J. F. STEWARD.
GRAIN-BINDERS.

2 Sheets—Sheet 1.

No. 194,978. Patented Sept. 11, 1877.

Fig. 1.

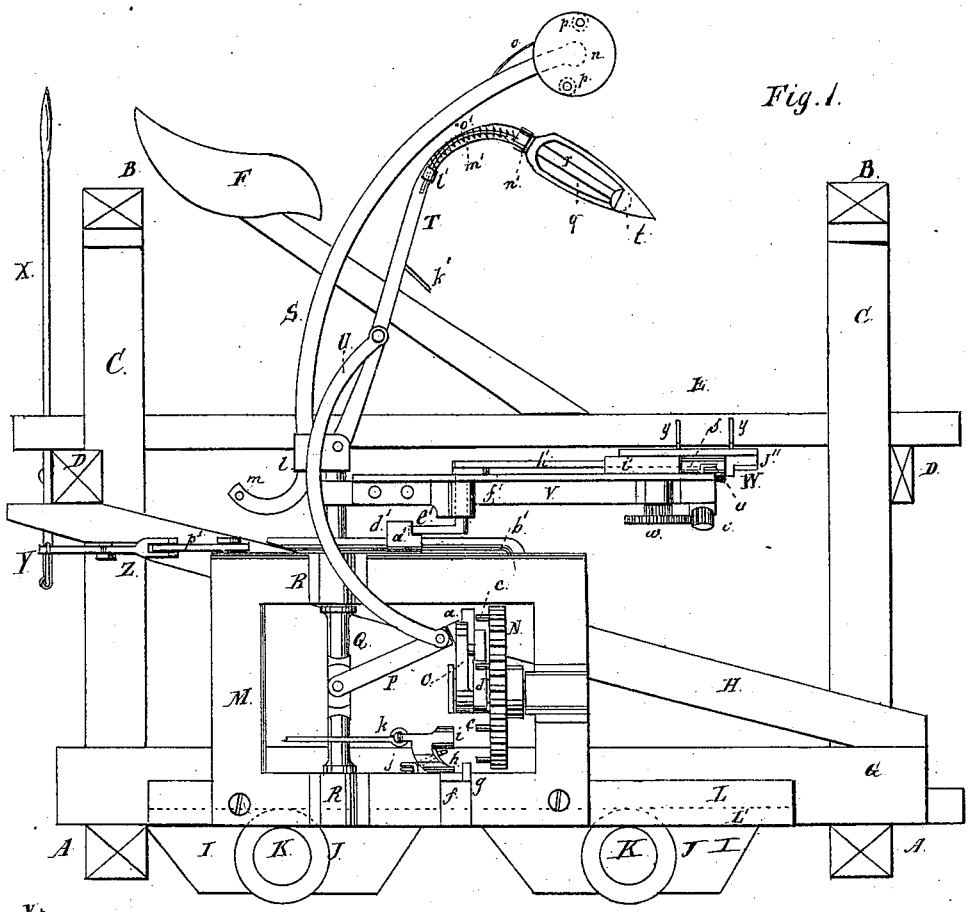
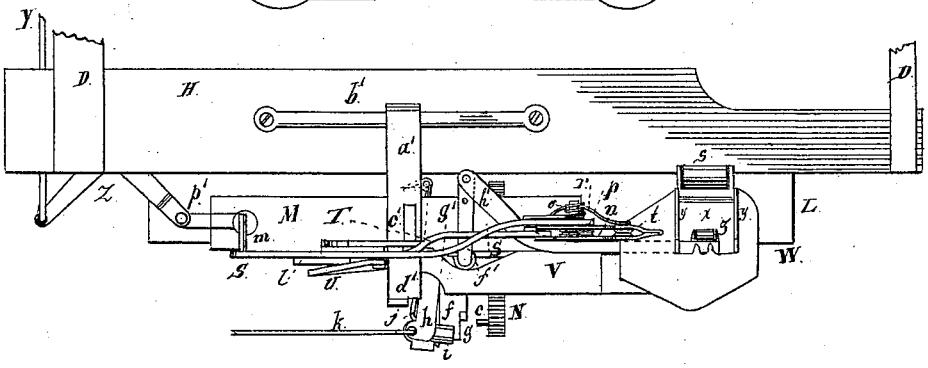


Fig. 2.



Witnesses:
Robert S. C. Dixon
Frank Lee

Inventor:
John F. Steward

2 Sheets—Sheet 2.

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Fig. 3.

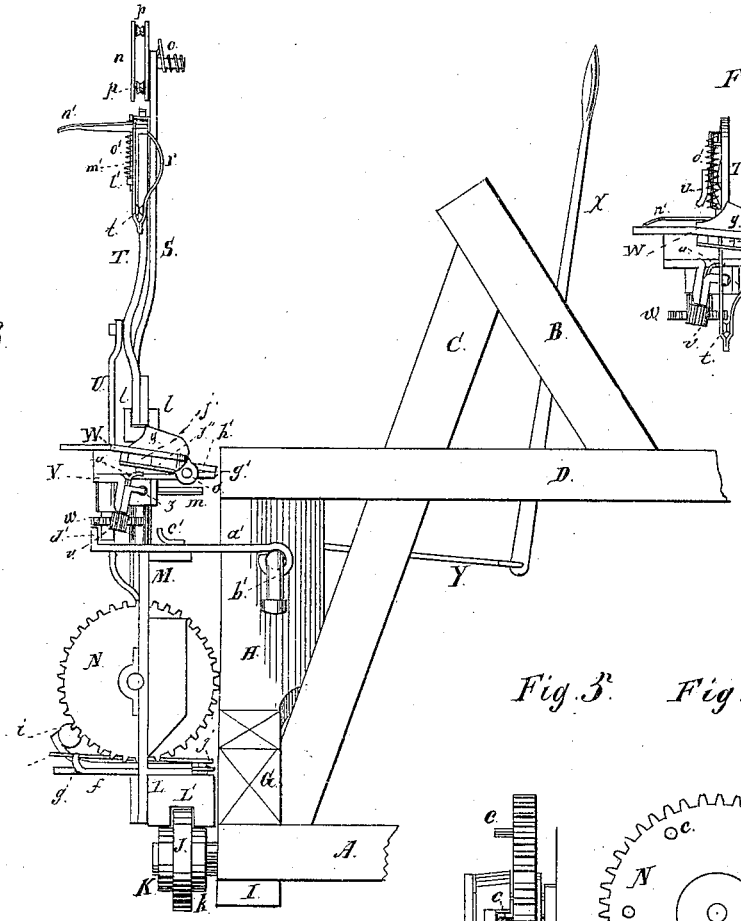


Fig. 7.

Fig. 4.

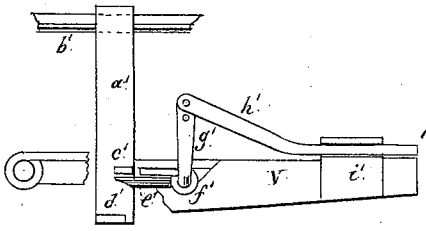
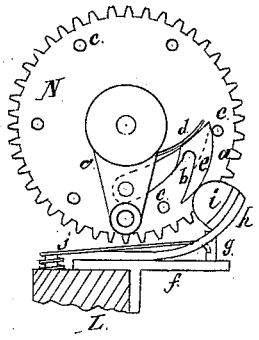


Fig. 5.

Fig. 6.



Witnesses:

Robert F. Dixon

Frank Lull

Inventor:

John F. Steward.

UNITED STATES PATENT OFFICE.

JOHN F. STEWARD, OF PLANO, ASSIGNOR TO ELIJAH H. GAMMON AND WILLIAM DEERING, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **194,978**, dated September 11, 1877; application filed March 15, 1877.

To all whom it may concern:

Be it known that I, JOHN F. STEWARD, of Plano, Kendall county, State of Illinois, have invented new and useful Improvements in Grain-Binders, of which the following is a full description, reference being had to the accompanying drawings, consisting of two sheets, in which—

Figure 1 is a side elevation; Fig. 2, a top or plan view of the binding devices; Fig. 3, a front elevation, a portion of the frame-work being broken away; Fig. 4, an enlarged detail, showing the cutter and its operating devices; Figs. 5 and 6, enlarged details, showing the devices for throwing the binding devices out of gear; Fig. 7, a detail, showing the needle-arm down.

The object of this invention is to improve and simplify the construction and the combination of parts, as will be hereinafter more fully described.

In the drawings, A represents the main frame; B C, the elevator-frame; D, the cross-bars, secured to the elevator-frame; E, the driver's platform, supported on the cross-bars D; F, the driver's seat, located on the platform E; G, the cross-bars on the main frame, between which the main or drive wheel is located. These parts, A, B, C, D, E, F, and G, are all constructed and arranged in any of the well-known forms for harvesting-machines, and the machine is to be provided with a suitable carrier and elevator, and the necessary gearing for operating the same, and with suitable gear on the main wheel for operating the sickle and other parts, and with other appliances to make a complete harvester; but as these parts may be of any of the ordinary forms, they are neither shown nor described.

H is an inclined brace-bar, one end of which is secured to the rear cross-bar D of the elevator-frame, and the other to the outer cross-bar G of the main frame.

I are supporting blocks or brackets, secured to the under side of the outer cross-bar G, to which are permanently secured the axles for the supporting-wheels.

J K are the wheels upon which the frame carrying the binding mechanism is supported at the bottom. The part K is smaller in diameter than the part J, and projects outward therefrom on each side, so as to form a shoulder, as shown in Fig. 3.

L is a movable bar, located at the side of the outer cross bar G. It is provided with a central groove, L′, extending the whole length of the bar, which groove fits over the parts J of the supporting-wheels, while the portions of the bar on each side of this slot rest upon the parts or shoulders K, thus furnishing two points of support, and preventing any tipping or swinging of the bar, and, at the same time, permitting its free movement on the wheels.

M is the frame which supports the devices for operating the binding mechanism. It is secured to the movable bar L at the bottom by means of bolts. *a′* is a plate or bar permanently secured to the top of frame M, and provided at its inner end with a socket which fits over a rod, *b′*, secured to the top of the inclined cross-bar H, so that *a′* can slide forward and back on *b′* when the binding devices are adjusted fore and aft.

N is the cog-wheel for operating the binding mechanism. It is driven from the main or drive wheel by means of a suitable gearing, (not shown,) as usual. It is located within the frame M, and is supported and revolves on an axle permanently secured to the side of the frame.

c are pins, permanently secured to the inner face of the wheel N at suitable distances apart.

O is a crank, placed loosely on the outer end of the same axle on which N is located, on which axle it revolves. It is cut away at its lower end, so as to leave a space between it and N, and is held in place by means of a nut, pin, or other suitable device at the end of the axle.

a is a dog or pawl, located in the space between N and O, and pivoted at one end to the crank O.

b is an opening or recess in the pawl *a*, so arranged that, when the pawl is down, it will catch upon one of the pins *c*.

d is a spring, one end of which is secured to the inner end of the crank, and the other engages with the upper end thereof, and holds the pawl down.

e is a passage on the side of the pawl *a*, near its lower end, so arranged that when the pawl

is raised the pins *c* will enter this passage instead of engaging with the notch *b*.

f is a metal plate, secured to the frame M, and extending out therefrom on a line with the top.

g is a stop formed on the outer end of the plate *f*.

h is another metal plate, located above the plate *f*, and pivoted at its inner end to the top of the frame M.

i is a cam or incline permanently secured to or formed on the outer end of the plate *h*, and so arranged that when the plate is in contact with the stop *g* the pawl or dog *a* will come in contact with *i*, and raise the pawl from its engagement with the pin *c*.

j is a spring, one end of which is secured to the bar L, and the other engages with the outer end of the plate *h* beneath the cam *i*, and keeps the plate and pawl *i* in such position that the binding devices will operate.

k is a rod, secured at one end to the outer end of the pivoted plate *h*, and at the other to suitable devices operated by the driver, through which the plate *h* can be forced forward so as to bring the cam *i* into such position that the pawl *a* will come in contact therewith, and be disengaged from the pin *c*.

P is an arm, one end of which is journaled in the lower end of crank O, and the other end is forked, and passes on each side of the perpendicular shaft Q, to which it is pivoted, which shaft is supported in suitable bearings R at the top and bottom of the frame M, as usual.

l are ears, at the extreme upper end of the shaft Q, which shaft projects some distance above the top of the frame M.

S is the arm which supports the binding-wire. It is secured near its lower end to one of the ears *l*, and its extreme lower end is bent or curved, and projects some distance to the rear of the ear *l*.

m is a pin, permanently secured to the bent lower portion of the arm S, on which the wire-spool is mounted.

n is a head, loosely secured to the upper end of the arm S, and consisting of two plates or disks.

o is a spring, one end of which is secured to the arm S, and the other to the axis or pivot of the head *n*, which projects through the side of the arm S.

p are two small grooved wheels, located between the plates of the head *n*, and revolving on suitable axes.

T is the needle or wire arm, pivoted at its lower end between the ears *l*, so that it can rise and fall, and provided with a point of peculiar construction, the form of which is shown in Figs. 1, 2, 3, and 7.

q is an opening formed in the enlarged point of the needle, either by cutting out a portion thereof, or in other suitable manner.

r is an incline formed on the side of the needle-point opposite to the opening *q*.

t is a small grooved wheel in the point of the needle, so arranged that its side or disk is nearly parallel with the side of the needle. By placing the wheel *t* in this position it permits the needle-point to be made so much thinner that it passes through the grain with greater ease.

U is a curved bar, one end of which is pivoted to the needle-arm, and the other to the outer end of the forked bar P, so that as the crank O rises or falls the needle-arm will be carried up and down.

V is the carrying-arm, rigidly secured to the upper end of the shaft Q, between the top of the frame M and the ears *l*.

It will be seen that as both the needle-arm U and carrying-arm V are attached to the same shaft Q, when this shaft is partially rotated, by means of the crank O and forked arm P, the needle-arm and carrying-arm will be carried forward and back in unison, preserving the same relative positions in this respect. On the outer end of this arm V is a head, in which are located the twisting devices.

u is the twisting-hook, similar in construction and operation to that shown and described in my patent of March 15, 1876. This hook revolves in a suitable bearing on the head of the arm V, in which bearing the shaft of the hook is set at an angle, as shown in Figs. 3 and 7, so that the point of the hook projects inward, so as to give it a wider range in grasping the binding-wire, and for the purpose of better holding the end of the wire, as hereinafter described.

v is a gear-wheel, secured to the lower end of the shaft of the twisting-hook. *w* is another gear-wheel, suitably journaled to the arm V, which engages with the wheel *v*. On the same shaft with this wheel *w* is a small pinion, with which a suitable stationary rack supported upon the frame M engages to drive the wheel *w*, and operate the twisting-hook.

W is an inclined platform or guard-plate, permanently secured to the outer end of arm V over the twisting-hook.

x is an opening in the plate W for the passage of the needle.

y are guards, one on each side of the opening *x*, permanently secured to the plate W, and having their front ends cut out. The object of these guards is to prevent the bundle from being carried so far over that the grain will be drawn into the throat or opening for the needle-bed and interfere with the operation of the twisting-hook.

z is a small roller, located in suitable bearings on the arm V, beneath the twisting-hook, in close proximity thereto, and at such relative position therewith that, no matter how far the point of the needle descends, the binding-wire will be taken off at such angle as that one portion of it will wind around the shank of the twisting-hook.

c' is a projection or stop, permanently secured near the center of the bar *a'*, on the front edge thereof.

d' is another projection or stop, formed on the outer end of the bar or plate a', and on the opposite edge to c'.

e' is an arm, the outer end of which is located between the stops c' d'.

f' is a bearing or support on the carrying-arm V.

g' is another arm, the outer end of which is pivoted to the outer end of the bar of the wire-cutter or shear-blade. These arms e' and g' are connected together by a perpendicular piece, which is journaled in the support f', and the two arms and their connecting-piece are made of a single piece of metal.

h' is a sliding bar, having at its inner end a shear-blade, h''.

i' is a groove in the head of the arm V, in which the bar h' slides, which bar is held in place by means of the plate W, which projects partly over that portion of the head in which the groove i' is located.

j' is an opening beneath the plate W, into which the shear-blade h'' enters when severing the binding-wire.

j'' is the lower or stationary shear-blade, secured below the opening j' in any suitable manner.

k' is a pin permanently secured to the needle-arm T, and so arranged that when the needle-arm descends the pin will be driven into the heads of the grain, and as the needle-arm is carried forward the heads of the grain will be carried forward also. By this arrangement the heads will be carried forward, preventing any tendency to hang back.

l' is an ear formed on the needle-arm, and provided with an opening.

m' is a curved rod, held in position at one end by the ear l', in the opening of which it slides. The other end of this rod m' is secured to a plate, n', one end of which is provided with a socket, which fits around the needle-arm and slides thereon. This plate n' is located at right angles to the needle-arm, and extends outward therefrom.

o' is a coil-spring around the curved rod m', one end of which engages with the ear l' and the other with plate n'.

X is a hand-lever, pivoted to the rear cross-bar D, and extending upward within reach of the driver.

Y is a rod, one end of which is secured in the lower end of the lever X.

Z is a connecting-piece, to one arm of which the other end of the rod Y is attached. Z is pivoted at its center to the under side of the inclined bar H.

p' is a connecting-link, one end of which is secured to the other arm of the piece Z, and the other end to the frame M.

s is a roller, located beneath the plate W in suitable supports. It is so arranged that the incline r will come in contact therewith when the needle-point enters the opening x.

In use, when the several parts are in the position shown in Figs. 1 and 2, the dog or pawl a will be engaged, by means of its notch b, with one of the pins c, and, as a is pivoted to the crank O, and c is on the wheel N, when a and c are engaged the crank O and wheel N will be connected together, so that when N is revolved it will carry with it the crank O, thereby operating the binding devices, as usual.

If from any cause it becomes necessary to stop the operation of the binding devices, it can be done by the driver, who, by means of the rod k, forces the plate h forward in contact with the stop g on the plate f, in which position the cam i will be directly under the pawl a, so that, with the revolution of the wheel N, the lower end of the pawl a will come in contact with the cam i, and raise the pawl, which disengages the pin c from the notch b, and allows it to enter the passage e, in which event there is no connection between the wheel N and crank O, and the wheel will revolve, while the crank O will remain stationary, thus preventing any movement of the binding devices, and this will continue to be the case as long as the pawl a is engaged with the cam i, as each succeeding pin c on the wheel N will enter the passage e, and pass therefrom without engaging with the pawl.

When the binding is to be commenced again, the driver, by means of a suitable lever, releases the connecting-rod k, when the spring j forces the plate h, and with it the cam i, back into their first position, when the spring d forces the cam a into engagement with one of the pins c, making the connection again, so that the crank O and wheel N will revolve together, as before.

By this arrangement the driver can at any time stop the operation of binding.

The operation of binding is as follows: The grain for the bundle is delivered from the elevator upon a suitable receiving-platform, (not shown,) in which is a suitable curved slot for the passage of the needle-arm, which platform is located above the carrying-arm V. The binding-wire passes from the spool on m up the side of the bar S, beneath the lower wheel p, and over the upper wheel p in the grooves in said wheels; thence under the grooved roller or wheel in the point of the needle; thence to the twisting-hook, around the shank of which its end is coiled; then the binding-wire is made to encircle the bundle by means of the crank O, forked bar P, perpendicular shaft Q, and curved connecting-bar U, as usual, these parts being so arranged and timed that when the devices are in position to receive a bundle the carrying-arm V and needle-arm T will be in their farthest forward lateral movement, and ready to return, the crank O occupying nearly a horizontal forward position; then, as the crank O rises, it will turn the shaft Q through the forked bar P, and at the same time the needle-arm will be raised by the action of the curved bar U through the raising of the inner end of the forked bar P, and such movements will continue until the crank O has reached a perpen-

dicular position; and when it commences to descend the needle-arm will also commence to descend, and this descent will continue until the outer end of the crank is opposite to the position in which it started, at which time the arm V and needle-arm have reached their farthest backward lateral position, and the needle-arm has passed completely over the bundle, carrying the binding-wire with it. Then, as the crank O descends still farther, the arm V and needle-arm will be returned toward their forward position laterally, and at the same time the needle-arm descends still farther, passing through the grain on the platform, completing the encircling of the bundle by the wire, and entering the hole *x* in the plate W, and the cam *r*, coming in contact with the roller *s*, the point of the needle will be forced inward toward the twisting-hook far enough to permit the hook to enter the opening *q* in the needle-point, across which the wire will be drawn, and grasp the binding-wire, at which time the pinion above the wheel *w* engages with its rack and drives this wheel, and, through the wheel *v*, operates the twisting-hook *u*, and twists the two strands of the binding-wire together, coiling the main wire around the shank of the hook. When the crank O reaches its lowest point, and is ready to commence its ascent, the pinion of *w* is disengaged from its rack, and the twisting ceases; then the crank commences to ascend, carrying forward the arm V, and the arm *e'* strikes the stop *d'* on the bar *a'*, causing the arm *g'* to be thrown in, and carrying forward the bar *h'*, and bringing the shear-blade *h''* in contact with the binding-wire, forcing the wire against the lower shear-blade *j''*, when the shear-blade enters the hole or guide *j'*, and severs the wire between the bound bundle and the twisting-hook, leaving the end of the wire coiled around the shank, and the bundle free to be discharged in the usual manner, by which time the carrying-arm V and needle-arm and the other parts have reached their first position, when the same operation is repeated.

The cutter or shear-blade *h''* is withdrawn from the opening *j'* by the return movement of the arm V, which causes the arm *e'* to strike the stop *c'*, and thereby throw the arm *g'* back, carrying with it the bar *h'* and blade.

It will be seen that the binding-wire, in order to be twisted around the shank of the twisting-hook, must be at nearly a right angle thereto, and, in order to get the proper angle for this purpose, the wire is made to pass over the roller *z*, and thence down over the roller in the point of the needle, so that the wire, when it winds onto the shaft, will always be at the proper angle, no matter how far below the twisting-hook the point of the needle may go.

By using the guards *y* there is no danger of any straw being forced down by the needle-arm into the hole *x*, as such straw will be caught by the guards, and prevented from being carried too far over in the lateral movement of the needle-arm.

By placing the hook *u* at an angle, as shown, the point thereof projects inward, and by providing the hole *q* in the point of the needle, when the needle is carried forward by the action of the cam *r* and roller *e* the end of the hook *u* will be within this opening, thus insuring the grasping of the wire every time, and doing away with all devices now used to push the wire into the twister.

By placing the pin *k'* on the needle-arm it will be seen that when such pin is forced into the heads of the grain such heads must be carried forward with the forward movement of the needle-arm, keeping them even with the butts, thus keeping the straw straight and in the right condition for binding.

The fore-and-aft adjustment of the binding devices is effected through the lever X, by means of which, and the rod Y and connecting-piece Z, the frame M, and with it the binding devices, is moved forward and back on the supporting-wheels. These wheels not only support the frame at the bottom, but by means of the part J, which fits in the groove L' of the bar L, such bar and the frame M are connected with the main frame and held in position.

By placing the binding-wire under and over the wheels *p* in the head *n*, when the needle-arm descends the friction on the wheels *p* will revolve the head *n*, and when the binding-wire is severed and the needle-arm commences to ascend, the action of the spring *o* will return the disk *n*, taking up any slack in the binding-wire between the twisting-hook and spool, keeping the wire strained enough to prevent any tendency to kink.

It is desirable that the strain on the binding-wire, when passing around the bundle, should not be too strong, and in order to compress the bundle properly some other devices, in addition to the binding-wire itself, should be used. Such a device is provided by the plate *n'* and extension of the plate W. As the needle-arm descends the plate *n'* is brought into contact with the bundle and compresses it, the spring *o'* permitting the curved bar *m'* to slide through the ear *l'* and also returning the plate *n'* to its first position when the needle-arm ascends.

By this arrangement a very simple compressor is provided, which takes the strain off from the binding-wire to a considerable extent; and by having the action of such compressor depend upon the movement of the needle-arm, it is always in working order, and will operate in unison with such arm.

The spring *o'* allows the compressor *n'* to yield gradually with the descent of the needle, so that the work of compressing the grain thereby will not interfere with the proper operation of the needle-arm.

As shown, the spring *j* is so arranged that its action will prevent the cam *i* from engaging with the pawl *a;* but it is evident that this spring can be so arranged that it will operate as a means for holding the plate *h* and cam *i*

in position for such engagement, in which event devices will have to be provided by means of which the plate *h* can be forced back, and prevent the engagement of the cam *i* and pawl *a*, and there held.

The cam or incline *r* on the back of the needle-arm will be found useful as a means for forcing the needle inward and bringing the binding-wire into position to enable the twisting-hook to grasp it when a straight needle having a notch in its point is used.

Other devices may be employed in place of the pins *c*. The wheel N might be provided with a projecting rim having notches with which the pawl would engage, the form of the pawl being changed correspondingly.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. The wheel N, provided with the pins *c*, in combination with the crank O, pivoted pawl *a*, spring *d*, cam *i*, spring *j*, and rod *k*, all constructed and arranged substantially as and for the purposes specified.

2. The diagonal brace-bar H and supporting rod or bar *b'*, in combination with the plate *a'*, having a socket and frame, M, for retaining the frame M in position at the top, and permitting its fore-and-aft adjustment, substantially as described.

3. The twisting-hook *u*, having its shaft set at an angle to throw the point of the hook forward, in combination with a reciprocating needle-arm, having a side opening, substantially as and for the purpose specified.

4. The reciprocating binding-arm T, provided with an opening near its point, and incline *r* at the side of said opening, in combination with the roller *s*, for forcing the point of the needle near the twister, substantially as and for the purpose specified.

5. The roller *z*, located between the twister-staff on path of the needle-arm, in combination with the twister and needle-arm, to maintain the binding-wire in proper position relating to the twister while rotating, substantially as described.

6. The reciprocating needle-arm T, provided with a pin, *k'*, in combination with suitable mechanism to give the needle-arm a lateral movement for engaging with the heads of the grain and moving them forward, substantially as specified.

7. The inclined guards *y*, located upon the twister-carrier, in combination with the reciprocating needle-arm for keeping the throat clear, substantially as described.

8. The movable bar *h'*, in combination with the arms *e'* and *g'*, and swinging arm V and stops *c'* and *d'*, for operating the shear-blade and severing the wire, substantially as described.

JOHN F. STEWARD.

Witnesses:
ROBERT H. DIXON,
FRANK LULL.