(No Model.)

J. F. APPLEBY.

KNOTTING MECHANISM FOR GRAIN BINDERS.

No. 312,790. Patented Feb. 24, 1885.

Fig 1

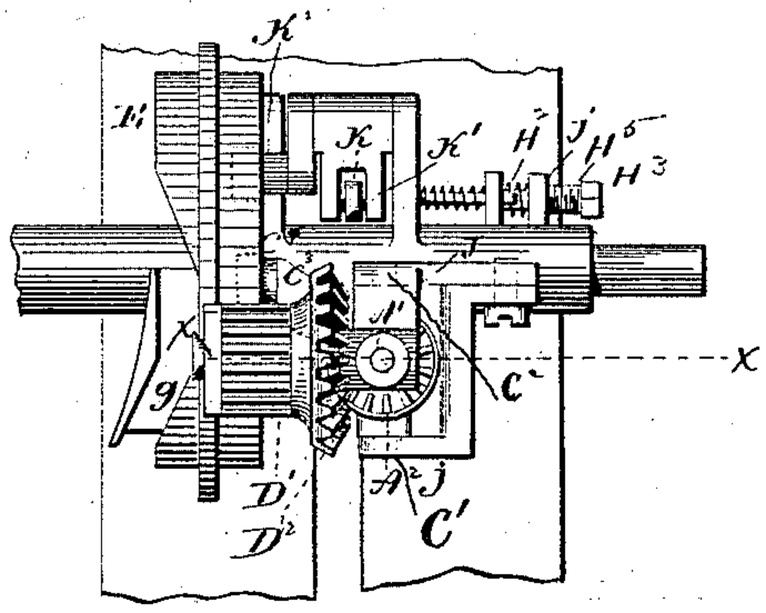


Fig. 2.

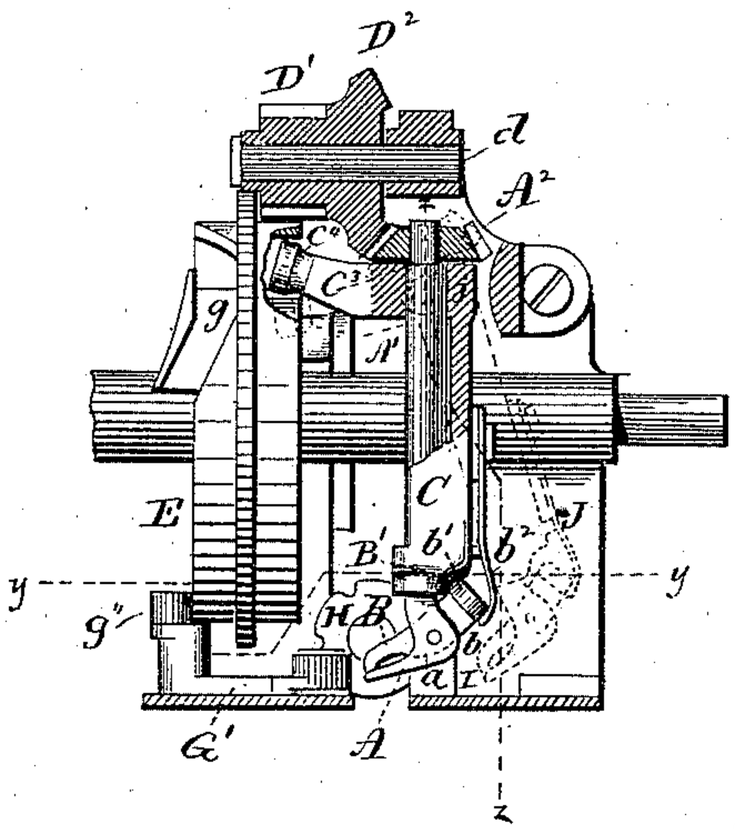


Fig. 3.

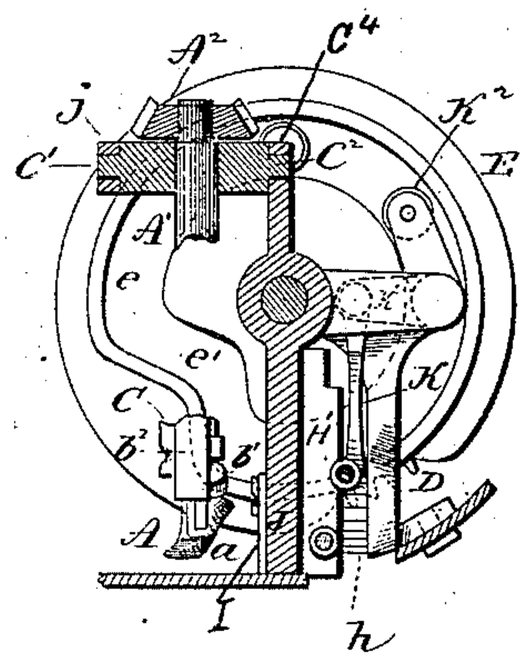


Fig. 4.

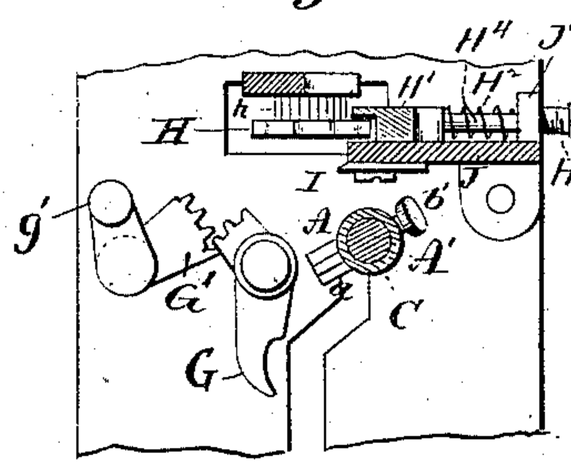
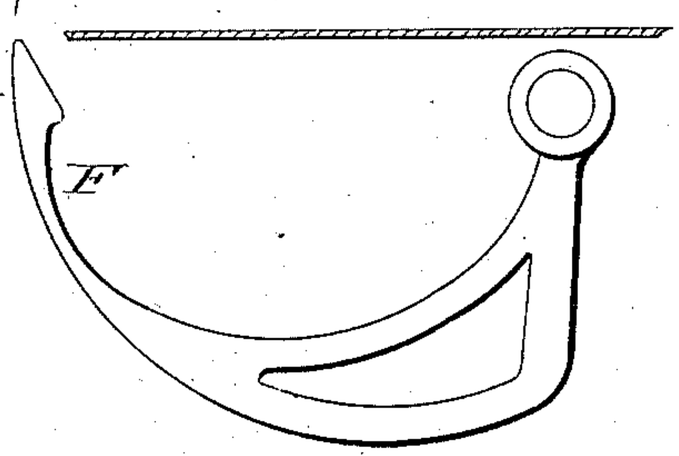


Fig. 5.



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UNITED STATES PATENT OFFICE.

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KNOTTING MECHANISM FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 312,790, dated February 24, 1885.

Application filed October 16, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. APPLEBY, of Minneapolis, Minnesota, have invented an Improvement in Knotting Mechanism for Grain-Binders, of which the following is a specification.

It is the object of my invention to simplify the knot-tying mechanism employed in grain-binders, first, by so organizing the parts that a single cam serves to actuate the mechanism for gripping the binding-cord, and also the mechanism for cutting the cord and disengaging it from the knotter after the knot is formed; secondly, by dispensing with the movable cutters and knot-strippers heretofore used. I accomplish the latter object by giving to the knotter-shaft, in addition to its usual capacity of rotation upon its longitudinal axis, a to-and-fro lateral motion. By this motion, after the knot is formed, the knotter first draws the cord across a stationary knife, by which the cord is cut, and then disengages itself from the knot which has been formed and returns to its normal position. My knotter is thus a self-stripper.

The drawings, which represent knot-tying apparatus embodying my improvements, together with some of the adjacent parts of a grain-binder to which the knot-tying apparatus is applied, are as follows:

Figure 1 is a top view. Fig. 2 is an elevation, partly in vertical section, through the line *x x* on Fig. 1. Fig. 3 is a vertical section through the line *z z* on Fig. 2. Fig. 4 is a horizontal section through the line *y y* on Fig. 2. Fig. 5 is a vertical section of the binder-table immediately beneath the knotting mechanism, showing the cord-needle and its path of motion relatively to the parts shown in Fig. 3.

The knot-tying mechanism represented in the drawings is composed of the usual knotter, A, which consists of the vertical shaft A′, having a bevel-pinion, A^2, affixed to its upper end, and having at the bottom the usual laterally-projecting hook, *a*, to which is pivoted the ordinary spring-jaw, B. The arm *b*, projecting backward and upward from the hub of the jaw B, is provided with an anti-friction roller, *b′*, which by the action of the jaw-spring b^2 is held up against the cam B′, formed upon the lower end of the tube C, in which the knotter-shaft A′ is inserted and has its bearings. As the knotter-shaft turns in its bearings within the tube C, the jaw B is opened or closed accordingly as the roller *b′* bears upon the projecting or recessed parts of the cam B′. The rotation of the knotter upon its vertical axis is effected by means of the segmental rack D, formed upon the periphery of the cam-wheel E, which rack at the proper time engages the pinion D′, affixed to the horizontal shaft *d*, carrying the bevel-wheel D^2, which meshes into the bevel-pinion A^2, and by such engagement turns the knotter once around upon its vertical or longitudinal axis. Prior to such engagement, the end of the cord being held in the gripper, and the cord passing thence over the hook B and around the gavel to the needle, the cord arm or needle F has completed its upward swing, carrying the new end of the cord across the top of the knotter-jaw B, and a vibrating claw, G, operated by a sector-plate, G′, having an arm, *g′*, engaging a cam-groove, *g*, formed upon the outer face of the cam-wheel E, has caught the cord farther back and has carried it under the knotter-hook alongside the old end of the cord, thus forming a bight in which the hook and jaw lie, so that when the knotter rotates the doubled cord is wound once around it. In making the turn the jaw B is raised by the bearing of the roller *b′* upon the projecting part of the cam B′, and the doubled cord is caught between the hook *a* and the jaw B. At the conclusion of the revolution of the knotter the roller *b′* rides into the recessed part of the cam B′, and the jaw B is thus permitted to spring down and grip the doubled cord upon the top of the hook *a*.

The mechanism thus far described, both in itself and in its mode of operation, is very similar to the knotting mechanism heretofore employed in grain-binders, and it is in the mechanism for the performance of the concluding steps of the knotting operation that the novelty and usefulness of my invention are chiefly manifested. These steps are, first, the cutting of the double cord a short distance from the part which is held by the knotter,

and next the stripping off of the loop which has been wound around the knotter, while the cut ends of the cord are gripped between the jaw B and the hook *a*, whereby the cut ends are made to pass through the loop, and the knot is thus formed. By my invention these two steps are accomplished by a novel combination of devices for imparting to the knotter-shaft at the conclusion of its revolution upon its longitudinal axis a laterally-outward motion in the vertical plane of its said axis, as the first result of which the doubled cord is cut between the knotter and the gripping-disk H by being drawn across the edge of the stationary knife I, affixed to the standard J. As the second result the knotter draws itself out of the loop, and in so doing draws the cut ends of the doubled cord through the loop, thus completing the knot.

The drawings illustrate the method of giving the required lateral motion to the knotter. The tube or bearing C is provided near the top upon opposite sides with the horizontally-projecting trunnions C′ and C², which have their bearings, respectively, in the standard J and the elbow *j*, projecting horizontally from the standard J. An arm, C³, extending from the upper part of the tube or bearing C toward the cam-wheel E, is provided with an anti-friction roller, C⁴, which is engaged by the cam-groove *e*, formed in the inner face of the cam-wheel E. So long as the roller C⁴ is engaged by the concentric part of the cam-groove *e* the knotter-shaft remains vertical; but when the rotation of the cam E has so far progressed that the rack D has performed its function of rotating the knotter the inwardly-curved part *e′* of the cam-groove *e* engages the roller C⁴ and rocks the arm C³ downward upon the horizontal axis afforded by the trunnions C′ and C², thus rocking the lower end of the tube C outward, and thereby giving to the knotter the lateral motion which has been described. The range of this motion is sufficient to effect the disengagement of the knotter from the knot, after which the knotter is swung back to its normal position as the roller C⁴ rides outwardly to the concentric part of the cam-groove *e*. It will be seen that the angle of the bevel of the pinion A² is substantially perpendicular to a radial line extending from the horizontal axis afforded by the trunnions C′ and C² to the middle of the bevel, and it follows that the swinging of the tube C does not fully withdraw the teeth of the pinion A² from engagement with the teeth of the bevel-wheel D², and causes no rotation of the pinion.

It is a feature of the organization shown that the same cam which actuates the cutting and knot-stripping mechanism is also employed to reciprocate the pawl K, which impels the ratchet-wheel *h* of the gripping-disk H. The pawl K is pivoted to one arm of the bell-crank lever K′, the other arm of which carries the anti-friction-roller K², which by engagement with the cam-groove *e* causes the bell-crank lever to be rocked back and forth once during each revolution of the cam-wheel E, and thereby at the proper time turns the gripping-disk H, as usual, one step in order to present a new notch for the reception of the cord next brought forward by the cord-needle. The cord is clamped against the disk H by the usual clamping-plate, H′, which is pivoted to the side of the standard J. I adjust the clamping force of this plate by means of the adjustable expanding spiral spring H², surrounding the bolt H⁴, the head of which bears against the clamping-plate, while its shank is loosely inserted in the tubular screw-bolt H⁵, inserted in a hole tapped through the flange J′ of the standard J. By screwing in the bolt H⁵, the spiral spring H², which bears against the inner end of the bolt H⁵ and the head of bolt H⁴, is additionally compressed, and, by screwing out the bolt H⁵, the tension of the spring H² is correspondingly diminished.

I claim as my invention—

1. The combination, substantially as before set forth, of the knotter-shaft, the pivoted bearing therefor constructed with a projecting arm, and the cam-wheel provided with a cam-groove which engages the arm of the said pivoted bearing.

2. The combination, substantially as before set forth, of the cam-wheel provided with a cam-groove, the knotter-shaft and its pivoted bearing constructed with a projecting arm which is engaged by the said cam-groove, the cord-holder, and mechanism, substantially such as described, actuated by the same cam-groove for independently operating the cord-holder.

3. The combination, substantially as before set forth, of the intermittingly-rotating bevel-wheel D², the knotter-shaft provided with the bevel-pinion A², the knotter-shaft bearing pivoted to the knotter-frame on an axis transverse to the axis of the bevel-wheel D², and a cam for swinging said pivoted bearing, whereby the swinging of the knotter effects practically no disengagement and no rotation of the said bevel-gearing.

4. In a grain-binder, the combination, with the knotter and the cutter, of mechanism for disengaging the knotter from the loop and severing the binding-cord, the gripping-disk H, the impelling-pawl K, and a single cam for actuating both said pawl and said disengaging and cord severing mechanism, as described.

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