6 Sheets—Sheet 1.

M. A. KELLER.

Grain-Binder.

No. 209,059. Patented Oct. 15, 1878.

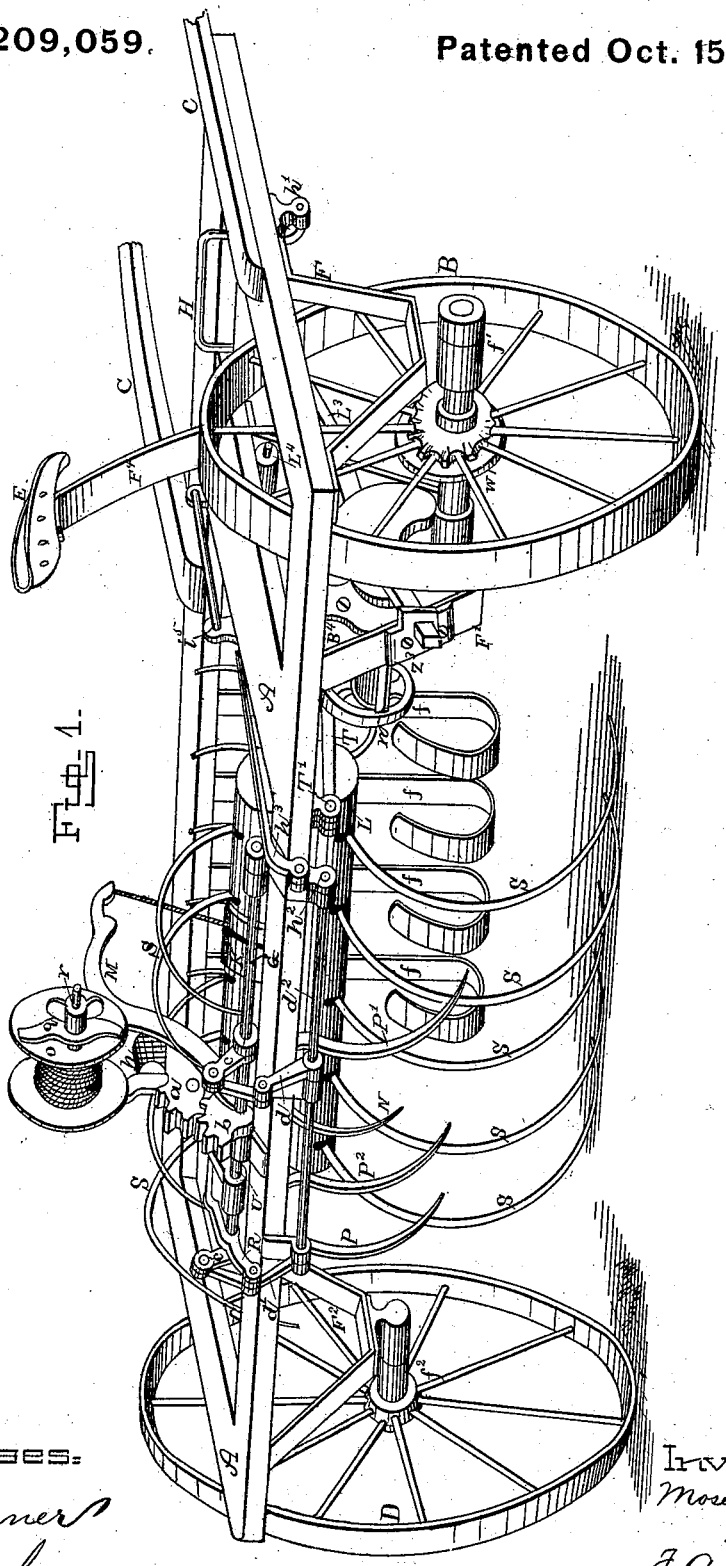

Fig. 1.

Witnesses:

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W. S. D. Barnes

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per

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atty.

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No. 209,059. Patented Oct. 15, 1878.

Fig. 2.

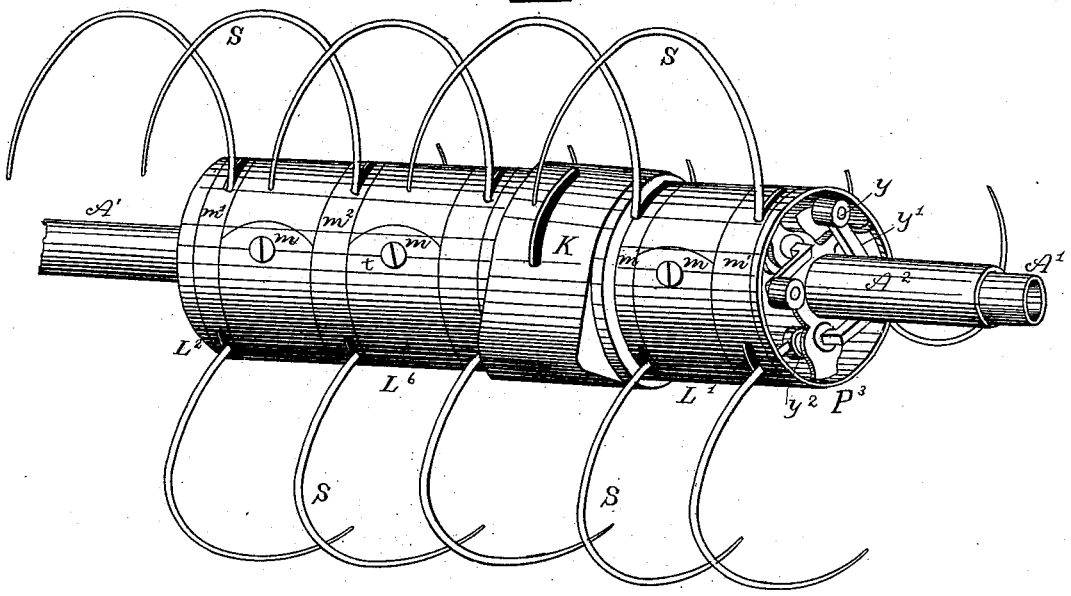


Fig. 3.

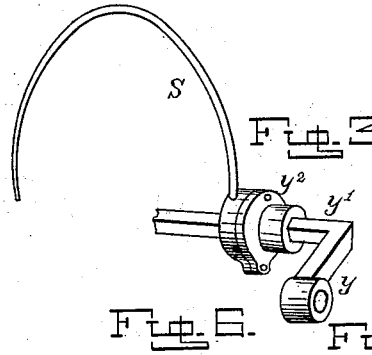


Fig. 4.

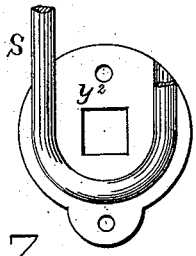


Fig. 5.

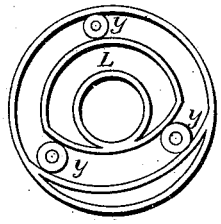


Fig. 6.

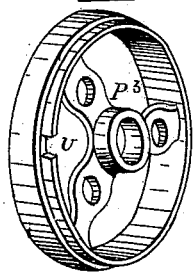


Fig. 7.

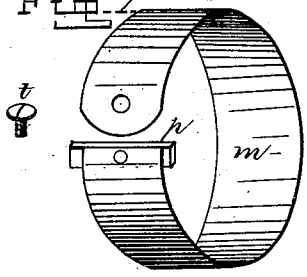
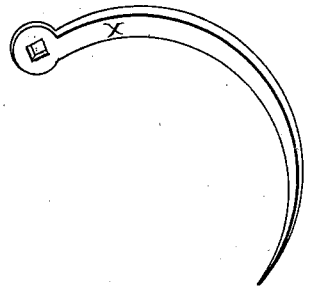


Fig. 8.



Witnesses:

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6 Sheets—Sheet 3.

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Fig. 9.

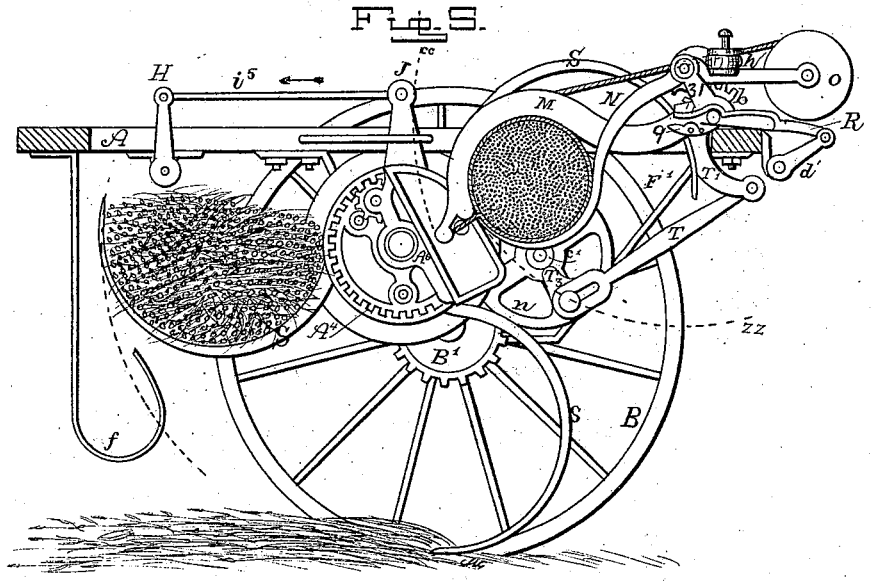
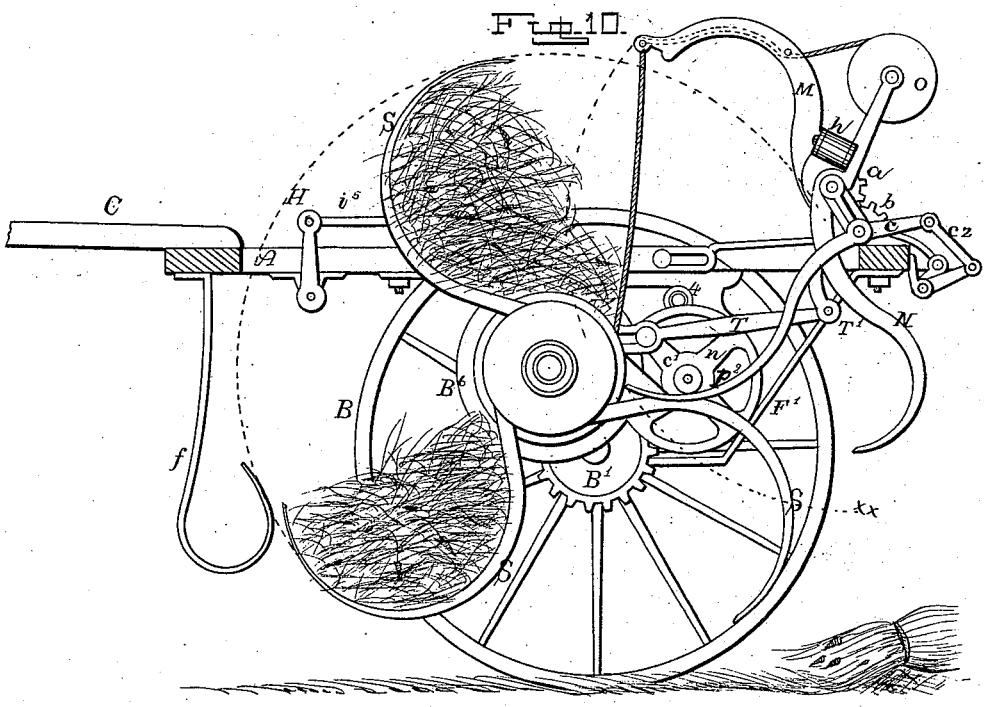


Fig. 10.



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6 Sheets—Sheet 4.

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No. 209,059. Patented Oct. 15, 1878.

Fig. 11.

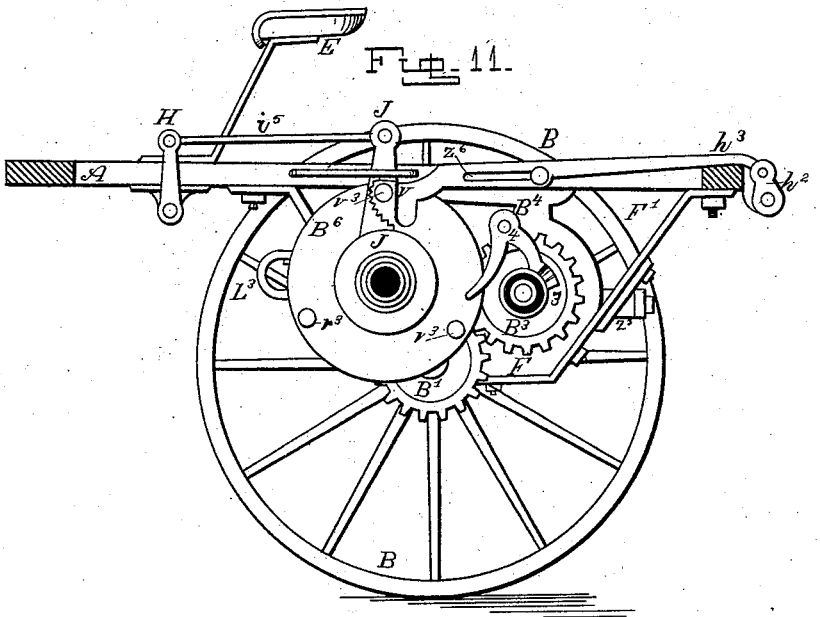


Fig. 12.

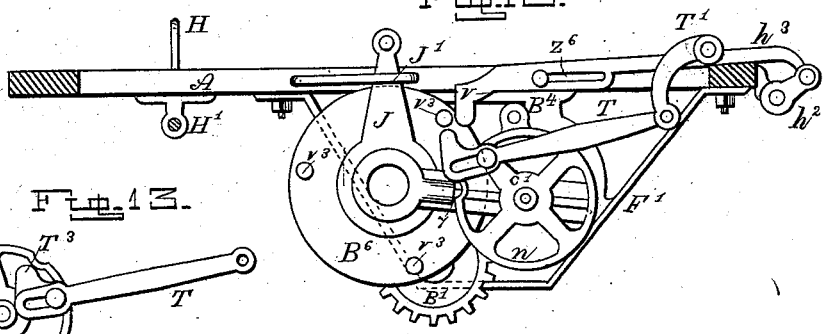


Fig. 13.

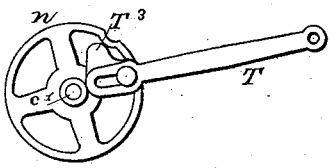
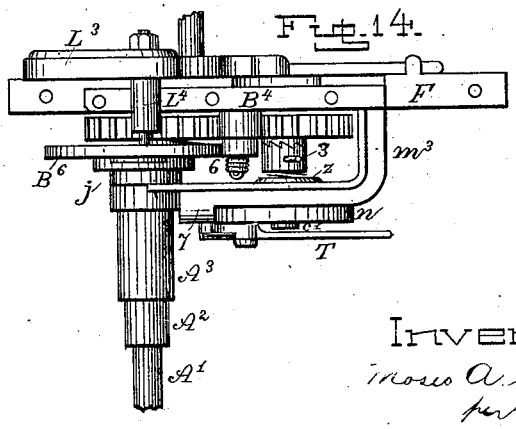


Fig. 14.



Witnesses:

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6 Sheets—Sheet 5.

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Grain-Binder.

No. 209,059. Patented Oct. 15, 1878.

Fig. 15.

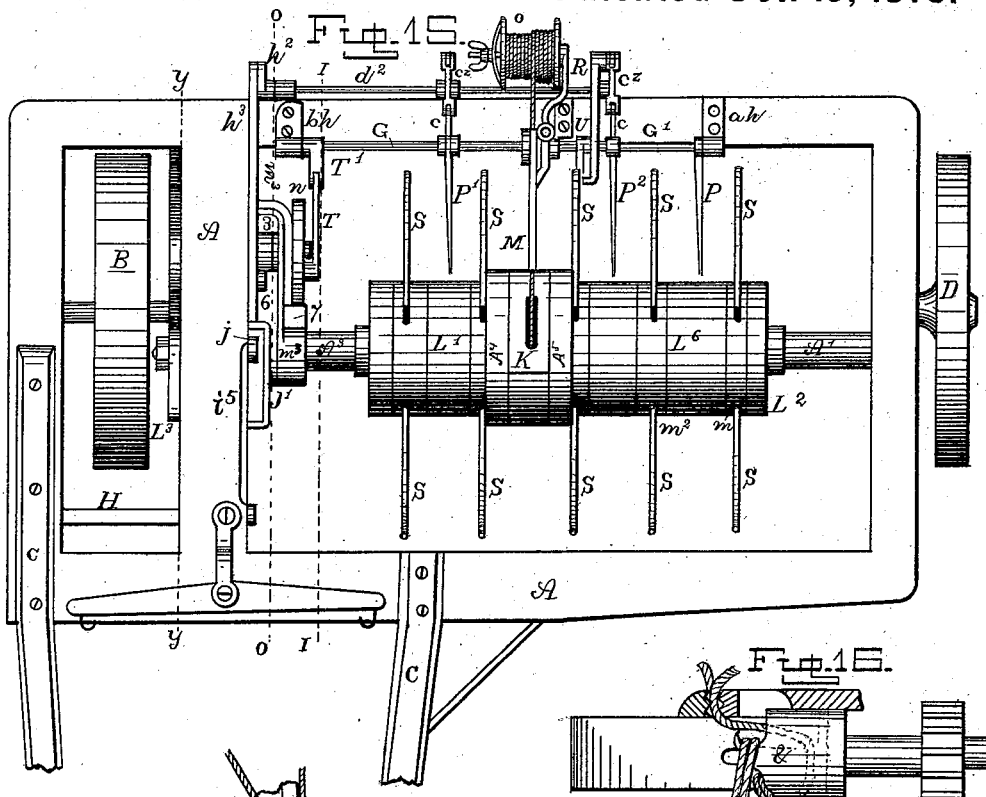

Fig. 16.

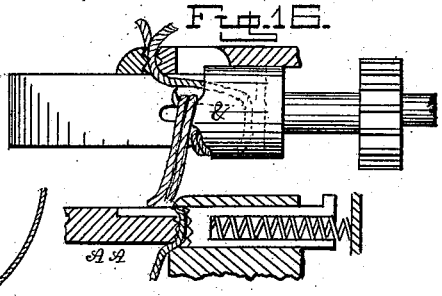

Fig. 17.

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6 Sheets—Sheet 6.

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Grain-Binder.

No. 209,059. **Patented Oct. 15, 1878.**

Fig. 18.

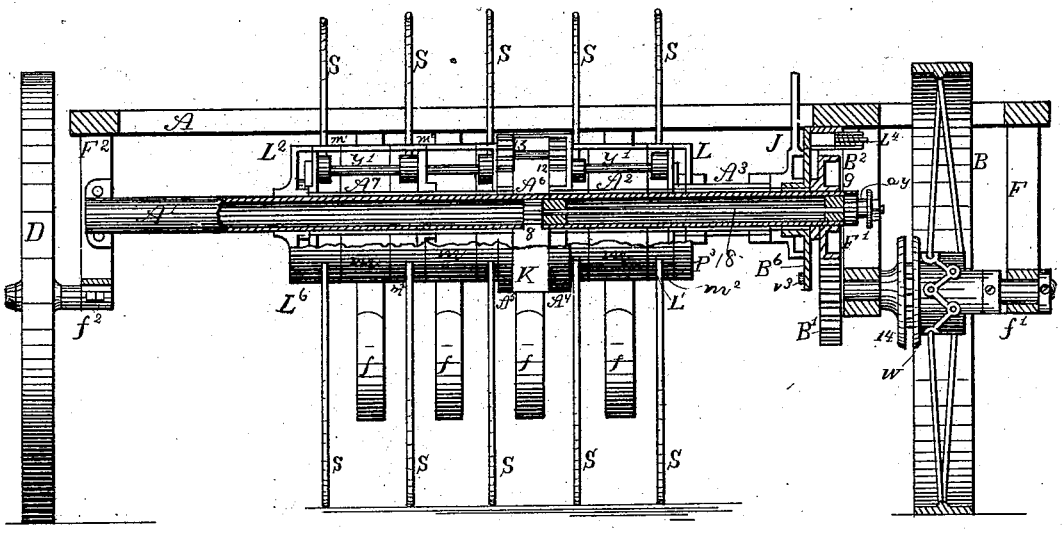


Fig. 19.

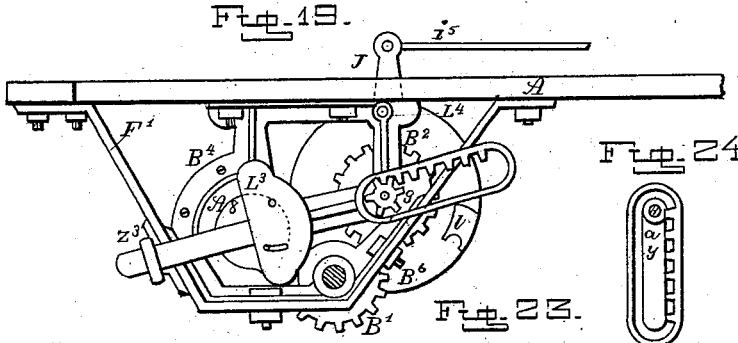


Fig. 20.

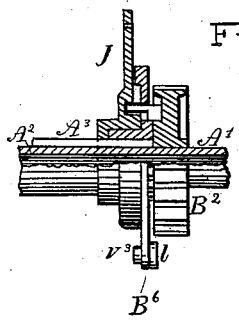


Fig. 21.

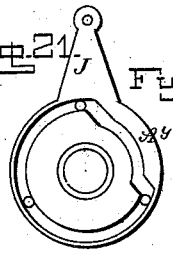


Fig. 22.

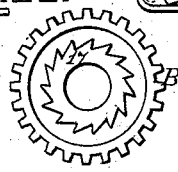


Fig. 23.

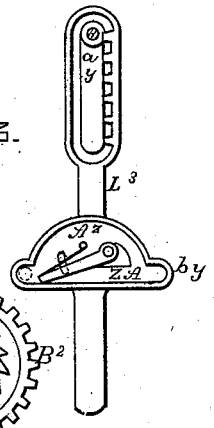


Fig. 24.

Fig. 25.

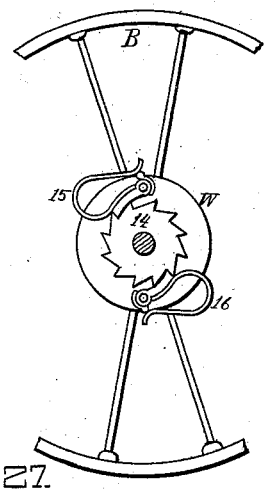


Fig. 27.

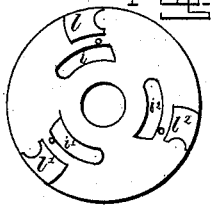
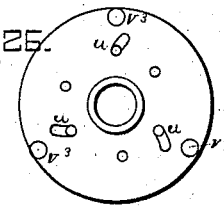


Fig. 26.



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W. D. Hamus

Inventor:

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per

F. A. Lehmann,

atty

UNITED STATES PATENT OFFICE.

MOSES A. KELLER, OF FREMONT, OHIO, ASSIGNOR OF ONE-HALF HIS RIGHT TO WINFIELD J. ENGLEBECK, OF SAME PLACE.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **209,059**, dated October 15, 1878; application filed April 22, 1878.

To all whom it may concern:

Be it known that I, MOSES A. KELLER, of Fremont, in the county of Sandusky and State of Ohio, have invented certain new and useful Improvements in Grain-Binders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in automatic grain-binders; and consists in the arrangement and combination of parts that will be more fully described hereinafter.

In the accompanying drawings, which illustrate my invention, Figure 1 is a perspective view of my improved machine, taken from the rear. Fig. 2 is a perspective view of the intermittently-revolving gatherer and elevating-cylinder with one of the cam-heads removed. Figs. 3, 4, 5, 6, and 7 are details of Fig. 2. Fig. 8 is a perspective view of a tapering flat or oval tooth, which may be employed in place of the round teeth. Fig. 9 is a sectional elevation, showing the position of the teeth *s s s* when the bundle is being bound and the cylinder brought to a stand for the time being. Fig. 10 is also a sectional elevation, showing the position of the grain and teeth *s s s* during the operation of elevating a bundle and delivering another to the band and the compressing and binding mechanism. Fig. 11 is also a sectional elevation taken on the line *o o* of Fig. 15. Fig. 12 is a sectional elevation taken on the line *i i* of Fig. 15. Fig. 13 shows the crank-wheel *n*, showing the pitman T, forming a lock to the cord-carrying arm M during the operation of the knot-tying mechanism forming the tie of the band, then encircling the sheaf. Fig. 14 is a plan view of the mechanism and gearing giving the necessary power to the elevating and binding mechanisms. Fig. 15 is a full plan view of the whole machine. Fig. 16 is a detail view of the knot-tying mechanism that I at present am employing in full-sized machines, but not shown in present application, for full reference to that part of the machine can be obtained in my patent of February 19, 1878, No. 200,544. This view is simply added to aid in explaining the operation of the machine, as is also Fig. 17, showing a longitudinal section of the knot-tying mechanism and the relative position of the band-carrying arm M during the operation of uniting the ends of the band and securing the end of the band material preparatory for the next bundle; also showing the pinion 8, which transmits motion to the tie-forming mechanism, and which is located in the tubular stationary shaft of the gathering-cylinder at a point suitable for that purpose. Fig. 18 is a longitudinal section taken through the center of the gathering elevating-cylinder and drive-wheel B, showing the front or forward part of the machine from the rear. Fig. 19 is a transverse section taken on the line *y y* of Fig. 15, showing the cam-rack plate L^3 that gives the necessary motion to the shaft 18, by which the motion is conducted to the tie-forming mechanism. Figs. 20, 21, 22, and 26 are detail views of the automatic shifting mechanism for starting and stopping the gathering elevating-cylinder and binding mechanism. Figs. 23 and 24 are detail views of Fig. 19. Fig. 25 is a section of the drive-wheel.

Similar letters of reference denote corresponding parts wherever used.

My invention relates to certain improvements in that class of machines by which the grain is automatically picked up from the stubble in suitable bundles and securely bound by the operation of the machine.

Other features which I shall adopt in carrying my invention into effect will be understood from the following description:

Referring to the drawings, A A represent a rectangular frame, which is mounted upon the axis of the driving-wheel B, and supporting wheel D by suitable brackets F, F^1, and F^2. C C represent the shafts by which the horse guides the machine, and E is the seat for the driver.

In the drawings, Fig. 25, Sheet 6, represents the driving-wheel, showing the spring-ratchet dogs 15 and 16, which engage with a suitable ratchet-wheel, 14, which is rigidly secured to the shaft of said driving-wheel. The driving-wheel is loose on said shaft, and held up against the ratchet-wheel by a suitable collar, as shown in Fig. 18; and to the inner end of the shaft is keyed the cog-wheel B^1, which

gives motion to all the rest of the gearing, as will be more fully described hereinafter

It will be seen, by the arrangement of the ratchet-wheel above described, when the machine is backed all the gearing will stand still, making therefore safe from all danger of breaking or disarranging any part of the gearing.

When the machine is backed, and in moving the machine from field to field or on the road, the spring-ratchet dogs of said drive-wheel can be lifted out of gear, and thereby stop all the gearing. When the machine moves forward, the cog-wheel B^1 meshes with cog-wheels B^2 and B^3, and when the ratchet-dogs 15 and 16 are in gear with the ratchet-wheel 14, and the machine moves forward, the said cog-wheels are in constant motion.

Cog-wheels B^2 and B^3 run loose on their respective shafts, the cog-wheel B^2 being provided with a ratchet-wheel, 17, as seen in Fig. 22, Sheet 6. This ratchet-wheel engages with suitable ratchet-shifting dogs for starting and stopping the revolving gatherer, as more fully described hereinafter.

Cog-wheel B^3 is also provided with a ratchet on its hub, which ratchet engages with a suitable sliding clutch, 3, as shown in Fig. 14, Sheet 4. This gear gives the necessary movement to the binding mechanism, which will be fully explained further on.

In Fig. 2, Sheet 2, Fig. 14, Sheet 4, Fig. 15, Sheet 5, and Figs. 18 and 20, Sheet 6, A^1 represents the stationary tubular shaft or axis upon which the intermittently-revolving gatherer turns, and which extends longitudinally across the under side of the frame A A, and is fastened at the ends to the bracket F^2 and main casting B^4, which is secured to the bracket F^1.

The gathering and elevating cylinder is one and the same mechanism, but performs a double function of collecting the bundle from the stubble and then elevating it to the point where it is being bound, and there stops until the next bundle is being elevated, and hence the name "intermittently-revolving gatherer." This gathering-cylinder is composed of two sections, L^1 and L^6, but moves as if they were but one cylinder, which is accomplished by means of the internal gear A^4 and A^5. (Represented in Figs. 15 and 17, Sheet 5, and Fig. 18, Sheet 6.) With these internal gear-heads mesh two corresponding pinions, 12 and 13, of equal number of teeth or cogs, and which are rigidly fastened to the ends of a shaft which turns in a suitable bearing between the two pinions formed in the shuttle-seat A^6, as represented in Fig. 18, Sheet 6. This seat is rigidly secured to the tubular stationary shaft A^1, and thus the said pinions have a permanent location; and when motion is given to the inner section of the gathering-cylinder, it transmits motion to the outer section, thus causing the two sections of the gathering-cylinder to revolve simultaneously.

Instead of a tubular axis, as its equivalent a solid shaft may be used having a groove or grooves to admit a rod, shaft, or chain, for the purpose of transmitting the power to the tying mechanism. A shaft, rod, or chain, in connection with a specially-constructed tying mechanism, can be made to produce the desired results, and even a screw-shaft might be made to answer; but the tubular axis is to be preferred.

The tubular shaft or axis gives greater rigidity and lightness, which are very important in a machine of this kind. The outer section cylinder, L^6, has a sleeve, A^7, to which is secured the internal gear-head A^5 and heads m^1 and m^2, as represented in Fig. 18, Sheet 6. In the arms or spokes of these heads are pivoted the gleaner-teeth S, as shown in Fig. 2, Sheet 2. In the rims of these heads are long mortises of suitable size to receive the gleaner-teeth S, and to allow them a slight vertical play as they spring up and down in said mortises while gliding over the undulation of the ground, and upon the periphery of these heads is formed a recess to receive the sheet-circles m. In taking off these circles the screw t is removed and the transverse bar p pushed round until it comes in the notch w, (shown in Fig. 6, Sheet 2,) when the said sheet-circle can be removed. It will be seen by this plan of construction that the cylinder is made entirely of metal, and therefore very durable, and can be made very light—two very important objects.

The other or inside section of the cylinder, L^1, is constructed precisely on the same plan, but the sleeve A^2, to which are secured the internal gear-head A^4, and head P^3, extends on and up to the cog-wheel B^2, at which end is securely fastened the driving-disk B^6, which comes close up to the ratchet-wheel 17 of cog-wheel B^2, which is mounted on the tubular shaft A^1, and runs loose on said shaft.

The disk B^6 is provided with three dogs, i, i^1, and i^2, Fig. 27, which are pivoted at one end to said disk, on that side next to the ratchet-wheel 17, and overhang the teeth of said ratchet-wheel. These three dogs have each a round pin, u, projecting through the disk by means of a suitable slot formed in said disk for that purpose, and these pins u project into the camway of the cam-lever J, which is pivoted upon the hub of said disk, and close up to the face of said disk, for the purpose of receiving the projecting pin u of the dogs. On the opposite side of the disk, while the gathering-cylinder is motionless, the pins u of the dogs i, i^1, and i^2 stand in the camway A Y of lever J, (indicated by the three white dots, as represented in Fig. 21, Sheet 6;) and when the foot-lever H is pushed forward it brings the lever J, by means of the connecting-rod i^5, forward in the direction of the arrow, and thereby pushes one of the aforesaid dogs into gear with the constantly-revolving ratchet-wheel 17. This will then set in motion the elevating-cylinder, and as the dog cannot disengage from the teeth of wheel 17 until the

lever J has reached again its vertical position, and is prevented from going any farther by the stop-staple J′, the disk B^6 continues to revolve until the pin *u* of the dog, then in gear with wheel 17, has reached the highest position in the camway of lever J, at which point the dog is disengaged from the ratchet-wheel 17. The elevating-cylinder then stops, having completed one-third of a revolution, and is held in that position by the automatic stop L^4, (shown in Fig. 1, Sheet 1, Figs. 18 and 19, Sheet 6, and Fig. 14, Sheet 4,) which drops into the concave end of one of the projecting lugs *l* l^1 l^2 of disk B^6.

At each end of the elevating-cylinder are stationary cam-heads L and L^2, head L^2 being fastened on the tubular shaft A^1, and the head L to a short sleeve, A^3, which sleeve is fastened in the eye of casting m^3. (Shown in Fig. 15, Sheet 5.) These heads have camways formed in them, as shown in Fig. 5, Sheet 2, in which move the rollers *y* upon the cranked ends of the rods *y′*. These rods are made square, and pass through similarly-shaped openings in the hinges or heads of the gleaner-teeth S, so that when the rod turns the teeth will turn with it. By this manner of connecting the gleaner-teeth and the cam-heads together I control the action of the gleaner-teeth S to elevate the points of said teeth.

When the cylinder is set in motion to elevate a bundle, the teeth are prevented from drawing into the ground, and are caused to quickly descend to the ground to gather the next bundle, so that there will be no space left unraked during the operation of elevating a bundle.

Having thus described the construction of the elevating mechanism, I will now proceed to describe the construction of the binding mechanism.

The rod h^3 is pivoted to a short lever, h^2, and slides on a pin in the slot z^6. (Shown in Figs. 11 and 12, Sheet 4.) The lever h^2 is rigidly secured to the end of the shaft d^2, which is mounted in suitable bearings on the rear sill of frame A A. To this shaft are also securely fastened the levers *d* and d^1, to which are pivoted at their upper ends the supporting-fingers P^1 and P^2 by links *c z*. To lever d^1 is also pivoted the spring-latch R. The supporting-fingers P and P^2 are secured to a shaft, G′, and finger P^1 is pivoted on the shaft G. Now when the end V of rod h^3 comes in contact with one of the rollers or projections v^3 of disk B^6, as the said disk begins to revolve it pushes the rod h^3 back, and by its connection with the shaft d^2, as above described, the supporting-fingers P, P^1, and P^2 are brought forward to assume the position as shown by the finger P^2, Fig. 10 of Sheet 3, and the spring-latch R locks over the shaft G, and thus holds the supporting-fingers until the bundle is bound, when the spring-latch will be lifted from the shaft by a pivoted pawl, 9, which is pivoted to the arm U. (Shown in Fig. 15 of Sheet 5 and Fig. 9 of Sheet 3.) This pawl 9 catches on the under side of the hook-projection of the spring-latch, and lifts the latch from the shaft at the moment the binding-arms begin to recede and relieve their hold upon the bound bundle, and the weight of the bundle will carry down and back the supporting-fingers, as indicated by the dotted line *x x*, Fig. 10, and the bound bundle will thereby drop squarely on the ground. The supporting-fingers will then remain in that position until the elevating-cylinder is again started to elevate the next bundle, when they will again be brought forward, and thus they act automatically upon bundle after bundle.

The cog-wheel B^3 runs loose on its shaft, and is in constant motion during the operation of the machine. At the inner end of the shaft that is next to the elevating-cylinder is keyed the crank-wheel *n*, with the roller *c′* pivoted on the end of the shaft, as shown, and on the other end of said shaft is keyed the crank A^8. Upon this shaft is mounted the shifting-clutch 3, that fastens the cog-wheel B^3 to the shaft during the operation of binding a bundle. This clutch is prevented from turning upon the shaft by a spline, and has a projecting pin, as shown in Fig. 14, Sheet 4. This pin, in combination with the crank-lever 4, performs the functions of starting and stopping the binding mechanism.

To the crank-wheel *n* is pivoted the pitman T, with the slotted end, the other end of the pitman being pivoted to the curved arm T^1. This arm is keyed to the shaft G, and to said shaft is secured the band-carrying arm M and segment-gear *b*. The shaft G is pivoted in a suitable bearing, *b h*, at the end next to the curved arm T^1, and in another bearing in the standard 31. (Shown in Fig. 9, Sheet 3.) To the upper end of this standard is pivoted, upon a stationary stud, the compressor-arm N, with its segment-gear *a* meshing in gear with segment *b*. The segment-gear *a* is provided with a rubber spring, *h*, which rests on the compressor-arm N, and the compressor-arm is extended back to form an arm for the cord-spool O. Now, when the elevating-cylinder has all but completed the elevating of a bundle, one of the projections v^3 of disk B^6 comes in collision with the angular lever 4 at that end next to said disk, and thereby lifts the opposite end of said lever from the pin of the clutch 3, when the clutch will be pushed in gear with the cog-wheel B^3 by the spring Z, as represented in Fig. 14, Sheet 4, and the shaft, with said clutch, crank-wheel *n*, and crank A^8, all begin to rotate with said cog-wheel B^3. The pitman T will then cause the binding-arm M to descend, encircling the bundle with the band, and, by means of the segment-gears *a* and *b*, the compressor-arm N moves upward, compressing the bundle, while the spool O is drawn backward, thereby taking up all the slack of the band around the bundle. When the pitman T has come in contact with the roller *c′*, the band-carrying arm M has reached its extreme downward point,

when it will remain there stationary until the heel end T^3 of pitman T has passed down and off the roller c', as shown in Fig. 9 of Sheet 3. During the time the said pitman was passing over the roller c' the roller on crank A^8 has acted on the straight portion of the rack-cam plate L^3, and has produced a double stroke to said rack-cam in the following manner: At the moment the roller of crank A^8 comes in collision with that portion and end of cam represented by *b y*, Fig. 24, Sheet 6, it causes the rack-plate to move downward until the roller comes in collision with the spring-switch Z A, which is precisely when the crank A^8 passes over its dead-center, and as the crank continues on it will cause, by the action of the roller upon the spring-switch, the said rack-plate to travel in the opposite direction until the roller has passed off the spring-switch; and when the roller has passed into the extreme end of the cam the sliding clutch 3 is drawn out of gear by the action of its projecting pin, before described, coming in collision with the hooked end of angular lever 4, which is so constructed as to produce this result. At the moment the clutch 3 is drawn out of gear with cog-wheel B^3, the shaft stops, and is securely held dead by the automatic stop 7, (shown in both Figs. 12 and 14, Sheet 4, and Fig. 15, Sheet 5,) which drops into the notch formed in the outer periphery of the crank-wheel *n*. At this point the band-carrying arm M has reached its highest position and the compressor-arm its lowest position, the band-carrying arm M stretching the cord again across the circle the elevating-teeth assume when they elevate a bundle, thus preparing the band for the next bundle. The end of the cord or band material has been firmly secured in the knotting mechanism K, which mechanism has received its working motion by means of the rack-cam plate L^3 during the movement of said rack-cam above described, and has transmitted the power to the knotting mechanism in the following manner: The rack portion of cam-plate L^3 gears into a corresponding pinion, *g*, as shown in Fig. 19, Sheet 6. Close up to this pinion, on the same shaft, is a roller, *a y*, for guiding the rack so as to move free and easy in mesh with pinion *g*. This pinion is rigid upon the shaft 18. (Represented in Fig. 18, Sheet 6.) Said shaft has secured to its inner end a spur-pinion, 8, and from this pinion the power is communicated to the knot-tying mechanism, similar to the one patented by me February 19, 1878, No. 200,544; but I do not limit my machine or invention to employing this special knotting mechanism, as any other suitable binding mechanism can be employed that it may be seen fit and proper to employ.

It will be seen by reference to the drawing, Fig. 17, Sheet 5, an opening is made in the stationary tubular shaft A^1, allowing the wheel 10 to mesh with pinion 8; but other mechanical appliances could be admitted at this opening to produce the desired object or motion to the tying mechanism.

Having thus described the mechanism of my improved machine, the operation is as follows: When the horse is guided along the butt-end of the swath or unbound bundles, as the case may be, the drive-wheel B is almost in line with the horse, while the supporting-wheel D strides the swath, thus leaving the gleaner-teeth S S S S to gather up the cut grain. When a bundle of sufficient size, in the judgment of the driver, has accumulated in the gathering-teeth, he with his foot pushes the lever H forward, thereby starting the elevating-cylinder, which will divide the bundle from the swath by the aid of the yielding fenders *f f f f*, and elevate it to the height in line parallel with the cylinder, as represented in the drawing, Fig. 9, Sheet 3, when the cylinder is automatically thrown out of gear, as before described. In the meantime another row of gathering-teeth has reached the ground to commence gathering the next bundle. When the cylinder is again started, it elevates the first bundle over the top of the cylinder, pushing the cord or band along back, drawing it from the spool O until the bundle has lodged in the supporting-fingers P, P^1, and P^2. At this moment the cylinder again stops, and immediately the cord-carrying arm M begins to descend, carrying the cord over and around the bundle and down through the opening into the casing K of the knotting mechanism. In the meantime the compressor N has also ascended, pressing the bundle against the binding-arm M, and at the same time the spool O has been drawn backward, and, by means of its tension *q*, the slack of the band around the bundle is all taken up. The ends of the band are then firmly united into a hard loop-knot, in the manner described in my patent of February 19, 1878, No. 200,544. During the operation of uniting the ends of the band the end of the cord that constitutes the band for the next bundle is firmly secured and held in the knotting mechanism; (also shown and described in the above patent;) but a section of that portion of the knotting mechanism is represented in Fig. 16, Sheet 5. The knot is completed, the end of the cord again secured as above stated, the binding and compressor arms begin to recede, lifting the spring-latch R from the shaft G', when the weight of the bound bundle will carry down and back the supporting-fingers P, P^1, and P^2, and the said bundle will drop squarely on the ground, without any danger of falling on one of its ends, as would be the case without these fingers.

The location of the driver's seat over or nearly over the driving-wheel and the location of binding-arms on the rear sill of the frame of the machine, having been made the subject of a separate application, are disclaimed in this application.

What I claim as my invention is—

1. In a grain-raking and automatic-binding

machine, an intermittently-revolving gatherer having two or more rows of pivoted teeth, in combination with a suitable operating mechanism, and a cylinder or head having mortises therein to allow the teeth a suitable play, as specified.

2. An intermittently-revolving gatherer having the internal gears A^4 and A^5, or their equivalents, in combination with the revolving cylinder and an operating mechanism, for the purpose described.

3. The combination of the intermittently-revolving gatherer, the cam-heads L and L^2, crank-rods y', and rollers y, to operate in the manner and for the purpose described.

4. The combination of the intermittently-revolving gatherer and the yielding fenders *f f f f*, or their equivalents, for the purpose described.

5. Combined with the intermittently-rotating gatherer, the disk-wheel B^6, ratchet-dogs i i^1 i^2, and cam-shipper j, the whole arranged and constructed to operate in the manner shown and described.

6. In a grain-raking and automatic-binding machine, the combination of the intermittently-rotating gatherer, provided with pivoted teeth, a cam-mortised cylinder or heads, stop L^4, and disk B^6, substantially as shown.

7. In a grain raking and binding machine that automatically binds the grain, the combination, with the rotating gatherer, of the stationary tubular shaft A^1, or its equivalent, for inclosing the driving-shaft 18, or its equivalent, that operates the tying mechanism.

8. The combination of the intermittently-revolving gatherer, the tubular shaft A^1, shuttle-seat A^6, shuttle-case K, shaft 18, and pinion 8, all substantially for the purpose set forth.

9. The cam-rack plate L^3, pinion g, shaft 18, and spur-pinion 8, in combination with the knot-tying mechanism, substantially as specified.

10. The combination of the crank-wheel n, roller c', and pitman T, as shown, and operating in the manner and for the purpose described.

11. The cord-spool O, mounted upon an extension of the compressing-arm N, to operate in the manner and for the purpose described.

12. In a grain raking and binding machine, the combination of the vibrating binding-arm M, the vibrating compressor N, segmental gears *a b*, spring *h*, and spool O, all substantially as shown, for the purpose specified.

13. The combination of the intermittently-revolving gatherer, the rod h^3, shaft d^2, spring-latch R, supporting-fingers P, P^1, and P^2, or their equivalent, to operate in the manner described, for the purpose set forth.

14. The combination of the wheel n, the automatic stop 7, clutch 3, wheel B^3, slotted pitman T, and vibrating arms M N, all as and for the purpose set forth.

15. The combination of the band-carrying-arm M, intermittently-revolving gatherer and its operating mechanism, and the stationary shuttle-seat A^6, or the equivalent thereof, whereby a joint operation of the band-carrying arm M and the forming mechanism may finish the tie of the band around the bundle.

16. In a grain raking and binding machine, the tying mechanism, when secured to the axis of the rotating gatherer, for the purpose set forth and specified.

17. The combination of the intermittently-revolving gatherer, the angular lever 4, and shifting-clutch 3, or their equivalent, for the purpose described.

18. The combination of the recessed heads P^3 m^1 m^2, and the metallic circle m, for closing the space between the elevating-teeth S, for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 15th day of April, 1878.

MOSES AARON KELLER.

Witnesses:
H. S. BUCKLAND,
W. J. ENGLEBECK.