2 Sheets—Sheet 1.

M. A. KELLER.

Grain-Binder.

No. 200,544. Patented Feb. 19, 1878.

Fig. 1.

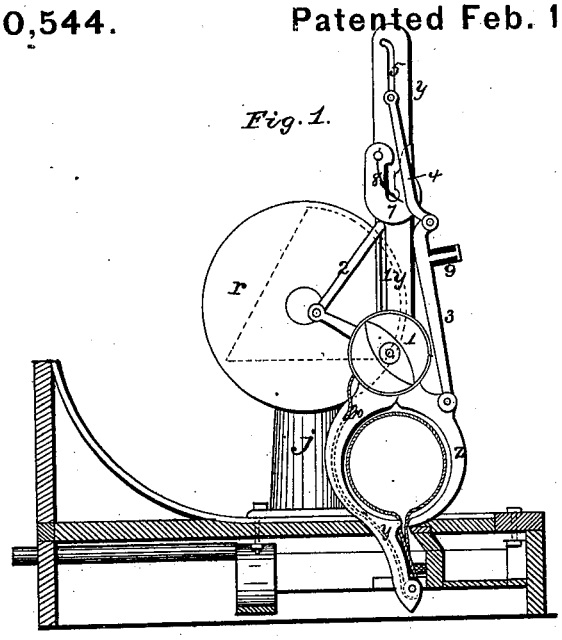


Fig. 12.

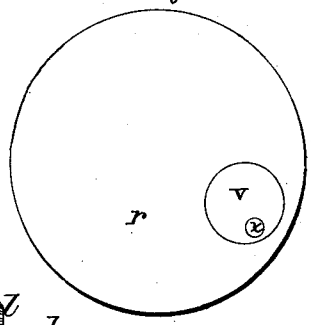


Fig. 2

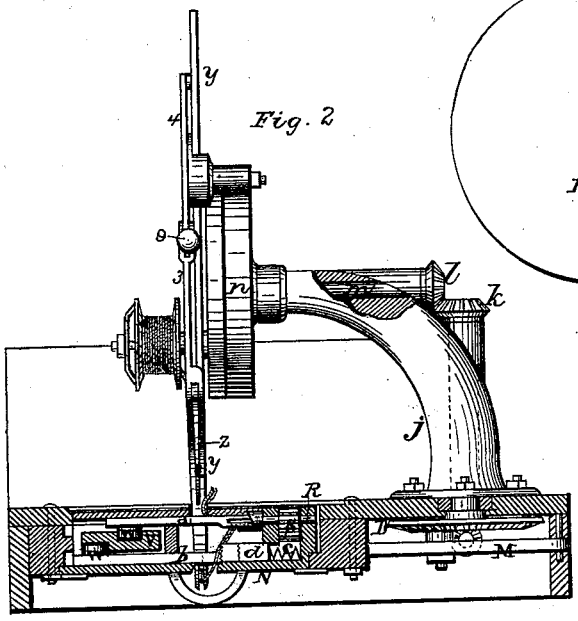


Fig. 5.

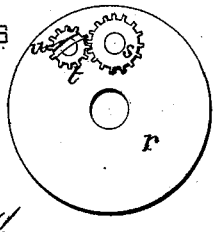
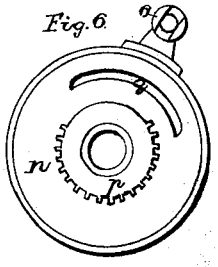


Fig. 6.



WITNESSES

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Atty

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Grain-Binder.

No. 200,544. Patented Feb. 19, 1878.

Fig. 3.

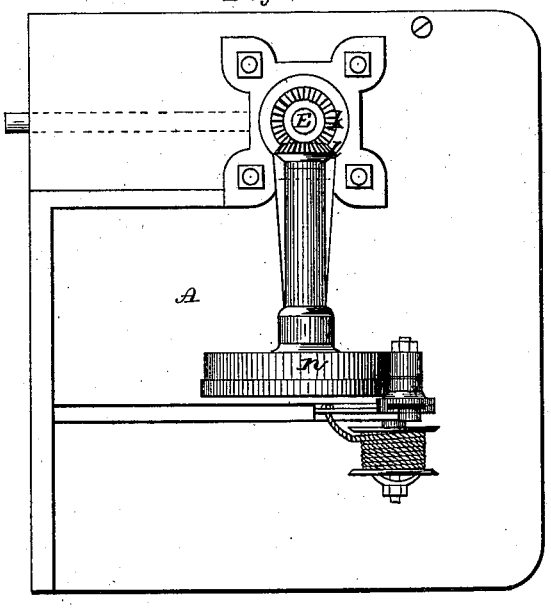


Fig. 4.

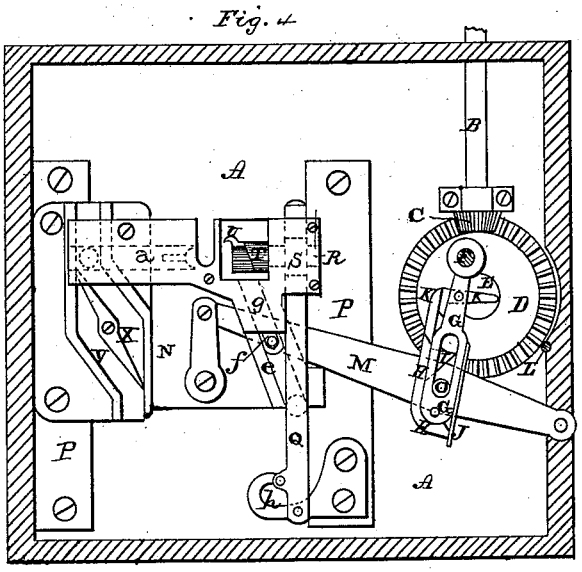


Fig. 7.

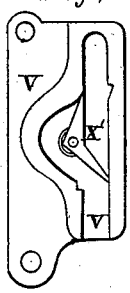


Fig. 11.

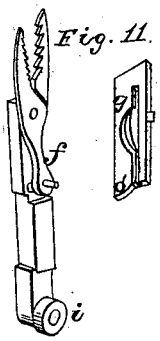


Fig. 8.

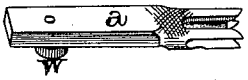


Fig. 9.

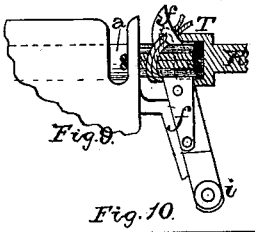
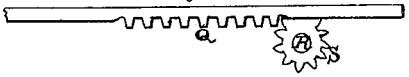


Fig. 10.



Witnesses:

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per

F. A. Lehmann.

Atty.

UNITED STATES PATENT OFFICE.

MOSES A. KELLER, OF LITTLESTOWN, PENNSYLVANIA.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **200,544**, dated February 19, 1878; application filed July 14, 1877.

To all whom it may concern:

Be it known that I, MOSES A. KELLER, of Littlestown, in the county of Adams and State of Pennsylvania, have invented certain new and useful Improvements in Automatic 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 improved automatic grain-binder for harvesters, in which cord or twine is employed as the binding material; and has for its object the provision of such devices as shall receive and take from the platform of the receiver or harvester a suitable amount of grain, shall compress the same into a gavel, and bind it, ready for delivery to the ground.

Figure 1 is a vertical side view, showing the whole plan of the binding-head, and a longitudinal section of the platform. Fig. 2 is a vertical front elevation of the binding-head, with a transverse section of the platform. Fig. 3 is a plan view of the horizontal mechanism, with part of the platform removed. Fig. 4 is a plan view of a part of the binder mechanism. Figs. 5 and 6 are internal views of the head disk; and Figs. 6, 7, 8, 9, 10, 11, and 12 are detail views of different parts of the mechanism.

A represents the binding table or platform, and B the driving or operating shaft, which has a bevel-pinion, C, on its inner end. This pinion meshes with the large bevel-wheel D, on the lower end of a vertical shaft, E, which operates the binding-head mechanism, and which wheel D is provided with a wrist-pin, F, that passes through one end of the slotted lever G. Pivoted in the outer end of this lever G is a catch, H, having a projection, I, on its inner side, and which projection passes through a mortise in the side of the lever G, so as to project across the slot, as shown.

Bearing against the end of the catch H is the spring J, which holds the catch pressed tightly against the side of the lever G, so as to keep the projection pressed inward across the slot, and so that when the cranked lever K forces the inner end of the catch outward it will snap back to place again. This cranked lever K is pivoted in a mortise through the inner end of the lever G, and is operated by a projection, L, on the inside edge of the frame A. As the lever G sweeps around, one end of this lever K strikes against the projection, thereby forcing it backward, which movement forces the inner end of the catch H outward, so as to withdraw the projection I from across the slot in the lever G.

Pivoted to the frame A, at any suitable point, is the lever M, which moves the shuttle-frame N back and forth, and which has its inner end fastened to the frame N by means of a link or other suitable device. Through an opening or slot near the outer end of this lever is passed a bolt or pin, O, which passes through the slot in the lever G. As the wheel D sweeps around, the wrist-pin F, through the slotted lever G, moves the lever M back and forth, in such a manner as to cause the shuttle-frame N to reciprocate back and forth in its bearings, alternately moving and standing still, while the wheel D continues to revolve. While the bolt O is held at the inner end of the slot in the lever G, by means of the projection I, the lever M is made to move the frame M; but as soon as the cranked lever K trips the catch H, so that the projection I releases the bolt O, the bolt moves freely in the outer end of the slot without causing the lever to move until the catch again gets behind the bolt, when the lever M and frame N are again moved.

By the above-described mechanism the frame N is moved forward to have the loop formed, stands still while the knot is being tied, and then moves back again after it is done.

Pivoted to one corner of the bearings P, in which the frame N moves back and forth, is the bar Q, which has a number of cogs formed on its under side for operating the shaft R, which has a segmental pinion, S, near its center, an enlarged recessed head, T, on its inner end, and a hook, U, on this head, for catching the strings and drawing them around with it as the shaft revolves. There are just enough cogs on the bar and the pinion to cause the shaft R to make one complete revolution—no more, no less.

As the frame N moves either forward or

back, as long as a flat part of the bar rests upon the cut-away portion of the pinion the shaft stays still; but as soon as the pinion reaches the rock, the shaft at once begins to revolve.

Rigidly secured to one of the bearings, to one side of the frame N, is the switch-plate V, which has a suitably-shaped recess in each side, and in these recesses are pivoted the spring-switches X X′, of such shape as will give the loop-former *a* and cutter *b* their necessary motions. The loop-former *a* consists of a straight bar or rod, having its inner end recessed vertically, so as to catch the string, and a deep recess formed horizontally into its end, so as to divide the end into two prongs, each of which has a groove in its top to receive the string as the string is forced against them. As the frame N is moved, the roller W, on the under side of this former, catches between the side of the recess in the switch-plate V and the switch X, and forces the former forward, so that its end enters the recess in the head T, carrying the string with it. Just as this former enters the head, the head is made to revolve entirely around the former, at which time the string is released, the cutter again comes forward, catches the string, cuts it, and holds one end, and the hook U catches the string while it is thus held in the head, so as to bring the two ends of the string around over the top of the former, just opposite the horizontal recess in its end. Just before the head completes its revolution around the former the motion of the frame N causes the friction-roller on top of the cutter *b* to move in the switch-plate, in such a manner as to force the cutter *b* forward against the string and cut it off. The end of this cutter is so shaped as to catch the string and carry it forward without any danger of its slipping off, while the under side of this end is roughened, so as to hold the string while the binder-arm carries the string around the sheave. Pressed forward against the end of the cutter *b* by a suitable spring, *c*, is a holder, *d*, which presses the string against the end of the cutter, and helps to prevent the string from slipping. The switch-plate may be cast with the bearing.

Rigidly secured to one end of the frame N is a guide, *e*, in which the plier-jaws *f* move back and forth. Upon the top of the rear end of the movable jaw is a small projection, which catches in the under side of a switch-plate, *g*, in which there is also placed a spring-switch. Upon the rear end of these jaws is a friction-roller, *i*, which is made to catch, by the motion of the frame N, behind the hook *h*, to draw the jaws back after they have been forced through the opening through the end of the former. Just before the frame N reaches the end of its motion toward the hook *h*, the switch-plate *g* causes the jaws to open as they pass through the end of the former, so as to catch the two ends of the string.

As the frame moves back, the roller is held by the hook just long and hard enough to cause the switch-plate to close the jaws, and thus grasp the two ends of the string and draw them through the loop into a knot. Upon the end of the switch-plate *g* there is a suitable projection, *o′*, which prevents the jaws from opening too soon, as they would otherwise do, and thus the knot not be drawn tight enough.

The vertical shaft E passes up through the hollow standard *j*, and has a gear, *k*, on its upper end, for meshing with a similar wheel, *l*, on the end of a horizontal shaft, *m*, which operates the binder-head mechanism. The horizontal part of the hollow standard J has the gear-case *n* fastened to it near its end, and upon its end is the segmental stationary wheel *p*, which has a portion of the cogs upon its periphery cut away, just opposite a portion of a circular guide, *q*, on the inside of the case *n*.

To the inner end of the shaft *m* is secured the disk *r*, upon the inner side of which disk are the two wheels *s t*. The wheel *s* is the larger of the two, and meshes with the wheel *p*, for the purpose of communicating its motion to the smaller one, *t*. The wheel *t* is secured to the rear side of a disk, *v*, which revolves in an opening made through the face of the disk *r*, and which has its face flush with that of the disk. Upon the side of the wheel *t* is a semi-circular guide, *u*, which, as the disk *r* revolves, catches over the top of the circular guide *q*, so as to hold both wheels *s t* stationary while they are passing that portion of the wheel *p* where the cogs are cut away.

To the disk *v* is secured the eccentric wrist-pin *x*, upon which is pivoted both the binder-arm *y*, compressor *z*, and spool 1. The binder-arm is of a single thickness of metal above the pivot, and about three thicknesses below, so as to form a groove for guiding the string, and to receive a pulley at its lower end. Above the pivot is made a long slot, 1, which acts as a guide for the upper end of the rod 2, which connects the binder and compressor arms together, and causes them to act in unison. Pivoted to the top of the curved portion of the compressor-arm is a rod, 3, which has its upper end pivoted to the lower end of a second rod, 4. The upper end of this rod 4 has its end secured in a slot, 5, in the upper end of the binder-arm *y*.

Upon the top of the gear-case *n* is formed a bearing, and in this bearing is pivoted a hub, 6, which has a suitable recess formed in its face for the upper part of the binder-arm to slide up and down in. To the front of this hub 6, and over the front side of the binder-arm, is secured the cam 7, which has an opening made down through its top, of the form shown. To the front of this cam is fastened the flat spring 8, which serves to force the head of the rod 4 over into the bottom of the cam 7 and hold it there for the time being. On the outer side of the rod 3 is placed a block of rubber, 9, or other suitable spring, against the inner side of which presses the lower end of rod 4. Should there be an unusually large

gavel taken in between the binder-arm and the compressor-arm, the joint between the two rods 3 4 and this spring will allow the compressor-arm to give or yield.

The string is drawn from the spool, passed through the slot 10, down through the groove, and around the pulley. When the disk *r* begins to turn, the binding and compressing arms are far apart, and the binding-arm assumes an inclined position, so as to sweep the grain into a gavel. As the disk continues to turn, the two arms assume an upright position, and their lower ends move toward each other, and the connecting-rod 2 has its upper end moved from the bottom to the top of the slot 1, as shown in Fig. 1. The knot is then tied by the mechanism already described. As long as the upper end of this rod 2 bears up against the under side of the cam 7, and the upper end of the rod 4 is held down to the bottom of the slot 5 in the top of the binder-arm and the bottom of the opening in the top of the cam 7, there is no yield to either binder or compressor arm, except what the spring 9 allows the compressor-arm for large bundles. As the disk continues to revolve and begins to raise the two arms upward after the knot has been tied, the upper end of the rod 4 is forced upward out of the recess in the top of the cam, and then the binder-arm begins to be forced upward through the hub 6. As the binder-arm rises, the upper end of rod 4 rises in the slot 5 at the same time that the under side of the cam 7 forces the upper end of the rod 2 downward, thereby separating the two arms and getting them ready for the next bundle. Until the spool reaches its highest point the string is being unwound; but as soon as it begins to descend, it revolves in the opposite direction, so as to take up all slack. The line of travel through which this spool passes is shown in dotted lines in Fig. 1; and as the binder and compressor arms are pivoted on the same pin, it is evident that they travel on the same line.

Instead of the shuttle-frame being made to operate back and forth, this frame may remain stationary and the bearings be made to move.

In building full-sized machines I follow the latter plan entirely, as being cheaper and better.

Having thus described my invention, I claim—

1. The lever G, slotted a portion of its length, catch H, spring-cranked lever, a tripping device, L, and an operating-lever, provided with a pin or projection, substantially as shown, the parts being combined for operation, as described.

2. The combination of the segmental pinion S and rack-bar Q with the shaft, having a recessed head to receive the loop-former, and a hook, U, substantially as shown, for the purpose specified.

3. The combination of a shuttle-frame, a rack-bar, a shaft having a segmental pinion, and a recessed head with a reciprocating loop-former, substantially as specified.

4. The combination of the reciprocating loop-former, that moves horizontally back and forth, and the stationary revolving recessed head T, having a hook, U, for the purpose of winding the cord around the loop-former, substantially as and for the purpose set forth.

5. The combination of the revolving stationary recessed head T, having the hook U and the reciprocating pronged loop-former, with the plier-jaws, moving at an angle to the loop-former, for the purpose of drawing the ends of the string through the prongs, substantially as shown.

6. A loop-former having its end divided into two prongs, for the purpose specified.

7. A loop-former having its end divided into two prongs, in combination with a mechanism for moving it back and forth, and a revolving recessed head, that is provided with a hook, U, substantially as shown.

8. A loop-former having its end divided into two prongs, and each prong having a groove formed in its outer side to receive the string, in combination with a revolving hooked head, as described.

9. The combination of the reciprocating cutter-bar *b* with the yielding cord-holder *d* and spring *c*, whereby the cord is securely held without any danger of being pinched off, substantially as shown and specified.

10. The plier-jaws *f*, constructed and operating as shown, in combination with the pronged loop-former, stationary revolving recessed head, provided with a hook, U, a switch to open and close the jaws, and a roller, *i*, substantially as described.

11. The jaws *f*, having a stud or projection to catch in the switch *g*, the switch being made to open the jaws as they advance and close as they recede, substantially as specified.

12. The combination of shaft *m*, standard *j*, gear-case *n*, toothed segmental disk *p*, and a revolving disk, *r*, substantially as described.

13. The combination of the segmental toothed stationary disk *p*, gears *s t*, guides *q u*, revolving disk *r*, and disk *v*, substantially as specified.

14. A mechanism for operating the binding and compressing arms of a binder, consisting of a large disk, *r*, that continually revolves a smaller disk placed in the larger one, and which revolves intermittingly, and a mechanism for revolving them, in combination with said arms, substantially as shown.

15. The combination of a large disk, *r*, that continually revolves a smaller disk revolving intermittingly in the larger one, and a mechanism for operating them, with a pivoted hub, 6, binder-arm *y*, and compressor-arm *z*, substantially as described.

16. The revolving disk *r*, or its equivalent, having a pivoted eccentric wrist-pin, *x*, that is secured to the intermittingly-revolving disk *v*, and upon which pin is mounted the cord-carrying arm, the compressor-arm, and the cord-

spool, the parts being combined to operate substantially as set forth.

17. The binding-arm *y*, having the slot 1, in combination with the compressor-arm *z* and connecting-rod 2, both arms being placed on the same pivot, substantially as shown.

18. The combination of the binding-arm *y*, having the slots 1 5, with the compressor-arm *z*, connecting-rod 2, and a rod with or without joints, for connecting the compressor-arm with the slot 5, substantially as described.

19. The combination of the compressor-arm *z*, rods 3 4, and binder-arm *y*, having slot 5, with a spring, 9, substantially as set forth.

20. The combination of the hub 6, binder-arm *y*, compressor-arm *z*, and their connecting-rods with the cam 7 and spring 8, substantially as shown.

21. In combination with the cord-carrying arm and revolving wrist-pin, the cord-spool mounted on said wrist-pin, and having a suitable tension, so as to keep the slack of the cord wound up as the cord-carrying arm carries the cord around the bundle, substantially as described and shown.

22. The combination of the pronged reciprocating loop-former *a*, having the friction-roller W, with the automatic switch-plate for moving the former in and out, substantially as shown.

In testimony that I claim the foregoing I have hereunto set my hand this 13th day of July, A. D. 1877.

MOSES A. KELLER.

Witnesses:

JOHN W. PILLING,

W. H. KERN.