(No Model.)

4 Sheets—Sheet 1.

P. P. COLER.

GRAIN BINDER.

No. 477,992. Patented June 28, 1892.

Fig. 1.

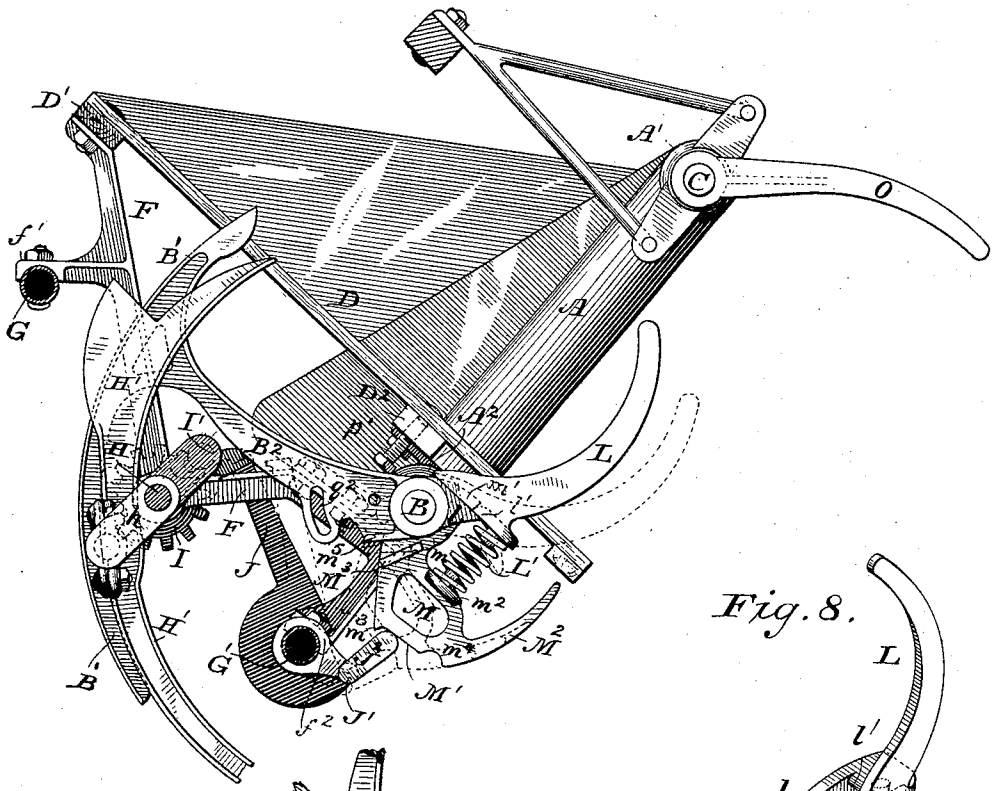


Fig. 8.

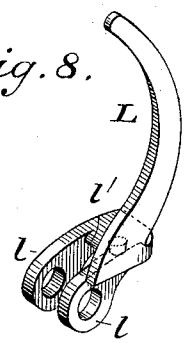


Fig. 2.

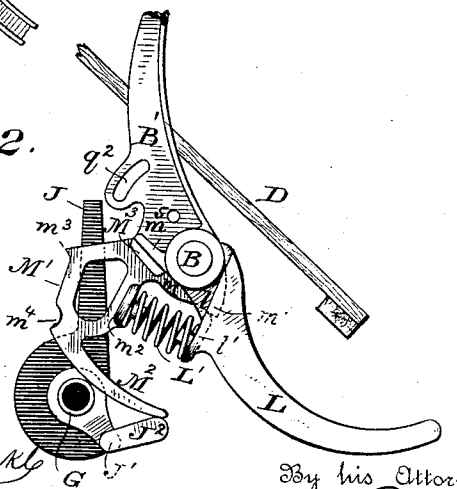
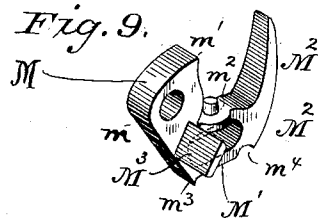


Fig. 9.



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(No Model.) 4 Sheets—Sheet 2.

P. P. COLER.

GRAIN BINDER.

No. 477,992. Patented June 28, 1892.

Fig. 3.

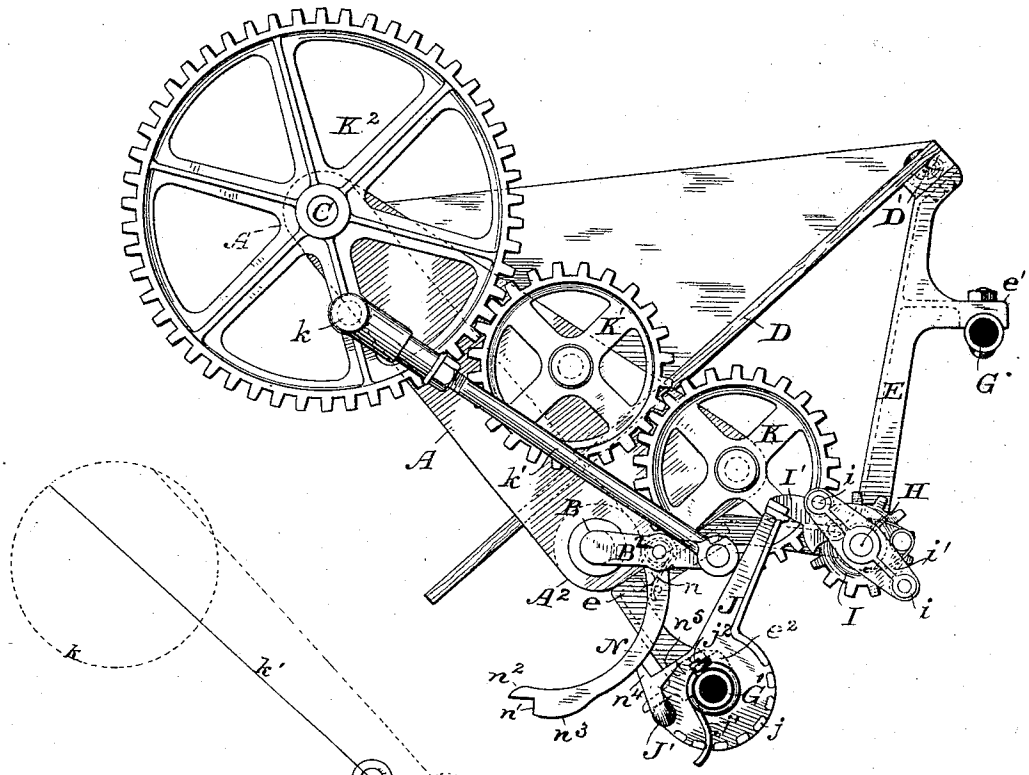


Fig. 4.

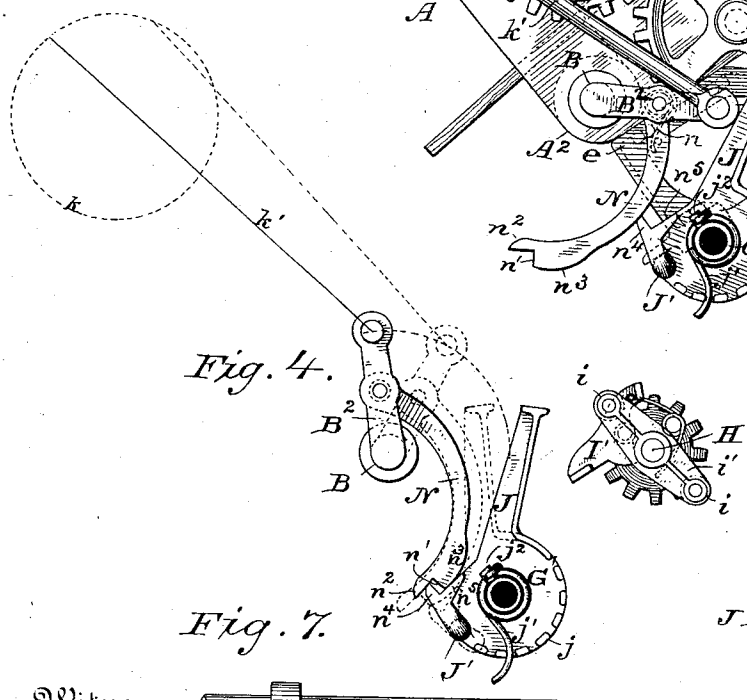
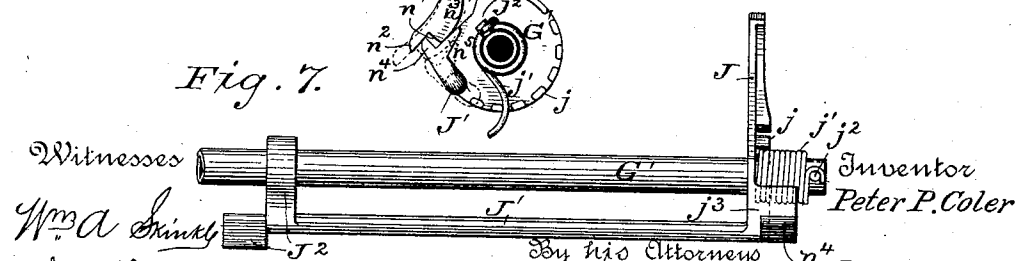


Fig. 7.



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(No Model.)

4 Sheets—Sheet 3.

P. P. COLER.

GRAIN BINDER.

No. 477,992. Patented June 28, 1892.

Fig. 5.

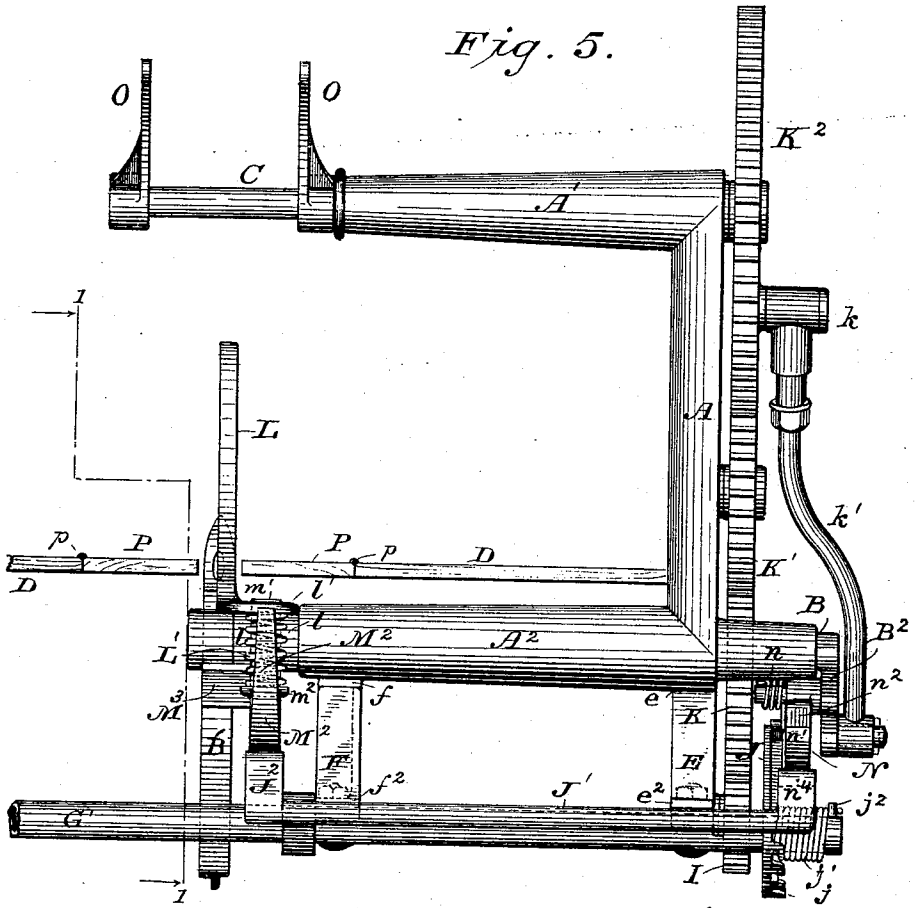
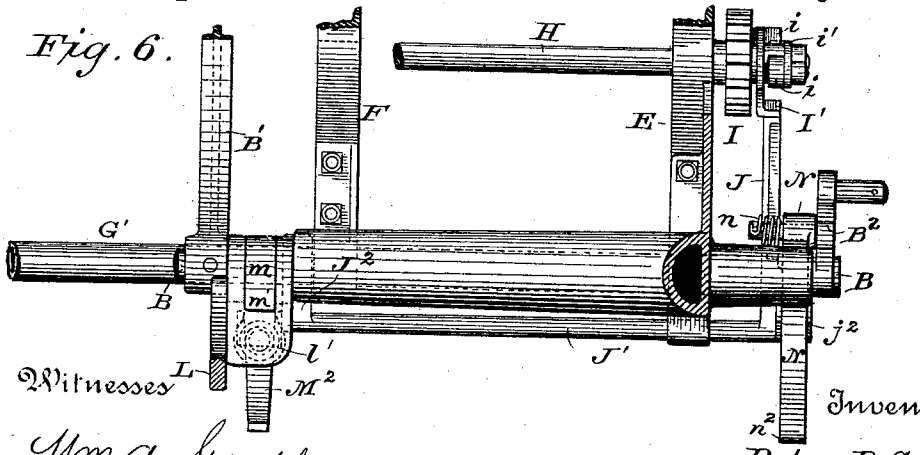


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

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GRAIN BINDER.

No. 477,992. Patented June 28, 1892.

Fig. 12.

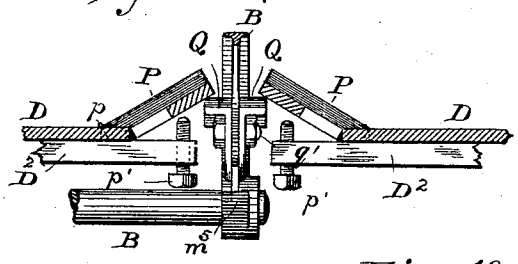


Fig. 10.

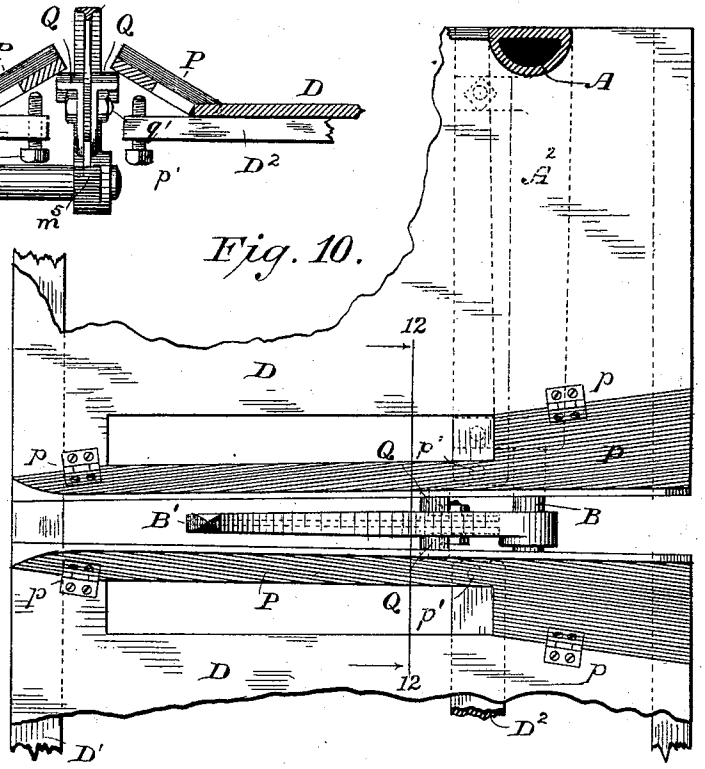
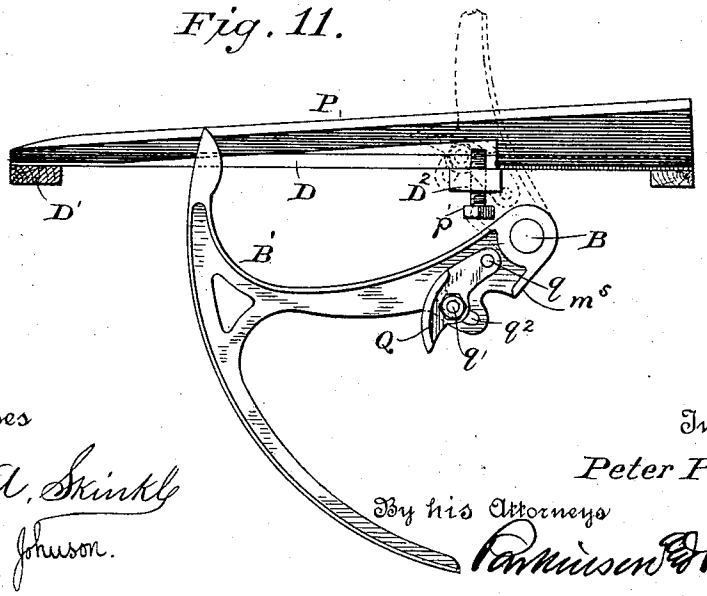


Fig. 11.



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UNITED STATES PATENT OFFICE.

PETER PAUL COLER, OF CLYMAN, WISCONSIN.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 477,992, dated June 28, 1892.

Application filed October 4, 1888. Renewed May 7, 1892. Serial No. 432,139. (No model.)

To all whom it may concern:

Be it known that I, PETER PAUL COLER, a citizen of the United States, residing at Clyman, in the county of Dodge and State of Wisconsin, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification.

My invention relates to the tripping devices which set the binding mechanism in motion, to means for regulating the size of the gavels and the compression thereon, and to means for ejecting the bound bundles from the binding-receptacle; and it consists in a pivoted outside compressing and tripping finger which forms the outer wall of the binding-receptacle, yields slightly to the pressure of the accumulated gavel, and trips the binder into action, is then locked against further outward movement until the bound bundle is to be ejected, when it is unlocked and falls below the plane of the binding-table to permit the bundle to pass over it, and is finally restored to its normal position; in forming the side of the cord-slot in the binding-table of loose leaves, the inner edges of which, or those farthest from the needle, are hinged and the outer edges, or those adjacent to the needle, held at any desired height to regulate the size of the binding-receptacle at the waist of the bundle; in means for raising these outer edges of the leaves during the forward movement of the needle to compress the gavel from below, and in the further combinations and details of construction whereby I am enabled to carry out these general as well as other features of minor importance of my invention, as will be hereinafter fully set forth and claimed.

In the drawings, Figure 1 is a rear elevation, partly in section, on the line 1 1 of Fig. 5, of so much of a binding mechanism as is necessary to illustrate the application of my invention thereto. Fig. 2 is a similar view of a portion of the mechanism, the parts shown occupying different positions from those shown in the preceding figure. Fig. 3 is a front elevation showing the gear-train through which the binder is driven and the immediate tripping mechanism by which it is thrown into or held out of operation. Fig. 4 is a similar view of some of the same parts occupying different positions to those last shown. Fig. 5 is an outside elevation, and Fig. 6 a plan view, partly in section, of the binding mechanism. Fig. 7 is a detached plan view of the trip-shaft and its pawls or dogs. Figs. 8 and 9 are perspective views of the compressing and tripping finger and its rear tripping-dog detached. Fig. 10 is a plan view of the binding-table with hinged central portions that are raised at their adjacent edges to compress the bundle from beneath. Fig. 11 is a vertical central section through the same in the line of the cord-slot; and Fig. 12, a vertical transverse section on the line 12 12 of Fig. 10, seen in the direction indicated by arrows.

The binder-frame proper consists of the usual front upright post A, having rearwardly-extending, overhead, and subtending arms $A' A^2$, which support the needle-shaft B, with its needle B′ and forward crank B^2, and the tyer-shaft C in the ordinary manner. The binding table or deck D rests upon sill-bars $D' D^2$, which are carried upon tie-bars or brackets E F, securely fastened at their outer ends to the subtending arm of the post-frame and provided with suitable feet *e f*, by which they are attached to the sill-bars, and with other feet $e' e^2 f' f^2$, by which they are attached to the tubular bars G G′, upon which the entire binding mechanism is supported. The constantly-driven packer-shaft H is carried in suitable bearings in these tie-bars or brackets and has the usual double crank *h* and swinging packer-arms H′, which are projected through slots in the binding-table and force the grain into the binding-receptacle near its outer edge. The binding mechanism is actuated by a trip-pinion I on the constantly-revolving packer-shaft in the usual manner, the pinion being loosely mounted on the shaft and connected therewith at intervals by means of the spring-pressed driving-dog or trip-dog I′, pivoted on the pinion and engaging lugs *i* on the ends of a cross-head *i′*, firmly secured on the front end of the packer-shaft. An intercepting pawl or trip-latch J is pivoted on the frame—for instance, upon the adjacent outer tubular frame-bar G′—and normally projects with its free end into the path of the trip-dog to arrest it and disconnect the clutching mechanism, but when withdrawn

from the path of the dog liberates it and permits it to clutch the pinion to the shaft, as will be readily understood by those skilled in the art to which my invention appertains. Such withdrawal is accomplished by the trip-rod J′, fixed to the heel of the trip-latch and extending rearwardly along the binder-frame parallel with the subtending arm thereof and at its rear end beneath the cord-slot fixed to the trip-lever J^2, which is pivoted to the frame in axial line with the pivot of the trip-latch, that is for the purposes of the present description upon the outer tubular frame-bar, and when depressed at its power end moves said rod bodily and trips the latch, the trip-rod oscillating with both the lever and latch in this tripping movement. The trip-latch is provided with a segmental web having a notched flange j at its periphery, engaged by a spring j', wound about the projecting end of the adjacent tubular frame-bar, which in this instance serves as a journal for said lever, one end of the spring being caught over a pin j^2 from the pipe and the other end entering one of the notches in the flange, by means of which the tension of the spring may be regulated and the tripping pressure on the bundle adjusted at pleasure.

The tyer-shaft C is driven through a train of gear-wheels K K′ K^2 from the trip-pinion, the wheels K and K′ being mere idle-wheels, while the wheel K^2, which serves as the main wheel of the binder, is firmly connected to the tyer-shaft and turns it, and is further provided with a wrist-pin k, connected by a pitman k' to the crank on the front of the needle-shaft, through which the needle on the rear end of the shaft is operated in the usual manner.

The mechanism so far as I have described it is substantially similar to the well-known form of Appleby binder, which form I have chosen to illustrate the application of my tripping device, as it is the form now most extensively used and is best known in the commercial world; but it is also applicable to other forms by slight variations in detail that will adapt it to them without departing from the spirit of my invention.

The compressing and tripping finger L, which forms the outer wall of the binding-receptacle and against which the grain is packed or compressed, is loosely pivoted on the rear end of the needle-shaft, being provided with perforated ears or lugs l, which embrace the shaft at each side of the shank or hub m of a trip-cam M, loosely mounted on said shaft and standing below the tripping-finger, as shown.

The lugs of the tripping-finger are connected by a cross-bar or base-plate l', from the rear side of which the arm rises, the inner edge of the plate forming a stop against which the shoulder m' on the shank of the cam bears to limit its independent movement in this direction. This cam is formed with a seat m^2 on its upper surface, between which and the cross-bar of the tripping-finger is a spring L′, the expansion of which tends to keep the stop-shoulder of the cam against the inner edge of the base-plate from the trip-finger, the stud-pins on the base-plate and cam-seat holding the spring in place.

On its lower edge the trip-cam has a straight cam-track or resisting bearing-surface M′, with a slight projection or hook m^3 at its inner end and a recess or notched depression m^4 at its outer end, from which a projecting guard or tail M^2 extends outwardly and is curved concentrically with the axis of the needle-shaft. A lateral offset M^3 projects rearwardly from the hub or shank of the trip-cam and stands in the path of a lug m^5 from the hub of the needle for a purpose that will be hereinafter explained. The under side of the trip-cam is borne against by the upper free end of the trip-lever, which stands in the vertical plane of the trip-cam, as shown, so that the rocking of said cam shall depress the lever, thereby disengaging the trip-latch and starting the binding mechanism, as heretofore explained.

The operation of my device as thus far explained is as follows: When the parts are in their normal position, as shown in the first figure, and the grain is being fed into the receptacle and against the compressor by the packer-arms, said compressor is held in its position by the spring interposed between it and the trip-cam, and the cam is borne up by the trip-lever, which is pressed thereagainst by its adjustable spring with any desired pressure. The trip-lever normally bears against the inner end of the straight track of the trip-cam, and is consequently in a position to offer its greatest resistance to the movement of said cam, its resistance being greater than that of the spring between the cam and trip-finger, which spring will be compressed by the pressure of the grain against the finger before the trip-lever will yield; but the instant the friction between the track and trip-lever is overcome and the latter is started the expansion of the spring will accelerate the movement of the cam and instantly throw the lever into its tripping position, as indicated by dotted lines in Fig. 1, where it rests in the recess m^4 of the cam. This movement of the trip-lever is communicated through the trip-shaft to the trip-latch, raising it from the engagement with the trip-dog shown in Figs. 1 and 3 to the position shown by dotted lines in Fig. 1 and by full lines in Fig. 4, where it stands out of the path of the dog, permitting the latter to connect the trip-pinion to the driving-shaft, and being held in its disengaged position by the continuing contact of the trip-cam with the trip lever. Such initial movement of the tripping mechanism permits the compressing and tripping finger and cam to move to the positions indicated by dotted lines in Fig. 1, where the cam is positively locked against further movement in such direction by the engagement of the trip-lever with the notch in said

cam, and the tripping-finger resists the pressure of the gavel with the full strength of its supporting-spring until the knot in the binding material is completed and the bound sheaf ready to be ejected from the receptacle, the positions of the parts being such that the pressure of the cam upon the end of the trip-lever is directly toward the pivotal center of the latter, so that no amount of force applied to the cam can force the lever out of the notch.

In order to release the trip-cam and permit it and the trip-finger to swing down to the position indicated in Fig. 2, where it will be out of the path of the bound sheaf and allow the latter to be ejected, I withdraw the end of the trip-lever from the notch, as follows: On the crank at the front end of the needle-shaft is pivoted a curved push-pawl N, held down to its working position by a spring n, coiled about its pivot-pin and provided at its free end with an abrupt shoulder n', an overhanging flange n^2, and a rounded projection or breast n^3, as shown in the drawings. Upon the heel of the trip-latch is a spur projection n^4, having an insetting ledge n^5, upon which the lugs n^3 of the push-pawl rests, as shown in Fig. 4, when said pawl is in action. In the normal quiescent position of the parts, as shown in Fig. 3, this pawl rests midway of its length upon the top or point of the spur n^4, and the trip-latch may be thrown up or opened to the position shown by full lines in Fig. 4 without materially effecting the pawl. When the binder is tripped into action, the needle-shaft crank is drawn up by the main gear-wheel through the intermediate pitman to the position shown by full lines in Fig. 4 and the pawl carried with it to a point where its shoulder n' falls behind the spur n^4, its lug n^3 resting upon the ledge n^5, as shown. In the continued movement of the main wheel the crank is reversed and carried back to the position shown by dotted lines in said figure, pushing down the pawl, which engages the spur, and thereby raises the trip-latch and through the trip-rod connecting the heel of said latch with the trip-lever withdraws said lever from the notch in the trip-cam, releasing the cam and allowing it, together with the trip-finger, to fall to the position shown by full lines in Fig. 2, so that the bundle may be ejected over them from the receptacle by the arms O on the tyer-shaft.

The parts are shown by dotted lines in Fig. 4 at the point where the pawl has pushed back the trip latch and lever to release the trip-cam and tripping-finger and is just about to slip off and past the spur from the latch as the downward movement of the crank continues. Now if the trip latch and lever were left entirely free when released from the push-pawl they would spring back to their original position and the latch engage the trip-dog before the completion of the full movement of the binder and stop it prematurely. To prevent this, I form on the trip-cam the before-mentioned guard or tail-piece, which intercepts the trip-lever and holds it down until such time as the cam is returned to its normal position, which is accomplished by the lug on the hub of the needle-arm coming, on the retreat of said arm, in contact with the lateral offset from the hub of the cam and forcing said cam back to its normal position, releasing the trip-lever and trip-latch, which also fall back to their original positions, the latter into the path of the trip-dog, which is thereby arrested in its rotary movement, and the trip-pinion disconnected from the driving-shaft. When leaving the binding-receptacle, the needle goes down to a point below its normal position, forcing the trip-cam before it, and then returning to its proper stopping-place. This return movement provides space enough between the lug from the needle and the lateral offset from the cam to permit the cam to make its next initial tripping movement without coming in contact with and being arrested by the needle.

At one or both sides of the cord-slot in the binding-table I form the adjacent portions of the cover or decking of a leaf or leaves P with hinges p at their inner edges, or those farthest from the slot. The outer or free edges of these leaves bounding the slot may be held at any desired elevation to graduate the size of the binding-receptacle at the waist of the gavel, and they may also be still further lifted by lifting-arms, tappets, or wipers on the rising needle to contract the size of the receptacle and compress the bundle from below. I have made the leaves much wider at their lower ends than at their tops, with the taper or inclined sides at the hinged edges, so that when they are tilted up the lower portions will rise relatively much higher than the upper portions, giving a considerable compression to the gavel in the receptacle, while not raising the upper ends of the leaves so far above the plane of the table. The inner edges of the leaves may be adjusted to and held at any desired height by means of set-screws p', passing through the sill-bars of the binding-table, as shown in Figs. 1, 10, 11, and 12, or through any other convenient portion of the frame. At a suitable point on the needle are arranged one or more lateral arms, tappets, or wipers Q, one at each side of the needle when two leaves are used, preferably being adjustable, and for this purpose being pivoted to the shank of the needle by a pin q and connected thereto along their length by a bolt q' through a slot q^2 in said shank. As the needle rises to place the cord in the knotter these wipers come in contact with the under side of the leaves at their inner edges and lift them off their adjustable screw supporting-stops, and, thereby contracting the size of the binding-receptacle, compress the bundle from below. By means of the slot and clamping-bolt the position of the wipers on the needle may be adjusted so that they will raise

the leaf edges more or less or not raise them at all, as desired.

So far as the tripping operation alone is concerned the tripping-finger and trip-cam might be made in a solid piece and the spring-cushion between them dispensed with; but this would not allow the tripping-finger to yield independently of the cam when pressed against by the gavel to effect the tripping or in resisting the final compression on the bundle, and I therefore prefer the arrangement shown. While I deem it advisable to make the hinged leaves of the table-decking narrower at their tops than at their bottom ends for the reason before stated, I do not regard this as necessary in all cases, for in some instances they might be made of an even width throughout with beneficial results.

I claim—

1. The combination, substantially as hereinbefore set forth, of the packers, the trip-finger, the trip-cam which supports it, the interposed spring, the subjacent trip-lever spring-pressed against the cam, and the clutch-tripping mechanism controlled by said lever.

2. The combination, substantially as hereinbefore set forth, of the trip-finger, the peripheral trip-cam which supports it, the interposed spring, the subjacent trip-lever having its end resting against said cam, and the spring which presses said lever against the cam, with means for adjusting the stress of said last-named spring.

3. The combination, substantially as hereinbefore set forth, of the trip-finger, the trip-cam which supports it, having a straight bearing-track with a notch at the outer end, and the trip-lever spring-pressed against the cam and yielding to it when in contact with the straight track, but positively locking it when resting in the notch.

4. The combination, substantially as hereinbefore set forth, of the trip-finger with its stop, the trip-cam with its shoulder, a bearing to which they are independently pivoted in the same axial line, the spring interposed between the finger and the cam to support the former yieldingly, and a trip-lever against which the lower periphery of the cam rests.

5. The combination, substantially as hereinbefore set forth, of the pivoted trip-finger, the pivoted trip-cam which supports it, having a straight track with notch at the end, the trip-lever spring-pressed against the cam and normally bearing against its straight track, and the spring interposed between the cam and trip-finger.

6. The combination, substantially as hereinbefore set forth, of the trip-finger, the trip-cam with its notch, the trip-lever spring pressed into the notch to lock the cam, and the pawl operating to force the lever out of the recess and release the cam to permit it and the trip-finger to swing below the plane of the binding-table.

7. The combination, substantially as hereinbefore set forth, of the needle and its shaft, the trip-finger, the trip-cam pivoted on said shaft and when released swinging below the plane of the binding-table, and the lug on the needle and offset on the cam, by which the needle as it retreats from the binding-receptacle will restore the trip-finger and trip-cam to their normal upright position.

8. The combination, substantially as hereinbefore set forth, of the trip-finger, the trip-cam, the trip-lever spring-pressed against the cam, the clutch-tripping mechanism controlled by the lever, and the guard extension on the cam, whereby the lever is held depressed and the trip-latch held out of engagement until the cam and trip-finger are restored to their normal position.

9. The combination, substantially as hereinbefore set forth, of the needle, the trip-finger, the notched trip-cam, the trip-lever and trip-latch rigidly connected together, and the spring which acts on said trip-lever, with the trip-clutch, the crank-arm on the needle-shaft, and the pawl pivoted on said crank-arm and acting to unlock the trip-lever from the trip-cam.

10. The combination, substantially as hereinbefore set forth, of the needle-shaft, the trip-finger loosely pivoted thereon and having an offset from its hub or shank, the needle provided with a lug arranged to strike said offset in the retreating movement, and mechanism operating to withdraw said needle past its normal position of rest and then to return it to said normal position, whereby the finger is first restored to its effective station and then the lug on the needle separated from the offset on the finger to permit the latter to yield before incoming grain.

11. The combination, substantially as hereinbefore set forth, of the binding-table slotted for the passage of the needle and cord which it carries, with leaves forming the sides of the slot, hinged at their inner edges, and capable of vertical adjustment at their outer edges, and means for adjusting the height of said outer edges.

12. The combination, substantially as hereinbefore set forth, of the binding-table, the cord-slot therein, the laterally-hinged leaves forming the sides of the slot, and lifting-arms which raise the free sides of said leaves to compress the under side of the gavel.

13. The combination, substantially as hereinbefore set forth, of the binding-table, the cord-slot therein, and the laterally-hinged leaves which form the sides of the slots, the needle, and the wipers thereon that strike against and raise the outer or free edges of the leaves to compress the under side of the gavel.

14. The combination, substantially as hereinbefore set forth, of the binding-table, the cord-slot therein, the laterally-hinged leaves which form the sides of the slot, the needle,

and the wipers mounted thereon, with means for adjusting the wipers upon the needle that they may raise the exposed edges of the leaves more or less.

15. The combination, substantially as hereinbefore set forth, of the binding-table, the cord-slot therein, and the hinged leaves at the sides of the slot, with the adjusting-screws which support the inner edges of the leaves at any desired normal height.

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