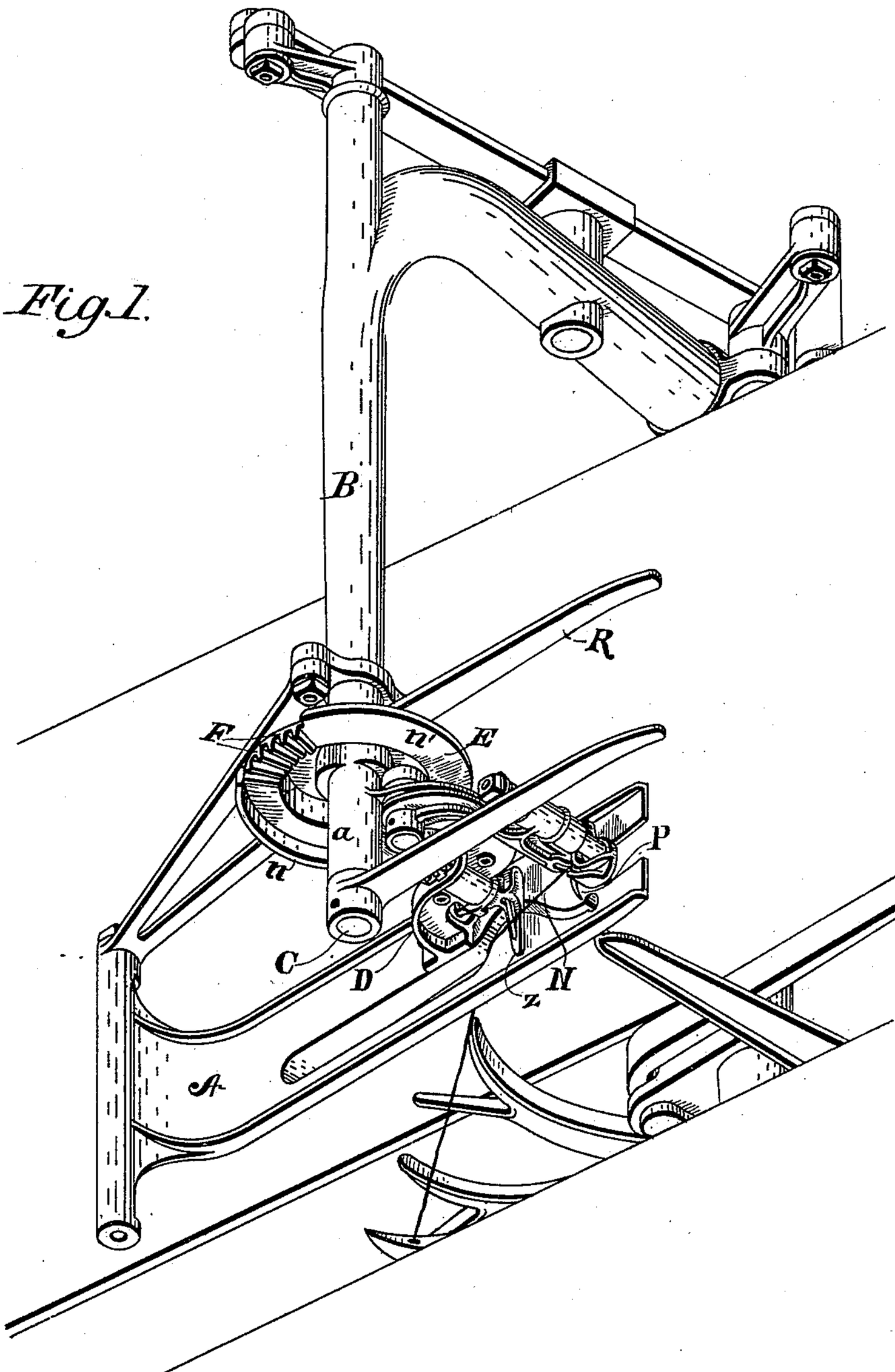
(No Model.) 5 Sheets—Sheet 1.

B. F. STEWART.

GRAIN BINDER.

No. 464,531. Patented Dec. 8, 1891.

Fig. 1.



WITNESSES:

Harry Frease.

Chas. R. Miller

Benjamin F. Stewart INVENTOR

BY

W. Kenicon

ATTORNEY

(No Model.) 5 Sheets—Sheet 2.

B. F. STEWART.

GRAIN BINDER.

No. 464,531. Patented Dec. 8, 1891.

Fig. 2.

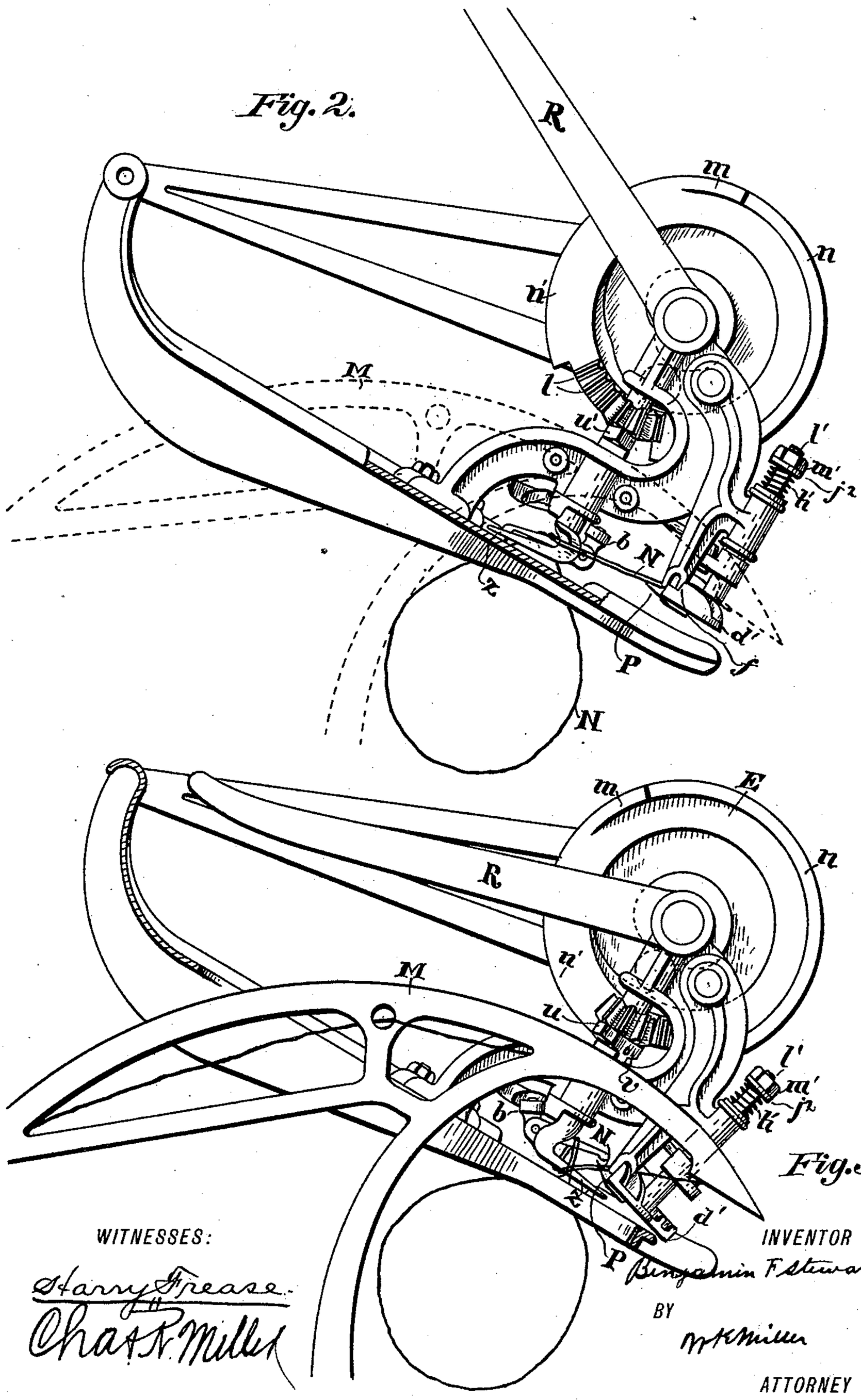


Fig. 3.

WITNESSES:

Harry Grease.

Chas. R. Miller

INVENTOR

Benjamin F. Stewart

BY

W. H. Miller

ATTORNEY

(No Model.) 5 Sheets—Sheet 3.

B. F. STEWART.

GRAIN BINDER.

No. 464,531. Patented Dec. 8, 1891.

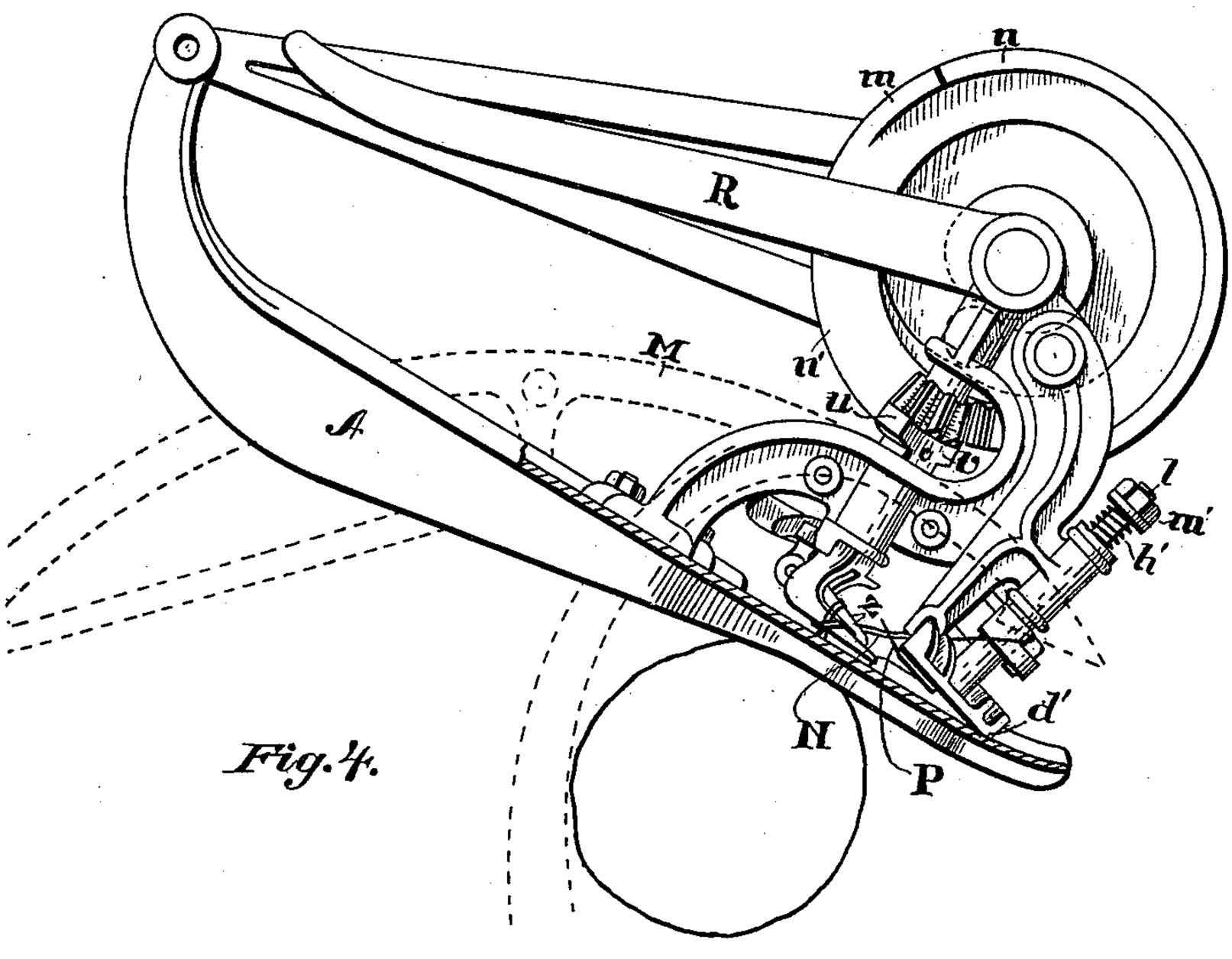


Fig. 4.

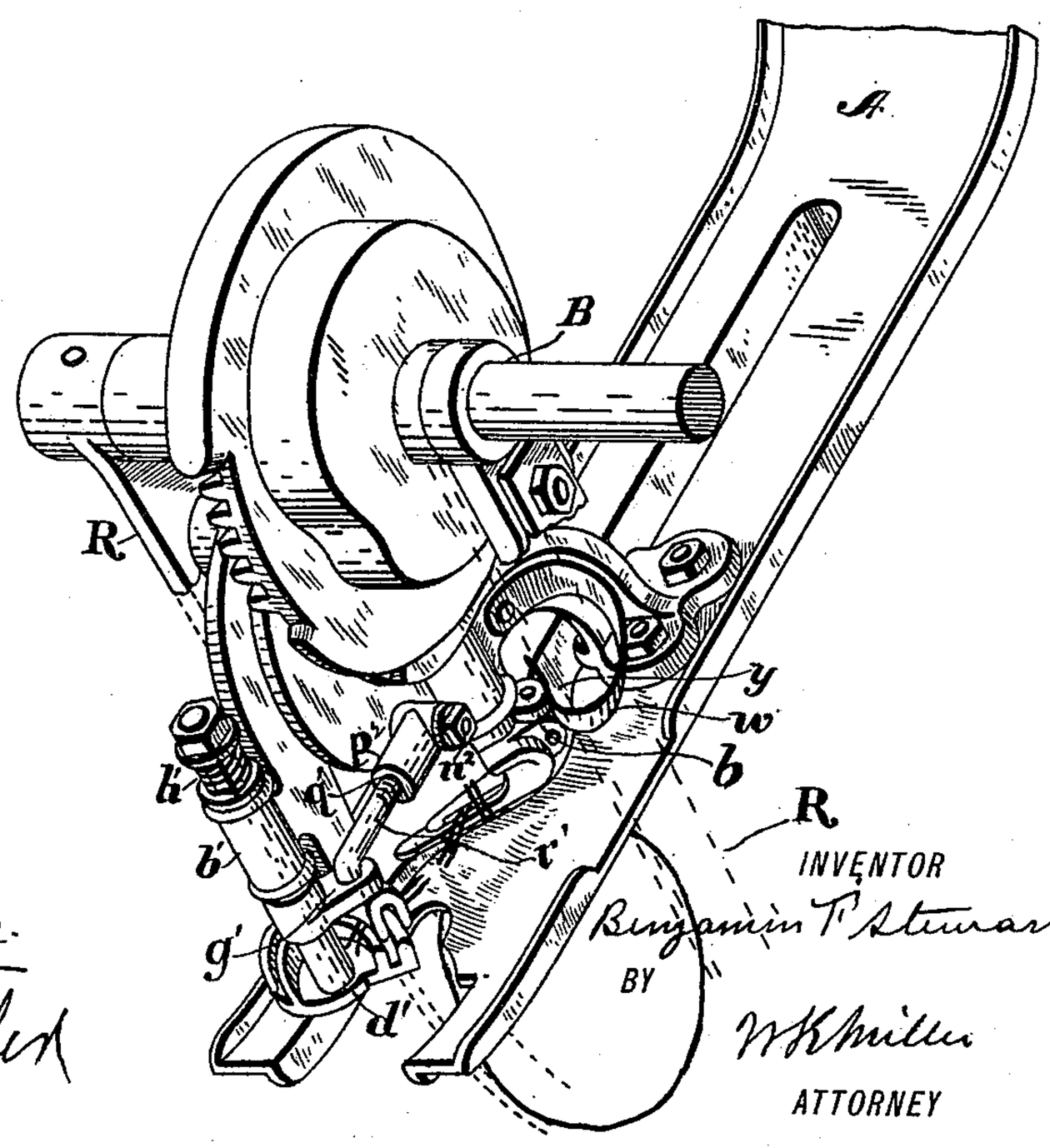


Fig. 5.

WITNESSES:

Harry Grease.

Chas. R. Miller

INVENTOR

Benjamin F. Stewart

BY

W. K. Miller

ATTORNEY

(No Model.) 5 Sheets—Sheet 4.

B. F. STEWART.

GRAIN BINDER.

No. 464,531. Patented Dec. 8, 1891.

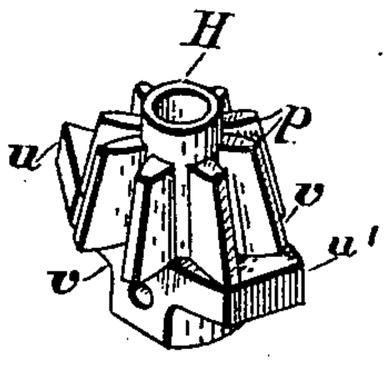


Fig. 9.

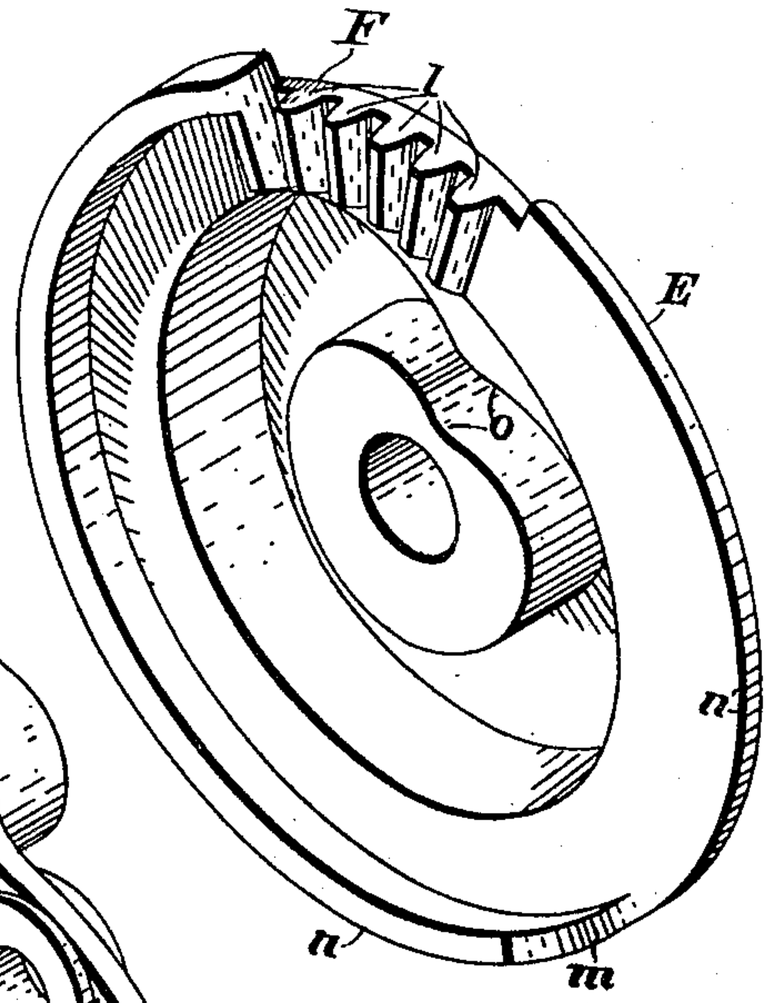


Fig. 7.

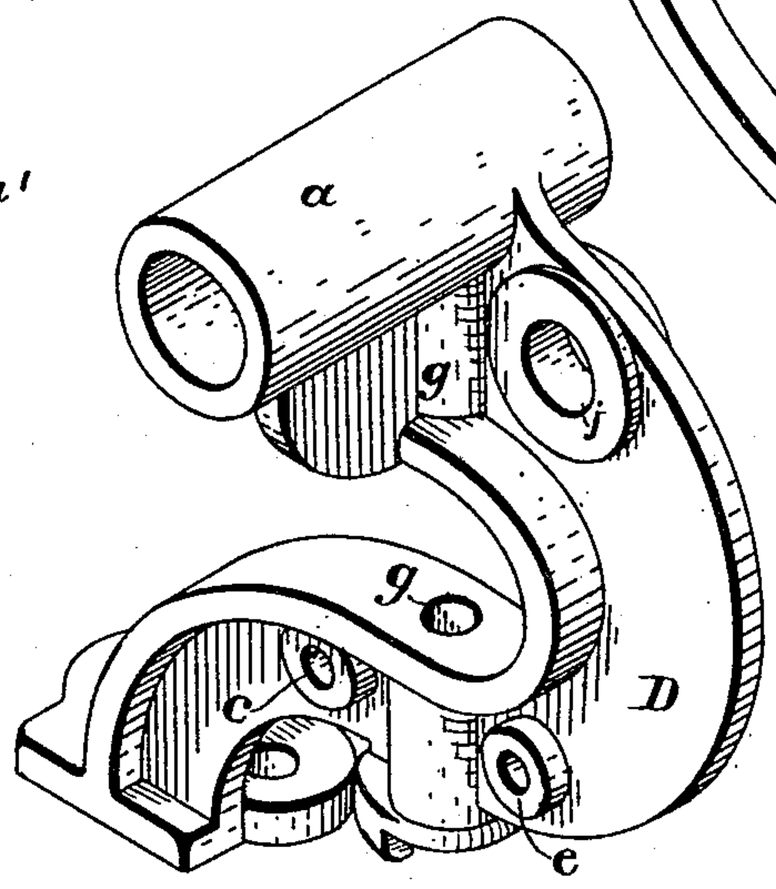


Fig. 6.

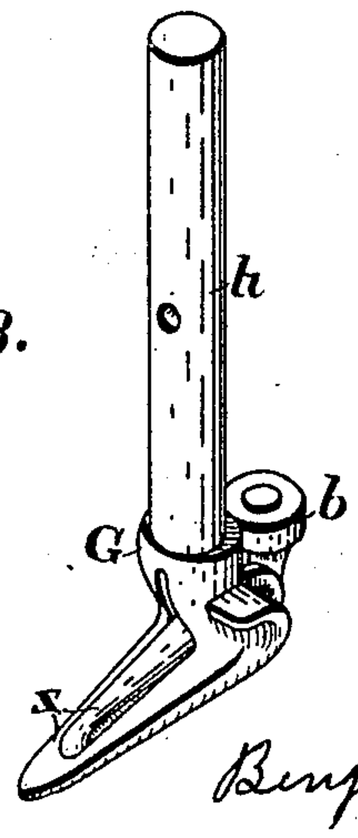


Fig. 8.

WITNESSES:

Harry Grease

Chas. R. Miller

INVENTOR

Benjamin F. Stewart

BY

W. K. Miller

ATTORNEY

(No Model.) 5 Sheets—Sheet 5.

B. F. STEWART.

GRAIN BINDER.

No. 464,531. Patented Dec. 8, 1891.

Fig. 15

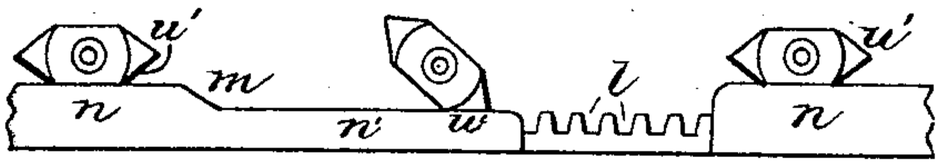


Fig. 13.

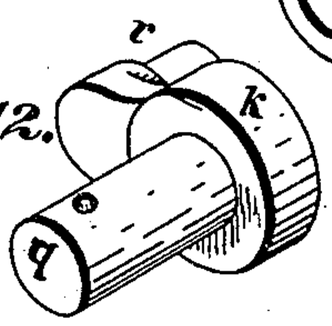


Fig. 12.

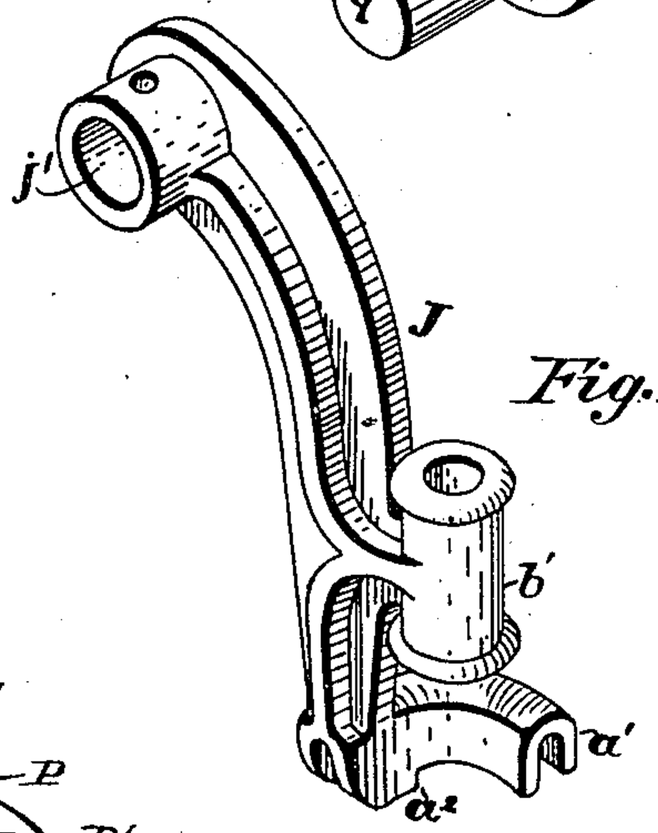
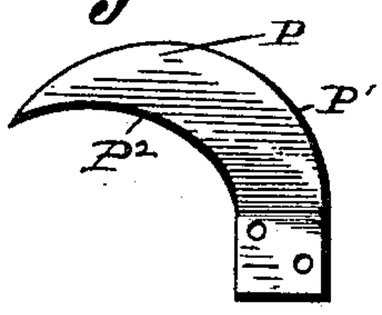


Fig. 10.

Fig. 14.



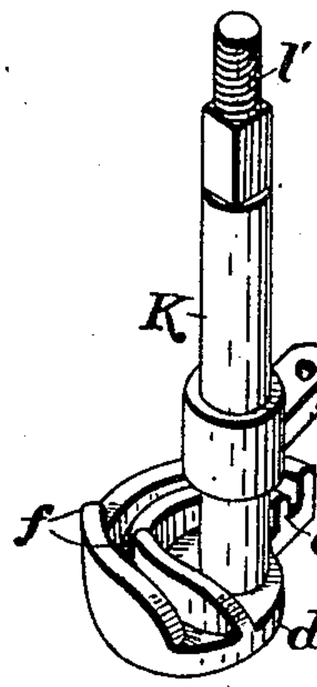


Fig. 11.

WITNESSES:

Harry Grease

Chas. R. Miller

INVENTOR

Benjamin F. Stewart

BY

W. K. Miller

ATTORNEY

UNITED STATES PATENT OFFICE.

BENJAMIN F. STEWART, OF CANTON, OHIO.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 464,531, dated December 8, 1891.

Application filed May 5, 1888. Serial No. 272,878. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. STEWART, a citizen of the United States, and a resident of Canton, county of Stark, State of Ohio, have invented a new and useful Improvement in Grain-Binders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to improvements in grain-binders, and more especially to the cord-tying devices.

With these ends in view my invention consists of the detail and combination of parts, as hereinafter described, and set forth in the claims.

Figure 1 is a perspective view showing the parts at rest in normal position. Fig. 2 is an end elevation from the left, showing the position of parts, the knotter-head having made one-eighth of its revolution. Fig. 3 is same view, showing the knotter having made six-eighths of its revolution, the tying-bills open to grasp the cord, the cord-holding disk having been drawn in to give cord for the knot. Fig. 4 is same view, showing the knotter having made seven-eighths of its revolution, the tying-bills having grasped the cord, and the knife about to sever the cord. Fig. 5 is a perspective view of same parts from the opposite side, showing the knotter having made seven-eighths of its revolution, and showing the cord severed and about to be stripped from the tying-bills to complete the knot, the cord-holding disk having been moved to its outer position by the cam-wheel, at which instant, by means of the cam-wheel, the revolution of the knotter-head is completed, bringing the parts in position, as shown in Fig. 1. Fig. 6 is a perspective view of the supporting-frame. Fig. 7 is a view of cam-wheel by which the knotter-head is rotated and the cord-holder vibrated. Fig. 8 is a view of the knotter and shaft. Fig. 9 is a view of the knotter-pinion, showing cogs and delay-shoes. Fig. 10 is a view of swinging supporting-arm for cord-holder, shoe, and disk; Fig. 11, a view of cord-holder disk; Fig. 12, a view of cranked pin by which the cord-holder arm is pivotally secured to the supporting-frame for engagement with the cam-wheel. Fig. 13 is same view of an anti-friction roller to be placed on the crank-pin shown in Fig. 12 for the purpose of reducing friction in the groove of the cam-wheel; and Fig. 14 is a detached view of the knife, hereinafter referred to. Fig. 15 is a profile of the cam-wheel and shoe, the rim of the wheel being projected in a plane to more clearly show the position of the shoe as it engages the delay-surfaces n' and n.

Similar letters of reference indicate corresponding parts in all of the figures of the drawings.

A represents the breast-plate, the upper end of which is supported in the usual way; B, the binder-shaft support, and C the binder-shaft. The thimble portion a of the knotter-supporting frame D is passed over the end of the shaft C and is supported thereby. The lower end is secured to the plate A. The said frame is provided with a perforation c, by which the spring w for operating the knotter-jaw is secured, and a similar perforation e, to which the arm r' for operating the cord-holder disk is secured, a journal-box g for the knotter-shaft h, and a journal-box j for the cranked pin k. (Shown in Fig. 12.) The cam-wheel E, secured to the binder-shaft C, is provided with a segment F, having six cogs or teeth, as l, an inclined face m, delay-surfaces n and n', and a cam o. The shaft h of the knotter G is supported by and rotated in the journal-box g. On said shaft is secured pinion H, said pinion having eight cogs or teeth, as p, that engage the cogs l on the cam-wheel E. The jaws z of the knotter-head are similar to those now in use and will need no further description. The swinging arm J is pivotally secured to the supporting-frame D by the cranked pin k, the pin portion q passing through the perforation j in the frame D and into the opening j' in the arm J and secured by a pin or key. The crank portion r, either with or without the roller s, is projected into and engaged by the cam o in the cam-wheel E, the rotary movement of which will vibrate the crank r, by which the pin q will be rocked in its bearings j and the arm J, secured thereto, vibrated to carry the cord-holder to and from the knotter-head. The segment F on cam-wheel E having six teeth and the engaging-pinion H having eight teeth, it is evident that there are not teeth enough to cause one full revolution of the pinion H and knotter-head.

The segment F, engaging the pinion H, the jaws *z*, standing on a line with the binder-shaft or thereabouts, as shown in Fig. 1, will revolve the head to a point shown in Fig. 4, or about seven-eighths of one revolution, at which point it will stop an instant, the delay-shoe *u'* on the pinion resting on the delay-surface *n'* on the face of the cam-wheel E, the roller *b* on the pivoted jaw resting in a slight depression *y* in the spring *w* until the knot has been completed and discharged, at which instant the incline *m* will engage the delay-shoe *u'* on the pinion H, by which the revolution will be completed, the delay-shoe *v* of the pinion resting on the delay-surface *n* of the cam-wheel, as shown in Fig. 1. It will be noticed that the form of the spring *w* is adapted not only to close the jaws about the cord, but to temporarily secure the head in position, as shown in Figs. 4 and 5, as hereinbefore stated, the roller *b* resting in the depression *y* of the spring, its rotary movement resisted by the delay-shoe *u'* of the pinion on the delay-surface *n'* on the cam-wheel in one direction and the grade and energy of the spring *w* in the other.

At the lower end of the swinging arm J there is provided a curved cord-holding shoe *a'*, U-shaped in cross-section, having shoulders a^2, by which the cord is held in the shoe during the reverse movement of the disk *d'*, by which the cord is driven into the shoe, and near the lower end of said arm is provided a journal-box *b'* for the cord-holder shaft K, on the lower end of which there is provided a rotary disk *d'*, having circular upwardly-projected ribs *e e*, with vertical shoulders *f*. From the said shaft K there is projected an arm *g'*, which will be hereinafter explained. The said shaft is placed in the journal-box *b'*, and about its upper end is placed a coil-spring *h'*, resting on the top of journal-box *b'* about the shaft K, and resting on the spring is placed a washer j^2. On the upper end of the shaft is provided a threaded portion *l'*, about which there is fitted a threaded adjusting-nut *m'*, by which the ribs *e* are adjusted in the shoe *a'*. The energy of the spring *h'* being exerted upwardly against the nut *m'* draws the ribs *e* into the shoe, and by turning the nut on or off of the shaft K the degree of tension on the cord in the cord-holder may be regulated.

A cord-severing knife P is secured to the disk *d'*, by which the cord is severed on the reverse movement of the disk. The knife P is preferably of curved or sickle form, as represented in Figs. 1 and 14, and projects from the disk *d'*, to the bottom of which it is secured, as shown in Figs. 2, 3, and 4, obliquely upward toward the knotter-head and at the same time outwardly, its outward extension being clearly shown in Fig. 1, and its oblique upper extension toward the knotter-head being clearly shown in Figs. 2, 3, and 4. Thus as the disk *d'*, with the knife attached thereto, rocks to carry the cord into the holder the knife will slide beneath the cord, the cord slipping along the back P' of the knife toward its point, as shown in Fig. 2; but when the disk is reversed the point of the knife will slide over the cord and draw the same across its inner or cutting edge P^2, as shown in Figs. 3 and 4, thereby severing the cord.

In the perforation *e* of the supporting-frame D there is placed a pin n^2, on which is placed a journal-box having a side projection p^2, in the outer end of which there is provided a threaded perforation *q'*. The arm *r'*, having a threaded end, is turned into the said threaded perforation, and a bent end into a perforation in the arm *g'*, projected from the cord-holder shaft K. The arm *r'* holding the arm *q'* at a fixed distance from the pin n^2, when the arm J is vibrated by the cam-wheel E the shaft K will be rocked in its bearing, by which the cord-holding disk will be carried into and out of the shoe. The rotary reciprocating movement of the disk may be adjusted as to the distance the cord-disk *d'* shall be turned into the shoe by adjusting the arm *r'*, which may be lengthened or shortened by turning the arm into the threaded perforation *q'*. By these same devices the sweep of the cord-cutter may also be adjusted. In this construction simplicity, durability, ease of management, and reduction of initial cost I think will be apparent.

The operation is as follows: The needle or binder arm M having carried the cord N over and onto the disk *d'*, the cord is secured in the holder as shown in Figs. 1 and 2, the cord being tucked in the groove in the bottom of the holder *a'* by the ribs *e* on the disk *d'* and the arm having dropped back below the grain-deck, the cord resting on the knotter-jaws. After the sheaf has been gathered the binder-arm is brought up, placing the cord about the sheaf and into the cord-holder a second time, the shoulders *f* of the disk carrying the cord into the shoe to a point inside of the shoulders a^2 on the shoe, at which instant the knotter-head has made one-eighth of its revolution, as shown in Fig. 2. As the movement progresses to a point shown in Fig. 3, or six-eighths of its revolution, the swinging arm J having moved in toward the knotter to supply cord to form the knot, the binder-arm recedes, as shown in Figs. 3 and 4. At this instant the knotter-head has made seven-eighths of its revolution, and the jaws closed on the cord. At this point the rotary movement of the knotter is arrested for a period of time. The reverse movement of the cord disk will carry the edge of the knife P against the cord and sever it, as shown in Fig. 5, at which instant the discharge-arm R will discharge the sheaf and complete the knot, and at which instant the cam *m* will have engaged the delay-shoe *v'* on pinion H and completed the revolution of the knotter-head G, the delay-shoe *v* resting on the delay-sur-

face *n*, the parts in normal position, as shown in Fig. 1.

Having thus fully described the nature and object of my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a knotter having outwardly-projecting jaws, and means for intermittently rotating said knotter, of a cord-holder support having a swinging movement toward and away from the knotter, a cord-holder consisting of an oscillating disk and a fixed shoe mounted on the support, a link connecting the knotter-frame with the oscillating disk, and means for swinging the cord-holder support and thereby oscillating the said disk, substantially as set forth.

2. The combination, with a knotter and its frame, and means for actuating the knotter, of a cord-holder support pivotally secured to the knotter-frame, a cord-holder consisting of an oscillating disk and a fixed shoe, an adjustable link connecting the knotter-frame with the oscillating disk of the cord-holder, and means for swinging the cord-holder support and thereby oscillating the disk, substantially as set forth.

3. The combination, with the knotter and its frame, and means for rotating the knotter, of a cord-holder support pivotally secured to the knotter-frame, a cord-holder consisting of an oscillating disk and a fixed shoe, a link connecting the knotter-frame with the oscillating disk of the cord-holder, and a crank on the cord-holder support in engagement with a cam on the knotter-actuating mechanism, substantially as set forth.

4. The combination, with a rotary knotter and its frame, of a swinging cord-holder support J, and a cord-holding shoe provided with a groove, a journal-support *b'* on the cord-holder support J, a shaft K, loosely secured therein, a cord tucking and holding disk *d'*, secured to the shaft K, an arm G' projecting therefrom, and a link connecting the arm G' with the knotter-frame, and means for swinging the support, whereby the cord-holding disk is oscillated as the support J is vibrated, substantially as set forth.

5. The combination, with the knotter, and means for intermittently rotating the same, of an oscillating cord-holder disk mounted on a vibrating support, and a connecting-link between the knotter-frame and the oscillating cord-holder disk to actuate the cord-holder, substantially as set forth.

6. The combination, with a shoe *a'*, having cord-retaining shoulders a^2 thereon, of a reciprocating cord-holding disk *d'*, having tucking-shoulders *f* thereon, a coil-spring *h'* to draw the cord-holding disk into engagement with the shoe, and a securing device *m'*, substantially as set forth.

In testimony whereof I have hereunto set my hand this 17th day of April, A. D. 1888.

BENJAMIN F. STEWART.

Witnesses:

W. K. MILLER,

CHAS. R. MILLER.