J. P. JOHNSON.

GRAIN-BINDER.

4 Sheets—Sheet 1.

No. 192,374.

Patented June 26, 1877.

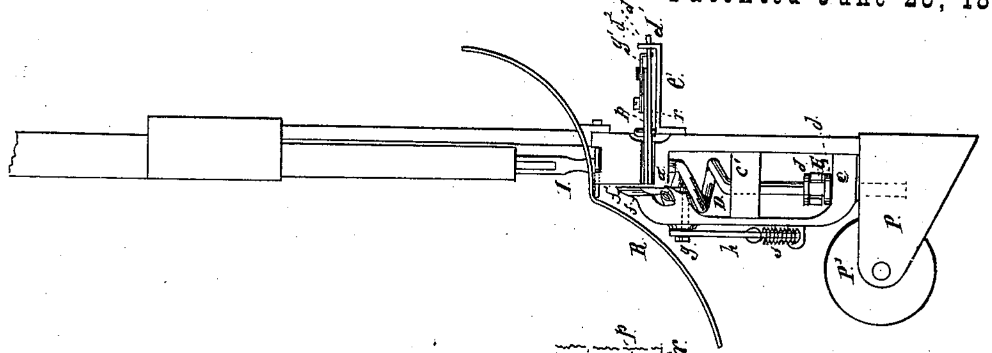

Fig. 2.

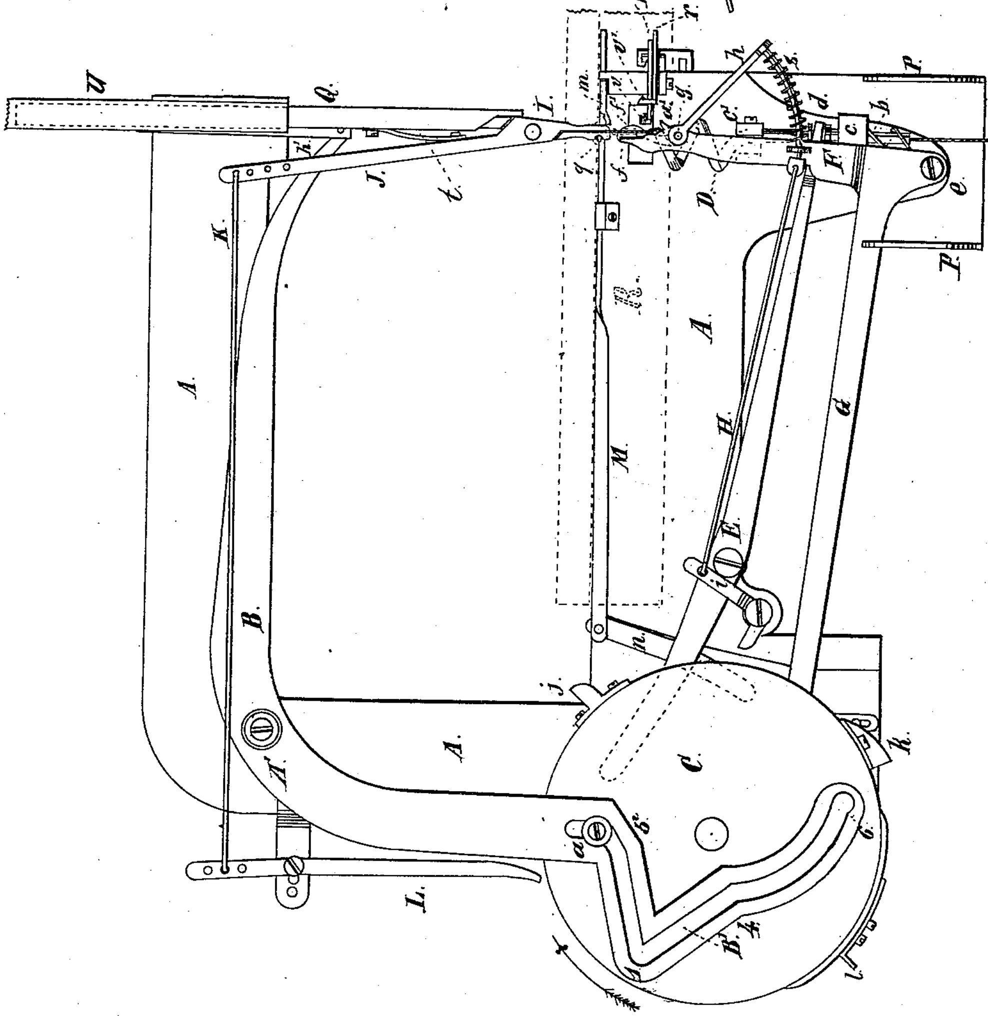

Fig. 1.

Witnesses
O. W. Bond.
Hiram L. Brown.

Inventor
John P. Johnson

Per West & Bond Attorneys

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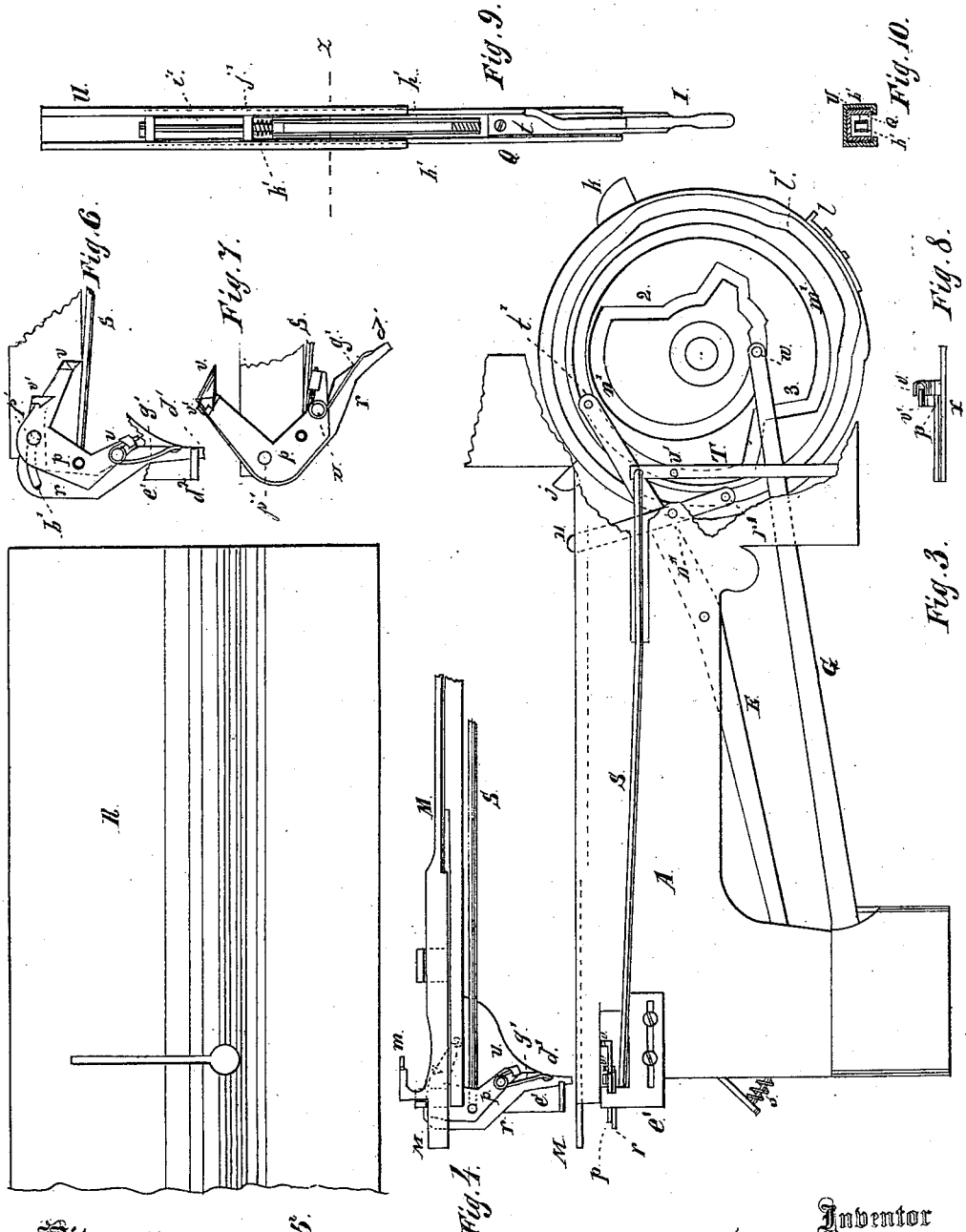

Witnesses
O. V. Bond.
Henry S. Burns.

Inventor
John P. Johnson
Per Wm. V. Bond Attorneys

4 Sheets—Sheet 3.

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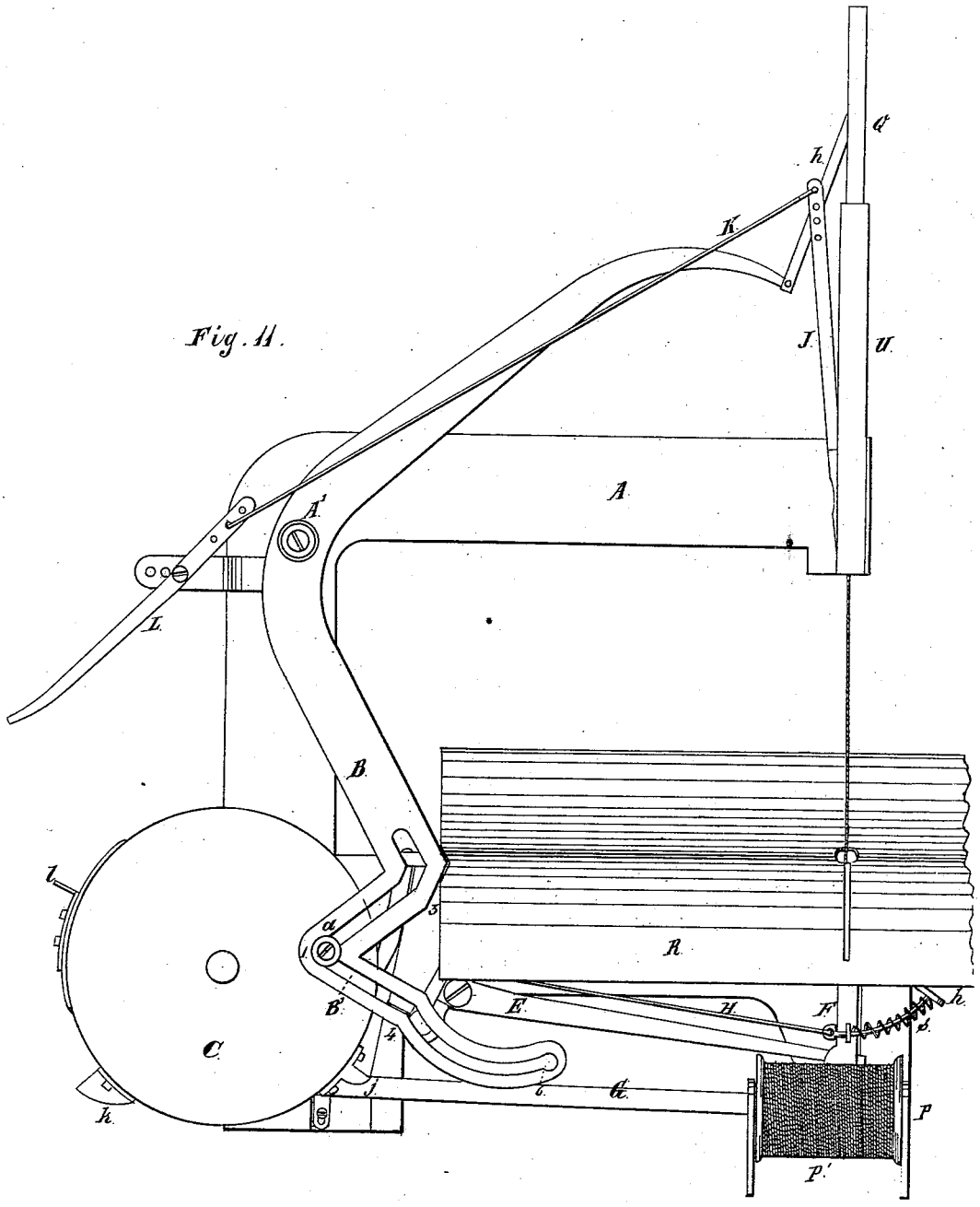
Fig. 4.



Witnesses

C. W. Bond

Henri L. Bonne

Inventor

John P. Johnson

Per Wait & Bond Attorneys.

4 Sheets—Sheet 4.

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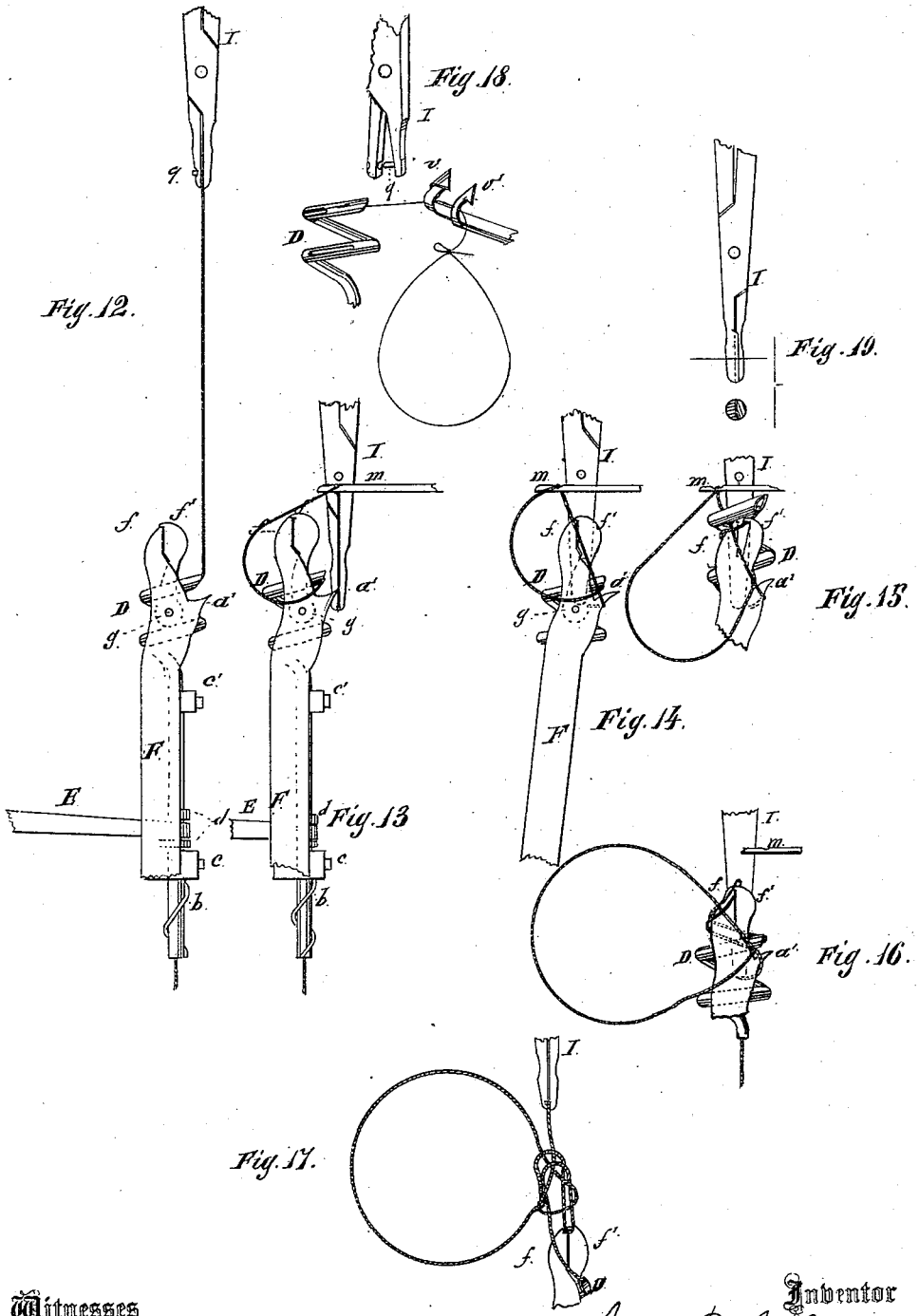

Witnesses
C. W. Bond
Henry F. Burns

Inventor
John P. Johnson
Per Wolf & Bond Attorneys

UNITED STATES PATENT OFFICE.

JOHN P. JOHNSON, OF ACTON, MINNESOTA.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **192,374**, dated June 26, 1877; application filed May 12, 1876.

To all whom it may concern:

Be it known that I, JOHN P. JOHNSON, of Acton, Meeker county, State of Minnesota, have invented new and useful Improvements in Grain-Binders, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation; Fig. 2, a front view; Fig. 3, a side elevation of the parts represented, showing the side opposite to that represented in Fig. 1; Fig. 4, a top view of the parts represented; Fig. 5, a top or plan view of the receiver; Figs. 6, 7, and 8, details of the plates *p r;* Fig. 9, a rear view of the pinchers and the parts therein shown; Fig. 10, a section at *z* of Fig. 9; Fig. 11, a side elevation of the parts shown, being the same as Fig. 1, the receiver being added, and the position of the parts changed; Figs. 12, 13, 14, 15, 16, 17, and 18, details, showing the different positions of the parts shown while a bundle is being bound; Fig. 19, a detail, showing the shear construction of the pinchers.

The object of this invention is to improve the construction of cord-binders for harvesting-machines, which I accomplish by means of the following devices: A bent arm carrying at one end a pair of pinchers to grasp one end of the binding-cord, and so constructed as to cut the cord, the other end of the arm being provided with a slot connected with an operating-wheel; a spiral cord-carrier; a loop-holder, opened and closed at intervals by devices for placing the cord in such a position that, after the knot has been tied, the pinchers can cut it and grasp the end thereof for the next bundle; by the use of a sliding device to hold the cord in its place, next to the pinchers, while the knot is being tied; by a device for opening and closing the pinchers; and by devices for operating the parts mentioned, hereinafter more fully described.

In the drawings, A represents the frame, to which the devices are connected.

B is a bent arm, pivoted at A′ to the frame.

B′ is a cam-slot in the lower end of the arm B.

C is an operating-wheel, provided with a suitable bearing in the frame A. Upon the face of this wheel, as shown in Fig. 1, is a roller, *a*, which, by the rotation of the wheel, operates the arm B. The opposite side of this wheel C is provided with cam-grooves for operating a series of levers, which grooves are represented in Fig. 3, and are hereinafter described. The periphery of this wheel C is also provided with dogs *j*, *k*, and *l*.

D is a hollow cord-carrier, the upper portion of which is spiral. The lower portion or shaft is supported in bearings *c c′*, and provided with a worm, *b*, which moves in a corresponding groove in the bearing *c*.

E is a lever, pivoted to the frame A, the outer end of which is forked, the fork passing between two collars or shoulders, *d d*, on the shaft of the cord-carrier, for the purpose of operating the same.

F is an upright bar, pivoted at *e* to the frame A, upon which bar the boxes or bearings *c c′* for the shaft of the cord-carrier D are permanently secured. The upper end *f* of this bar F forms the stationary portion of a small pair of nippers, and *f′* is a movable jaw, which forms the other part of these small nippers, which nippers serve the purpose of catching the loop. The lower end of the jaw *f′* has an extension, *g*, at right angles thereto, which passes through F, and serves as a pivot for the jaw, and to which the arm *h* is firmly secured.

G is an arm or lever for the purpose of moving the bar F back and forth. As shown, G is permanently secured to F.

H is a rod. One end is connected to the outer end of the arm *h*, and the other to the bell-crank lever *i*, by means of which and other devices the jaw *f′* is operated. On one side of the bar F and near the top is a hook or projecting point, *a′*.

I are the pinchers, which cut and grasp one end of the cord. One jaw is fixed, the other is movable by means of the lever J, rod K, and lever L. To the upper end of the stationary portion or jaw of the pinchers one end of the spring *t* is permanently secured. The other end of this spring *t* is pivoted to the arm or lever J, and the spring is so formed that it performs the office of holding the movable jaw in contact with the stationary one. The stationary jaw of the pinchers I is permanently secured to the lower end of the

sliding bar Q. This bar Q is grooved on the inside, as shown in Fig. 10, and it slides in the guide U. h' h' are two bars, to the lower ends of which one end of the arm B is pivoted. The upper ends of these bars are pivoted to the lower end of a rod, i', the upper end of which rod i' is secured by means of a nut to the top of the bar Q. Near the lower end of the rod i' is a cross-piece, j', through which i' passes, and between j' and the bars h' h' is a coiled spring, k, as shown in Fig. 9. The back side of the pinchers I is formed and arranged to operate as a pair of shears to cut the cord. Near the lower end of one of the jaws of the pinchers I is a pin, q, which serves as a stop to prevent the cord from passing too far into the pinchers, as shown in Fig. 18.

m is a guard or projecting point, permanently attached to the sliding bar M, which bar is pivoted to the lever n.

p r are two plates, pivoted one to the other at u. The forward end of p has a hook, v, and the forward end of r has another hook, v'. b' is a slot in the forward part of r, through which passes a guide-pin p'. The rear end d^1 of r engages with a notch in the upturned portion d^2 of the plate e', which plate is fastened to the frame. g' is a spring. One end is arranged to engage with the rear end of the plate p, and the other end with the rear end of the plate r, for the purpose of forcing the hooks v v' together.

S is a rod, for the purpose of operating the plates p r. One end passes through the upper plate p, but has no connection with the under plate r. The other end is pivoted to the operating-lever T, and the plate p is pivoted to the frame by means of the guide-pin p'.

The back side of the wheel C is provided with three cam-grooves, l' m' n, the forms of which are shown in Fig. 3. In the outer cam-groove l' is located a roller, r', upon the end of the lever n, which is pivoted to the frame at n'', for the purpose of operating the sliding bar M. In the second cam-groove, m', is a roller, t', which is located upon the end of the lever E, for the purpose of operating the cord-carrier D. In the same groove m' is also another roller, w', located upon the lever T, the lower end of which is pivoted to the frame, for the purpose of operating the rod S, and through it the plates p r. In the third groove n' is a roller, w, upon the end of the bar G, for the purpose of moving the bar F.

P are bearings for the spool P′, which carries the cord. (See Fig. 11.) R is the grain-receiver, provided with a hole and slot for the passage of the pinchers and cord, as shown in Figs. 5 and 11.

I provide the cord-carrier D with slots or openings to facilitate the introduction of the binding-cord. (See Fig. 18.)

s is a coil-spring around the rear extension of the arm h, and between the arm h and the projection on F, for the purpose of closing the jaw f' of the loop-catcher.

The worm or screw thread upon the shaft of the cord-carrier has the same inclination as the spiral or cork-screw portion thereof, so that such spiral portion rotates with the same speed as the shaft.

The wheel C may be driven from the driving-wheel of the harvester, in any suitable manner.

The dogs l and k are located on the inner edge of the periphery of the wheel C, and the lever i is so arranged that both of these dogs operate it, but neither of them come in contact with the lever L. The dog j is located on the outer edge of the wheel C, and operates the lever L, but does not come in contact with the lever i.

The operation is as follows: In Fig. 1 the parts are shown in the position which they occupy after a bundle has been bound and released and the work of binding another bundle has just commenced, the end of the cord being held by the pinchers, which have commenced to ascend by the action of the pin a, upon which is a roller moving in the slot B′. As the wheel C revolves in the direction indicated by the arrow the pinchers will be elevated to the highest point, as shown in Fig. 11, at which time the pin or roller a will be at 1 in the slot B′, the accumulated grain will be upon the upper portion of the receiver and against the cord, and by a suitable feeder or compressor (not shown) the grain will be forced over onto the lower portion of the receiver. Then the pinchers I descend, but before they reach the opening in the receiver R the guard m will be carried back so as to cover the slot in the receiver, which will be accomplished by means of the bar M, lever n, and the roller r' thereon, in the cam-groove l'. The pinchers continue to descend and carry the end of the cord down through the hole in the receiver and behind m. The cord is now around the grain to be bound into a bundle, and the pinchers have reached their lowest point, their position being shown in Fig. 13, the cord passing from the end of the pinchers up along their side and between them and m, and the side of the pinchers being hollowed a little, there is a space between the cord and the pinchers at this point.

The upper end of the bar F will now be carried forward by means of the lever G and the roller w in the cam-groove n', the point 2 in said groove n' having reached the roller w at the same time the point a' and the loop-catcher f f' pass between the cord and the pinchers I, and m is carried a little further back, bringing the parts and the cord into the position shown in Fig. 14; then the cord-carrier D will be rotated by means of the lever E, operated by the roller t' and the cam-groove m', the point 3 in such groove having reached the roller t' at the commencement of this operation. The cord-carrier will perform something more than one revolution and ascend, the spiral or cork-screw portion encircling the pinchers I. The upper end of the cord-carrier, with the cord at that point, passes first between the end of

the cord and the pinchers, and then, when the carrier has nearly reached its highest point, it passes outside of and over the same end of the cord, bringing the parts into the position represented in Fig. 15. This movement of the carrier has formed a loop in the cord, but just before the carrier reaches its highest point the dog *l* engages with the short arm of the bell-crank lever *i*, and thereby, through the connecting-rod H and arm *h*, opens the movable jaw *f'* of the loop-catcher. At the same time that the cord-carrier reaches its highest point, as shown in Fig. 15, the bell-crank lever is released from the dog *l*, and by means of the spring *s* the movable jaw *f'* is brought back in contact with *f*, and grasps and holds the loop. Then the movement of the cord-carrier is reversed, and it descends to its first position, the point of the loop being firmly held by the loop-catcher, as shown in Fig. 16. Then the arm F is carried partly back, releasing the cord from the point *a'*; then the pinchers ascend, the pin *a* having reached the point 4 in the slot B', carrying the end of the cord up to complete the knot, at which time the knot will be formed, as shown in Fig. 17, and the knot will be drawn tight by the continued ascent of the pinchers until the roller *a* reaches the point 1 in the cam-slot B'.

It will be seen that by the upward movement of the cord-carrier a loop must be formed at its upper end; that this loop is carried first between the pinchers and that end of the cord held by them; that then the loop is carried around the pinchers and over upon the outside of the same cord; that then the loop, being grasped and held by the loop-catcher, the carrier descends, sliding down upon the cord within it; that then, as the pinchers ascend, they carry the end of the cord which they hold up through the knot, and the loop being still held by the loop-catcher, the knot is tightly drawn by the ascent of the pinchers. At the same time the loop-catcher is opened by means of the dog *k* coming in contact with the bell-crank lever *i*, and the loop is released. At this time the dog *j* comes in contact with the lever L and opens the pinchers, releasing the end of the cord.

All that remains to be done is to cut the cord and grasp the end for the next bundle, which is done as follows:

While the knot is being drawn tight the two plates, *p r*, are brought into the position shown in Fig. 7, by means of the rod S operated by the roller *u'* in the cam-groove *m'*; at which time the two hooks *v v'* are held together by means of the spring *g'*. The pinchers begin to descend again after the pin *a* has reached the point 1 in the slot B'. At the same time the two hooks *v v'* catch that portion of the cord between the bundle and the upper end of the carrier, and return to a point back of the pinchers, carrying the cord back with them in the form of a loop; then the hooks separate, *v'* carries that portion of the loop last mentioned, which is nearest to the bundle, away from the pinchers, so that it will not be caught by them, as shown in Figs. 6 and 8. The pinchers continue to descend, and are held open by means of the dog *j* until they pass down over that portion of the cord which is between the hook *v* and the top of the cord-carrier, when the lever L is released from the dog *j*, the pinchers close and grasp the cord, and at the same time, by means of the shear device on the back thereof, cut the cord, and the bundle is released.

The pinchers then again begin to ascend, and the parts return to the position represented in Fig. 1, for the next bundle.

It may occasionally happen that the strain upon the cord at the time that the knot is tightly drawn may be greater than usual, and too much for the strength of the cord. To provide against this contingency, I use the coil-spring *k'*, which, arranged as described, relieves the undue strain.

The hooks *v v'* are so formed and constructed that the point of the hook *v'* can pass into *v*, the two when together forming practically a single hook. When the plates are in the position shown in Fig. 6 the hook *v'* is thrown away from *v* by the pushing action of the rod S upon the plate *p*, the two plates being pivoted together at *u*, as described, and the rear end of *r* coming in contact with d^2.

It is not absolutely necessary that the shaft of the cord-carrier be hollow; indeed, except at the point, the spiral part may be in the form of a deep groove, in which case the cord passes through a hole near the upper end of the bar F, or other guide, and thence through the upper end of the cord-carrier, such upper end being in the form of a tube. Such device would operate with some success, but I prefer a hollow cord-carrier, with the cord passing through its entire length.

During the operation the pinchers ascend, while the pin *a* passes from the position shown in Fig. 1 to the point 1 in the slot B', then they descend until the pin has passed to the extreme end of the slot, and, commencing its return, has reached the point 6; then they remain stationery until the pin has reached the point 4; then they ascend until the pin returns to the point 1, and then again descend until the pin reaches the point 5, from which point they again begin to ascend, having at that point grasped the cord.

The pin *q* is permanently secured in the lower end of one of the jaws of the pinchers I, and the other jaw is provided with a hole to receive the pin, so as not to interfere with the closing of the pinchers when grasping the cord.

The cord-spool P, as shown, is located at and close to the lower end of the cord-carrier, which location permits the cord to pass directly into the cord-carrier, but it may be located at some other point, if desired.

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

1. The spiral cord-carrier D, constructed and operating substantially as described.

2. The combination of the cord-carrier D, lever E, and wheel C, provided with a cam-groove, m', substantially as set forth.

3. The loop-catcher $f\,f'$, in combination with the arm h, connecting-rod H, lever i, and wheel C, provided with the dogs $l\,k$, substantially as described.

4. The loop-catcher $f\,f'$, and pivoted bar F, in combination with the cord-carrier D, substantially as specified.

5. The bar or lever G, in combination with the pivoted bar F and wheel C, provided with the cam-groove n', substantially as described.

6. The guard m, in combination with the sliding bar M and slotted receiver R, substantially as and for the purpose specified.

7. The pinchers I, provided with the lever J, in combination with the rod K and lever L, substantially as specified.

8. The pinchers I, sliding bar Q, and guide U, in combination with the bars h' h', rod i', and spring k', substantially as and for the purpose specified.

9. The plates p r, provided with hooks v v', and spring g', in combination with the operating-rod S, lever T, and upturned end d^2 of the plate e', substantially as and for the purpose specified.

10. The combination of the cord-carrier d, the point a' on the pivoted bar F, and the loop-catcher $f\,f'$, with the pinchers I and reciprocating arm B, for tying the knot, substantially as specified.

Witnesses: JOHN P. JOHNSON.

E. A. WEST,

O. W. BOND.