

H. H. BRIDENTHAL, Jr.  
Grain-Binder.

No. 196,626

Patented Oct. 30, 1877.

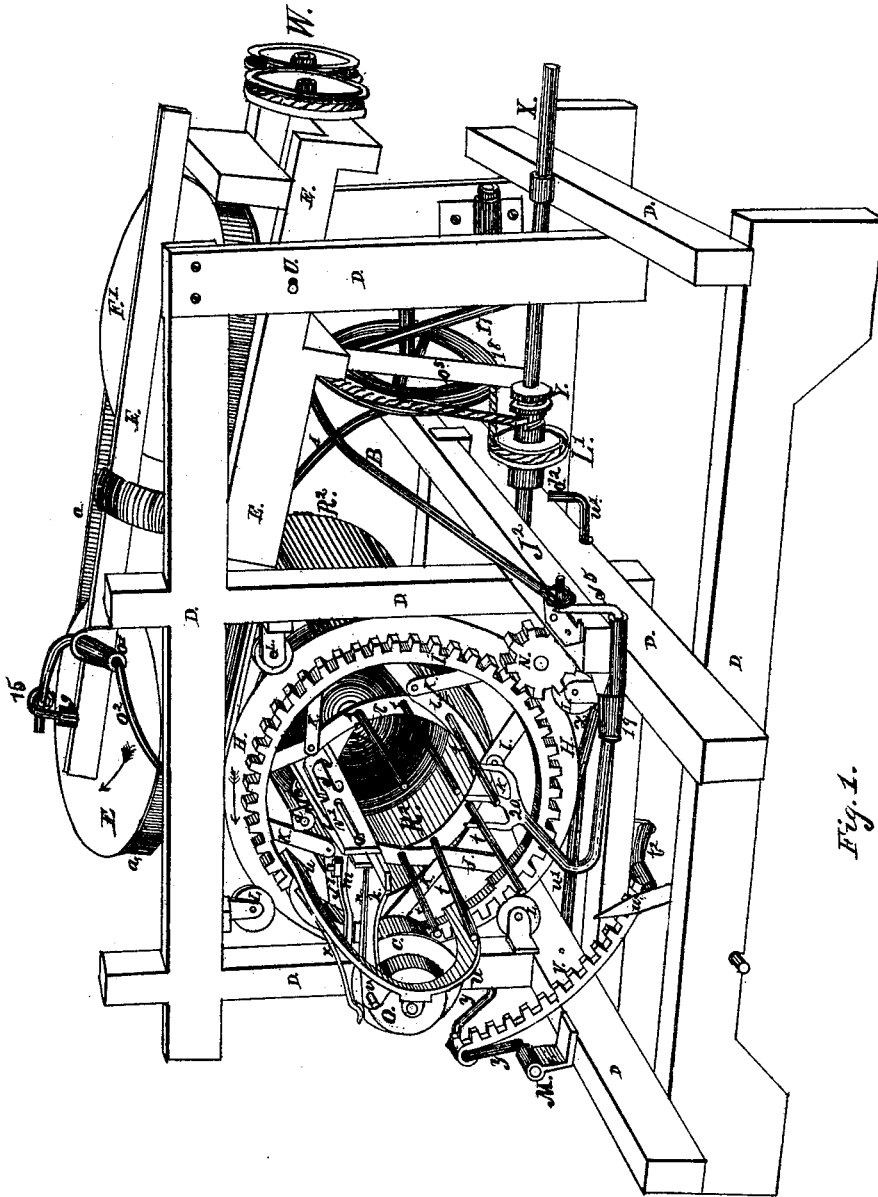


Fig. 1.

Witnesses. *Wm. McKee Gallagher*  
*John A. Knox.*

Inventor.  
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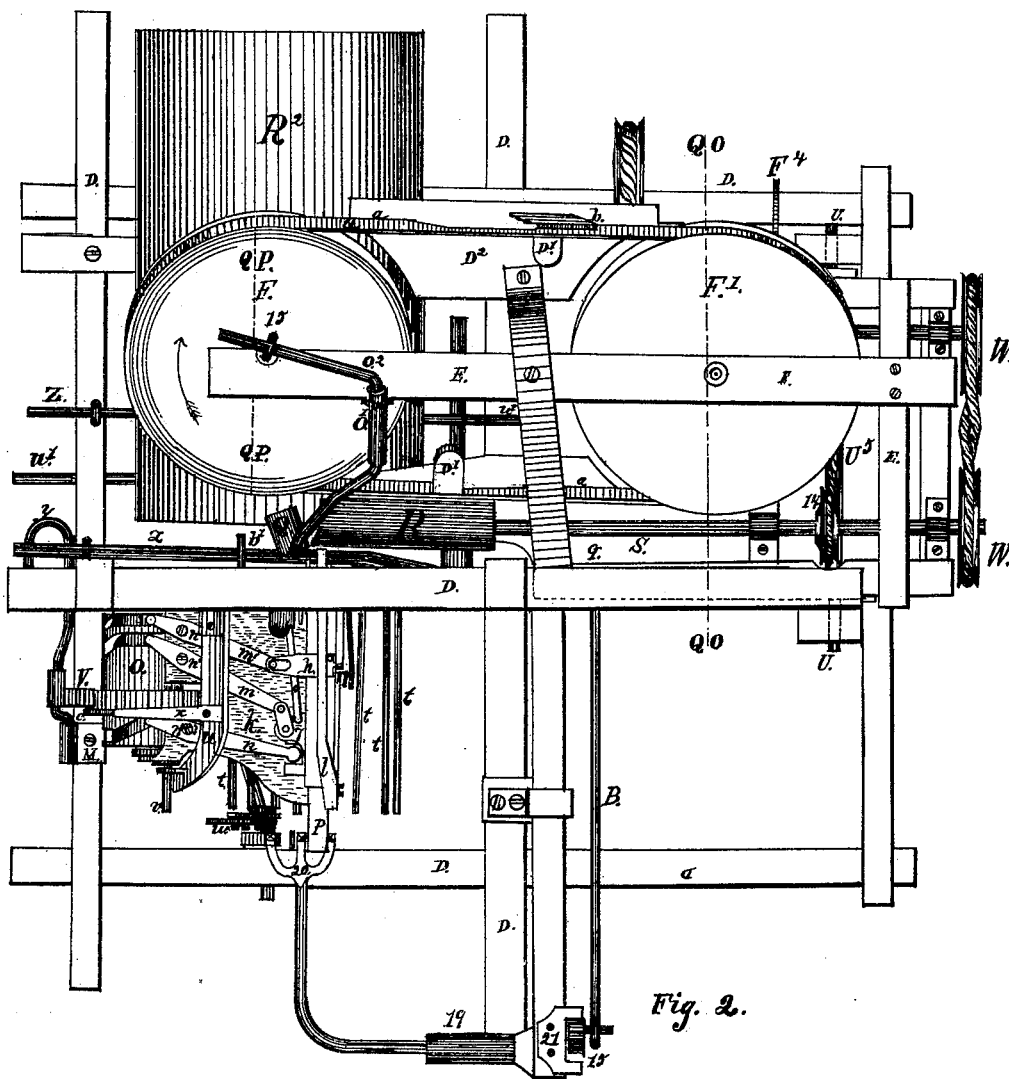


Fig. 2.

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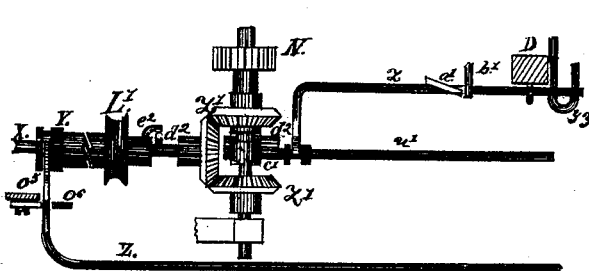
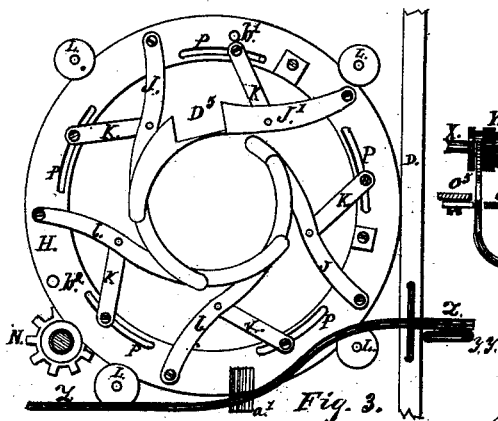


Fig. 4.

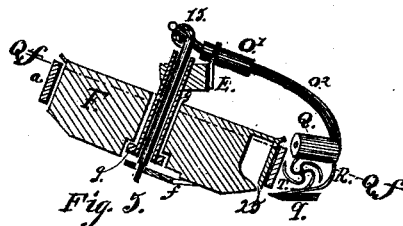


Fig. 5.

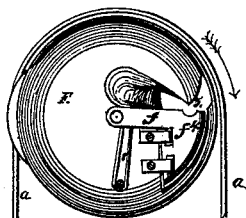


Fig. 6.

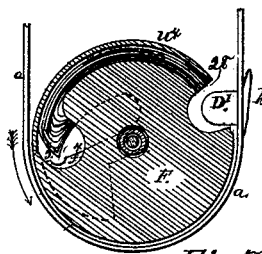


Fig. 7.



Fig. 8.

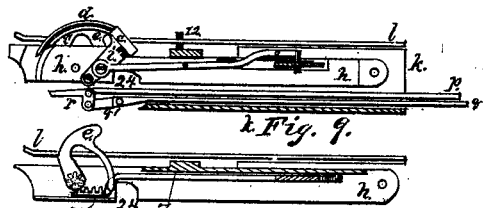


Fig. 9.

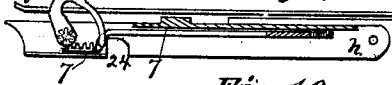


Fig. 10.

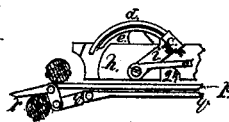


Fig. 11.

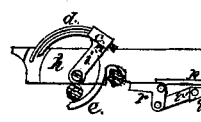


Fig. 12.

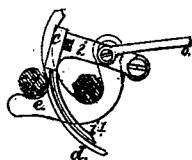


Fig. 13.

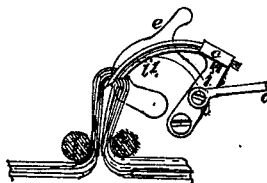


Fig. 14.



Fig. 15.



Fig. 16.

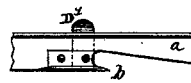


Fig. 17.

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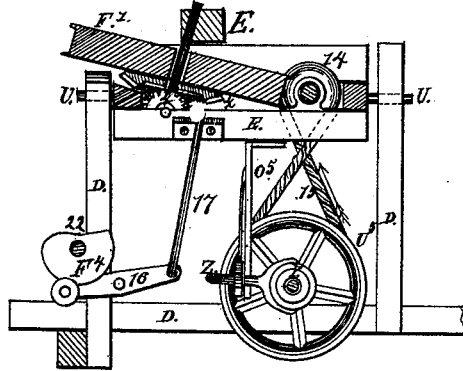


Fig. 18.

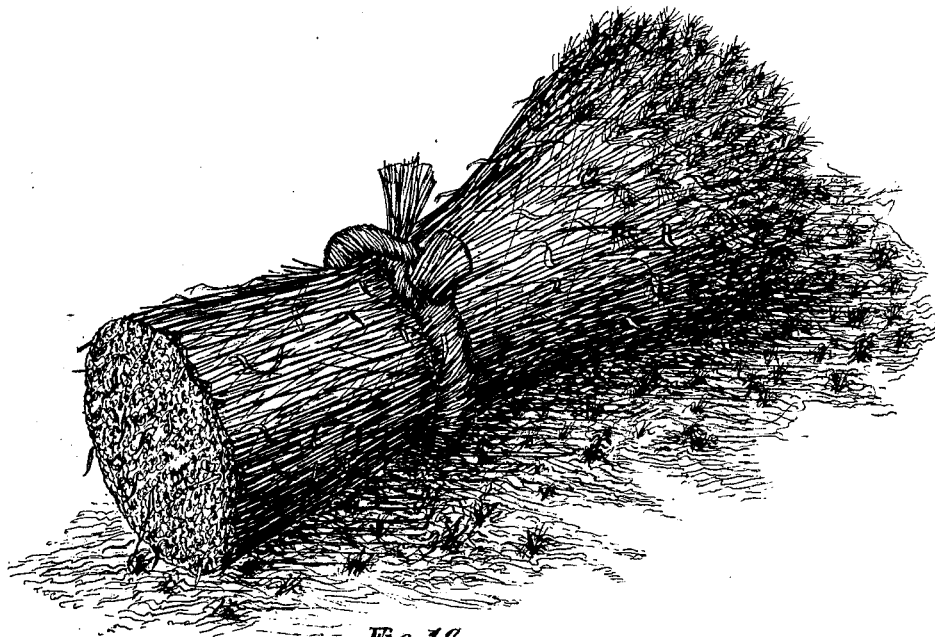


Fig. 19.

Witnesses.

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*John F. Knox.*

Inventor.

*H. H. Bridenthal, Jr.*

# UNITED STATES PATENT OFFICE.

HARRY H. BRIDENTHAL, JR., OF WESTMORELAND COUNTY, PENNSYLVANIA.

## IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. 196,626, dated October 30, 1877; application filed April 8, 1876.

*To all whom it may concern:*

Be it known that I, HARRY H. BRIDENTHAL, JR., of the county of Westmoreland and State of Pennsylvania, have invented certain new and useful Improvements in Grain-Binders for Harvesting and Reaping Machines; and I do hereby declare the following to be a clear and exact description thereof, that will enable those skilled in the art to which it appertains to make and use the same, reference being had to the drawings forming a part of this specification.

My invention relates to that class of binders which form a band by twisting together the butt-ends of straws taken from the outside of the sheaf or gavel to be bound, the top ends thereof remaining in place upon said sheaf; and my invention consists in simple and effective devices whereby the gavel is compressed and rotated while the band is being formed thereon, and in improved devices for separating from the gavel stocks or straws, and forming the same into a band.

It further consists in a novel manner of securing the ends of said bands, and in the combination and arrangement of the various elements, as will be hereinafter more elaborately explained.

My invention is applicable to any reaping or harvesting machine wherein the grain can be cut and delivered to the binder in gavels of suitable size to form sheaves; and in describing it I will refer to the drawings, in which—

Figure 1 is a perspective view of my machine. Fig. 2 is a top or plan view thereof. Fig. 3 is a front elevation of the holding and rotating devices. Fig. 4 is a plan of the drive-gear and system of clutches governing the same. Fig. 5 is a vertical sectional view of the separating-disk, taken on the line Q P Q P of Fig. 2; and Fig. 6 is a bottom view of the same. Fig. 7 is a top sectional view of the lifting-disk, taken through the line Q f Q f, Fig. 5. Fig. 8 is a side view of the twister. Fig. 9 is a side view of the knotting devices, and Fig. 10 is a vertical section of the same. Figs. 11, 12, 13, and 14 are side views of the knotting-hooks, shown in various positions relative to the band during the operation of forming the knot or connection between the ends of the band. Fig. 15 is a front view of the

loop-hook *d*. Fig. 16 is a diagram of the knot finished. Fig. 17 is a section of the belt *a*, showing the carrying-hook *b*. Fig. 18 is a vertical sectional view of the machine, taken through the line Q O Q O, Fig. 2; and Fig. 19 is a perspective view of a sheaf of grain as bound on my machine, showing the band and knot or connection between the ends of said band.

Similar letters and figures of reference where they occur in different figures denote like parts of the machine in all of the drawings.

D represents the main supporting-frames, which are to be so modified as to form a part of, or be connected with, the reaper or harvester to which the binder is to be attached.

X represents the main driving-shaft, which is connected, by means of any suitable clutch mechanism, with some part of the moving machinery of the reaper, and in such a manner as to be easily controlled by the attendant. To the end of said driving-shaft is attached the miter-wheel L', which meshes with two similar miter-wheels, which turn loosely upon the short shaft *l*, upon which, and between said miter-wheels, is placed a double clutch, so constructed as to engage with either one of said wheels, thus forming a reversing-gear, for the purpose of reversing the motion of the holder H, which is connected therewith by means of the pinion N, which meshes with the toothed circle I.

The circle H is supported by the series of rollers L, which are strongly connected with the frames D, and in such a manner as to permit of their rotation, the thin edge of the circle H resting within the annular grooves of said rollers L, thus preventing the circle from falling out sidewise.

Near the outer edge of the circle H is pivoted the series of arms or curved blades J, which, being quite thin at the inner ends, overlap each other, as shown in Fig. 3.

To the back of the circle H is secured the toothed circle I, by means of a series of studs or bolts, which pass through the corresponding slots P in the circle H, in such a manner as to allow it to move a short distance circumferentially upon said circle H.

To the ends of the studs or bolts which pass through the slots P are secured the outer ends

of the arms K, the opposite ends of which are pivoted to the arms or blades J, which are thus held uniformly in position, the curved ends thereof forming a circle which is contracted or enlarged, respectively, by a right or left movement of the circle I upon the circle H.

To the back of the blades J are secured a series of projecting pins or rods, *t*, the object of which is to support the top end of gavel, keeping it straight within the grasp of the holding-blades J.

To the back of the circle H is secured the U-shaped frame *u*, which has for its purpose the forming of a support for the mechanism which forms the knot or connection between the ends of the band.

To the back of the larger holding-blade J<sup>1</sup> is secured the swinging frame *k*, which is also pivoted to the frame *u*, in line with the connection between the said blade J<sup>1</sup> and the circle H, thus allowing the frame *k* to swing freely with the blade J<sup>1</sup>.

Upon the swinging frame *k* is secured the reciprocating frame *h*. The rear end of the said frame is secured to the frame *k* by means of a stud working within the slot *v*<sup>1</sup> in the frame *k*, while the opposite end is held in place by means of the long spring *l*, and in such a manner as to allow it to be raised while being moved forward by a pin therein passing over the slide *s*, and rearward beneath the said slide *s*.

The frame *h* is operated by means of the arm *m*<sup>1</sup>, which is pivoted to the frame *k* by means of the stud *n* thereon. One end of said lever-arm is connected with the frame *h* by means of a slotted arm, while the opposite end carries a friction-roller within a groove in the intermittent revolving cylinder O, which is pivoted within the frame *u*.

To the outer end of the reciprocating frame *h* is pivoted the knotting-hooks *e* and *d*, both of which receive motion from a second groove in the cylinder O, by means of the oscillating arm *m* and the slide 7 within the frame *h*.

Upon the forward end of the said slide 7 is formed a toothed rack, which meshes with a pinion on the shaft of the hook *e*, and the hook *d* receives motion from said slide 7 by means of the connecting-rod *o*, pivoted to the arm *i* of said hook, and in such a manner that the hooks will reciprocate in opposite directions, for purposes as will be hereinafter described.

Beneath the frame *h*, and upon the frame *k*, are secured the slides *q p*.

To the forward end of the slide *p* is pivoted the small fork *r*, an arm on the rear end of which is connected, by means of the connecting-rod *q*<sup>1</sup>, to the lower slide *q*.

A reciprocating motion is given to the slides *q p* by means of the oscillating lever *n*<sup>2</sup>, pivoted to the frame *k* by the stud *n*<sup>3</sup>, and the end of said lever works within a third groove in the cylinder O.

The fork *r* has for its purpose the holding of the first formed end of the band while the

latter end is being formed over it. A particular arrangement of the notches in said slides, within which works the lever *n*, causes a slight difference in the movement of the same, which produces the requisite vertical movement of the point of the fork *r*.

The cylinder O is retained in position by means of the spring *x*, which is attached to the frame *u* by resting within a notch in the periphery of the disk C, except when the toothed part of the said cylinder is engaged by the segmental reciprocating rack V, which has a sufficient number of teeth to cause the cylinder O to turn one revolution as it is carried around by the revolution of the compressor H, which makes one and one-half revolution forward and one-half of a revolution back in binding a sheaf; and to prevent the cylinder from turning more than once, or turning backward during the operation, the segmental rack V is hung upon the curved rods *y* and *t*<sup>2</sup> in such a manner as to be out of the way of the cylinder except during the operation of forming the knot or connection in the band.

E is a swinging frame attached to the main frame D, by means of the pivots or trunnions U U, about which it oscillates a short distance, for the purpose of raising the band-forming devices out of the way of the gavel while it is being placed within the compressor; also, to allow the lifter-disk to rest directly upon the gavel.

The frame E may be of any shape or form suitable to contain the working parts of the straw-lifter and band-twister.

The lifter consists of the revolving disk F, (shown in detail in Figs. 5, 6, and 7,) and it is hung upon the diagonal sleeve or spindle *g*, attached to the frame E, and provided at the lower end with a collar or other suitable means to prevent the disk from running off.

The disk F receives motion from the disk or pulley F<sup>1</sup>, by means of the belt *a*, which assists in carrying the straw from the gavel to the twister, by means of the hooks *b* and the blocks D', the latter of which present a rounded edge, over which the straw passes, thus preventing it from being torn, as it would be, more or less, if drawn over or around the thin edge of the belt.

The blocks D' have also for their purpose to keep the belt *a* in its proper place upon the disk F, which is provided with one or more recesses in which the said blocks enter as they pass around the said disk F.

The disk F<sup>1</sup> is also provided with one or more recesses, and in this respect is similar in construction to the disk F, thus preventing the belt *a* from slipping or otherwise working out of place.

Any number of said blocks D' and recesses may be used. There should, however, be at least two recesses in each of the disks.

Motion is communicated to the disk F<sup>1</sup> from the twister-shaft S by the pulleys W and the bevel-gear 4 4, the larger of which is attached to the under side of the disk or pulley F<sup>1</sup>,

which revolves upon a diagonal stationary spindle, which is placed at a similar angle relative to the frame E as is the hollow spindle *g*.

The object of placing the lifter-disk diagonal relative to the axis of the gavel is to give more room for the operation of the mechanism which holds the butt-end of the gavel, also to allow only the beveled edge of said disk to come in close contact with the gavel, which causes it to be more reliable in catching up the binding-straw.

S is the twister-shaft, which is hung in bearings within the frame E, parallel, or nearly so, with the belt *a*, and it receives motion from the driving-shaft X by means of the pulleys U<sup>3</sup> 14 and the crossed belt 15. The pulley 14 is placed upon the shaft S nearly in line with and between the pivots U U, so as to allow the frame E to oscillate without interfering with the tension of said belt. To the opposite end of the shaft S, and within the case R, is placed the twister T, which consists of a series of leaves curved longitudinally with their shaft from which they spring gradually in the direction of which the straw is drawn as the band is formed or twisted.

The shaft S reaches only about half through the entire length of said twister-leaves, thus forming a sort of tube, through which the band passes as it is formed. By this construction any detached straws are, by the band, carried out of the twister, thus preventing choking. The band is also kept, by the projecting ends of the leaves, centrally relative to the axis of the revolving twister.

The end of the hood or case R is formed so as to admit the roller Q, pivoted to one arm of the rock-shaft O<sup>2</sup>, to rise and fall therein. The said rock-shaft O<sup>2</sup> is pivoted to the frame E by the sleeve O<sup>1</sup>, and its opposite arm is pivoted to the top of the rod 15 within the hollow spindle *g*. The lower end of said rod is in turn pivoted to the end of the arm *f* of the leaf or bridge *f*<sup>4</sup>, which is hinged to the under side of the lifter-disk F, and has for its purpose to regulate the quantity of straw taken from the gavel by the point 5.

A light spring, 8, retains the leaf *f*<sup>4</sup> closed against the disk, thus leaving the point 5 exposed, so as to take up straw to its full capacity except when there is a full-sized band forming through the twister and beneath the roller Q, which is thereby raised by said band, and, by means of the rock-shaft and rod 15, causes the leaf *f*<sup>4</sup> to fall, so as to prevent the point 5 from taking up more straw than is necessary for the formation of an ordinary-sized band.

The frame E is supported by means of the rod 17, the lower end of which is pivoted to the end of the lever 16, which is, by means of a short shaft, 16, which is, near its middle, pivoted to the frame D, and to the opposite end is pivoted a friction-roller, which rests against the periphery of the disk F<sup>4</sup>, as shown in Fig. 18.

The disk F<sup>4</sup> is secured to a shaft pivoted to the frame D, and receives motion from the

main drive-shaft X by means of the pulleys 18 and L<sup>4</sup>, the former of which is rigidly connected with its shaft, while the latter turns loosely upon the main shaft X, and is connected therewith by means of clutch Y, which is so arranged as to cause the pulley and shaft 18 to turn one revolution and stop.

To the rim of the pulley 18 is connected a short arm, which is provided with a wrist, and, thus serving as a crank, it is connected to and reciprocates the rail J<sup>2</sup> by means of the connecting-rod B and the crank-arm S<sup>5</sup>.

To the end of the rail J<sup>2</sup> is secured the sleeve 19, through which passes the curved rod carrying the fork 20, which has for its purpose to carry the bound sheaf out of the binder.

To the opposite end of the fork-rod is connected the arm S<sup>5</sup>, the motion of which is limited by means of two projecting studs upon the plate 21 on the end of said rail J<sup>2</sup>. By this construction the revolution of the pulley 18 causes the rail J<sup>2</sup> to reciprocate, and the rod B being connected with the arm S<sup>5</sup>, thus causing the fork to move toward the binder beneath the sheaf, and when the movement is reversed the fork is raised, and the tines thereof enter the said sheaf and carry it from the binder.

To the opposite end of the rail J<sup>2</sup> is rigidly connected the curved arm A. To the opposite end of and within the receiver R<sup>3</sup> is pivoted the convexed revolving disk O<sup>4</sup>, which has for its purpose the pushing of the gavel into the compressor, and revolves with said gavel during the operation of binding.

The operations of my machine are as follows: The machine being out of gear with the harvester, and the disk O<sup>4</sup> drawn to the end of the receiver farthest from the compressor, a gavel of grain is deposited in the said receiver R<sup>3</sup>. The operator then starts the binding mechanism, when the pulley 18 will turn one-half of a revolution, carrying the rail J<sup>2</sup> to the opposite end or extremity of its movement, causing the disk O<sup>4</sup> to push the gavel about the half length of itself through the open compressor-ring. The disk F<sup>4</sup> will then be in a position allowing the roller on the end of the arm 16 to rise into the notch 22 therein, thereby allowing the frame E to fall, bringing the lifter-disk in contact with the gavel. At the same time a latch-hook on the lower end of the arm O<sup>3</sup>, which is attached to the under side of the frame E, draws back the rod Z, thereby releasing the clutch Y, allowing the pulley L<sup>4</sup> and connections to stop. The attendant then moves the rod *u*<sup>1</sup>, so as to cause the clutch C<sup>1</sup> to engage the miter-wheel L<sup>1</sup>, thus starting the ring I, which moves a short distance upon the ring H, as before described, thus closing the blades J upon the gavel, when the ring H also commences to revolve within its supporting-rollers. The point 5 of the lifter-disk E takes up a few straws from the gavel near the compressor, and, passing under the same, they are drawn into the cavity O O. (Shown in Fig. 7.) The disk F in its revolution separates the



binding-straws from near the place of the band toward the butt of the gavel, thus leaving the straw of the said gavel which may be entangled with the said binding-straw, and which would otherwise be torn up and entangled with the moving parts of the machine, straight and in place upon the sheaf. The lifting-disk having turned a little more than one-half of a revolution, the whole length of binding-straw will be carried into the cavity O O, when the hook b upon the belt a, coming around, catches the said binding-straw, drawing it out of the disk through the opening 28, and laying it within the case R parallel with the twister, by which it is caught and twisted into a rope against the holding-blades J. The said rope being connected with the rotating gavel, it is drawn out of the case and beneath the roller Q, which is thereby raised, thus regulating the quantity of straw carried to the twister in the manner before described. The compressor-ring H having turned one-half of a revolution, a pin in the frame u strikes against the arm w, connected with the curved rod or shaft t, thereby carrying the toothed segment V into the path of the toothed part of the cylinder O, also at the same time raising the end of the rod x, by means of the curved arm y y on the rod y, so that the next revolution of the ring H brings the pin b' against the stud a', moving the rod w, thus carrying the arm d' into the path of the short arm e' on the main shaft X. The said arm e' strikes against the arm d', and causes the clutch C' to engage the opposite miter-wheel L', thus reversing the motion of the compressor H. The revolution of the ring H brings the before-mentioned toothed part of the cylinder O in contact with the segment V, causing it to turn one revolution, thus moving the slides g p forward, carrying the fork r over the first formed part of the band, pushing it away from the holding-blades, and holding it against the gavel. The latter end of the band is then formed over the said fork and first part of the band, as shown in Fig. 11. The frame h is then moved outward, as before described, and over the said latter end of the band, which comes into the notch 24. The slide 7 is carried forward a short distance, bringing the hooks to the position shown in Fig. 12, and withdrawing the fork r. Further movement of the slide 7 causes the hook e to carry the last formed end of the band under the first formed end thereof, and the hook d is passed into the gavel and between the strands of the band, as shown in Fig. 13. Both hooks are then withdrawn, the hook d drawing with it from the interior of the sheaf, and between the strands of the band, where it is twisted together, a bunch or loop of straw, the said hook having a shoulder, 29, which comes against the frame h, causing it to turn on its pivot, when the point d' throws the loop off the hook, leaving the knot substantially as shown in the diagram, Fig. 16.

The frame h is then withdrawn, and the cylin-

der O having made one revolution, the spring x drops into the notch in the disk C. The motion of the ring H having been reversed, in the manner before described, thus opening the compressor-blades, and in making one-half of a revolution back the pin v carries the arm w to its first position, thus throwing back the segment V and allowing the rod L to fall. The pin b' coming against the stud a', moves the rod L, bringing the rod w to its first position. A pin on the main frame (not shown) causes it to release the clutch C', allowing the compressor to stop. The attendant now, by means of the rod Z, engages the clutch Y, starting the crank-pulley 18 with its shaft, the disk F raising the frame E, and the fork 20 moves beneath the sheaf, and, in moving back, the tines thereof enter and carry said sheaf to the stubble, when the operation may be repeated with another gavel.

By forming the band-connection in the manner herein described, the straws taken from the gavel for the formation of the last formed end of the band are closely drawn over the first formed end thereof, where said ends are twisted together. The connection is thus effectually prevented from slipping, and presents, when finished, the appearance shown in Fig. 19.

Having thus described the construction and operation of the machine, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The combination of the rings H I, blades J, arms K, and the driving-pinion N, substantially as and for the purposes herein specified.
2. The combination of the ring H, pinion N, rods L u', arms e' d', and the reversing-gear L', substantially as and for the purposes herein specified.
3. The combination of the frame u, cylinder O, curved rods y t, segment V, arm w, pin v, and the knotting-gear lever m', substantially as and for the purposes herein set forth.
4. The combination of the frame u, ring H, swinging frame K, and the knotting-frame h, substantially as and for the purposes shown and described.
5. The combination of the cylinder O, lever m, reciprocating frame h, segment v, and the hook e, substantially as and for the purposes herein specified.
6. In combination with the hook e, or its equivalent, the reciprocating hook d, substantially as and for the purposes herein specified.
7. The combination of the hook d, frame h, rod o, and the twisting-hook slide 7, substantially as and for the purposes set forth.
8. The reciprocating frame h, shoulder 24, hook e, and the reciprocating holding-fork r, these members all arranged to operate in combination, substantially in the manner and for the purposes herein specified.
9. The combination of the cylinder O, arm n, slides p q, and the pivoted holding-fork r, substantially as and for the purposes herein specified.



10. In combination with the swinging blades J, the projecting rods or tines *t*, substantially as and for the purposes herein specified.

11. The combination of the reciprocating rail J<sup>2</sup>, fork-arm 20, arm S<sup>5</sup>, stud-plate 21, and the connecting-rod B, substantially as and for the purposes set forth.

12. The gavel-pusher arm A and the discharging-fork 20, all mounted upon and operated by the reciprocating rail J<sup>2</sup>, substantially in the manner and for the purposes herein specified.

13. In combination with the main frame D, the swinging frame E, the straw-separator, and band-twister mounted thereon, substantially as and for the purposes set forth.

14. The swinging frame E, shafts X S, pulleys U<sup>5</sup> 14, and the belt 15, these members all arranged substantially in the manner and for the purposes herein specified.

15. The combination of the clutch-pulley L', wheel 18, disk F<sup>4</sup>, lever 16, rods 17 Z, arm O<sup>5</sup>, and the frame E, substantially as and for the purposes set forth.

16. The herein-described band-twister T, consisting of a series of curved overlapping leaves springing gradually from and projecting beyond the end of the shaft S, as and for the purposes set forth.

17. In combination with the frame E and the twister T, the hood or case R, substantially as and for the purposes set forth.

18. The combination of the frame E, hollow spindle *g*, separating-disk F, arm *f*, rod 15, rock-shaft O<sup>2</sup>, roller Q, and the twister T, substantially as and for the purposes set forth.

19. The combination of the driving-pulley F<sup>1</sup>, hooked belt *a*, separating-disk F, and the blocks D', substantially as for the purposes herein described.

20. The combination of the pulley W, shaft S, bevel-gear 44, and the pulley F<sup>1</sup>, as and for the purposes set forth.

21. The disk F, annular internal cavity O O, openings 25 and 28, rim *u*<sup>4</sup>, and the point 5, these members all constructed to operate substantially in the manner and for the purposes herein specified.

22. In combination with the frame *k* and the reciprocating knotting-frame *h*, the spring *l*, substantially as and for the purposes herein specified.

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