(No Model.) 3 Sheets—Sheet 1.

W. N. WHITELEY.

GRAIN BINDER.

No. 368,436. Patented Aug. 16, 1887.

Fig. 1.

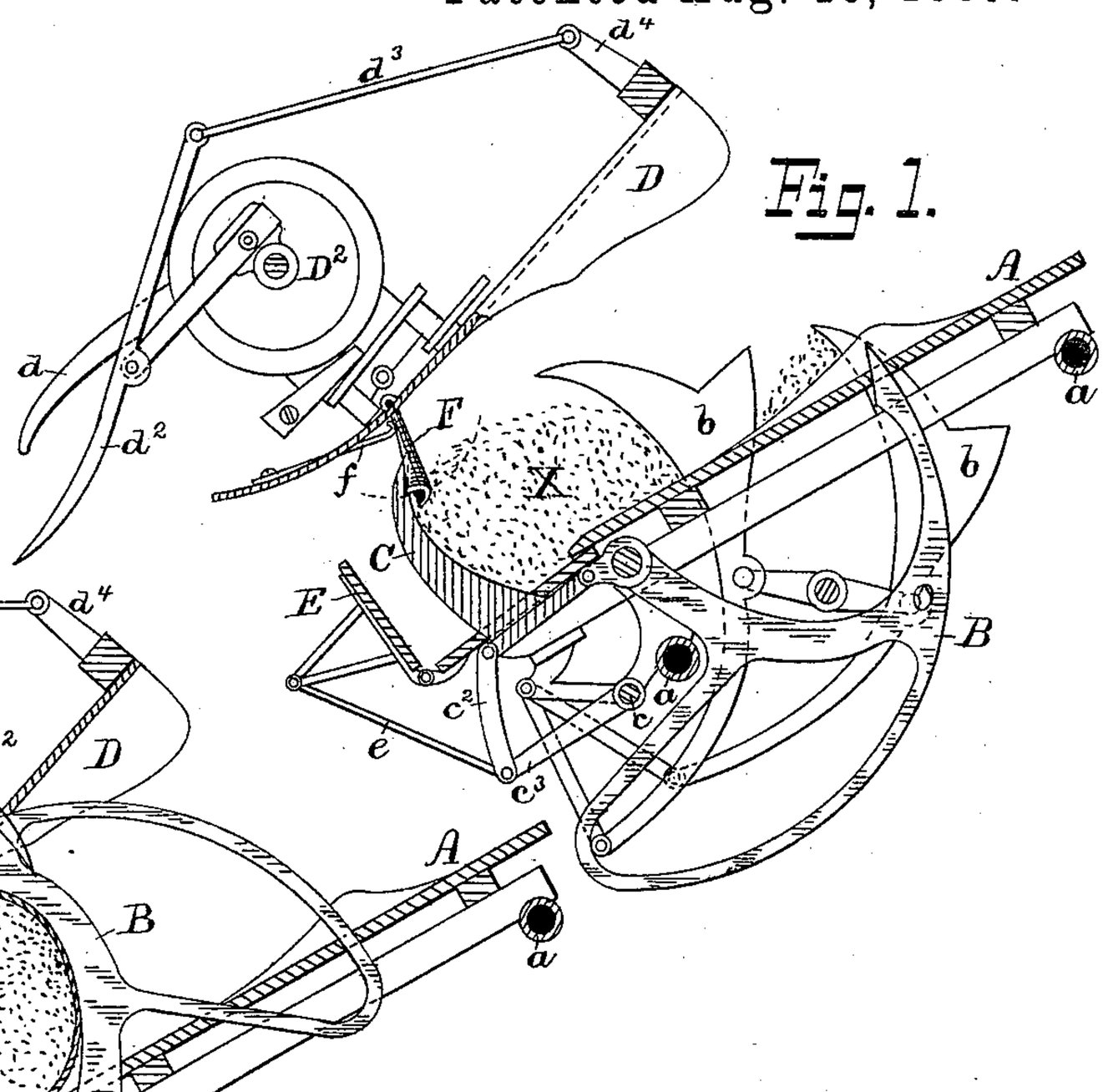


Fig. 2.

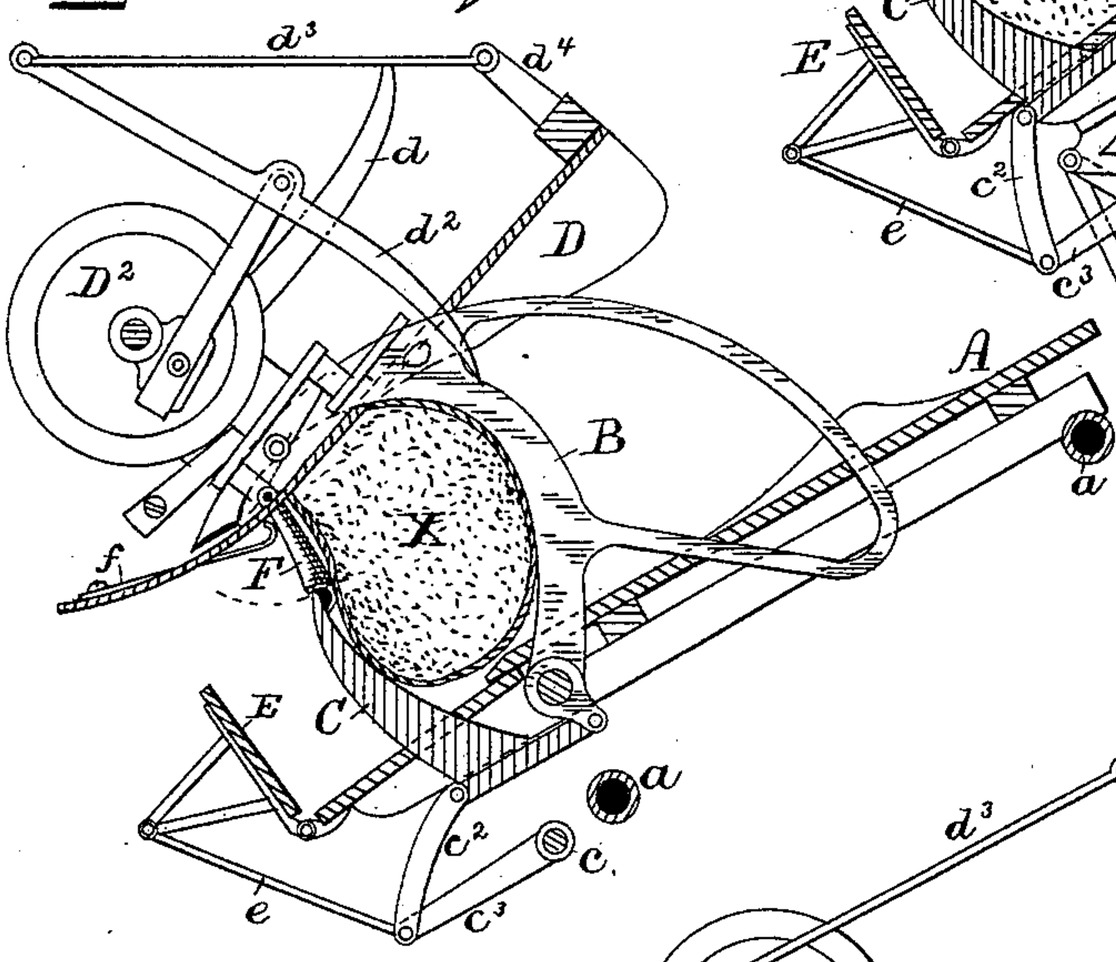
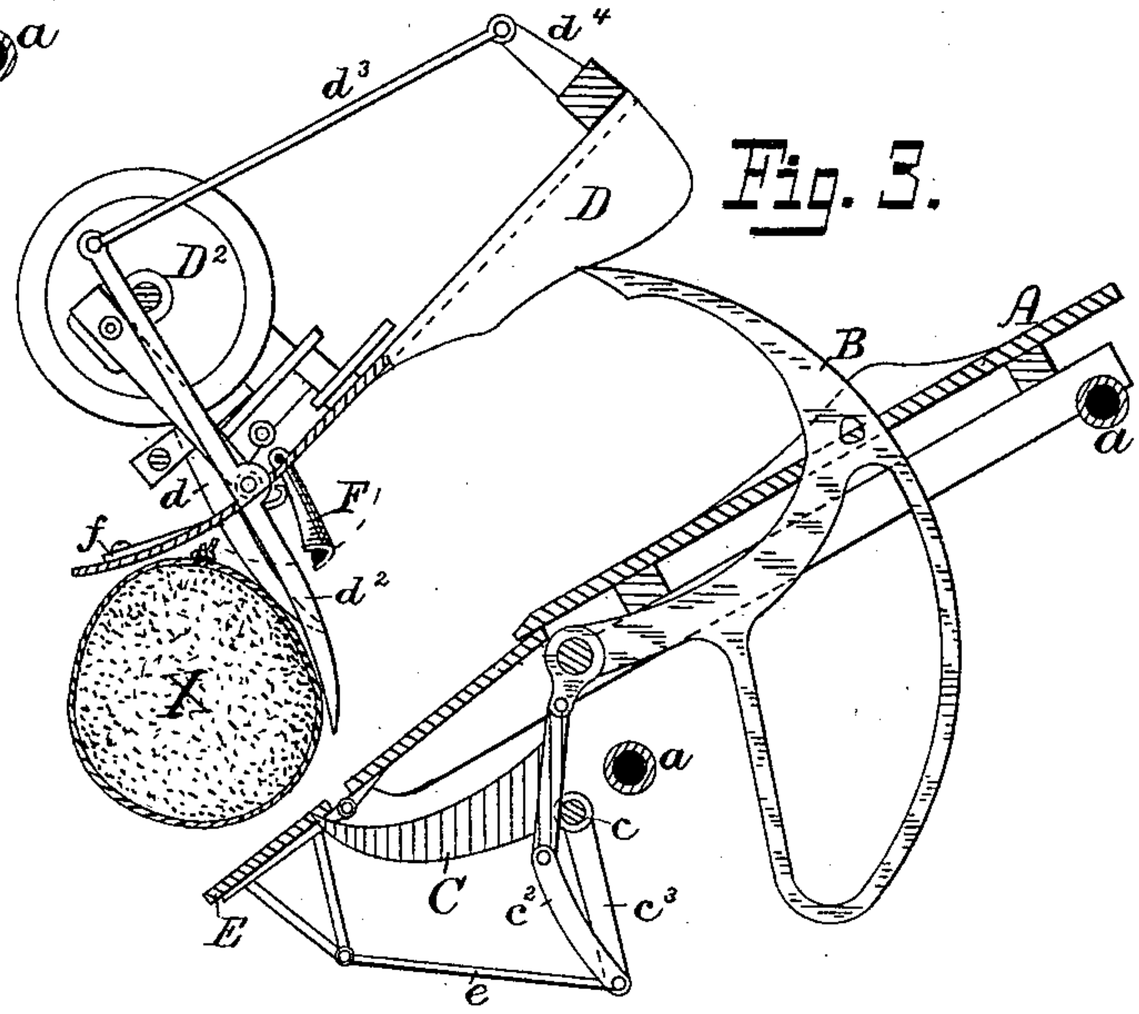


Fig. 3.



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William N. Whiteley

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GRAIN BINDER.

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Fig. 4.

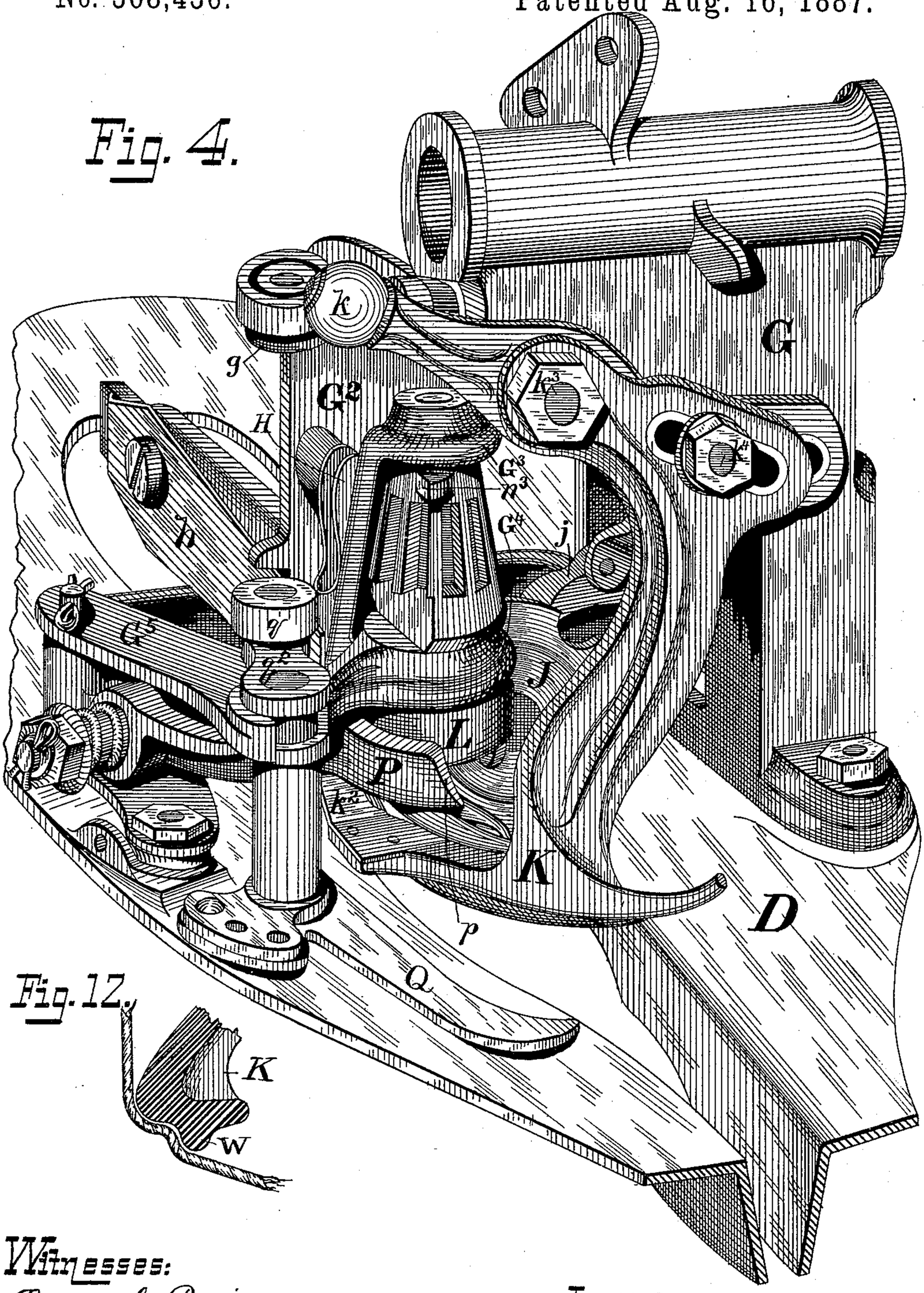

Fig. 12.

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(No Model.) 3 Sheets—Sheet 3.

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GRAIN BINDER.

No. 368,436. Patented Aug. 16, 1887.

Fig. 5.

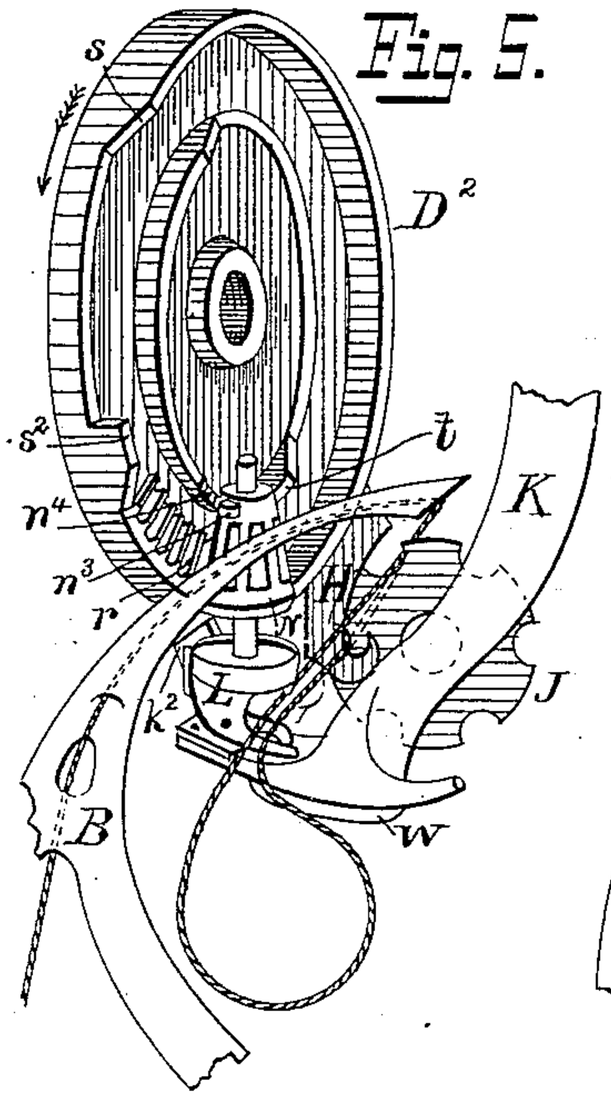


Fig. 6.

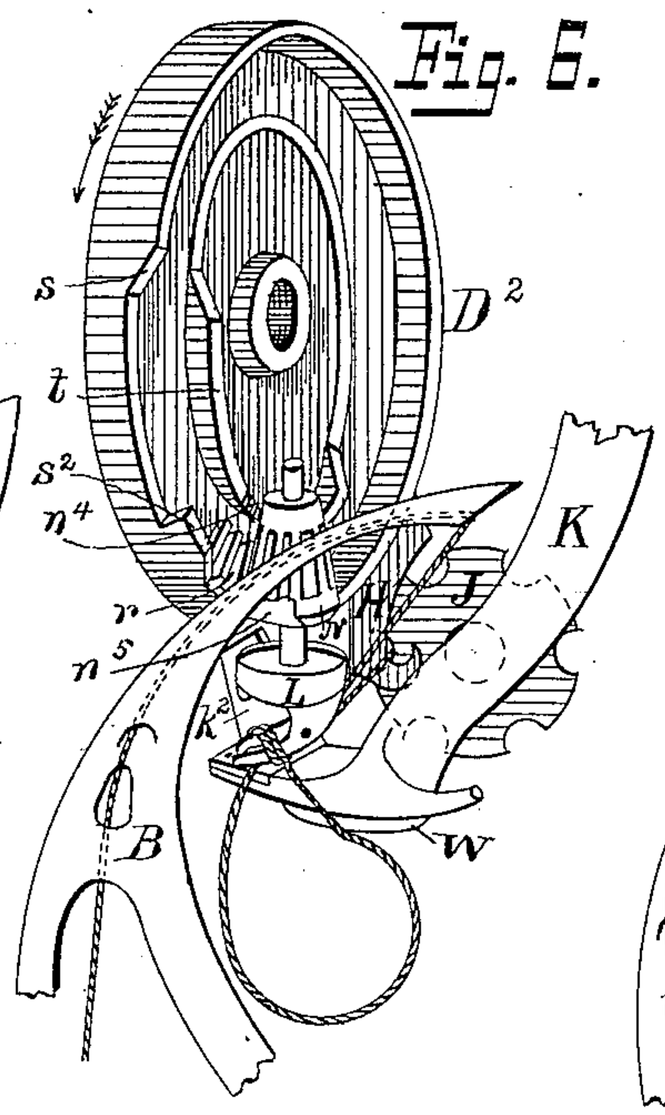


Fig. 7.

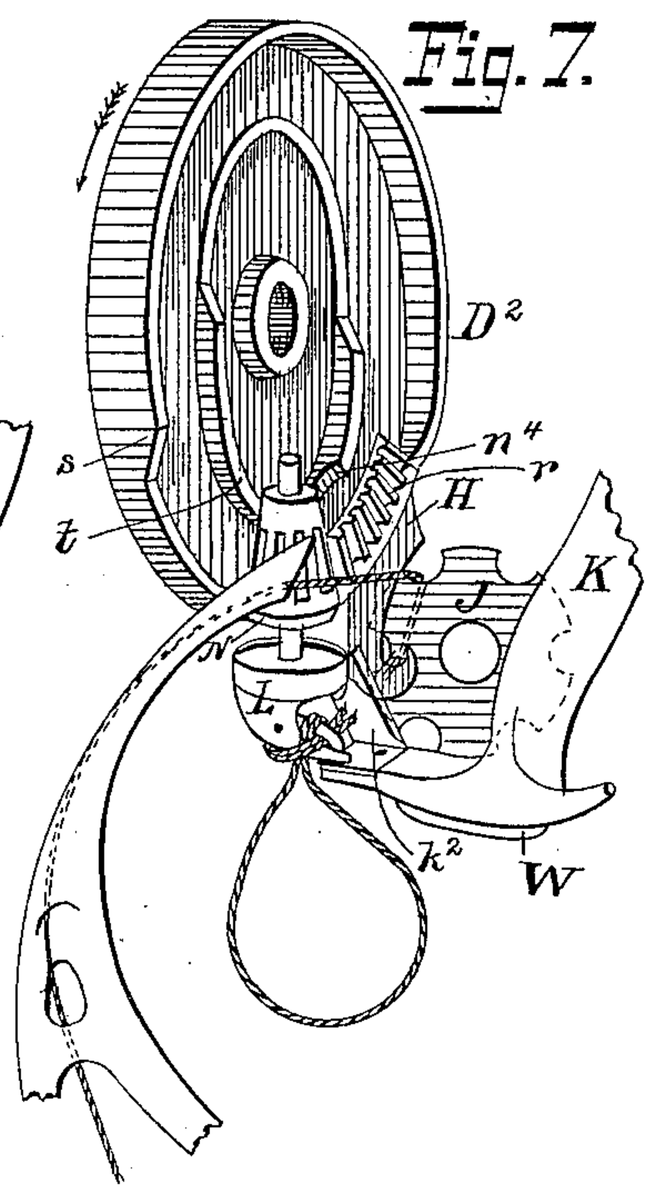


Fig. 8.

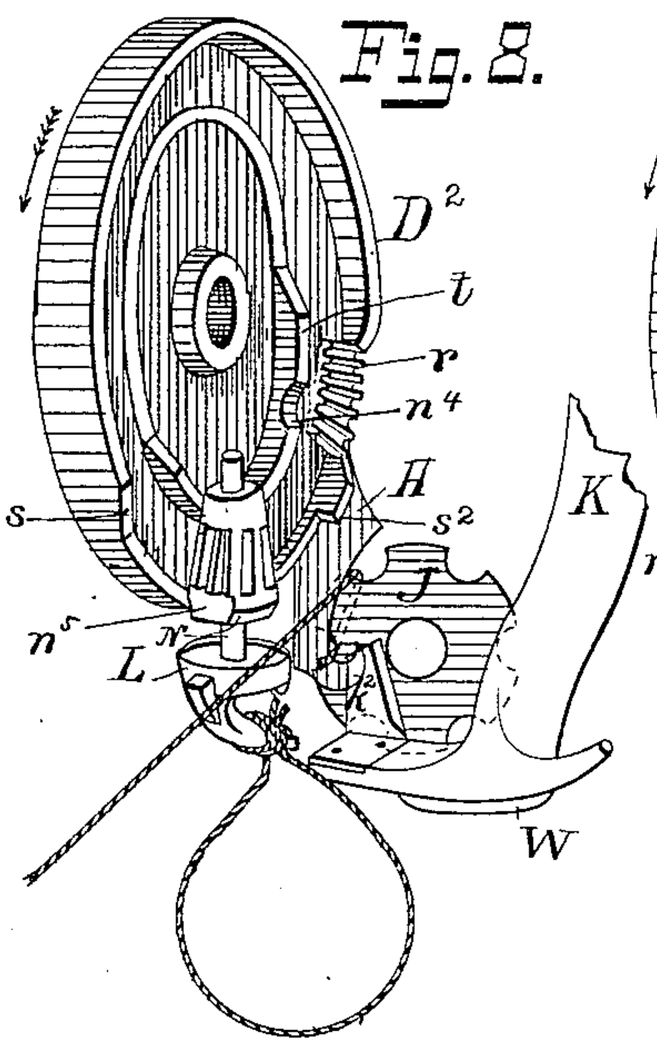


Fig. 9.

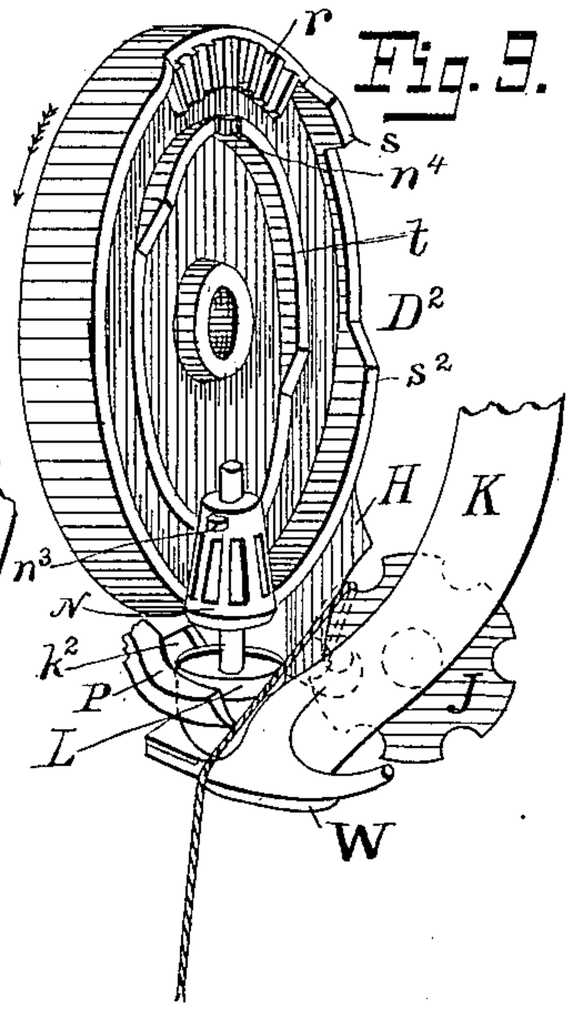


Fig. 10.

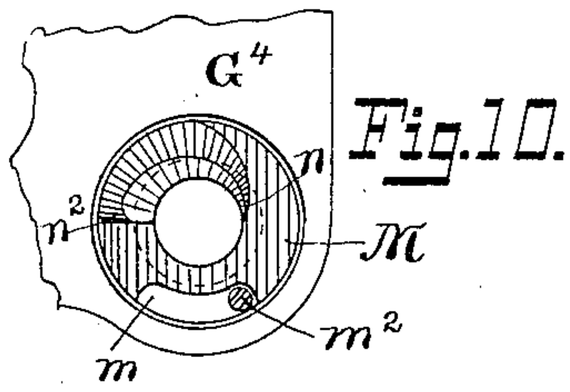
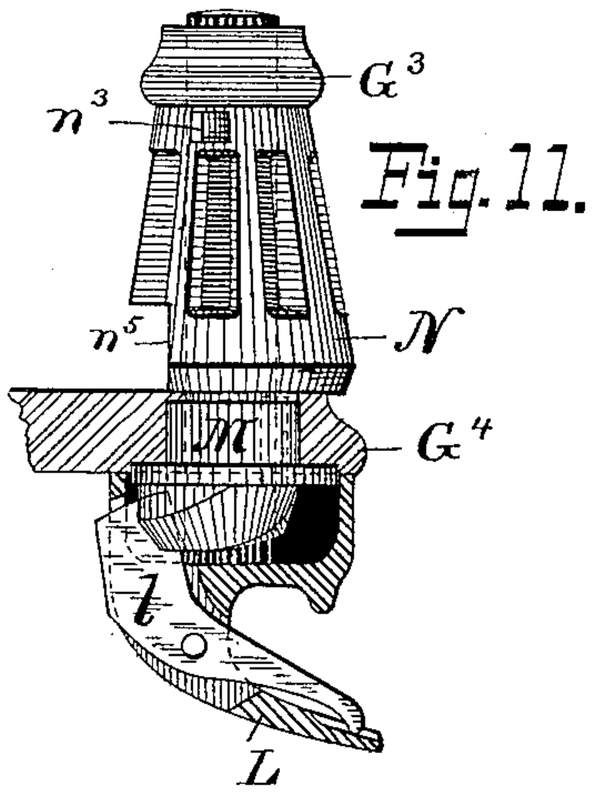


Fig. 11.



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UNITED STATES PATENT OFFICE.

WILLIAM N. WHITELEY, OF SPRINGFIELD, OHIO.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 368,436, dated August 16, 1887.

Application filed March 30, 1886. Serial No. 197,099. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM N. WHITELEY, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Grain-Binders; and I do hereby declare the following to be such a full, clear, and exact description of the invention as will enable any person skilled in the art to which it pertains to construct and use the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to that class of automatic grain-binders wherein the cut grain is delivered by elevator-belts to and upon an inclined binding-deck, where it is accumulated into a gavel, which is formed against a yielding compressor, after which a binding-arm encircles the gavel with a cord, which is secured by a knot formed automatically, the remaining cord being then severed from that surrounding the sheaf, and the sheaf discharged.

My improvements consist, first, in providing for a backward rotation of the tyer-bill for the purpose of allowing the knot to strip from the same when the bundle is discharged, by which means I am enabled to reduce the functions of the stripper; second, providing a stop upon the tyer-bill gear, whereby the backward movement of the same may be limited to its proper extent; third, providing upon the tyer-wheel proper cams for permitting the backward movement of the tyer-bill and for confining said movement within proper limits; fourth, in consequence of the backward rotation of the hook, dispensing with the stripping function of the stripper and knife-arm, leaving it to perform only its functions as a knife-arm and cord-guide; fifth, pivoting the spring closing-cam at a point much farther from the central line of the knotter and elongating the cam-track upon the same, whereby the closing of the tongue of the tyer-bill is much easier and more gradual, while the elongated end of the spring-cam is formed to serve as a cord-guide; sixth, forming a downwardly-projecting ridge upon the under side of the knife-arm and cord-guide for the purpose of preventing the cord from being caught between the cord-guide and "tucker-finger" and accidentally cut off.

In the accompanying drawings, Figures 1, 2, 3 are cross-sections of a binder, showing the location and operation of my newly-invented compressor-tongue and its relation to the working parts of a binder in the different positions of said parts in binding and discharging a bundle. Fig. 4 is a perspective view of the knotter. Figs. 5, 6, 7, 8, 9 are sectional perspective views of the knot-tying mechanism proper in their respective positions at different stages of tying the knot. Fig. 10 is a bottom view of the opening-cam of the tyer-bill. Fig. 11 is a side elevation, with parts shown in section, of the tyer-bill, tyer-bill gear, opening-cam, &c. Fig. 12 is a cross-section of the lower part of the guide and knife-arm, showing the form of the rib for preventing the cord from being caught and accidentally cut by the tucker-finger.

Similar letters refer to like parts in the several views.

The general form and construction of the binder herein described and illustrated is the same as the usual form of what is generally known as the "Appleby Binder," described in Letters Patent No. 212,420, granted to J. F. Appleby February 18, 1879, and since improved, and my invention is in the nature of improvements thereon.

Referring to Fig. 1, A is the binding-deck, supported upon the gas-pipes *a a*. B is the needle-arm. *b b* are the packers. C is the compressor, pivoted at one end to the needle-arm and at the other to the link c^2, connecting it with crank c^3 of the compressor crank-shaft *c*. D is the breast-plate. D^2 is the tyer-wheel. *d* d^2 are the ejector-arms, the latter being pivoted to a crank fixed to the tyer-wheel, the upper end of the ejector being kept in proper position by a link, d^3, pivoted to it and to the bracket d^4. The backboard E is hinged to the binding-deck and operated by the rod *e*, connecting it with the compressor-crank c^2.

The parts so far described are all constructed and arranged in the usual manner, except the breast-plate D, which will be hereinafter more particularly referred to.

Hinged or pivoted to the breast-plate D, and projecting downwardly therefrom, is the compressor-tongue F, which is pressed forward by the spring *f*, fixed to the breast-plate D.

Fig. 1 shows the parts in position for forming a gavel, the compressor occupying its usual place, projecting upward nearly to the breast-plate, the remaining space being closed by the compressor-tongue F. The packers *b b* now proceed to pack the grain against the compressor, which is allowed to yield slightly by the usual compressor-spring (not shown) acting upon the compressor-shaft *c*, while the compressor-tongue F prevents any grain from being forced over the top of the compressor. The compressor C is long and positively operated, and serves as the support for the gavel while the gavel is being bound in the usual manner, while the compressor-tongue operates more to prevent the overflow of grain past the compressor, and hence it is short, and may be held in position by a comparatively light spring, and needs no positive lock during the binding or other operations of the machine. The gavel X having been formed and the binding mechanism "set off" in the usual manner, the needle-arm B swings up, carrying the cord and encircling the gavel, and at the same time drawing forward and slightly downward the compressor C, the compressor-tongue F still retaining its relative position and assisting to hold the gavel in shape while the knotting mechanism is acting. This part of the operation is illustrated in Fig. 2. The knot having been formed and the band severed from the remaining cord, the tyer-wheel D^2 continues to rotate and the ejector-arms *d* d^2 sweep around and discharge the bound bundle, the compressor C and backboard E dropping out of the way and the compressor-tongue swinging back by the passage of the bundle, after which it is again thrown forward by the spring *f* in the position shown in Fig. 3, and the compressor and its appendages resume their position, as shown in Fig. 1, ready for the formation of another gavel.

The knotting device is of the following construction, referring to Figs. 4, 10, 11, 12: The general form is the same as that of Appleby's patent hereinbefore referred to—*i. e.*, a main frame, G, through the top of which passes the tyer-wheel shaft, a swinging cord-holder frame, G^2, pivoted upon the plunger-rod *g* and operated by a cam-track on the tyer-wheel D^2, said frame carrying the usual cord-holder shoe, H, held in place by the spring *h*, and the cord-holder disk J, rotated at proper intervals by the pawl *j* engaging a ratchet (not shown) on the back of the cord-holder disk J, the pawl *j* being pivoted to a lever operated by the plunger-rod *g*. The swinging guide and knife arm K are pivoted upon the frame G and operated by a cam-track on the tyer-wheel D^2 engaging the friction-roller *k*. The knife k^2 is carried by the knife-arm K, and its movement is regulated and adjusted by its being made in two parts, secured to each other by the pivot-bolt k^3 and adjusting-bolt k^4. The guide and knife arm K was formerly called the "stripper," as one of its functions was to strip the knot from the tyer-bill; but in this case the tyer-bill is allowed to turn backward far enough to allow the knot to readily slip off the tyer-bill by the pressure exerted upon the bound bundle by the ejector-arms *d* d^2. Pivoted to the breast-plate D and to the projection G^5 of the frame G is the tucker-finger Q, of the usual form and operated by a cam-track upon the tyer-wheel D^2 acting upon the friction-roller *q*, journaled upon the arm q^2 of the tucker-finger. The function of the tucker-finger is to sweep around under the guide-arm K and assist in placing the cord in proper position across the tyer-bill L and hold it there while the knot is being formed. One of the frequent troubles in this form of knotter is that when the tucker-finger sweeps around to press the cord into its place just previous to the rotation of the bill-hook the cord impinges upon the lower edge of the stripper, and the tucker-finger, acting as a shear, cuts off the cord. I obviate this difficulty by forming upon the bottom of the knife-arm K a downwardly-projecting ridge, W, (shown in section at Fig. 12,) which is considerably narrower than the knife-arm proper. In practice I find that, the cord having an opportunity to conform to the contour of the bottom of the knife-arm and the ridge W presenting less surface to friction, the cord slides freely off and the difficulty of the accidental severing of the same is prevented.

The tyer-bill L has the usual tongue, *l*, pivoted in a slot, as shown in Fig. 11. The upper portion is recessed from above downward to allow it to inclose the opening-cam M, a bottom view of which is shown in Fig. 10. The stem of the tyer-bill L passes up through the opening-cam M, through the tyer-bill gear N, to which it is fixed, and through a projecting bracket, G^3, formed upon the frame G. The opening-cam M is recessed into another projecting bracket, G^4, upon the frame G, in which it is allowed to turn within proper limits by a slot, *m*, engaging a pin, m^2, fixed in the projecting bracket G^4. Upon the opening-cam M is formed the spiral-shaped cam-track *n* n^2, increasing from *n* to n^2, the distance being about half of the circle. Against this cam-track *n* n^2 the inner edge of the upper end of the tongue *l* rests, and by traveling around it as the tyer-bill L rotates the tongue *l* is opened to admit the cord, as hereinafter more particularly described. When the tongue *l* is open to its fullest extent, the upper end rests upon the cam-track at n^2. The rotation continuing, the tongue drops off the cam-track at n^2 and is left free to be closed by the closing-cam P. It being necessary to allow the tyer-bill to rotate backward without opening the tongue, the slot *m* is formed in the opening-cam M, by which means the upper end of the tongue, pressing against the ledge n^2 at the end of the cam-track *n* n^2, rotates the opening-cam backward to the same extent as the tyer-bill and to the position shown in Fig. 10. Upon the next forward rotation of the tyer-bill in

tying the next knot the pressure of the upper end of the tongue *l* upon the cam-track at *n* returns the opening-cam M to its proper position to begin the opening of the tyer-bill in forming the next knot.

The closing-cam P is similar to the usual closing-cam in this form of knotter, except that it is pivoted to the knotter-frame G at a point much farther from the center line of the knotter, whereby the curved cam-track formed upon its front end is enabled to reach much farther around to the front of the tyer-bill L and to have formed upon it a short guiding-incline, as shown at *p*, for the purpose of assisting the guide-arm K in guiding the cord to its proper position across the tyer-bill L preparatory to the knot being formed.

The operation of tying the knot is, for convenience of illustration and description, divided into five movements or positions, which are shown, respectively, in Figs. 5, 6, 7, 8, 9, and is as follows, viz:

Fig. 5 shows the position of the essential parts when the gavel has been formed by the packers *b b*, the binding mechanism set off or started by any of the usual devices employed for this purpose, and the needle-arm B thrown upward, encircling the sheaf with the binding-cord, one end of which is held, as usual, in the cord-holding device H J, and from thence it continues, lying across the tyer-bill L, over the guide and knife arm K, down and around the gavel, thence upward and again across the tyer-bill L, to which position it is guided by the guide and knife arm K on one side and the incline *p* on the spring closing-cam P on the other, to the point of the needle-arm B, as shown in Fig. 5. The tyer-wheel D^2 then rotating in direction of the arrow, the tucker-finger Q swings around closely under the guide and knife arm K and carries the cord close to the tyer-bill L, where it holds it, preparatory to tying the knot. In Figs. 5, 6, 7, 8, 9 the tucker-finger is omitted, as the principal object of these illustrations is to show the essential parts for forming the knot only. The tyer-wheel D^2 continuing to rotate, the teeth *r* engage the teeth of the tyer-bill gear N, rotating it to the position shown in Fig. 6, the tyer-bill having made one-half of a revolution. Formed upon the tyer-bill gear N, near its top, is a projection, n^3, which falls into a depression, n^4, in the cam-track *t* on the tyer-wheel D^2. This cam-track and the projection n^3 are for the purpose of confining the backward rotation of the tyer-bill L within proper limits. The lower portion of the tyer-bill gear N is flattened at n^5, as usual, and has the cam-track *s* formed upon the tyer-wheel D^2 to fit it, which prevents the rotation of the tyer-bill L when not actuated by the gear-teeth *r*, as usual, except that a portion of the cam-track *s* from *s* to s^2 is cut away to allow of the backward rotation of the tyer-bill L. Continuing the rotation of the tyer-wheel D^2, the tyer-bill L completes one revolution, the tongue *l* having engaged the opening-cam M and received the folds of the cord within the bill, in the usual manner, the cord-holder disk J having rotated one-sixth of a revolution and one of its notches caught the cord in the cord-holder H; the knife-arm K having been thrown forward and the knife k^2 severed the formed knot from the remaining cord, the several parts take the position shown in Fig. 7, and the knot is now ready to be cast off or "stripped" from the tyer-bill L as the bound bundle is discharged. At this time the ejector-arms *d* d^2, Fig. 2, engage the bundle and force it out of the binder in a direction nearly at right angles with the line of the tyer-bill L as it stands in Fig. 7. The force of the bundle in being discharged rotates the tyer-bill L backward to the position shown in Fig. 8, the projection n^3 encountering the cam-track *t* and preventing the tyer-bill L from going back too far, and the knot is stripped from the tyer-bill L and the bundle discharged. At the same time the continued rotation of the tyer-wheel D^2 brings the incline *s* of the cam-track *s* s^2 against the flattened surface n^5 on the tyer-bill gear N, and the tyer-bill L is returned to its position of rest, as shown in Fig. 9, the needle-arm B having returned to its position, as shown at Fig. 1, and the knotting mechanism being in position for tying another knot.

Having thus described my invention, its construction, arrangement, and operation, and pointed out wherein it consists of new and useful improvements, and without wishing to be understood as restricting my claims of invention to any precise form or proportion of parts, or to any particular devices not essential to the principle of construction and mode of operation herein described, what I claim as new, and desire to secure by Letters Patent, is—

1. In the knotting mechanism of an automatic grain-binder, the combination of a tyer-wheel, a cam-track thereon having a cut-away portion, a tyer-bill, a tyer-bill pinion having a flattened portion adapted to engage with said cam-track, a projection on the tyer-bill gear, and another cam-track on said tyer-wheel, with which said projection engages, said parts operating substantially as set forth, to permit backward rotation of the tyer-bill within proper limits for the purpose of facilitating the shedding of the knot.

2. In the knotting mechanism of an automatic grain-binder, the combination, with the tyer-bill revolving backward to allow the force of the discharging bundle to strip the knot from said tyer-bill, of a projecting lug carried by the tyer-bill shaft, a tyer-wheel, and a suitable cam, against which said lug rests for the purpose of confining the backward revolving movement of the tyer-bill within proper limits.

3. In the knotting mechanism of an automatic grain-binder, a spring-cam for closing the tongue of the tyer-bill, provided with a

front extension inclined to act as a guide for assisting in guiding the cord to its proper position across the tyer-bill for the purpose of facilitating the tying of the knot.

4. In the knotting mechanism of an automatic grain-binder, a vibrating knife-arm and cord-guide having a downward-projecting ridge formed upon its under side, in combination with a tucker-finger, substantially as and for the purpose set forth.

WILLIAM N. WHITELEY.

Witnesses:
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