2 Sheets—Sheet 1.

S. H. RICHARDSON.

Grain-Binder.

No. 218,774. **Patented Aug. 19, 1879.**

Fig. 1.

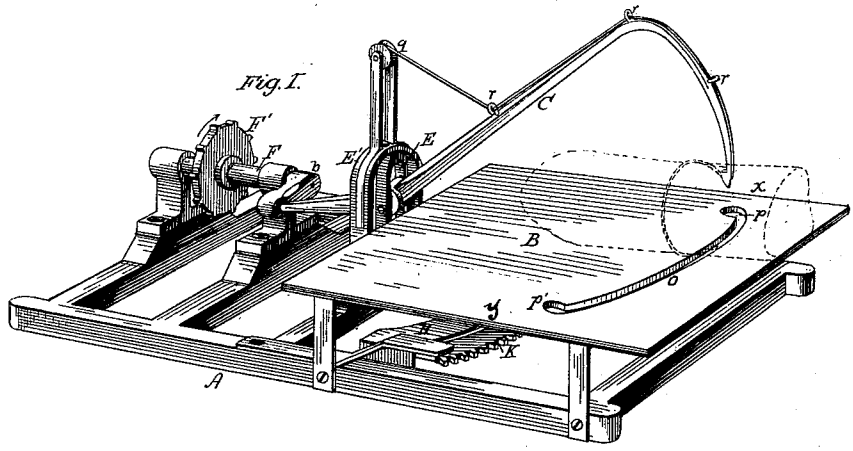
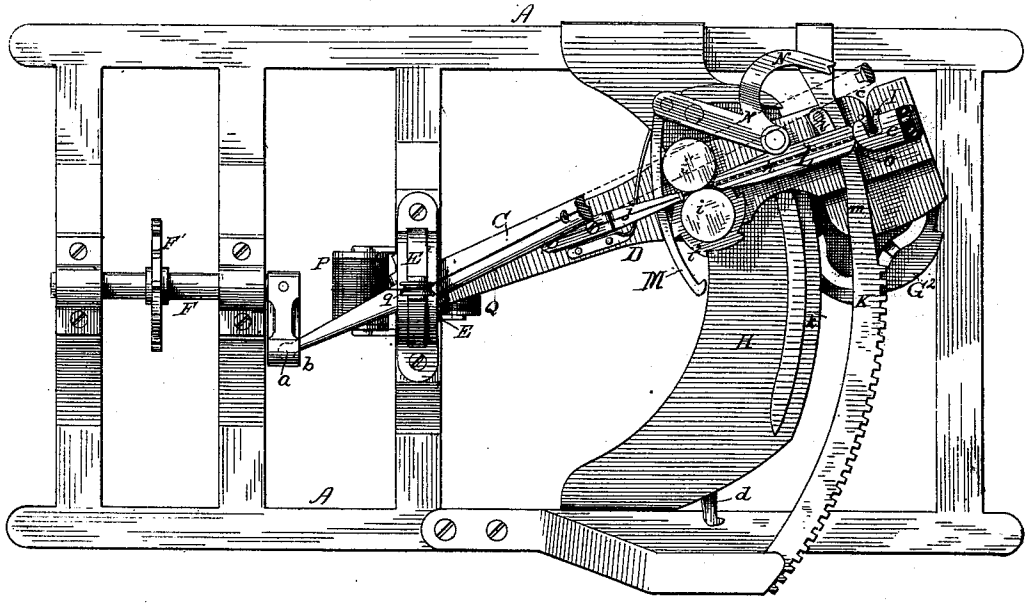


Fig. 2.



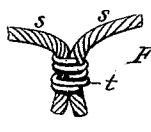


Fig. 6.

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R. F. Dyer.

Inventor:

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by Geo. W. Dyer & Co.

Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

2 Sheets—Sheet 2.

S. H. RICHARDSON.

Grain-Binder.

No. 218,774. **Patented Aug. 19, 1879.**

Fig. 3.

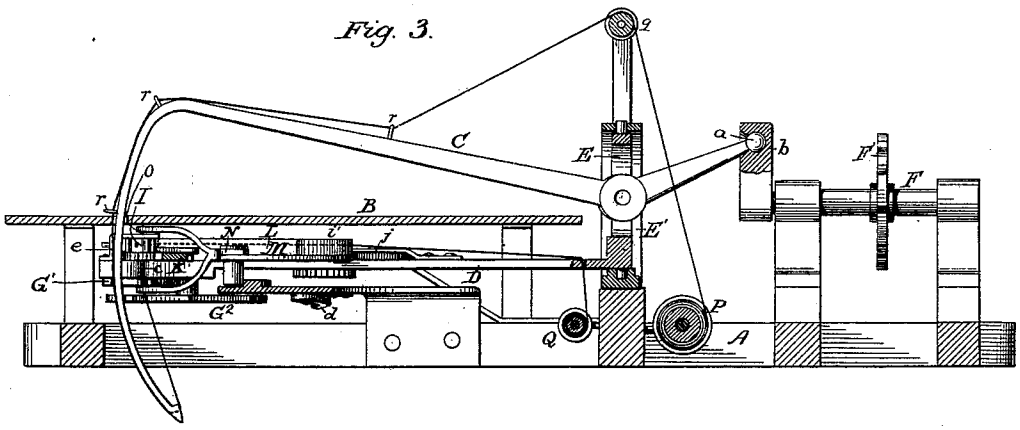


Fig. 4.

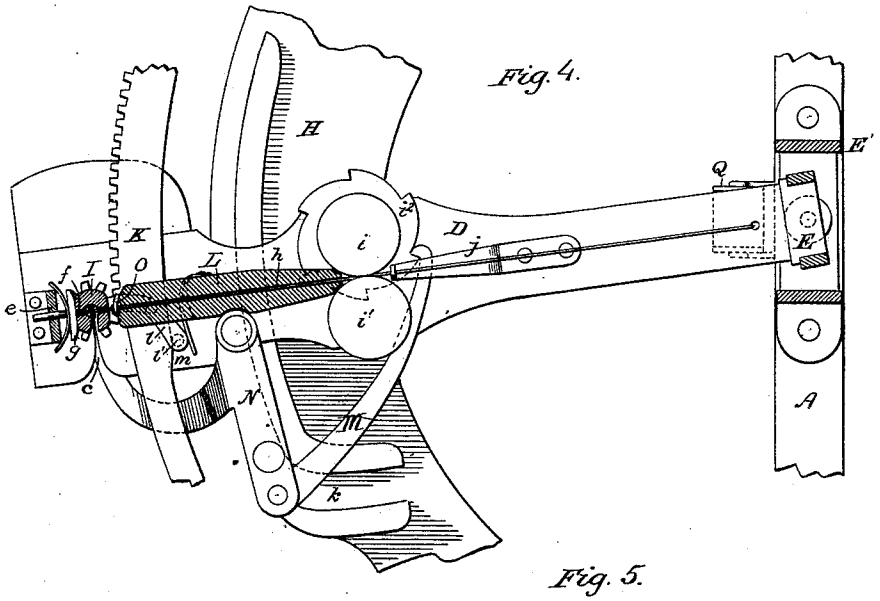
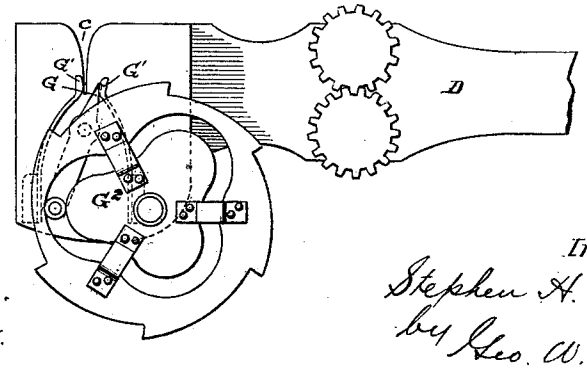


Fig. 5.



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UNITED STATES PATENT OFFICE.

STEPHEN H. RICHARDSON, OF SPRINGFIELD, ILL., ASSIGNOR OF TWO-FIFTHS HIS RIGHT TO JOHN C. LAMB AND JOHN L. MOON, OF SAME PLACE.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **218,774**, dated August 19, 1879; application filed October 28, 1878.

To all whom it may concern:

Be it known that I, STEPHEN H. RICHARDSON, of Springfield, in the county of Sangamon and State of Illinois, have invented a new and useful Improvement in Grain-Binders; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object I have in view is to provide a simple fastening for securing the ends of the binding-cord passed around a gavel of grain, which fastening can be made and the sheaf gathered by very simple mechanism; and my invention therein consists, first, in the peculiar manner of securing the ends of the binding-cord; second, in the combination, with the needle-arm, of a swinging bar having a slot to receive the cord and a spring-clip to hold the end of the cord, and provided with a slotted pinion, which also receives the lapped portion of the cord, and is constructed with a hole or opening at right angles to such slot, into which opening the securing-wire is fed; third, in the combination of the pivoted twine-clamp for pushing the cord into the slot, worked by a cam, and having a pawl which moves the wire feed-wheels; fourth, in the peculiar devices for cutting off the wire; fifth, in the combination of such cutting devices with the slotted twisting-pinion and the wire feed-wheels; sixth, in the peculiar means for holding the slotted twisting-pinion in position and regulating the feed of the wire; seventh, in the peculiar vibrating knife and springs for cutting and holding the cord; and, eighth, in the devices for operating said knife, all as fully hereinafter explained.

In the drawings, Figure 1 is a perspective view of the binder with the platform in position. Fig. 2 is a top view of the same, the platform being removed and the needle-arm partly broken away. Fig. 3 is a vertical section through the frame, showing a side view of the arms at about the center of their lateral movement. Fig. 4 is a top view of the parts just before the wire is twisted, with the twister and the wire feeding and cutting devices in section. Fig. 5 is a view of the means for cutting and holding the cord; and Fig. 6 is a view of the ends of a cord fastened together by my machine.

Like letters denote corresponding parts in all the figures.

A represents the frame of the binder, and B the platform, mounted in suitable position on the harvester or reaper. Above the platform is the needle-arm C, which guides the cord, and below the platform is the bar D, which carries most of the parts of the mechanism. The inner end of the bar D is rigidly connected with the lower end of a swinging yoke-frame, E, mounted on vertical pivots in the vertical frame-standard E′, and the needle-arm is pivoted in this yoke-frame E by a horizontal shaft, and has a ball, *a*, on its short end, which projects on the opposite side of the yoke-frame. This ball works in the end of a crank, *b*, on the end of a horizontal shaft, F, which is journaled in two standards rising from the frame A, and between these standards a chain-wheel, F′, is keyed on the shaft, through which the binding mechanism is operated by connection with the harvester.

By the revolution of the shaft F the needle-arm C is caused to describe a circle, its outer end working wholly on one side of the swinging bar D, while the bar D is vibrated back and forth on the arc of a circle.

In one side of the swinging bar D, at its head or outer end, is cut a vertical slot, *c*, with the corners of the slot rounded off, as shown, to guide the cord into the same. On the under side of the head of the bar D is pivoted the knife G, with its cutting and holding end projecting under a portion of the slot. On each side of the knife is a spring-clip, G^1, between which clips the end of the knife vibrates. The shank of this pivoted knife has a pendent stud carrying an anti-friction roller, which works in a horizontal cam-wheel, G^2, pivoted on a pin projecting downwardly from the under side of the bar D. This cam-wheel has ratchet-teeth on its periphery, and extends under a plate, H, connecting parts of the frame, upon which plate at one end is a spring-pawl, *d*, which catches on one of the ratchet-teeth and turns the cam-wheel when the bar D reaches that end of its movement.

Over the slot *c* is placed a slotted wheel, I, which is held between the head of the bar and

an angle-plate, *e*, secured to such head. The lower edge of the slotted wheel I has cog-teeth, which mesh with the cogs on the curved rack-bar K, close to the under side of which the head of the bar D works. The wheel I has a horizontal hole, *f*, bored through it centrally, and crossing the slot in the same, and into this hole the end of the wire is pushed from the guide-block L, as will be presently explained.

The upper side of one part of the slotted wheel is made flat at one end of the hole *f*, and against this flat side a spring-plate, *g*, presses to keep the hole in line with the guide, the spring-plate being held in place by a stem projecting through the angle-plate *e*.

The wire-guide block L is secured to the upper end of the bar D, and has its outer end projecting over the rack-bar nearly to the wheel I. It has a hole, *h*, through which the wire is fed, and at its inner end are arranged two horizontal feed-wheels, *i* i^1, whose spindles extend downwardly through the bar D, and have meshing cog-wheels, so that such feed-wheels will turn together. Just behind these wheels *i* i^1, and in line with the passage in the block L, is an arm, *j*, having an upturned inner end provided with a guide-hole.

The feed-wheels may be roughened to gripe the wire, and the wheel *i* has a ratchet, i^2, with which engages a spring-pawl, M, pivoted to and worked by the cord-clamp N. This cord or twine clamp is pivoted to the bar D, and has arms with notched ends projecting outwardly, one above and the other below the rack-bar K.

The inner arm of the clamp N has a stud projecting from its under side, carrying an anti-friction roller, which works in a cam-groove, *k*, on the plate H. The cam-groove *k* runs parallel with the rack-bar throughout the greater part of the length of such groove, but at one end turns abruptly to the rear, so that when the bar D is approaching this end of its movement the clamp-arms will be thrown back from the twine-slot, and as the bar returns on the reverse movement the clamp-arms will be moved forward above the slot in the wheel I and below the slot in the bar D, and the feed-wheels *i* i^1 will be moved by the pawl M.

A curved knife, O, is situated on the outer end of the guide-block L, and between the same and the slotted wheel, its shank *l* being pivoted to the under side of the guide-block. The shank *l* has a downwardly-projecting pin, *l'*, which moves against the inner side of the rack-bar. A leaf-spring throws the shank *l* forward against the rack-bar and the knife O back away from the hole *h* in the guide-block when the bar D is at one end of its movement; and the rack-bar is provided with a beveled shoulder, *m*, which moves the knife across the end of the hole *h*, cutting off the wire.

The rack-bar has no teeth on its rear side, and its front side is plain at one end, not being provided with any teeth from a point a little beyond the shoulder *m* to its nearest end.

The platform B, preferably constructed of sheet metal, is supported from the frame just above the rack-bar and the bar D, and it has a curved slot, *o*, through which the needle-arm traverses in one direction, the ends *p p'* of this slot being enlarged to allow the end of the needle-arm to pass downwardly and upwardly through the platform.

The cord or twine is carried on a tension-reel, P, supported on the frame in rear of the standard E'. The cord is taken from the reel and passed around a wheel, *q*, (once or twice, as the tension may require,) supported above the standard E', through a number of eyes, *r*, on the upper side of the needle-arm, and then to the rear through a hole in the pointed end of the needle-arm.

The wire-spool Q is held between spring tension-arms just below the inner end of the bar D. The wire extends from this spool upwardly through a hole in the bar D, and forward along the upper side of the bar, through the guide *j*, between the feed-wheels *i* i^1, and into the block L.

In operation the chain-wheel F' is revolved in the direction shown by the arrow in the drawings. The needle-arm is moved down through the slot in the platform, and the end of the cord is caught (by hand to start the machine) between one side of the knife G and one of the springs G^1. The parts are then moved by the continued revolution of the chain-wheel to the opposite end of the slot, the grain in the meantime being thrown onto the platform from the side *x*. The point of the needle-arm then rises through the platform, leaving the end of the cord held by the knife G, and drawing the cord from the reel. The needle-arm then advances over the platform toward the side *x*, the cord inclosing and bundling up the grain, Fig. 1, and the cord being drawn by the tension around the bundle into the slotted wheel I and the slot *c* of the arm D. The needle-arm then passes down through the end *p* of the slot, drawing the cord tight around the bundle, and the clamp N comes forward, forcing the loop of the cord into the slot *c* and the wheel I, and between one of the springs G^1 and the opposite side of the knife G from that which holds the end of the cord. The forward movement of the cord-clamp works the feed-wheels *i* i^1, and the end of the wire is pushed through the hole *f* in the wheel I between the cords before the clamp has pushed the loop into place. The needle-arm and arm D then move toward the side *y* of the platform. The pin *l'* strikes the shoulder *m*, and the knife O cuts off the end of the wire. The wheel I then engages with the teeth of the rack, and the wire is twisted around both parts of the cord, the gavel at the same time being pushed toward the side *y* of the platform. One of the ratchet-teeth of the cam-wheel G^2 then engages with the pawl *d*, and the knife G is moved from one spring G^1 to the other, releas-

ing the end first caught, cutting off the loop outside of the fastening, and catching the new end. The needle-arm then rises through the platform and the operation is repeated, one bundle pushing the preceding bundle off of the platform, and the needle-arm, each time it passes down through the platform, dividing the grain necessary to form one gavel from the rest of the grain thrown on the platform. The fastening formed by the mechanism is shown in Fig. 6.

Between the ends *s* of the cord is a wire, *t*, which is bent from its center around both parts of the cord. The fastening is very secure, and the mechanism required to make it is quite simple.

I hereby disclaim the broad invention of a binding-arm pivotally supported on a universal joint and combined with a driving-wheel or crank to which the rear end of the binder-arm is directly connected, and also the same parts when the axis of the driving-wheel or crank is in line with the axis of the universal joint and the parts are combined with a twisting mechanism.

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

1. The mode of securing the ends of the binding-cord, consisting in laying a short wire between them as they are brought together and twisting the ends of the wire around both parts of the cord, substantially as described.

2. The combination, with the needle-arm, of the swinging bar D, having a slot in its side to receive the cord and a spring-clip on its under side to hold the end of the cord, and provided with a slotted pinion having a hole at right angles to the slot into which the fastening-wire is fed, substantially as described and shown.

3. The pivoted twine-clamp N, worked by a cam on the plate H, and carrying a pawl which moves the wire-feed wheels, substantially as described and shown.

4. The pivoted knife O on the end of the wire-guide block L, operated by a shoulder on the rack for cutting off the wire, substantially as described and shown.

5. In a grain-binder, the combination, with the slotted twisting-pinion, of the guide-block L, having the knife O on its end, and the wire-feed wheels i i^1, geared together and operated by a pawl, substantially as described and shown.

6. In a grain-binder, the slotted wire-twisting pinion I, having a wire-hole and constructed with a flat side, in combination with a spring-plate, *g*, adapted to hold the pinion and to regulate the feed of the wire, substantially as described and shown.

7. The pivoted knife G on the under side of the bar D, in combination with the springs G^1, between which the cutting and holding end of the knife moves, substantially as described and shown.

8. The combination, with the knife G, of the cam-wheel G^2, having ratchet-teeth on its edge, and the stationary pawl *d*, substantially as described and shown.

This specification signed and witnessed this 13th day of September, 1878.

STEPHEN H. RICHARDSON.

Witnesses:
SAML. D. SCHOLES,
T. C. MATHER.