2 Sheets—Sheet 1.

C. L. TRAVIS.

Knot-Tying Device for Grain-Binders.

No. 219,187. **Patented Sept. 2, 1879**

Fig. 1.

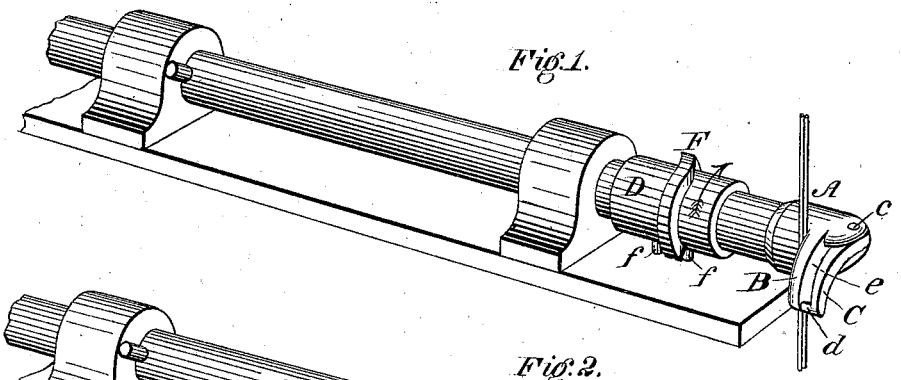


Fig. 2.

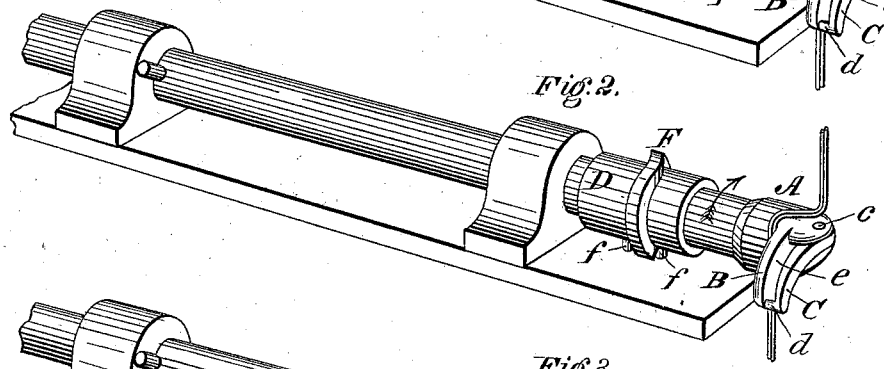


Fig. 3.

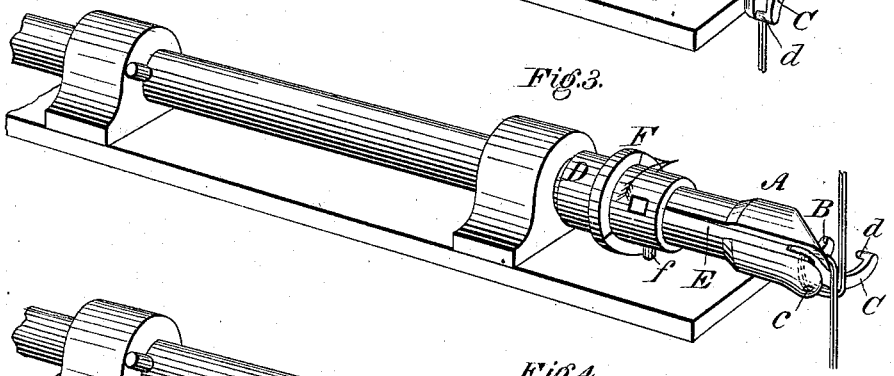
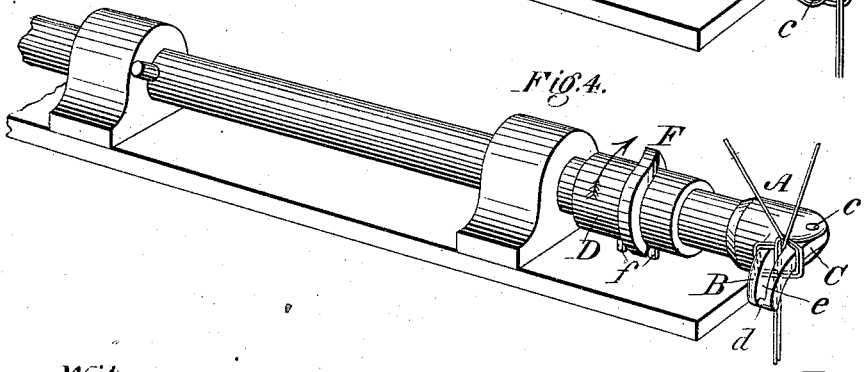


Fig. 4.



Witnesses:

Dom. P. Twitchell.
William M. Dodge

Inventor:

C. L. Travis
By his attys
Dodge & Son

C. L. TRAVIS.

Knot-Tying Device for Grain-Binders.

No. 219,187. Patented Sept. 2, 1879.

Fig. 5.

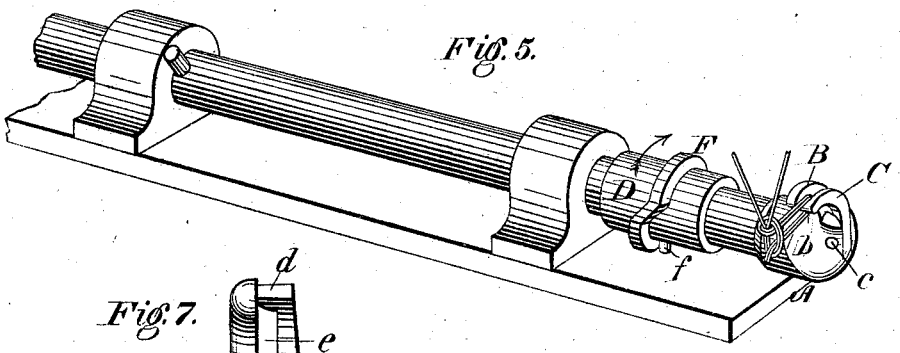


Fig. 7.

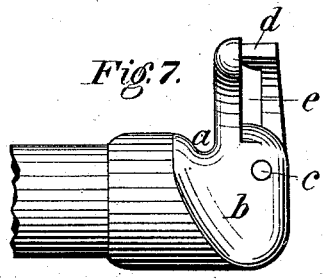
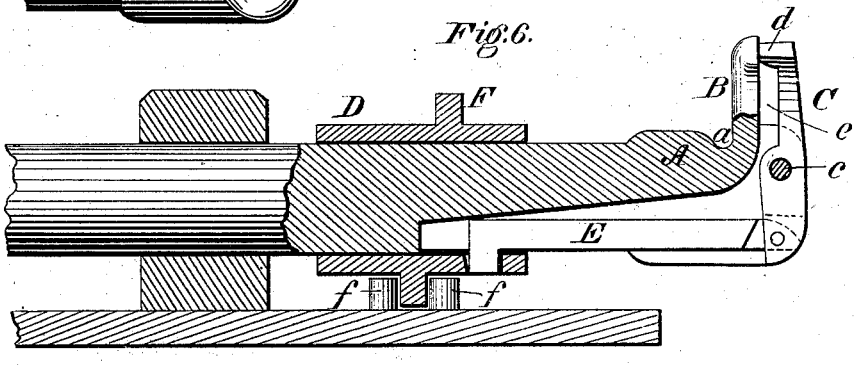


Fig. 6.



Witnesses:

Donn J. Twitchell.

William N. Dodge.

Inventor:

C. L. Travis

By his attys.

Dodgerson

UNITED STATES PATENT OFFICE.

CHARLES L. TRAVIS, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO MINNEAPOLIS PAPER GRAIN BINDER COMPANY.

IMPROVEMENT IN KNOT-TYING DEVICES FOR GRAIN-BINDERS.

Specification forming part of Letters Patent No. **219,187**, dated September 2, 1879; application filed December 27, 1878.

To all whom it may concern:

Be it known that I, CHARLES L. TRAVIS, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain Improvements in Knot-Tying Devices, of which the following is a specification.

Various attempts have hitherto been made to produce practical cord-tying devices, and in the course of such attempts rotary heads, arms, and clamping-jaws have been made in a great variety of forms; but all were found to possess some imperfection, some being too complicated, others uncertain in their action, and all of them incapable of tying a knot tightly close to the bundle of grain, so as to prevent the expansion of the latter when the devices released the cord.

In practice, it is necessary that the band shall be applied tightly and under considerable tension to the grain, and that a loosening of the band to the extent of one or two inches will frequently result in the escape of the grain.

The main object of my invention is therefore to produce a device which, while being simple and positive in action, will fasten the knot tightly against the grain.

To this end the invention consists in a rotary head provided with a rigid arm and a positively-acting laterally-movable arm, there being a space between the arms to admit of the cord slipping down freely to the point, and a lip on the end of the movable arm to draw the ends of the cord through the loop in completing the knot.

Figures 1 to 5 are perspective views, illustrating my device and the cord thereon during the different steps or stages in the formation of the knot; Fig. 6, a longitudinal central section of the device; Fig. 7, a plan view of the same.

A represents a rotary head, having at or near its outer end a rigid outwardly or radially extending arm, B, which is curved backward in the plane of its rotation, and rounded on the inner side in order that it may be encircled by the shortest possible length of cord. At the junction of the head and arm the former is recessed or cut inward, as shown at *a*, Figs. 6 and 7, which is for the purpose of permitting the cord to draw inward as nearly as possible to the axis of the head, so as to reduce to the smallest possible limit the amount or length of cord wound upon the head by its rotation. From the recess or depression *a* the head is beveled or rounded off toward its outer end and toward the heel of arm B, as shown at *b*, in order to facilitate the passage of the loop which is formed around the head and arm onto the latter.

C represents a second arm or jaw, arranged outside of and corresponding in form to arm B, and secured at its inner end by a transverse pivot, *c*, within a groove or mortise in the end of the head, in the manner shown, so that it may be closed up parallel with the arm B, or swung outward therefrom, as shown in Fig. 3.

At its extreme end the arm C is provided on its inner side with a lip or stud, *d*, to bear against the arm B, and the two arms are so constructed that when closed together so that the lip bears against arm B a space, *e*, exists between them sufficiently wide to admit of the cord playing freely between them.

On the spindle or shaft of the rotary head A there is mounted a sliding collar, D, connected by the pivoted rod E to the rear end of the arm or jaw C, for the purpose of causing the same to open and close. The sliding motion of the collar, which rotates with the shaft, is secured by providing it with an irregular flange or cam, F, the edge of which passes between two fixed studs, *f*, as represented.

In arranging the device for use suitable devices will, of course, be provided for presenting, guiding, and holding the cord; and as the cord requires to be carried transversely across the path of the arms, the entire device shown will be arranged to move endwise at the proper time, or the cord-guide arranged to move transversely in relation to the path of the arms.

The operation of the device is as follows: The head A receiving a continuous rotary motion in the direction indicated by the arrows, the arm C opens outward from arm B when they are in an upright position, and so remains until they have completed about half a revolution and extend downward, when the arm C closes, and remains closed against arm

B until they again reach the upright position. The two ends of the cord or band are first extended downward past the head A, against the inner or rear side of the rigid arm, and then, by moving the tying device to the left or bending the cord to the right, it is carried across the two arms, as shown in Fig. 2, so that the first rotation of the head and arms causes the cord to slide over the end of the head and form a loop encircling the arms, as shown. When this loop is formed the arm C opens, and, as the rotation continues, the lower ends of the cord below the head enter between the two arms, which close upon them, as represented in Fig. 4, the ends extending across the middle of the loop, which still encircles the arms.

As the rotation of the parts continues and the second revolution is completed, the arms draw out of the loop, which slides off over their ends, the ends of the cord being meanwhile retained by the arms and drawn through the loop, as shown in Fig. 5, thereby completing the knot. The arms retain their hold upon the cord until the knot is drawn, or close when they open and release the cord. The device may be arranged to leave a bow-knot, as shown, or to pull the ends completely through the loop, as preferred.

The curvature of the arms in the manner shown is advantageous, in that it permits the loop to escape more easily, and in that it admits of the arms being used in contact with or in close proximity to the grain without danger of becoming entangled therewith.

The arms may be used to good advantage in actual contact with the grain, in which case the grain will facilitate the passage of the loop from the arms. The construction of the arms so as to leave the space between them when closed, and the arrangement of the retaining finger or lip at the extreme ends of the arms, are of the greatest importance, since they admit of the knot being tied close to the grain and of the loop being drawn down to a very small size before being released, so that the cord is not permitted to slacken to an appreciable extent as the loop tightens. Of course, the arm C may swing outward to any desired extent, and may be actuated by mechanism other than that shown.

I am aware that tying devices having two lateral rotary clamping and knotting arms have been made in various forms; that their arms or fingers, when made without retaining-lips at the ends, have been curved backward; and that arms which depended upon the action of the loop to hold them in a closed position have been provided with retaining-lips near the outer ends; and therefore I lay no claim to either of said features separately considered.

It will be noticed that my devices combine the several features of the backwardly-curved arms, the retaining-lip at the extreme end of the arms, the open space between the arms, and the positively-acting devices to control the arms in all of their movements. This combination secures the formation of the loop by a positive action, causes the cord to be retained and the knot to be drawn tight by the action of the arms, and secures the automatic delivery of the loop from the arms without the aid of the usual clearing or stripping devices employed in this class of tyers. The backward curvature of the arms when they are provided with the retaining-lip at the end and the beveling of the outer side of the head at the base or inner end of the arms are of great importance, since they cause the loop to work down upon the arms and outward to their ends automatically, and in such manner that the loop is reduced to an extremely small size and crowded upward toward the bundle, so that the usual difficulty consequent upon the formation of a large loop and the slackening of the band in taking the same up is avoided.

The hinging of the outer arm or jaw to the head, instead of arranging it to slide outward, as usual, is advantageous, in that it permits the free end to be thrown outward a great distance by a slight movement of the actuating devices, and in that the inclination of the arm, when open, causes the cord to ride more readily and smoothly to its place at the center.

Having thus described my invention, what I claim is—

1. The knotting device consisting of the rotary head provided with the two lateral arms, said arms being curved backward in the path of rotation, and provided at the extreme end with the cord-retaining lip, as shown, whereby the loop is caused to pass automatically from the arms and the cord drawn through the lip with a positive action at the same time.

2. The combination of the head A, rigid arm B, pivoted arm C, bar E, and collar D, with cam F, and cam-bearings *f*.

CHAS. L. TRAVIS.

Witnesses:
P. T. DODGE,
DONN I. TWITCHELL.