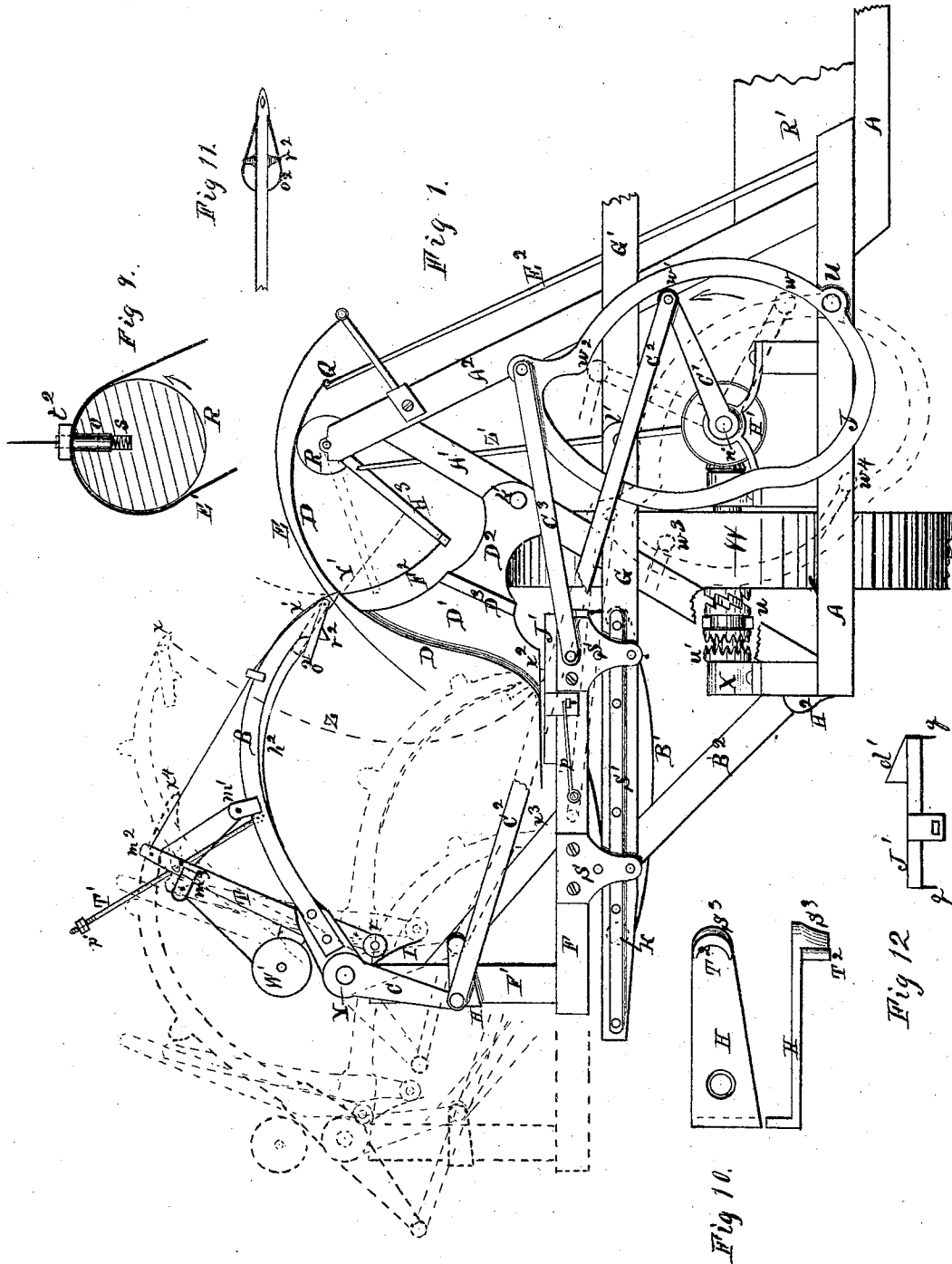


J. F. GORDON.
Grain-Binders.

No. 152,481.

Patented June 30, 1874.



Witnesses.

Witnesses.
J. A. Longborough
M. Gardner

Inventor:

By Jas. H. Gordon
Jas. H. Gordon

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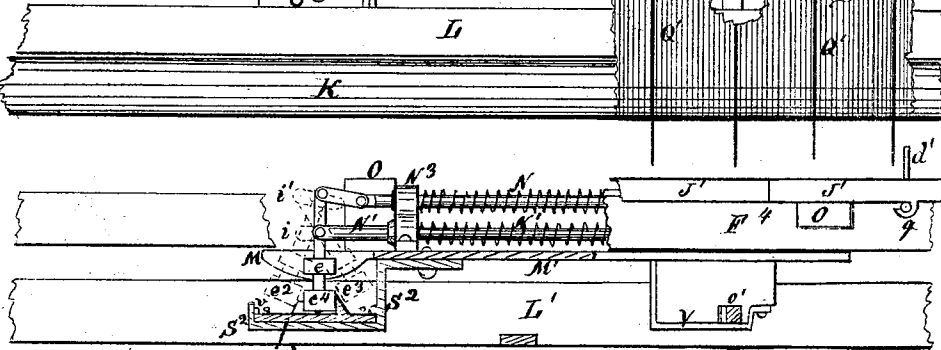
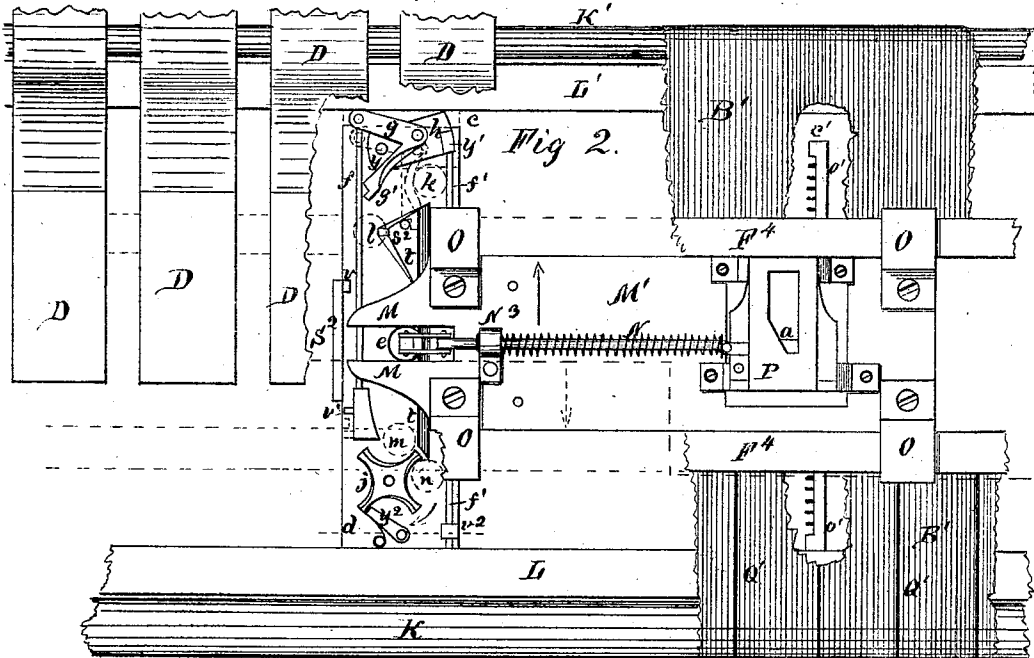


Fig 3.

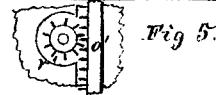


Fig 5.

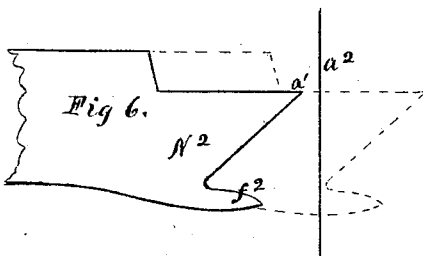


Fig 6.

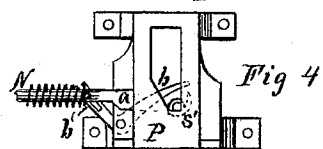


Fig 4.

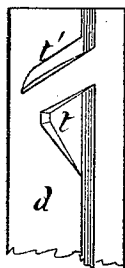


Fig 7.

Witnesses.

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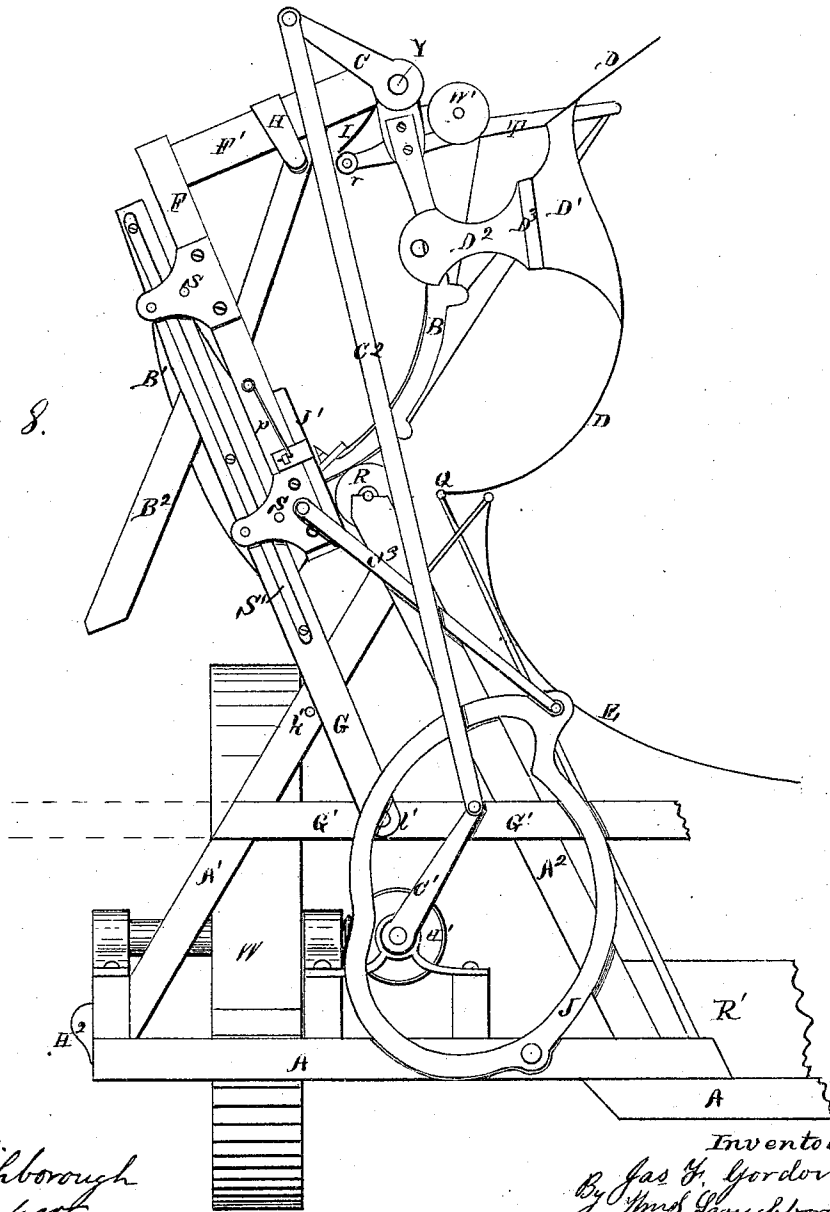
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Fig 8.



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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. **152,481**, dated June 30, 1874; application filed May 13, 1874.

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 new and useful Improvements in Self-Binding Harvesters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a front elevation of my improved self-binding harvester, having the cutting-platform and reel broken away. Fig. 2 is a top sectional view of the binding apparatus and platform. Fig. 3 is a rear sectional elevation of the same. Fig. 4 is a detached top view of the saddle or hanger frame for the wire-clamping jaws, and showing the wire-relieving guard *b*. Fig. 5 is a detached inverted view of the twister-hook pinion and its rack *a*¹. Fig. 6 is a view of the lower wire-clamping jaw *N*³. Fig. 7 shows a modification of the switch-track, for operating the clamping-jaws. Fig. 8 is a front elevation of those portions shown in Fig. 1, but representing the binder-frame, &c., folded up, whereby the machine may be drawn through an ordinary gateway. Fig. 9 is a sectional end view of the elevating-belt *R*, and showing a spring or yielding carrier bolt or lug to catch the cross-bars *t*² of the elevating-belt *E*¹. Fig. 10 is an elevation and a top view of the cushioned draft socket or lug of the crank-arm *C*. Fig. 11 is a top view of the end of the binder-arm, showing the pivoted clearing-yoke *o*². Fig. 12 is a detached view of the jacket *J*¹.

This invention consists more especially in mounting the binding mechanism upon a reciprocating frame; and the employment of an automatically-locking device to govern the movements of the same; and in providing for the folding up of the said frame and its carrier-bars, for the purpose of permitting the machine to be driven through ordinary gateways; in greatly simplifying the method of operating the wire-clamping jaws and the twister; also, in providing a sliding clutch to be under the constant and immediate control of the driver, by means of which clutch the working parts of the binding apparatus may

be either thrown into action or locked in any desired position while the other portions of the machine are in operation.

A represents the sill of the machine; *A*¹ and *A*², the supporting-braces of the upper portions thereof; *B*, the binder-arm; *B*¹, the fender-belt; *B*², the brace which sustains the swinging end of the pivoted carrier-bars *G*, upon which the sliding or reciprocating frame *F* and *F*¹ of the binding mechanism is supported; *C*, the binder-arm crank; *C*¹, the driving-crank; *C*², the connection of said crank-arms; *C*³, the connection of the locking-cam *J* and the said sliding frame; *D*, the conveyer-slats; *E*, the guards; *H*, the cushioned draft-stops for the crank-arms *C*; *J*¹, the metallic sheathing for the twister-frame; *K* and *K*¹, belt-rollers hung in the pivoted supporting-bars *G*; *L*, cross or tie bars of the same; *M*, jaws or ways between which the switch-roller *e* runs; *N* and *N*¹, rods of the clamping-jaws; *O*, hangers of the binder-frame; *P*, face-plate of binder-jaws; *Q*, hinge-joint of the slats *D*; *R*, elevating roller; *S*, stirrups or roller-hangers of the sliding frame; *T*, take-up lever for the binding-wire; *W*, ground or driving wheel.

I use the same cutting and elevating mechanism in this case as that set forth in my patent of August 27, 1872, No. 130,852. The carrier-slats *D* in this case are shaped about as shown in Figs. 1 and 2, one end being hinged to the upper end of the inclined bars or slats *E*, so as to permit them to be folded back, as indicated in Fig. 8. A hanger, *h*¹, is detachably connected to the brace *A*¹ at *t*³, each side of the machine. These hangers are fixed to the ends of the cross-bar *D*³ and the supporting-blocks *D*¹, to each one of which a slat, *D*, is fixed, and attached at proper distances to said cross-bar. The horizontal portion of the slats at the lower end are thereby suspended above the jacket or sheathing *J*¹ on the sliding frame, and the interstices between the slats *D* are entirely open and unobstructed, as shown in Fig. 2, from the line where the binder-arm strikes in to the extremity of the slats *D*. The supporting-rails *G* are pivoted to the bar *G*¹ at *U*. These two side bars are framed together by means of two cross-bars or girts, *L* and *L*¹, Fig. 2, between the rollers

K and K'. The bars G are provided with a track, S¹, upon which the reciprocating binder-frame F is carried. The hangers S are secured to the frame, and are each provided with two rollers, one above and the other below the track. The upper ends of the braces B² are rigidly fixed to the pivoted bars, and their ends rest in the sockets H², when the frame is in its working position, as shown in Fig. 1. The reciprocating binder-frame is composed of two side rails, F, and under the jacket J¹ two cross-bars, F¹, and the post F¹, the upper ends of which latter are connected by a cross-bar under the binder-arm shaft Y. This shaft is mounted in suitable boxes at the top of the posts F¹. The arm C is keyed to this shaft, so as to sustain about the relative arrangement to the binder-arm B as that shown by the full lines in Fig. 1. The arm B may be made adjustable laterally across the machine, substantially the same as in any of my former patents. The take-up bar T is pivoted to the binder-arm, and at the lower end is provided with a roller, r, that bears against the curved plate I, which is fixed to the cross-girt at the top of the posts. This plate I should be of sufficient length to admit of any desired amount of change in the adjustment of the binder-arm. The wire-reel W¹ I mount upon the take-up bar T. The latter is provided with a grooved pulley at m³, also one at m², and the binder-arm has a pulley at m¹. The wire passes from the reel to the roller m³, thence to m¹, and from that to m², and from that to the eye in the point of the binder-arm at x. The rod T¹ is pivoted to the binder-arm near m¹, and passes loosely through a loop fixed to the side of the take-up bar. The set-nuts p' may be adjusted so as to just rest upon the fixed loop through which the rod passes when the binder-arm is in its extreme downward position, and the rod is thereby made to hold any spring brought upon the take-up bar by the strain of the wire when compressing a gavel, and thus prevent it from drawing through the end of the binder-arm, or out of the grasp of the clamping-jaw, after being severed by the twister-hook.

It will be seen that when the binder-arm is in the position of the dotted lines at x, Fig. 1, the wire-pulleys m¹, m², and m³ are very near each other, but as the arm descends these points are separated, which causes a quantity of wire to be reeled off, (the end having been previously passed through the eye of the arm B and fastened to the lower end of the same,) and when the arm has returned to its upper position the descending grain from between the slats D and the guards E will readily cause this slack to assume a curve similar to that indicated by the dotted curve z, and when the arm again descends to encircle the gavel with the wire the former is permitted to readily assume a round or cylindrical form.

The metallic jacket or sheathing may be made in three or more sections, and the end

one made to overlap the central section, which latter is movable with the twister-frame, and has an opening to admit the end of the binder-arm with the wire. They are provided with open loops, as shown at q, Fig. 3, on each side, and these catch around the hooks or pins inserted in the bars F¹ and a hasp-loop, n', Fig. 1, over a staple, in which position the parts are secured by the hook p. The belt B¹ is attached to the front and rear cross-bars F⁴ of the sliding frame, and passes over the rollers K and K'. This belt may be made of ordinary canvas or any other suitable material, and is designed to prevent straws, &c., from dropping into the wire-twisting apparatus and the clamping-jaws and their operative mechanism.

There are several sustaining-fingers, Q', fixed to the rear bar F⁴ of the sliding frame, for the purpose of retaining one bundle, at least, upon the binding-frame until the next succeeding one is being encircled or compressed by or with the binding-wire, and thus insure a more perfect separation. These fingers Q' might be fixed to a separate bar hung between the pivoted arms G, in rear of the belt-roller K, if desired; or a close shelf might be employed, and attached in either position.

The cushioned draft-loops H are bolted to the posts F¹ of the sliding frame. They are made, as shown in Figs. 1 and 10, so as to receive the end of the crank-arms C when they are to draw the binder-frame in. The sockets S³ of these stops are preferably provided with a cushion, T², of rubber, felting, or other suitable material, to relieve the parts from the concussion otherwise produced by the end of the cranks C striking the socket. A metallic spring would serve the same purpose.

The roller R, which is the driving-roller of the elevating-belt, I provide with several yielding carrier-bolts, o, which consist of a small bolt having a slight enlargement or shoulder at such a distance from the outer end as to permit it to project through the plate which secures it in its place in the roller, and to catch against the cross-bar t² of the elevator-belt E'. This bolt is rendered yielding by means of a spring, s, whereby, if a cross-bar should happen, as is liable to occur, to come upon the end of the said carrier-bolt, as shown in Fig. 9 in full lines, the spring would allow the bolt to retract, and thus avoid breaking or straining the belt.

The divider-fingers F² may be curved, as shown in Fig. 1; or they may be made of thin plates, constructed with a wide base, as indicated by the space between the curved line F² and the dotted line Y'. This latter shape would undoubtedly effect a more perfect separation or division of the grain-stalks. These fingers are fixed to a cross-bar extending from one arm, H³, to the opposite one. These are hung to the axial shaft of the elevator-roller R, and are operated by a connecting-rod, Z', which is driven by a cam upon the shaft n'.

The fingers F^2 may be made to work between the slats D, or through openings in them made for that purpose.

The binder-arm B is operated, by means of the levers or crank-arms C, from the driving-crank C^1 , through the connection C^2 . As will be seen, when the driving-crank is at w the binding-arm would be at x . As the crank passes up to w^1 the binder-arm is carried down to x^1 ; and, when the crank reaches w^2 the end of the binding-arm has entered the twister-frame at x^2 ; and as the crank C^1 moves beyond this point the binding-arm preventing the crank C from turning any farther upon its axis, the sliding carriage or binding-frame is thrown back to the position shown by heavy dotted lines. Then, as the driving-crank C^1 moves toward w^4 the end of crank C is brought into the sockets S^3 of the stirrups H, and raises the binding-arm to the upper position, indicated at x^4 ; and when the crank C^1 reaches the point w^4 the reciprocating frame is returned to the position shown in full lines. The binder-arm and twister should be adjusted so as to register to one of the openings between the slats D, which being opened out to the end of said slats, the end of the binder-arm is allowed to swing down into the twister-frame, and remain there while the frame F is thrown back; and, furthermore, there is no obstruction to straws, &c.

It is obvious that, owing to the above-described construction of these parts, whenever the cranks C were not in contact with the sockets S^3 , the reciprocating frame would be liable to move back or forth by the jostlings of the machine, &c., or when the gavel is being compressed or encircled by the binding-arm. To prevent this, I provide the locking-cam J, which is shaped about as shown, and is pivoted to the sill of the machine at u . The upper or swinging portion is connected, by the pitman or connection C^3 , to the sliding frame, whereby it is firmly held in the desired position at all times.

While the crank is passing from w to w^2 the sliding frame is at rest; and while it is passing from w^2 to w^3 said frame is thrown out, as indicated by the heavy dotted lines, where it again remains at rest while the crank passes around to w^4 , and the frame is returned while the former is swinging from w^4 to w .

It being desirable to enable the driver to throw the binding mechanism into or out of gear or operation at any time, I provide a sort of double clutch, or one that will lock the parts in a fixed position when those parts are thrown out of gear with the driving-wheel, so as to prevent a retrograde or a continuous forward movement of the binding mechanism.

The clutch w' , preferably having V-shaped teeth, is fixed to the box X; and when the binding machinery is to be thrown out of operation while the harvester is still moving, the clutch u on the main axle would be thrown clear over, so as to lock into the fixed clutch

w' , whereby, through the bevel-gears II^1 and the locking-guard J, the parts are all firmly held in a fixed position. This ratcheted locking-clutch u may be operated by any ordinary system of bell-cranks and levers extending to a convenient position near the driver's seat, to be operated by either his hand or his foot in one direction, and be moved in the opposite way by a counteracting spring, or otherwise.

The shaft w' and locking-cam J may be hung higher up in the machine, if desired, by any suitable arrangement of gears and shafting, to prevent the lower portion of the cam or guard, and also the crank C^1 during that portion of the sweep of the latter, from dropping below the sill of the machine.

The stock M' , Fig. 2, to which is attached the wire-clamping jaws and twisting mechanism, is hung between the cross girts or bars F^4 of the reciprocating binding-frame by means of the looped hangers O, which permit the stock to be adjusted to any desired position laterally across the machine, and, at the same time, serve as a tie between the bars F^4 .

It will be seen that the twisting apparatus in this case occupies a horizontal position instead of vertical or inclined, as in my former patent before mentioned.

The wire-clamping jaws are made and arranged to operate substantially the same as set forth in my application filed February 21, 1874, except the rear or under jaw N^2 , which I now make as shown in Fig. 6. This construction of that jaw has been found to work far more satisfactorily than as formerly made. The point of the jaw at a^1 being shortened so as to be entirely withdrawn from the fixed jaw indicated by the line a^2 , causes it to effectually discharge any fragment of wire or severed ends of the band at each stroke or operation of the jaw. The end of the wire is looped around the finger f^2 , and forced thereby against, and partially into, the cavity in the fixed jaw, whereby it is firmly held while the binder-arm rises to its open position to receive a bundle or gavel, and while it is encircling the succeeding gavel with wire.

I have found that during the time the binder-frame is returning to receive each succeeding gavel, there was a liability of the backward revolutions of the twister-hook, which takes place at the same time, to cut off the wire thus strained across the track of the points thereof. This I obviate by means of the bar b , Fig. 4, pivoted to the under side of the face-plate P. This bar constitutes a sort of bell-crank, and the opposite arm b' is slotted, as shown, or otherwise connected with a pivot on the arm or rod N of the jaw a , so that when this jaw is open or withdrawn, as shown in Fig. 4, the arm b is thrown forward, as shown, and bears the wire with it beyond the track of the revolving twister-hook. This latter is operated by means of a simple rack, o^1 , and pinion r' , the former being carried or sustained in the hanger V, by which it is suspended be-

tween the cross girts or bars L and L' of the pivoted or supporting bars G . When the reciprocating frame or stock M' moves in the direction indicated by the dotted arrow in Fig. 2, the twister-hook s^1 is made to rotate forward so as to cut off and twist the ends of the band together; and when they move in the direction of the full-line arrow the direction of rotation of the hook is reversed. The rack is made a very little shorter than the distance between the bars L and L' , which affords a short interval of rest for the twister-hook at the end of each reciprocation, more than is occupied by the frame—that is, the frame moves a short distance either way in commencing a return-stroke, carrying the rack with it, before the end of the latter strikes the bar L or L' . This distance, as indicated at c' , Fig. 2, may be made more or less according to the length of time the twister is desired to remain at rest, which is for the purpose of enabling the wire-clamping jaws to act—the upper one to grasp the ends of the encircling-band, and the lower one to release the wire previously held by it before the twister commences its revolutions.

The wire-clamping jaws a and N^2 are connected with, and operated by, the rods N and N^1 , and their springs, which are relatively arranged the same as those shown in my former application filed February 21, 1874, but the rods are actuated in the following manner.

To the under side of the stock M' is bolted a hanger-plate, S^2 , Figs. 2 and 3, which sustains a narrow bed-plate, d , that extends nearly from bar L to L' , as shown in Fig. 2. This plate d is fitted to slide freely in its track or bearing in the hanger, but as its length is but little less than the distance between the said bars, its longitudinal movement is only sufficient to permit of the automatic changes of the switch, more fully described hereafter, yet allowing the stock M' and the hanger S^2 to be easily reciprocated by the sliding frame.

The plate h is pivoted to the bed-plate d at y . Said plate h is provided with a socket, y^1 , which sustains that end of the shipper-rod f^1 , and the opposite end passes through and has a bearing in the lug v^2 . This rod should be of such a length that it and the shipper-plate h shall just measure the distance between the bars L and L' , whereby the axial point of the switch g' is prevented from moving forward with the plate d as the frame and stock M start to move in the direction of the dotted arrow. This change of relative position of the switch and the lug s^2 unhooks and relieves the former from the latter.

The track t is fixed to the plate d in the position shown, and at the opposite end of the plate is pivoted the star-wheel or switch j , which is permitted to revolve in the direction of the arrow, but is prevented from turning in the opposite direction by the spring dog or pawl y^2 .

The lever connecting the rods N and N^1 is provided at the lower end with rollers e and

e' . The roller e works between the jaws M of the stock M' . The roller e' travels either side of the track t in the following manner: As the stock moves in the direction of the dotted arrow, Fig. 2, the several parts occupy their position, as shown in full lines. When the roller e' arrives at the point m it comes in contact with an arm or point of the star-wheel or switch j , which turns and carries the roller to the position indicated by the dotted circle at n , Fig. 2, and as the stock M' starts in the direction indicated by the full-line arrow the roller is forced over upon the other side of the track, as indicated by the dotted lines e^3 , the lever swinging in the end of the rod or spindle N^1 as a fulcrum, the upper end of the lever assuming the position indicated by the dotted lines at v' , which withdraws the rod N and opens the upper jaw a . The lug v on the hanger S^2 strikes the lug v^1 on the rod f about the time the roller reaches the point m , and draws the switch g' up in the line indicated by the dotted lines, and when the stock M' starts to move toward the bar L' the bed-plate d is carried with it until the end strikes against said bar, and this movement, it will be seen, forces the plate h into the position indicated by the dotted lines, and thus causes the end of the switch to catch upon the lug s^2 . The roller e' travels upon the right-hand side of the track, as shown at e^3 , holding the upper jaw open and the other closed until it arrives at the point k , where it drops into the curved depression in the switch-arm g' , which is for the purpose of permitting the arm b to drop back out of the way of the wire and twister-hook. Then, as the opposite reciprocation of the stock M' commences, the plate d moves with it until the end strikes the bar L , and the rod f^1 preventing that end of the plate h from following, the switch-arm g' is unhooked from the lug s^2 , and the roller e' is forced up the inclined plane to the point l , which closes the upper jaw a and opens the lower one. The same position of the roller e' is represented by the dotted lines e^2 in Fig. 3, the upper rod becoming the fulcrum in this case, and the lower one, N' , being withdrawn, as indicated by the dotted lines at i . Since the lower jaw only requires to be open for a short interval, the roller e' is immediately allowed to return to its normal position, and the various operations are repeated. The movements of the jaws and their actuating mechanism must be timed to correspond with those of the binder-arm, &c. Instead of the automatically-acting switch g' and the several devices for operating it, a tolerably satisfactory result may be attained by means of a simple guiding-track, t^1 , fixed to the bed d , Fig. 7. The lower end of the brace B^2 may be locked to the socket H^2 by a hook or other suitable means. The guard or clearing yoke o^2 may be composed of a single plate bent in the form of a bow, and the ends pivoted near the end of the binder-arm, as shown in Figs. 1 and 11,

and it is forced to the position shown by the full lines by the spring h^2 , except when the binder-arm enters the twister, when it is brought into the position indicated by the dotted lines in Fig. 1. This device is designed to prevent the side projections r^2 from catching in the straws when entering the grain.

The machine is folded up, as shown in Fig. 8, to permit it to be drawn through gateways by removing the bolts k' , when the parts can be swung into the position shown in said Fig. 8. It might be desirable to suspend the twister-rack o' and the bed-plate d , either or both, from the bars L and L' by having the ends rest in suitable mortises, or on brackets, or otherwise.

To insure the proper delivery of the bound bundle from the horizontal portion of the slats D I provide the brackets d' , which are preferably attached to the jacket J' , as shown in Fig. 12. They are shaped as shown to enable them to be readily carried under the grain or gavel as the binder-frame moves forward; but to insure their catching the bundle when it moves back, and to discharge the same from the slats, there may be one or more fixed to each of the end jackets, and they should be so arranged as to register to the interstices between the slats.

The operation, briefly stated, is as follows: The cut grain, after being elevated, is delivered to the binding apparatus upon the horizontal portion of the slats D . The end of the binding-wire having been previously adjusted in the twister, and secured by the lower clamping-jaw, the reciprocating frame moves to the position indicated by the full lines in Fig. 1. The end of the binder-arm being at x the slack wire before described is readily forced back by the accumulating grain, and as the arm descends and enters the twister just a sufficient quantity of wire is reeled off to encircle the compressed bundle, whether it be large or small. The ends of the encircling-band are twisted together, while the reciprocating frame is being thrown to the position indicated by the heavy dotted lines, Fig. 1, at which time the arm is again raised, the bound bundle still remaining upon the frame, which tends to trim up the grain in the next gavel as the reciprocating frame moves forward for it. It is found that this keeps the gavels truer and makes the separation more perfect, because the grain-stalks are more or less overlapping each side of the binder-arm, and when the last-bound bundle is dropping from the frame, before the next succeeding one is bound, the division is liable to be imperfectly effected, there being more or less slobber in the operation, especially if the grain is lodged or tangled; but when the last bundle remains until the next is being compressed or bound each takes its own when they part.

If there should be no gavel to be bound when the arm descends at any time the slack wire will be temporarily taken up, as before

shown, by that movement of the parts, and as the arm rises it will be again released. The quantity of this slack wire may be regulated by using a longer or shorter take-up lever, or by changing the relative position of the wire pulleys m^1 , m^2 , and m^3 . These pulleys should all have some sort of a guard-loop to prevent them from unthreading.

I use a wind-board similar to that set forth in my said former patent, but in this construction of the machine I prefer to attach it to the pivoted side bars G . Instead of the locking-cam J the connection C^3 might be provided with a toggle-joint, and the end now attached to the cam J be pivoted to the side bar G . This would lock the binding-frame in its outer position until the joint was tripped, which might be done by a lug fixed to the pitman C^2 . The frame might be locked into its inner position by a similar toggle-jointed lever, having one end pivoted to the cross-bar L , Fig. 2, and the other to a lug fixed to the under side of bar F^4 . This lever should fold horizontally after being tripped. Instead of the star-wheel j a pivoted bell-crank switch, similar to g and g' , might be employed, and connected thereto by the rod f , whereby either would receive its adjustment from the other alternately. Instead of the brackets d' a pivoted bar, with rake-teeth arranged to rise and fall by the reciprocations of the binding frame or carriage, might be employed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The reciprocating binder frame or table, carrying the binding-arm and twisting mechanism, in combination with the receiver, substantially as described, for the purpose of compressing and binding the cut grain and discharging the same from the receiver, substantially as set forth.
2. The oscillating binding-arm, pivoted or journaled on the reciprocating binder frame or table, in combination with the twisting mechanism, arranged to operate conjointly, substantially as and for the purposes set forth.
3. The automatic locking device J , or its equivalent, constructed and arranged to operate conjointly with the reciprocating binder-frame and binding-arm for the purpose of controlling the intermittent reciprocations of the binder frame or table, so as to permit the binding-arm to compress the gavel and return to its open position alternately, substantially as set forth.
4. In combination with the crank-arms which actuate the binding-arm shaft, the latter being journaled to the reciprocating binder frame or table, the open sockets or stops S^3 , for the purposes set forth.
5. The revolving cranks C^1 or their equivalent, and the connecting-rods C^2 , in combination with the cranks C and the stops S^3 , for the purpose of imparting to the binding-arm a reciprocating and an oscillating movement,

substantially as described, for the purposes set forth.

6. The take-up lever T, pivoted or journaled to the binding-arm B, in combination with the cam-governing plate I, arranged to operate conjointly upon the binding-wire, substantially as and for the purposes set forth.

7. The adjustable tie-rod T¹, in combination with the binding-arm and take-up lever T, substantially as and for the purposes set forth.

8. The wire reel W' and pulleys M² M³ upon the take-up lever T, in combination with the pulley M' on the binding-arm B, arranged as described, to permit of there being a slack in the wire when the binding-arm is in its upper position, and provide for taking up the same when it descends, substantially as and for the purposes set forth.

9. The grain-supporting slats D, secured to the suspension-brackets D¹ on the cross-bar D², substantially as and for the purposes set forth.

10. The supporting-slats D, hinged or jointed to the upper ends of the slats E², in combination with the detachable cross-bar D³ to permit of their being folded with the binding mechanism, for the purpose set forth.

11. The pointed cut-off or dividing-fingers F², constructed with a broad base, substantially as shown and described, and arranged to operate conjointly with the binding-arm B for the purpose of providing a free passage for the said binding-arm through the grain, as set forth.

12. The grain-supporting slats D, curved at their lower end and extending horizontally over the reciprocating binder frame or table, substantially as shown and described, for the purposes set forth.

13. The fender-belt B¹, secured to the reciprocating binder frame or table, substantially as shown and described, and passing around the rollers K and K' on the supporting-timbers for the purpose of protecting the operative mechanism and the wire-clamping and twisting devices from becoming clogged with straw or other foreign substances, substantially as set forth.

14. The lower wire-clamping jaw N², constructed with the point a¹ and finger f², as shown, for joint operation with the fixed jaw.

15. The pivoted guard-bar b, constructed to operate substantially as described, for the purpose of preventing the binding-wire from coming in contact with the twisting-hook during the reverse movement thereof, as set forth.

16. The elevating-roller R, provided with a yielding spur or bolt, o, constructed and arranged to operate in combination with the cross-bars t² of the elevating-belt E, substantially as and for the purpose set forth.

17. The supporting-fingers Q', or their equivalent, secured to the reciprocating binding-frame for the purpose of retaining the bundle until the next gavel is compressed, as set forth.

18. In combination with the binding-arm B, the spring-guard o², operating to shield the projection r² while passing through the grain, as set forth.

19. The hanger S², fixed to stock M¹, constructed and arranged to operate conjointly with plate d, provided with track t, substantially as and for the purpose set forth.

20. The rack o¹, movably suspended from stock M', and arranged to operate the pinion r' on the twister-shaft, substantially in the manner shown and described.

21. The star-wheel switch j, arranged to operate on the roller e¹ to change its path upon opposite sides of the track t in its reciprocations, substantially as and for the purposes set forth.

22. The lock-gate g', constructed and arranged to operate conjointly with the travelling-roller e¹, substantially as described, for the purpose set forth.

23. In combination with the pivoted lock-gate g', the swinging axial plate h, rods f and f¹, and reciprocating lug v, constructed and arranged to operate conjointly, substantially as and for the purposes set forth.

24. The cam-shaped projection on the track t at l, Fig. 2, in combination with roller e¹, and its lever pivoted to shanks N N¹ for the purpose of opening the lower wire-clamping jaw, substantially as set forth.

25. The timbers G, supporting the reciprocating binding-frame and binding mechanism, pivoted or jointed to the main frame of the harvester to permit of their being folded vertically with the binding mechanism, substantially as described.

26. The brackets d', or their equivalent, on the reciprocating frame or table, constructed and arranged to operate substantially as described, for the purpose of assisting the binding-arm to discharge the compressed gavel from the extended or horizontal portion of the supporting-slats D, as set forth.

27. The reciprocating binding-frame, carrying the binding mechanism, the crank-shaft w¹, and main driving-axle, in combination with the sliding clutch u on the main axle, and fixed clutch w' on the main frame, for the purpose of locking the binding mechanism, substantially as set forth.

JAS. F. GORDON.

Witnesses:

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