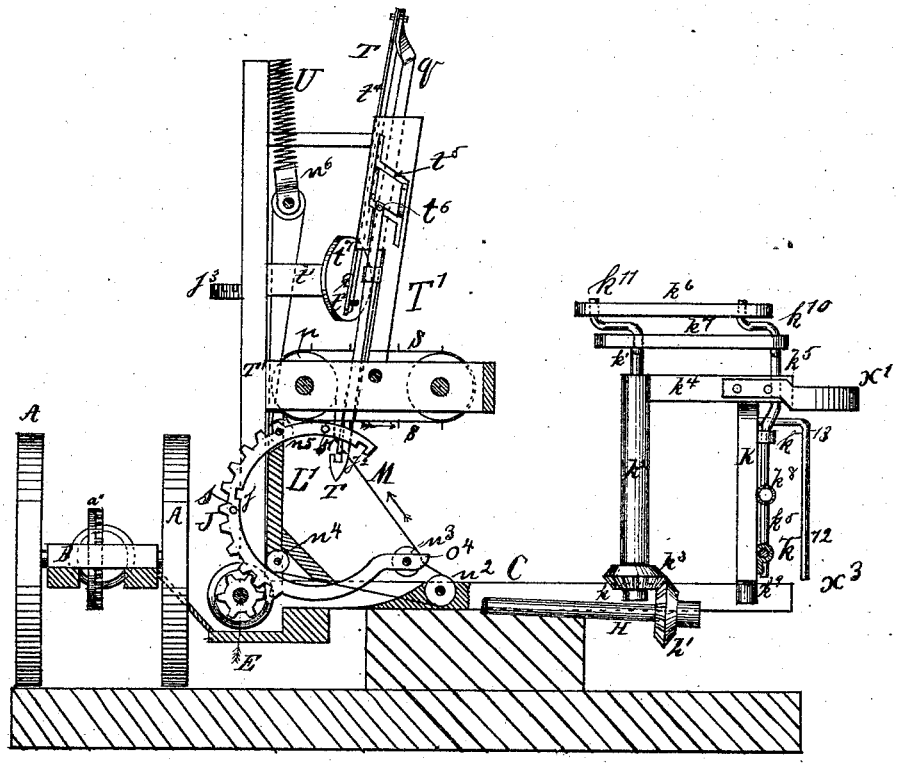
4 Sheets--Sheet 1.

H. H. BRIDENTHALL, Jr.

Harvester.

No. 164,799. Patented June 22, 1875.

Fig. 1.



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4 Sheets--Sheet 2.

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Fig. II.

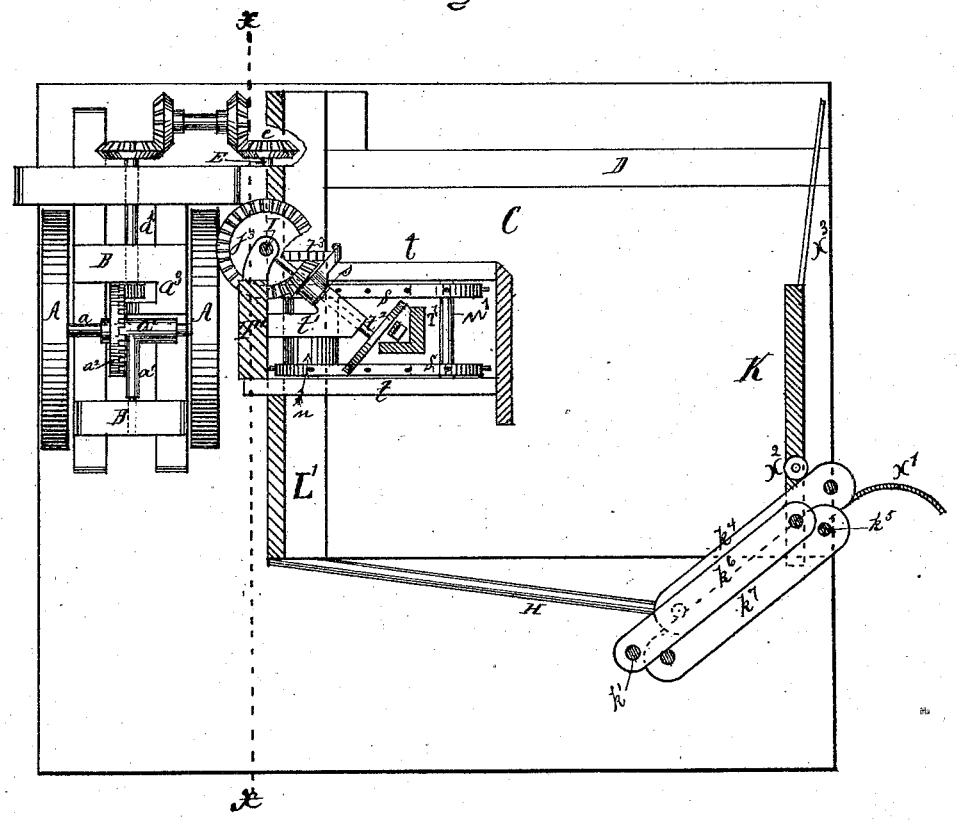

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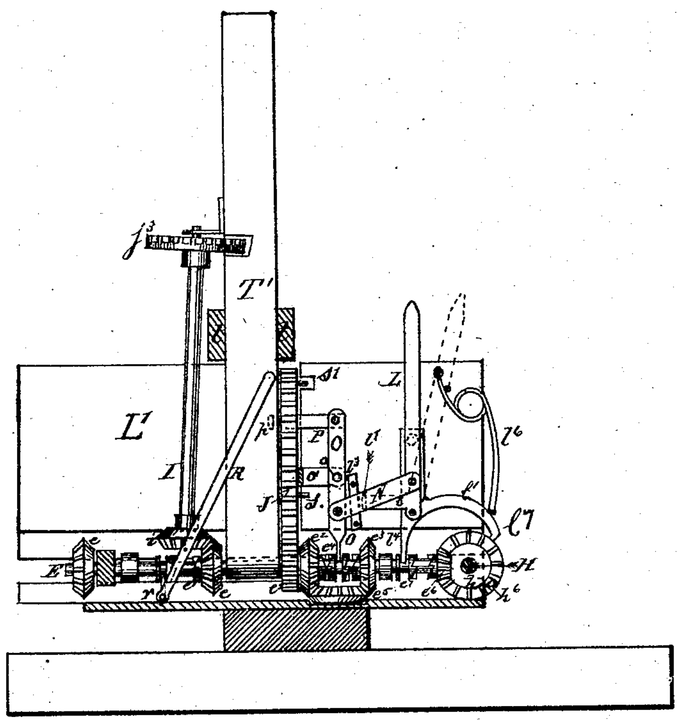
Fig: III.



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H. H. BRIDENTHALL, Jr.

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Fig: IV

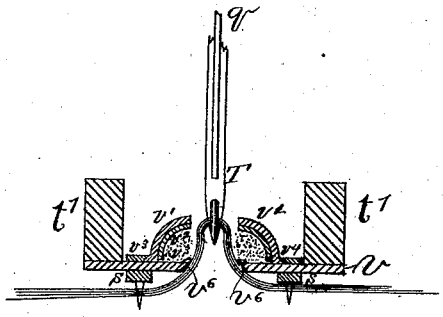

Fig: V.

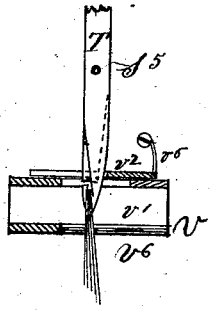

Fig: VI

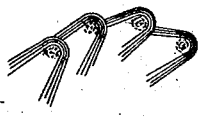

Fig: VII

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UNITED STATES PATENT OFFICE.

HARRY H. BRIDENTHALL, JR., OF LATROBE, PENNSYLVANIA.

IMPROVEMENT IN HARVESTERS.

Specification forming part of Letters Patent No. **164,799**, dated June 22, 1875; application filed May 25, 1874.

To all whom it may concern:

Be it known that I, HARRY H. BRIDENTHALL, Jr., of Latrobe, in the county of Westmoreland, in the State of Pennsylvania, have invented new and useful Improvements in Grain-Binding Harvesters; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure I is a rear view of my improved machine partly in section, the sectional part of which shows the compressing mechanism. Fig. II is a top view of the same, showing the general plan of arrangement of the various devices. Fig. III is a side sectional view of the same taken through the line *x x x*, Fig. II, and showing the operating mechanism. Figs. IV and V are detailed sectional views of the throat, and show the manner of forming the band. Figs. VI, VII are sectional views of the band, showing its arrangement.

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

The object of my invention is to improve the construction of grain-binding harvesters, making them more convenient in use and more effective in operation, causing the cut grain to be deposited at such distance from the standing grain as to be out of the way of the machine in its next round and in gavels suitable for hand-binding, or substantially bound in sheaves as may be desired. It consists in a raking device; in the arrangement of the forming-hook, whereby the gavels are bound by means of the interlocked hoop system; in a throat, by which the loops are protected while being formed, and more closely and substantially interlocked; and in the construction, combination, and arrangement of the various parts of the machine, so that the operations of reaping, gaveling, and binding may be performed, as hereinafter more fully described, and specifically claimed.

The cutting device to be used in my machine does not differ from that usually employed in this class of harvesters.

A A are the drive-wheels, which are connected to the main axle *a* in any suitable way. The axle *a* has its bearing within the sleeve a^1, which is rigidly attached to the forward end of the shaft a^1. The shaft a^1 is pivoted to the frame B by suitable bearings, in boxes attached to the frame B. The bevel-wheel a^2 is rigidly connected with the axle *a*, and meshes with the bevel-pinion a^3 upon the shaft a^4. The shaft a^4 rotates within suitable boxes in the frame B. The bearings of the shafts a^1 and a^4 are in axial line with each other. C is the grain-platform, which is, by means of the finger-bar D, rigidly connected with the frame B. By this construction the axle *a* is allowed to oscillate above the main frame B, thereby enabling the machine to move more steadily over the rough ground of the field. The shaft E revolves within suitable bearings attached to the inner side of the platform C, and motion is communicated to it from the shaft a^4 by suitable miter-gears and shaft, arranged at the forward part of the frame B and the platform C.

The wheel *e* fits loosely upon the forward part of the shaft E, which turns therein, except when engaged by the clutch e^1, in order to communicate motion to the shaft I, for purposes hereinafter described. The clutch e^1 is operated by the lever R, which communicates with the shipper-arm *r*, by means of a short shaft in a suitable box. The lever R is operated by a pin in the toothed segmental arm J, in such a manner as to connect the clutch e^1 only when there is a gavel in the binder. e^2 is a combined square pinion and miter-wheel, the square part of which meshes with the segmental arm J, and the miter-gear meshes with an idler-miter, e^5, which is pivoted to a stationary stud on the platform C. The idler-miter e^5 meshes with the miter e^3 upon the shaft E, which turns loosely within the wheels e^2 and e^3, between which and upon the shaft E is the double clutch e^4, which can be, by means of the shipper-lever O, made to connect with either e^2 or e^3, or be disengaged with both.

By this construction the segmental arm J can be moved backward or forward, as may be desired, and is held in either extremity of its movement by means of the studded rod P, which is operated as hereinafter described.

The bevel-pinion e^6 fits loosely upon the rear

end of the shaft E, and meshes with the bevel-wheel *h*, which is rigidly connected with the shaft H, which communicates motion to the raking device when the clutch e^7 is engaged in a manner hereinafter described. The pawl e^7 rests within the notch h^6 in the wheel *h*, when the rake is not in operation, thereby holding it in its position while a sheaf is being bound, or a gavel gathering upon the platform C. To the inner side of the grain-platform is attached the post T′, which supports the band-forming mechanism. To the upper end of the shaft I is connected the bevel-wheel j^3, which meshes with a pinion upon the shaft t^2, which has its bearing in boxes in the arm t^1. Near the middle of the shaft t^2 is an eccentric, which operates the pawl upon the ratchet-wheel t^3, giving it an intermittent rotary motion. The said ratchet-wheel in turn rotates its shaft, which communicates motion to the pulley *u* and the endless spiked bands S S, and the compressing-belt M, for the purpose of holding and rotating the gavel while the band is being formed thereon. The bands S S may be formed of a metal chain, with links suitably provided with prongs or tines. The shaft *u* may be connected with the frame *t*, so as to be capable of adjustment therein, in order to adjust the tension of the bands S S. The endless belt M passes around the pulley *n*, as indicated by the arrow, thence around the pulley n^5, thence through the tightening spring-block n^6, thence down around the pulleys n^4, n^2, and n^3. The tightening-spring U serves to take up the slack of the compressing-belt M when there is no gavel in the binder; also, to enable the machine to bind a large or a small sheaf with equal tension. In place of the spring U there may be substituted a weight or a spring coiled within a drum, with a cord or chain to wrap around the same, for the purpose of operating the pulley-block n^6. The toothed segmental arm J is secured within suitable bearings, so as to be capable of moving in its own arc, and carries the pulley n^3 at its outer end, around which is the guard or hood o^4, for the purpose of assisting in gathering the grain into the binder, and to keep the belt M upon the said pulley n^3. The toothed segmental arm J has for its purpose to carry the compressing-belt M around the gavel to hold it against the bands S S, for the purpose before mentioned.

To the outer end of the shaft t^2 is secured the crank-wheel t^7, which, by means of the connecting-rod t^4, gives the rod *q* a reciprocating motion corresponding with the intermittent motion of the belts S S. The said rod *q* is connected by means of suitable boxes, rigidly connected to the frame T^1. To the lower end of the said rod *q* is pivoted the band-forming hook T. One arm of the said hook extends upward to the slot t^5 in the frame T^1, where it is provided with a pin or friction-roller, which plays within the said slot t^5, which is provided with spring-ledges, which guide the pin in its vertical motion, so as to pass upward along the left-hand slot, and downward along the right-hand slot, thereby giving the forming-hook a lateral oscillating motion, while being driven with a vertical reciprocating motion, for the purpose of drawing the loops from the gavel and stretching or drawing the said loops forward in order to allow the forming-hook to pass through the last one formed, and draw the next one through it without tearing the said loop. The lower end of the rod *q* serves as gate or cast-off to throw the loops over the forming-hook. By this construction the forward or that part of the forming-hook which bears against the loop is nearly or altogether in line with the plane of its longitudinal motion, thereby, in a measure, preventing the loop from being torn or cut by the friction produced by the reciprocating movement of the said forming-hook, as in the ordinary construction, wherein an inclined plane impinges against the loop, drawing forward and stretching the loops or bands. The forming-hook T and the rod *q* are placed at angles with the frame T^1, so as to reciprocate and draw the loops obliquely to the radius line of the gavel, thereby allowing the hook to pass farther into the gavel to draw the loops therefrom, and, in a measure, obviating the liability of the loops being entangled in the center of the sheaf, as in the ordinary construction, wherein the tufts or loops are drawn radially from the center of the sheaf. By this construction and arrangement the sheaves are more easy to open for thrashing, and a more substantial band formed by giving the loops a better hold within the sheaf, and by overlapping the loops with a sharper angle, as shown in Fig. VI. To the under side of the frame T^1 is secured the throat-plate *v*, which is constructed so as to form the cheeks v^6 and v^6, which are rounded on the inner and under side edges in such a manner as not to cut the loops as they are drawn upward through, as shown in Fig. IV. Friction-rollers may be advantageously used, suitably pivoted to the lower inner edges of the plate *v*. The cap v^1 is connected with the upper side of the plate *v*, by means of the ledges v^3 and v^4, in such a manner as to be adjustable in relation to the hook T, and the plate *v*. Under the said cap v^1 is the slide v^2, which fits loosely within its place, and is held to the right-hand extremity of its movement, and against the hook T, by means of the spring v^5. The slides v^1 and v^2, being arched form a cavity under them, and above the cheeks v^6, as shown in Fig. IV.

The plate *v* and the cap v^a may be formed in one piece, and dispensing with the slide v^2, by making the plate *v* adjustable upon the frame t^1. The plate *v* may also be grooved so as to let the endless belts S S operate within the grooves, and their lower edges come flush with the under surface of the said plate *v*. From the rear edge of the platform C projects a short bracket, to which is secured the post or rod k^1, about which rotates the sleeve k^2.

To the lower end of the sleeve k^2 is secured the miter-wheel k^3, which meshes with and receives motion from the miter-wheel h^1 upon the shaft H. The arm k^4 is rigidly secured to the top of, and rotates with, the sleeve k^2. At the outer end of the arm k^4 is a box or bearing, in which works the rod k^5, the top of which is bent, forming the cranks k^{10}, which are similar to the stationary cranks k^{11}. At the top of the rod k^1 the said cranks k^{10} and k^{11} are connected by the slats k^6 and k^7. The rod k^5 is curved forward and downward, the lower end of which terminates in a shaft running backward and parallel with the surface of the grain-platform C. By this construction the rod k^5 is carried by the arm k^4 around the post k^1 as a common center, and the straight part of the rod k^5 always points in the same direction in relation to the platform C. The rake-board K is secured to the straight part of the rod k^5 by means of the sleeve k^{12}, which has suitable ears for its secure attachment to the rake-board K. The upper edge of the said board is secured by means of the guard k^{13}, thereby allowing the rake-board to move a short distance backward and forward along the straight part of the rod k^5, and is held in the forward extremity of its movement by means of the spring k^8. To the lower rear corner of the rake-board K is secured the friction roller k^9, which has for its purpose to prevent the rake-board K from passing too far forward by striking against and rolling along the rear edge of the platform C while the rake is sweeping the grain to the inner side of the platform. The flexible rod x^3 is securely connected to the upper forward corner of the rake-board K, and projects forward and is curved downward nearly to the platform, and has for its object to assist in gathering the grain into the binder, and enabling the segmental arm J to encircle the gavel by passing between the vertical part of the rod x^3 and the end of the rake-board K. The rod x^3 being elastic enables it to extricate itself, when entangled with other portions of the machine, without injury.

To the outer end of the arm k^4 is secured the short curved arm x^1, which has for its purpose to move the rake-board backward for the purpose of allowing the rod x^3 to pass the sleeve k^2, while the rake is passing rearward from the inner to outer side of the grain-platform, by pressing against the friction-roller x^2, which revolves about a stud connected with the top of the rake-board K, in a manner as hereinafter described. The arm k^4 and the slats k^6 and k^7 are made sufficiently wide so as to overlap each other a little when their respective cranks are at right angles with them, for the purpose of preventing stalks of grain from getting between.

The operations of my machine are as follows: Sufficient grain having accumulated upon the grain-platform C to form a sheaf, the operator pushes the lever L slowly forward. The stud l^1 upon the end of the arm l slips down the inclined ledge l^3. The lower end of the lever L being pivoted to the shipper-lever l^4, thereby moving the pawl l^7 upon the arm l^1 of the shipper-lever l^4 out of the notch h^6 in the wheel h, further movement of the lever L engages the clutch e^7, and thus communicating motion to the rake. The stud l^1 slips a little way under the end of the inclined ledge l^3, thus holding the lever L in its position. The clutch e^7 is held in gear by the pawl l^7, which rests against the rim of the wheel h. The rake moves rearward around to the outer side of the platform, thence across, sweeping the gavel over the pulleys n^2 and n^3, and upon the compressing-belt M. The bevel-wheel h and the rake having made one revolution, the pawl l^7 is forced into the notch h^6 by the spring l^6, thereby releasing the clutch e^7 and retaining the wheel h and the rake securely in position against the gavel, where it remains during the operation of binding, and preventing the falling grain from being entangled with the revolving sheaf. The pawl l^7, in moving into the notch h^3, throws the lower end of the lever L, with the connecting-rod N, forward, thereby carrying the stud l^1 past the lower end of the ledge l^3. At the same time, by means of the connecting-rod N, oscillates the shipper-lever O upon its fulcrum o, withdrawing a stud upon the rod P from the notch j^7, Fig. I, and moving the clutch e^4 so as to engage the wheel e^2, thereby operating the segmental arm J, so as to carry the belt M around the gavel rising and holding it against the spiked bands S S. The arm J having nearly completed its movement, the pin s^1 strikes the end of the arm o^1, depressing it, thereby bringing the shipper-lever O to its first position, moving the stud upon the rod P into the notch j^2 in the arm J, and releasing the clutch e^4, thereby retaining the arm J in its position; also holding the gavel encircled by the belt M and spiked bands S S. The lever R being now depressed, as before described, motion is communicated to the band-forming mechanism, which operates as follows: The forming-hook T strikes into the gavel, and, in so doing, the pin or stud t^6 passes to and down the right-hand slot, thereby opening laterally the hook T, which returns a little way open, or in the same lateral position, before closing, for the purpose of filling the said hook with straw. The hook closes by the pin t^6 passing across to the left-hand slot, and passes upward, drawing the tuft with it through the throat v, forming a loop. The pawl s^4 now acts upon the ratchet-wheel t^3, and moves the bands S S so as to rotate the gavel a little to the right as the forming-hook commences its descent, when the point of the hook proper just passes the edge of the slide v^2. The pin t^6 passes across to the right-hand slot, thereby oscillating the hook T upon its fulcrum s^5, thereby carrying the band to the left, stretching the loop and placing it beneath the slide v^2 and upon the plate v. The hook passes through, and, being tapered side-

wise, spreads the loop, forcing it into the cavity v^3, as shown in Fig. IV, where it remains protected from being injured by drawing the next loop through it. The hook having again filled itself, as before described, draws the tuft through the throat and the previously-formed hoop, when the pawl s^3 again acts upon the ratchet t^3, and again moves the gavel to the right, carrying the first-formed loop out of the cavity v^3. The downward movement of the forming-hook places the second loop within the cavity in the same manner as the first, then, passing into the gavel and taking up another, and drawing it through the second, and so on, repeating the operation until a band of loops is formed. The first of the series coming under the hook, the last are drawn through them, thus connecting the first and last, and forming an endless band of interlocked loops.

The part of the pulley n carrying the belt M is somewhat larger than the parts carrying the bands S S. By this construction the slack or difference of circumference of the gavel, caused by the shrinking of the sheaf while being rotated and bound, is taken up just before coming under the bands S S. The gavel is therefore being compressed during nearly the whole of the binding operation. It will be seen that the compressing-belt M passes directly over the series of loops as they are formed, compressing them and insuring their coming fairly under the hook for the purpose described. The binding of the sheaf being completed, the operator draws the lever L backward, and, by so doing, the stud l^1 passes over the inclined ledge l^3, and the connecting-rod N oscillates the shipper-lever O, so as to push the stud upon the rod P out of the notch j^2, thereby releasing the segmental arm J. The lower end of the lever O moves the clutch e^4 so as to connect the wheel e^3, thereby reversing or withdrawing the arm J, which, when withdrawn nearly far enough, the pin s strikes against the arm o^1, thereby releasing the clutch e^4, and drawing the stud upon the rod P into the notch j', and holding the arm J in position. The upper end of the lever R being now raised by the segmental arm J the clutch e^1 is released, and the binding mechanism stops. The tightener U takes up the slack of the belt M, causing it to throw the sheaf against the rake-board K, where it remains until another gavel is to be bound. Sufficient grain having accumulated upon the platform for a sheaf, the operator pushes the lever L forward, as before described, throwing the pawl C^7 out of the notch h in the wheel p and starting the rake, which moves backward, throwing the sheaf off the platform. During the backward movement of the rake-board the arm x^1 presses against the friction-roller x^2, thereby moving the rake-board rearward along the straight part of the rod k^5, for the purpose of allowing the rod x^3 to pass behind the sleeve k^2, when the end of the arm x^1 slips past the roller x^2, and the spring k^8 moves the rake-board forward, and the operation of raking and binding a sheaf is repeated.

When the gavels are to be deposited upon the ground for hand-binding, the frame T^1, arm J, belt M, shaft I, and the shipper-lever O, with their necessary connections, are removed, and the mesh of the miter-gear wheels h^1 and h^3 are changed, so that when the pawl l^7 rests within the notch h^6 the rake-board will be in a position at the outer side of the grain-platform to deliver a gavel. The operator moves the lever L forward, as before described, releasing the wheel h, and engaging the clutch e^7, thereby starting the rake, which sweeps the grain across to the inner side of the platform and against the board L^1, when the backward movement of the rake draws the gavel off the platform and passes round to the outer side of the platform, when the pawl drops into the notch h^6, as before described.

When the machine is to be used as a mower, the whole of the platform C, with its necessary connections, are to be removed. The height of the stubble may be regulated by means of any suitable arrangement which will enable the tongue to be adjusted to different angles relative to the main frame, so as to tilt it forward to lower the cut, and tilt it backward to raise the cut.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the wheels e^2, e^3, and e^5, clutch e^4, shipper-lever O, arm o^1, rod P, and the toothed segmental arm J, with each other and with the driving-shaft E and the compressing-belt M, substantially as herein described, and for the purposes set forth.

2. The combination of the driving-pulley n, belts S and M, binding-arm J, and the pulleys n^3, n, and n^5, substantially as and for the purposes herein specified.

3. In combination with the driving-shaft E, and the rake-operating shaft H, the notched gear-wheel h, wheel e^6, clutch e^7, shipper-lever l^4, pawl-arm C^1, spring n^6, operating-lever L l, and the inclined ledge l^3, all arranged substantially in the manner and for the purposes herein specified.

4. The combination of the shaft t^2, eccentric s, pawl and ratchet t^3, and the pulley n, as and for the purposes set forth.

5. The pivoted forming-hook T, in combination with a slotted guide-frame, substantially as shown, and for the purposes described.

6. The cheeks v^6 v^6, slides v^1 and v^2, and the cavity v^3, in combination with each other and with the frame T^1, substantially as and for the purposes herein described.

7. The combination of the lever L, shipper-levers l^4 O, pawl-arm C^1, spring h^6, ledge l^3, arms l o^1, and the rods N P, with each other and with the driving-shaft E, rake-operating gear, and the binding mechanism, substantially as and for the purposes herein specified.

8. The combination of the platform C, driv-

ing-shaft H, gears h^1 k^3, post k^1, sleeve k^2, arm k^4, cranks k^{10} k^{11}, connecting-slats k^6 k^7, rake-head K, and the friction-roller k^9, substantially as and for the purposes set forth.

9. In combination with the rake-driving arm k^4, and the rake-head K, the curved arm x^1, and the friction-roller x^2, substantially as herein shown and described, and for the purposes set forth.

10. In combination with the rake-head or board K, the flexible rod x^3, and the binder-arm J, substantially as and for the purposes set forth.

11. The rod and cut-off q, forming-hook T, fulcrum-pin s^5, forming-hook arm and stud t^6, with their supporting-frames, guiding and driving mechanisms, all arranged relative to each other and to the gavel-holder, substantially in the manner and for the purposes herein specified.

12. The driving-pulley n, pulley n^5, compressing-belt M, tightener U, with their supporting-frames, all arranged substantially as specified, and for the purposes described.

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