2 Sheets—Sheet 1.

M. A. KELLER.

Knotting Apparatus for Grain-Binders.

No. 221,921. **Patented Nov. 25, 1879.**

Fig. 1.

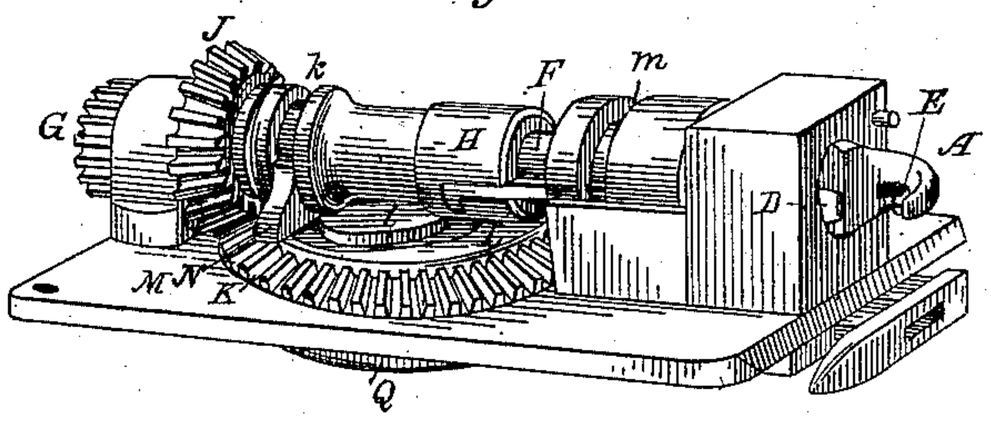


Fig. 2.

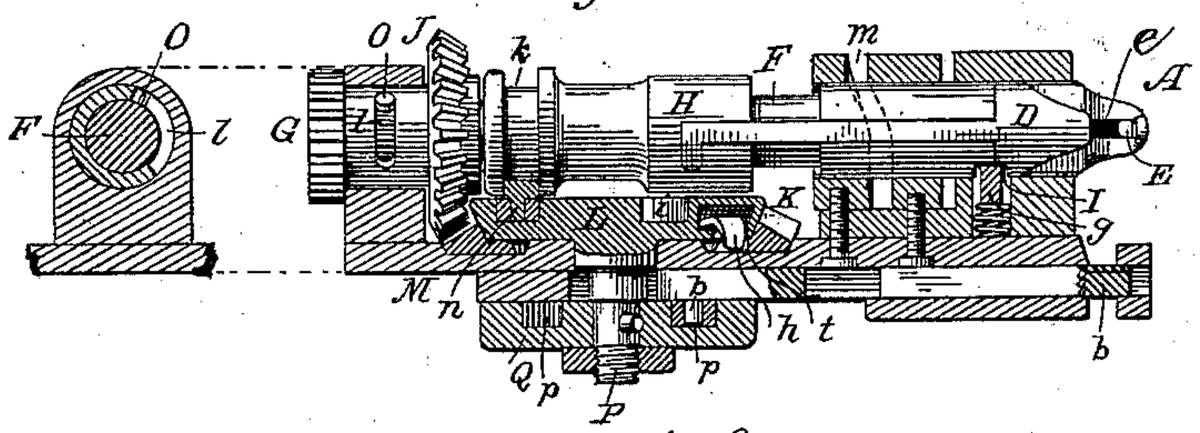


Fig. 3.

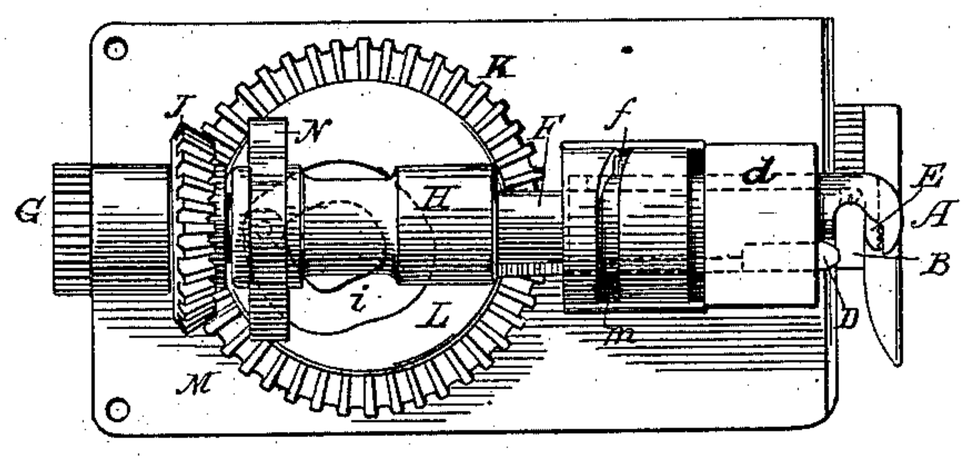
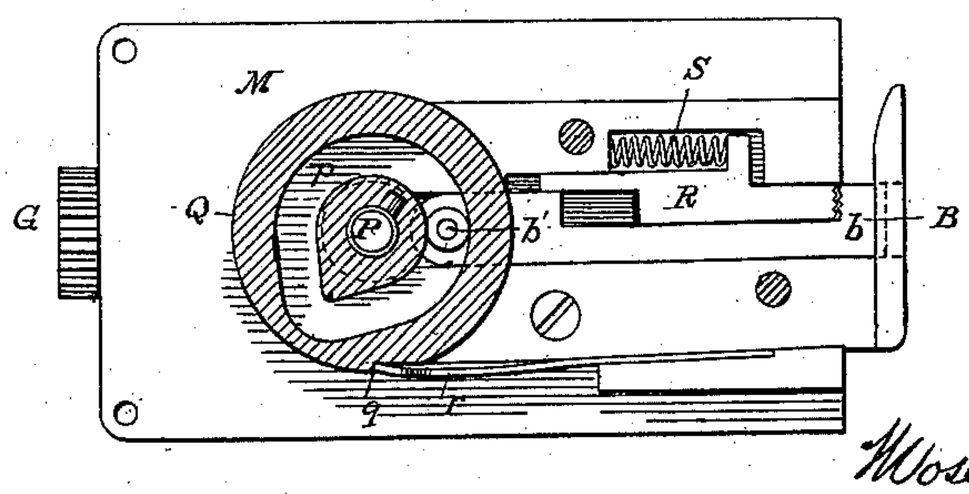


Fig. 4.



Attest:

Clarence Poole
L. H. Marshall

Inventor:

Moses A. Keller
By his atty
P. D. O. Smith

2 Sheets—Sheet 2.

M. A. KELLER.

Knotting Apparatus for Grain-Binders.

No. 221,921. **Patented Nov. 25, 1879.**

Fig. 5.

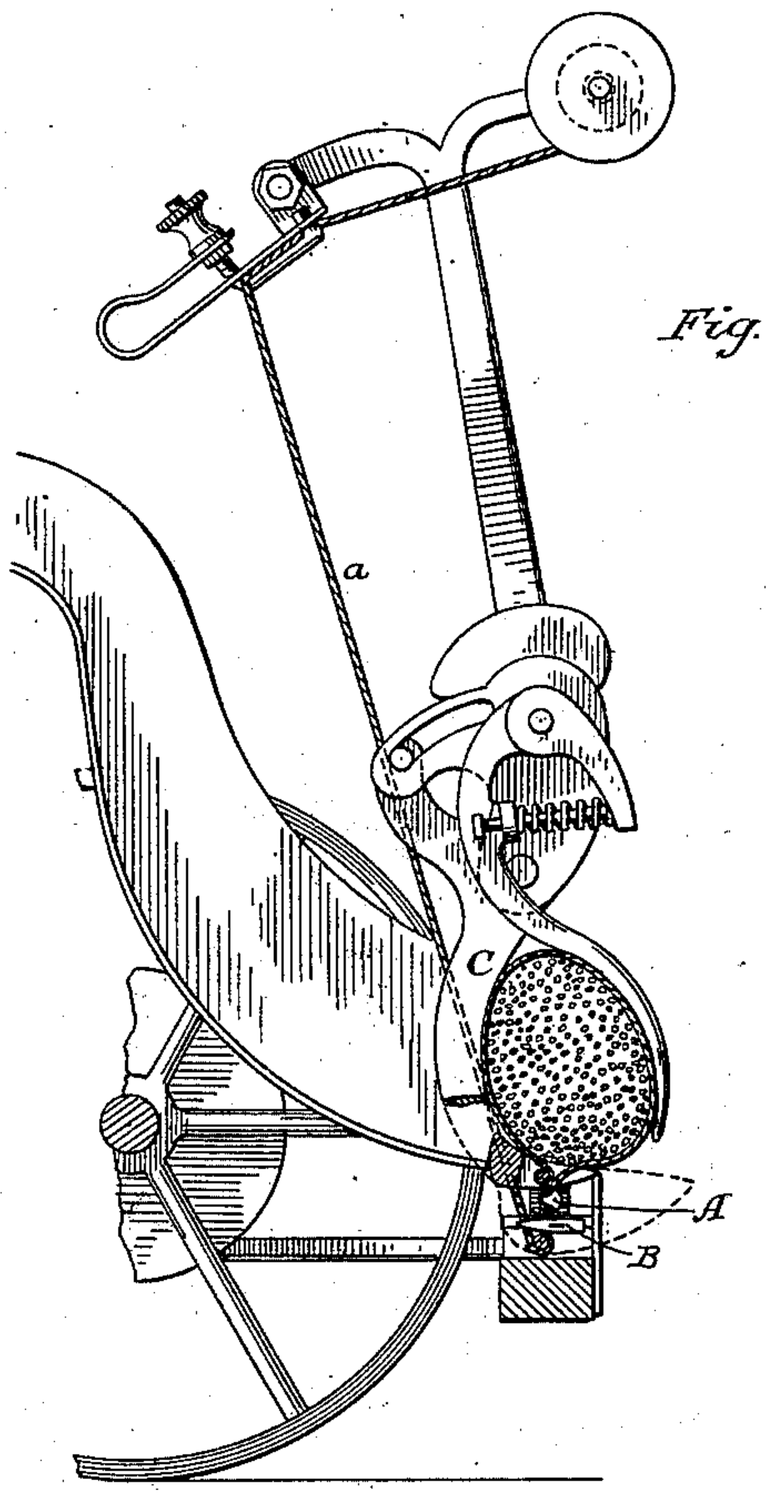


Fig. 6.

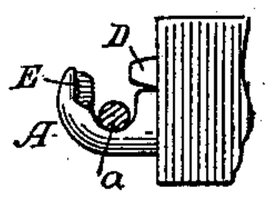


Fig. 7.

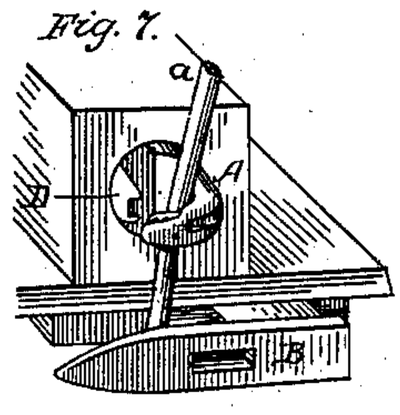


Fig. 8.

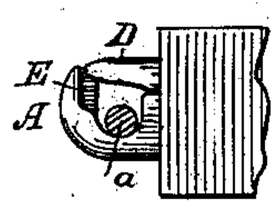


Fig. 9.

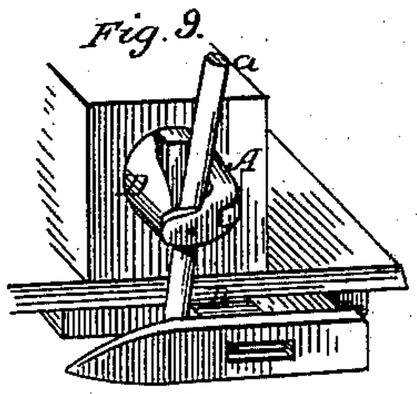


Fig. 10.

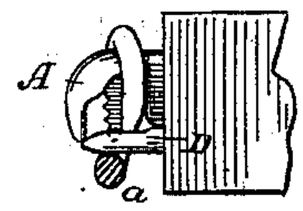


Fig. 11.

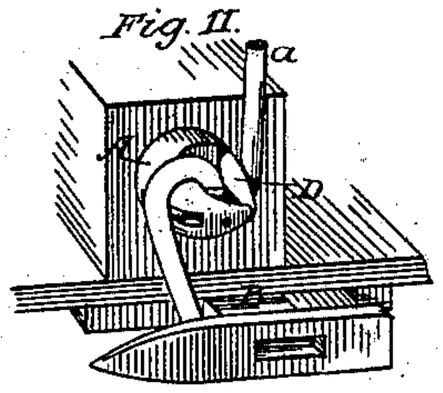


Fig. 12.

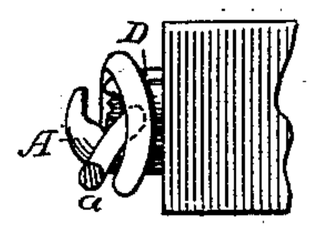


Fig. 13.

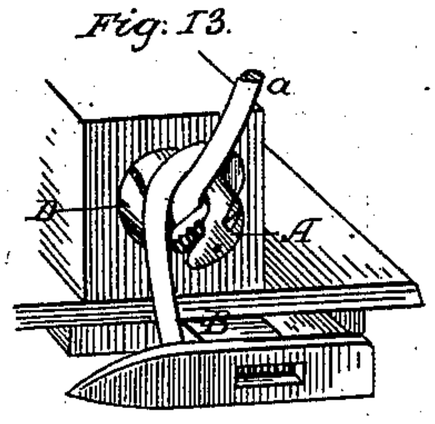


Fig. 14.

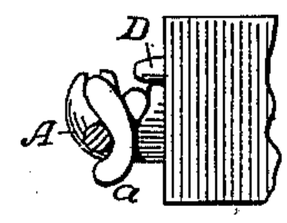


Fig. 15.

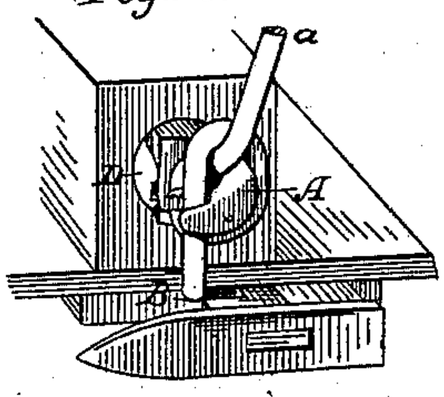


Fig. 16.

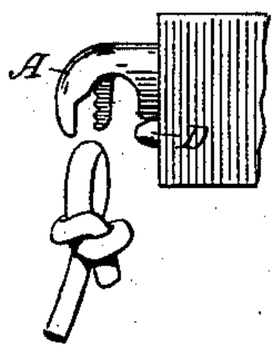


Fig. 17.

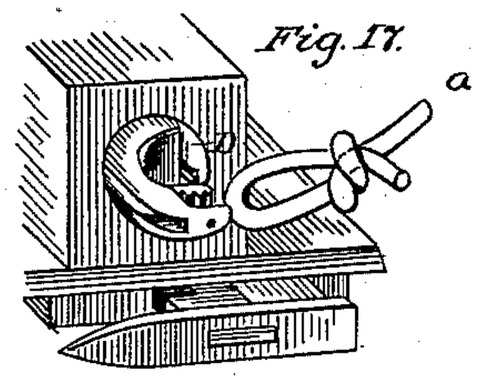
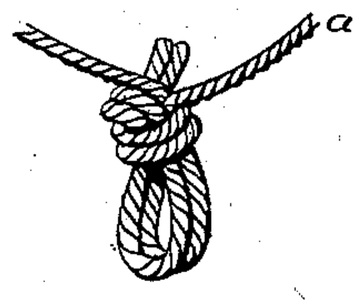


Fig. 18.



Attest:

Clarence Poole
L. H. Marshall

Inventor:

Moses A Keller
By his attys
R. D. Smith

UNITED STATES PATENT OFFICE.

MOSES A. KELLER, OF BROCKPORT, NEW YORK.

IMPROVEMENT IN KNOTTING APPARATUS FOR GRAIN-BINDERS.

Specification forming part of Letters Patent No. **221,921**, dated November 25, 1879; application filed April 4, 1879.

To all whom it may concern:

Be it known that I, MOSES AARON KELLER, of the town of Brockport, in the county of Monroe, in the State of New York, have invented new and useful Improvements in Knotting Apparatus for Grain-Binders, of which the following is a full and exact description.

The knot produced by this apparatus is of that kind known as the "bow-knot," and in operation this device seizes the loop of the cord positively to produce the knot, so that there cannot be any failure thereof by reason of inequalities in the size of the cord, accidental slipping, &c.

That others may fully understand the structure and operation of my device, I will more particularly describe it, having reference to the accompanying figures.

Figure 1 is a perspective view of my device in operative condition. Fig. 2 is a longitudinal section of the same. Fig. 3 is a plan of the same. Fig. 4 is a bottom plan, showing the operation of the griper and cutter. Figs. 5 to 16 represent, in elevation and perspective, the successive positions of the knotting device during the process of producing the knot. Fig. 17 represents the knot actually produced by this device.

The mechanism for conveying the cord around the bundle and presenting it properly to the knotting device may be of any approved description. In this patent it is not proposed to include any of the devices for carrying the grain, conveying the cord around the bundle, or discharging the bundle, but only such devices as pertain to the operation of knotting the cord, folding, and severing it.

In Figs. 5 to 16 one cord only is represented, as it is possible thereby to represent the operation of forming the knot more conveniently and with less confusion than if the two parts of the cord which are actually used were represented in the drawings, the actual knot being represented in Fig. 17.

Before detailing the various mechanisms which are employed to give effect to the operative devices which form the knot, the general operation for constructing the knot will be described.

A is a rotary knotting-hook. Its initial position is shown in the perspective, Fig. 6. The end of the cord *a* being held by the griper B expands therefrom upward and rests in the bend of the hook A, and from thence extends to the spool. The cord-carrying arm C at the proper moment seizes the cord *a* and conveys it around the bundle in the hook A and in contact with the griper B, so that the grain is inclosed within a loop of the binding-cord, two parts of which come together at the hook and griper. At this point the operation of the knotting device commences. The two parts of the cord (represented by the single cord *a* in Fig. 5) occupy the bend of the hook at the moment when the movement of the acting mechanism of the hook commences. The first movement of said mechanism thrusts forward the finger D, so as to inclose within the bend of the hook the cord *a*. This position is shown in Figs. 7 and 8. When so inclosed the rotation of the hook A commences, and its second position is represented in Figs. 9 and 10, wherein the reciprocating jaw E has been drawn back toward the bend of the hook. The fourth position is represented in Figs. 11 and 12, when one revolution of the hook has been completed, carrying the binding-cord around the neck of the hook. The reciprocating finger D has been withdrawn from the point of the hook and rests over the end of the jaw E, so that that part of the cord which rests above the finger D is permitted to slip within the point of the hook, between it and the jaw E. The further revolution of the hook (shown in Figs. 13 and 14) causes the jaw E again to advance so as to positively seize that part of the cord which is between it and the point of the hook, holding the same firmly, while the loop of the cord which surrounds the neck of the hook is caused to slip off by the operation of the mechanism and assume a position shown in Figs. 15 and 16, wherein the knot is represented as complete and ready to be finally discharged from the knotting mechanism, which is effected by the recession of the jaw E, as represented in Fig. 16.

The griper B is a sliding bar having a notch or L-shaped end, *b*, faced with a blade of hardened steel, so as to form at one edge a cutter which severs the cord at the proper moment by shearing against a similar cutter attached to the frame of the apparatus. Below the cutting-

blade the griper is somewhat enlarged and has a roughened surface, and acts in connection with a movable counter having a similar surface, the end of the cord being firmly griped between the griper and counter at the moment the cord is being severed. The movement of the griper B takes place about the time represented in the fifth position, Figs. 13 and 14, when it is advanced, as shown in Fig. 14, so as to release the end of the cord to receive the cord between the twister and head of the binding-arm C, so that when said griper is retracted again the cord will be severed and the bundle liberated, and the new end firmly held as before. These, in general terms, are the various movements which effect the knotting of the cord. The mechansim whereby said movements are produced will now be described.

The hook A is placed at the end of a shaft, F^2, to which is imparted a vibrating rotary movement—that is, it is caused to rotate for a time in one direction, and then rotate for an equal time in the opposite direction, so as to bring it back to the point of starting. The forward rotation spoken of produces the knot, and the return rotation brings the hook back into position to receive the cord for another knot. The vibratory rotation may be produced by any convenient mechanism, but such mechanism does not form any part of the invention included in this patent; therefore it is neither shown nor described. Means of application, however, is shown in the pinion G, which is attached at the rear end of the shaft F. I do not, however, propose to limit myself to this means of connecting said shaft with its prime mover.

A slot, *e*, is made through the back of the hook A to receive the jaw E, and along the back of the shaft connecting with said slot there is a groove, within which the shank d^2 of the jaw E is placed, and in which it may move backward and forward. Near the end of said shank there is a small stud, *f*, projecting outward radially to engage with a suitable cam, whereby the shank and the jaw E are moved at suitable times. Upon the opposite side of the shaft F there is a similar groove for the shank of the jaw D, the end of which extends into an L-shaped notch in the slot or sleeve H, whereby said jaw D may be moved backward and forward at the proper times, as heretofore stated.

Upon the side of the shaft F there is also a transverse notch, I, in which the latch *g* engages at the proper time, and offers a slight resistance to prevent said shaft from revolving and retain it in its initial position, as shown in Figs. 5 and 6, during its period of rest.

Near the rear end of the shaft there is a beveled pinion, J, which takes its revolution from the pinion G, and is used to actuate the cams which determine the movements of the jaw D and the griper and cutter B. In gear with said pinion J is a gear-ring, K, and within said ring is a cam-wheel, L, having upon its face a cam-groove, *i*, the outline of which is shown in the drawings. Said cam-wheel is mounted upon a shaft, P, which passes downward through the frame-plate M of the apparatus, and engages with said gear-ring K by means of a spring-latch, *h*, and notch *t*, whereby the revolution of the ring K in one direction causes a corresponding revolution of the cam L; but its revolution in the opposite direction leaves said cam at rest.

Above the cam L there is a traveler, N, the upper edge of which is concave, and fitted to the clutch-groove *k* on a sleeve, H, and the bottom of said traveler is provided with the stud *n*, which rests in the groove I, and is moved back and forth longitudinally when the cam L is rotated.

The stud *n* may be provided with the ordinary friction-roller, as represented.

The revolution of the pinion J and the gear-ring K thereof causes the sleeve H to traverse back and forth on the shaft F at times, determined by the curvature of the cam-groove *i*, and thereby causes corresponding advances and retreats, with intervals of rest, of the jaw D, as above set forth.

As heretofore described, the first and second positions include merely a change of position of the jaw D, as shown in Figs. 5 and 8. That movement of the jaw D prior to the commencement of the revolution of the shaft F is produced by means of a slot in the pinion J, or, as shown in the drawings, of the sleeve connected with pinion J and the pinion G, and a pin which is inserted in shaft F and placed within said slot *l*, whereby the first movement of the pinions G and F would be a free rotation upon the shaft F throughout the limit of the slot *l*, because the said shaft will not be actuated until the pin O traverses from one end of said slot to the other; but this rotary movement prior to the revolution of the shaft F will be communicated through the gear-ring K to the cam L, and is just sufficient to thrust the jaw D forward from its position in Fig. 5 to its position in Fig. 7.

The stud *f* engages with a cam-groove, *m*, which is made in the stationary block permanently attached to the frame M, so that the jaw E is caused to move only during the revolution of shaft F. As above stated, the shaft P passes through the frame-plate M, and on the lower side thereof has mounted upon said shaft a cam-wheel, Q, having upon its inner face a heart cam-groove, *p*, the larger portion whereof is concentric to the axis of the wheel Q. The shank of the griper B moves in guides on the under side of the frame M, and at its rear end has a stud, *b'*, which rests in the cam-groove *p*, and may be provided with the ordinary friction-roller. The griper and cutter B is reciprocated at the proper times by the revolution of said cam. On the outer edge of the cam-wheel Q there is a notch, *q*, which engages with the end of the spring-latch *r*, and

said cam-wheel Q is thereby prevented from backward rotation. The griper and cutter B act in connection with and in position to a counter, R, as heretofore stated, the counter R being placed within guides on the under side of the frame M, as shown in Fig. 4, and made elastic or yielding to accommodate the griper to cords of different diameters by means of a spring, S, which constantly presses said counter forward into engagement with the griper; but, as stated, it is enabled to yield slightly to accommodate the varying diameters of cords.

A rotation of the shaft F may vary from one and a half to one and three-quarters turns and back again to the point of starting.

Having described my invention, what I claim as new is—

1. In a knotting-hook having a vibratory rotation, a movable jaw within the bend of the hook to separate the parts of the cord wound upon the hook at different times to gripe one of said parts and hold it positively, as described, combined with a movable cut-off, which is advanced to the point of the hook and retained there until, in the revolution of the device, the movable jaw has been retracted to receive the standing end of the cord and form the loop.

2. A knotting-hook, A, having a vibratory rotation, as described, and the reciprocating jaw E within the bend of said hook, combined with a shank, *d*, provided with stud *f* and a fixed cam, M, whereby said jaw is caused to operate.

3. A knotting-hook, A, having a vibratory rotation, as described, a reciprocating finger or jaw, D, the shank whereof moves in a longitudinal groove in said shaft and rotating therewith, combined with a sliding sleeve, H, whereby jaw D is caused to reciprocate at the proper time.

4. A knotting-hook, A, having a vibratory rotation, as set forth, provided with a slot, *e*, and the jaw E, reciprocating in said slot, combined with a stationary cam to actuate said jaw, and a reciprocating cut-off finger or jaw, D, and a sliding sleeve, H, whereby said finger is actuated.

5. The shaft F, having at its forward end the knotting-hook A and the reciprocating cut-off jaw D, and a sliding sleeve, H, which is provided with a groove, *k*, combined with a traveler, N, and a wheel, L, which has a cam-groove, *i*, for the purpose of actuating said traveler and sleeve, as set forth.

6. The knotting-hook A, having an intermittent vibratory rotation, as set forth, and a cut-off, D, rotating with said hook and reciprocated by the sliding sleeve H, traveler N, and cam-wheel L, provided with a spring-latch, *h*, combined with a gear-ring, K, having a notch, *t*, whereby the revolution of the said ring in one direction will rotate said hook and reciprocate said cam and cut-off, and in the other direction will leave said cam and traveler at rest.

7. The shaft F, having at its front end the knotting-hook A, the reciprocating jaw D, the sliding sleeve H, the traveler N, cam-wheel L, and gear-ring K, constituting a train to move said jaw D, combined with the driving-pinion J, mounted upon said shaft, and connected thereto by means of the slot *l* and pin O, whereby, at the commencement of motion in either direction, said pinion has a free movement upon said shaft, determined by the length of said slot, for the purpose of imparting an initial movement to said jaw D, as set forth.

8. The shaft F, having the vibratory rotation and periods of rest, as set forth, provided with a notch, I, and combined with an elastic latch, *g*, to offer slight resistance to the rotation of said shaft and hold it in proper position during its period of rest.

MOSES A. KELLER.

Witnesses:
R. D. O. SMITH,
C. CLARENCE POOLE.