3 Sheets—Sheet 1.

J. F. GORDON.

GRAIN-BINDERS.

No. 194,817. Patented Sept. 4, 1877.

Fig. 1.

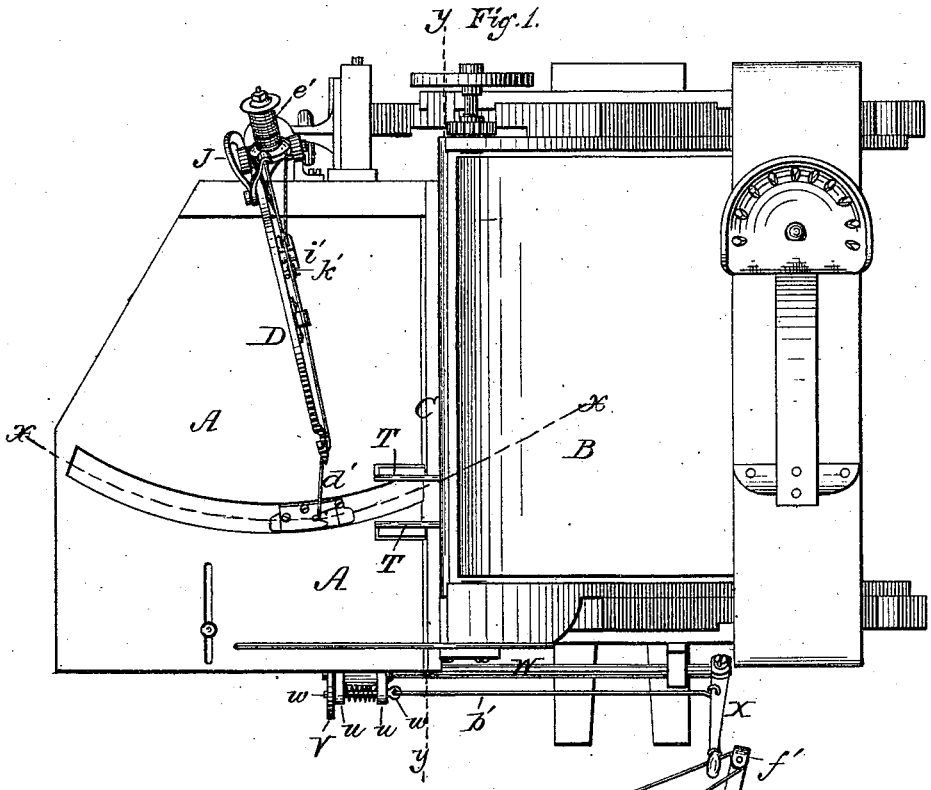
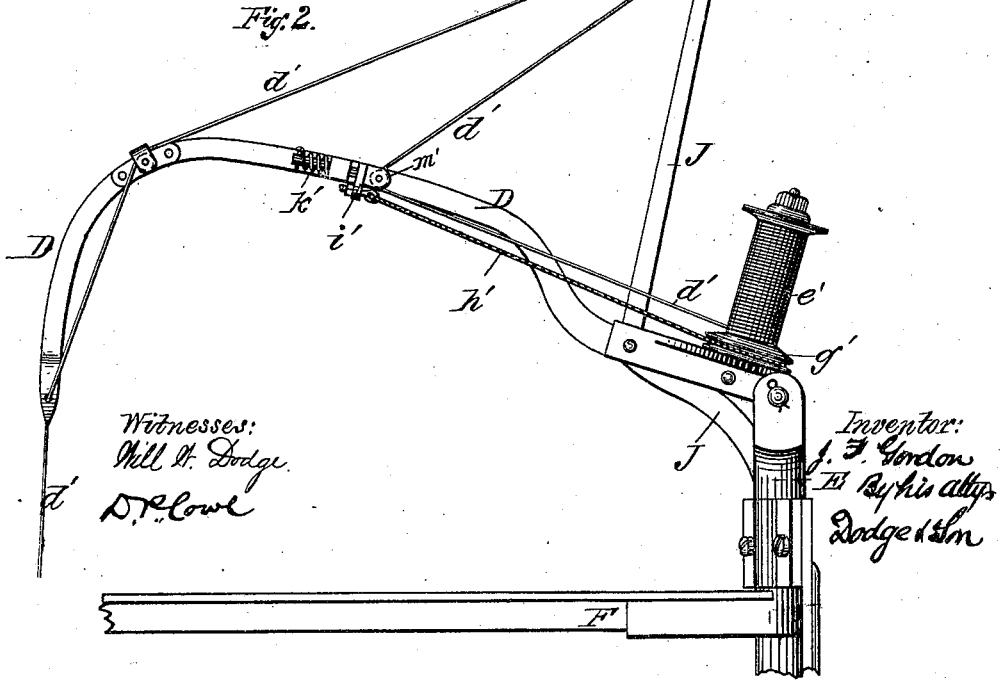


Fig. 2.



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3 Sheets—Sheet 2.

J. F. GORDON.

GRAIN-BINDERS.

No. 194,817. Patented Sept. 4, 1877.

Fig. 3.

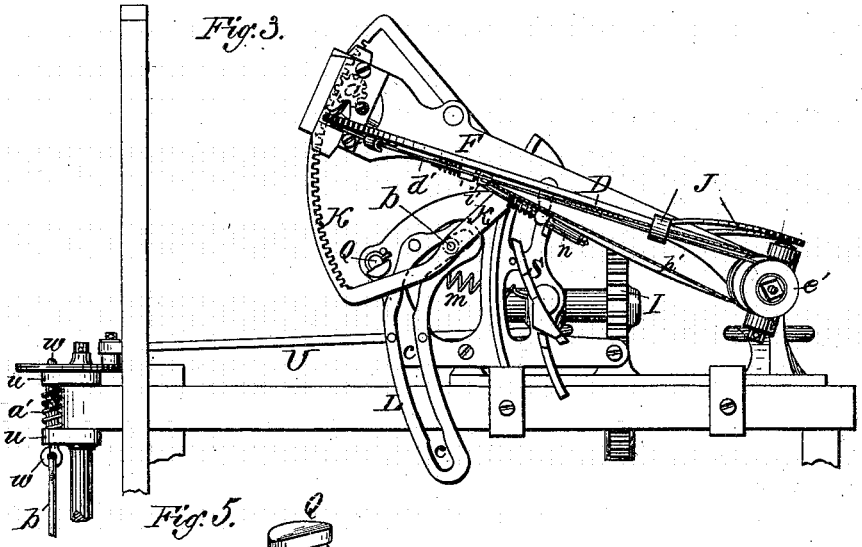


Fig. 5.

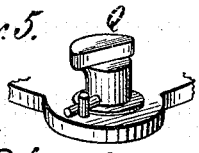
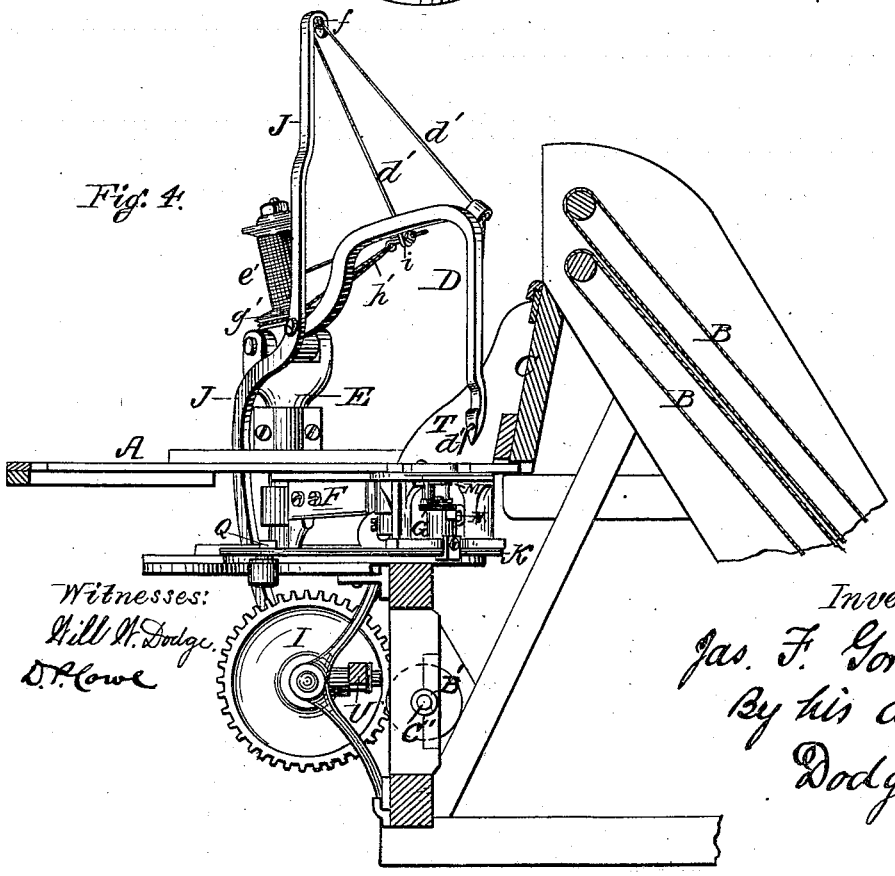


Fig. 4.



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3 Sheets—Sheet 3.

J. F. GORDON.

GRAIN-BINDERS.

No. 194,817. Patented Sept. 4, 1877.

Fig. 6.

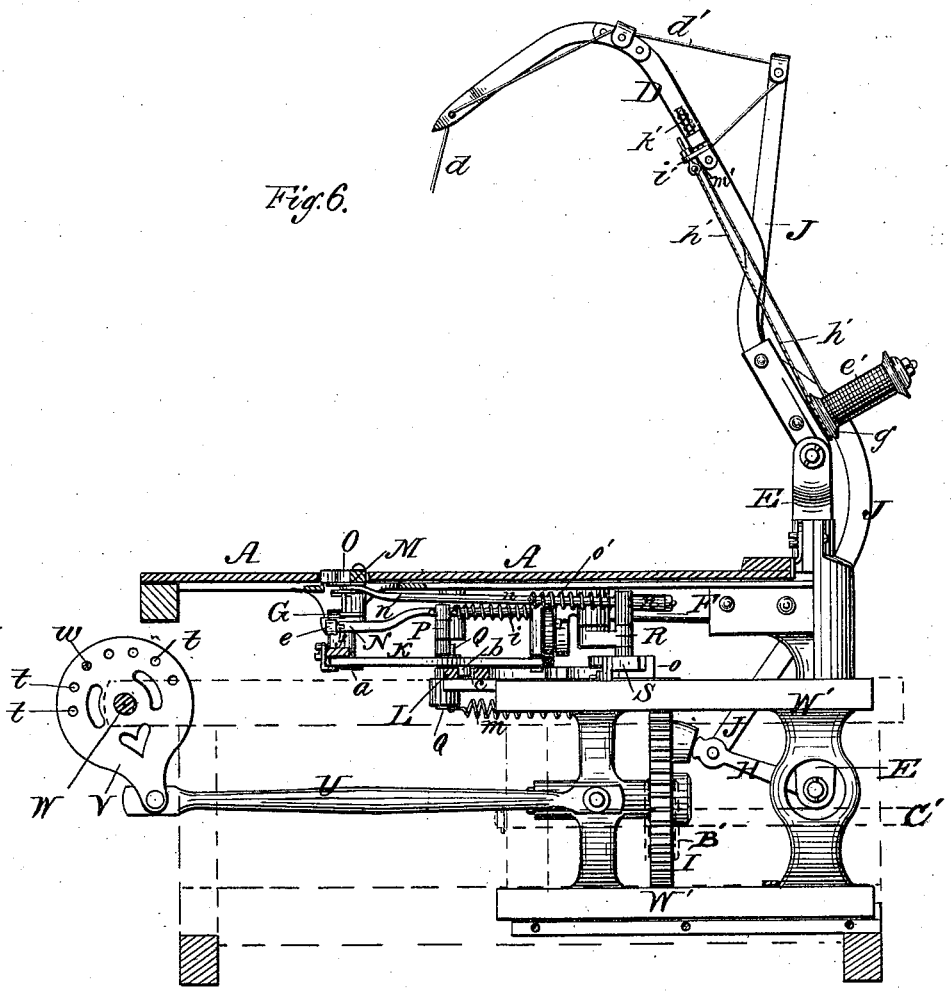
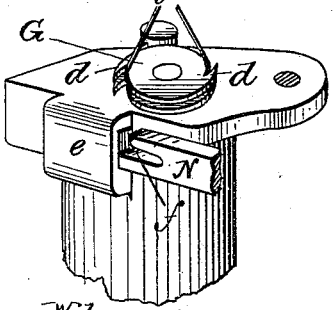


Fig. 7.



Witnesses:
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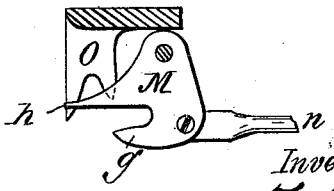
D. P. Lowe

Fig. 8.



Inventor:
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By his Attys.
Dodger Son

UNITED STATES PATENT OFFICE.

JAMES F. GORDON, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **194,817**, dated September 4, 1877; application filed March 1, 1877.

To all whom it may concern:

Be it known that I, JAMES F. GORDON, of Rochester, in the county of Monroe and State of New York, have invented certain Improvements in Grain-Binding Machines, of which the following is a specification:

My invention consists in a novel manner of operating the movable rack by which the twister is operated; in an improvement in the twister-head; in a peculiar construction of the upper wire-holding jaw; in the manner of operating the jaws; in an improved tension device for the binding-wire; in guards or brackets to throw the grain within reach of the binding-arm, mounted on the movable table, and arranged to slide upon a fixed backboard; in novel devices for shifting the binding mechanism; and in other details, hereinafter fully described and explained.

Figure 1 represents a top plan view of my binding mechanism and the adjacent parts; Fig. 2, a side elevation of the binder-arm and its supporting-shaft, showing the tension device; Fig. 3, a plan view of the binding mechanism, with the table or grain-receiver removed; Fig. 4, a view looking from the front of the machine toward the binding mechanism, with the table and grain-elevating aprons taken in section on the line *x x* of Fig. 1; Fig. 5, a view of the rotating dog or cam, by means of which the lower wire-clamping jaw is actuated; Fig. 6, a vertical section on the line *y y* of Fig. 1, looking outward toward the binding-arm; Fig. 7, a perspective view of the twister and the lower wire-clamping jaw; Fig. 8, a view of the upper wire clamping or holding jaw.

In its general construction and mode of operation, the machine represented in the drawings is similar to the one for which Letters Patent were granted to me October 26, 1875, No. 169,258.

A represents the table or receiver, upon which the cut grain is delivered in a loose condition by two elevating-aprons, B. The aprons are extended, as usual, some distance above the table, and the space between their upper ends and the table filled by an inclined board, C, which prevents the escape of the grain, and holds the same in position on the table, as shown in Fig. 4.

D represents the binding or wire-carrying arm, connected by a transverse pivot to the upper end of a vertical rock-shaft, E, which latter is mounted at the rear end of the grain-table, and provided below the same with a rigid horizontal arm, F, on which the twister G and its attendant parts are mounted, as shown, directly below the binding-arm, so that the rotary oscillation of the shaft causes the binding-arm and twister to swing back and forth across the table to and from the elevating-aprons. The rotary movement of the shaft is caused by means of an arm, H, which has one end connected by a transverse pivot to the lower end of the shaft, and the other end mounted in a socket on the face of a driving-wheel, I, as shown. The vertical movement of the binding-arm is caused by means of a bar, J, having its ends pivoted to the binder-arm and the arm H, respectively.

The rotation of the wheel I causes the binder-arm to rise and the arm and twister to move forward, the former over and the latter under the grain, and then causes the arm to close down over the grain on the table and carry the wire around the same into the twister G, after which the arm and the twister move back together with the bundle, out of the way of the falling grain, in the same manner as in my original machine.

In the original machine the bar or rod J was made straight and stood some distance in front of the shaft E, so that it limited the amount of grain which could be grasped under the binding-arm; but in the present machine the bar is curved backward to the shaft E, as shown in Figs. 2, 4, and 6, out of the way of the grain, which is permitted to fill the entire space under the binding-arm.

The twisting-head G, by which the binding-wire is fastened around the bundles, is provided at its lower end with a pinion, *a*, and rotated by means of a sector-rack, K, pivoted to the arm on which the twister is mounted, and arranged to engage with the pinion *a*, as shown in Figs. 3 and 6.

The vibration of the rack on its pivot necessary to cause the rotation of the twister is effected, as shown in Figs. 3 and 6, by providing the rack on its under side with a stud or roller, *b*, and arranging the same to travel in a slot, *c*, formed in an arm, L, secured rig-

idly to the frame, so that as the rack is carried to and fro by the vibration of the arm F, to which it is attached, the roller will be retained in and guided by the slot in such manner as to give the rack the required movements on its pivot, as hereinafter more fully explained.

By changing the form of the slot the movements of the rack may be varied, as desired, and the twister thereby rotated at such times and to such extent as circumstances may require. This method of operating the rack is especially meritorious in being simple and strong and positive in its action, and in admitting any peculiar or irregular movements of the twister that may be desired.

It is obvious that instead of using the slotted guide-arm and the single roller on the rack, a solid arm of the shape or curvature of the slot may be arranged to pass between two rollers on the rack.

The twister-head used in the present instance consists of a horizontally-rotating disk or wheel, such as shown in Fig. 7, having on opposite sides two curved points or hooks, *d*, to catch and hold the ends of the wire and twist them together, the hooks being pointed in the same direction on the disk, and made of such form that the wire will readily wedge fast inside of them against the edge of the disk or head.

As shown in Figs. 4 and 6, the twisting-head is mounted below one wire holding or clamping jaw, M, and above another one, N. The lower jaw N consists, as shown in Fig. 7, of a horizontal bar having its end arranged to slide into a fixed socket, *e*, and provided on the upper edge with a notch, F, to catch the binding-wire and carry the same into the socket, in order to hold it firmly. The upper jaw M consists, as shown in Fig. 8, of a pivoted horizontally-swinging plate provided with a nose or hook, *g*, and with a rear arm, *h*. The jaw operates, as shown, in connection with a fixed throat-plate, O, having a V-shaped notch in its front. When the jaw swings backward its nose catches the binding-wire and forces the same into the notch in the throat-plate, and thereby holds it with great firmness; and then, as the jaw swings forward, its nose releases the wire, and the rear arm *h* forces the same out of the throat-plate.

For the purpose of operating the lower jaw N its end is extended backward in the form of a rod or stem, and pivoted to the free end of a short horizontally-swinging arm, P, which is pivoted to the main arm F, as shown in Fig. 6. On the stem of the jaw I mount a spiral spring, *i*, which bears against a fixed stud, and tends to keep the jaw closed; and on a plate secured to the frame of the machine I mount a rounded cam or dog, Q, to act against the arm P and cause the opening of the jaw as the binding-arm swings backward.

As shown in Figs. 3, 5, and 6, the cam or dog Q is pivoted eccentrically, and allowed a limited rotary motion, and has connected to it a spiral spring, *m*, which tends to hold it in an operative position, as shown.

As the binding-arm and twister move outward with a bundle of grain, the arm P rides against the dog or cam Q, and is thereby forced to one side in such manner as to open the jaw N and release the binding-wire therefrom; but as the binder-arm and twister move forward toward the incoming grain, at which time it is desired to have the jaw N retain its hold on the wire, the cam Q yields before the arm P, and turns out of its way, allowing it to pass without being moved, and allowing the jaw N to remain closed under the pressure of the spring *i*.

The rotary yielding dog is both simple and reliable, and is especially adapted for use in connection with the arm P, which has too small a movement to pass around a vibrating switch.

In order to operate the upper jaw M it is connected by a rod, *n*, with a short swinging arm, R, pivoted, like the arm P, to the main arm F, and actuated, as shown in Fig. 3, by means of a stationary guide or track, *o*, and a pivoted switch, S, which latter is allowed a limited movement, and acted upon by one end of the spiral spring *m*, which tends to keep it in the position shown in Fig. 3. As the twister and binder-arm swing toward the incoming grain the arm R passes behind the switch S and holds the upper jaw open; but as the twister and binding-arm move backward the arm R rides over the front of the switch, and is thereby caused to close the jaw upon the wire.

In order that the arm R may pass around the switch without cramping, as well as to force the jaw M with a yielding or spring pressure against the wire, the rod *n*, by which the arm is connected with the jaw, is passed through a swivel-stud on the arm, and provided, as shown in Fig. 6, with a spiral spring, *o'*, bearing at one end against the swivel-stud and at the other against a pin in the rod or stem. The spring permits the arm R to swing forward under the action of the switch after the jaw is closed; but a head or nut on the rear end of the rod *n* causes the arm R to actuate the same and open the jaw with a positive action as the arm is carried back in passing behind the switch.

For the purpose of sustaining the arm F, on which the twister and jaws are mounted, so as to prevent the parts from binding, the arm is provided with a supporting-wheel, *r*, which travels upon a track on the plate which sustains the switch, as shown in Fig. 6.

In order that the binder-arm may be permitted to pass down freely behind the grain which is to form the bundles, and that it may be enabled to divide the same cleanly from the falling or incoming grain, there are placed upon the table against the board C two inclined guards or fenders, T, between which the point of the binder-arm descends. The guards or

fenders are inclined downward away from the board C, and serve to throw the falling grain over on the table far enough to admit of the point of the binder-arm descending behind it, so that the arm is permitted to descend easily and without danger of being stopped by the grain, or of its carrying the same down into the twisting devices—a prolific source of trouble in machines of the ordinary construction.

As in the machines hitherto patented by me, the entire binding mechanism is sustained by a frame, W′, arranged to slide forward and backward, in order that the wire may be applied to the middle of grain-stalks of different lengths.

In order that the driver sitting in his seat may by short movements of a hand-lever move the binding mechanism any required distance forward or backward, I employ the arrangement represented in Figs. 1, 3, and 6.

The frame on which the binding mechanism is mounted is connected by a pitman, U, to a disk or crank, V, mounted loosely on the end of a horizontal shaft, W, which is mounted on the front of the machine, and provided with a hand-lever, X, in such position that it may be readily reached by the driver.

As shown in Fig. 6, the disk or crank V is provided with a series of holes, *t*, and the end of the shaft W provided with two rigid arms, *u*, supporting a sliding bolt, *w*, the end of which may be engaged in one or the other of the holes *t*, so as to lock the disk or crank to the shaft and cause it to turn therewith. The bolt *w* is provided with a spring, *a′*, which tends to keep it engaged with the disk, and is connected by a rod, *b′*, with the lever X, which latter is pivoted to the shaft W in such manner that while its forward and backward motion causes the shaft to rotate and move the binding mechanism, its lateral movement on its pivot will, through the rod *b′*, cause the engagement or disengagement of the bolt *w*.

When the binding mechanism is to be moved a distance greater than can be effected by a single movement of the lever forward or backward, the lever is thrown as far as convenience will permit, and then tipped to one side to disengage the bolt *w* from the crank or disk, and drawn back to its original position, and tipped sidewise to engage the bolt in another hole in the disk, after which it is given a second movement forward or backward, as the case may be, and so on repeatedly until the required adjustment of the binder is attained, the crank and binder being moved step by step by the short easy, movements of the lever, either forward or backward, as required.

In order to produce a proper tension of the binding-wire *d′*, which is wound upon a spool, *e′*, mounted on the rear end of the binder-arm, and passed thence through a take-up, *f′*, and the point of the binder-arm to the twister G, I employ the arrangement of devices shown in Figs. 1 and 2. The wire-carrying spool is secured firmly to a revolving spindle, which is provided with a grooved pulley, *g′*.

An endless friction-band, *h′*, is passed around the pulley *g′*, and attached to an eyebolt on a sliding block, *i′*, which is mounted on the binder-arm, and drawn backward by a spiral spring, *k′*, as shown, to produce a strain on the band and a friction on the pulley.

The sliding block *i′* is provided with a pulley, *m′*, around which the wire is carried between the spool and the take-up in the manner shown, so that the strain of the wire upon the pulley tends to draw the block *i′* backward, and thereby lessen the strain on the band and the friction on the pulley.

It will be readily seen that under the above arrangement of parts any increase of strain or tension on the wire causes a lessening of the friction against the spool, so that the excessive strain of the wire is at once overcome.

As shown in Figs. 3, 4, and 6, the driving-wheel I of the binder is driven by a pinion, B′, mounted on a shaft, C′. The pinion B′ is so arranged that it can slide upon its shaft, and is provided with peripheral flanges or rims which embrace or fit over the edges of the wheel I, so that as the binding mechanism is moved forward or backward, the said flanges cause the pinion to move with and remain in gear with the wheel I.

The guards or fenders T, heretofore described, for throwing the loose grain over within the binding-arm, are in the present instance attached to the movable table A, and arranged to slide, when the table is moved, against the stationary backboard C, which has its upper edge provided with a lip or flange extending down over the upper ends of the guards, as shown in Fig. 4, to hold them in place and prevent the passage of grain between them and the backboard.

The operation of the machine is as follows: The grain is elevated by the aprons B, and permitted to fall upon the table against the guards or fenders T, by which it is thrown over within the point at which the end of the binder-arm D descends. The binding-wire passes from the spool through the tension and take-up devices and the point of the binder-arm to the twisting devices, which always retain a hold upon its end. The binder-arm being swung back to the outer side of the table, behind the loose grain thereon, rises and then swings forward over the grain and descends in front of the same between the guards T, thereby carrying the wire around the grain to the twisting devices under the table.

The arm and twisting devices then swing backward with the bundle of grain, and by means of the two jaws and the twister-head the wire is severed at the proper point, and the end of the main wire held fast, while the two ends of the portion encircling the bundle are

caught one under each hook of the twister-head, and by the rotation of the latter twisted together.

The action of the twister and the attendant devices in securing the wire is in detail as follows: The end of the wire extending from the spool is, in the first place, caught and held by the lower jaw, which forms a bend therein in order to take a secure hold. When the binder-arm descends it carries the wire around the grain and down past the jaws and the twister. The upper jaw immediately closes, and holds both ends of the wire or applied band. The twister next makes a half-revolution, severing the wire above the lower jaw, cutting off the band and the bent end which was held in the lower jaw, and throwing said end from the machine. At the same instant the lower jaw takes a new hold upon the main wire, and the twister, holding one end of the applied band in each hook, rotates and twists them together. Previous to the descent of the binding-arm the twister is rotated far enough to catch the end of the wire with one hook, and throw it to one side out of the way, and at the same time bring the second hook in position to receive the wire when brought down by the binder-arm.

Having thus described my invention, what I claim is—

1. In a grain-binding machine, the combination of the sector-rack K, pivoted to the vibrating arm F, and provided with the stud *b*, and the rigid arm L provided with the slot *c*, to receive the stud *b* and operate the rack, as shown.

2. In a grain-binding machine, the combination of a vibrating arm, F, carrying a twister-head, G, and a pivoted sector-rack, K, for operating the same, with a fixed guide, L, arranged to cause the movement of the rack on its pivot, substantially as shown and described.

3. In combination with the throat-plate O, the pivoted wire-clamping jaw M, provided with the nose *g* and arm *h*.

4. In combination with the jaw M, the horizontally-swinging arm R, the rod *n*, connecting the jaw with the free end of the arm, and the pivoted switch S, arranged to operate as shown and described.

5. In combination with the jaw M, the horizontally-swinging arm R, and switch S, the rod *n*, extending from the arm loosely through the jaw, and provided with the spring O′, whereby it is permitted to yield, as and for the purpose described.

6. In combination with the jaw N, the swinging arm P, and the pivoted spring cam or dog Q, constructed and arranged as shown, so that the arm passes both forward and back on the same side thereof.

7. In a grain-binding machine, the combination of the wire-carrying arm and wire-clamping devices O, M, and N, with the rotary twister G, having the two hooks *d* on opposite sides, mounted below the upper clamping devices, and arranged to rotate in the manner and at the times specified, whereby one hook is caused to grasp one end of the wire and carry the same to one side out of the way previous to the descent of the wire around the bundle within reach of the other hook.

8. In combination with the stationary board C and the movable grain-table A, the guards or brackets T, attached to the table, and arranged to slide upon the board C when the table is moved.

9. The tension device, consisting of the grooved pulley *g′* on the spool-spindle, friction-band *h′*, and the movable block *i′*, mounted on the binder-arm, and provided with the spring *k′* and the pulley *m′* to guide the binding-wire, as described and shown.

10. The combination of the binder-frame W′, pitman U, and disk or crank V, with the shaft W, pivoted lever X, bolt *w*, and rod *b′*.

11. In combination with the shaft E and arms D and H, the connecting-bar J, curved backward in the manner shown.

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