(No Model.) 2 Sheets—Sheet 1.

H. J. CASE.

GRAIN BINDING MACHINE.

No. 417,811. Patented Dec. 24, 1889.

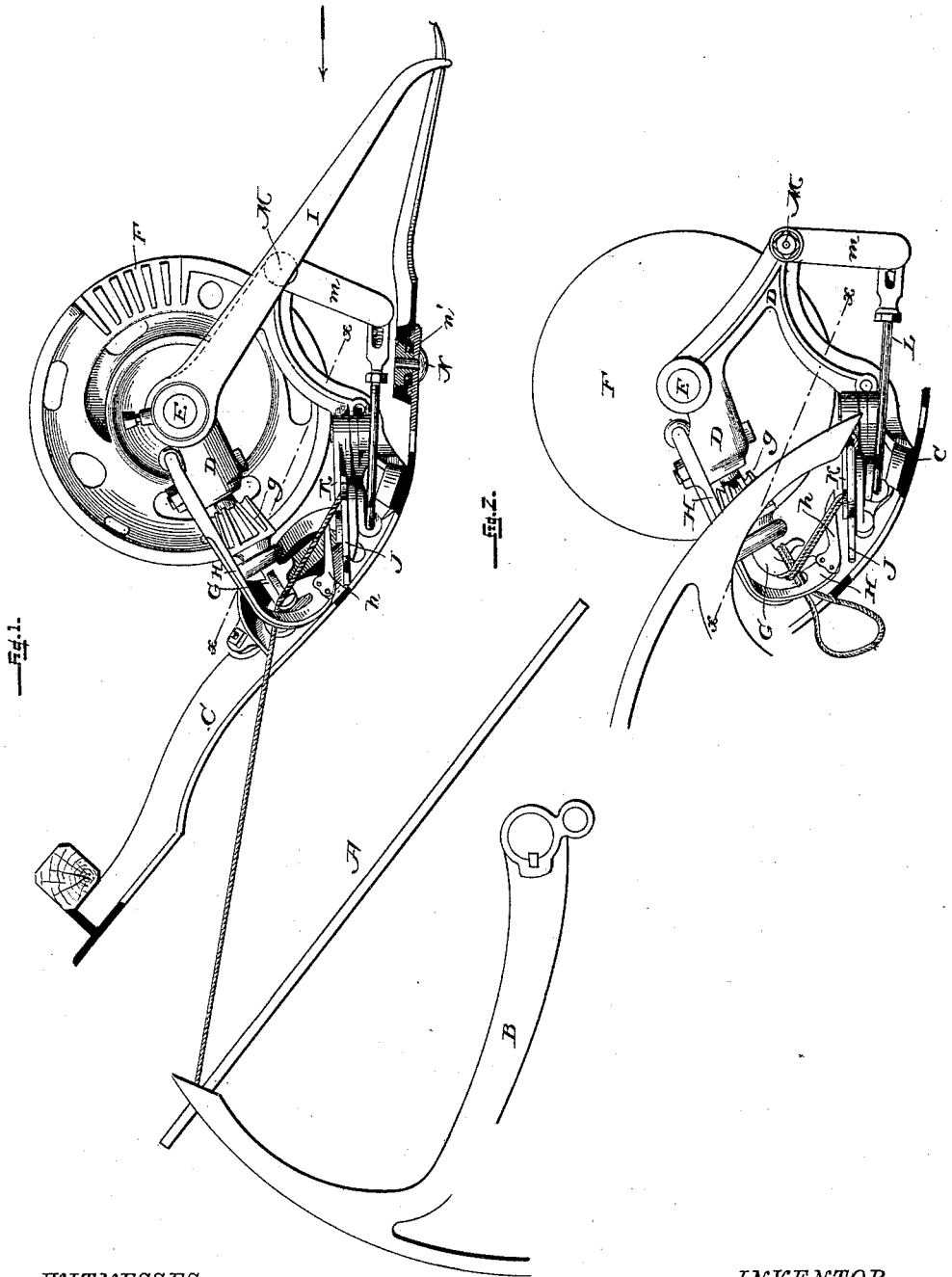

Fig. 1.

Fig. 2.

WITNESSES

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Fig. 3.

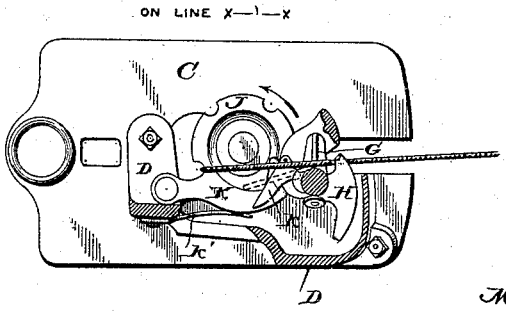


Fig. 4.

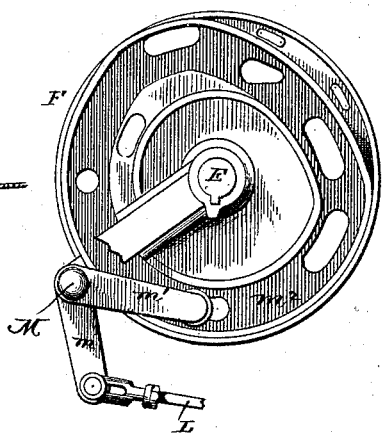


Fig. 5.

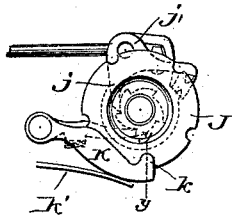


Fig. 6.

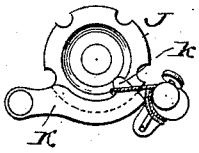


Fig. 9.

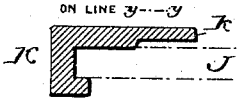


Fig. 7.

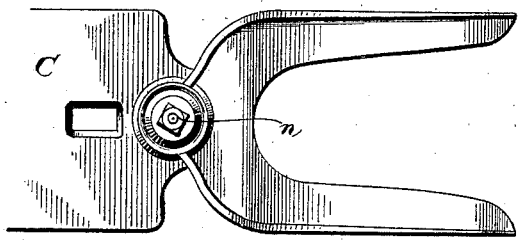
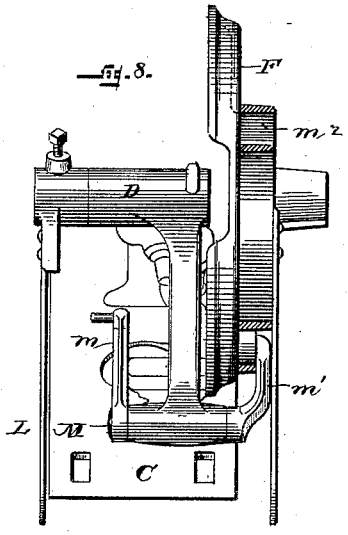


Fig. 8.



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UNITED STATES PATENT OFFICE.

HENRY J. CASE, OF AUBURN, NEW YORK, ASSIGNOR OF ONE-HALF TO THE D. M. OSBORNE & COMPANY, OF NEW YORK.

GRAIN-BINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 417,811, dated December 24, 1889.

Application filed June 16, 1888. Serial No. 277,286. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. CASE, of Auburn, in the county of Cayuga and State of New York, have invented certain Improvements in Grain-Binding Machines, of which the following is a specification.

This invention has reference to that class of machines in which a rotary knotting-bill of the Behel-Appleby type is combined with a clamp to hold first the extreme end of the cord and thereafter the two ends of the applied band.

In this class of machines as commonly constructed it is found advisable to yield or slacken the cord toward the tyer during the formation of the knot in order to relieve the same from excessive strain; and to this end various contrivances—such as swinging or yielding cord-holders and cord-holders which revolve during the formation of the knot—have been devised.

The aim of my invention is to provide for this slackening of the cord to the tyer, and also for the presentation of the cord to the tyer in an advantageous position by means more simple than those hitherto employed; and to this end it consists, essentially, in combining with the tyer a rotary cord-holding disk of ordinary form mounted on a stationary support and a co-operating clamp, the parts being arranged in peculiar relation to the tyer, as hereinafter described, and the disk adapted to rotate during the formation of the knot in such manner as to turn under the strain of the cord and to yield the latter to the knotter, and also in various details appertaining thereto, all as hereinafter more fully explained.

As my devices may be used in connection with machines which are in other respects of ordinary construction, I have deemed it sufficient to illustrate in the drawings those parts which are immediately related to my improvement.

In the accompanying drawings, Figure 1 is an elevation of the tying mechanism, looking against the end of the knotter-driving shaft, the breast-plate being shown in section and the needle or binder arm in side elevation, the various parts being represented in the positions they occupy before the band is laid around the gavel. Fig. 2 is a similar view illustrating the parts in the positions in which they stand after the knot is partially formed. Fig. 3 is a section on the line $x\,x$ of Figs. 1 and 2, looking downward on the tying and clamping devices beneath. Fig. 4 is a rear elevation of the cam mechanism for turning the cord-clamping disk. Fig. 5 is a top plan view of the disk, the co-operating clamp, and the operating devices. Fig. 6 is a plan view showing the relation of the cord to the clamp and tyer toward the completion of the knot. Fig. 7 is a top plan view of the lower or delivery end of the breast-plate. Fig. 8 is an end view looking in the direction of the arrow in Fig. 1, showing the cam mechanism for turning the cord-clamping disk, the tyer and its connections being omitted to avoid confusion; Fig. 9, a cross-section on line $y\,y$, Fig. 5.

In its general construction and organization the tying mechanism herein represented resembles somewhat that of the ordinary Appleby binders at present in general use.

A represents the binder deck or table on which the grain is received; B, the vibratory cord carrying or binding needle, which is mounted on a rock-shaft below the table; C, the stationary breast-plate overlying the table and grain-passage to act on top of the gavel; D, a rigid standard bolted to the breast-plate to sustain the tying mechanism; E, the knotter-driving shaft mounted at one end in this standard; F, the knotter-driving gear mounted on said shaft; G, the rotary tying-bill; H, the vibratory cord-guiding and knife-carrying arm, and I the bundle-ejecting arm fixed on the shaft E.

The foregoing parts are of substantially the same construction as those now in general use, the tyer being made of ordinary form and provided with a stop-motion pinion g, through which it is rotated intermittingly by the action of teeth and delay-surfaces on the main wheel, as usual. The vibratory arm H is also constructed and operated by a cam in the main gear-wheel in the ordinary manner, that it may assist in delivering the cord and stripping the knot from the tyer, and that its knife h may sever the cord, after the completion of the knot, between the tyer and the clamp.

Passing now to the subject-matter of my invention, J represents a cord-clamping disk

provided in its periphery with cord-receiving notches, and K a grooved clamp fitting over the edge of the disk and acting to confine the cord in the notches. The disk is provided on the lower side with a ratchet-hub and rotated intermittingly by a pawl *j*, attached to an arm *j'*, which vibrates around the axis of the disk. These parts are of the same general character as those now used in the Appleby machine, except that the disk is made of greater diameter than usual, and that the clamp K, instead of being made of the usual form, is provided near one end with a shoulder *k*. The disk and clamp, instead of being arranged in the usual relation to the tyer, are placed in the peculiar position represented in the several figures. The disk is located on the opposite side of the tyer from that on which the needle approaches and in a plane at about forty-five degrees to the axis of the tyer-spindle. The axis of the disk is to one side of the path in which the cord is laid by the needle, and the parts are in such position that the cord is laid by the needle across the disk and into its rear edge on the side distant from the tyer, so that as the disk revolves the cord carried between its edge and the clamp K will be held thereby, but yielded or slackened toward the tyer.

The cord is laid in a path between the tyer-spindle and the axis of the disk, as shown in Fig. 3; but the receiving and holding edge of the disk projects beyond the path of the cord and of the tyer-spindle in such manner that as the end of the cord is carried around with the disk toward the tyer it is also deflected, as indicated by dotted lines in Fig. 3, so that it is carried toward the heel of the tying-bill, or, in other words, toward the spindle of the tyer. In this manner it is strained across the tying-bill in a direction which prevents it from working off over the end at an improper time. This manner of laying cord to the tyer is also advantageous, in that the cord is held as near as possible to the axis of the tyer, which therefore requires but a minimum amount of cord for the formation of the knot, the tension on the cord being correspondingly reduced. It will also be observed, on reference to Figs. 1 and 2, that owing to the oblique position of the disk the end of the cord is gradually lowered by its revolution, so that it stands primarily in position to permit the formation of the loop by the rotation of the tyer, after which its end is lowered, as shown in Fig. 2, to a position more nearly parallel with the plane in which the tyer-bill revolves, so that it stands in position to advantageously enter between the jaws or bills of the tyer. Thus it will be seen my disk performs the fourfold office of holding the cord, slackening it toward the tyer, urging it rearward toward the heel of the tyer, and changing the position of its end, so that it may be readily grasped by the bill.

In practice I find that the disk arranged as described will be drawn forward at the proper time and to the proper extent to slacken the cord during the formation of the knot by the strain of the cord thereon, and my experience has shown that it is best to operate the disk in this manner, the pawl-and-ratchet mechanism being relied upon merely to turn the disk sufficiently to insure the entrance of the cord between the disk and the clamp K, that the latter may secure a firm hold thereon.

To limit the slackening action and prevent the cord from accidentally escaping beyond the ends of the clamp, the latter is preferably provided with a shoulder *k*, overlying the face of the disk to encounter the cord passing over the disk to the bundle, but commonly cut away or recessed on the under side, as in Fig. 9, to permit the waste ends severed from the cord to pass thereunder. The clamp is urged against the disk, as usual, by a spring *k'* in the form and manner shown, or in any equivalent form which will answer the same purpose. The spring should be made of somewhat greater strength than is usual in other machines.

The ratchet mechanism for turning the disk may be operated in any suitable manner; but I recommend as a simple construction that shown in the drawings, in which the pawl-carrying lever is connected by an adjustable link L to an arm *m* on one end of a horizontal rock-shaft M, which is mounted on a bracket and provided on its opposite end with a second arm *m'*, having a lateral roller or projection which enters a groove m^2 in the rear face of the main gear-wheel F.

I am aware that a main gear for driving a knotter-pinion has been provided on its rear face with a cam through which cord-clamping devices were operated. The peculiarity of my combination in this regard lies in having the cam arranged on the rear face of the driving-gear and in having the rock-shaft M extended past the edge of the gear and connected to the cam on the rear face. This leaves an unobstructed space in front of the gear and affords more convenient access to the tying mechanism.

The operation is as follows: The cord being secured at one end between the disk and clamp and extended thence over the tying-bill to the needle and thence to the ball or spool, as usual, the grain is delivered on top of the cord, after which the needle, ascending, lays the cord in the customary manner around and over the gavel across the tying-bill, and thence to the rear edge of the disk to the position shown in Fig. 3. The ratchet mechanism then imparts a slight rotation to the disk in the direction indicated by the arrow. At this time the cord extends from the tying-bill upward in a plane oblique to that in which its bill revolves. Immediately thereafter the tyer, commencing its rotation, forms the loop of the knot, as usual, and in so doing strains the cord forming the ends of the applied band, so that the disk is pulled around, thereby advancing the ends

of the cord from their original position toward the tyer until they reach the shoulder *k*, and their further advance is stopped. While thus advancing the ends are gradually lowered until they lie in the position shown in Fig. 2, when they are grasped by the bill, after which the knot is completed and stripped in the ordinary manner, the cord being severed by the knife and the newly-formed end retained by the disk in a manner understood by every person skilled in this art.

The lower end of the breast-plate, instead of being made rigid, as usual, is connected to the remaining portion by a perpendicular pivot-bolt N, so that it may swing laterally. The upper end of the bolt is secured by a nut *n*, encircled by a strong spring *n'*, which, bearing on the movable portion of the breast-plate, holds the same down forcibly in frictional contact with the stationary portion, so that under ordinary circumstances it will remain in operative position. In the event, however, of encountering a post or other obstruction it will yield and swing laterally around the pivot, thus preventing the breakage which frequently occurs in consequence of the breast-plate projecting beyond the remaining portions of the machine. The pivotal arrangement is also advantageous in that it allows the end to be turned out of the way, so that the attendant may gain access more conveniently to the tying mechanism.

I do not seek to secure in this patent the breast-plate having the hinged or pivoted end except when combined with the friction-spring, substantially as herein shown.

Having thus described my invention, what I claim is—

1. In combination with a rotary tying-bill, the rotary notched disk mounted on a fixed axis in a plane oblique to that in which the bill revolves and free to turn at its receiving-edge under the strain of the cord toward the bill, the co-operating peripheral clamp having a cord-retaining shoulder at its delivery end, and the cord-placing arm or needle arranged to lay the cord to the tyer and thence to the distant edge of the disk, whereby the disk is enabled to retain the successive ends of the cord, to direct the cord in an advantageous position to the bill, and to slacken the cord to the bill during the tying operation.

2. In combination with the rotary cord-tying bill and the cord-placing arm or needle, the rotary cord-holding disk mounted on an axis oblique to that of the tyer in position to receive the cord at the edge farthest from the tyer, the spring-actuated clamp or shoe acting as the sole means of preventing forward rotation of the disk, and a pawl-and-ratchet mechanism, substantially as described, to initiate the forward rotation.

3. In a grain-binder, the cord-placing arm or needle, the tying-bill having its axis on one side of the path of the cord, the rotary notched cord-holding disk having its axis on the opposite side of said path and oblique to the axis of the tyer, said disk free to turn at its receiving-edge toward the tyer during the formation of the knot under the strain of the cord, and the co-operating clamp, whereby the disk is enabled while retaining the cord to slacken the same toward the tyer and also deflect it toward the heel of the tyer during the formation of the knot.

4. The main gear-wheel F, provided on one face with the teeth and delay-surface to operate the tyer and in its opposite face with the cam-groove, in combination with the tyer and its delay-pinion, the cord-disk and its ratchet-wheel, the actuating-pawl and its carrying-arm, the rock-shaft arranged parallel with the axis of the main gear and across the edge of the same, the arm on one end of said rock-shaft connected with the cam, the arm on the opposite end of said shaft, and the rod connecting the last-named arm with the pawl-carrying arm.

5. The rotary tying-bill and the cord-placing arm or needle to lay the cord across the bill to the clamp, in combination with the rotary notched clamping-disk lying in a plane transverse to the axis of the bill and in position to receive the cord from the needle at the edge farthest from the tyer and free to turn at its retaining-edge toward the tyer under the strain of the cord and the clamp.

6. In a grain-binding machine, the breast-plate comprising the stationary inner section, the movable outer section, the vertical connecting-pivot, and the friction-spring, whereby the outer end of the plate is held normally in an operative position, but permitted to yield laterally in the event of its encountering an obstruction.

7. In combination with a cord-holding disk provided with peripheral notches and free to revolve under the stress of the cord, a co-operating clamp or shoe bearing upon the periphery of the disk and provided at its delivery end with the projecting lip or shoulder, and a binder arm or needle arranged to lay the cord to the successive notches of the disk, whereby the device is adapted to receive and retain the two ends of the cord in succession and to prevent the accidental escape of the cord at the delivery end of the shoe.

8. In combination with the notched cord-holding disk free to revolve under the stress of the cord, the co-operating clamp provided at its delivery end with the cord-retaining lip or shoulder *k*, said shoulder formed, as described and shown, with a space between its face and the face of the disk for the passage of the waste ends of the cord between them.

In testimony whereof I hereunto set my hand, this 31st day of May, 1888, in the presence of two attesting witnesses.

HENRY J. CASE.

Witnesses:
ED. W. ROUNDS,
J. FRANK DAVIS.