L. MILLER. 2 Sheets—Sheet 1.

Grain-Binder.

No. 198,898. Patented Jan. 1, 1878.

Fig. 1.

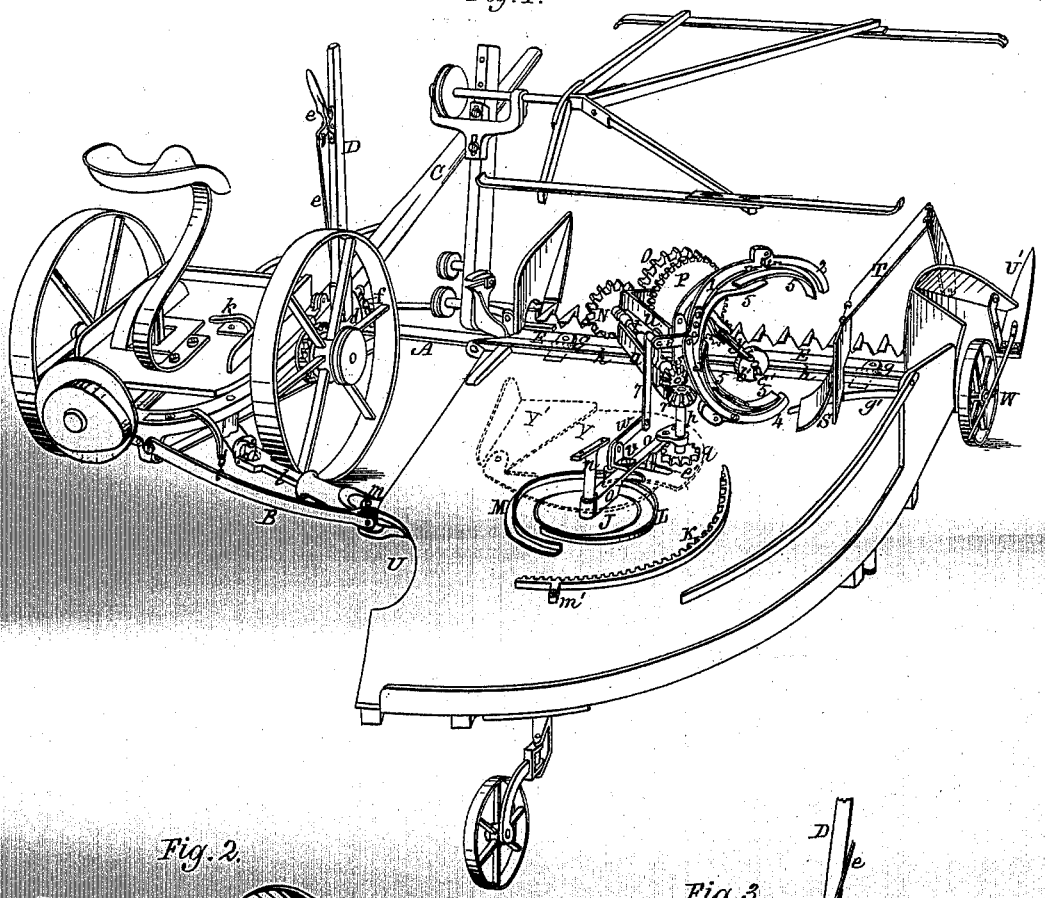


Fig. 2.

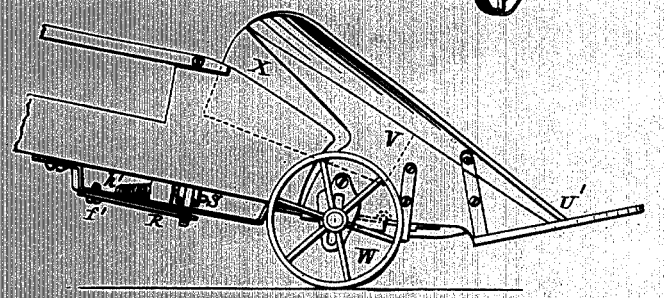
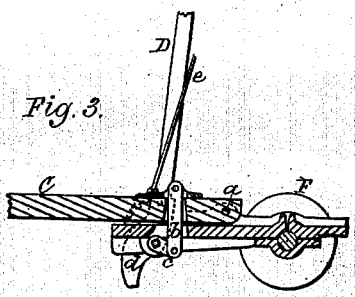


Fig. 3.



L. MILLER.
Grain-Binder.

2 Sheets—Sheet 1.

No. 198,898. Patented Jan. 1, 1878.

Fig. 1.

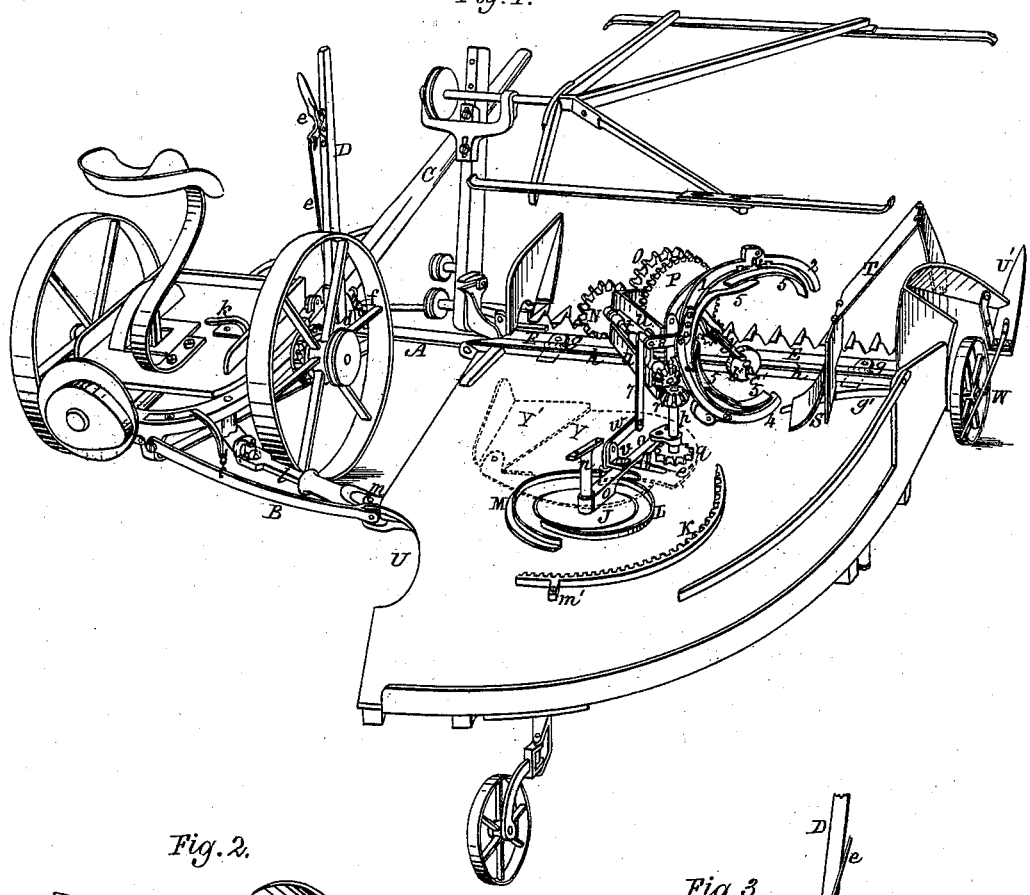


Fig. 2.

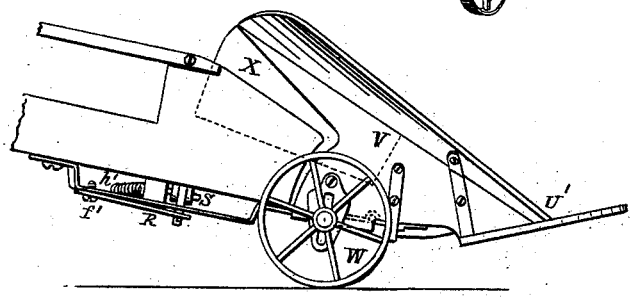
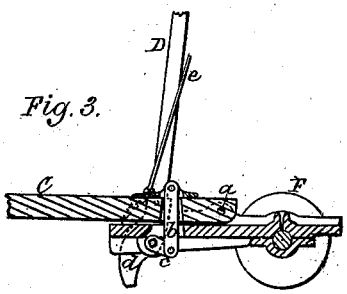


Fig. 3.



Witnesses.
D. P. Cowl
Edmund Masson

Inventor.
Lewis Miller.
By atty. A. B. Stoughton

UNITED STATES PATENT OFFICE.

LEWIS MILLER, OF AKRON, OHIO.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **198,898**, dated January 1, 1878; application filed June 5, 1875.

To all whom it may concern:

Be it known that I, LEWIS MILLER, of Akron, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Harvesting-Machines with Automatic Binder Attachments; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 represents, in perspective, a harvesting-machine, with the automatic binder attachments arranged thereon. Figs. 2 and 3 represent details of the machine, which will be hereinafter more fully referred to. Fig. 4 represents a plan of the under side of the machine; and Figs. 5 and 6 represent details of the binding mechanism, on an enlarged scale, to more clearly show the construction and mode of operation thereof.

My invention relates to the several mechanisms hereinafter more fully set forth; but which may be enumerated or mentioned as follows, to wit: A finger-bar hinged to the front of the platform, so that such finger-bar may rise and fall without materially affecting the platform; a tongue pivoted to the main frame, and further connected thereto by a link and crank, so that through the intervention of a ratchet, pawl, and lever, said main frame may be adjusted to or on the tongue, and the latter be made loose or rigid, as may be required; a gathering mechanism, which takes the grain from the platform, where it falls, puts it in bundle form, and holds it in that form until it is bound up into a sheaf, and then delivers it upon the ground; a twister, by which a two-strand band or rope is formed from the straw constituting the bundle, taken at intervals from the gavel held by the gatherer, until such rope has passed one or more times around the bundle; an arm for carrying the rope or band around the gavel, which arm has its center of rotation at or near the center of the diameter of the gavel, and placed at either the heads or butts of the gavel; a segmental-arm compressor, which is open as the rake-arm moves across the platform to gather the grain, and when so gathered, said arm closes and becomes a compressor to the bundle forming the gavel; the combination of a non-rotating compressor with the revolving straw-rope band-twister; the arrangement of the springs within the jaws of the compressor, to make such compressor adaptable to gavels of different sizes; a yielding twister, that will adapt itself to gavels or bundles of different sizes or circumference; mechanism for throwing open and closing the compressor at suitable intervals; mechanism for rotating the twister at proper intervals; mechanism for moving the straw into the compressor; mechanism for binding a bundle or gavel into a sheaf while said bundle or gavel is being moved from where it drops upon, to where it is delivered from, the platform; a vertically and rearwardly inclined ledge behind the finger-bar, for the gatherer to move under and insure the taking of all of the straw.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same with reference to the drawings.

The main frame, the driving and supporting wheels, the seat, and the platform may be of any of the usual well-known kind. The platform is connected to the front and rear of the main frame by the hinged coupling-arms A B. The tongue C is hinged to the main frame, as at *a*, Fig. 3, and it is further connected to said main frame by a link, *b*, one end of which is pivoted to the tongue and the other end to a crank, *c*, placed on the axis of the segment *d*, to which segment a hand-lever, D, and a latch-lever, *e*, are connected, said latch-lever working with a toothed segment which is rigid upon, while the segment *d* is pivoted to, the main frame. A chain, *f*, Fig. 1, extends from the segment *d* to the coupling-arm A, to raise, hold up, or let down the cutting apparatus. When the latch-lever *e* is between the teeth of the rigid toothed segment, the pole or tongue is rigid. When released from the segment, the tongue is loose, and can work upon its pivot *a*.

The finger-bar E is hinged to the platform, as at *g g*, so that it may be raised, lowered, or tilted without materially affecting the platform. On the platform, immediately behind the cutting apparatus, there is a ledge, *h*, behind or under which the gatherer (to be here-

inafter described) may pass or move, to insure its taking all of the grain or straw as it sweeps across the front of the platform. The reel it is not deemed necessary to describe. It is shown sufficiently to fully understand its operation.

Upon the main axle, as seen in Fig. 4, there is placed a bevel-gear, F, which runs a pinion, G, upon a shaft, *i*, that passes through a hollow frame-piece, H, there being a clutch, *j*, arranged for throwing the gear F into or out of connection with the pinion G, the lever for operating said clutch projecting through the floor of the machine, as at *k*, Fig. 1. The driven shaft *i* connects through a toggle-link, *l*, with a shaft, *m*, supported in suitable bearings underneath the platform; and upon the end of this shaft *m* there is a bevel-pinion underneath the shield I, which pinion gears into the crown bevel-wheel J, moving around a shaft, *n*, that projects up through the platform; and through this driving and driven mechanism the gathering and binding devices are all operated.

On the bevel-wheel J, that moves around the stud or shaft *n*, and on top of the platform, there is secured a radial arm, *o*, to which the gathering, clamping, and carrying mechanism is attached, and by which said mechanism is operated, as follows: At or near the extreme outer end of the radial arm *o* there is arranged in suitable bearings a vertical, or nearly so, shaft, *p*, which has upon its lower end a pinion, *q*, which, as the arm *o*, attached to the wheel J, moves around the stud or shaft *n*, gears into the circular rack K, permanently fixed on the platform, and receives a rotating motion thereby. On the top of the shaft *p* there is a bevel-gear, *r*, that meshes with a bevel-gear, *s*, on the end of a horizontal shaft, *t*, supported in a frame-work, *u*, which is also attached to and carried around by the radial arm *o*.

To the frame *u* is hinged the gathering and clamping mechanism, consisting of the hinged segments 1 2 3 4, within which there are a series of compensating springs, 5, that admit of uniform, or nearly so, pressure upon gavels or bundles of differing sizes. On the arm *o*, as seen at *v*, there is pivoted a bell-crank lever, *w*, which has upon its short arm a friction-roll, 6, that runs in or against stationary camways L M on the platform, giving said lever a vibratory motion upon its pivot. To the long arm of the bell-crank is attached one end of a connecting-rod, 7, the opposite end of which is attached to the tail-piece 8 of the segment 1, and through this mechanism the segments are opened and closed to deliver the bound bundle, and to receive the next gavel for being bound.

Upon the outer end of the shaft *t* there is a gear-wheel, N, that meshes with and turns another gear, O, which is fastened upon its shaft *x*, which shaft passes through the hub or center of a stationary gear, P, fastened to the frame *u*; and on the inner side of the gear P and upon the shaft *x* of the gear O there is attached a crank-arm, *y*, to the outer end of which is hinged a hollow shaft or sleeve, *z*, through which passes a shaft, *q*, upon one end of which there is a pinion, *a'*, that rolls around the perimeter of the stationary gear P, and in mesh with its cogs, by which said pinion *a'* and its shaft *q* receive a planetary motion—viz., a very rapid rotation around about its own axis, and a less rapid one about the axis of the stationary gear P. The outer end of the shaft *q* has upon it the twister or band-former *b'*, said twister having two catches or take-ups, *c' c'*, so that it takes up two strands of straw from the bundle that is being bound without drawing them out of the bundles, and twists these two strands into a rope, which rope is fastened to the bundle, and may pass entirely around the bundle one or more times, and the end be tucked in or under the sheaf, if found necessary to do so; but the rope could not well become loosened, as it is woven in with the straw of the bundle all the way around, or at very short intervals.

The outer hinged segments 2 and 4, without suitable appliances, would be loose and inefficient for closing upon and holding the bundle while it is being carried around and bound; and for this purpose braces or hinged arms *d' d'* extend from the rear beyond or past the hinges of said two outer segments, and are fastened to them beyond their hinges, and these holding said segments inward, and the springs 5 pressing them outward, keep them in efficient working position.

The arm 4 of the clamping and carrying mechanism is, while it is passing along the front of the platform, the gathering device also, as it moves close to, behind, or under the ledge *h*, and moves the grain in advance of itself toward the outer side of the platform. But this arm 4, though it moves the grain along, cannot of itself place the gavel within the clamping arms or segments, and to accomplish this end another mechanism is necessary, which I shall now describe. To the under side of the platform is pivoted a lever, the upper end *e'* of which projects through the platform, in a slot made therethrough, said lever *e'* standing in the path or sweep of the radial arm *o*, so as to be struck by said arm and vibrated on its pivot at proper intervals or at a suitable time in the operation. To the lower end of this lever *e'*, and underneath the platform, is fastened a connecting-bar, Q, Fig. 4, which is attached to a radius-arm, R, pivoted at *f'* to the under side of the platform. At the outer end of this radius-arm R a curved slot, *g'*, is cut through the platform, through which passes the lower end of a wing, S, Fig. 1, that is above the platform, and is fastened to the radius-arm R. This wing S, and the shield or guard T connected to it and to the outside grain-board, are kept close to said grain-board by a reactionary spring, *h'*, underneath the platform. When, however, the arm *o* strikes and vibrates the lever *e'*, the wing S

moves toward the compressor and pushes the grain into the compressor, the latter immediately closing upon the gavel, and the wing returning to its original position. At the instant that the compressor closes upon the gavel the gear *q* has reached the rack K and the twister is set in motion, spinning its rope out of the straws of the bundle, and carrying it around the bundle, so that by the time the compressor has reached the point U of the platform the gear *q* has run out of the rack K, the twister has accomplished its purpose, and the compressor has been opened and the bound bundle delivered upon the ground, and the next succeeding similar operation is gone through with.

The twister-shaft, it will be perceived, as in Fig. 5, stands at quite an acute angle in relation to the plane of the wheel P, from which it is rotated, and it is held in this position by a spring, *i'*, which, however, yields, so that, whatever difference there may be in the sizes of the bundles, the twister accommodates itself to them, and the pinion *a'* can always roll around the perimeter of the gear P, while the twister will follow the circumference of the bundles, which vary in size. The center of the gear P may represent the center of the bundles to be bound, and the center of this gear P is also the center of rotation of the arm which carries the twister, and also carries the band or rope around the gavel.

On the frame *u*, that supports the gatherer, compressor, and twister, there is pivoted a lever, *j'*, Fig. 5, to the upper end of which is fastened a tucker, *k'*; and as said compressor moves around over the platform, and the twister has finished weaving its rope or band around the bundle, and ceased revolving as its driving-pinion *q* has run out of the rack K, the lower end of said lever *j'* strikes against a projection, *m'*, on the rack or platform, and causes the tucker *k'* to push the end of the rope or band into the bound bundle, and hold it from slacking or becoming loose.

The finger-bar E, as heretofore described, is hinged to the front of the platform. The outside divider U', grain-board V, and supporting-wheel W, being attached to the finger-bar, must move with the finger-bar and independent of the platform; and to form this hinged connection, so that no joint will be left into which the straws would work, a shield, X, is attached to the divider or grain-board, which extends back of and covers said joint, as seen in Fig. 2.

A shield, Y, (shown in dotted lines in Fig. 1,) stands over the driving-arm *o* and cams L M, it being attached to the top of the post *n*, which is stationary; and a portion of this shield Y' is hinged, so that it may swing out of the way when the gatherer and compressor pass by it, and be returned again to its position by a spring after the compressor has passed it. Nearly the whole of the twister driving-gear may be incased to prevent straws from winding upon it.

It is unnecessary to describe in detail how these several mechanisms are timed so as to act or be passive, as the case may be, but in general to state that when the machine is working in the field, the gatherer, compressor, and deliverer are always in motion, except when thrown out by the clutch *j*. The compressor gripes the gavel the instant that the latter is pushed within its jaws or segments, and holds it in bundle form. The twister or spinner is now set in motion, and passes twice around the circumference of the bundle (or more times, if necessary) before the pinion *q* runs through the rack K. When the twister or spinner stops, the tucker pushes the end of the band or rope into the bundle, the segments open, and the bound bundle is dropped. The arm 4 then commences to move the grain across the platform. The wing S starts, pushing the grain within the influence of the segments or compressing-arms, where it is seized, held, carried around, bound, and delivered, as above stated. The compressor, though revolving in a horizontal path over the platform, does not revolve the bundle around its own center. On the contrary, the bundle is not revolved about its own axis, but is held rigid while being bound, the twister performing the axial rotation to carry the band around the bundle.

Having thus fully described my invention, what I claim is—

1. The combination of the segmental arms 1 2 3 4, to gather the grain from the platform in a bundle or gavel, and then to compress and hold it in bundle form until it is bound during its passage over the platform, substantially as described.

2. In combination with the gatherer, compressor, and carrier, the twister or spinner *b'*, geared to rotate one or more times around the bundle, for forming a two-strand rope or band from the straw held by the gatherer, substantially as described.

3. In combination with the compressor and twister or spinner, the arm *z*, which has its center of rotation at or near the center of the diameter of the gavel, for forming the band around the gavel, as and for the purpose described.

4. The cam-guide on the platform, in combination with the segmental-arm compressor, and the jointed-lever connection, for opening and closing said arms at stated intervals, substantially as described.

5. The combination of the segmental gathering and compressing jaws with the revolving straw-rope band-twister, substantially as described.

6. The jointed-arm compressor, combined with springs attached to each segment, and overlapping each other, so as to cover the joints and present a continuous yielding surface to the gavel, substantially as described.

7. In combination with the inwardly-inclined

twister and the crank-arm which carries it around, the hinge in the crank-arm and the spring *i'*, crossing said hinged connection, so that the twister may yield and conform to the differing-sized gavels, substantially as described.

8. In combination with the twister, the gears O, P, and *a'*, for giving said twister its planetary motion around the gavel and a rotary motion around its own axial center, as and for the purpose described.

9. In combination with the compressor, the wing S, for pushing the gavel within the grasp of the compressor, substantially as described.

10. The combination of the rack K, arranged on the surface of the platform, with the cam M L, also arranged on the platform, and with the shaft and gears for operating the binding mechanism, and the compressor and jointed levers for compressing the gavel, substantially as described.

LEWIS MILLER.

Witnesses:
NERI NEWCOMB,
S. P. WALLACE.