4 Sheets—Sheet 1.

J. F. GORDON.
Grain-Binder.

No. 210,319. Patented Nov. 26, 1878.

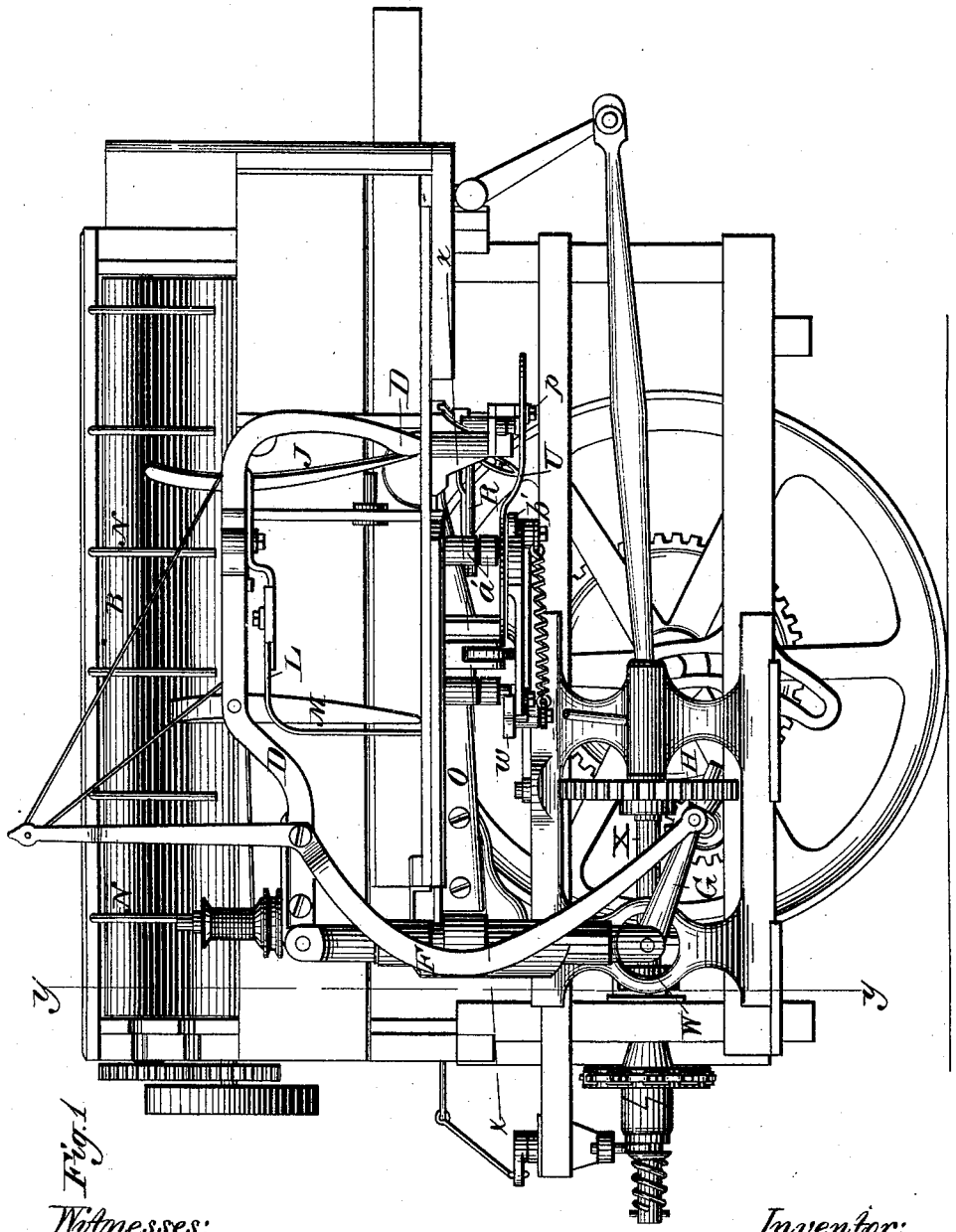

Fig. 1.

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J. F. GORDON.

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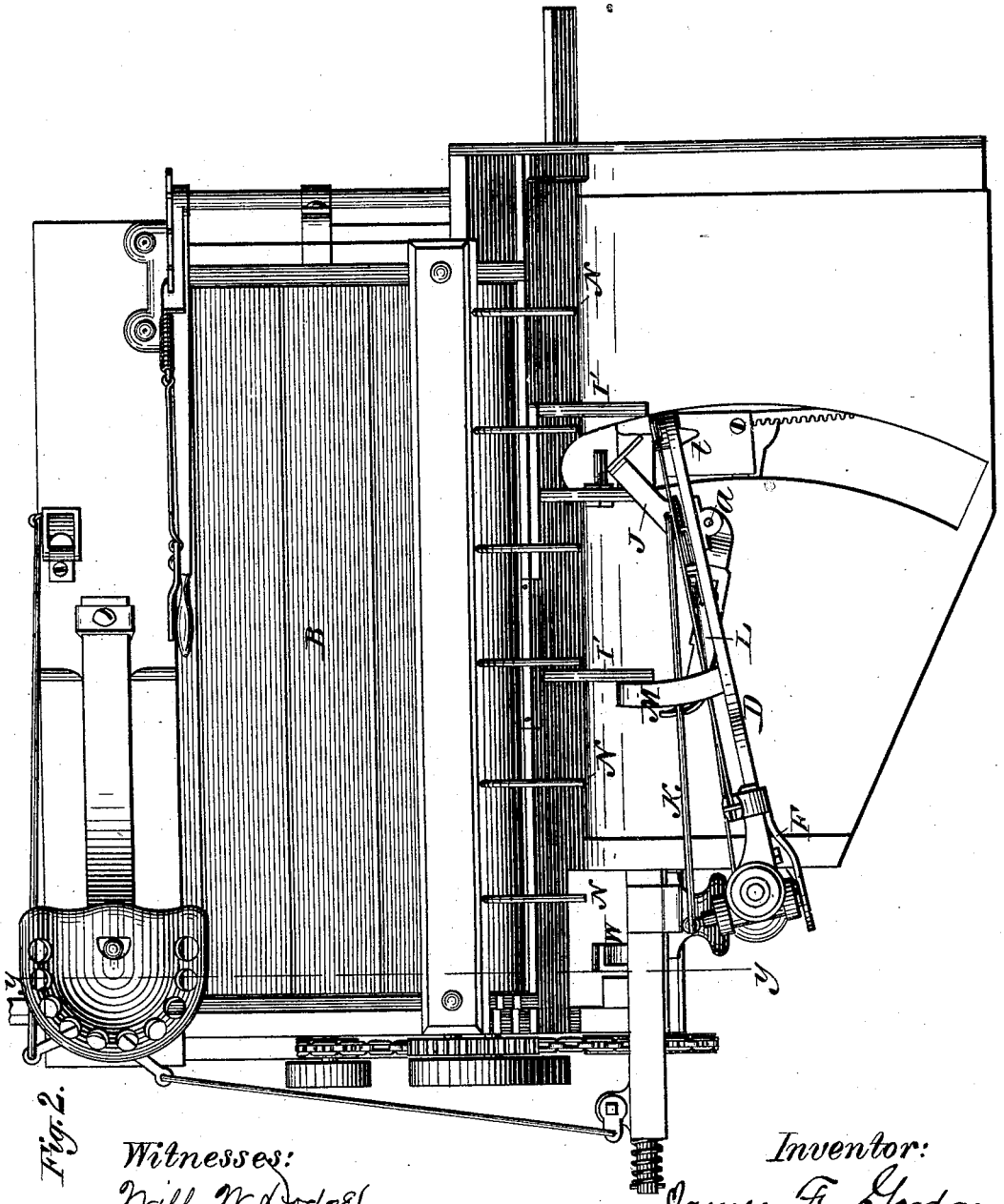

Fig. 2.

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Fig. 3.

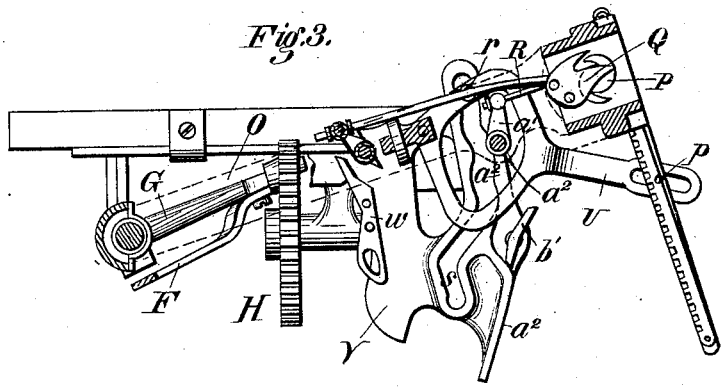
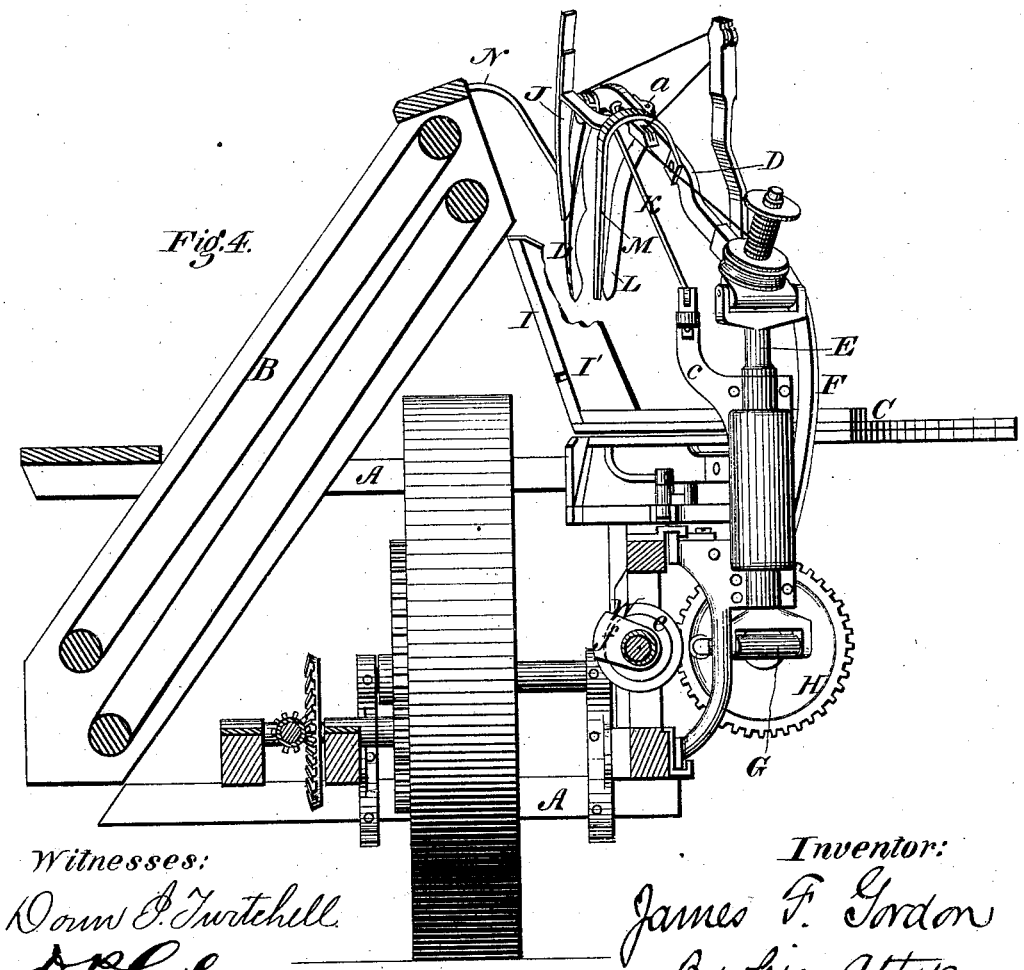


Fig. 4.



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Grain-Binder.

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Fig. 5.

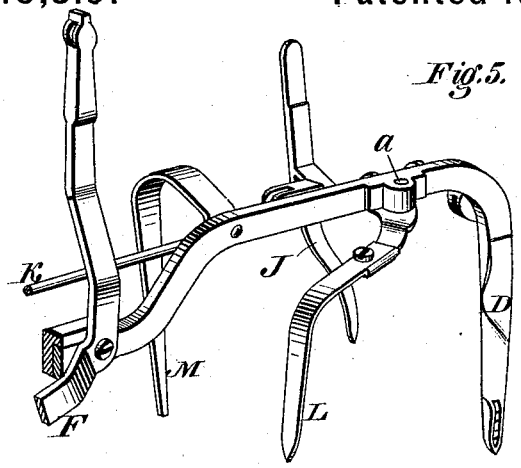


Fig. 6.

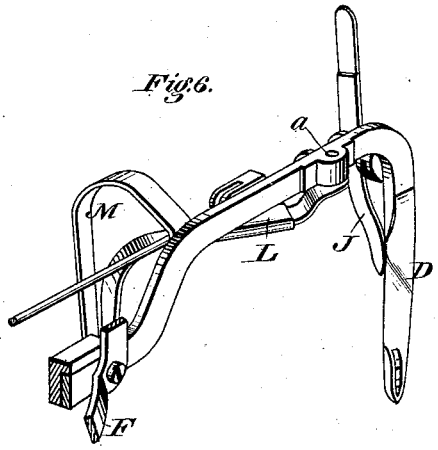


Fig. 7.

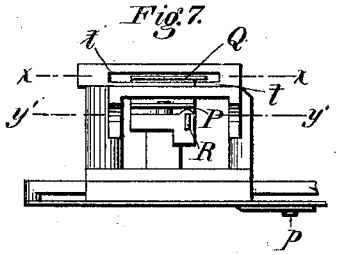


Fig. 8.

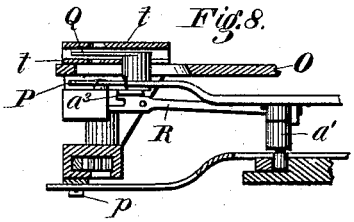


Fig. 10.

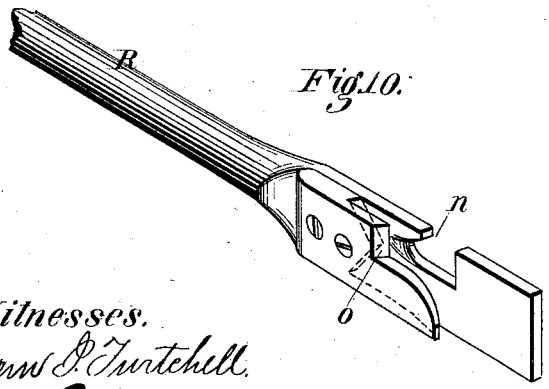
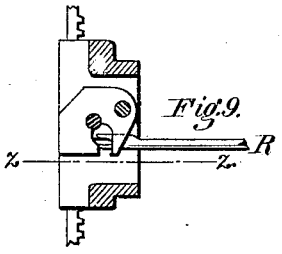


Fig. 9.



Witnesses.
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D. P. Cowe

Inventor:
James F. Gordon
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UNITED STATES PATENT OFFICE.

JAMES F. GORDON, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **210,319**, dated November 26, 1878; application filed October 16, 1878.

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-Binders, of which the following is a specification:

This invention relates to improvements in that class of binding-machines in which a movable binder-arm and twisting mechanism are employed, but more particularly to that class of machines in which the binder-arm and twisting mechanism vibrate horizontally about a vertical axis, advancing to seize the grain and then moving backward with the same during the operation of fastening the band, and represented in the Letters Patent No. 169,258, granted to me on the 26th day of October, 1875.

The present improvements consist, mainly, in the use of a divider-arm, of particular construction and arrangement, for the purpose of separating each bundle or sheaf, as it is seized by the binder-arm, from the incoming grain; in an arm arranged to sweep the bound bundles outward from the binding table or platform, to insure their delivery, preventing the bundles from clinging to each other, and causing the heads to move outward at the same or a greater rate of speed than the butts, in order that the bundles may be delivered squarely from the table or platform; in a peculiar combination and arrangement of the divider and delivering arms, in connection with each other; in certain improvements in the wire-twisting mechanism, consisting mainly in the form and arrangement of the lower wire clamping and cutting jaw; in a peculiar arrangement of a vibrating arm and fixed cam for controlling the twister-operating rack; in a clutch of peculiar construction and arrangement, to prevent the binder-arm from falling when its dividing mechanism is thrown out of gear; and in other and minor details, hereinafter fully described.

Figure 1 represents an outside elevation of my improved binder, as applied to a harvesting-machine. Fig. 2 represents a top-plan view of the same; Fig. 3, a horizontal section on the line *x x* of Figs. 1 and 7, looking downward and showing the details of the twisting mechanism; Fig. 4, a vertical cross-section on the line *y y*, Figs. 1 and 2, looking forward; Figs. 5 and 6, perspective views, showing the binder-arm, with the delivery and binding arms attached; Fig. 7, a front elevation of the twisting devices proper; Fig. 8, a vertical section of the same on the line *z z* of Fig. 9; Fig. 9, a vertical section of the twisting devices on the line *y'* of Fig. 7, looking downward; Fig. 10, a perspective view of the lower jaw of the twisting mechanism.

Referring to the drawings, A represents the frame of the harvesting-machine, provided with endless elevator-aprons B, of ordinary construction, by which the cut grain is delivered upon the outside horizontal binding-table, C, the table being arranged, as usual, below the upper ends of the elevator, and provided with an upright inner side, I, having brackets I', thereon to hold the grain in position against the advance of the binding-arm and wire.

D represents the horizontally-vibrating and vertically-reciprocating binder-arm, attached at its rear end by a horizontal pivot to the upper end of the vertical rock-shaft E, which latter is mounted in bearings at the rear end of the grain-table. At its lower end the shaft E is connected by a horizontal pivot to the end of the arm G, which latter has its forward end mounted in an eccentric-bearing in a rotary driving-pinion, H. A pitman or connecting-bar, F, extends from the binder-arm downward to the arm G, being connected to the two by means of pivots.

The above arrangement of parts, which is substantially the same as that in my original machine, causes the binder-arm to rise, swing forward toward the grain-elevators, then descend over the grain into the twisting devices located below the slotted table, and finally swing backward in the arc of a circle.

In practice, it has been found difficult at times to effect a clean and perfect separation of the bundles from the incoming grain. The first part of my present invention is designed to overcome this trouble; and to this end it consists in arranging, in connection with a binder-arm, a divider or separator, which descends with the binder-arm through the incoming grain, and there remains at rest, or practically so, in order to hold the incoming

grain from advancing as the binder-arm moves backward with its bundle. This divider may be constructed and arranged in a great variety of ways, and may be either attached to the binder-arm or mounted separately, as preferred; but I prefer to pivot said divider directly upon the binder-arm, and to operate it by means of a link or rod connecting with the stationary part of the machine, as shown in the drawings.

Inasmuch as the purpose of the divider is to effect a clean and complete separation of the bundle from the loose grain, and inasmuch as there is a strong tendency of the grain to cling together at the ends, even when separated at the middle, it is necessary that the divider-arm shall separate a wide distance from the binder-arm. In practice, I find that the least separation which will answer is from ten to twelve inches, and that to secure a perfect action the separation should be even greater, the best results being secured by a separation of about two feet.

Referring to Figs. 1, 2, 4, 5, and 6, J represents the divider or separator arm, connected at the point *a* to the binder-arm by means of a vertical pivot, the arm extending horizontally from said pivot, and thence downward such distance as to reach the level of the table when the binder-arm is depressed. To the arm J, at a point near its pivot, there is connected a rod, K, which extends backward, and has its rear end pivoted to a swivel-block, mounted on a rigid arm, *c*, on the binder-frame.

Under the above arrangement of parts it will be seen that as the binder-arm rises and swings toward the incoming grain, the divider, being elevated therewith, swings closely against its inner side, and then descends with the binder-arm through the grain; and that as the binder-arm swings backward with the bundle, the divider, remaining at rest, or nearly so, holds the accumulating loose grain, and insures a clean and perfect separation of the bundle from the same.

Another difficulty which has been experienced in the field is that of the tendency of the bound bundles of grain to cling to each other and to the loose grain upon the table at the heads. In order to overcome this difficulty I provide two arms, one of which serves to hold the loose grain back, while the other, advancing rapidly, serves to separate the bundle from the loose grain. This movable arm, advancing outward at the same or a greater rate of speed than the nose of the binder-arm and acting against the heads of the bundles, also serves the additional purpose of carrying the heads of grain outward at the same speed that the butts are carried, whereby the bundles are delivered squarely from the platform instead of being allowed to fall endwise therefrom, as usual.

The two last-mentioned arms may be arranged in a variety of different ways; but, as shown in the drawing, it is preferred to connect them directly to the binder-arm.

Referring to Figs. 1, 2, 4, 5, and 6, M represents a depending arm, rigidly attached to the binder-arm, for the purpose of descending through the flowing mass of loose grain and holding the same, as explained, while the bundle is being carried therefrom.

L represents the movable delivery-arm, which, in the present instance, for the sake of economy and simplicity, is attached to the before-mentioned divider-arm J.

The arm L extends outward and backward from the pivot *a*, and thence downward a sufficient distance to travel upon the face of the binding-table as the bundle is carried backward.

As the binder-arm swings forward to take the grain the arms L and M close together, as represented in Figs. 4 and 6, and then descend with the binder-arm through the loose grain at the inner side of the receptacle.

As the binder-arm swings outward the arm L, swinging outward under the binder-arm away from the arm M, and traveling at the same or a greater rate of speed than the nose of the binder-arm, forces the head of the bundle away from the loose grain, and outward squarely over the edge of the binding-platform.

It is manifest that the divider-arm J or the delivery-arm L may either of them be used separately, or that they may both be used to operate independently of each other; but the construction represented in the drawings is preferred.

In cases where the square delivery of the bundle is not considered of special importance, the arm L may be attached rigidly to the binder-arm and the arm M made movable, for the purpose of separating the grain at the heads.

In practice it may be desirable in certain conditions of grain to have the delivery-arm reach farther back toward the heads of the grain, and in badly-tangled grain it may also be desirable to cause it to travel a greater distance outward than the point of the binder-arm; and to this end the arm L is made in two parts, one of which is slotted and overlaps the other, and is secured thereto by a set-screw in such manner as to be adjustable.

It is obvious that, instead of making the arm L in two parts, the bearing on which it is pivoted on the binder-arm may be made capable of adjustment, and also the actuating-rod may be made with reference to adjustment as to length, as well as the point to which it is attached to the binder-frame.

In the use of the machine in the field it frequently becomes necessary to throw the binder-arm out of gear with the driving mechanism, and it is important that when this is done the binder-arm should not be permitted to fall vi-

olently in the event of its happening to be el evated at the time, as it would do in certain cases were no means provided to prevent.

For the purpose of sustaining the arm under the circumstances mentioned, I employ, as shown in Figs. 1, 2, and 4, a friction-clutch, W. This clutch is located upon the driving-shaft X, said shaft carrying a pinion, which drives the main operating-wheel H of the binding mechanism, as shown in Fig. 4. This clutch consists merely of a smooth wheel or disk, *e*, fastened upon the shaft, and of an eccentrically-pivoted arm, *f*, the end of which bears upon the periphery of the wheel or disk. The clutch permits the shaft to turn freely in the proper direction to drive the binding mechanism, but prevents it from being turned backward by the weight of the binding-arm acting through the intermediate mechanism. The eccentrically-pivoted friction arm or dog *f* may be arranged to bear against the inner side of the rim of the disk *e*, instead of bearing against the periphery of the same, and it may be found desirable to so arrange it as the dog or arm *f* would be less liable to break under such a construction.

Referring next to Figs. 1, 2, 3, 7, 8, 9, and 10, I will describe my improvements in the twisting mechanism. The mechanism consists, in the main, of a rotating hooked twister-head, P, and two wire-clamping jaws, Q R, one above and the other below the twister, as represented in Figs. 7 and 8. The upper jaw, Q, is mounted on a vertical pivot between two parallel plates, *t*, and arranged to force the wire into V throats or notches cut in said plates, as shown in Fig. 2, and in various patents heretofore granted to me. The lower jaw, R, is arranged to slide through an eye or bearing in the frame below the twister, and is provided, as shown in Fig. 10, with a shoulder, *n*, to receive the wire, and with a cutting-lip, *o*, which, acting in conjunction with a corresponding fixed lip on the frame, serves to sever the wire at a point below the twister. The jaw, so far as its operation in holding wire is concerned, is essentially the same as that in my prior patents; but the addition thereto of the knife or cutter is an essential feature of the present invention. By arranging the knife or cutter upon the jaw the severing of the wire at the proper time is rendered certain, and the difficulties attendant upon the use of a cutting-jaw on the twister-head avoided. When the cutter is thus formed upon the lower jaw the twister may be made, as shown, of a single thickness—that is to say, with a single hook or single set of hooks, instead of two hooks or sets of hooks, one above the other, as usual.

When the twister-head is made of a single thickness, and used in connection with a cutter on the lower jaw, as before described, it should stand far enough above the cutter to leave the ends of the wire long enough below the twister to admit of their being bent back at right angles, or practically so, when the twister is revolved, by their coming in contact with the plate a^3 below the under side of the twister, the object of which bending is to insure a more positive action of the hook or hooks in firmly twisting the wire.

The construction of the twister, as shown, avoids the necessity for the use of the ordinary stripping or clearing device for removing wire or straw therefrom. When the parts are constructed as above described the hooks of the twister are readily drawn away from the wire during the reverse movement of the twister-head, so that the usual difficulty arising from catching and binding of the wire in the twister-head is entirely avoided. The arrangement also avoids the necessity of clipping the lower ends of the binder-wire and wasting the same, as in machines hitherto constructed by me. As the lower jaw acts directly upon the wire, and the cutter acts in close proximity thereto, the usual danger of breaking the wire by straining the same across a sharp shoulder, such as that ordinarily used in connection with a cutting-lip on the twister-head, is avoided. The twister-head has the lower end of its shaft provided with a pinion, driven by a straight reciprocating rack passing through a suitable bearing in the twister-frame. The twisting devices, including the rack, are all mounted on a horizontally-swinging arm, O, attached to the vertical rock-shaft which carries the binder-arm, and extending forward under the binding-table, as in my original machine above mentioned.

For the purpose of giving to the rack the proper reciprocating movement to cause it to rotate the traveling twister at the desired times, I attach to its under side, or to a metal strap fastened thereon, a stud or pin, *p*, as shown in Figs. 1 and 3, and mount upon this stud the slotted swinging end of the horizontal lever U, which is pivoted to the vibrating twister-carrying arm O. On the under side of the arm U, I mount a stud or roller, *r*, extending downward into an irregular slot, *s*, formed in the plate V, which is secured firmly and immovably to the binder-frame. As the arm O is vibrated horizontally, it carries the arm U with it, and the roller *r* of said arm playing to and fro in the slot, it is given a vibratory movement upon and independent of the carrying-arm O, in such manner as to cause the required movements of the rack. By changing the form of the slot, the rack may be moved at such times and to such extent as the construction of the jaw and twister may render necessary.

When made of the form represented in the drawing, the slot causes, first, a slight rotation of the twister-head immediately upon the descent of the binder-arm, just before it has reached the limit of its downward movement and previous to the introduction into the head of the wire encircling the bundle, the object of this first partial rotation being to cause the first wire to be seized by one of the hooks of the twister, and carried out of the way at the

same time that the other hook is brought into position to grasp the second wire or end when presented by the binder-arm. After the above rotation the head remains at rest an instant, while the binder-arm completes its descent and presents the wire, and then receives another slight rotation, while the lower jaw, R, is open, which causes the shoulder *n* to remove the loop or bend of the wire from the jaw, and bring the wire just introduced to be grasped by the lower jaw as it is again closed. The hook next makes a second brief pause, in order to give the jaw time to grasp the wire firmly before it is severed, and then rotates a sufficient number of times to fasten the wires together.

During the inward movement of the carrying-arm the reverse movement of the twister takes place. The movement of the upper pivoted jaw, Q, is effected by means of a rod connecting with the swinging arm U, pivoted to the carrying-arm O, and operated by means of a pivoted cam or switch, *w*, mounted upon the plate V, as shown in Fig. 3.

In machines heretofore patented by me the reciprocating jaw or wire-holder R is dependent upon a spring for its action in clamping and holding the wire; but in the present instance the movement of said jaw and wire-cutter is effected by connecting its shank with a swinging arm, a', which is pivoted on the vibrating carrying-arm O, and provided with a roller, which, by the vibrations of the carrying-arm O, is caused to traverse the side of a fixed track, a^2, on the frame V, which is provided at the proper point with a pivoted switch, b', as shown in Fig. 3. The switch b' is held in its normal position (see Fig. 1) by a spring, having one of its ends eccentrically attached to its stem, the other end of the spring being preferably attached in like manner to the stem of the switch *w*. When the carrying-arm O swings outward the jaw R is held firmly closed in its socket against the wire by means of the roller on the pivoted arm a^1 traveling along the stationary track until it reaches the switch b', which causes it to withdraw from its socket and release the end of the wire at the proper time, which, under the present organization of the twister and attendant devices directly concerned in the fastening of the applied band, is immediately after the ends of the band encircling the bundle have been caught and firmly held by the upper clamping-jaw. Immediately after opening, as above, the jaw is closed again by the actuating-roller coming in contact with the incline on the track after passing the pivoted center of the switch b', thus firmly clamping the succeeding wire, which, by the second slight rotation of the twister, as before explained, has been placed across the notch in said jaw while it was withdrawn from its socket. As the actuating-roller passes up the incline on the track the spring before described permits the switch b' to turn on its pivot sufficiently to permit the passage of the roller and cause the jaw to return to its normal position again after the egress of said roller; and as the carrying-arm O vibrates inward the actuating-roller passes on the opposite side of the switch b', which, by the action of said roller after it has reached its center, is closed, thus forming a continuous track for the passage of the roller during the entire return movement of the carrying-arm O, whereby the jaw or wire-holder R is held firmly closed in its socket, thus insuring the positive holding of the wire. This positive action of the jaw or wire-holder is also desirable in order to insure the positive severing of the wire, as before described, instead of depending on a spring, which is liable to become weakened when in constant use, and which could not be depended upon for reliable action.

The switch b', instead of being pivoted, may be arranged to slide back and forth in a straight line and accomplish the same purpose; and instead of a spring to hold it in its normal position, its action may be made positive by a suitable cam arranged on the carrying-arm O. Instead of the shank of the jaw R being connected to the swinging arm a^1, it may slide in a suitable bearing on the carrying-arm O, and the actuating-roller journaled directly thereon.

It is obvious that the twister-operating rack, instead of being straight, may be curved in the arc of a circle, and that its operating-arm may be connected with it by means of a link, instead of being slotted and arranged to act directly thereon, as shown.

If desired, the binding mechanism under the present organization may be readily attached to machines having a right-hand cut, in which case the heads of the grain would be moved farther than the butts, for the reason that the binder-arm would then swing from a point in front of the butts and in front of the machine, instead of from the rear side of the machine, as at present arranged; and it may even be found desirable to so organize the binding mechanism that it shall swing from the front of the receptacle or butt-ends of the grain in machines having the cutter-bar arranged at the left-hand side, in which cases the before-described dividing and delivering fingers would be applicable to operate upon the reverse ends of the grain.

I am aware that in a grain-binding machine a wire-carrying or binding arm has been provided, with a small supplemental arm pivoted thereto, and arranged to have a very slight independent movement in advance of the binder-arm to assist the latter in forcing wire into the twister, the independent motion being necessarily limited to half the diameter of the twister-wheel, and the ends of the two arms standing in the same vertical plane. This arrangement, designed solely for the forcing of the wire into the twister, serves no other purpose. It does not effect a separation of the grain at the ends, and, owing to the arrangement of parts, and the fact that the supplemental arm moves in advance of the binder-arm, and cannot be carried beyond the twister,

it is impossible to cause more than a very limited separation of the two arms.

I am also aware that the point of a vertically-swinging binder-arm has been provided with a small pivoted shield or covering, having a slight independent movement as the two enter the grain, so as to hold the loose grain from crowding between the twister and the guide-hook. This device, while causing a slight separation or opening of the grain at the center, does not and cannot be made to effect a wide separation, or to cause the separation of the ends of the bundle from the loose grain.

In view of the foregoing devices, it is to be understood that I do not claim a divider having a slight separation from the binder-arm, for the purposes stated; but that my invention is limited to a divider which effects a minimum separation of ten inches, and which is adapted to effect the disengagement of the bundle from the loose grain.

Having thus described my invention, what I claim is—

1. In combination with a laterally-moving binding-arm, a divider-arm mounted thereon and arranged to separate therefrom after the two have entered the grain, substantially as and for the purpose described.

2. In combination with the vibrating binder-arm D, the pivoted arm J and link K.

3. In combination with a horizontally-vibrating binder-arm, two depending arms, one fixed and the other movable in relation thereto, arranged to act upon the head of the grain and prevent the loose grain from clinging to the bundles at the head.

4. In a binding-machine having a table or receiver, on which the loose grain is delivered, two arms, arranged to descend through the grain at its head and separate from each other, for the purpose of separating the head of each bundle from the loose grain.

5. In combination with the binder-arm D, arranged to operate as described, the arms L and M, substantially as shown.

6. In combination with a binder-arm arranged to vibrate around a vertical axis, substantially as shown, a delivery or carrier arm arranged to act against the heads of the bundles and move them outward, substantially as shown.

7. The arm L, pivoted to the binder-arm D, and arranged to swing outward at the same or a greater speed than the nose of the said binder-arm, for the purpose of delivering the bound bundles squarely from the machine.

8. In combination with an upper clamping-jaw, Q, and twister P, a lower clamping-jaw, R, having a knife or cutter attached, substantially as shown.

9. The combination of a stationary eye or socket and a sliding jaw, R, provided with a shoulder, *n*, sliding into said socket to hold the wire, and with a cutter, *o*, acting against an outside shoulder to sever the wire, substantially as shown.

10. A wire-fastening mechanism consisting of an upper clamping-jaw, Q, a lower clamping and cutting jaw, R, and an intermediate twister, P, having a single hook or single series of hooks arranged for joint operation, as shown and described.

11. The combination of the vibrating arm O, having the twister-head and its sliding operating-rack T, mounted thereon, the arm U, pivoted to the arm O, and the fixed plate V, provided with slots to operate arm U, as shown.

12. In a grain-binder, the combination, substantially as heretofore set forth, of the wire-holder or jaw R, having the wire-cutter attached, the pivoted arm a^1, having the roller thereon, the switch b' or equivalent, and stationary track a^2, for the purposes set forth, whereby both the clamp and the cutter are actuated positively.

13. In a grain-binder, the combination, substantially as hereinbefore set forth, of the wire-holder R, the pivoted arm a^1, having the roller thereon, the stationary track, and a switch, b', or its equivalent, located at a central point in the track, for the purpose set forth.

14. The twister-hook arranged in relation to the wire-cutter and plate, substantially as described, whereby the wire is bent at right angles, or practically so, under said hook or hooks, for the purpose set forth.

15. In a grain-binder, the combination, substantially as hereinbefore set forth, of the wire-holder R, its actuating-roller, the stationary track, and a switch, b', or equivalent, located centrally in said track, for the purpose set forth.

JAMES F. GORDON.

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