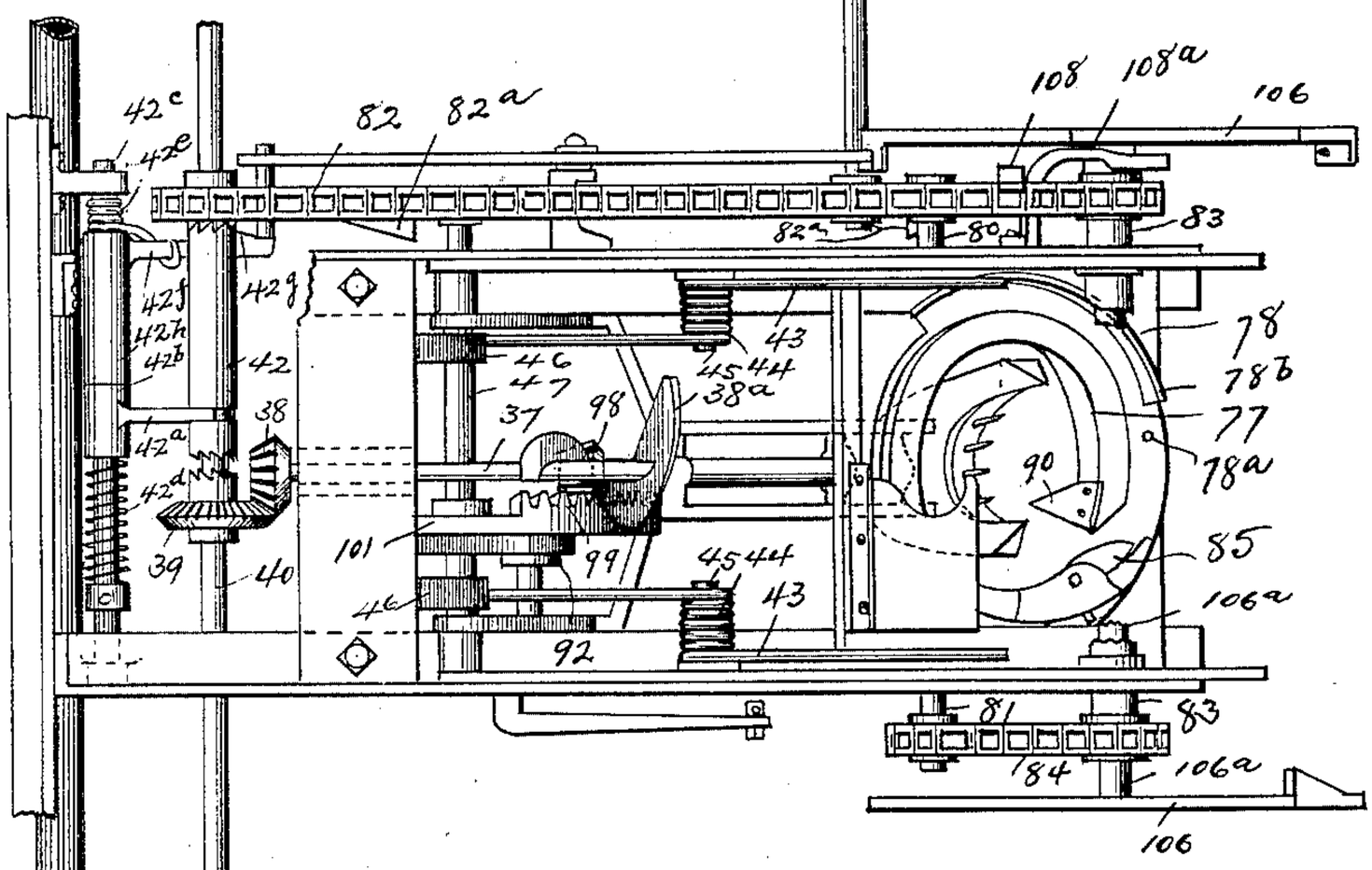


Fig. 5.

Fig. 6.



Witnesses,
F. G. Mann.
L. F. McCrea.

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Attys,

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C. E. DONNELLAN.

STRAW BINDING HARVESTER.

No. 462,306. Patented Nov. 3, 1891.

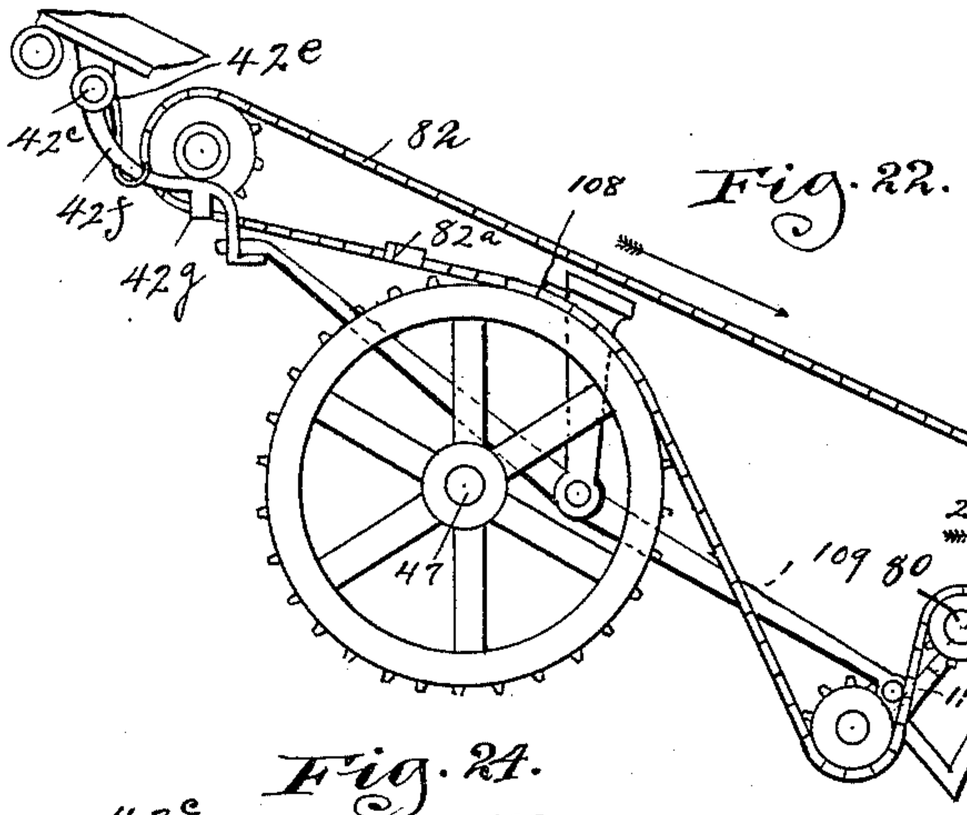

Fig. 22.

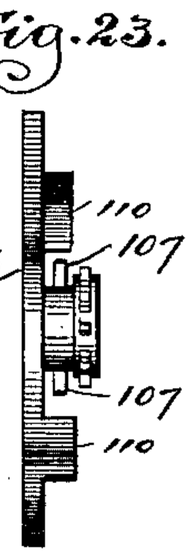

Fig. 23.

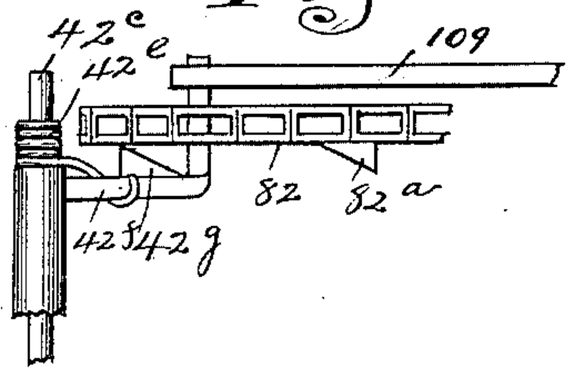

Fig. 24.

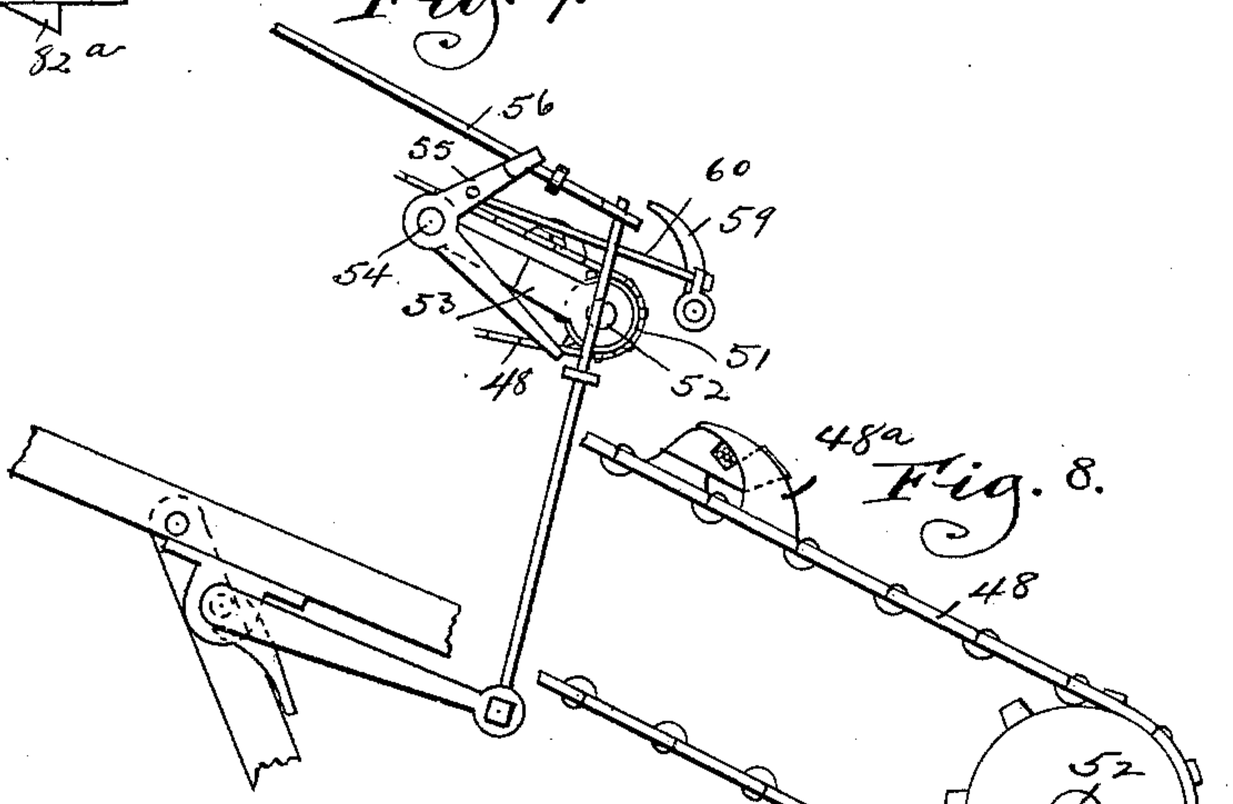

Fig. 7.

Fig. 8.

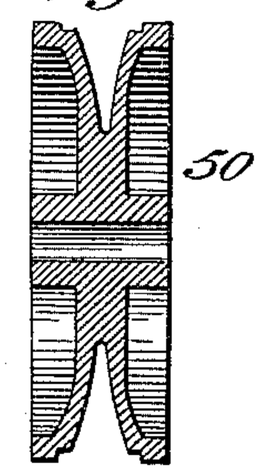

Fig. 25.

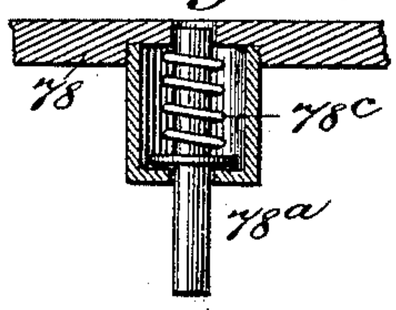

Fig. 26.

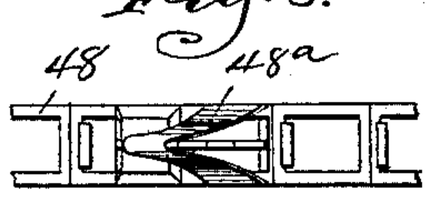

Fig. 8a.

Witnesses
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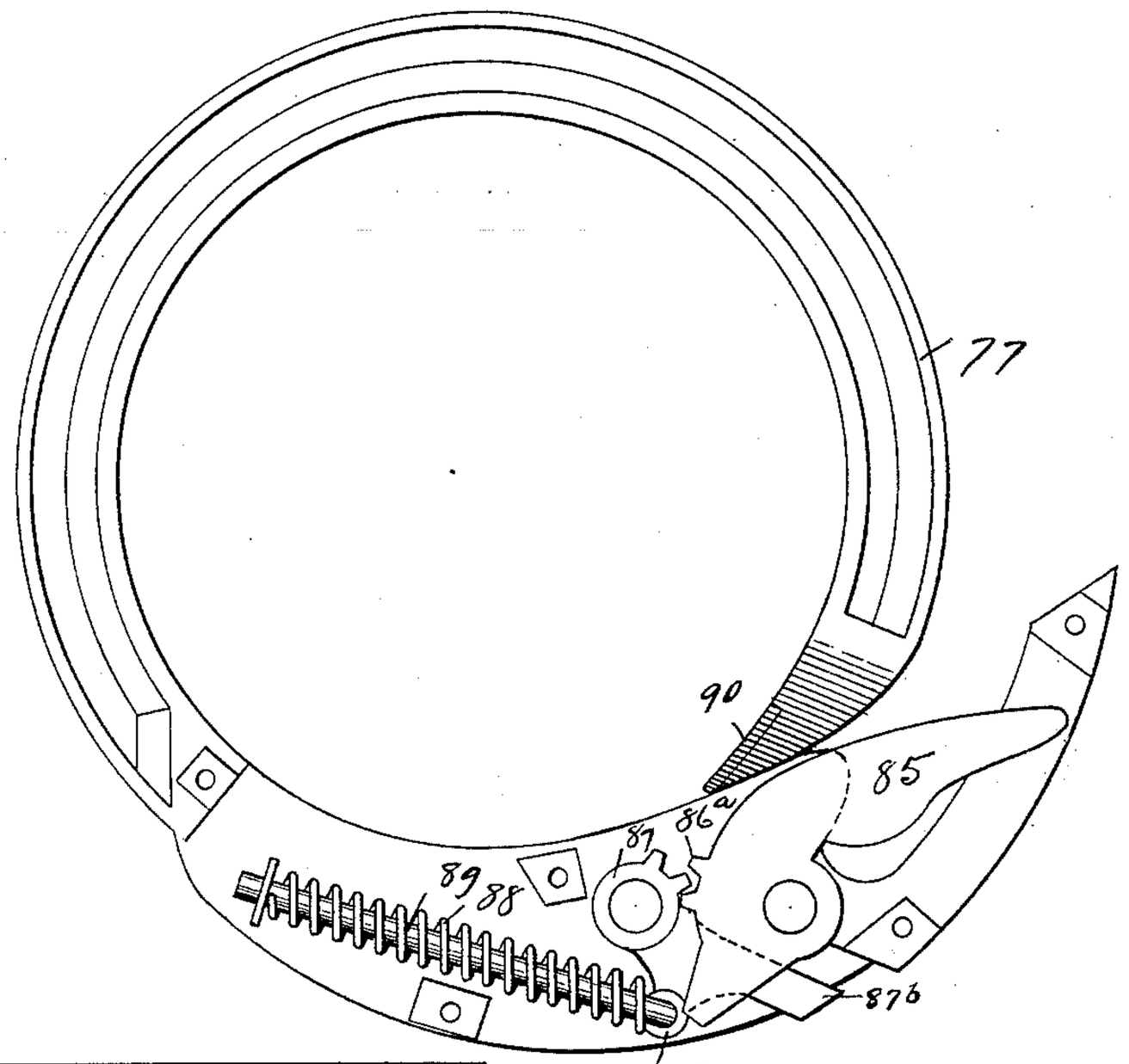
C. E. DONNELLAN.

STRAW BINDING HARVESTER.

No. 462,306. Patented Nov. 3, 1891.

Fig. 9.



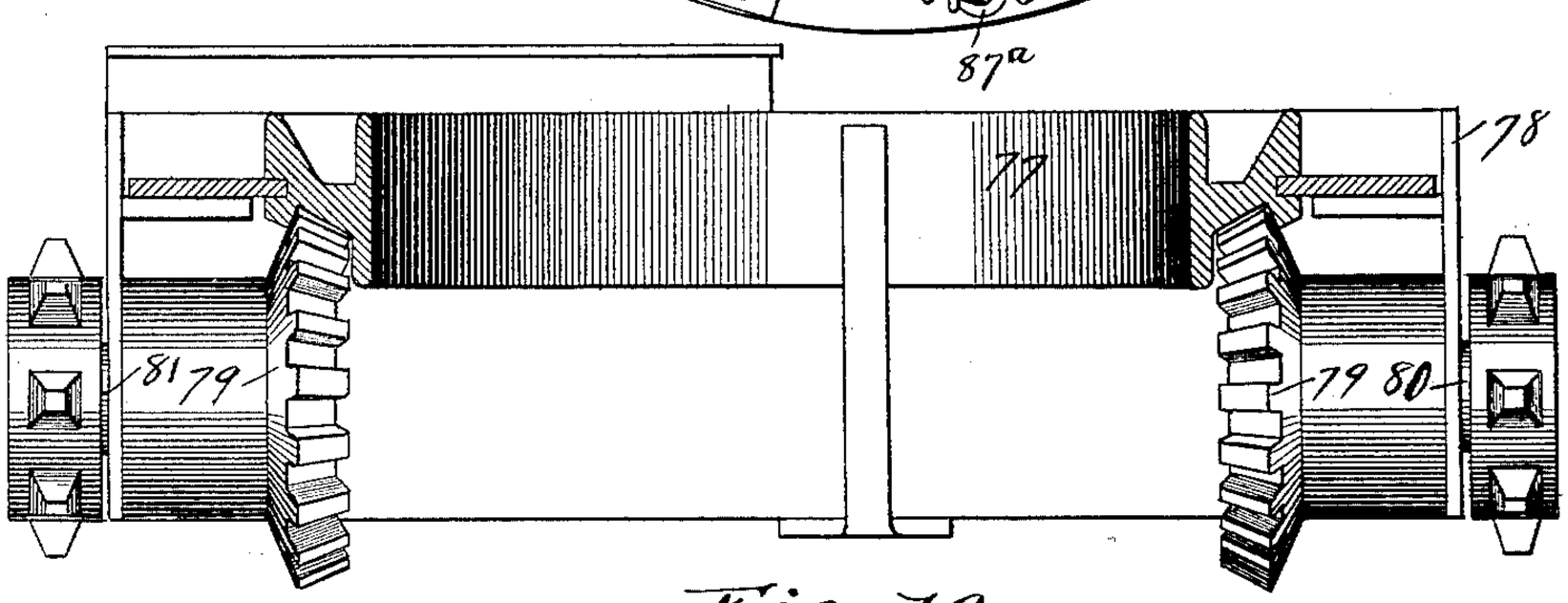


Fig. 10.

Witnesses,
F. F. Mann.
L. F. McCrea.

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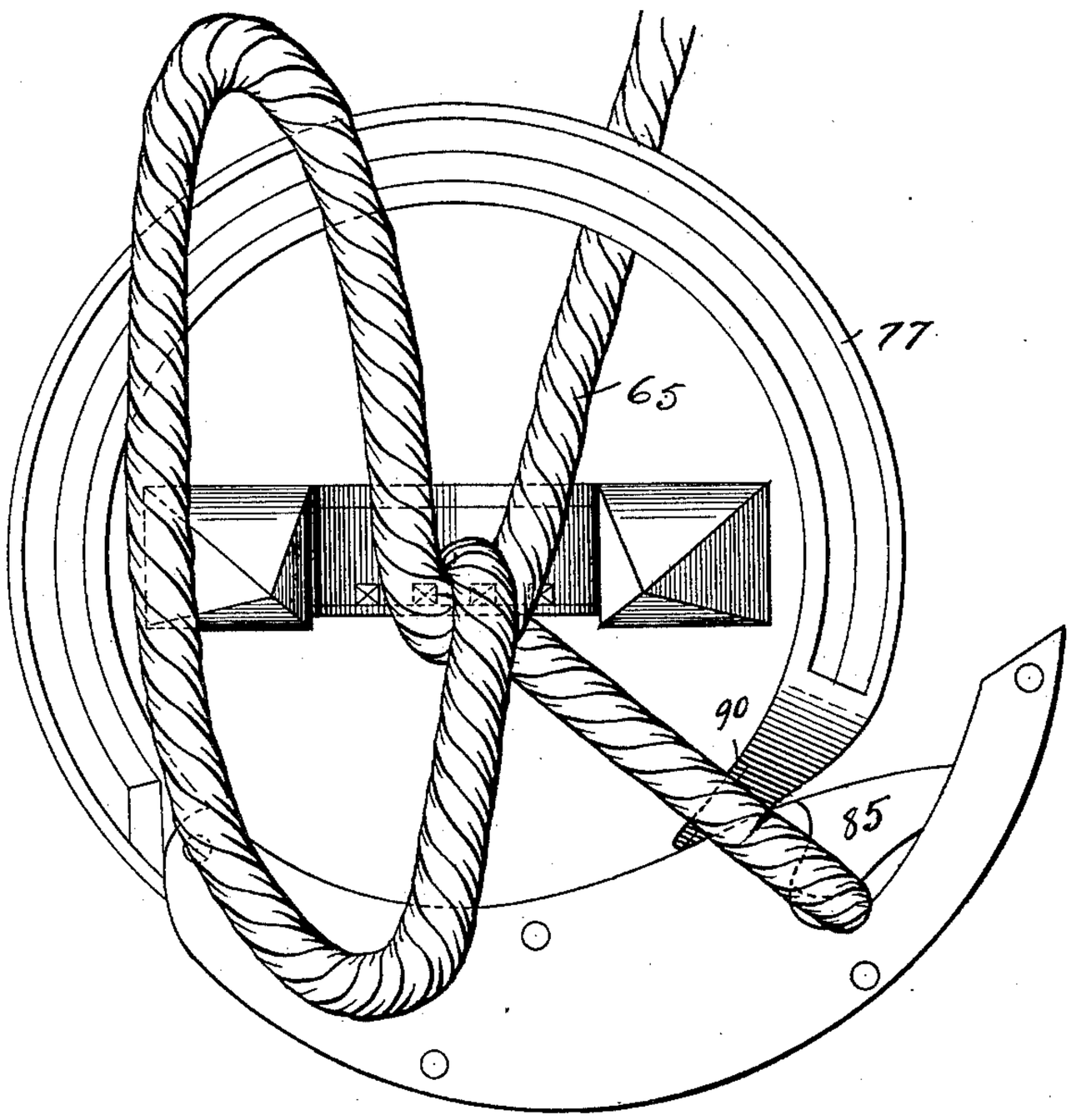
C. E. DONNELLAN.

STRAW BINDING HARVESTER.

No. 462,306. Patented Nov. 3, 1891.

Fig. 11.



Witnesses,
F. F. Mann.
L. F. McCrea.

Inventor:
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C. E. DONNELLAN.

STRAW BINDING HARVESTER.

No. 462,306. Patented Nov. 3, 1891.

Fig. 12.

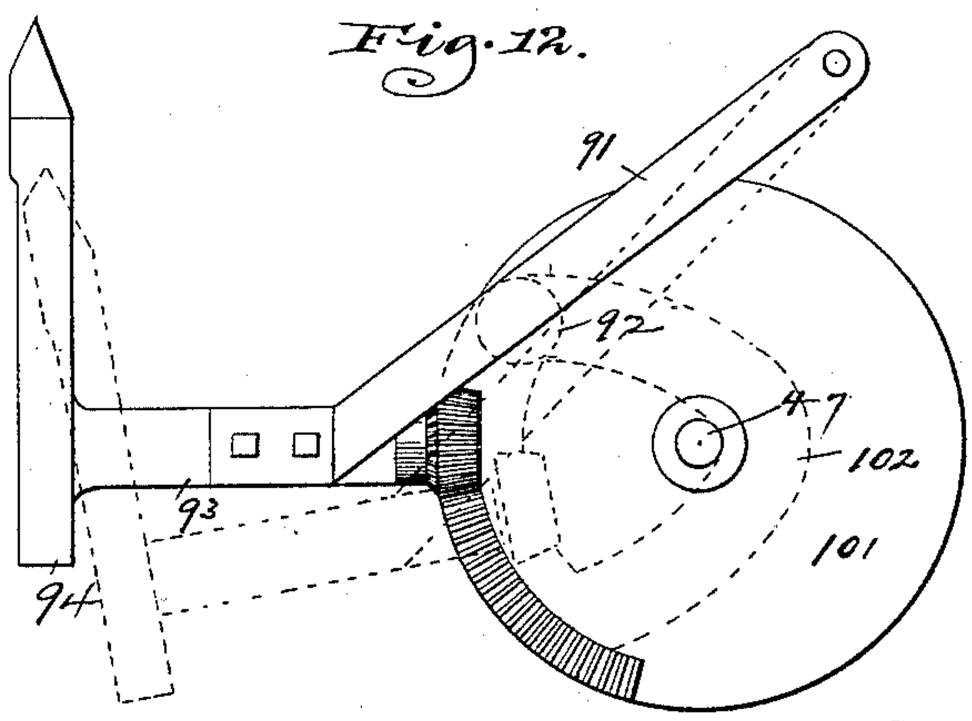

Fig. 13.

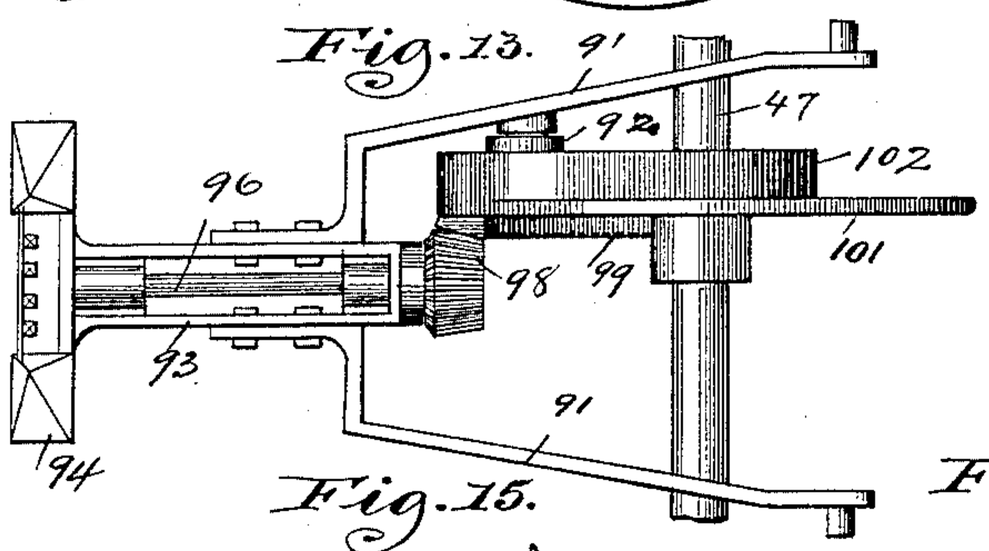

Fig. 14.

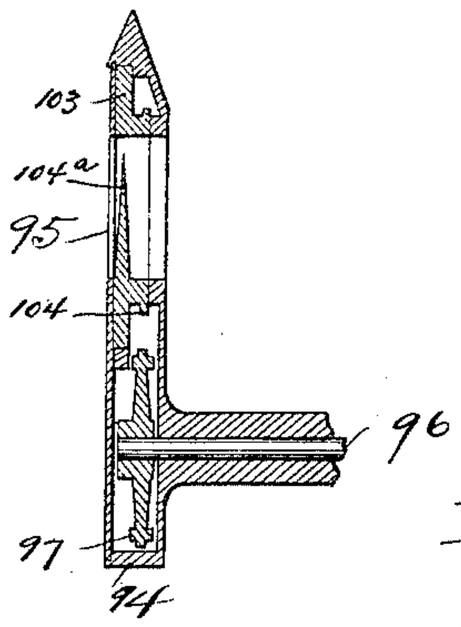

Fig. 15.

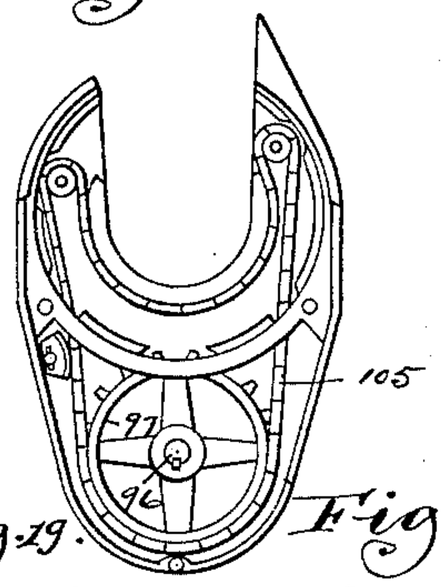

Fig. 16.

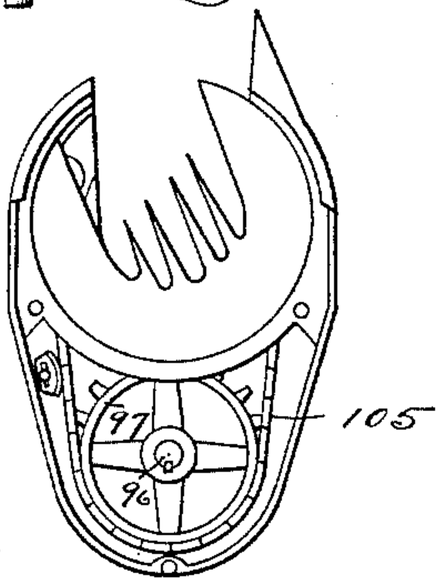

Fig. 17.

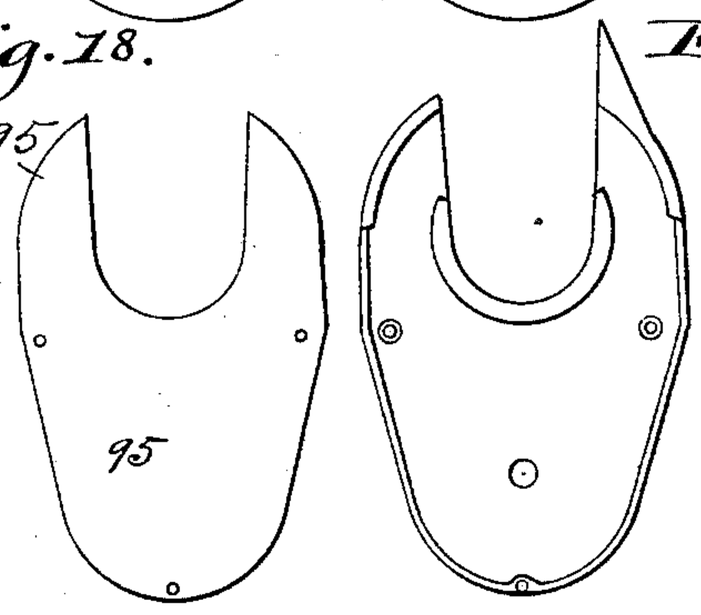

Fig. 18.

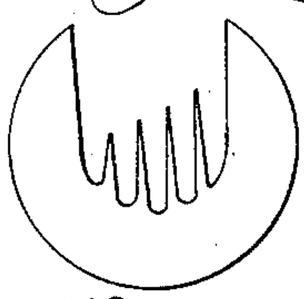

Fig. 19.

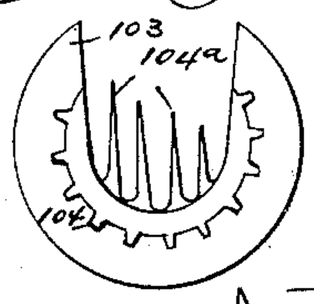

Fig. 20.

Fig. 21.

Witnesses,
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L. F. McCrea.

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Charles E. Donnellan
Offield & Towle
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES E. DONNELLAN, OF CHICAGO, ASSIGNOR OF ONE-HALF TO JOHN M. THOMPSON, OF JOLIET, ILLINOIS.

STRAW-BINDING HARVESTER.

SPECIFICATION forming part of Letters Patent No. 462,306, dated November 3, 1891.

Application filed July 16, 1890. Serial No. 358,966. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. DONNELLAN, a citizen of the United States, residing at Chicago, in the county of Cook and State Illinois, have invented certain new and useful Improvements in Straw-Binding Harvesters, of which the following is a specification.

My invention relates to a self-binding harvester which forms a straw rope and binds the gavel therewith.

One of the features of my invention is an improved packer, the same comprising a rotating shaft having a spiral screw-flange which engages the incoming grain and feeds it forward, packing it in mass to form the gavel, the threads of the screw passing angularly through the deck.

I have also provided a new form of feeder for the grain from which the straw rope is made, which comprises an endless moving chain or belt having thereon jaws which seize a few straws at a time from the mass of incoming grain and carry it back to the rope-maker, and I also provide a hopper which may be filled by hand with suitable straw from which to form the rope, and from which hopper the jaws are adapted to take the straw, the feed-chain with its grasping-jaws being so arranged that it may be made to take the grain from the incoming mass or from the hopper.

My improved rope-maker comprises a trough or casing into which the feed-chain delivers the straw and within which trough is secured a rotating shaft having projections from its periphery, which engage the straw to cause it to rotate with the shaft, and said shaft having a pointed end, over which the rope is formed, said rope being conducted from the rope-maker over a take-up device to the needle-bar and co-operating binding mechanism.

I have also made an improved looper, which comprises a rotating rope-carrier which takes the free end of the rope after grain sufficient for a gavel has accumulated and after the needle-bar has descended, carrying the rope down on one side of the gavel, and carries the free end of the rope behind that portion of it carried by the needle-bar and around the sheaf, and then partially around the bight to form the loop and releases said free end and completes its second revolution, during which it engages the rope again and the band is severed. Co-operating with this needle-bar and looper is a tucking device, the same comprising an arm which is reciprocated at an angle to the knot and which has tucking-fingers formed upon the edge of a disk and adapted to be rotated with the fingers, piercing the knot so as to tuck the ends of the band beneath its body portion, thereby completing the knot.

I have also made certain improvements in the mechanism for starting and stopping the binder and for controlling the discharge of the gavel.

I have also improved certain other features of the construction of the machine, which improvements will be hereinafter particularly described and claimed.

In the accompanying drawings, Figure 1 is a rear elevation of so much of the machine as is necessary to be shown in order to illustrate my invention. Fig. 2 is a front elevation thereof. Fig. 3 is an elevation of the discharge side of the machine. Fig. 4 is an elevation, partly broken away, of the grain side, the platform being shown in section. Fig. 5 is a vertical section on the line 5 5 of Fig. 3, showing the packer and tucker in side elevation; and Fig. 6 is a plan view of the deck side of the machine, particularly intended to illustrate the relation of the packer, tucker, and rope-twister. Fig. 7 is a detail in side elevation of the means for adjusting the feed-chain to cause it to take from the incoming grain or from the hopper, as desired. Fig. 8 is an enlarged detail of said chain in side elevation, and Fig. 8ª is a like detail in plan. Fig. 9 is a plan view of the rope carrier or twister with its covering-plate removed, and Fig. 10 is a sectional detail thereof intended to show particularly the gearing for driving the twister. Fig. 11 is a plan view of the twister, showing the form of knot, the covering-plate on. Fig. 12 is a side elevation of the tucker and its gearing. Fig. 13 is a plan view of the same. Fig. 14 is a vertical transverse section of the tucker-head. Fig. 15 is a front elevation of the same with the covering-plate and tucking-fingers removed. Fig. 16 is a similar

view with the tucking-fingers in place and shown at their position after the tucking operation has commenced. Fig. 17 is an elevation of the inner side of the casing. Fig. 18 is a view of the covering-plate. Figs. 19 and 20 are views of the two sides of the disk having the tucking-fingers, the latter figure showing the segmental gear formed integrally with the disk. Fig. 21 is an edge view looking down upon the points of the fingers. Fig. 22 is a side elevation of the discharge-arms and showing the tripping mechanism for operating said arms intermittently. Fig. 23 is an edge view of the discharge-arms, looking in the direction indicated by the arrow of Fig. 22; and Fig. 24 is a plan view of a tripping device for the discharge-arms. Fig. 25 is a detail of a guiding-sprocket for the feed-belt, and Fig. 26 is a detail view of the spring-pin used to release the rope-grasping jaws of the band-looper.

In the drawings, the numeral 25 represents the main frame of the machine, which is of the common angle form and is carried upon a ground-wheel 26, the main driving-gear being marked 27 and the main driving-shaft 28 and which transmits motion through a sprocket-wheel 29 to the beveled gear 30, enmeshed with a beveled pinion 31, mounted on a driven shaft 32, which drives the sickle, and also by means of a suitable driving-sprocket moves the link belt 33, through which power is transmitted to drive the platform-belt, elevator-belts, rope-maker, packer, and binding mechanism.

34 represents the platform, 35 the elevator-frame, and 36 the deck on which the grain is discharged from the elevator, and the parts heretofore described may be of the usual or any suitable construction, and the grain is cut and elevated in the usual way.

My improved packer in the preferred construction consists of a rotating shaft 37, which is driven by means of the beveled gears 38 39, the latter being loosely mounted on the shaft 40, (see Fig. 6,) which shaft is rotated by the driving-belt 33, which engages the sprocket 41 on the end of said shaft. This shaft has a sliding clutch member 42, which engages the hub of the beveled gear 39, and the movement of this clutch therefore controls the operation of the packer. On the packer-shaft 37 is a spiral flange 38^a, which works through an aperture in the deck and engages the grain deposited thereon, feeding it forward. The deck-floor is usually inclined, and I prefer to make the flange 38^a conical and arrange its shaft in a horizontal plane, the small end of the flange being that which first engages the grain and the large end filling the space, so as to prevent the return or choking of the grain and holding it securely packed during the formation of the sheaf. This screw form of packer is an improvement in many particulars over the ordinary vibrating packers, and its chief characteristic is an even steady feed forward of the grain without breaking the straw or imparting to the grain any shock or blow which has a tendency in packers of the ordinary construction to thrash out the grain.

Instead of making the packer conical or tapering from end to end, it may be made of uniform diameter and placed in a plane passing through the platform at such angle as will bring the receiving end of the packer with its flanges flush or slightly above the platform and the discharge end above the surface of the platform sufficiently to prevent the return of the grain. As the grain leaves the forward end of the packer, it is forced up the inclined spring-arms 43. These arms have a number of integral coils 44 between their ends and stubs 45 extend through the coils to support the spring-arms. The forward end of the arms 43 are bent to prevent the grain from the forming-gavel backing out under them, and their opposite ends are projected downwardly, so as to be engaged by cams 46 on a shaft 47, which is driven by the binder-chain and the revolution of which shaft is so timed that the spring-arms are rocked on their pivots while the gavel is being bound, so as to check the inflow of the grain until the bound gavel is discharged. The primary purpose of the arms is to hold the grain up to the feeding device which carries the supply of straw to the rope-maker, and this feeding device comprises an endless belt or cable 48, (see Figs. 1 and 5,) which is driven by a shaft 49, carrying a sprocket-wheel 49^a, engaged by the driving-belt 33. The belt 48 may be an ordinary link belt, and it is carried from the sprocket-wheel on its driving-shaft upwardly to the apex of the angle-frame and its strands are turned over the guiding-sprockets 50 and around a sprocket 51 on a shaft 52, carried upon arms 53, whose opposite ends are secured with a rock-shaft 54. This rock-shaft has a crank 55 (see Fig. 7) applied thereto, and a shift-rod 56 is connected with the outer end of this crank and projected into convenient proximity to the driver's seat.

The feed-belt 48 bears thereon co-working jaws 48^a. These jaws are secured, respectively, with adjoining links of the chain and may be cast integrally therewith. Their form may be considerably varied; but I prefer to make them substantially as shown in Figs. 8 and 8^a of the drawings. One of the jaws has its lower end bifurcated, the legs thereof being connected, respectively, to the side bars of the link, while the point is slightly hooked, so as to insure its engagement with the straw, and the other jaw is adapted to work in the aperture between the diverging legs of its fellow and under the curved point thereof, and its upper edge is notched to receive the straw, as clearly shown in Fig. 8. A number of these grasping-jaws will be provided at suitable intervals along the chain, and they are brought into condition to receive the straw by the turning of the chain around the sprocket-wheel 51, owing to the links which

carry them being turned at an angle to each other, which causes the jaws to open, as shown in Fig. 8 of the drawings, and when in the revolution of the chain the links are again straightened the jaws are closed, thus grasping the straw tightly therein. It will be observed that the shaft carrying the sprocket-wheel 51 is positioned above the spring-arms 43, and these arms force the grain upwardly, so that it passes in position to enable the hooked jaw to grasp the straws as the jaws make the turn about the sprocket 51. These jaws discharge the straw into a rope-maker located on the grain side of the machine, and which rope-maker will be described presently. In order to enable the jaws of the feed-belt to turn the lower sprocket 50, the latter may be made in the form shown in Fig. 25 of the drawings.

It may be found expedient to provide an independent supply of straw from which to form the rope, and to this end I employ a hopper or reservoir 57, which is located above the deck and has a discharge-aperture 58 slightly above the pulley 51, and this aperture is closed against the passage of straw therethrough, when desired, by means of a latch 59, pivoted at one end, and which is rocked on its pivot by means of a link 60, connected with the crank 55 on the rock-shaft 54. When this shaft is rocked in its bearing, it not only raises the sprocket-wheel 51 and chain so as to bring the jaws into position to take the straw from the reservoir or hopper, but it also opens the aperture by moving the latch 59 out of the way through the intervention of the link 60.

The rope-maker will be best understood by reference to Figs. 1 and 2 of the drawings. It comprises a trough 61, supported on a bracket-arm 62 and its open side presented in position to receive the straw falling from the feed-chain 48, which, being turned around the sprocket 51^a, opens its jaws in the manner above described, so as to deposit the straw in the trough. This trough has a spiral bead 61^a in its body, which works the straw forward. Rotatably mounted within the trough 61 is a shaft 63, having projections 64, which engage the straw and twist it about the shaft. This shaft has a pointed end 63^a, over which the rope is formed, and a roller 64^b is journaled in a vertical slot at the base of the point, as shown by dotted lines in Fig. 4. This roller serves the same purpose as the other projections on the shaft to cause the twisting of the forming rope; but it is journaled so that it may be rotated by the rope as it passes off the point of the shaft, and thus prevent the rope from becoming tangled. The trough has its end inclosing the pointed end of the shaft converged, and an aperture therein permits the adit of the rope 65. The shaft 63 is driven by gear-wheels 66 67, the former being mounted upon the shaft 49, on which the sprocket 51^a is mounted. At the rope end of the shaft 49 it carries a feed-wheel 68, and a second feed-wheel 68^a is journaled beneath it, and between these feed-wheels the rope is conducted, passing thence over a guiding-pulley 69, thence around a sliding pulley 70, which serves as a take-up for the forming rope while the sheaf is being bound. From this take-up pulley the rope passes over a guide 71, and is conducted thence to a point above the binder, being suitably guided in its course, and is thence threaded through a needle-bar 72 and its end carried downwardly and engaged with a rope carrier and looper. The needle-bar reciprocates in guide 73. Motion is imparted to it through a belt 75, which is mounted on a shaft 75^a, driven by a belt 75^b, which is carried over a sprocket on shaft 75^c, which latter is driven by a belt 82, hereinafter described. The belt 75 is connected to the needle-bar by means of the pivoted links 76, and the reciprocation of this bar is so timed as that it descends when a sufficient quantity of grain has accumulated to form a gavel. On its downward stroke its point divides the grain, carrying the bight of the rope down with it until it has passed below the plane of the looper. In these movements the links allow the bar to remain stationary for an interval at the end of its downward movement, and this gives sufficient time for the looper to operate. The looper is shown in detail in Figs. 9, 10, and 11 of the drawings, and its position with reference to the co-operating parts is best shown in Fig. 3 of the drawings. This looper comprises a rotatable open ring with its ends slightly separated, one projecting above the other. This ring-like portion is marked 77, and it may be cast or wrought to the form desired. It is secured to revolve within a frame 78, and the form of the looper in cross-section is best shown in Fig. 10 of the drawings. It has on its lower side rack-teeth, which are enmeshed with the pinions 79 on stub-shafts 80 81, the former being geared with a driving-belt 82, carried over a sprocket on shaft 40, and the latter being driven from the hollow shaft 83, turned by belt 82 and the short belt 84. The rack should cover more than half of the surface of the ring 77, and the purpose of employing two driving-pinions is to provide for imparting to the open ring a continuous rotary motion, and the form being such that it would be difficult to drive it from gearing applied to its periphery. The upper end of the ring is farther from its axis than the lower end and it bears a grasping-jaw 85, which is pivoted between its ends, the forward end being adapted to hold the rope, while the rear end is provided with gear-teeth 86^a, which engage with similar teeth on the hub of the bell-crank lever 87, pivoted also to the open ring. One member 87^a of this bell-crank lever is engaged by a compression-spring 88, coiled about a sliding rod 89, moving in keepers or ways on the frame, and the other member 87^b of the bell-crank projects beyond the periphery of the ring and is adapted to engage a spring-pin 78^a on the frame 78, and which is adapted to be projected above the surface of said frame

by the impingement thereon of an arm 77^b, connected with the tucking mechanism and hereinafter to be described. A detail view of the spring locking-pin is shown in Fig. 26, and it is there shown normally depressed by its spring 78^c. As the tucking mechanism is not operated until after the loop has been formed, the spring-pin is not actuated until the loop has been formed, which has occupied the time of a complete revolution of the looper. During the first revolution of the ring the rope passes through the opening in the ring. When the loop has been formed, the pin on the second revolution of the looper strikes the projecting member of the bell-crank, opens the jaw, and in order to hold the jaw open until it reaches the rope a ledge 78^b is formed on the periphery of the frame 78, as shown in Fig. 6 of the drawings. At the end of this ledge the jaws have passed into position to engage the rope, and the spring being free to act the jaws are grasped upon the rope and the looper continues its revolution until it has carried the rope behind the forming sheaf, as shown in Fig. 11. When the rope has been again engaged and while it is tightly held against the under side of the ring by the upward movement of the needle, carrying the rope with it, a knife 90, projecting from the edge of the lower end of the ring, engages the rope and shears it, thus leaving the knot tied and free to be turned by the tucker, while the looper continues its revolution until it reaches the position shown in Fig. 3 of the drawings, when it is thrown out of gear.

The mechanism by which the looper is thrown out of gear is shown in Fig. 6 of the drawings. To the shaft 40 is applied the sliding clutch-member 42, one end of which engages the hub of the beveled gear 39, which imparts motion to the packer-shaft, and the other end of said clutch member engages a corresponding member on the hub of the sprocket of the driving-belt 82, which imparts motion to the looper. The clutch mechanism is shifted automatically by means of lugs 82^a on the side of the driving-belt 82. (See Figs. 6, 22, and 24.) The clutch member 42 is engaged by an arm 42^a, projecting from a sleeve 42^b, which slides on a rod 42^c, held in brackets on the frame. This sleeve has a coiled spring 42^d. 42^h is a sleeve, also mounted on the shaft 42, and has a spring 42^e, the latter having an extended end, which is hooked beneath an arm 42^f, projected from the sleeve 42^h. During each half-revolution of the belt 82 one of its lugs 82^a is brought into contact with the projection 42^g on the arm 42^f, and thereby the sleeve 42^b is shifted endwise on its rod, throwing the clutch member 42 into engagement with the clutch member on beveled wheel 39, thereby putting the packer-shaft in motion. The same movement throws the binder out of gear and the lug 82^a holds it out of gear until the arm 42^f is tripped by the weight of the sheaf in the manner to be hereinafter described. After the looper has completed its work the next operation is to tuck the severed ends of the band to complete the knot, and this work is performed by the mechanism shown in Figs. 5 and 6 and the detail views, Figs. 12 to 21, inclusive. The tucker comprises arms 91, which are pivoted on the deck-frame and carry an open frame 93, from the outer end of which rises a head 94, having a removable face-plate 95. A shaft 96, having its bearing in the open frame 93, projects at one end into the cavity of the head, and the end of said shaft bears a sprocket-wheel 97, while its rear end carries a beveled pinion 98, enmeshed with a rack-segment 99 on the disk 101, mounted on the shaft 47, driven by belt 82 and having on its face a heart-shaped cam-track 102. One of the arms 91 bears a roller 92, which travels within the cam-slot, and the disk being rotatably mounted the reciprocation of the tucker-head is thereby effected. In the upper part of the cavity of said head is mounted a mutilated disk 103, having a gear-segment 104 on one of its faces and projecting fingers 104^a in the bottom of the cavity of the disk and lying in the plane of its body. A link-belt 105 is carried around sprocket 97 in the bottom of the head and the segmental gear on the disk bearing the tucking-fingers, as clearly shown in Fig. 16 of the drawings. Now it is apparent that when the disk having the cam-track thereon is rotated the cam will raise the head to the position shown in full lines in Fig. 12 of the drawings, and then the continued rotation of the disk will bring its gear-segment into mesh with the beveled pinion, thus rotating the shaft and through it turning the link belt and the disk bearing the tucking-fingers. The first operation—viz., raising the tucking-head—causes it to move upwardly, entering the aperture in the ring of the looper, so as to engage the knot on the lower side of the sheaf. The fingers or prongs pierce the knot and partially turn it, and by this time the rope has been severed and the pinion has engaged the rack of the disk 101, thus moving the belt carrying the tucking-fingers. When the disk has been completely rotated, the knot has been turned, so that the free ends of the band are securely tucked, and it only remains to discharge the sheaf.

106, Fig. 6, represents discharge-arms, which are secured to the respective ends of a shaft 106^a, which is passed through the hollow of shaft 83. These arms are secured near their middles to their supporting-shaft, and their faces are preferably curved, as clearly shown in Fig. 22 of the drawings. One of these arms has on its hub oppositely-projecting pins 107, which are adapted to be engaged at one point in the revolution of the chain 82 by lugs 108 on the chain 82, the result of which engagement is to rock the shaft 106^a, bearing the arms, thus discharging the sheaf and bringing the other members of the arms into

position to receive the grain for another sheaf.

108[a], Fig. 22, is a pivoted latch, which is adapted to engage the pins 107 and hold the discharge-arms against rotation until said latch is lifted by the lug 108, which engages the under side of the latch and raises it before striking the pin, thus unlocking the arm.

108[b] represent arms, which are secured with a rock-shaft 108[c], Fig. 3, and said rock-shaft has a spring 108[d], which is adapted to depress the arms, as shown in Fig 1. These arms are preferably light iron rods and curved, as shown. They are adapted to pass and engage shoulders 110 on the ends of arms 106, whereby their entire separation from the discharge-arms is prevented during the formation of the sheaf while the rods are permitted to rise, slowly sliding on the shoulders while the sheaf is forming, and when the sheaf is discharged they are entirely freed by the rotation of the discharge-arms. The incoming grain exerts a certain pressure on these arms, which I utilize to shift the clutch mechanism to put the binding mechanism into gear and to throw the packer out of gear, and this I do by means of a pivoted bar 109, having at one end thereof a bearing on a ledge 110 on the side of the discharge-arms and its other end projected to engage an extension of the arm 42[s], as clearly shown in Fig. 24 of the drawings. Now when the pressure of the incoming grain under the feed of the packer has exerted sufficient force to rock the shaft 106[a] in its bearing, thus rocking the arm 106, which is receiving the grain downward, the lever 109 will be rocked on its pivot, thus depressing the extension of the arm 42[s] sufficient to cause its disengagement with the lug 82[a] on the chain 82, and thereupon the spring 42[d] will return the clutch member into engagement with the sprocket which drives the chain 82, and the binder will thereby be thrown into gear and the packer out of gear.

It is obvious that modifications may be made in the structural features above described and mechanical equivalents may be used for some of the operating mechanisms, and also that some of the features may be omitted in the construction of a harvester in which the other features are employed. For example, changes may be made in the straw-carrier—as, for instance, the carrying-belts described may be duplicated and the auxiliary hopper might be dispensed with. The jaws also may be spring-actuated to hold them normally-closed and tripping devices employed for opening the jaws to engage and release the straw. The gearing of the several parts may also be differently arranged, and instead of the several belts shown positive gearing may be employed in some instances with advantage. I do not therefore limit my invention to the precise details of construction and arrangement of parts.

I claim—

1. In a self-binding harvester, a packer therefor, comprising a rotatable shaft having on its periphery a conical screw-flange the threads whereof taper from the discharge to the receiving end of the packer, substantially as described.

2. In a self-binding harvester, the combination, with a packer comprising a rotatable shaft having a peripheral conical screw-flange tapering from the discharge to the receiving end of the packer, of arms adapted to receive the grain from the packer and direct it upwardly to a straw-carrier for the rope-maker, and a straw-carrier adapted to take straws from the incoming grain and deliver them to said rope-maker, substantially as described.

3. In a straw-binding harvester, the combination, with means for elevating the grain and packing it to form the gavel, of a straw-carrier for the straw-rope maker, comprising endless flexible belt having driving and guiding pulleys and traveling in line with the moving grain, said belt having thereon co-working jaws adapted to be opened by the turning of the belt around its pulley to seize straws from the moving grain at one point of its circuit and discharge them at another point convenient to the rope-maker, substantially as described.

4. In a straw-binding harvester, the combination, with means for elevating the grain and packing it to form the gavel, of a straw-carrier for the rope-maker, comprising a link belt having a driving and a guiding sprocket-wheel, and co-working jaws secured with adjacent links of the belt and one of said jaws having a hooking-point and the other a recess in its upper side, whereby when the belt is moved into contact with the grain the jaws are opened and the hooked jaw gathers straws therefrom and the recessed jaw receives said straws at one point of the circuit and said jaws are opened at another point of the circuit convenient to the rope-maker by the turning of the jaw around its pulley.

5. In a self-binding harvester, a packer therefor, comprising a rotatable spiral projecting through an aperture in the platform in a plane passing angularly through the platform, whereby the receiving end of the packer is adapted to take the grain from the platform and the discharge end thereof acts as a stop to limit the backward movement of the grain, substantially as described.

6. A rope-maker for straw-binding harvesters, comprising a trough-shaped receptacle for the straw from which the rope is made, and a shaft rotatably secured within the straw-receptacle and having a smooth cylindrical body, with projections thereon to engage and twist the straw, substantially as described.

7. A rope-maker for straw-binding harvesters, comprising a trough-shaped straw-receptacle having a spiral bead in its peripheral wall from end to end thereof, and a shaft rotatably secured within the receptacle and having projections thereon adapted to engage

and twist the straw, the bead co-operating with the shaft to feed the straw to the forming rope, substantially as described.

8. In a straw-binding harvester, the combination of a straw-carrier belt having jaws adapted to seize straws from the mass of moving grain and carry and discharge them to a rope-maker, and an auxiliary straw-reservoir, from which the belt is also adapted to take straw at need, substantially as described.

9. In a straw-binding harvester, a needle-bar through which the straw rope is threaded, said bar having driving means comprising an endless belt, and pivoted links connecting said bar and belt, whereby an inconstant reciprocating motion is imparted to the bar, substantially as described.

10. A band-looper for straw-binding harvesters, comprising a rotatable open ring-shaped body having rope-grasping jaws and a trip adapted to open said jaws to release the rope, substantially as described.

11. A band-looper for straw-binding harvesters, comprising a rotatable open ring-shaped body having rope-grasping jaws, a trip for said jaws, and a knife secured on the rotating body and adapted to sever the band after the loop is formed, substantially as described.

12. A band-looper for straw-binding harvesters, comprising a rotatable open ring-shaped body having rope-grasping jaws, one fixed and the other pivoted, and a spring connected with the pivoted jaw and adapted to hold it normally closed upon its fellow, substantially as described.

13. A band-looper for straw-binding harvesters, comprising a rotatable open ring-shaped body having rope-grasping jaws, one fixed and the other pivoted, a spring connected with the pivoted jaw and adapted to hold it normally closed upon its fellow, an arm connected with the pivoted jaw, and a trip adapted to engage the the arm, whereby to rock the pivoted jaw to release the rope.

14. A looper for straw-binding harvesters, comprising a ring-like body having an opening therein and a rack on its lower side, pinions enmeshed with the rack at opposite points in the path of motion, and grasping-jaws carried by the body and adapted to carry the rope to form the loop.

15. In a straw-binding harvester, the combination, with a reciprocating needle-bar through which the straw rope is threaded and means for reciprocating the bar to carry the bight of the rope in front of the gavel, of a looper comprising a revoluble plate having an opening therein, pivoted jaws to normally engage the free end of the rope, gearing to turn the body, whereby to pass the end of the rope outside the bight held by the needle-bar on the initial revolution, and a tripping device adapted to open the jaw to release the rope end toward the close of the second revolution of the looper, substantially as described.

16. A tucker for straw-binding harvesters, comprising a swinging frame having a head adapted to be projected against the gavel and having rotatably secured therein a disk bearing tucking-fingers to engage the loop, gearing for swinging the frame to project the fingers into engagement with the loop, and gearing to rotate the disk bearing the tucking-fingers, whereby to tuck the severed ends of the band and form the knot, substantially as described.

17. In a tucker for straw-binding harvesters, a swinging frame having a bearing on a cam-track formed on a rotating disk, said disk having also a circular rack-segment, a shaft journaled in the frame and having a pinion to engage the rack, a head on the swinging frame into which the shaft projects, a disk having tucking-fingers rotatably mounted in the head, and gearing between the shaft and disk bearing the tucking-fingers, substantially as described.

18. In a self-binding harvester, the combination, with the packer and binding mechanism and a driving-belt therefor, of a spring-actuating sliding clutch mechanism adapted to put the packer or binder in motion accordingly as it engages the gearing of the one or the other, a discharge-arm carried by a shaft adapted to be intermittently rotated by a driving-belt having lugs thereon, a pivoted arm bearing yieldingly during the formation of the sheaf on the discharge-arm, and a latch sustaining the end of the pivoted arm opposite the discharge-arm and adapted to be tripped by the lug on the driving-belt, whereby the pressure of the grain is utilized for controlling the shifting of the clutch mechanism, substantially as described.

19. A tucker for self-binding harvesters, comprising fingers or spurs adapted to be projected to engage the band at the loop and adapted to be rotated in engagement therewith, whereby to turn the loop to secure the ends of the band, substantially as described.

20. In a self-binding harvester, the combination, with the packer, of a spring arm or arms adapted to receive the grain from the packer and to yieldingly support the grain against a fixed part of the machine, whereby to maintain a plenum of grain from which to supply the rope-maker, substantially as described.

21. In a straw-binding harvester, the combination, with means for elevating the grain, of a straw-carrier for the straw-rope maker, comprising an endless carrier adapted to engage straws in the mass of incoming grain and carry it to the rope-maker, substantially as described.

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