(No Model.) 3 Sheets—Sheet 1.

P. HANSON.

CORD TYER FOR GRAIN BINDERS.

No. 377,828. Patented Feb. 14, 1888.

Fig. 1.

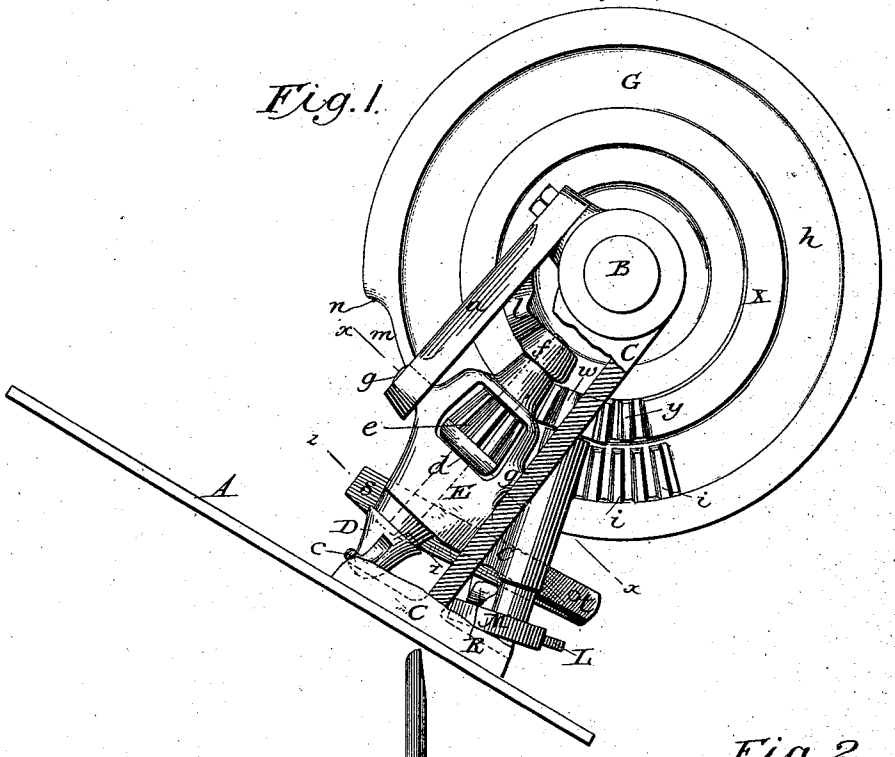
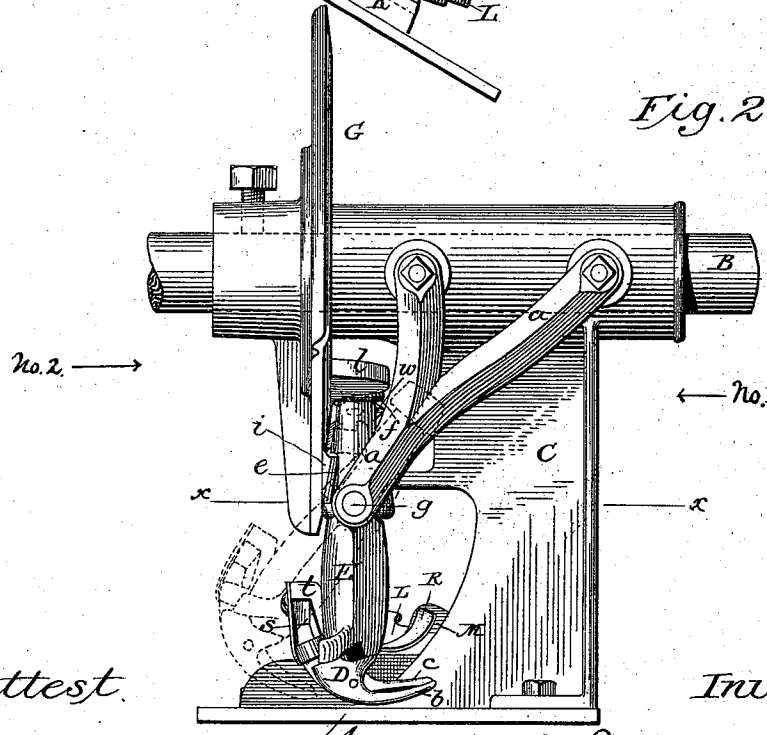


Fig. 2



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

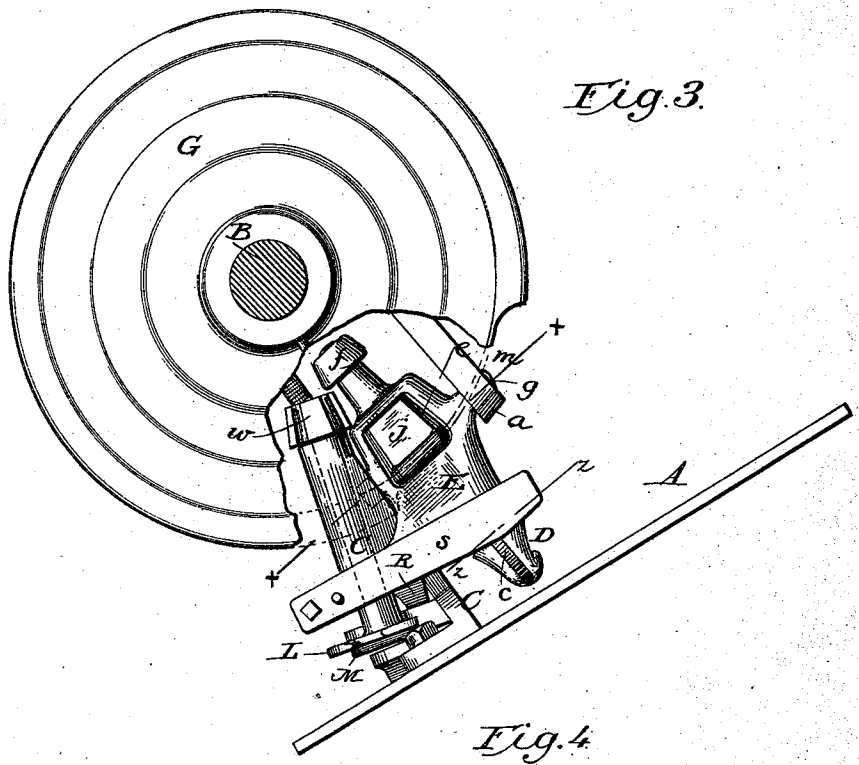

Fig. 4
on x–x

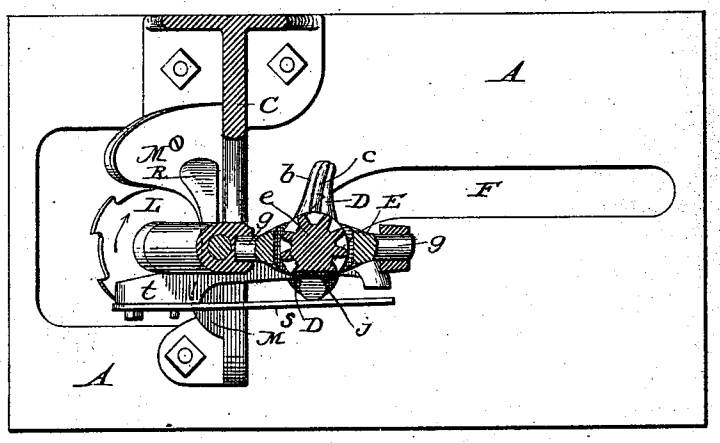

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Fig. 5.

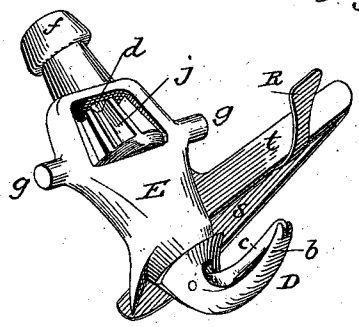


Fig. 6.

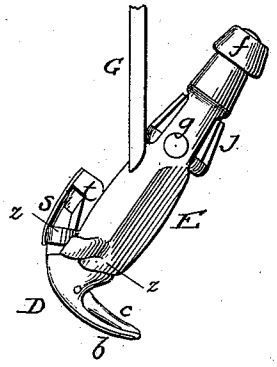
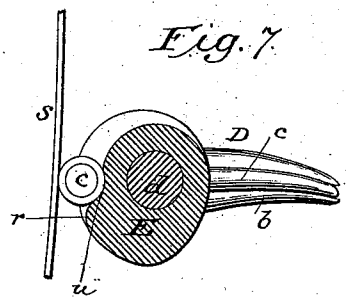


Fig. 7.



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UNITED STATES PATENT OFFICE.

PAUL HANSON, OF ST. PAUL, MINNESOTA.

CORD-TYER FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 377,828, dated February 14, 1888.

Application filed January 30, 1884. Serial No. 119,227. (No model.)

To all whom it may concern:

Be it known that I, PAUL HANSON, of St. Paul, in the county of Ramsey and State of Minnesota, have invented certain Improvements in Cord-Tyers for Grain-Binders, of which the following is a specification.

This invention relates to that class of rotary cord-tying devices ordinarily known in the art as "tying-bills," in which two looping and knotting jaws or fingers are arranged transversely on one end of the spindle by which they are carried, as represented in the patent to Jacob Behel, No. 41,661, dated February 16, 1864.

It has reference more especially to those tying-bills which are mounted in swinging supports arranged to move the bill bodily backward for the purpose of withdrawing the same from the knot at the completion of the looping action, as also represented in the Behel patent aforesaid.

The improvements relate to the construction of the tyer, the devices by which it is sustained, and to the clamping and cutting mechanisms employed in connection therewith, whereby the parts are operated with certainty and the cord slackened during the tying operation in such manner as to prevent undue strain thereon.

In the accompanying drawings I have represented my device adapted for application to what is known as the "Appleby" type of machine—such as represented, for example, in Letters Patent of the United States granted to George Esterly, Nos. 262,126 and 266,254; and it is to be understood that, except as to the particulars hereinafter specified, the various parts of the machine may be identical with those represented in said patents.

Referring to the drawings, Figure 1 represents a side elevation of the tying, clamping, and cutting devices constructed in accordance with my present invention as viewed in the direction indicated by the arrow No. 1 in Fig. 2. Fig. 2 is a view of the same, looking downward in the direction in which the grain is delivered thereto. Fig. 3 is an elevation of the same mechanism, looking in the direction indicated by the arrow No. 2 in Fig. 2, the main actuating-wheel being partially broken away to expose to view the other parts. Fig. 4 is a transverse section on the line *x x* of the preceding figure, looking in a downward direction. Fig. 5 is a perspective view of the tying-bill, the swinging frame in which it is mounted, and the knife for severing the cord, said parts being detached from the remainder. Fig. 6 is a side elevation of the tyer-frame and of the driving-wheel, showing the manner in which the latter operates to urge the former forward. Fig. 7 is a horizontal section on the line *z z*, Fig. 6, looking downward, showing the cam and the spring by which the tying-bill is opened and closed.

Referring to the various figures, A represents the stationary breast-plate, beneath which the grain is compressed and bound, as usual.

B represents the horizontal main shaft, located above the breast-plate for the purpose of imparting motion to the cutting, tying, and clamping devices, as well as to the usual ejector-arm.

C represents a standard or bracket having its lower end bolted firmly to the breast-plate and its upper end adapted to encircle the main shaft in substantially the usual manner, except that on the upper or forward side the standard has bolted firmly thereto a depending arm, *a*, designed to assist the same in giving support to the tyer-frame, as hereinafter explained.

D represents the rotary tying-bill, having on its lower end the stationary jaw or finger *b* and the movable co-operating finger *c*, which differs from those in common use only in the minor particulars hereinafter enumerated. The tying-bill has the usual spindle or shaft, *d*, which bears near its upper end a pinion, *e*, from which it receives motion, and also above the pinion a roller, *f*, the purpose of which will be presently explained. The tyer-spindle, instead of being mounted in stationary supports, is mounted in a pendent swinging frame, E, which is provided with two journals, *y*, mounted, one in the standard C and the other in the depending arm *a* of said standard, as plainly represented in Figs. 1, 2, and 3. The journals are arranged in such position that the frame E is free to swing in a direction at right angles to that in which the cord is laid about the bundle. This movement is plainly represented in Fig. 2, in which the tyer is repre-

sented by full lines in its normal position in the path of the cord and by dotted lines in the position which it occupies when thrown backward, so that its bills are withdrawn from the path of the cord.

The cord or other binding material will be laid around the bundle by means of the usual binder arm or needle, which will be arranged in such manner as to present the cord across the tying-bill and thence backward or downward to a clamping device in its rear.

The breast-plate is provided with a slot, F, through which the needle ascends to present the cord to the tying devices, as in other machines. This slot, instead of being made of large size and with an expanded lower end, as usual, has its lower end restricted in width and curved laterally, so that it terminates directly beneath the axis of the tying-bill, as plainly represented in Fig. 4. This lateral curvature of the slot has the effect of causing the same to urge the cord laterally as it is drawn about the bundle, so that it may be certain to pass over the fingers of the tyer and remain in position thereon.

Referring, now, to the means for imparting the rotary and rocking motions to the tyer, it will be perceived on reference to Figs. 1, 2, and 3 that both actions are secured by means of a wheel, G, secured firmly on the driving-shaft. For the purpose of imparting an intermitting rotary motion to the tyer and of holding the same at rest during the intervening periods of time the wheel is provided with an annular surface, *h*, having at one point in its length a sufficient number of teeth, *i*, to impart a single rotation to the tyer-pinion *e*. On one side this pinion is provided, as shown in Fig. 4, with a flat delay-surface, *j*, which co-operates with the smooth surface *h* of the driving-wheel to hold the tyer against rotation except when the teeth *i* are in action. The tyer receives a single rotation at each revolution of the driving-wheel, and is stopped and held in position with its fingers or jaws extending transversely to the line in which the band is laid, as plainly represented in Fig. 4 and in other figures.

The backward swinging or rocking motion of the tyer is effected by means of a projecting cam surface or incline, *l*, formed on the face of the driving-wheel in position to act against the roller *f* on the upper end of the tyer-spindle. This roller being located above the axis of the tyer-frame, it follows that when the cam *l* acts against the roller *f* to force the same forward it has the effect of rocking the frame E in such manner as to throw the tying-bills backward in the direction of their length, thus withdrawing the bills from the loop, which will escape over their ends. As soon as the cam *l* has passed the roller and ceased its action thereon, the rocking frame and tyer will fall back to their original positions by gravity. In order that the tyer-frame E may swing backward without interference from the driving-wheel, the latter is cut away at the periphery, as represented at *m*, the opening thus formed being opposite the tyer at the time that the latter is moved backward. In order to render the forward motion of the frame and tyer positive, the wheel has its periphery provided with an inclined or beveled surface, *n*, at one edge of the opening or cut-away portion. This inclined surface acts against the rear side of the tyer-frame E, when the latter is in its backward position, in the manner represented in Fig. 6, so as to force the same backward at the proper time should it fail to fall back by gravity and hold it in position.

The movable jaw or finger *c* of the tying-bill is pivoted midway of its length and extended from the rear or heel of the fixed jaw, as usual, this heel projection being adapted to co-operate with a relatively stationary cam-surface by which the opening of the jaw is positively effected, and with a spring by which the closing of the jaw is effected.

The cam-surface by which the jaw is opened is formed on the under side of the frame E, and is plainly represented at *r*, Fig. 7. The spring by which the jaw is closed is represented at *s* in the various figures. It is made of flat form and acts at one end against the heel end of the jaw, while it is secured firmly at its opposite end to an arm, *t*, formed upon and extended laterally from the rocking tyer-frame E, in the manner plainly represented in Figs. 1, 4, and 5. Being thus attached to the tyer-frame, the spring moves therewith and retains an unchanged position with respect to the tyer. For the purpose of insuring the stoppage of the tyer at the exact point required, and to prevent the same from being accidentally displaced during the instant which occurs between the locking action of the delay-surfaces *h* and *j*, I adopt the construction represented in Fig. 7.

The tyer-frame E is provided in its rear side with a slight notch or depression, *u*, into which the heel end of the movable jaw may be forced by the action of the closing-spring *s*. At the instant that the tyer completes its rotation, and before the frame swings backward, the heel end of the jaw enters the notch, as represented, the effect of which is to lock the tyer against rotation until sufficient strain is applied to overcome the resistance of the spring.

Passing next to the means employed for retaining the two ends of the applied band and for severing the same from the body of the cord extending to the spool or reel, attention is particularly directed to Figs. 1, 3, and 4. The clamping device consists of an intermittingly-rotated disk, L, having its periphery provided with notches and arranged to pass within a grooved or recessed clamping-plate, M. The disk revolves in a plane substantially parallel with the breast-plate, and is located above said plate at a point slightly behind or in rear of the tyer. The disk is arranged with its axis closely on one side of the line in which the binding-cord is laid, as will be seen on reference to Fig. 4, this arrangement being

adopted in order that the cord may be laid with certainty to pass across the face of the disk, so as to enter its notched edge.

By means hereinafter explained the clamping-disk is revolved in the direction indicated by the arrow in Fig. 4, and in the course of its revolution it causes the cord, which may be laid in either of the notches, to be carried into the outer or rear edge of the clamping-plate M and there confined. In the course of its revolution the confined end of the cord is moved along the edge of the plate M toward the tyer. In this manner the end of the cord, although held securely by the clamp, is slackened toward or permitted to approach the tyer, whereby the cord is relieved from the excessive strain to which it would otherwise be subjected. The forward rotation of the disk is controlled or retarded, so that the cord is given up only as fast as demanded by the tyer, the sudden rotation of the disk under the strain of the cord being positively prevented. This construction of the clamp to yield up the cord toward the tyer without releasing the end is an important feature of my invention. The construction of the parts to this end may be modified as regards the minor details, provided the mode of action above described is substantially retained. The clamping-plate M may consist of a single block of metal or of two plates united by screws, as represented in the drawings.

It will be observed that the clamping-plate encircles nearly one-half of the periphery of the clamping-wheel, which latter is provided, as usual, with several cord-receiving notches at equal distances apart. This construction enables the clamp to receive the first and the last ends of the band in different notches, the slackening action occurring principally with the second or last end of the band.

For the purpose of imparting the intermittent motion to the clamping-disk, I mount it on a spindle seated in the rigid standard C, and secure to its upper end a wheel, *w*, having a series of flat delay-surfaces and intermediate notches. The main driving-wheel G is provided with an annular surface, *x*, having at one point in its length a single tooth, *y*. At each revolution of the driving-wheel the tooth *y* acts in one of the notches of the wheel *w* and imparts a fifth of a revolution to the clamping-disk, after which the tooth passes out of action and the delay-surface *x* comes into play to retain the disk immovable until the driving-wheel has made another revolution.

For the purpose of severing the band at the completion of the tying action, I make use of a curved reciprocating knife, R, secured at one end firmly to the arm *t* of the tyer-carrying frame E and extending thence forward immediately above the clamping device across the path in which the cord is laid. During the tying operation the knife remains at rest, with the cord laid over its upper surface; but when the frame E is swung backward to withdraw the tyer from the knot the knife is also carried back with the frame, and thus moved across the cord with a drawing or shearing action, whereby the band portion of the cord is severed with certainty from the remainder.

The parts are constructed and arranged to operate in the following order: The tying-bill standing at rest in its forward position (represented in Figs. 1, 2, and 3) and the cord being held at one end in the clamp, the needle or binder-arm ascends and places the cord about the bundle, presenting the second end of the band across the tying-bill, over the knife, and thence downward between the edge of the disk and the plate M. The driving-wheel being rotated, its teeth *i* first impart a complete rotation through the pinion *e* to the tying-bill. The first effect of this rotation is to cause the jaws to twist the cord into a loop around them, and at the completion of the rotation the movable jaw opens to admit the bight of the cord between the two jaws, after which the movable jaw immediately closes to retain the cord, the action up to this point being the same as in other tyers of this class. During the rotation of the tyer, while the cord is being looped thereon, motion is imparted by the tooth *y* through the intermediate parts to the clamping-disk, which is caused to yield up the cord to the tyer, in the manner before explained. In order to prevent the accidental escape of the binding-cord after being laid across the tying-bill, it is preferred to give the jaws or fingers an upward curvature toward their extremities, as represented in the several figures. It is also preferred to give the fingers a slight curvature or twist forward in the direction of rotation, as represented, whereby they are enabled the better to engage over the cord.

For the purpose of preventing the escape of the cord from between the two fingers or jaws, the movable jaw is ordinarily constructed with a depending point to enter a corresponding notch in the extremity of the stationary jaw, as shown. The instant that the rotation of the tyer ceases the inclined surface *l*, acting upon the roller of the tyer-spindle, causes the tyer to swing backward to the position indicated by dotted lines in Fig. 2, the effect of which is first to withdraw the tying-bill backward out of the loop and at the same time to move the knife and cause the severance of the band.

I do not claim, broadly, a swinging tyer-frame in combination with a cam for vibrating the same, nor a wheel adapted to operate both the tyer and the vibratory tyer-frame, nor a swinging tyer-frame in combination with a knife actuated thereby, my invention in these respects being limited to the particular form and construction of details hereinafter specified in the claims.

Having thus described my invention, what I claim is—

1. In combination with the tyer-spindle, its sustaining-frame, journaled at an intermediate point in its length, and the wheel provided with two cam-faces arranged to act alternately on the frame and on opposite sides of the jour-

nals, whereby the frame is moved positively to and fro.

2. The driving-wheel G, provided with the teeth and delay-surfaces to operate the tyer, the tooth and delay-surface to operate the rotary clamp, and the incline *l*, to effect the swinging action of the tyer.

3. In combination with the rotary tying-bill, the rotary cord-clamping disk L, the stationary co-operating plate M, and means, substantially as described, for rotating the disk toward the tyer, whereby the cord is clamped at a point distant from the tyer and gradually slackened to the latter during the looping operation.

4. In combination with the tyer and the swinging frame in which it is mounted, a cord-clamp, and a knife secured rigidly to the swinging frame and arranged to act upon the cord between the clamp and tyer.

5. In combination with the rotary tyer having a pivoted finger with the heel-extension, the supporting-frame provided with a notch, *u*, and a spring, *s*, as described, to seat the heel end of the finger in said notch, whereby the accidental rotation of the tyer is prevented.

6. The combination of a cord-tying bill, a rotary clamp adapted to hold the cord at its periphery, a binder-arm or cord-carrier whereby the cord is presented to the grasp of the clamp at a peripheral point distant from the tyer, and a driving-gear whereby the tyer is turned and its forward rotation limited to carry the clamping-point toward the tyer, and thus slacken the cord gradually to the latter during the tying operation.

PAUL HANSON.

Witnesses:
HJALMAR STAKKE,
HENRY FOSS.