(No Model.) 2 Sheets—Sheet 1.

K. C. & A. A. KUNKLE.

KNOTTING DEVICE FOR GRAIN BINDERS.

No. 407,734. Patented July 23, 1889.

Fig. 2.

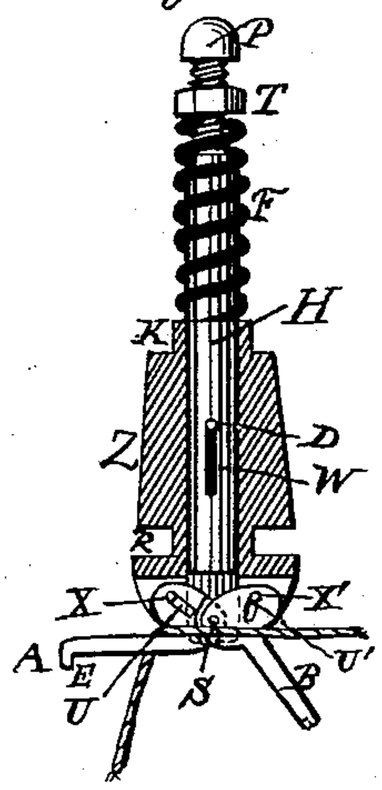


Fig. 1.

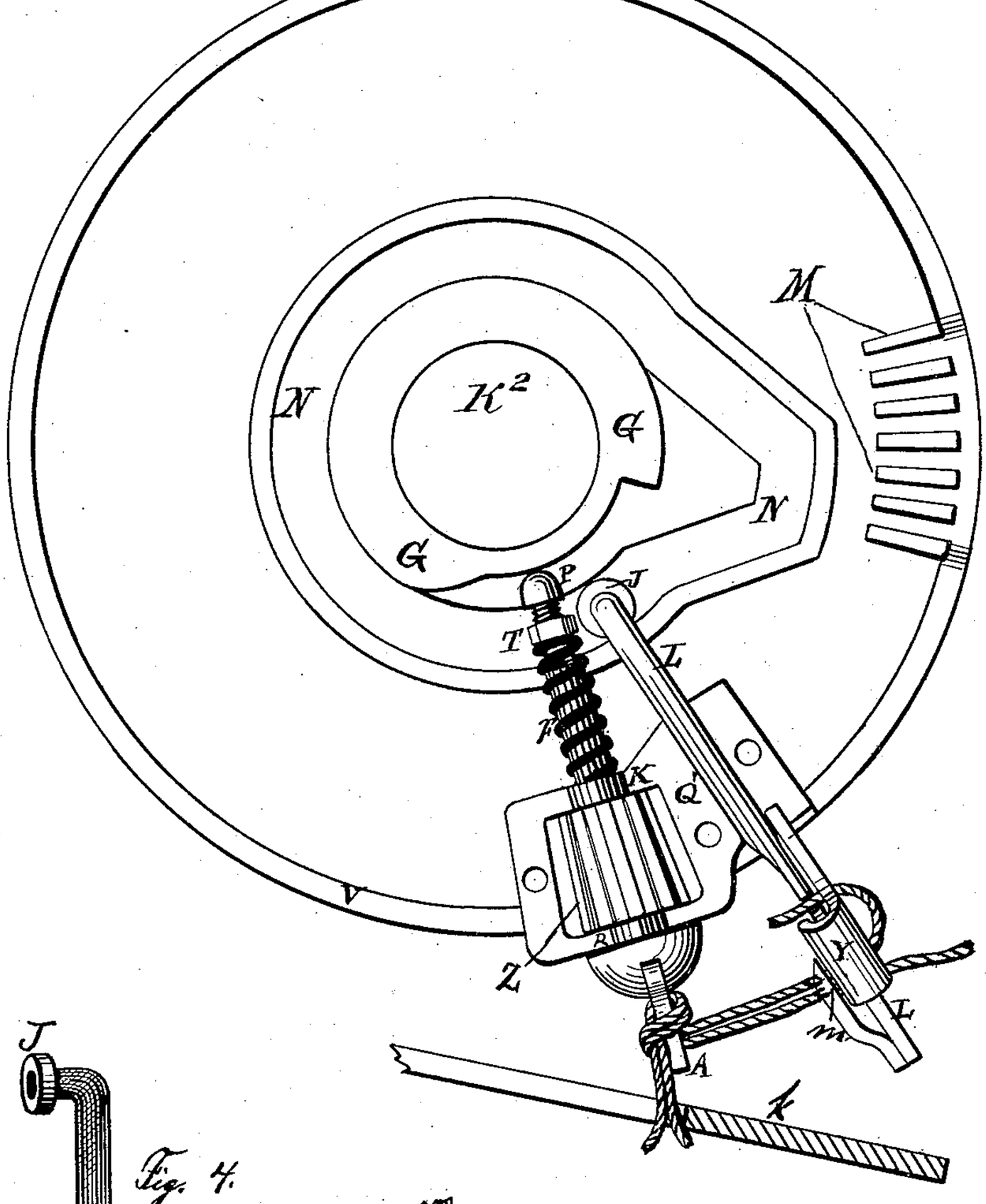


Fig. 3.

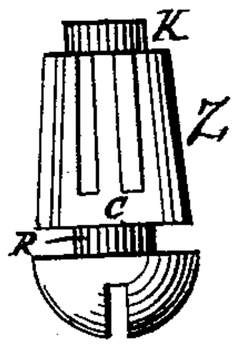


Fig. 4.

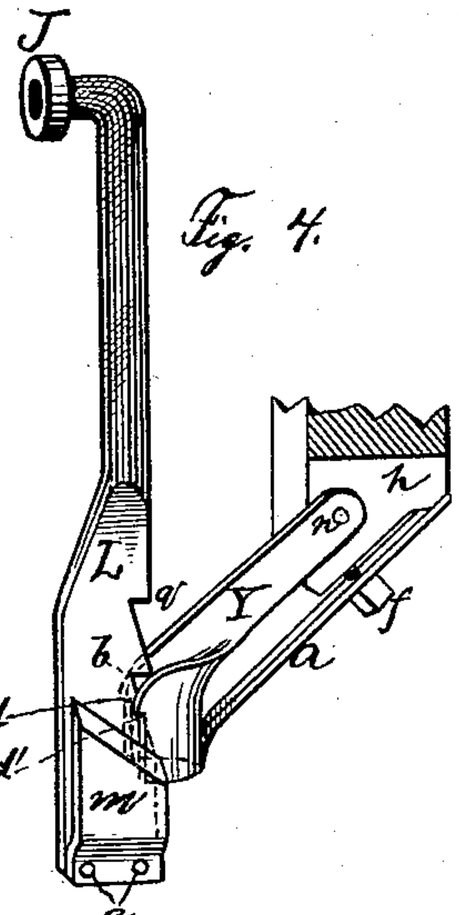
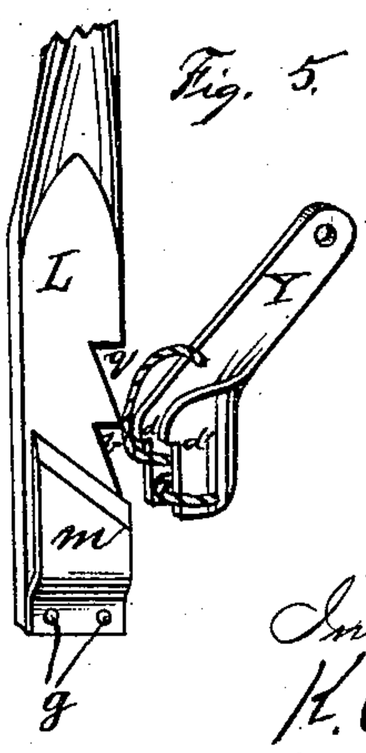


Fig. 5.



Attest:
Thos. Bishop
D. C. Vance

Inventors:
K. C. Kunkle.
A. A. Kunkle.

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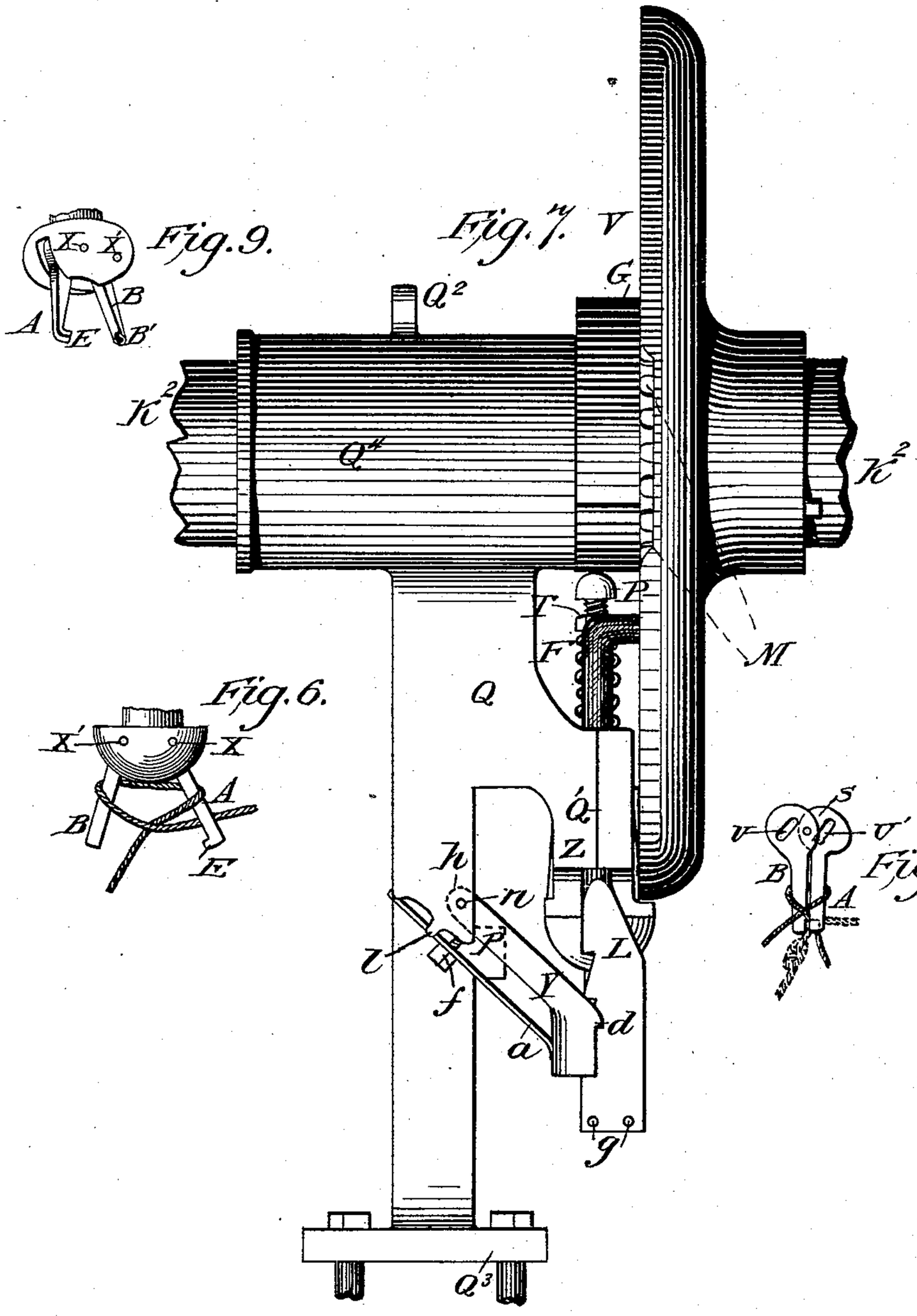

Attest:
Thos. V. Bishop
D. C. Vance

Inventors:
K. C. Kunkle,
A. A. Kunkle.

UNITED STATES PATENT OFFICE.

KENTON C. KUNKLE AND ALLEN A. KUNKLE, OF LEBANON, OHIO; SAID ALLEN A. KUNKLE ASSIGNOR TO SAID KENTON C. KUNKLE.

KNOTTING DEVICE FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 407,734, dated July 23, 1889.

Application filed August 18, 1888. Serial No. 283,159. (No model.)

To all whom it may concern:

Be it known that we, KENTON CLARK KUNKLE and ALLEN ALBRO KUNKLE, citizens of the United States, residing at Lebanon, Warren county, in the State of Ohio, have invented a new and useful Knotting Device for Twine-Binders, of which the following is a specification.

Our invention relates to improvements in knotting devices for twine-binders in which the knotting device is operated by means of a cam and gear wheel; and the objects of our improvements are, first, to simplify the mechanism in knotting devices by providing a knotter having two movable jaws operating and situated in such a manner as to avoid the necessity of any mechanical force except the usual force of the sheaf-ejectors against the sheaf as said sheaf is discharged in forcing the twine off the knotter-jaws during the process of tying the knot, and by providing a reciprocating knife for cutting the twine attached to and carried by a movable jaw, said jaw being a part of twine-holder; second, to provide a more efficient knotter by using the following mechanism: a longitudinal reciprocating knotter-spindle for opening and closing the knotter-jaws independent of the rotary motion of knotter, and having two movable knotter-jaws, which are so constructed as to set the twine free immediately upon the completion of the knot, and having their connection with the knotter-head and knotter-spindle entirely inclosed in the knotter-head, so as to prevent clogging; third, to provide a knotting device with a twine-holder having a holder-shoe constructed and combined as hereinafter described, the functions and advantages of this holder-shoe and of its combinations with other parts of our device being fully hereinafter specified. We attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a face view of the cam and gear-wheel, showing the relation of the knotter, twine-holder, and knife to the same. Fig. 2 is a section through the knotter-head, and shows the relation and connection between the knotter-head, knotter-spindle, and movable knotter-jaws. Fig. 3 is a view showing the knotter-head with its delay-surface, pinion, bearing-surfaces, and slot. Fig. 4 is a view of the twine-holder and knife combined. Fig. 5 is a view showing the position of the twine in the twine-holder. Fig. 6 is a view showing the lower end of the knotter during the process of revolution with the position of the twine during the closing of the movable knotter-jaws. Fig. 7 is a view in elevation of the knotting mechanism, including the cam and gear wheel, the knotter, twine-holder, and stationary frame, looking toward the cam and gear wheel's edge from the right-hand side of Fig. 1. Fig. 8 is a view showing the knotter-jaws detached and closed and the position of the twine around said jaws, and showing in solid lines the loop formed in preparation for the completion of the knot in readiness for the cut strand of the loop to be pulled through the loop and the knot completed. The dotted lines in said Fig. 8 represent the loop after the said cut strand has been pulled through by the hook and the knot finished. Fig. 9 is a view of the lower end of the knotter with the knotter-jaws sufficiently open to show the depression in one of the jaws intended to receive the hook upon the other jaw.

Similar letters refer to similar parts throughout the several views.

The standard Q, securely connected at its upper end to the sleeve Q^4 and at its lower end to the foot Q^3, and having the plate Q′ firmly secured to the side of the standard Q next to the cam and gear wheel, constitutes the entire frame and support of the knotter-head and twine-holder.

Q^2 is the usual projection on the sleeve Q^4, in which is fastened the brace to connect it with the upper and inner end of the breast-plate *k* of the binder, all as usual. The foot Q^3 is also to secure the frame to the lower outer end of the breast-plate, as usual. In said stationary frame is rotatably mounted the knotter and longitudinally mounted the movable cord-holder jaw L in a plane parallel with the face of cam and gear wheel. To the standard Q tension-spring *a* and holder-shoe Y are fastened, the shoe Y being fastened upon a pivot.

The movable knotter-jaws A and B, opened and closed by knotter-spindle H by its longitudinal motion through the knotter-head, are pivoted and hinged in a slot in lower end of knotter-spindle H by the pin S and sepa-

rately pivoted by the pins X and X′ in the slot of the knotter-head, said pins passing through the slots U and U′. Said jaws, when open, stand at different angles to the axis of the spindle H, as shown in Fig. 2, and when closed stand in line with said axis, as shown in Fig. 1. The means whereby we accomplish this feature of our invention is shown in Figs. 2 and 8. In Fig. 8 it will be seen that the slots U and U′ are parallel to each other, or nearly so, when the jaws are closed, and in Fig. 2 that said slots form different angles with the axis of spindle H when open. The slots in jaws A and B thus being parallel when said jaws are closed would necessarily cause A and B to stand at different angles with the axis of knotter-spindle when open, the purpose thereof being to form the proper loop in twine around the jaws, in the manner described farther on. The jaw A has at its loose end a hook E, fitting in a corresponding depression B′ in the loose end of the movable jaw B, (see Fig. 9,) said hook preventing said jaws from tightly pressing the twine, and also said hook holding the twine while the loop is drawn off the said jaws, pulling the twine entirely through said loop, completing the knot.

The knotter-spindle H, to which are pivoted the knotter-jaws A and B, is cylindrical in general shape, having a slot in lower end, in which is the pivotal connection of said jaws. The spindle is again slotted through the portion working in knotter-head. Through said slot W passes pin D, uniting it with knotter-head and aiding said spindle to rotate therewith, said slot permitting the spindle to move longitudinally through the knotter-head. (See Fig. 2.) The spindle is reduced at its upper portion and is provided with a screw-thread, upon which is placed a nut for adjusting the tension of a coil-spring F, surrounding said spindle and bearing at one end against the knotter-head, at the other end against said adjusting-nut, and at the extreme and upper end of the knotter-spindle there is secured a cap-piece P, adapted to bear against the cam-surface G on the cam and gear wheel, which cam causes the longitudinal downward motion of spindle H, the reaction of the tension-spring F causing the returning or upward motion of the spindle, thus opening and closing the knotter-jaws A and B.

The knotter-head, as shown in Fig. 3, has a cylindrical aperture passing longitudinally through it, and through this aperture passes the spindle H. Said knotter-head, being hemispherical in shape at its lower end, is provided with a slot in its lower portion, in which the knotter-jaws are separately pivoted through the agency of said spindle H, the main portion of knotter-head being a pinion Z, which meshes with the gear-section M on the cam and gear wheel, causing one complete revolution of knotter-head, spindle, and jaws combined to form the loop in the twine. This revolution of the knotter-head is accomplished by the aid of the pin D, which passes through the knotter-head and slot W in the spindle, and also with the assistance of the said knotter-jaws fitted in the slot in the lower end of the knotter-head and knotter-spindle combining them, causing the knotter-spindle to rotate with the knotter, so forming the loop in twine, as above stated. Said knotter-head has the bearing-surface R between the hemispherical end of knotter-head and pinion Z and the bearing-surface K at the extreme upper end of said pinion for the purpose of rotatably mounting the knotter-head in a stationary frame by fitting said bearing-surfaces into the corresponding fixed portions of said frame. Upon the pinion Z is the delay-surface C, engaged by a raised rim V on the cam and gear wheel surrounding the cam G, to prevent the revolution of the knotter during the interval of rest.

The twine-holder is composed of a movable jaw L and a holder-shoe Y, provided with the tension-spring *a*. The movable jaw L has a rounded stem at its upper portion and is flattened at the lower portion, on one side of which flattened portion are two notches *q* and *b*, the former for pushing one strand of the twine into the holder-shoe Y and the latter for pushing the other strand out of the shoe. The upper end of the jaw L is bent at a right angle. Upon the bent arm is mounted the anti-friction roller J, which travels within an irregular cam-groove N N, causing the movable jaw to make its reciprocating longitudinal motion between the folds of the holder-shoe. The said movable jaw is longitudinally mounted in one and the same stationary frame with the knotter-head. To the inner flattened side of the jaw L a knife *m* is secured by the rivets *g g*. The use of said knife is to cut the twine in the process of tying the knot. Said knife is constructed so that the line of its cutting-edge forms a bevel-angle with its line of motion, so as to produce a slicing cut, and cuts the twine between the holder and knotter. The holder-shoe Y is a folded plate, within the folds of which the movable jaw L works, carrying and holding the twine therein. Said holder-shoe Y is provided with the notches *d* and *d′*, which are situated in the edge of each side of the fold to prevent the twine from being dislodged as the movable jaw L returns after carrying the twine within said holder-shoe, and is also provided with a projection or arm from its fold to guide the twine within reach of the notch *q* of the movable jaw L and to provide means for securing said shoe to the stationary frame. Said holder-shoe is fixed with the pivot *n* to a projection *h* of the standard Q of the main frame. The tension-spring *a* is fixed by an adjusting-screw *f* to the projection *h*, and bears against the fold of holder-shoe Y and presses the shoe against the jaw L, thereby holding the twine, and to prevent the dis-

lodging of spring *a* from the holder-shoe there is provided a small projection *l* from the projection *h*.

The cam and gear wheel is securely fixed to the shaft K^2, and is carried thereby as usual, said shaft passing through the sleeve Q^4, all as usual.

The knotter and twine-holder are mounted in the stationary frame in the following relative positions: A plane passing parallel with face of cam and gear wheel will pass through the knotter-spindle H and movable jaw L, the axes of said spindle and movable jaw being so inclined to each other that a line passing longitudinally through the axis of the former will intersect a line passing through the axis of the latter at the center of the axis of the cam and gear wheel, and the knotter at its lower end is far enough from the knife to allow the jaw A to pass unobstructed in its revolving motion to form the loop in the twine.

In forming the knot by the above-described mechanism the knotter makes one complete revolution. The knotter-jaws A and B stand open during the latter half of the knotter's interval of rest, and start in said revolution with the twine lying upon and passing over the knotter-jaw A to the twine-holder from a notch at the end of needle-slot in breast-plate *k*, the knotter starting with the knotter-jaws A and B standing sufficiently open in opposite directions and forming different angles with the axis of knotter-spindle H, so that B passes under the twine extending from the knotter to the twine-holder, and A passes over said division of twine. Said jaws close with the twine in the position as shown in Figs. 6, 1, and 8. The twine is cut, as shown in Fig. 1, after the loop is formed around the knotter-jaws and said jaws are closed, and before the twine is discharged off of said jaws A and B, the hook E pulls the cut strands entirely through the loop, completing the knot, as shown by dotted line in Fig. 8.

What we do claim as our invention, and desire to secure by Letters Patent, is—

1. In a knotting device, a twine-knotter having two movable knotter-jaws A and B, having the slots U and U′, respectively, a knotter-head having pins X X′ passed through the slots U U′, respectively, and the longitudinally-movable spindle mounted in the knotter-head having the pin S in its lower end, upon which the jaws are pivoted, as and for the purpose specified.

2. In a twine-knotter, the knotter-head and two knotter-jaws A and B, located in an opening between opposing portions of said head and moving toward and away from one another, the jaw A having pivotal slot U, and jaw B having pivotal slot U′, each jaw being pivoted to said knotter-head by a pivot passing through its respective slot aforementioned, the jaws being free, when actuated by the spindle H, to reciprocate within the limit of their slots, and reciprocating spindle H, pivotally attached to the rear portion of said jaws between slots, the said slots, when the jaws are closed, lying obliquely to the length of the jaws and parallel to one another, thereby causing the jaws, when apart, to stand at different angles to the axis of the knotter-spindle, substantially as and for the purposes specified.

3. In a twine-knotter, a rotating knotter-head having a longitudinally-movable knotter-spindle mounted therein and connected thereto to rotate upon the same axis by a pin D passing through a slot U in said spindle, knotter-jaws located in a slot in the lower end of the spindle and in the knotter-head and pivotally connected to said spindle and knotter-head, respectively, a tension-spring surrounding the spindle and interposed between the upper end of the knotter-head and an adjusting-nut on the upper portion of said spindle, a cap-piece P, mounted upon the extreme upper end of the spindle to be engaged by a cam-surface on the knotter-operating wheel to reciprocate the spindle in the knotter-head and to open and close the knotter-jaws, and means for rotating said knotter-head, substantially as described.

4. The combination, in a twine-holding device, of the movable jaw L, having the notches *q* and *b* and provided with an anti-friction roller J, the holder-shoe Y, having the notches *d* and *d′* and pivoted to a stationary frame, and spring *a*, bearing against the holder-shoe, and the knotter-operating wheel having cam-groove N N, within which the roller J travels, substantially as and for the purpose specified.

5. The combination of a wheel provided with cam-groove N N, the spring *a*, shoe Y, movable jaw L, having the notches *q* and *b*, and having the anti-friction roller J, traveling in the cam-groove N N, with the knife *m*, secured to and carried by said movable jaw, as and for the purpose specified.

6. The combination, in a twine-holding device for knotting mechanism, of a movable jaw having the notches *q* and *b*, the knife carried thereby and secured thereto, and the holder-shoe Y, having the notches *d* and *d′*, as and for the purpose specified.

K. C. KUNKLE.
A. A. KUNKLE.

Witnesses:
F. M. FARIES,
E. P. GREEN.