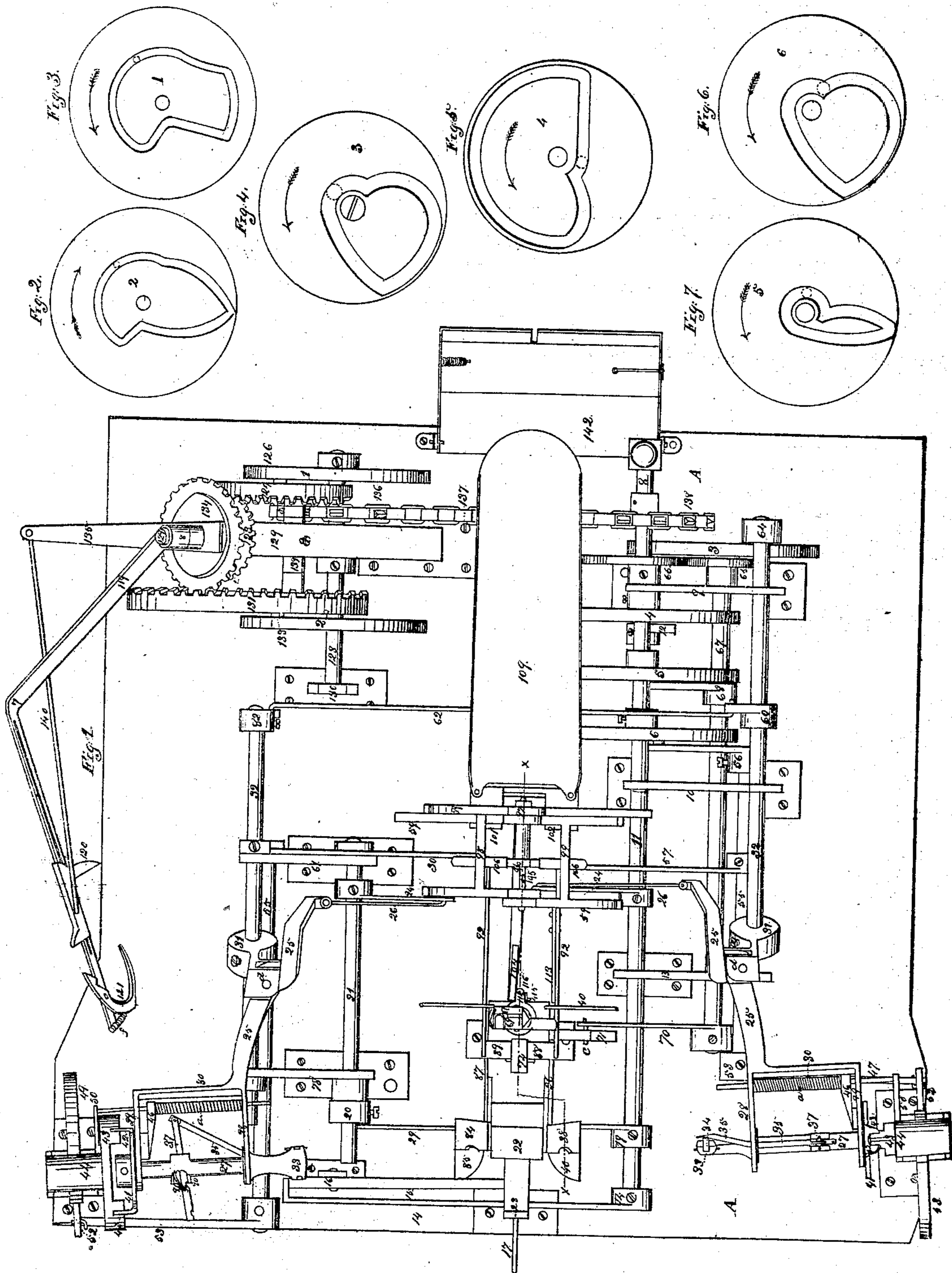


J.M. McMaster Grain Binder

No 91,860

Patented Jun. 29. 1869.



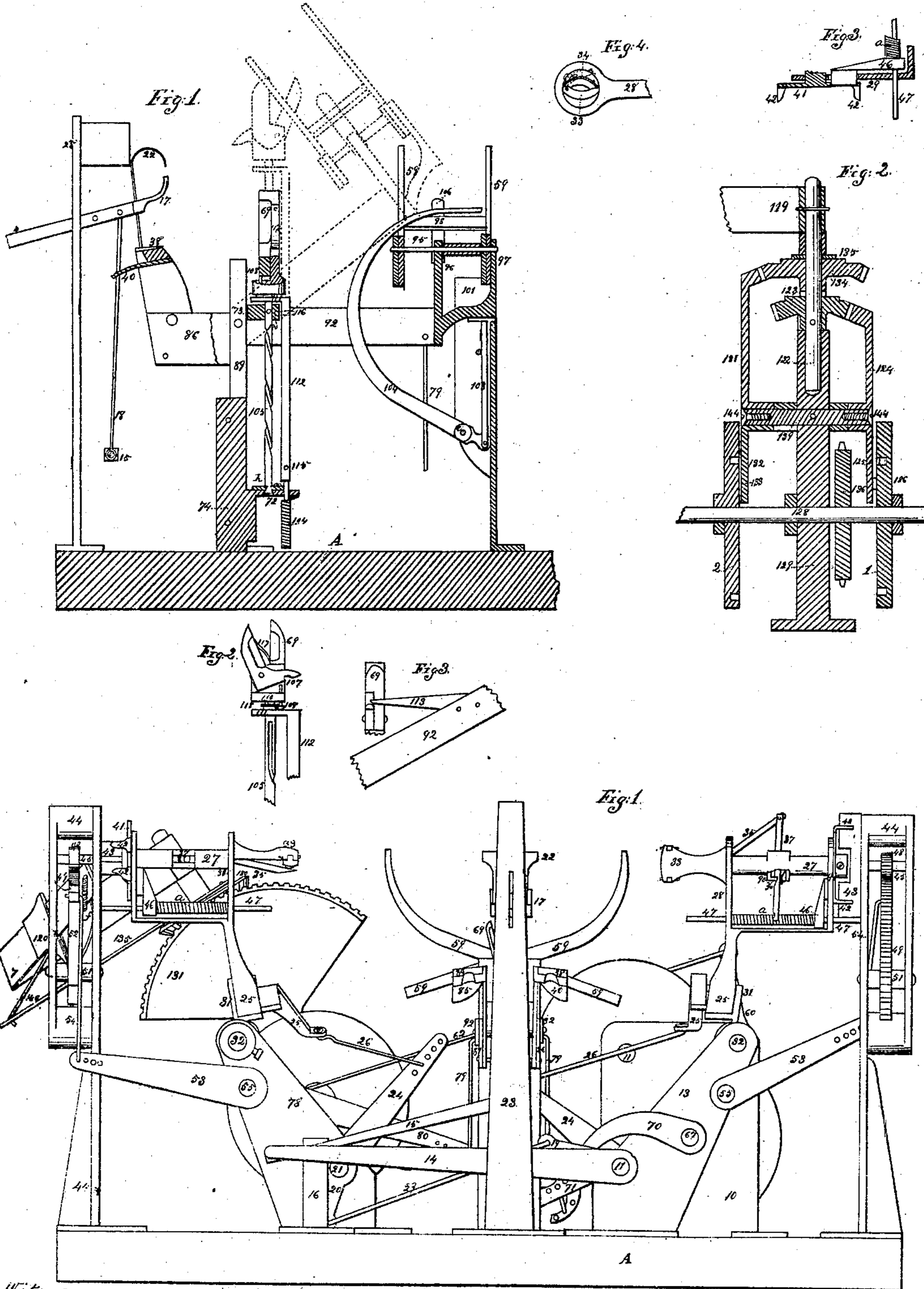
Witnesses:
Jas. M. McMaster
J. M. McMaster

Inventor
J. M. McMaster

J. M. McMaster
Grain Binder

N^o 91,860

Patented Jun. 29, 1869.



Witnesses:
J. M. McMaster
J. M. McMaster

Inventor:
J. M. McMaster

UNITED STATES PATENT OFFICE.

J. M. McMASTER, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. 91,860, dated June 29, 1869.

To all whom it may concern:

Be it known that I, J. M. McMASTER, of the city of Rochester, in the State of New York, have invented a new and useful Grain-Binder; 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, Sheet A, is a top view. Figs. 2, 3, 4, 5, 6, and 7, Sheet A, are elevations of cams 1, 2, 3, 4, 5, and 6. Fig. 1, Sheet B, is an elevation taken on the left-hand side of the machine. Fig. 2, Sheet B, is a vertical section of the devices that move the rake. Fig. 3, Sheet B, is a sectional view of the locking device of automatic hands 33. Fig. 4, Sheet B, is an end view of automatic hands 33. Fig. 1, Sheet C, is sectional elevation taken in the direction of lines *x* in Fig. 1, Sheet A. Fig. 2, Sheet C, is an elevation of twisting tying-pinchers. Fig. 3, Sheet C, is a side elevation of a portion of frame 92, arm 113, which closes the tying twisting-pinchers 69.

The nature of this invention will be understood from the drawings and specifications.

To enable others skilled in the art to make and use my invention, I will describe its construction and operation.

A suitable platform, A, is provided, on which are located the several parts of the binder, and is carried by wheels of proper dimensions. When the binder is in use it is located in the rear of any reaper, and in such a relative position as that the grain may be reached by the clamping-rake 7. It is driven by a chain-belt (or shaft with proper gearing) extending from shaft 8 to a wheel on the reaper or one under the platform. The shaft 8 is located on the rear end of the platform A, and sustained by bearings 9 and 10 on the shaft 8.

I rigidly attach cams 4, 5, and 6, Figs. 1, 5, 7, and 6, Sheet A. The cam 4 operates the shaft 11, by means of crank 12, which is keyed thereto. The shaft 11 extends nearly to the side of the platform opposite the driving-power, and is sustained by bearings 10, 13, and 9. On the shaft 11, and near the left-hand end, an arm, 14, is keyed, which extends toward the front of the binder and operates on the

short arm of the lever 15, Figs. 1, Sheets A and B, which is pivoted on the upright post 16, same figures. The long arm of lever 15 is attached to and operates the gathering-arm 17, Fig. 1, Sheet C. One end of the gathering-arm 17 is sustained and guided in a vertical movement by the slide 22, Figs. 1, Sheets A and C. The outer end moves through a slot in standard 23, Figs. 1, Sheets A, B, and C, and is also held in position by it. The inner end is bent upward in the form of a segment of a circle, and, with the upper end of the slide 22, which is in like form, collects the straw, before it is twisted, into a compact form after it is separated from the gavel.

On the shaft 11, and near the arm 14, a short arm, 19, is keyed, which is connected to arm 20 on shaft 21 by rod 29, Figs. 1, Sheets A and B. The shafts 21 and 11 have also attached to them arms 24, which are connected to levers 25 by rods 26, Figs. 1, Sheets A and B, by which they are caused to move together; but the arms 19 and 20, occupying different positions in regard to their shafts 11 and 12, move in opposite directions, thereby moving the twisting devices to and from one another.

On the shafts 11 and 21, I fasten the arms 24, Figs. 1, Sheets A and B. These arms, by the connecting-rods 26, are connected to the short arms of the levers 25, Figs. 1, Sheets A and B, which carry the bearings 28 and 29 of the twisting-spindles 27, Figs. 1, Sheets A and B. Two of these bearings 28 extend out directly from the long arms of the levers 25. The others, 29, are parallel to arms 28 and sustained by arms 30, which are at right angles to and attached to the levers 25. These levers 25 are pivoted at *d* to hubs 31, which are keyed to shafts 32, Figs. 1, Sheets A and B, and when the shafts 32 are moved onward, they carry the twisting-spindles 27, to grasp the straw for the band, in the arc of a circle that will pass the out end of the rods 37 over the inclined planes 38 and 84, Figs. 1, Sheets A and B, and when the twisting devices again move onward to deliver the ends of the band into the pinchers 69, Figs. 1, Sheets A, B, and C, to be fastened, they are caused by the peculiar shape of cam 4, operating levers 25, to move in the curve that would pass over

the inclined planes 40 and 85, Figs. 1, Sheets A and B, thus giving three distinct movements to the twisting devices.

The spindles 27, Figs. 1, Sheets A and B, extend out beyond both bearings, and on the inner ends automatic hands 33 are formed in the shape of pinchers, Fig. 1, Sheet A, and Figs. 1 and 4, Sheet B, to grasp sufficient straw from the gavel to form the band. These hands are opened by the springs 34, Fig. 4, Sheet B, and closed and held so by the levers 35, Fig. 1, Sheet A, Fig. 1, Sheet B. These levers 35 are pivoted near the journal of 28 of the spindles 27, Figs. 1, Sheets A and B, one end resting on the movable part of the hand; the other is attached to a rod, 37, and operated thereby, which passes through the spindle and has a notch, 36, to receive the catch 90, into which it is pressed by a spring, 91, Figs. 1, Sheets A and B, for the purpose of holding it rigidly when the inner end presses on the hand.

Both the rods 37 of the twisting devices are operated by being pressed, the front one on the inclined plane 84, and the rear on 38, just at the time the hands grasp the straw, which closes them; and the hands are opened by the springs 34, Fig. 1, Sheet A, Fig. 4, Sheet B, when they make the movement to deliver the ends of the band into the pinchers 69, Fig. 1, Sheet C, by the rods 37, being relieved from catch 90, at the same time, by being pressed against the notches in the edge of the inclined planes 38 and 84. (Shown in Figs. 1, Sheets A, B.) In this movement, while the hands are passing to the tying-pinchers, the rods 37 being pressed on the planes 40 and 85, prevent the levers 35 being relieved from the hands before the tying-pinchers 69 have a firm hold. The inclined planes 40 and 38 are fastened to the arm 86, which is bolted to guide 88, Figs. 1, Sheets A and B, and the planes 85 and 84 are attached to arm 87, which is bolted to guide 89, all of which are shown in Fig. 1, Sheet A. The arms 86 and 87 also serve to steady the guide 22, to which they are attached, as shown in Fig. 1, Sheet C.

On the out end of the spindles 27 I fasten rigidly disks 41, Figs. 1, Sheets A and B, and Fig. 3, Sheet B, having on their outside faces four fingers, 42, two of which are on opposite sides. They receive in the space between each the arms 43, Figs. 1, Sheets A and B. There is also in the disks 41 an opening, partially shown, Fig. 3, Sheet B, which receives the movable catches 46, Figs. 1, Sheet A, and 1 and 3, Sheet B, and by them the disks are prevented from rotating while the hands 33 are passing to and from them. The catches 46 are firmly fixed on movable rods 47, Figs. 1, Sheet A, and 1 and 3, Sheet B, and are moved into the openings in the disks 41, by spiral springs *a*, on shaft 47, and out by the ends of the rods being pressed against plates 50, on standards 44, Fig. 1, Sheet A,

as the spindles 27 swing into the places where they meet the arms 43. The arms 43 revolve the spindles 27 when it is desired to twist the band. They are keyed to shafts 45, Figs. 1, Sheets A and B, which are carried by the standards 44, Figs. 1, Sheets A and B. On these shafts pinions 48 are keyed, Fig. 1, Sheet B. Below the pinions 48, and meshing into them, and by which they are driven, are segments of spur-wheels 49, Figs. 1, Sheets A and B, of such a comparative size as will give the number of revolutions to spindles 27 as is required to twist the band. These segments are carried by shafts 51, Fig. 1, Sheet B. To the hubs of these segments I attach an arm, 52, Fig. 1, Sheet A, and they are connected to the arms 53, Figs. 1, Sheets A and B, by rods 54, Fig. 1, Sheet B. The arms 53 are keyed to the shafts 55, Figs. 1, Sheets A and B, which are sustained on bearings 10 and 13, and 61 and 78, Fig. 1, Sheet A. The shaft 55 in the rear is rocked by cam 6 and crank 56, Fig. 1, Sheet A, thereby imparting the rotary motion to the twisting-spindles 27 when forming the band. On the rear shaft there is keyed an arm, 57, which is connected to frame 92 of receiving-arms 59, Figs. 1, Sheets A and B, by rod 79, Fig. 1, Sheet B. The front shaft 55 is also connected to the frame of receiving-arms 59 by arm 80, which is keyed thereto, and rod 79, Fig. 1, Sheet B. The two shafts, being thus connected, move their attachments, viz., the segments of spur-wheels 49. But the pinions 48, which they drive, being geared at opposite ends, as shown in the drawings, and the levers 52 being on opposite sides of the center of the segments, cause the twisting-spindles to revolve in different directions at the same time, which gives the necessary twist in forming the bands. The receiving-arms 59, being connected to the frame 92, are caused by the rocking motion of shaft 55, in the rear, to move into position that is required to have the band pass around the gavel, as shown in dotted lines Fig. 1, Sheet C, and into the position to receive the gavel from the rake, as shown in full lines Figs. 1, Sheets A, B, and C. The shaft 32, in rear, is sustained by bearings 13, 10, and 9, and the front by bearings 78 and 61, Fig. 1, Sheet A. The rear shaft 32 extends to the right side of the machine, and on it an arm, 60, is keyed, Fig. 1, Sheet A. On the front shaft 32 an arm, 82, is keyed, Fig. 1, Sheet A. These arms are connected together by rod 62, Fig. 1, Sheet A, but being in nearly opposite positions to one another on their shafts 32, move them, and consequently the hubs 31 and their attachments at the same time, but in opposite directions. The shafts 32 receive their rocking motions from cam 3, Figs. 1 and 4, Sheet A. The cam 3 has a pinion, 65, rigidly attached to it, which is driven by the spur-wheel 66, on shaft 8. The cam is carried by shaft 67, and moves freely on it. The spur-wheel 66 is in diameter two to

one of the pinion 65, thus giving two rocking motions of the shafts 32 to one of the other shafts, this being necessary because the twisting-hands, which are gyrated to and from the gavel by them, require two motions to one of the other parts of the machine, the one while reaching after the straw as it lies in the receiving-arms 59, the other when they return to deliver the ends of the band into tying-pinchers 69, Figs. 1, Sheets A and C, after twisting it. Cam 5 operates the tying-pinchers 69, by means of crank 68, shaft 67, and arms 70 and 71, Figs. 1, Sheets A and B, the arms 70 and 71 being connected together by connecting-rod *c*, Fig. 1, Sheet A. The twisting tying device is composed of a pair of pinchers, the jaws of which have a recess, as shown in Fig. 2, Sheet C. One of the jaws is rigidly fixed to the rod 105, Figs. 1 and 2, Sheet C. This rod 105 is sustained and moved vertically on the arm 72 of slide 74, Fig. 1, Sheet C. This slide moves vertically between the guides 88 and 89, Fig. 1, Sheet A, 89 being more fully shown in Fig. 1, Sheet C. This rod is also sustained and moves through a hole in arm 73, Fig. 1, Sheet C, attached to guides 88 and 89, near the top, and the rod 105 has a spiral groove extending from the bottom to near the top, where the groove is parallel to the axis of the rod, Fig. 2, Sheet C. The object of this groove being straight at the top is so that the tying-pinchers will not begin to turn as soon as they begin to rise, but allow them to be firmly closed before the hands 33 let loose of the band. The other jaw is pivoted to the jaw attached to rod 105, and has on its lower end a projection, (shown in dotted lines, Fig. 1, and full lines Fig. 2, Sheet C,) in which there is a notch, 107, to receive a pin, 108, which holds it rigidly when the jaws are closed on the ends of the band.

A pin, 110, shown in dotted lines on rod 105, is inserted in the arm 73, which registers in the groove, and as the pinchers move vertically causes them to revolve and twist the ends of the band together. The pin 108 rests on an arm, 111, of upright carrying-bar 112. The head of this pin is held between it and a collar, 118, Fig. 2, Sheet C, and is thereby caused to move with the bar 112, so that the bar will move the pin out of the notch when it is necessary to allow the jaws to open. This shaft or bar 112 is carried and moved vertically by arm 72, Fig. 1, Sheet C, and has on the lower end a spiral spring, 104, which is fastened to it and the arm 72. This spring sustains the bar 112, which operates the pin 108. When in its upward motion it arrives at the point where the pin 115 comes in contact with the pin 116, dotted lines, Fig. 1, Sheet C, the bar is arrested while the pinchers still rise sufficiently to allow the pin 108 to be relieved from notch 107 of the pivoted jaw, which then is forced open by spring 117, Figs. 1, Sheets A and C.

The lower end of spiral rod 105 has a groove,

into which is fitted a plate, *h*, fastened to arm 72, Fig. 1, Sheet C, which allows it to turn, but causes it to move vertically with the slide 74. On the frame 92 of receiving-arms 59 I attach an arm, 113, fully shown in Fig. 3, Sheet C, which, when the receiving-arms rise up, as shown in dotted lines, Fig. 1, Sheet C, passes over the projection of the pivoted jaw of twisting tying-pinchers 69, and presses it down, thereby closing the pinchers as they rise up.

While the twisting of the band is going on by the automatic hands 33, the gathering-arm 17 descends, and the receiving-arms 59 rise up, as shown in dotted lines, Fig. 1, Sheet C, and the gavel is moved forward toward the gathering-arm 17, and is pressed together by the receiving-arms 59, being closed by the springs 106, Figs. 1, Sheets A and C. The gavel is then under the bands in an inclined position. The twisting devices, then moving toward each other, bring the ends under the gavel and deliver them into the cavity in the tying-pinchers 69. These pinchers are then caused to rise upward by cam 5, and at the same time to turn around, which twists the ends together and leave them inside of the gavel.

The receiving-arms 59 are four in number. The two in front are joined together by cross-bar 98, Figs. 1, Sheets A and C, and the two in rear by bar 99, and are pivoted on the rod 95, same figures, and so arranged that in operating they will approach and recede from each other. The rod is sustained by upright bearings 96 and 97, Figs. 1, Sheets A and C, attached to frame 92, which is pivoted to slides 88 and 89. The two arms 59, next to the bearing 97, extend down below the pivoting-rod 95, Figs. 1, Sheets A and B. The one crossing the other at that point, if the lower extremities are pressed apart it causes the arms to open. These arms are spread when they descend into position to receive the gavel, Fig. 1, Sheet A, by the lower portion of the arms being passed over the tops of the guides 101 and 102, Fig. 1, Sheet A, (101 is shown also in Fig. 1, Sheet C,) and closed by springs 106, Figs. 1, Sheets A and B, when they rise up to place the gavel in position to be bound, shown in dotted lines, Fig. 1, Sheet C.

Between the guides 101 and 102 a rod, 103, Fig. 1, Sheet C, moves vertically, which is attached to a discharging-bar, 104, shown fully in same Fig. 1, Sheet C. This discharging-bar is pivoted to and between the guides 101 and 102, at *e*, and is operated by the bearing 97 of the receiving-arms pressing on the rod 103, when descending to the position to receive a gavel from the rake. This forces the upper end of the discharging-bar 104 between the receiving-arms and against the bound gavel, which shoves it out of the arms onto the inclined chute 109, Sheet A, Fig. 1. There are also attached to the arm 115 stationary arms 140, near the tying-pinchers 69, shown in Fig. 1, Sheet A, on which the gavel rests partially when delivered from the rake.

The chute 109 is attached at its inner end to the guides 101 and 102, its outer end extending over the outside of the machine, and to the box 142, Fig. 1, Sheet A. The box 142 is attached to the platform A, and has a bottom pivoted at one end and sustained by a spring-catch at the other. This box receives the bundles, and when the desired number has been bound and delivered into it the bottom is released, and they fall in a heap for a shock.

The rake 7 is composed of the arm 119, Figs. 1, Sheets A and B, on which the smaller arm 120 slides to meet the pivoted arm 121, to pick up the gavel from the platform of the reaper. This arm 119 is firmly fixed to the inclined shaft 122, same figures, so that when it turns the rake gyrates. This shaft 122 has its bearing in the inclined standard 129, Fig. 1, Sheet A. The bevel-pinion 123, Fig. 1, Sheet A, and Fig. 2, Sheet B, is rigidly attached to the shaft 122, and gears into and is driven by the segment of a bevel-wheel, 124, Fig. 1, Sheet A, Fig. 2, Sheet B, which is sustained and moves freely on shaft 139, same figures, extending through and rigidly attached to standard 129. This segment 124 has an arm, 125, Fig. 2, Sheet B, in which there is a pin, 126, same figures, which is operated by the cam 1, Figs. 1 and 3, Sheet A, and Fig. 2, Sheet B. When the cam 1 turns, the pin 125 is moved by it to and from the center, thus giving a rocking motion to the segment 124, thereby gyrating the rake. Cam 1 is keyed to the shaft 128, which passes through the standard 129, and the inner end is carried by the bearing 130, Fig. 1, Sheet A. On the inner end of shaft 128 cam 2, Figs. 1 and 2, Sheets A and B, is keyed, and operates the segment of the bevel-wheel 131, Figs. 1, Sheet A, and 1 and 2, Sheet B, by means of pin 133 in the arm 132, Fig. 2, Sheet B. This segment 131 is pivoted on the inner end of the shaft 139. This segment 131 gears into and moves the pinion 134, Sheets A and B, which moves loosely on shaft 122. To this pinion 134 I attach an arm, 135, Figs. 1, Sheet A, and 1, Sheet B. This arm is attached to and moves the short arm of the rake by rod 140, Figs. 1, Sheets A and B. This arm projects toward the pivoted arm 121, and is slightly raised upward to operate against the top of the pivoted arm 121, which causes them to press against the straw before they would come together. The pivoted arm 121, Fig. 1, Sheet A, is caliper-shaped, so that it will pass under the straw as it lies on the platform of the reaper. The upper end projects above the arm of the rake, and has a notch, as shown in the drawings, in which the leading portion of arm 120 enters to allow the two arms to come closer together when grasping the straw than they otherwise would do without it. This arm 120 has a spring, *f*, attached to it to draw it from under the gavel when it is being delivered into the receiving-arms, and the spring also holds the arm in position until arm 120 moves against and operates it. The spring *f* is shown in Figs. 1,

Sheets A and B. The rake being turned by cam 1 around to pick up the gavel-cam 2, then operates the pinion 134 and arm 135, so that arm 120 is forced toward the pivoted arm 121, and they together grasp the gavel.

On shaft 139 the segments 124 and 131 are pivoted and kept from coming off by screws 144 put into the ends of the shaft, as shown in Fig. 2, Sheet B. This mode of retaining them is desirable, as it makes an even face on the outside and allows the cams 1 and 2 to be nearer them, thereby allowing shorter pins to be used than could be otherwise. This prevents unusual strain. On the shaft 128 I also key a chain-wheel, 136, between cam 1 and standard 129, Figs. 1, Sheet A, and 2, Sheet B. This wheel is driven by a chain-belt, 137, Fig. 1, Sheet A, the same being carried and driven by chain-wheel 138 keyed on shaft 8. This gives motion to rake 7 and its parts. The object of this invention is to make a machine that will bind grain in the straw by a straw band made out of two lengths of straw.

The operation is as follows: The rake 7, by the movement of cam 1, is caused to reach after the gavel as it lies on the reaper-platform; but before it begins to sweep around, the movement of cam 2 causes the arm 120 to move backward, so there will be room for the spreading gavel between the two arms 120 and 121. The rake then moves over the gavel and stands still, because the pin 127 is passing around the circular portion of cam 1. In the mean time, by the action of cam 2, the arm 120 is caused to move toward the pivoted arm 121, thereby moving all the gavel over to the further side. The arm 120 then coming in contact with the pivoted arm 121, causes it to move under the gavel, and they, together, clasp it. The action of cam 1, together at this point with cam 2, now causes the rake to rise in a diagonal direction, and just as the gavel comes above the receiving-arms 59 and 140 the slightly contrary movement of cams 1 and 2 separates the arms 120 and 121, dropping the gavel into the receiving-arms. The automatic hands now, by the movement of cam 3, approach the butt of the gavel and are closed on as much straw as will make the bands by the connecting-rods 37 being pressed on the inclined planes 84 and 38 until their notches 36 register with catches 90. This causes the hands to have a firm hold of the butts of the straw. The hands now move back until twisting-arms 43 enter between the fingers 42 of disks 41. The out ends of the straw, held by the hands, will now lie loose and scattered, but drawn toward the gathering-arm 17, which is caused to rise by the movement of cam 4 and collect the ends, and rising at the same time raises them into a line between the hands, the ends overlapping each other. Cam 6 now begins to operate the segments 49, which causes the hands to revolve, but in contrary directions, which twists the straw into a compact band, thus forming the bands out of two lots of straw connected

at their ends. While cam 6 is operating the twisting devices it also raises up the receiving-arms, as shown in dotted lines, Fig. 1, Sheet C, and they are caused to close tightly on the gavel by springs 106, and to press it compactly. By the rising up of the receiving-arms they carry the gavel toward the gathering-arm 17, and under the band as it stretches from one to the other hand; but just before the gavel arrives in that position the gathering-arm falls down out of the way. The hands now pass down to the tying twisting-pinchers 69, but in doing so, by the peculiar shape of cam 4, acting on the levers 24, the ends of the sustaining-rods 37 are caused to pass over the inclined planes 40 and 85, and into the notches in the edge of planes 38 and 84. The hands in this movement deliver the ends of the band into the twisting-pinchers, and the hands are opened by springs 34 (the clamping-levers 35 being partially relieved by the rods 37) being pressed against the notched edge of planes 38 and 84 until the notches 36 of rods 37 are relieved from catches 90. But it being necessary that the hands should not let loose entirely before the tying-pinchers have a firm hold; the ends of the rods 37, resting on the inclined planes 85 and 40, will not move sufficiently to entirely relieve the levers 35 until the hands begin to rise. The ends of the band being now delivered into the tying-pinchers, they are caused to rise by the action of cam 5 and turned by the action of pin 110 in that part of the groove which is spiral. It being necessary that the pinchers should not turn until they rise sufficiently high to be closed by the arm 113 on frame 92, the upper portion of the groove is parallel to the axis of the shaft 105, as shown in Fig. 2, Sheet C. As the tying-pinchers rise up, and when the spiral portion of the groove arrives at the pin, they turn and twist the ends of the band together until the pinchers carry them into the center of the gavel or through it as it lies on the receiving-arms. The receiving-arms now begin to descend before the tying-pinchers, which moves the bundle back, and the tying-pinchers beginning to descend immediately after they come out of the bundle at a different point to where they entered, thus preventing them drawing out the bands. When the receiving-arms descend to their horizontal position, the bearing 97 acts on the discharging-bar and presses the upper end against the band of the gavel and throws it out on the chute 109, whence it slides onto the ground or into the receiving-box 142. If into the receiving-box, the bundles are allowed to accumulate until sufficient number to form a shock is deposited, when the bottom is allowed to fall, and they are left in a heap on the ground.

A spring may be attached to standard 129 and pinion 123 to assist the gyrations of the rake.

The hand-spindles 27 may be driven by a

chain and bell-crank, instead of the segments 49.

More arms may be added, as auxiliary to arms 140 and 59.

Any parts of this machine that may be exposed to straggling straw may be inclosed by a proper cover.

The cams 3, 4, 5, and 6 may be substituted by a cylinder to produce the desirable motion of the several parts, the said cylinder having sinuous grooves in its outside surface for the crank-pins to travel in.

The guide 22, on which arm 17 slides, may be made flexible by having a joint and spring near the top, so that it may yield by the pressure of the gavel to allow the center of the gavel to come under the band.

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

1. The two twisting automatic hands, operating conjointly for the purpose of making the band out of two lengths of straw.
2. The collecting-arms 17 and 22, in combination with the twisting automatic hands, as and for the purpose set forth.
3. The springs 34, in combination with the jaws of the hands 33, for the purpose set forth.
4. The rods 37 and levers 35, in combination with hands 33, for the purpose herein shown and described.
5. The inclined planes 38, 84, 40, and 85, in combination with rods 37 and levers 35, for the purpose set forth.
6. Spring 91, notch 36, rod 37, in combination with catch 90, for the purpose of holding the hands 33 closed.
7. The cam 6, arms 56 and 53, shaft 55, rod 54, segment and pinion 49 and 48, wings 43, and hand-rods 27, substantially as shown.
8. The movable catches 46, and springs *a*, in combination with the disks 41, as and for the purpose set forth.
9. The movable catches 46, springs *a*, and disks 41, in combination with plates 50 and rods 47.
10. Providing levers 25 with an independent axis on hub 31, as and for the purpose set forth.
11. The spur-wheel 66, pinion 65, cam 3, arm 64, shaft 32, hub 31, in combination with levers 25, and attachments, for the purpose set forth.
12. The arm 60 and connecting-rod 62, in combination with arm 82, hub 31, and levers 25, for the purpose of giving the oscillating motion to the twisting devices on the front of the machine.
13. The cam 4, crank 12, shaft 11, arm 24, and connecting-rod 26, in combination with levers 25, as and for the purpose set forth.
14. The arm 19, connecting-rod 29, in combination with arm 20, shaft 21, and its arm 24, connecting-rod 26, to give motion to levers 25 on the front of the binder.

15. The cam 5, crank 68, shaft 67, arm 70, and connecting-rod *c*, in combination with arm 71, and twisting-pinions 69, constructed as herein shown, and for the purpose set forth.

16. The cam 4, crank 12, shaft 11, and arm 14, in combination with lever 15 and connecting-arm 17, as and for the purpose set forth.

17. The cam 6, crank 56, rear shaft 55, arm 57, and connecting-rod 79, in combination with frame 92 and receiving-arms 59, as herein shown, and for the purpose set forth.

18. The arm 80, front shaft 55, and arms 53, in combination with cam 6, crank 56, rear shaft 55, arm 57, connecting-rod 79, frame 92, and receiving-arms 59, acting conjointly for twisting the band.

19. The spiral rod 105 and pin 110, in combination with the tying twisting-pinchers 69, for the purpose set forth.

20. The spring 117, in combination with the jaws of the tying-pinchers 69, as and for the purposes set forth.

21. The movable pin 108, in combination with the pivoted jaw of the tying-pinchers 69, as and for the purpose set forth.

22. The slide 74, bar 112, spring 104, and pins 115 and 116, in combination with the movable pin 108 and pivoted jaw of the tying-pinchers 69, as and for the purpose set forth.

23. The arm 113, in combination with the

pivoted jaw of the tying-pinchers, for the purpose set forth.

24. The pivoted receiving-arms 59, guides 101 and 102, and springs 106, constructed and operating as herein shown, and for the purpose set forth.

25. The pivoted discharging-arm 104, rod 103, in combination with the bearing 97 of the receiving-arms 59, as and for the purposes set forth.

26. The chain-wheels 138 and 136 and chain-band 137, in combination with the rake 7, cam 1, segment 124, and pinion 123, arranged and operating as and for the purposes set forth.

27. The cam 2, in combination with the segment 131 and pinion 134, for the purposes described.

28. The cam 1, segment 124, and pinion 123, in combination with the arm 119, arranged and operating conjointly, as and for the purposes set forth.

29. In combination with the binder, the receiving-box 142, when provided with a self-adjusting trip-bottom, arranged and operating as and for the purposes shown and described.

Witnesses: J. M. McMASTER.

JAS. LORENZO GAGE,

WM. S. LOUGHBOROUGH.