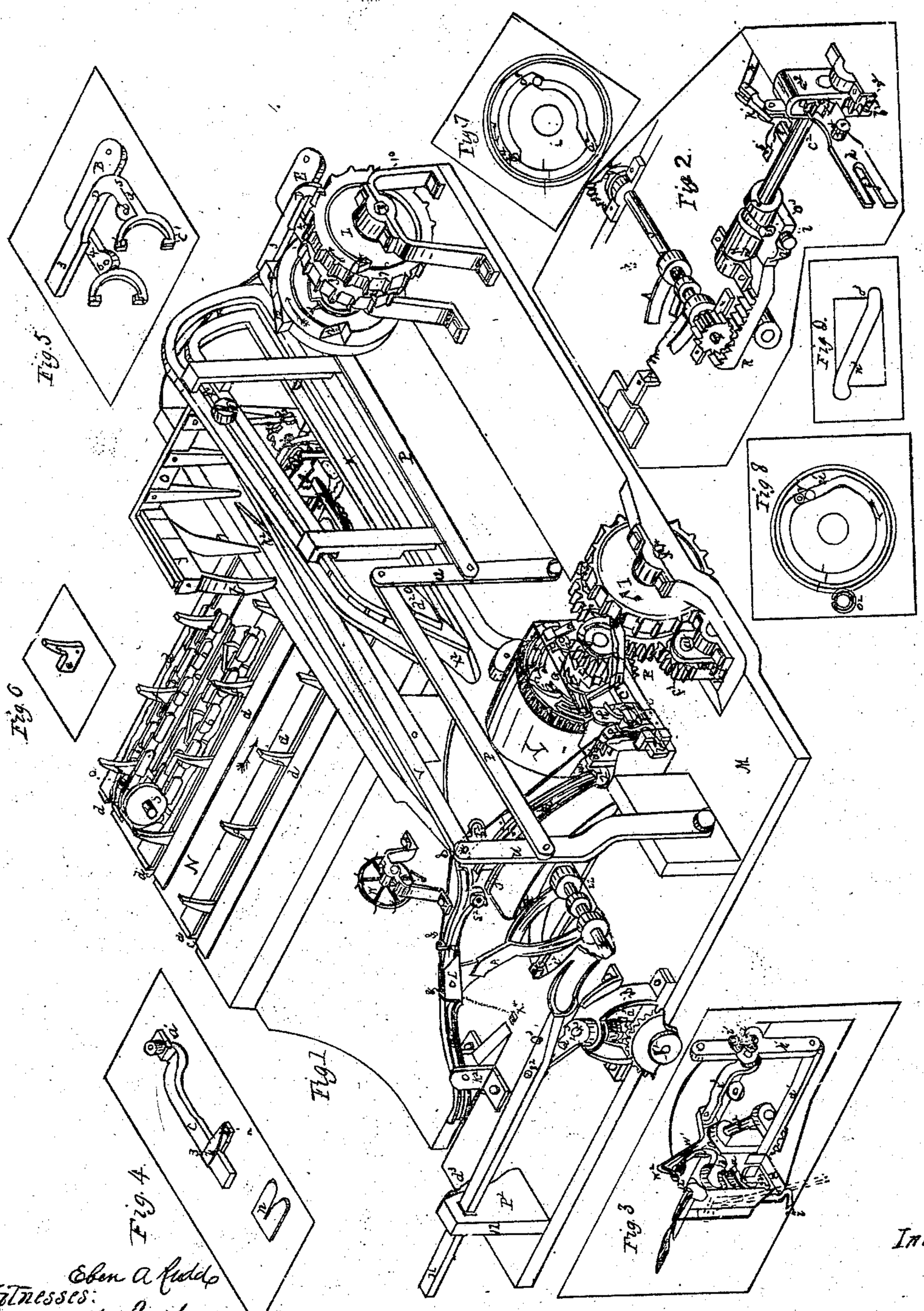
# A. Underwood.

## Grain Binder.

No. 39510 Patented Aug. 11, 1863

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# UNITED STATES PATENT OFFICE.

ALEXANDER UNDERWOOD, OF KENOSHA, WISCONSIN.

## IMPROVEMENT IN BINDING ATTACHMENTS TO HARVESTERS.

*Specification forming part of Letters Patent No.* 39,510, *dated August* 11, 1863.

*To all whom it may concern:*

Be it known that I, ALEXANDER UNDERWOOD, of the city and county of Kenosha, in the State of Wisconsin, have invented a new and improved machine or combination of machinery for raking and binding grain; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of an automatic raking and binding apparatus, embracing my improvements. Fig. 2 is a perspective view, from the under side of the platform, of a part of the binding-machinery. Fig. 3 is a perspective view (from the left-hand corner and under side of Fig. 1) of the other portions of the binding mechanism, hereinafter to be described. Fig. 4 is a perspective view of devices for holding and severing the ends of the cord. Fig. 5 is a perspective view of devices for throwing certain parts of the mechanism in and out of gear. Fig. 6 is one of the teeth of the endless-chain rake. Figs. 7, 8, and 9 are diagrams illustrating the form and operation of certain cams, hereinafter to be described.

Similar letters of reference indicate corresponding parts in the several views.

The subject of my invention is a machine which may be attached to the side or rear of a harvesting-machine of any form, to automatically gavel the grain as fast as cut, and bind and discharge it in sheaves of any desired size.

The invention particularly consists, first, in devices for passing the cord around the sheaf; second, in devices for securing and tying the band; third, in devices for throwing the mechanism in and out of gear.

In order that others skilled in the art to which my invention appertains may be enabled to fully understand and use the same, I will proceed to describe its construction and operation.

I construct a platform, M, Fig. 1, of light material as possible, consistent with strength and durability. On the top of this platform, directly back of the finger-bar, I construct another platform, N, with three slots or openings *a*, parallel with the finger-bar; also corresponding slots or openings in the platform M, directly under the openings in N.

The shaft *j* is placed at right angles with the openings in M and N. An endless-chain pulley, as shown at *g*, is secured on the shaft *j*, at the end of and in line with each opening, and a chain-belt loose pulley, *i*, on the outer end of *j*, held onto a clutch or pin (not here shown) by spring *i'*, so that when the machine is moving forward *i* serves as a tight pulley, and as a loose pulley when moving backward. At the opposite end of and in line with each opening is a smooth-faced flange-pulley, as shown at S. *c* is a plate of band-iron, secured to the under side of platform N, directly under the openings, extending from pulleys S to Z. *d d d d* are plates of band-iron (two for each opening) secured to the top of platform N, the inner edges of which are placed parallel with and nearly over the center of the openings, leaving a space between wide enough for the rake-tooth *f* to pass freely between them.

The endless-chain rakes, as shown at *b b f e*, Fig. 1, and *f e*, Fig. 6, are constructed of two series of metal plates, riveted or screwed together, with angular-shaped teeth hung loosely between them at intervening distances, as there shown. The chains being in the openings *a a a* of the platforms, and on the pulleys *g* and S, and the pulley *i* geared to the reaper, the plates *d d d d* serve to hold down the chain and guide the teeth sidewise, and *e e e* serve as ways for the shank *e* of the teeth to slide on, and cause the teeth *f* to move in a vertical position across the platform till they are successively brought directly over the shaft *j*, when the shanks *e* leave the plate *c* and the teeth *f* fall back and are drawn from the grain in a longitudinal direction. Thus, as the grain is cut and falls upon the platform, it is conveyed to the box or trough and rolled up into a gavel directly under the rakes O and *y*. P is a counter-shaft. L is a loose chain-belt pulley, provided with a clutch and groove on the back end of the hub. J is a chain-belt pulley, secured firmly on the shaft P and provided with a corresponding clutch on the front end of the hub. K is a loose pulley or wheel, which serves as a crank, the wrist-pin being on the back side and near the periphery of the wheel, and a clutch and groove on the front end of the hub, and a cor-

responding clutch secured firmly on the shaft P between the back journal and hub on K. (The wrist-pin and clutches on K, J, L, and P are not shown on the drawings.) D, Figs. 5 and 1, represents a clutch-lever, having horns $e^1$, which fit in the groove in the hub of the pulley J. E is a second clutch-pulley, provided with horns 5 5, fitting in a groove in the hub of the crank-wheel K, and having its fulcrum at 6, equidistant between 4 and 5 5. L is geared to I by a chain-belt, and likewise J to a corresponding pulley on the reaper-shaft.

The grain having been formed into a gavel in the box or trough under O and $y$, the crank and cam wheel K is thrown in gear by the lever E, which operates the connecting-bars $p$ $p$, swing-levers $u$ $u$, rake-staff $v$, and follower-pin $w$, which moves around the slot $X^1$ X X $X^2$ and guides the rakes O and $y$ down behind and outside of the gavel, and brings it through the trough to the binder Y. The swing-rake $y$ serves to compress the gavel and separate it from the incoming grain by means of an inclined plane, $h^2$, acting on the tooth $b^3$, while passing to the binder Y. As the follower-pin $w$ passes under the inclined hinged catch $d^2$ to $X^2$, the inclined plane $d^2$ drops behind the pin $w$. The cam $m$, on wheel K, operates on lever D at 3, which throws pulley L in gear, and, passing on, brings cam $n^2$ in contact with lever E at 4, which throws pulley K out of gear; the rakes O and $y$ at the same time have been carried back to $X^2$, and the wrist-pin on K rests on stop 8.

The cord is passed from the reel W through the tension-aperture $X^4$, through the mortise L in the arm B, through the studs & & and the end of the arm at $L^2$ into the opening $Z^2$ of the platform, and over the hook $l^2$ through the V-shaped opening in pinion $o^2$, and the end made fast between the stud $k$ and shear-blades $n$. The binder is then ready for the reception of the gavel, which is deposited thereon in manner already explained, the pulleys L and I and gear-wheel F being in motion, and the gavel in the binder, and the yoke $h$, Fig. 2, hung to the swing-hanger $a$ and shaft $f^4$, Fig. 1; the pin $d^4$, Fig. 2, in the cam-groove at $a^4$, Fig. 7. The pinion $c^2$, in gear with the wheel F, operates the spiral cam H, on roller $e^3$, which moves the rack R, pinion T, shaft U, and lever A, the latter being firmly secured to the shaft V and pivoted in the mortise in the arm B at L. This action raises the forward end $L^2$ of the arm B, by means of the groove $m^2$ in the back part of the arm, passing over a roller, $k^2$, till the rollers $S^2$ catch on the ways $f^2$ $f^2$, bringing the cord around the gavel, down onto the hook $l^2$ into the V shaped opening in the pinion $o^2$, and under the inverted hooks $r$.

The stud $e^7$ rises with the lever A, and, engaging under the arm B at $m^2$, serves to hold the branch of the arm at $s^2$ firmly on the cord, which is on the hook $l^2$. The cam H, Fig. 2, having made one revolution, rests when the roller $e^3$ is at the apex of the cam at $e^3$, Figs. 2 and 9.

Fig. 7 represents the rear face of the wheel F; Fig. 8, the rear side of the wheel G and the grooved pinion $o^2$, working in connection therewith. Fig. 9 is a plan of the spiral cam H.

The pinion $c^2$, Figs. 2 and 1, is thrown out of gear as the roller $d^4$ passes $b^4$, Fig. 7; and while the roller $d^4$, Fig. 2, is passing to $c^4$, Fig. 7, the clutch-pinion V, Fig. 1, is thrown on the clutch $J^2$ by the inclined plane 5, on the wheel I, acting on shifting-lever $g^2$, and also withdraws dog $r$ from a notch in gear-wheel G. While G is making one revolution, the pinion $o^2$, being geared with the wheel G, serves to twist the cord lying between the hook $l^2$ and hooks $r$. The follower-roller $a$ on the sliding bar C, Figs. 4 and 1, running in the groove $s$ in the wheel G, is forced over the shifting curved inclined plane $i$ into the groove $g^1$, which moves the sliding bar C from right to left, or vice versa, as the case may be. The shear-blades $k^3$ and $n$ cut off the cord, while the stud $k$ passes in front of the blade $n$ and catches and holds the outer end of the cord between $k$ and $n$. At the same time the roller $a^1$, while passing the back end of the inclined plane $t$, acting on the curve, throws the point to the opposite side in the groove $g^1$, in position to receive the roller $a^1$ on the opposite side of the inclined plane, in the process of binding another sheaf, and the point of $t$ is held to either side by spring Z catching in notch or notches in the broad end of $t$, as there shown. At the same time the cord is being cut off, and while it is yet in the slot in the pinion $o^2$, by means of the follower-rollers $i^1$ $i^1$, Fig. 3, passing through the grooved cam at $w^1$ and $v^1$, on the back side of G, Fig. 1, as shown in Fig. 8, operates swing-lever $h^1$, rack $d^1$, pinion $c^1$, finger $l$, connecting-bar $k^3$, angular hook-lever $W^1$, obliquely-vertical rocking-shaft $w^2$, Fig. 3. The hook $w^2$, by an obliquely-circulatory forward movement, catches the cord under its chin, and, passing around under the hook $l^2$ and close back of the cord that is around the sheaf, thereby forming a loop. The finger $l$ at the same instant catches the twisted end of the cord near the V-shaped slot or opening in pinion $o^2$, Fig. 1, and carries it around the hook $l^2$. Between the sheaf and the cord that is around it, and by means of the spiral cam $a^6$, Fig. 3, passing over a pin, (not shown here,) the finger is made to move obliquely downward, and, bringing the twisted part of the cord into the hook $w^2$, the latter is instantly withdrawn, bringing the doubled ends back through the loop made by the hook, and thereby tying a knot, and the hook $w^2$ and finger $l$ are brought back to the position shown at $w^2$ and $l$, Fig. 3. The clutch-pinion V, Fig. 1, is now thrown off of clutch $J^2$ by the inclined plane $o$, in wheel F, acting on lever $g^2$, and dog $r^2$ is thrown into the notch in gear-wheel G, and G rests. The follower-roller $d^4$,

Fig. 2, now passing $c^4$, Fig. 7, throws the pinion $b^2$ in gear with the wheel F, Fig. 1; and while the follower-roller $d^4$, Fig. 2, is moving from $c^4$ to $a^4$, Fig. 7, the spiral cam H, Fig. 2, is moved backward, forcing the follower-roller $e^1$ from $o^3$, Fig. 9, to $n^3$, which operates the rack R, pinion T, shaft U, and also lever A and arm B; and while the end $L^2$ of arm B is being moved back and down to $Z^2$, the bevel-gear $V^2$, being fast on shaft V, operates pinion $a^3$, which is held from turning on shaft $X^3$ by clutch $u^3$; and also the crank $Q^2$, by which the fork $Q^3$ (being pivoted at $8^2$, the stem 11 sliding through the mortise in stud $P^2$ at 12) is thrown forward in the direction of $l^2$, entering the sheaf near the band, and making an elongated circuitous movement, throws the sheaf off the platform and passes on to the position as shown at Q, Fig. 1, and is caught by a spring-dog, $d^3$. At the same time, the cord being fast at $r$ and suspended through $o^2$ $l^2$ $u^2$ $L^2$ & & &, swing-hook $i^2$, Fig. 3, is sprung upward by means of spring $s^1$, Fig. 2, acting on levers $k^1$ and $n^1$, Figs. 2 and 3, which catches the cord between the hook $l^2$ and the end of the arm $L^2$, Fig. 1, and by means of cam $t^2$, Fig. 2, acting on the lever $k^1$ and rod $n^1$, hook $i^2$, Fig. 3, is drawn down into the slot $Z^2$, Fig. 1, and close back into the angles under the binder Y, taking the cord with it and leaving it ready for the next gavel. The roller $d^4$, Fig. 2, having passed from $c^4$ to $a^4$, Fig. 7, the cam 7, on the pulley L, Fig. 1, operates on lever D at $a^5$, as shown in Fig. 5, which throws L out of gear, and the cam $b^1$, on the pulley L, stops against the arm of the standard at 10.

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

1. The self-acting shifting-levers E and D, operated by the cams or inclined planes $m$ and $n^2$, on the wheel K, and the cam 7, on the wheel L, all as herein described.

2. The arm B, provided with the cam-groove $m^2$ in its rear half, the friction-rollers $s^2$ on the forward part, and the mortise L near the center, and operated substantially as explained.

3. The combination of the arm B, forked lever A, shaft U, stud $e^2$, guide-rollers $k^2$ $s^2$, and ways $f$, all constructed and arranged in the manner and for the purposes described.

4. The combination of the spiral cam H, rack R, pinions T $b^2$ $c^2$, swinging hanger $a^2$, yoke $h$, pin or roller $d^4$, and cam-grooved gear-wheel F, when the said parts are constructed and arranged as herein described, so as to impart a reciprocating motion to the arm B by a continuous motion of the cam and gear-wheel F.

5. The combination of the hooks $l^2$ $r$, radially-slotted pinion $o^2$, sliding bar C, and shear-blades $h^3$ and $n$, when the said parts are constructed and arranged in the manner hereinbefore described, so as to adapt them to uniformly twist and subsequently knot and sever the band.

6. The stud $k$, operated by the sliding bar C, and employed, in the described combination with the shear-blades $h^3$ and $n$, to hold the said blades in close proximity and retain the end of the cord, as explained.

7. The combination, with the gear-wheel G, sliding bar C, stud $k$, and blades $h^3$ and $n$, of the roller $a^1$, grooves $s$ $g^1$, shifting curved inclined plane $t$, and spring-stop $z$, operating as explained, to impart an alternate motion to the bar C to sever the cord on one or other branch of the blade $n$.

8. The combination, with the gear-wheels I, F, and G, of the clutch-pinion V, clutch $J^3$, cams $f^1$ $o$, lever $g^2$, and dog $r^2$, whereby an intermittent motion is imparted to the wheel G and the dog $r^2$ inserted in and retracted from a notch therein, as explained.

9. The combination, with the gear-wheel G, pinion $o^2$, and hook $l$, of the lever $h^1$, rack $d^1$, pinion $e^1$, connecting-rod $k^3$, rock-shaft $w^2$, hook $w^2$, and finger $l$. operating, in the manner described, to catch, loop, and tie the ends of the cord around the sheaf.

10. The hook $i^2$, operated by the cam $t^1$, lever $k^1$, and rod $n^1$, to draw down the cord, in readiness for the next sheaf, as explained.

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Witnesses:

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