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C. E. DONNELLAN.

Grain-Binder.

No. 167,997. Patented Sept. 21, 1875.

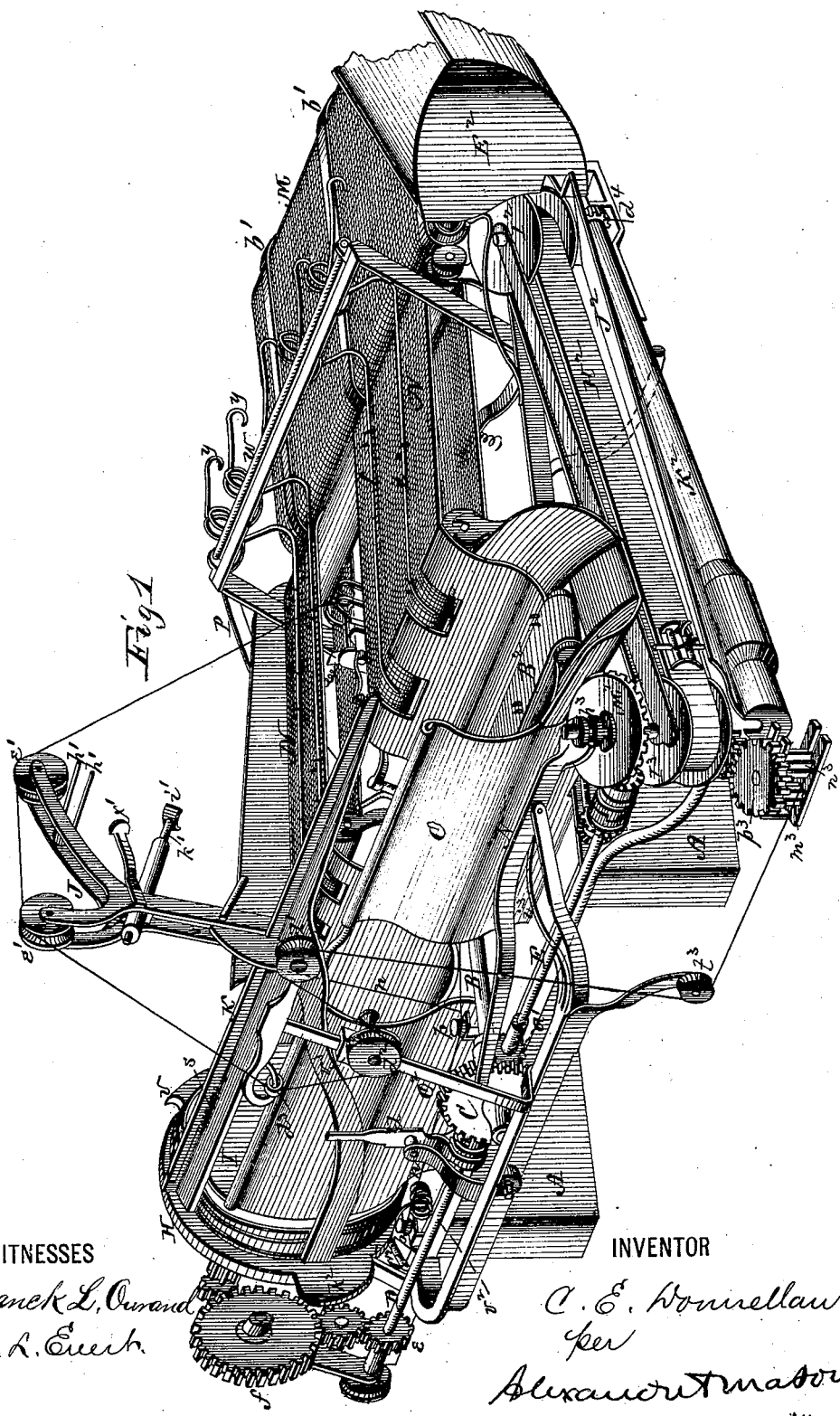

Fig. 1.

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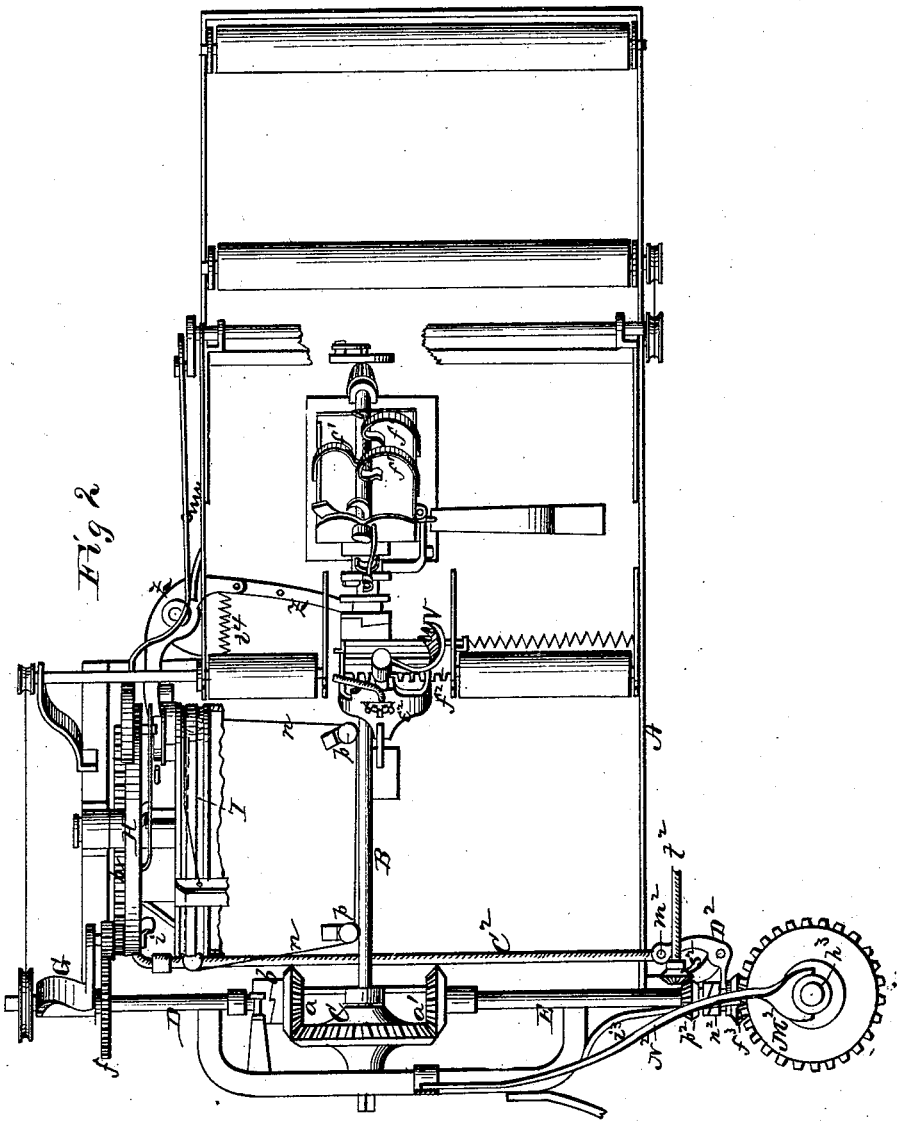

Fig. 2.

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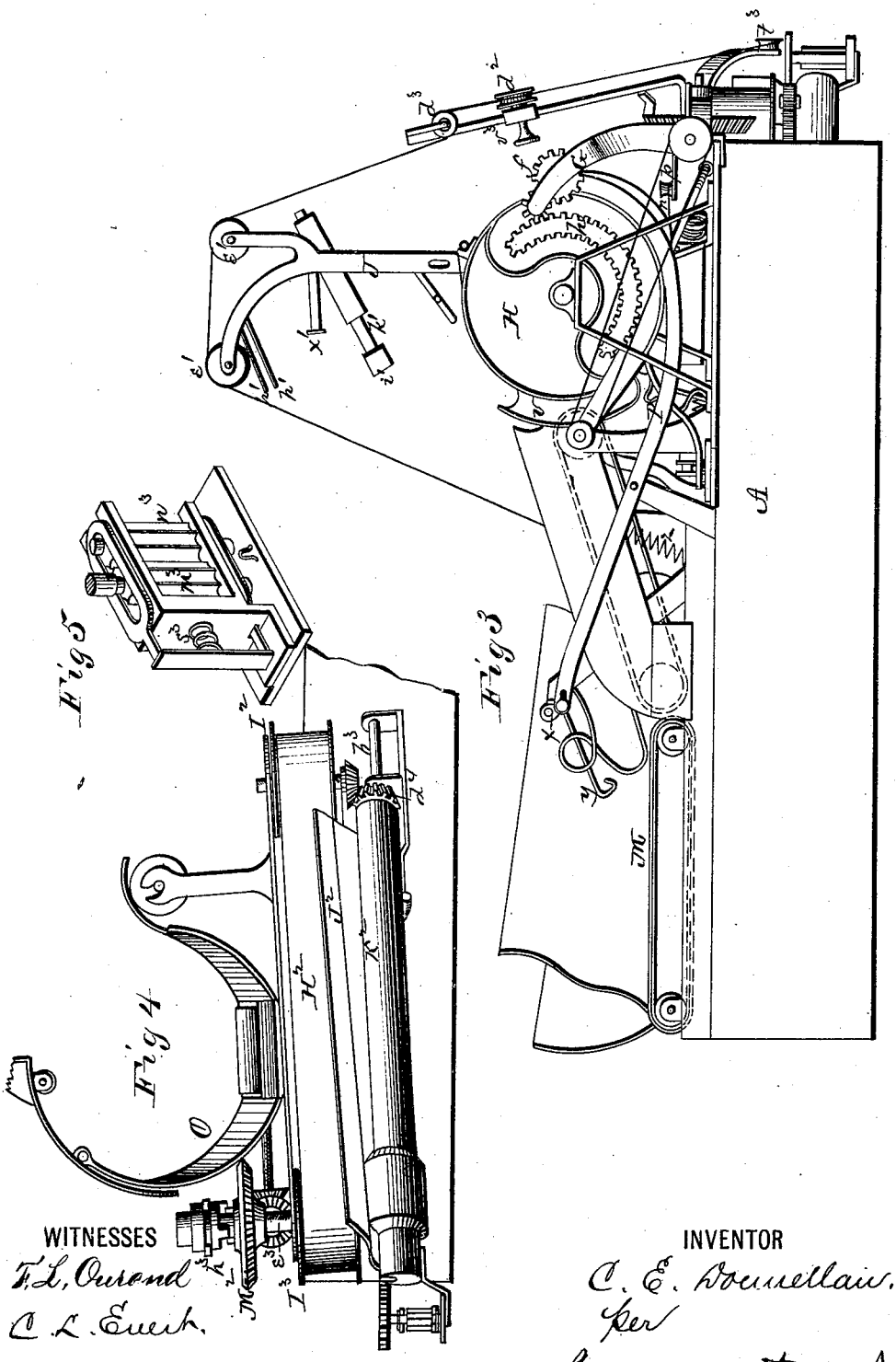

Fig 3

Fig 4

Fig 5

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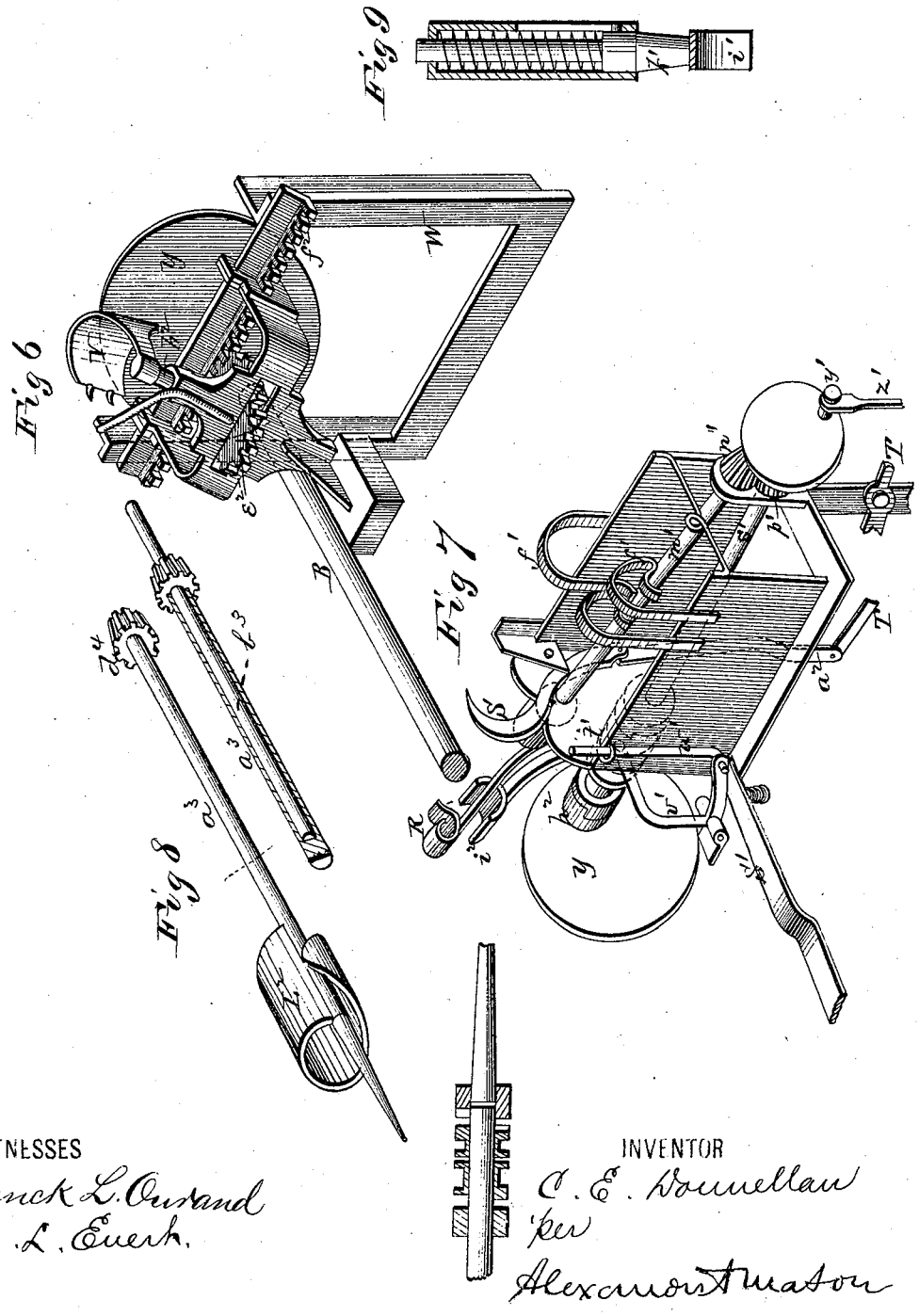

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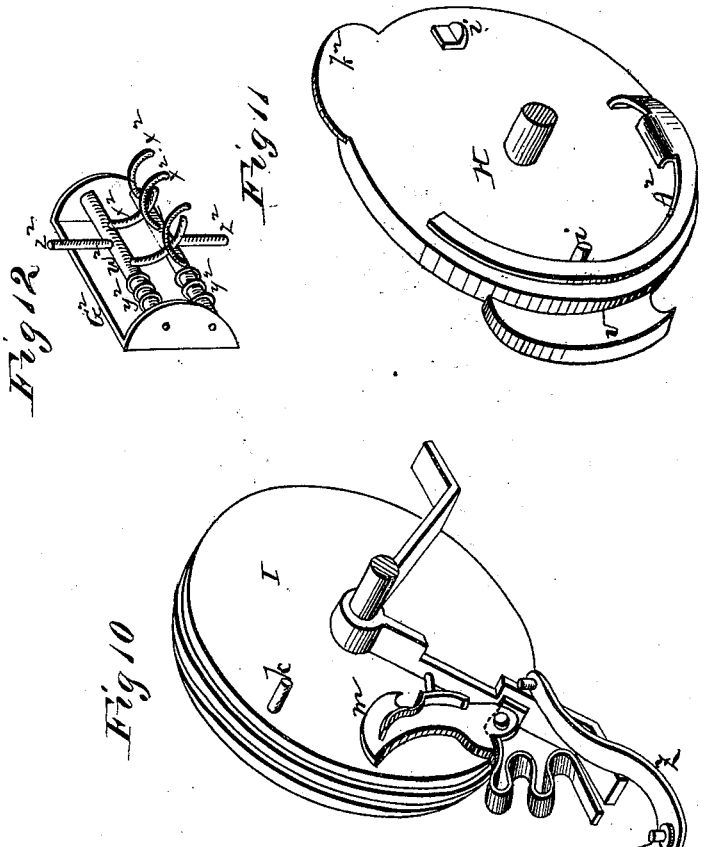

Fig 12

Fig 11

Fig 10

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UNITED STATES PATENT OFFICE.

CHARLES E. DONNELLAN, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO HIMSELF, B. R. McCORD, AND WILLIAM M. WHEATLEY, OF SAME PLACE.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **167,997**, dated September 21, 1875; application filed January 9, 1875.

To all whom it may concern:

Be it known that I, CHARLES E. DONNELLAN, of Indianapolis, in the county of Marion and in the State of Indiana, have invented certain new and useful Improvements in Grain-Binders; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention consists in the combination of a grain-binder and a straw-rope-making mechanism, which shall make the straw rope as fast as needed by the binder. It also consists in the construction and arrangement of the grain-binding and straw-rope-making mechanisms, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings, in which—

Figure 1 is a perspective view of my machine. Fig. 2 is a plan view of the same with the rope-maker, rope-carrying arm, and aprons removed. Fig. 3 is a side view of the entire machine. Fig. 4 is a side view of the rope-maker. Fig. 5 is an enlarged perspective view of the rope-feeding device. Fig. 6 is a perspective view of the tucking mechanism of the binder. Fig. 7 is a similar view of the twisting and cutting mechanisms of the binder. Fig. 8 is a perspective view of the twisting device of the rope-maker. Fig. 9 is a section of an attachment to the rope-carrying arm. Figs. 10 and 11 are perspective views of certain wheels of the machine; and Fig. 12 is a perspective view of the device for carrying the straw from the hopper to the rope-making mechanism.

A represents the frame of my machine, constructed in any suitable manner to contain the various working parts thereof, and to be attached to the frame of a harvester, or form a part of said frame. B represents the driving-shaft, to be provided with a suitable driving-wheel, which is to receive its motion from the harvester to which the machine is connected. At or near the rear end of the shaft B is fastened a beveled cog or miter wheel, C, which gears with two pinions, *a* and a^1, upon the inner ends of two shafts, D and E, respectively, said shafts standing at right angles with the shaft B, and extending to the front and rear of the machine. The pinion *a* is loose on the shaft D, and connected therewith by a clutch, *b*, operated by means of a lever, *d*. On the shaft D, near the outer end, is placed a loose arm, G, carrying a train of idle cog-wheels, *f f*, which are run by means of a pinion, *e*, on the shaft. The last cog-wheel *f* in the train or series attached to the arm G gears with a double rack-bar, *h*, secured to, or formed on, the outer side of a wheel or disk, H. The rack-bar *h* is in the form of a semicircle, cogged upon both sides and ends, and concentric with the wheel upon which it is secured. The wheel or disk H, by these means, receives a rotary reciprocating motion, it turning one-half a revolution around its shaft, and then back again. The arm G being loose on the shaft D allows the pinion or cog wheel that gears with the rack-bar *h* to move in and out, and pass around the ends of the rack-bar.

The wheel H gives motion to another wheel or disk, I, placed on the same shaft, so as to give this latter wheel or disk one-fourth of a revolution for every half-revolution of the wheel H by means of two lugs, *i i*, on the wheel H, one of said lugs, on the forward motion, striking a lug, *k*, on the wheel I, and turning it one-fourth of a revolution, thereby throwing down the rope-carrying arm J, which is attached to the wheel I by a braced arm, K. The wheel I then remains stationary, letting the arm J rest while the knot is being tied; then, on the backward motion, the other lug *i* strikes the lug *k*, raising the arm J up, and letting it rest there while the gavel runs and another comes in.

The rope-carrying arm J is held down while the knot is being tied by the lug *k*, which catches on a spring-hook, *m*. (Shown in Fig. 10.) On the backward movement of the disk H the lug *i* that carries the arm back strikes the spring-hook, and throws it off the lug *k*.

On the periphery of the wheel or disk I are two grooves, in which runs a cord, *n*. The

cord being fastened to the disk, the ends thereof cross each other below and pass around pulleys *p p*, arranged as shown in Fig. 2, the ends being tied together, and one end passing over a pulley on the arm J and fastened to a spring, *s*, thereon, so that when said arm is down both ends of the pressure-cord *n* come near together and around the gavel. N N are two endless elevating-belts, run by a belt from a pulley on the outer end of the shaft D. M is an endless apron, which forms the platform for the grain to fall on when it is cut, and it is run by belt from the lower roller of the elevator. The grain is carried by the apron M to the belts N N, they being provided with suitable teeth for that purpose, and the grain is carried up between the belts N N and the shields *t t*, over them, into a receptacle, O, where it is bound. When the rope-carrying arm J starts down, a cam, *v*, on the periphery of the wheel H, presses on one end of a pivoted lever, P, the other end of which is connected to a crank, *x*, on the end of a shaft, *w*, running above the rear roller of the apron M. The shaft or rod *w* is provided with a series of teeth, *y*, which, by the pressure of the cam *v* on the lever P, are thrown down to the apron M, and are held down so that no straw can pass up while the gavel is being bound. When the arm goes back, a spring, *z*, attached to the lever P, throws the teeth *y* up again. The apron M is provided with longitudinal ribs b^1, to hold the straw off of the apron, so that the teeth *y* on the rod *w* may reach below the straw and not touch the apron. In binding grain the rope is first started, carried around rollers d^1 d^2 d^3, which keep up the slack, then over rollers e^1 e^1 on the rope-carrying arm J down to a clutch formed by three curved steel springs, f^1, which hold it fast. This clutch, as well as the rope-cutter, twister, and tucker, are all located bebetween the two elevating-belts N N. When the grain is carried up by said elevating-belts it goes on top of the rope, pushing it back at the same time. When the rope-arm goes down it takes the rope and pressure-cord *n* over and draws them both tight around the gavel. On the rope-arm are pressure-plates h^1 h^1, which push the rope into the clutch, and the rope is guided and held to the twister by a spring-guide, k^1, attached to the rope-arm, and provided with a semicircular foot, i^1. Below this is a stationary half-circle, i^2, the two forming a circle around the twister R and the two ends of the rope, thus preventing the twister from missing the rope. The twister is constructed as shown in Fig. 7, and is attached to the rear end of an inclined shaft, m', upon the front end of which is a tapering pinion, n', gearing with a pinion, p^1, on a shaft, s^1. The shaft s^1 runs on a line with the main driving-shaft B, and is connected therewith by a clutch, t^1. This clutch is connected to a pivoted elbow-lever, v^1, having at one end a rod, w^1, extending upward, as shown in said Fig. 7. The clutch t^1 is held out of gear by means of a spring-arm, S′, operating against the end of the lever v^1, and said clutch is thrown in gear as the rope-arm J completes its downward movement by a projection, x^1, thereon, striking and pushing down the rod w^1. As soon as the rope-arm ascends the spring-arm S′ throws the clutch t^1 out of gear again.

On the front end of the shaft s^1 is a disk with crank-pin, y^1, connected by a pitman, z^1, with one end of a pivoted lever, T, and the other end of this lever is, by a rod, a^2, connected with a curved knife, S, located between the clutch f^1 and the twister R at the rear end of the frame which supports the shafts m^1 s^1. The knife S slides in suitable guides on said frame. When the clutch t^1 is thrown in gear, as above described, the knife S is operated to cut the rope, and the twister R revolved to twist the rope close up to the gavel. As soon as the twisting is done the tucker V is thrown into gear and tucks the twisted end in under the rope around the gavel. The tucker V is constructed as shown in Fig. 6, and attached to an inclined shaft, b^2, upon which is secured a pinion, e^2. This pinion gears with a rack-bar, f^2, attached to a frame or gate, W, which is moved laterally back and forth by means of a cam, Y, placed upon the driving-shaft B. The cam Y is loose upon the shaft, and thrown in and out of gear therewith by means of a clutch, h^2, which clutch is operated by a compound lever, Z, actuated by a cam, A^2, on the disk H. When the clutch h^2 is thrown in gear, the cam Y makes one revolution, thereby throwing the tucker in and out. A spring, i^4, attached to the compound lever Z throws the clutch h^2 out of gear again as soon as the cam A^2 ceases to operate on said lever. The rope arm J then moves up, leaving the rope as at first, ready for another gavel. The gavel is taken out by a belt, B^2, running around rollers in the bottom of the receptacle O. This belt is thrown in gear at the proper time by means of a cam, k^1, on the disk H, which operates an L-shaped lever, C^2, and this, by means of a pin, m^2, at its other end, operates an elbow-lever, D^2, which is connected to a clutch, n^2, on the shaft E. This clutch throws a loose pinion, p^2, on said shaft in gear, so as to revolve the lower roller, around which the endless belt B^2 is placed a shaft, t^2, extending from said roller with a pinion, s^2, on its end gearing with the pinion p^2. As soon as the gavel is taken out the cam k^2 passes off the lever C^2, and a spring, v^2, connected to said lever actuates it in such a manner as to throw the clutch n^2 out of gear with the pinion p^2. At the right side of the machine, near the rear of the grain-platform, is a hopper, E^2, to be filled with straw for making the rope. This hopper is set on an incline, so that the butts will settle down even, and in the lower rear end on the inner side is a slot, through which the grapples take a few straws, and carry the same to the twister. These grapples each consists of a plate, G^2, with a projecting ear at each end, in which

are two parallel shafts, w^2 w^2, provided with curved fingers x^2, said fingers interlocking between each other, and held close by means of springs y^2 coiled around the shafts w^2. Each shaft is provided with an arm, z^2, the one on the upper shaft extending upward, and the one on the lower shaft extending downward, as shown in Fig. 12.

The grapples thus constructed are secured to an endless belt, H^2, which passes around two flanged pulleys, I^2 and I^3. As it passes around the front pulley I^2 the fingers x^2 open by the arms z^2 riding on the flanges of the flanges of the pulley, and in this position the fingers enter the slot in the hopper E^2, and while there the arms z^2 pass off the flanges on the pulley, and the springs Y^2 close the fingers, causing them to grab a few straws, and carry them along an inclined chute-board, J^2. As the grapple reaches the rear pulley I^3 the arms z^2 strike the flanges thereon, and open the fingers, allowing the straws carried by them to fall down lengthwise into a tube, K^2, along the lower edge of the inclined chute-board J^2.

Through the tube K^2 runs a shaft, a^3, provided at its rear end with the twister L^2, constructed as shown in Fig. 8.

The lip of the twister catches the straw as it falls down, and twists it around the pointed end of the shaft a^3. The shaft a^3 is hollow about half-way from the heel toward the point, and it runs on an arm, b^3, which arm is held stationary in suitable bearings on the frame. On the front or heel end of the shaft a^3 is a bevel-pinion, d^4, which gears with a similar pinion on the lower end of the shaft of the pulley I^2. e^3 is the shaft of the pulley I^3. On the upper end of the shaft e^3 is a bevel cog-wheel, M^2, placed loosely thereon, which cog-wheel gears with a pinion, f^3, on the outer end of the shaft E. The wheel M^2 is held in gear with the shaft e^3 by means of a clutch, h^3, connected to a pivoted lever, N^2, which is held in position by a spring, i^3. The rope is pulled from the twister by running between two rough rollers, m^3 n^3. The roller m^3 runs in stationary bearings, and is revolved by suitable pinions p^3 from the lower end of the shaft e^3. The roller n^3 is placed in movable bearings and actuated by a spring, so that the roller will yield to suit the irregularities of the rope. The rope passes from the rope-maker thus constructed under a roller, t^3, then over the roller d^1, under the roller d^2, and over the roller d^3, then over the rollers e^1 e^1 on the rope-carrying arm J to the clutch f^1, that holds the end of the rope.

The roller d^2 is placed on a stud projecting from a slide, v^3, which moves up and down on an arm, O^2, and to this slide should be attached a weight or spring, to force the slide down with sufficient pressure to cause the roller d^2 to keep up the slack between the rope-maker and the binder, and to draw the rope tight around the gavel. In a full-sized machine it is intended to have a band ahead all the time.

As the slide v^3 descends it bears on the end of the lever N^2, thereby raising the clutch h^3, and throwing the rope-maker out of gear, to prevent having any more than one band ahead.

The rope-maker may be set in any convenient position, the hopper set by the side of the driving-wheel, the rope-maker at right angles to it; or it may be set under the hopper, the belt turned up the other way, and the straw run around one pulley and back to the other before it drops.

The hopper may be set on the side of the driving-wheel, and be made so as to fold up and be out of the way in passing through gates.

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

1. The combination of the shaft D, loose arm G, train of cog-wheels f, and the wheel or disk H, provided with the semicircular double rack-bar h, substantially as and for the purposes herein set forth.

2. The combination of the rotary reciprocating disk H, having lugs i i, the disk I, having lug k, and the spring-hook m, substantially as and for the purposes herein set forth.

3. The combination, with the rope-carrying arm J, and the grooved disk I to which it is attached, of the cord n, pulleys p, and spring s, arranged substantially as and for the purposes herein set forth.

4. The combination of the shaft or rod w with teeth y and crank x, the lever P, spring z, and the cam v on the wheel or disk H, substantially as and for the purposes herein set forth.

5. The steel springs f^1, arranged to form a clutch for holding the rope carried down by the arm J, as herein set forth.

6. The spring-guide k^1, attached to the rope-arm J, and provided with the semicircular foot i^1, in combination with the stationary half-circle i^2 and twister R, substantially as and for the purposes herein set forth.

7. The combination of the twister R, shaft m^1, pinions n^1 p^1, shaft s^1, clutch t^1, and main shaft B, all substantially as and for the purposes herein set forth.

8. The combination, with the shafts B s^1 and clutch t^1, of the elbow-lever v^1, rod w^1, spring-arm S^1, and projection x^1 on the rope-arm J, all substantially as and for the purposes herein set forth.

9. The combination of the shaft s^1, crank y^1, pitman z^1, lever T, rod a^2, and knife S, all substantially as and for the purposes herein set forth.

10. The carrying-aprons N N, running parallel with each other, in combination with the cutter, twister, tucker, and clutch, arranged between said aprons, and the reciprocating rope-carrying arm J, substantially as set forth.

11. The combination of the tucker V, shaft b^2, pinion e^2, rack-bar f^2, frame or gate W, and

cam or eccentric y, all substantially as and for the purposes herein set forth.

12. The combination, with the shaft B and cam or eccentric y, of the clutch h^2, compound lever Z, spring i^4, and cam A^2 on the disk H, substantially as and for the purposes herein set forth.

13. The combination, with the endless gavel-carrying belt B^2, and its rollers, shaft t^2, pinions s^2 p^2, and shaft E, of the clutch n^2, elbow-lever D^2, L-shaped lever C^2 with pin m^2 and the cam k^2 on the disk H, all substantially as and for the purposes herein set forth.

14. The combination of the hopper E^2, endless belt H^2, with its grapples, chute-board J^2, twister-tube K^2, and twister L^2, for making the straw-rope to be used in the grain-binder, substantially as herein set forth.

15. The combination of the endless belt H^2, the grapples attached thereto, and the flanged pulleys l^2 I^3, all substantially as and for the purposes herein set forth.

16. The combination of the twister L^2, shaft a^3, pointed at one end, and hollow for about half its length from the other end, and the stationary arm b^3, substantially as and for the purposes herein set forth.

17. The combination of the shaft E, pinion f^3, cog-wheel M^2, flanged pulley I^3, shaft e^3, clutch h^3, lever N^2, spring i^3, and weighted slide v^3, all substantially as and for the purposes herein set forth.

18. The combination of the corrugated revolving roller m^3, actuated, by means of gearing p^3, from the shaft e^3, and the yielding corrugated and revolving roller n^3, substantially as and for the purposes herein set forth.

19. The rollers d^1 d^3 and the roller d^2 placed on a stud projecting from a slide, v^3, for taking up the slack of the rope, substantially as herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 2d day of November, 1874.

CHARLES E. DONNELLAN.

Witnesses:

O. H. CASTLE,

JOSEPH SCHROTZ.