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W. N. WHITELEY & S. DYER.

KNOTTING DEVICE FOR GRAIN BINDERS.

No. 379,622. Patented Mar. 20, 1888.

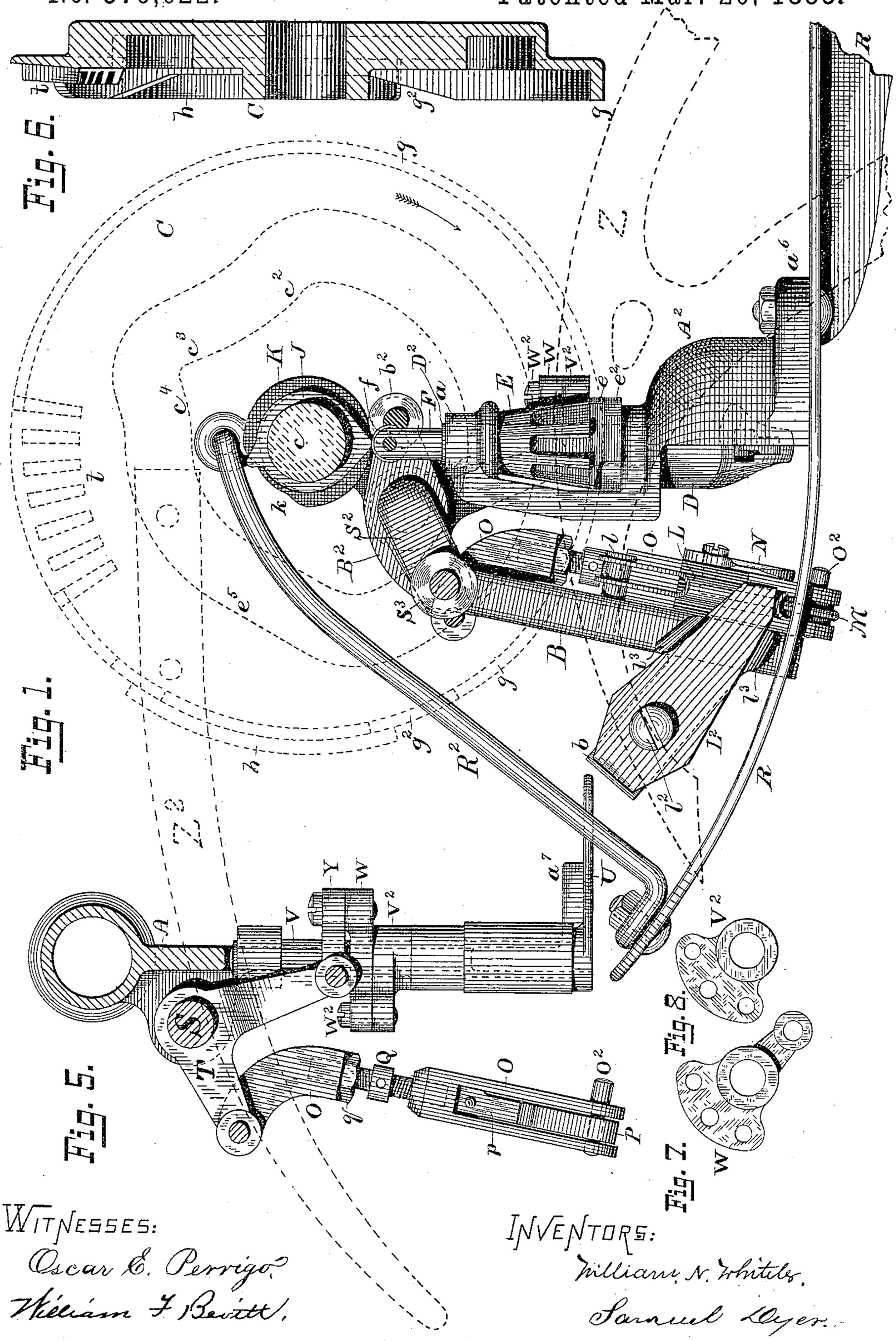

Fig. 1.

Fig. 5.

Fig. 8.

Fig. 7.

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Fig. 2.

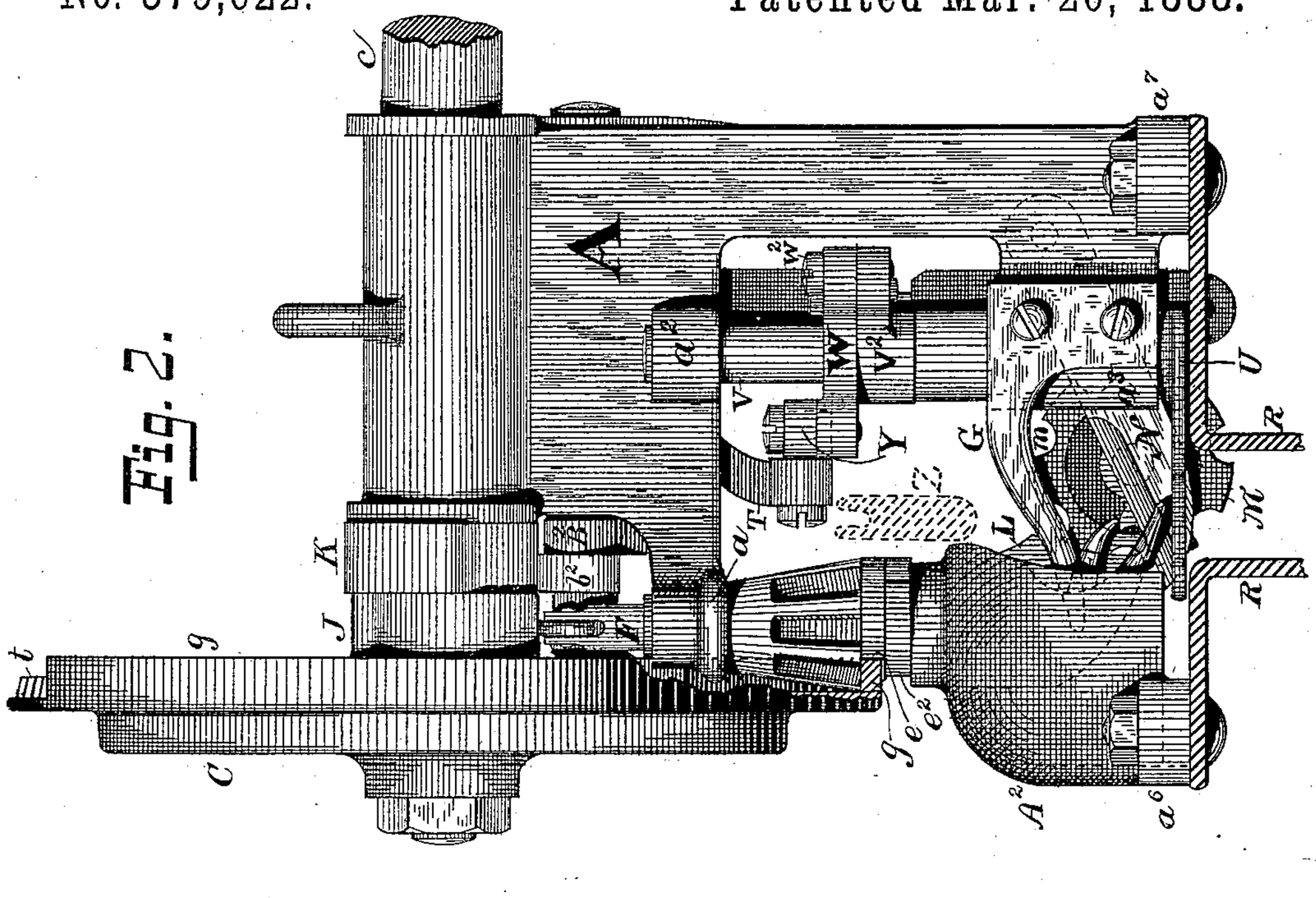
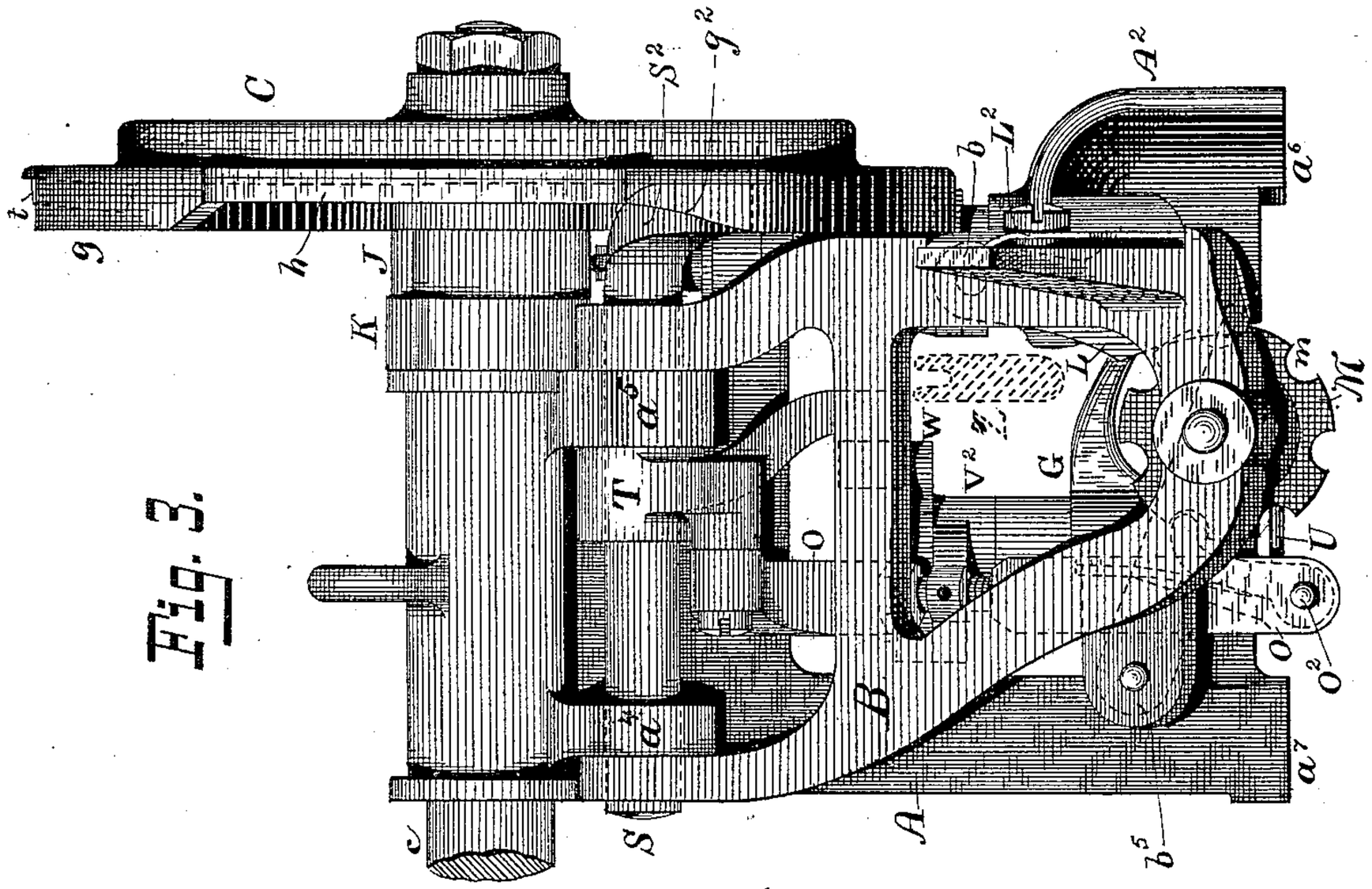


Fig. 3.



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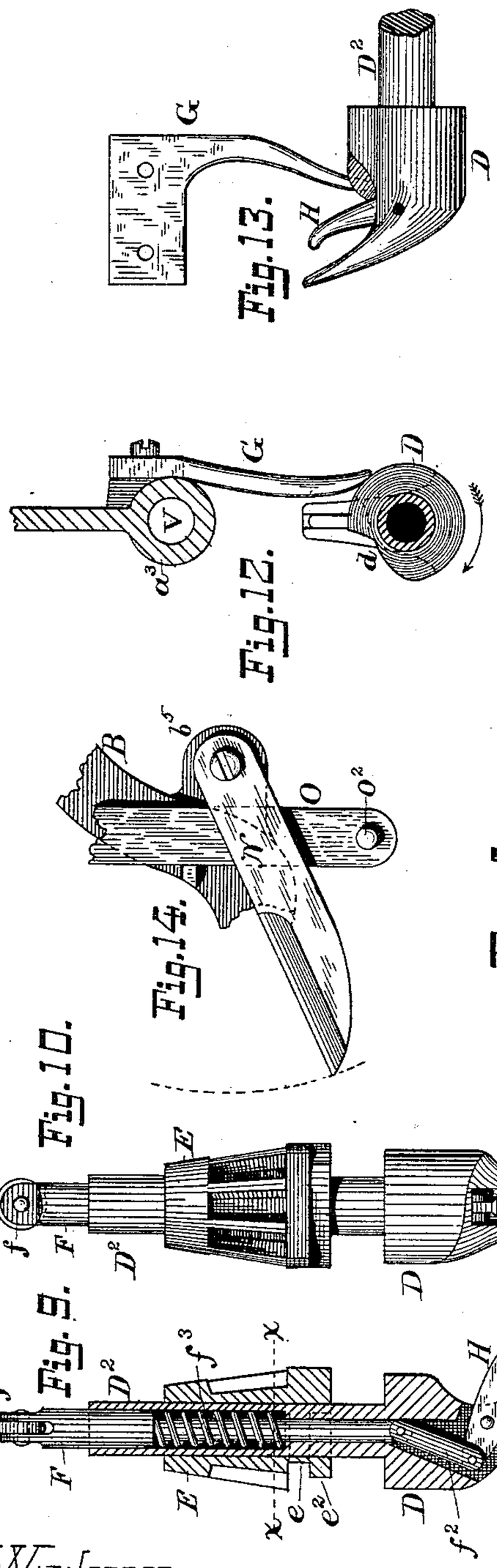

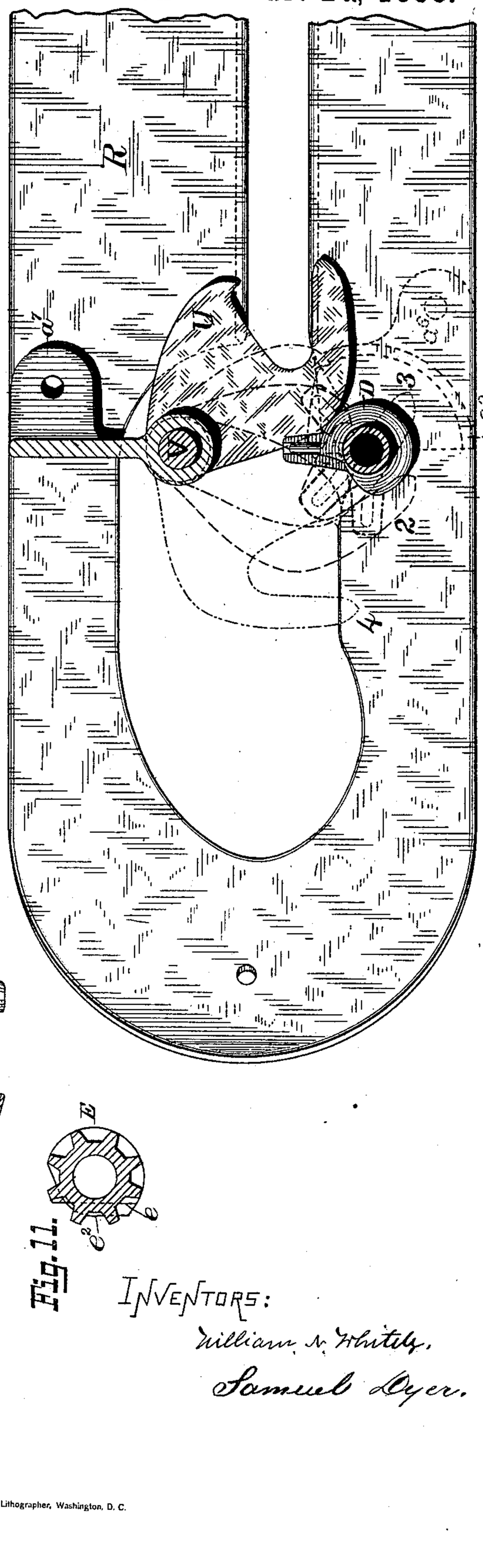

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KNOTTING DEVICE FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 379,622, dated March 20, 1888.

Application filed May 1, 1886. Serial No. 200,807. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM N. WHITELEY and SAMUEL DYER, citizens of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Knotting Mechanism for Grain-Binders, of which the following is such a full, clear, and exact description as to 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.

Our invention relates to that class of automatic grain-binding harvesters wherein the cut grain is delivered upon an inclined binding deck, where it is formed into a gavel and encircled by the binding cord by proper devices, after which the binding-cord is automatically tied and that surrounding the bundle severed from the remaining cord and the bundle discharged.

Our invention consists in certain devices for tying the knot and severing the cord, and is in the nature of improvements upon the knotting mechanism described in Letters Patent No. 212,420, granted to J. F. Appleby, February 18, 1879.

Our invention relates more especially to the following enumerated features, which are hereinafter particularly described in detail:

First. A retaining-finger which, resting nearly against the body of the knotting-hook and acting in connection therewith, holds the cord in its proper place during one portion of the rotation of the knotting-hook, the body of which is cut away at one side, leaving a space at that point between it and the retaining-finger, through which the cord passes at the proper time for allowing the knotting-hook to form the knot. Formerly the cord was liable to become disarranged and slip aside and out of place by the faulty construction of the various cord-guides which reached under the knotting-hook. In our invention we hold and guide the cord above the knotting-hook by the retaining-finger, and also below it, as next described.

Second. A forked tucker-finger pivoted directly to the knotter, and whose function is to receive the cord between the two projections forming the fork, and to "tuck" it closely under the knotting-hook and retain it there while the knot is being formed, swinging back slightly for the purpose of tightening the cord and holding it on the knotting-hook, and enabling the mechanism to bind the bundle more tightly at the moment the knotting-hook jaw grasps the cord, and swinging forward again to assist in stripping the knot from the knotting-hook, which has rotated backward to such a position that the direction of the knotting is nearly in line with the line of motion of the sheaf as it is discharged. Formerly the tucker-finger was pivoted partly to the knotter and partly to the breast-plate, and vibrated in an arc of a circle, and had but one forward and one backward movement to force the cord properly across the knotting-hook and returned to its first position after the knot was formed. The usual form of the tucker-finger has been a single curved arm, which confined the cord upon one side only. In our invention we construct it of a wide plate or semi-disk, having a properly-shaped slot or notch formed therein for receiving the cord when said tucker-finger is employed in connection with our breast-plate, next described.

Third. To the mechanism for operating the cord-holder disk, tucker-finger, and knife.

In the drawings, Figure 1 is a side elevation of our knotter. Fig. 2 is a front elevation. Fig. 3 is a rear elevation. Fig. 4 is a partial plan. Fig. 5 is a vertical section of the frame, showing the mechanism for operating the cord-holder disk, knife, and tucker-finger. Fig. 6 is a vertical section of the tyer-wheel. Fig. 7 is a plan of the adjusting-arm for the tucker-finger. Fig. 8 is a plan of the adjusting-segment for the tucker-finger. Fig. 9 is a vertical section of the knotting-hook and its appendages. Fig. 10 is a rear elevation of the knotting-hook, gear, plunger, &c. Fig. 11 is a horizontal section on the line *x x* of the knotting-hook gear. Fig. 12 is a horizontal section showing the retaining-finger and its relation to the knotting-hook. Fig. 13 is a rear elevation of the same parts, and Fig. 14 is a front elevation of the cord-severing knife and its appendages.

Similar letters refer to like parts throughout all the views.

A is the main frame, through the upper part of which passes the tyer-wheel shaft *c*, upon which are fixed the tyer-wheel C, the knotting-hook cam J, and swing-frame cam K. Formed upon the frame A is the vertically-perforated projection *a* and the knotting-hook shield A^2, in which is journaled the knotting-hook D, whose shaft or stem D^2 passes through both projections *a* and A^2, and is perforated through its length for the passage of the plunger F, which has pivoted in its upper end the friction-roller *f*, which engages the knotting-hook cam J, and at its lower end is pivoted to the link f^2, whose lower end is pivoted to the knotting-hook jaw H. The spiral spring f^3 lifts the plunger F and keeps the friction-roller *f* constantly in contact with the knotting-hook cam J. The knotting-hook jaw is pivoted in the knotting-hook, as usual. The knotting-hook gear E is fixed to the shaft D^2 of the knotting-hook. The tucker-finger U is a flat plate of metal of the form shown in Fig. 4, and fixed to a vertical shaft, V, which is journaled in the projections a^2 a^3 of the main frame. Fixed upon the tucker-finger shaft V is the adjusting-segment V^2, which is shown in Fig. 8. Fitted loosely upon the shaft V is the adjusting arm W, which is shown in Fig. 7. The adjusting-segment and adjusting-arm are each perforated with three holes for an adjusting-screw, w^2. The holes in the adjusting-arm being slightly nearer together than those in the adjusting-segment, the changing of the adjusting-screw w^2 from one hole to another slightly changes the relative angle of the adjusting-arm W and tucker-finger U, making all the changes required for setting the tucker-finger U in its proper position.

Formed upon the back of the main frame A are the horizontally-perforated projections a^4 a^5, through which the rock-shaft S passes, and has formed upon it the right-angled arm S^2, provided with the friction-roller S^3, which engages the cam-track in the tyer-wheel C.

The swing-frame B is pivoted upon the rock-shaft S, and has a projecting arm, B^2, provided with a friction-roller, b^2, which engages the swing-frame cam K on the tyer-wheel shaft *c* in the usual manner.

The cord-holder L is pivoted to the swing-frame B by the stud *l*, and is held in position by the usual cord-holder spring, L^2, which is attached to the projection *b* of the swing-frame B by the tension-screw l^2, and kept in position by the lugs l^3 l^3, formed upon the projection *b*.

The cord-holder disk M is pivoted to the swing-frame B in the usual manner, and is of the usual form, except that it has no ratchet for rotating it, the cord-notches *m* serving that purpose.

Fixed upon the rock-shaft S is a "bell-crank" lever, T, one of its arms projecting downwardly and being connected with the adjusting-arm W of the tucker-finger by the link Y, and the other arm projecting rearwardly and pivoted to the upper part of the sliding bar O.

Pivoted in the lower end of the sliding bar O by the pin O^2 is the pawl P, engaging the notches *m* of the cord-holder disk M, and kept in contact therewith by the spring *p*. The sliding bar O is formed of two parts connected by the adjusting-screw Q, having a right and left thread on opposite ends, which screw into the upper and lower parts, and are held in any required position by the check-nut *q*. This adjustment is for the purpose of rotating the cord-holder disk M to the exact position required for properly grasping and holding the binding-cord.

Pivoted to the front of the projection b^5 is the cord-severing knife N, which is operated by the pin O^2, which projects to the front far enough to engage the knife N as it is raised, and lifts the knife upward, severing the cord. This mechanism is separately illustrated in Fig. 14.

The retaining-finger G is fixed to the projection a^3 of the main frame A, and its point rests nearly or quite against the body of the knotting-hook D, as shown in Figs. 12 and 13.

The breast-plate R is of the usual form, except as to the contour of the slot for the needle-arm, &c., and the main frame A is secured to it by bolts through the ears a^6 a^7, and braced by the brace R^2, as shown in Figs. 1, 2, and 4.

The needle-arm Z is shown in dotted lines in Fig. 1 in the position it occupies when it has placed the cord across the knotting-hook, ready for tying the knot, and a section of it is also shown in dotted lines in Figs. 2 and 3.

Z^2 is one of the ejector-arms, fixed to the tyer-wheel C, as usual.

The operation of tying the knot is performed as follows, viz: The parts being in position, as shown by full lines in the drawings, the end of the binding-cord being held in the cord-holder and the cord passing over the retaining-finger and above the knotting-hook, and thence down under the binding-deck to the needle-arm, the grain having been packed upon the cord, the binding mechanism having been started, and the needle-arm having encircled the gavel with the binding-cord and laid the second fold of the cord across the retaining-finger and above the knotting-hook, the tyer-wheel C is caused to revolve in direction of the arrow. The knotting hook cam J has allowed the spring f^3 to close the knotting-hook jaw H. At the proper moment the incline c^2 of the tyer-wheel cam-track, Fig. 1, engages the roller S^3 on the arm S^2 of the rock-shaft S, and the tucker U is moved to the position shown by dotted lines in Fig. 4, (marked 2,) and draws the cord tightly across the knotting-hook, which is then rotated in direction of the arrow in Fig. 12, and when the part of the body of the knotting-hook which is cut away, as shown at *d*, comes opposite the retaining-finger the cord passes through the space then between said body and finger and

is free from the retaining-finger. In the meantime the incline c^2 of the tyer-wheel cam-track has, through the mechanism already described, drawn upward through a portion of its stroke the sliding bar O, and the pawl P, engaging the cord-holder disk M, rotates it to the next notch, carrying the cord down to the proper position to be severed. The incline c^3 of the tyer-wheel cam-track now acts upon the friction-roller S^3, and throws the tucker-finger back to the position marked 3 in Fig. 4, thus inclosing the cord in the angle of the tucker and preventing it from slipping off the knotting-hook, also drawing the cord more tightly around the gavel, insuring the proper tying of the knot, and enabling the mechanism to bind more tightly than usual. As shown in the drawings, it will be seen that the tucker-finger has four motions—*i. e.*, first, counting from the initial position, forward to place the cord upon the knotting-hook to the position marked 3; second, backward slightly to the position marked 2, to inclose the cord more closely in the angle of the tucker and retain it more securely upon the knotting-hook as it rotates; third, again forward to the limit of its motion to position marked 4, to strip the knot from the knotting-hook, and, fourth, backward to its first or initial position. While these movements have been taking place the usual teeth, *t*, on the tyer-wheel have engaged the teeth of the knotting-hook gear E and rotated the knotting-hook a complete revolution, (in direction of the arrow in Fig. 12,) during which the knotting-hook cam J has pressed down the plunger F and opened the knotting-hook by raising the jaw H and grasped the strands of the cord after they have been "crossed" in the usual manner and closed by the action of the spring f^3 as soon as the cord is grasped. Meanwhile the swing-frame cam K has rotated until the depression *k* therein has arrived at the friction-roller b^2 and allowed the swing-frame B to swing inward toward the knotting-hook, and so furnished slack cord to prevent the rotation of the knotting-hook from breaking that portion of the cord between it and the cord-holder. The incline c^3 of the tyer-wheel cam-track, which throws the tucker-finger back from position 2 to 3, Fig. 4, does not affect the cord-holder disk or knife, as the pawl P and pin O^2 simply drop down slightly without effect on these parts. The needle-arm now drops back to its original position, during which time the incline c^3 of the tyer-wheel cam-track operates upon the friction-roller S^3, again raising the sliding rod O, and this time high enough that the pin O^2 lifts the knife N and severs the cord between the cord-holder and the formed knot, the same movement throwing the tucker-finger around to the position marked 4 in Fig. 4 for the purpose of stripping the knot from the knotting-hook. This operation is facilitated by the knotting-hook being allowed to rotate freely backward nearly one-fourth of a revolution. When not acted upon by the teeth *t*, the knotting-hook gear E is prevented from rotating by a raised rim, *g*, in the form of a cam-track, formed at the edge of the tyer-wheel, and which rests against the flattened surface *e*, formed on the knotting-hook gear E. This cam-track is cut entirely away opposite the teeth *t*, so as to allow the knotting-hook to rotate forward when acted upon by the teeth *t*. It is again cut away at the point where it is desired to allow the knotting-hook to rotate backward, and having rotated backward to the proper position it is retained in that position by another similar cam-track, *h*, (formed outside of the cam-track *g*.) which engages a flattened surface, e^2, on the knotting hook gear. The cam-track *h* having passed the knotting-hook gear, the incline g^2 of the cam-track *g* engages the flattened surface e^2 on the knotting-hook gear and rotates it forward to its original position, where it rests until another knot is to be formed. At the same time, the bundle being discharged by the ejector-arm Z^2, the incline e^5 of the tyer wheel cam-track throws the tucker-finger back to its original position, the sliding rod O drops down, carrying with it the knife N and pawl P, all the parts being now ready for repeating the operations just described and forming another knot.

Having thus described our 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 our claims of invention to any precise form or proportion of parts, or to any particular devices not essential to the principles of construction and mode of operation herein described, what we claim as new, and desire to secure by Letters Patent, is—

1. In the knotting mechanism of a grain-binder, a stationary retaining-finger the point of which rests nearly against the body of the rotary knotting-hook, for the purpose of holding the binding-cord in place as it lies over said finger, in combination with a knotting-hook, a portion of the body of which is cut away to allow the cord to pass off from said finger at the proper time for forming the knot, substantially in the manner shown and described.

2. In the knotting mechanism of a grain-binder, a forked tucker-finger pivoted at one side of the breast-plate and adapted to receive the binding-cord, in combination with the breast-plate, one side of which opposes the fork in the finger and co-operates therewith to close the notch and positively control the cord, and suitable mechanism for rotating said finger forward about one-fourth of a revolution to place the cord in position to form the knot, then backward about one-eighth of a revolution to secure the cord in place as the knotting-hook rotates and enable the mechanism to bind more tightly, then forward about three-eighths of a revolution to assist in strip-

ping the knot from the knotting-hook, substantially in the manner shown and described.

3. In the knotting mechanism of a grain-binder, the combination of a rotating knotting-hook having a portion of the body cut away to allow the cord to pass the retaining-finger, a retaining-finger fixed to the knotter-frame, or some fixed part thereof, and whose point rests nearly or on the body of the rotary knotting-hook, a tucker-finger having a slot formed therein to receive the binding-cord, and a breast-plate provided with a slot of such shape as to receive the binding-cord and prevent its escape from the tucker-finger, substantially in the manner shown and described, and for the purpose of properly forming the knot in the binding-cord.

4. In the knotting mechanism of a grain-binder, in combination with the tucker-finger, cord-holder disk, and cord-severing knife, a transverse rock-shaft having an arm provided with a friction-roller, and arms connected respectively with the tucker-finger to actuate the same, and with said knife and disk, and an operating-wheel having a lateral cam connected with said rock-shaft by said first arm, substantially as and for the purposes described.

5. In the knotting mechanism of a grain-binder, in combination with the cord holder disk, severing-knife, and tucker-finger, a tyer-wheel having formed thereon a lateral cam track for operating the said parts, and a transverse rock-shaft connected with and operated by said cam, and connections between said parts and the rock-shaft, substantially as set forth.

6. In the knotting mechanism of a grain-binder, in combination with the cord-holder disk, severing-knife, and tucker-finger, a tyer-wheel having formed thereon a lateral cam track for operating the said parts, and a gear for operating the knotting-hook, a transverse rock-shaft having an arm carrying a friction-roller which engages said cam-track, and connecting mechanism between said rock-shaft and the said disk, knife, and finger, substantially as shown and described, and for the purpose of assisting a rotating knotting-hook in tying the knot.

7. In the knotting mechanism of a grain-binder, a swinging frame carrying the cord-holder, and a cord-severing knife pivoted to said swinging frame and operated by the parts which rotate the cord holder disk.

8. In the knotting mechanism of a grain-binder, the combination of a rotating knotting-hook, a swinging frame carrying the cord-holder, a pivoted vibrating tucker-finger provided with a slot for receiving the binding-cord, and a cord-severing knife pivoted to said swinging frame, substantially in the manner shown and described, and for the purpose of properly securing the band around the bundle of grain.

9. In the knotting mechanism of a grain-binder, a forked tucker-finger pivoted at one side of the breast-plate, the slot of which finger extends tangentially relative to its pivot, the inner end of the slot being in proximity to the opposing side of the breast-plate, and forming therewith an eye which is adapted to surround the cord and convey the same positively along said opposing side of the breast-plate, in combination with a knotting-hook situated at said opposing side of the breast-plate, and mechanism for operating the tucker-finger.

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