

No. 757,127.

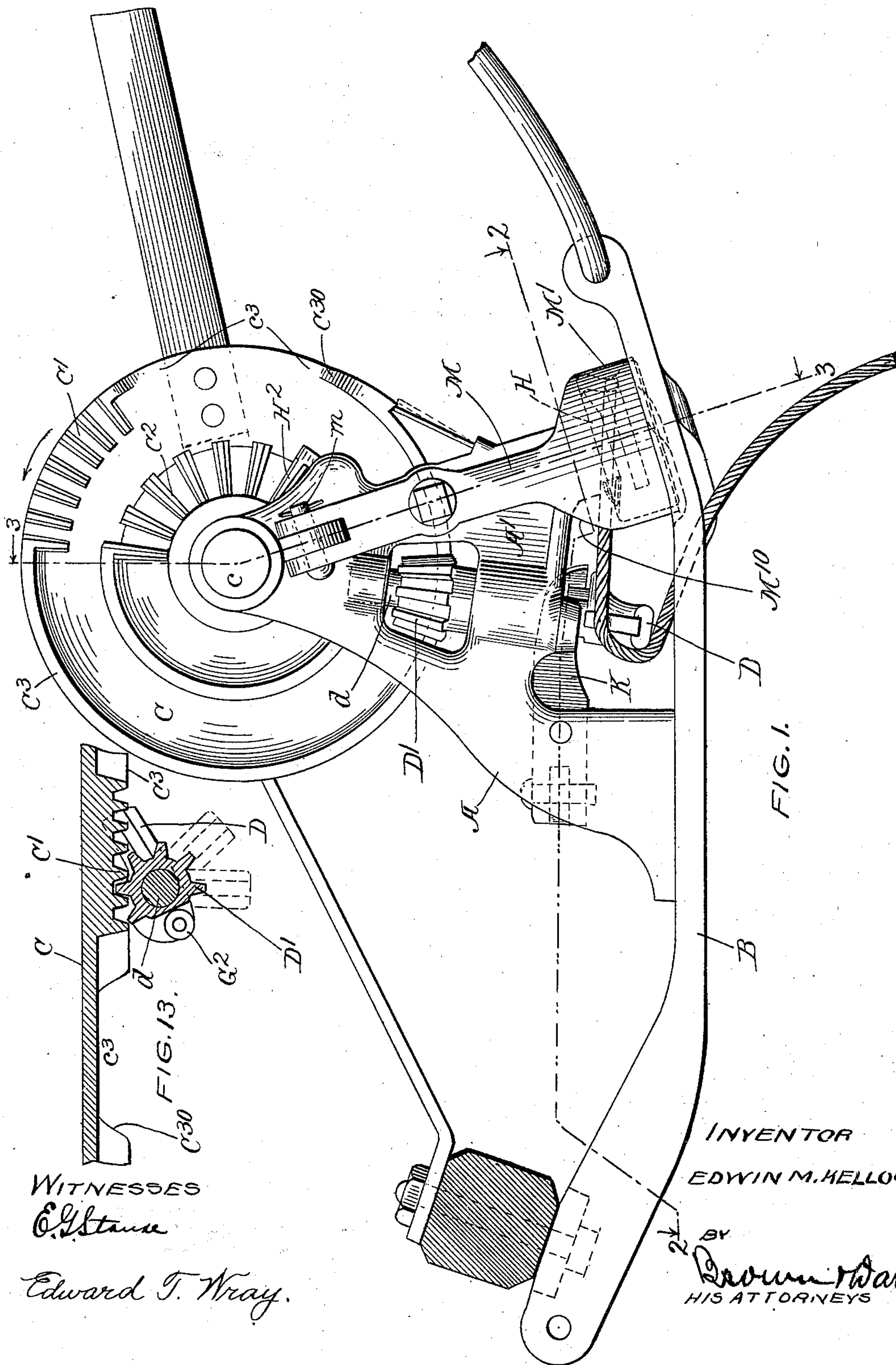
PATENTED APR. 12, 1904.

E. M. KELLOGG.
CORD KNOTTER.

APPLICATION FILED JULY 23, 1900.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES

C. G. Stane

Edward T. Wray.

INVENTOR

EDWIN M. KELLOGG

BY

Lawrence D. Wray
HIS ATTORNEYS

No. 757,127.

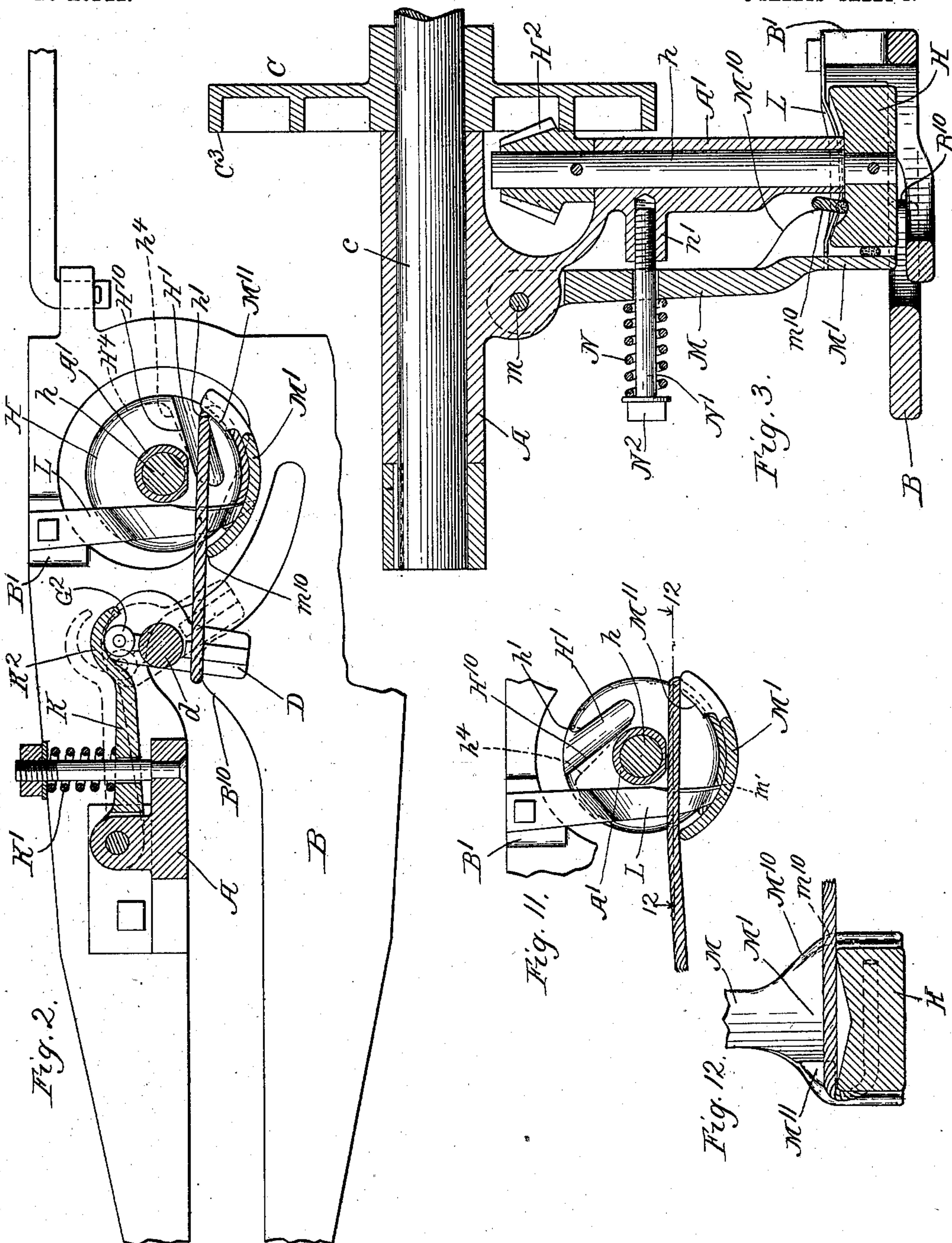
PATENTED APR. 12, 1904.

E. M. KELLOGG.
CORD KNOTTER.

APPLICATION FILED JULY 23, 1900.

NO MODEL.

3 SHEETS—SHEET 2.



Witnesses.

Edward T. Wray.
Edgar L. Conant.

Inventor:

Edwin M. Kellogg
by Brown & Barby
his attys.

No. 757,127.

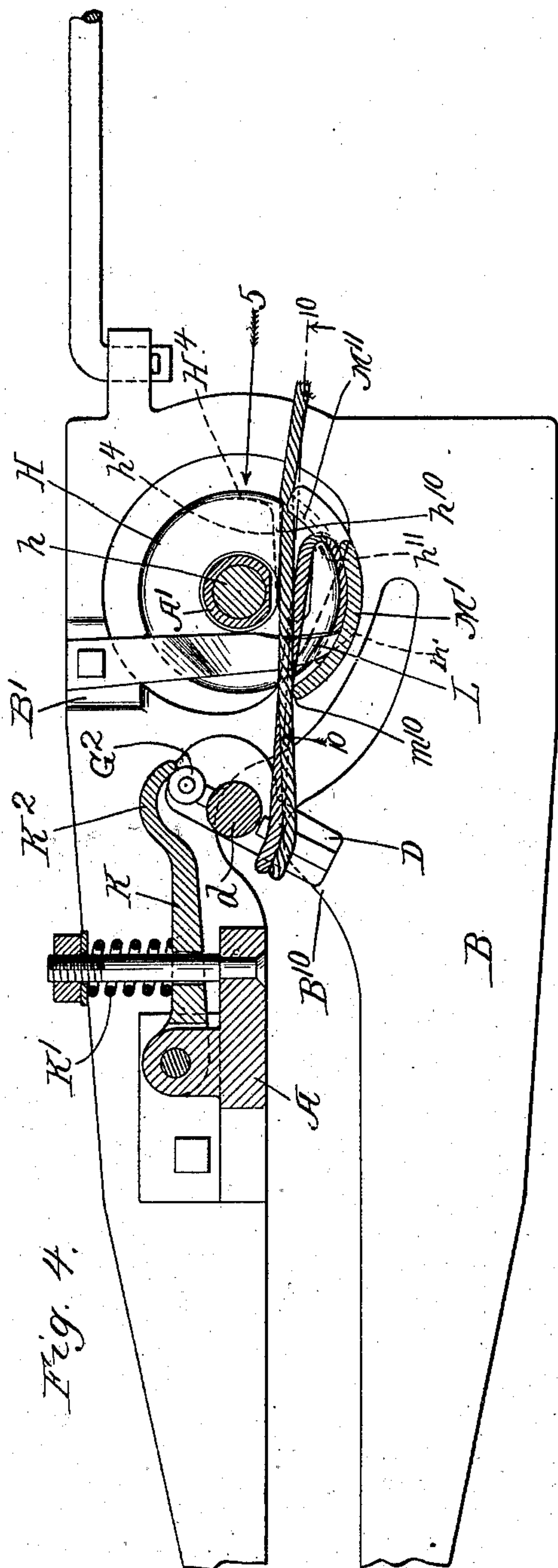
PATENTED APR. 12, 1904.

E. M. KELLOGG.
CORD KNOTTER.

APPLICATION FILED JULY 23, 1900.

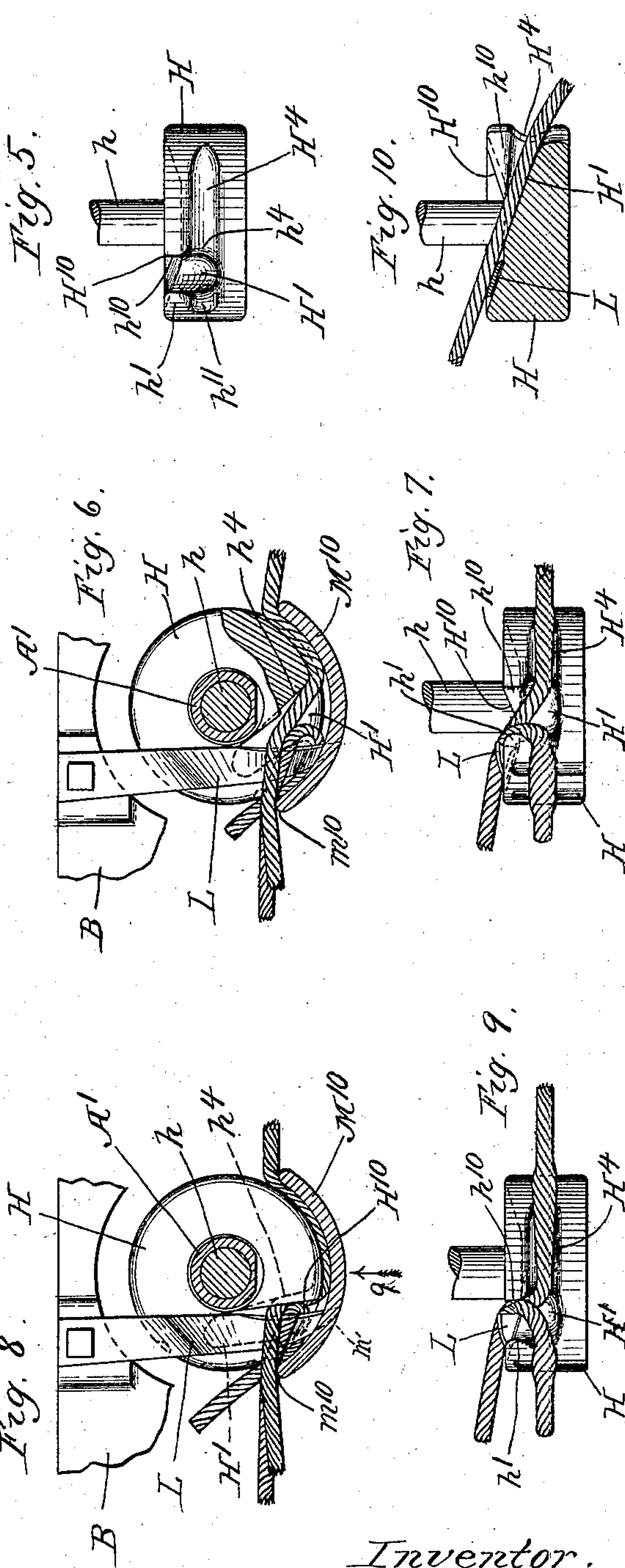
NO MODEL.

3 SHEETS—SHEET 3.



Witnesses,

Edward T. Wray.
Edgar L. Conant



Inventor.

Edwin M Kellogg
by Brown & Darby.
his Attys.

UNITED STATES PATENT OFFICE.

EDWIN M. KELLOGG, OF ST. PAUL, MINNESOTA, ASSIGNOR OF ONE-HALF
TO WILLIAM C. THOMPSON, OF CHICAGO, ILLINOIS.

CORD-KNOTTER.

SPECIFICATION forming part of Letters Patent No. 757,127, dated April 12, 1904.

Application filed July 23, 1900. Serial No. 24,482. (No model.)

To all whom it may concern:

Be it known that I, EDWIN M. KELLOGG, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented a new and useful Improvement in Cord-Knotters, of which the following is a specification.

The purpose of this invention is to provide a cord-knotter for grain-binders which while adapted and having some advantages for use with any sort of binding-twine is by reason of the specific features of construction especially adapted to overcome some difficulties encountered in the use of grass twine.

Figure 1 is a rear side elevation of a knotter embodying my invention, comprising in the view the breastplate and a portion of the parts of the binder which sustain it. Fig. 2 is a section at the line 2 2 on Fig. 1. Fig. 3 is a section at the line 3 3 on Fig. 1. The foregoing figures show the parts at the position of rest during the accumulation of the bundle. Fig. 4 is a view similar to Fig. 2, but showing the parts at the position occupied after the second cord is laid by the needle and the knotter-bill and holder have both commenced their movement. Fig. 5 is a detail edge elevation of the holder with the shoe removed, showing the parts in the same position as in Fig. 4 looking in the direction of the arrow 5 on Fig. 4. Fig. 6 is a detail sectional plan of the holder, showing the cords therein in the position occupied after the second cord is carried to the shoe, section being made in proper plane to disclose the cords. Fig. 7 is an edge or side elevation of the revolvable element of the holder, the shoe being removed, the position being the same as in Fig. 6. Fig. 8 is a view similar to Fig. 6, showing the parts at the position occupied just before the cord is severed. Fig. 9 is a side or edge elevation of the holder with the shoe removed looking in the direction of the arrow 9 on Fig. 8. Fig. 10 is a section at the line 10 10 on Fig. 4. Fig. 11 is a detail plan view of the holder in the position occupied after the cord is severed and the knot discharged and when the holder has about half completed its return to rest posi-

tion. Fig. 12 is a detail section at the line 12 12 on Fig. 11. Fig. 13 is a detail view showing the relation of the knotter-bill pinion to the gear and delay-surface, which actuate and control it at a certain part of the action.

A is the knotter frame or bracket.

B is the breastplate.

C is the knotter-actuating gear-wheel. *c* is its shaft.

D is the knotter-bill. *d* is its shaft.

The knotter-actuating wheel C has the gear-segment C' for engaging the knotter-pinion D' and the segment C² for engaging the holder-pinion H².

C³ is the delay-surface which controls the halt or rest of the knotter-bill, the same being cut away at *c*³ to permit it to be reversed for stripping the knot in a manner which is familiar.

The operation of the knotter-bill is that which is familiar in a considerable class of knotting mechanisms. The gear-wheel and knotter-pinion have their gear-segments and delay-surfaces coöperatively constructed to cause the knotter-bill to receive one complete positive revolution, starting and coming to final rest in the position shown in Figs. 1 and 2, the bill standing across the plane of the cord and needle path and the delay-surface C³ of the wheel C being cut away at *c*³ to permit the bill to be reversed through an angle amounting to from thirty degrees to forty-five degrees under the stress of the discharge action, so as to strip the knot from the bill in an oblique direction toward the discharge side, the bill being restored to final rest position by the shoulder C³⁰ of the delay-surface. A lever K, pressed by a spring K', is pivoted to the frame A in suitable position to permit the free end of said lever to move in and out in respect to the knotter-bill axis at the side opposite that at which the jaws stand at rest and, being encountered by the roll G² on the heel of the knotter-bill as the latter revolves, close the jaws at the proper time. This lever K is provided at its free end with the hook K², adapted to seat the roll G² and check the rotation of the pinion when there is no cord on the bill to check it at the

proper point to be engaged by the delay-surface C^3 after the recess c^3 is passed. This feature is not claimed in this application.

The frame A has an arm A' , in which the
 5 shaft h of the holder is journaled. This holder comprises a revoluble element H, which is a short cylinder or thick disk, hereinafter termed the "holder-cylinder." Said holder-cylinder H is secured at its center to the shaft
 10 h , which protrudes from the lower end of the bearing A' . The axis of the holder is inclined to that of the knotter-bill, and the holder-cylinder is enough farther from the axis of the shaft d so that the plane of the rotation of the
 15 holder-cylinder H is oblique to the cord drawn over the bill onto the holder-cylinder, which thus appears tilted upward at the side remote from the knotter-bill, as seen in Fig. 1. In the upper face of the holder cylinder or disk—
 20 the face toward the cord—there is formed a cord-receiving recess H' , which extends non-radially with respect to the disk and sloping or oblique as to its bottom with respect to the plane of rotation or upper surface of the disk,
 25 said recess commencing at said upper surface and deepening toward the periphery and extending thereto and constituting a gap therein, but preferably not extending across the entire periphery, so as to constitute a complete
 30 notch in its edge. The holder comprises besides said revoluble element H the clamp M, said clamp being pivoted at m to the frame A and adapted to swing about its pivot in a direction substantially radial to the shaft h , its
 35 lower end being expanded into a shoe M' , which bears upon the outer periphery of the holder-cylinder H and extending thereabout on the side of the cord and needle path opposite the plane in which the axes of the knotter
 40 and holder shaft lie for a distance which may be one-third the circumference, more or less.

N is the holder tension-spring. It is coiled around the stud N' , screwed into the arm A' of the frame A, and extended through an aperture
 45 in the suspending arm of said pivoted clamp M and provided with a head N^2 and adjustable by screwing into and out with respect to the post to modify the tension of the spring at will. The boss n' , in which the stud N' is
 50 screwed, is above the path of the needle, which is thus permitted to play under the same above the holder shoe and cylinder and between the bearing A' and the clamp-arm. The shoe M' is extended above the plane of the upper face
 55 of the holder-cylinder H, forming a sloping cord-guiding rib or flange M^{10} on the side toward the knotter-bill, its slope adapting it to guide the cord laid by the needle inward toward the knotter-axis. At the side remote from
 60 the knotter-bill the shoe has a guard-lug M^{11} , which overhangs the margin of the cord holder-cylinder H, and the upper edge of the shoe at this side is also sloped, so as to guide the cord laid by the needle inward toward the axis of
 65 the holder as it is carried down along said

edge. The gear-segments and the delay-surfaces of the gear-wheel C and the pinion H^2 , by which the holder-cylinder is rotated, are arranged to cause the same to come to rest with the gap or peripheral end of the recess H'
 70 at the side remote from the knotter-bill and with the recess extending approximately in the direction of the cord stretched from the end of the holder-shoe back over the knotter-bill, and at this position of rest of the holder,
 75 as shown in Fig. 2, the lug M^{11} of the shoe overhangs the edge h' of said gap, the cylinder coming to rest immediately after said edge has passed inside the shoe and under said guard-lug M^{11} and while said recess is still un-
 80 covered. As the cord laid by the needle is guided down along the sloping edge of the shoe at the farther side and runs off from the lug M^{11} it comes into said recess. In order that the cord may not hang on the edge of
 85 said recess, but may pass down into the same deeply enough to be properly engaged and carried to the shoe, the edge h' of the gap at the peripheral end of the recess thus overhung is cut away, forming an undercut at h^{11} , into
 90 which the cord thus guided down the slope of the shoe and over the lug M^{11} readily drops as it passes off the shoe into this gap.

L is a rigid bar or blade which may be provided with a cutting edge, but which whether
 95 thus provided or not constitutes one of the two elements necessary to the severing of the cord. The other element is the edge H^{10} of the recess H' . Since this latter is the moving element and the bar or blade L is the fixed
 100 element, I call said bar or blade the "cord-stop;" but this is merely a convenient designation, since it may be and is shown as a knife having an acute cutting edge. It is secured
 105 to a boss B' on the breastplate B and extends over the upper face of the cord holder-cylinder in a direction transverse to the plane of the path of the cord and past said plane on the side of the axis of the holder toward the
 110 knotter-bill, so that the cords laid by the needle into the recess H' are laid over and immediately upon said cord-stop. Its edge remote from the knotter-bill, which is the cord-encountering edge and the cutting edge when
 115 it has such an edge, stands close above the path of the edge H^{10} of the recess H' , so that it is in position to cooperate with said edge to sever the cord when the holder-cylinder H, revolving, causes said edge of the recess, crowding the cord before it, to pass by the
 120 edge of said cord-stop L. Either of said cooperating edges may be a cutting edge, or both of them may be so acute as to operate as cutting edges, and preferably the cord-stop L is so situated as to stand in a distinctly shearing
 125 relation to the edge H^{10} , so that cutting action shall not impose any additional tensile strain on the cord.

Certain of the features of my improved knotter, and particularly of the cord-holder, 130

are designed in order to adapt it to operate to tie a knot in a band composed of grass twine. Such twine, while having sufficient tensile strength to serve the purpose of grain-binding, is composed of vegetable filaments whose structure is easily broken down by being bent abruptly over a sharp angle or being grasped tightly between hard surfaces, especially if one of them is angular. All the devices and structures designed to operate with that twine must therefore be so constructed as to avoid thus crushing or breaking the fiber until after the knot is fully formed. In view of this circumstance it is necessary to provide, in the first place, that the cord which extends from the holder over the knotter-bill down through the breastplate to the eye of the needle while the bundle is being accumulated and which is subjected to more or less severe strain during such accumulation is not drawn over any sharp angle nor in any position where it is particularly liable to be chafed by any lateral movement to which it may be subjected by the swaying of the bundle during its accumulation. In binders designed to use a band of material heretofore customary a finger has usually been provided in the breastplate-slot, over which the cord is drawn and held tightly during the accumulation of the bundle and from which the bundle is in a measure suspended while it is being encircled by the cord as the needle rises, such finger being located below the position of the knotter-bill, so that the cord runs from the bill onto the finger. Such finger would be extremely liable to cause grass twine to become chafed and cut off by being folded over as the bundle is packed. I therefore dispense with such finger as a cord-stop, providing, however, in the breastplate-slot a mere deflecting prominence B^{10} , by which the cord is guided over toward the shank of the knotter-bill and caused to be lodged on the bill. Such deflecting prominence, however, does not extend to the line of the axis of the bill, and the cord guided by it toward that axis does not remain lodged against it, but, on the contrary, passes by the end of it, as seen in Fig. 1. The absence of this cord-supporting finger in the breastplate-slot leaves the bundle suspended by the cord directly from the knotter-bill while it is accumulated and encircled with the band. If the knotter-bill stood, in the ordinary position, pointing directly across the slot, without the finger to assist in supporting the cord, the stress of the bundle would very often cause the cord to slip off the bill, losing the bundle. This I prevent by the formation of the clamp-shoe, the edge of whose flange M^{11} is so situated that the cord laid by the needle and guided by this edge is carried so far aside from the plane of the cord-path toward the plane of the axes of the bill and holder that from this point the cord extends across the bill in a direction making an obtuse angle with the

bill, and for the same purpose and to increase the angle I locate the bill on its shaft with respect to the delay-surface of its pinion, so that at its position of rest said bill trends somewhat back toward the incoming needle, away from a direction at right angles to the cord-path, as seen in Fig. 2. By considering said Fig. 2 it will be observed that the cord held in the holder at the side remote from the knotter-bill and passing thence by the edge of the flange M^{10} of the shoe to the knotter-bill will require slack to be drawn from the bundle in order to swing laterally about the point of lodgment on the flange of the shoe, so as to escape over the end of the bill—that is to say, the distance from the point m^{10} , at which the cord is lodged on the shoe, to the point at which it lodges on the bill in proper position, as seen in Fig. 2, is less than the distance from the same point m^{10} to the extremity of the bill which the cord must pass in order to escape from the latter. With the weight of the bundle and the further pressure tending to draw the cord tightly onto the bill (and it is this pressure which, if anything, would cause it to slip off from the bill) it will be seen that no slack will exist and that all the pressure and weight therefore tend to hold the cord on the bill and prevent it from coming off. By reason of the characteristics of grass twine, as above explained, it may be understood that if the cord when first laid by the needle in the recess of the holder-cylinder and carried by the edge of the recess inside the shoe were to be immediately pinched hard between the periphery of the cylinder and the face of the shoe, as necessary ultimately in order to hold it during the accumulation of the bundle, the strain upon the cord produced by the action of the knotter-bill in “laying” the knot would break it off at the point where it is thus pinched, since it would not bear the strain of rendering through the holder the amount needed for laying the loops of the knot. For this reason I form in the periphery of the cylinder H , commencing at the edge of the gap formed by the peripheral end of the recess H' , a groove H^1 , which at the margin of the gap is nearly deep enough to completely accommodate the cord, but which extends through only about one-sixth of the circumference of the cylinder, becoming shallower all the way until it runs out entirely. This causes the cord as it is carried under the shoe to be compressed gradually and with a pressure extending over considerable distance before the pressure becomes hard or amounts to a positive grip. The result is that the cord is under control from the moment it is encountered by the edge of the recess and carried to the shoe, and by such control is prevented from becoming slack, so as to uncoil from the bill or prevent the laying of the knot, but is nevertheless held so mildly that there is no danger of abrading the fibers

or causing the cord to be weakened to such extent as to give way under the strain. Moreover, the cord being thus gradually pressed by the rotation of the cylinder H behind the shoe has opportunity to flatten out, and thus is not subjected to nearly such severe pressure on any particular fiber as it would be if the first grip of the shoe upon it were the full and complete grip, which is finally obtained beyond the groove H^4 . This feature of construction adapts my knotter to operate with grass twine, which is entirely unmanageable with an ordinary cord-holder. Another special advantage of the groove H^4 in the periphery of the cylinder H is not confined to the use of grass twine, but is of equal importance whatever be the character of twine employed. In the absence of such groove or any equivalent feature of construction, if the portion of the "second cord" laid in the notch or recess of the revoluble element happens to be of greater diameter than the portion which is already clamped between the periphery of the cylinder and the shoe, or if said second cord at the point where it is carried inside the shoe contains a knot or thick place, it will be seen that the shoe will be forced out by said thicker portion of the thick place or knot of the twine and the held end or "first cord" may thereby be released, so that it will slip out, and the bundle will be lost. This is a fruitful cause of missing bundles in all knotters now in use with any twine which is not perfectly even, and it is this which creates the imperative necessity for great uniformity in twine which is used for binding. When, however, the groove H^4 is formed in the cord-seating periphery of the revoluble element or carrying element it will be seen that a wide variation in the diameter of the cord is provided for and can be accommodated without danger of releasing the held end, because by the time the cord-carrying element has moved so far inside the shoe that the end of the groove has reached the shoe and the cord is clamped between the full face of said periphery and the shoe the knotting operation has proceeded so far that the knot is fully laid on the knotter-hook, and the release of the held end of the cord would cause no damage. By reason of the same peculiarity of the grass twine it is necessary to avoid causing it to be drawn or folded tightly over the edge of the knife, which, nevertheless, must extend across the cord-path and under the cord, so that the first cord is laid over it when the needle retreats and the second cord is also laid over it when the needle advances. To this end the upper surface of the holder-cylinder H is given such a slope that the cord running in a straight line from the top of the recess H' to the bill extends at an angle to the upper surface of the cylinder, and in this angle the knife L is accommodated, so that it does not either by its

forward or rear edge constitute a deflection for the cord. This slope of the upper surface of the cylinder is mainly obtained by the inclination of the axis; but as a matter of economy of space and in order to get all the parts in the best working relation I obtain the desired angle between the upper surface of the cylinder H and the cord by slightly hollowing said upper surface, as most perfectly seen in Fig. 3, causing the knife to be deflected or depressed to correspond with such hollowing. In order to avoid folding the cord around a sharp corner at the point where it passes from the recess H' around into the groove H^4 when it is carried behind the shoe, I round the corner of the gap which the recess makes at the periphery of the holder in the zone of the groove H^4 , and this causes an undercut to be formed, as seen at h^4 , in the side of the recess H' . This undercut is of itself of value and may be formed independently of the purpose of rounding the corner in order that the cord which is laid in the recess by the needle and which by the rotation of the cylinder is to be carried to the shoe may be provided with an overhanging guard-lip h^{10} to prevent it from slipping up out of the recess and escaping. This is especially important in view of the fact that the recess is a sloping one and that the cord extends in that recess up to its shallower end and would therefore be liable to be pried out by the rotation of the cylinder if the edge of the recess which advances toward it should encounter it first at the shallow end of the recess and before it became overhung in any manner at the deeper end. This may be best understood by considering Fig. 4, which shows the cylinder in the position occupied as it is just about encountering the second cord to carry it to the shoe. It will be seen by comparing this view with Fig. 2 (the latter being the position of rest) that the direction of the recess, or particularly the advancing edge thereof, with respect to the line in which the cord is laid by the needle or in which it is drawn, which extends drawn from the corner of the shoe to the position on the bill, is such that the outer end of the driving side of the recess reaches the cord before the inner or shallower end. Notwithstanding this, if it were not for the undercut the cord might sometimes be pried up; but the overhanging lip h^{10} , produced by the undercut reaching and overhanging the cord before the edge H^{10} of the recess H' at the shallow end encounters it, retains it securely while it is carried to the shoe.

The fixed element or shoe M' of the cord-holder has a recess or pocket m' , into which the end of the cord-severing stop L protrudes where it extends beyond the periphery of the rotary element of the holder, as indicated in dotted line in several of the figures. The purpose of this construction is to guard the end of the cord-stop to prevent the cord which is

lodged thereon from passing by that end, and so becoming engaged on the wrong side of it, as is liable to happen if the cord is frayed.

I claim—

5 1. In a knotter for a grain-binder, in combination with a suitable knotting-hook, a cord-holder comprising two elements, one revoluble and the other non-revoluble, between which both ends of the cord remain lodged during
10 the laying of the knot; means for rotating the revoluble element in direction to carry the side at which the cord is lodged toward the knotter-bill during the wrapping of the cords on the bill by the rotation of the latter, said
15 elements of the holder being relatively formed at the surfaces which constitute the lodging-places respectively of the holder end of the cord and of the needle end of the same so as to clamp such holder end firmly and to exert
20 only mild pressure on the needle end during a substantial portion of the wrapping of the cords about the bill to form the knot.

2. In a knotter for a grain-binder, the combination of a knotting-hook with the cord-
25 holder comprising two elements, one revoluble and the other non-revoluble, between which both ends of the cord are lodged during the knot-laying operation, the cooperating surfaces of said elements being relatively
30 formed at the portion which forms the lodging place of the holder end so as to clamp said end, and at the portion which forms the lodging place of the needle end so as to afford said
35 end lodgment with mild pressure from the lodgment of the cord between said elements throughout a substantial portion of the period of wrapping the cords on the bill to form the knot; and means for operating said revoluble
40 element in a direction to carry the lodging places of both ends toward the knotting-hook during said knot-laying operation.

3. In a knotter for a grain-binder, in combination with the knotting-hook, a cord-holder comprising two elements, one having move-
45 ment with respect to the other; means for moving the former to cause the cord to be lodged between said elements and to carry the cord thus lodged toward the knotting-hook, said cord-holder elements being relatively
50 formed at the portion of their cooperating surfaces which forms the lodging place of the holder end of the cord so as to clamp said end, and at the portion which constitutes the lodging place of the needle end so as to afford said
55 end lodgment with mild pressure from the time said needle end is lodged between said elements throughout a substantial portion of the period of wrapping the cords on the bill to form the knot.

60 4. A cord-knotter for a grain-binder provided with means for engaging the cord running from the needle to the knotting-hook and an element of a holder onto which the cord is drawn lengthwise and lodged and on which it
65 is retained by said cord-engaging means, said

parts being relatively formed to cause and permit such carrying lodgment and retention with only slight pressure on the cord during the portion of the knot-laying operation next following said engagement and lodgment of the
70 latter.

5. A cord-knotter for a grain-binder comprising two elements of a holder, one of which has movement past or along the length of the other, said moving element being adapted to
75 engage the cord running from the needle to the knotting-hook to lodge it on the other element, said elements being formed respectively to cause and receive such lodgment with only
80 slight pressure on the cord; and means for operating the moving element in direction to carry the lodgment of the cord thereon toward the knotting-hook during the knot-laying operation.

6. In a cord-knotter, a holder having a suitable cord-clamping shoe, and means for engaging the needle-cord and carrying it lengthwise toward the knotting-hook and between the walls of the holder without affecting the
85 pressure of such clamping-shoe on the holder end of the cord during the greater part of the operation of wrapping the cords on the bill to form the knot.

7. A cord-knotter; a holder comprising means for engaging the loose end or needle-
95 cord and lodging it between the walls of the holder and simultaneously carrying it with only slight pressure toward the knotter-hook, in combination with means for gradually releasing the held end of the cord while under
100 pressure during the knot-laying operation.

8. In a knotter for a grain-binder a cord-holder comprising two elements, one of which moves relatively to the other to engage and carry the cord between said elements toward
105 the knotter-bill during the rotation of the latter to form the knot, said holder elements having cooperating surfaces between which the cord is lodged, one of said elements having said surface provided with a long recess back
110 of the cord-encountering point, affording lodgment for the needle-cord in which said cord is held with only mild pressure, said recess extending for a distance approximately equal
115 to the movement of the moving part occurring while the cords are wrapped around the bill for forming the knot.

9. In a knotter for a grain-binder, a cord-holder comprising two elements between which the cord is grasped, one of which carries the cord to the other in direction toward
120 the knotter-bill during the formation of the knot on the bill, said carrying element having its face on which the cord is first received, provided with a recess extending back with
125 respect to the direction of rotation from the cord-encountering point, said recess being of gradually-diminishing depth to accommodate the cord; whereby the cord is held by only mild pressure in said recess, the length of
130

such recess being approximately equal to the movement which said cord-carrying element makes while the bill is wrapping the cords about it for the knot.

5 10. In a knotter for a grain-binder, a cord-holder comprising two elements between which the cord is clamped; means for causing
10 relative movement between said elements in direction to cause the cord to be drawn lengthwise between them, the cord-pressing face of one of said elements being shaped with respect to the direction of movement to cause it to approach the corresponding face of the other element as said movement progresses
15 lengthwise with respect to the cord, so gradually and slightly as to cause only mild pressure on the cord during the greater part of the period of wrapping the cord about the bill to form the knot.

20 11. In a knotter for a grain-binder, a cord-holder comprising two elements between which the cord is clamped, one of which draws the cord lengthwise into contact with the other, the cord-pressing face of such drawing element
25 being shaped with respect to its path of movement so as to approach the corresponding face of the other element as it advances lengthwise with respect to the cord along said other element from the cord-encountering point, so
30 gradually and slightly as to produce only mild pressure on the cord during the greater part of the wrapping of the cords about the bill to form the knot.

35 12. In a knotter for a grain-binder, a cord-holder comprising a fixed element and a moving element which draws the cord lengthwise into contact with the fixed element, the cord-pressing face of said moving element being shaped with respect to its path of movement
40 so as to approach the opposite face of the fixed element as it advances lengthwise of the cord along said fixed element from the cord-encountering point, so gradually as to exert only mild pressure on the cord during the greater portion of the wrapping of the cords on the bill
45 to form the knot.

50 13. In a knotter for a grain-binder, a cord-holder comprising a fixed element and a moving element which draws the cord lengthwise into contact with the fixed element, the moving element having a groove in its cord-pressing face which is deepest at the cord-encountering point and extends, gradually diminishing in depth, back with respect to the direction of movement from cord-encountering point so gradually as to exert only mild pressure on the cord during the greater portion of the wrapping of the cords on the bill to form the knot.

60 14. In a knotter for a grain-binder, a cord-holder comprising a revoluble element having its face, which is transverse to the axis, provided with a cord-receiving recess, which at the position of rest of said element, extends
65 in said face substantially in the plane of the

cord-path from a point within the periphery to said periphery, forming a gap therethrough, in combination with a shoe which presses toward the periphery to hold the cord thereagainst; said revoluble element having in the
70 peripheral face on which the shoe presses, a groove leading from the gap formed in the periphery by the cord-receiving recess, back with respect to the direction of rotation, affording space within which the needle-cord is
75 received, and relieved from the pressure of the shoe, said groove extending in said periphery for a distance corresponding to a substantial portion of the period of formation of the knot
80 by the bill.

15. In a knotter for a grain-binder, a cord-holder comprising a revoluble element having its face which is transverse to the axis provided with a cord-receiving recess extending in said face non-radially with respect to the
85 axis of rotation from a point within the periphery to the periphery, and forming a gap therethrough, in combination with a shoe which presses toward the periphery to hold the cord thereagainst, said revoluble element
90 having in the peripheral face on which the shoe seats, a cord-receiving groove which commences at and merges in the gap which the cord-receiving recess in the transverse face forms through the periphery, and extends from
95 said gap back with respect to the direction of rotation for a distance corresponding to a substantial portion of the period of formation of the knot; whereby the cord received in said groove is relieved of the pressure of the shoe
100 so as to be held only mildly thereby during such portion of the rotation.

16. In a knotter for a grain-binder a cord-holder comprising a revoluble element having its face which is transverse to the axis provided with a cord-receiving recess which extends in said face from a point within the periphery to the periphery, forming a gap therethrough, in combination with a shoe which presses toward the periphery of the revoluble
110 element to hold the cord thereon; a cord-receiving groove in the peripheral face of the revoluble element on which the shoe seats, commencing at the gap and merging therein, and extending therefrom back with respect
115 to the direction of rotation; and mechanism which gives such revoluble element one complete revolution for each knotting operation, bringing it to rest with said recess in the transverse face extending substantially in the plane
120 of the cord's path.

17. In a knotter for a grain-binder, a cord-holder comprising a revoluble cylinder having one face transverse to its axis provided with a cord-receiving recess which extends from a
125 point within the periphery to said periphery, forming a gap therethrough; a shoe which presses toward the periphery to hold the cord thereon; means for rotating the revoluble element to cause one edge of the gap to carry the
130

cord lodged in the recess under or behind the shoe; and a cord-stop whose cord-encountering edge extends over said transverse recessed face in cord-severing relation to one of the edges in said face, of said recess.

18. In a knotter for a grain-binder, a cord-holder comprising a revoluble cylinder having a face transverse to its axis provided with a cord-receiving recess extending from a point within the periphery to the periphery, forming a gap therethrough; a shoe which presses upon the periphery of said element to hold the cord thereagainst; means for rotating said revoluble element to cause one edge of the gap in the periphery to carry the cord lodged in the recess of said transverse face under or behind the shoe; a cord-stop whose cord-encountering edge stands adjacent to said transverse recessed face of the cylinder in shearing relation to one of the edges in said face of said recess.

19. In a knotter for a grain-binder, a cord-holder comprising a revoluble cylinder having a face transverse to its axis provided with a cord-receiving recess commencing at a point within the periphery and extending in said face to the periphery, forming a gap therethrough, said periphery having a face on which a shoe may seat; a shoe which presses toward said face to hold the cord thereon; a cord-receiving groove cut back in said peripheral face, under or behind the shoe, commencing at and merging in the gap formed in the periphery by the recess in the transverse face, and extending from said gap back with respect to the direction of rotation, to afford the cord a long seat in which it is relieved of the extreme pressure of the shoe and held only mildly thereby; mechanism for giving the cylinder one revolution for each knotting action, bringing it to rest with the recess in the transverse face substantially in the plane of the cord's path, and with the gap which said recess forms in the periphery at the opposite side of the holder from the knotter-bill.

20. In a knotter for a grain-binder, a cord-holder comprising a revoluble cylinder whose plane of rotation is transverse to the plane of the cord's path, said cylinder having a face transverse to its axis and facing toward the cord's path, recessed to receive the cord, such recess commencing within the periphery and extending to and through said periphery, forming a gap therethrough, in combination with a shoe pressing inward toward the periphery of the cylinder to hold the cord thereagainst; mechanism which gives the holder one complete revolution for each knotting action, and brings it to rest with the recess in the transverse face substantially in the plane of the cord's path, and with the gap which said recess forms in the periphery at the opposite side of the holder from the knotter-bill; and a rigid knife whose cutting edge extends over said transverse recessed face of the cylinder

in cord-severing relation to one of the edges in said face of said recess.

21. In a knotter for a grain-binder a cord-holder, comprising a revoluble cylinder whose plane of rotation is transverse to the plane of the cord's path, said cylinder having its face toward the cord-path recessed to receive the cord, such recess extending to the periphery of the cylinder and forming a gap therein; a shoe pressing in toward the outer periphery of the cylinder to clamp the cord thereagainst; mechanism which gives the holder one complete revolution for each knotting action, and brings it to rest with the gap substantially in the plane of the cord's path, on the opposite side of the holder from the knotter-bill; and a cord-stop whose cord-encountering edge extends across the cord's path, adjacent to the recessed face of the holder at the side of the axis of the latter toward the knotter-bill.

22. In a knotter for a grain-binder, a cord-holder comprising a revoluble cylinder having at one face a sloping cord-receiving recess commencing in the surface of such face and extending deepening to the periphery and forming a gap therethrough; a shoe pressing in toward such periphery to clamp the cord thereagainst; a fixed cord-stop extending across the plane of the cord's path over the surface of the face of the cylinder in which said cord-receiving recess is formed; mechanism which revolves the cylinder and brings it to rest with the gap in the periphery at the side remote from the knotter-bill, the sloping recess extending from such gap toward the knotter-bill; the cord-stop having a cord-severing edge, and said edge being between the surface in which said sloping recess is formed, and the direct line of the cord drawn taut from the bill to the top of said recess and in position to cooperate with one edge of the recess for cutting the cord.

23. In a knotter for a grain-binder a cord-holder, comprising a revoluble cylinder whose plane of rotation is transverse to the plane of the cord-path; a concentric shoe which presses in toward the periphery of the cylinder to clamp the cord thereagainst, said cylinder having the face toward the cord-path provided with a cord-receiving recess which extends to the periphery and forms a gap therein, said periphery of the cylinder having a groove which merges in said gap at one side thereof diminishing in depth from the gap to the remote end of the groove; and mechanism which revolves the cylinder to carry the groove behind the shoe, deeper end foremost.

24. In a knotter for a grain-binder, a cord-holder comprising a revoluble cylinder having a face transverse to its axis provided with a cord-receiving recess which commences within the periphery and extends to the periphery, forming a gap therethrough; a shoe which presses toward the periphery to hold the cord thereagainst; mechanism for giving the cylin-

der one complete revolution in each knotting operation to cause the cord laid in the recess in the transverse face to be carried by the edge of the gap toward the shoe, the side of the recess which faces the shoe as the holder thus
5 revolves being undercut at the end toward the periphery.

25. In a knotter for a grain-binder a cord-holder, comprising a revoluble cylinder having
10 one face provided with a cord-receiving recess which extends to the periphery forming a gap therein; a shoe pressing in toward said periphery to clamp the cord thereagainst; the side of the recess which faces the entrance end of the
15 shoe as the cylinder is revolved being undercut at the periphery, and the periphery having a groove which merges in said undercut forming a rounded corner; said groove diminishing in depth as it extends back from the recess to
20 the remote end.

26. In a knotter for a grain-binder, in combination with the knotter-bill a cord-holder, comprising a revoluble cylinder having its axis inclined to that of the knotter-bill to tilt the
25 cylinder up on the side remote from the bill, such cylinder having its face toward the cord-path provided with a sloping, cord-receiving recess, which, in the direction of its greatest slope, trends non-radially with respect to the
30 cylinder, deepening toward the periphery of the latter, and which forms a gap in said periphery; mechanism which gives the cylinder one revolution for each complete knotting action, and brings it to rest with said gap at the
35 side remote from the knotter-bill, the trend of the taut cord from the shallow end of the recess to the knotter-bill at the position of rest being slightly away from the recessed face of the cylinder; and a cord-stop extending across
40 the plane of the cord-path in the angle between said taut cord and said face of the cylinder having its cord-encountering edge situated in cord-encountering relation to the edge of the cord-receiving recess as the cylinder revolves.

45 27. In a knotter for a grain-binder a cord-holder, comprising a revoluble cylinder having one face provided with a sloping recess extending to the periphery and forming a gap therein; said recessed face of the cylinder being
50 slightly hollowed, and a fixed knife extending over the said face, across the plane of the cord-path, and inclined from its back to the cutting edge to correspond to the hollowing of said face; whereby its edge stands in shearing relation to the advancing edge of the recess and
55 below or back of the line of the cord drawn taut from the knotter-bill into said recess.

28. In a knotter for a grain-binder a cord-holder, comprising a revoluble cylinder having
60 one surface provided with a cord-receiving recess which extends to the periphery and forms a gap therein; a shoe which presses against the periphery to clamp the cord thereagainst; said shoe having a lug which over-
65 hangs the margin of the cylinder at the side

remote from the knotter-bill, and having its edge at that side sloped to guide the cord in toward the axis of the cylinder; mechanism which revolves the holder and brings it to rest with said recess at the side remote from
70 the knotter-bill and the advance edge of the recess just entering behind the shoe; said side of said recess being undercut at the edge of the gap where said edge is overhung by the lug of the shoe; whereby the cord drawn down
75 along the guiding edge of the shoe into the gap is delivered into said undercut and prevented from hanging in the edge of the recess.

29. In a knotter for a grain-binder, a cord-holder, comprising a revoluble cylinder whose
80 plane of rotation is transverse to the plane of the cord-path; a concentric shoe pressing in toward the periphery of the cylinder to clamp the cord thereagainst, said cylinder having its face toward the cord-path provided with a
85 cord-receiving recess which extends to the periphery of the cylinder and forms a gap therein; said periphery being cut back from its cylindrical outline to form an eccentric face or seat for the lodgment of the cord which com-
90 mences at the gap and merges in the cylindrical outline a short distance therefrom, around the periphery in the direction of rotation.

30. In a knotter for a grain-binder a cord-
95 holder, comprising a revoluble cylinder having one face provided with a cord-receiving recess extending to the periphery of the cylinder; a shoe pressing in toward said periphery to clamp the cord thereagainst; a rigid
100 stop for severing the cord, whose cord-encountering edge extends over the recessed face of the cylinder in cord-severing relation to one edge of the recess, such blade or bar terminating beyond the periphery of the cylinder and having a guard in which the end is received, to prevent the fibers of the cord passing by said end.
105

31. In a knotter for a grain-binder a cord-holder, comprising a revoluble cylinder having
110 one face provided with a cord-receiving recess extending to the periphery of the cylinder; a shoe pressing toward said periphery to clamp the cord thereagainst; a rigid stop for severing the cord, whose cord-encountering
115 edge extends over the recessed face of the cylinder in cord-severing relation to one edge of the recess; such blade or bar terminating beyond the periphery of the cylinder; and the shoe having a recess into which the end of
120 such bar protrudes, whereby the shoe guards the end of said cord-stop and prevents the fibers of the cord passing by said end.

32. In a knotter for a grain-binder, in combination with the knotter-bill a cord-holder
125 comprising a revoluble cylinder; a shoe pressing on the outer periphery of the cylinder to clamp the cord thereagainst and extended above the cylinder on the side of the cord-path opposite the knotter-bill axis; such shoe
130

having an extension on the side of the holder toward the knoter-bill, such extension having its edge sloped to guide the cord laid by the needle inward toward the knoter-bill axis; and mechanism which gives the cylinder one revolution for each complete knotting operation.

In testimony whereof I have hereunto set

my hand, at St. Paul, Minnesota, in the presence of two witnesses, this 20th day of July, 1900.

EDWIN M. KELLOGG.

In presence of—

HENRY WOLFE,
GUY CHASE.