(No Model.) 5 Sheets—Sheet 1.

J. S. DAVIS.

STARTING MECHANISM FOR GRAIN BINDERS.

No. 419,423. Patented Jan. 14, 1890.

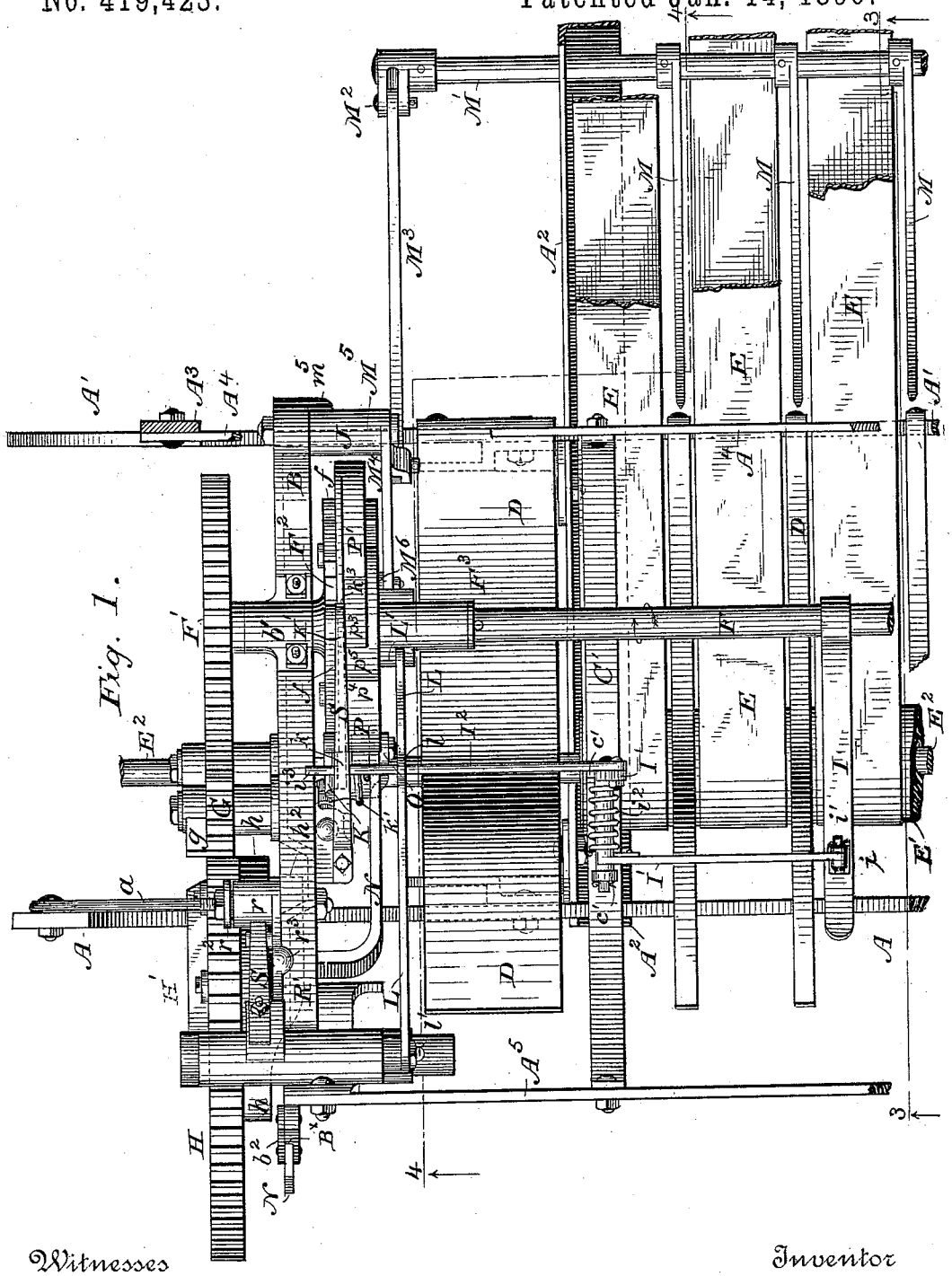


Fig. 1.

Witnesses

Arthur Johnson

Leonard Gassall

Inventor

John S. Davis

By his Attorney

Wm A. Skinkle

(No Model.) 5 Sheets—Sheet 2.

J. S. DAVIS.

STARTING MECHANISM FOR GRAIN BINDERS.

No. 419,423. Patented Jan. 14, 1890.

Fig. 6.

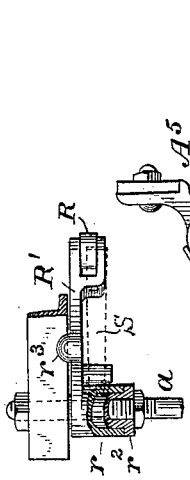


Fig. 2.

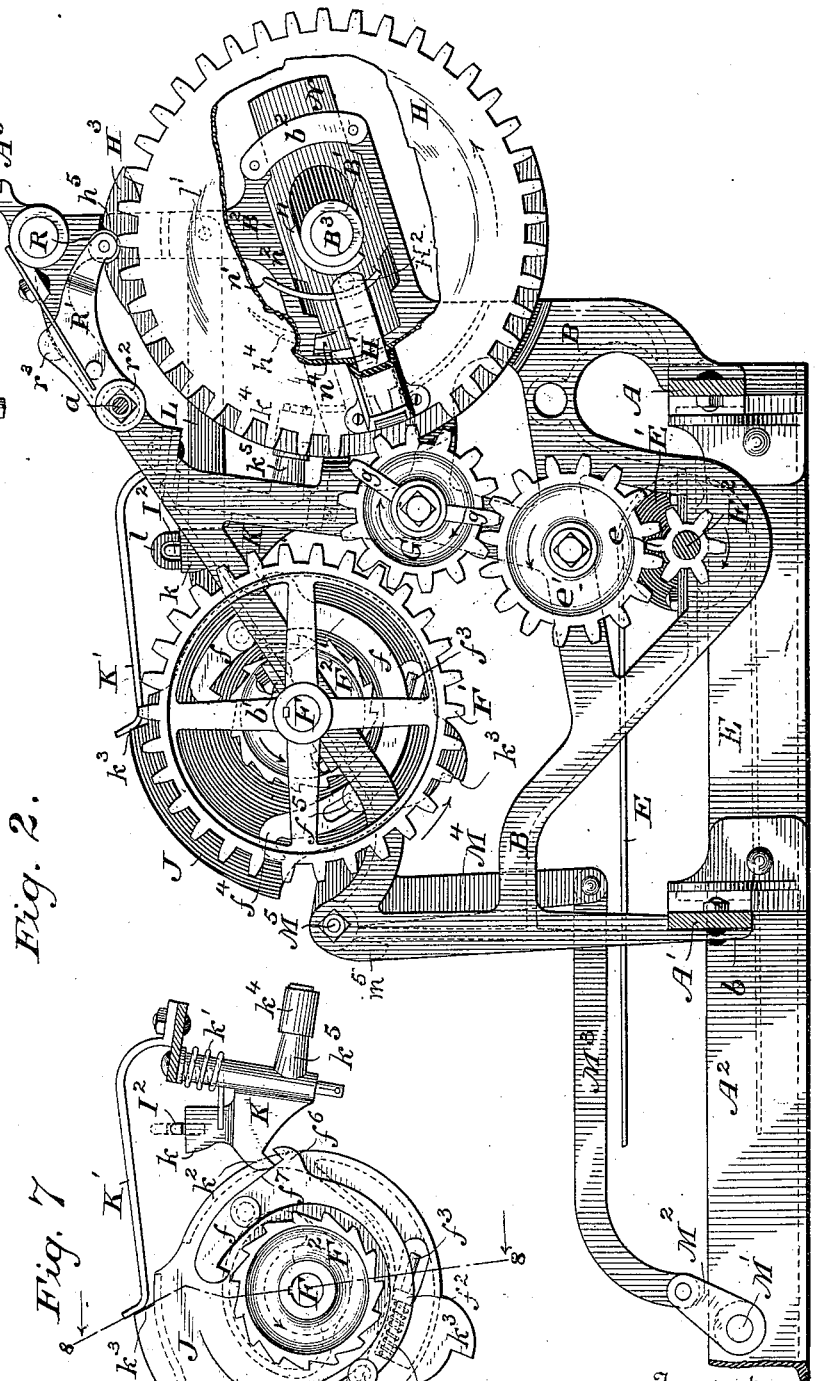


Fig. 7

Witnesses

Arthur Johnson.

Leonard Vassall.

Inventor

John S. Davis

By his Attorney

Wm A. Skinkle

(No Model.) 5 Sheets—Sheet 3.

J. S. DAVIS.

STARTING MECHANISM FOR GRAIN BINDERS.

No. 419,423. Patented Jan. 14, 1890.

Fig. 8.

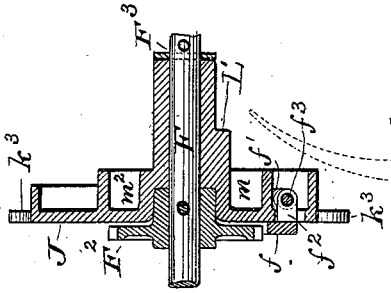


Fig. 3.

Witnesses

Arthur Johnson.

Leonard Wassall

Inventor

John S. Davis

By his Attorney

Wm A. Skinkle

(No Model.) 5 Sheets—Sheet 4.

J. S. DAVIS.

STARTING MECHANISM FOR GRAIN BINDERS.

No. 419,423. Patented Jan. 14, 1890.

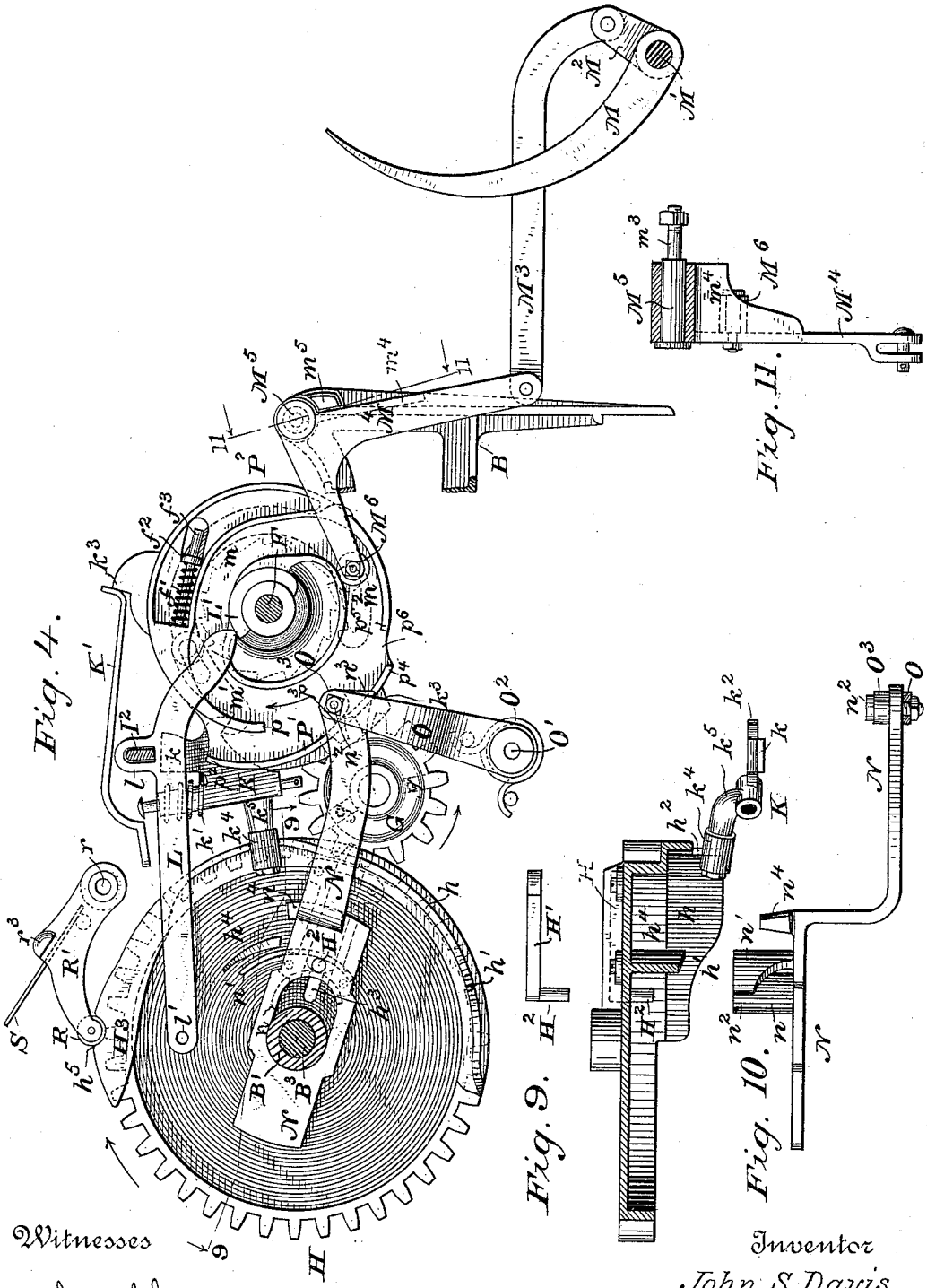


Fig. 4.

Fig. 11.

Fig. 9.

Fig. 10.

Witnesses

Arthur Johnson.

Leonard Tassall.

Inventor

John S. Davis

By his Attorney

Wm A. Skinkle.

(No Model.) 5 Sheets—Sheet 5.

J. S. DAVIS.

STARTING MECHANISM FOR GRAIN BINDERS.

No. 419,423. Patented Jan. 14, 1890.

Fig. 12.

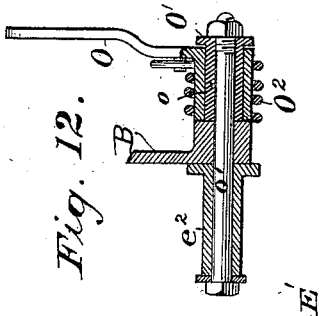
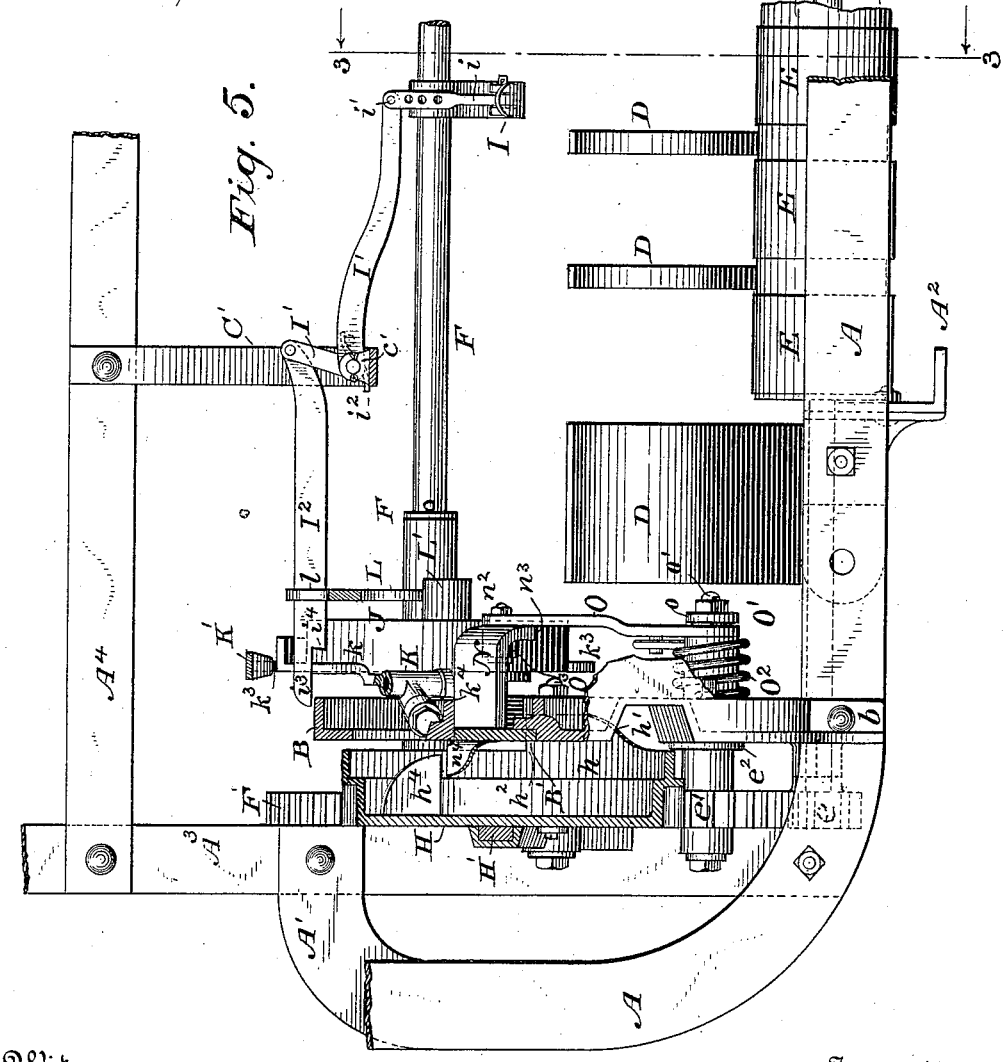


Fig. 5.



Witnesses

Arthur Johnson.

Leonard Tassall.

Inventor

John S. Davis

By his Attorney

Wm A. Skinkle

UNITED STATES PATENT OFFICE.

JOHN STENGER DAVIS, OF TOLEDO, OHIO.

STARTING MECHANISM FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 419,423, dated January 14, 1890.

Application filed March 3, 1888. Serial No. 266,080. (No model.)

To all whom it may concern:

Be it known that I, JOHN STENGER DAVIS, a citizen of the United States, residing at Toledo, in the county of Lucas, State of Ohio, have invented certain new and useful Improvements in Starting Mechanism for Grain-Binders, of which the following is a description.

My invention relates to grain-binders of the class generally known as "low-down" or "platform" binders, in which the grain is bound by mechanism located on or substantially on the level of the platform, into the gaveling and binding receptacle of which it is delivered by a suitable platform-carrier.

While this present improvement is particularly applicable to the special type of machines shown and described in the many patents on grain-binders granted to me since 1881, some portions of it may by slight modification be adapted to use in other machines without departing from the spirit of my invention, as hereinafter fully set forth and claimed.

The objects of my invention are to cut off the flow of grain into the binding-receptacle by means of a series of fingers projecting into the moving stream on the platform at a predetermined time before the starting of the binder, to start the cut-off-actuating mechanism by a trip actuated by the pressure of the grain in the binding-receptacle, to stop the cut-off mechanism and hold its fingers in the path of the incoming grain, restraining and holding it out of reach of the gavel-packing devices during the binding operation, to cause the cut-off mechanism at or near the completion of its first movement to start the binder, to lift and hold out of engagement during the binding operation the tripping device by which the cut-off mechanism was first started, to cause the binder before the completion of its movement to retrip the cut-off mechanism which retracts the fingers and allows the obstructed grain to flow into the binding-receptacle, to positively stop the binder at the end of its movement and hold it against accidental rotation, to such an arrangement of the gearing as will insure the timely tripping and proper engagement of the binder-starting device with its actuating-pinion, and to the details of construction by which these principal as well as other objects of minor import are carried into effect.

In the accompanying drawings, Figure 1 is a plan view of so much of a grain-binding harvester as is necessary to illustrate the application of my improvements thereto. Fig. 2 is a front elevation showing the mechanism in its normal position of rest and some of the parts broken away for the purpose of more clearly illustrating those behind them. Fig. 3 is a rear elevation, partly in section, on the lines 3 3 of Figs. 1 and 5, also showing the mechanism at rest. Fig. 4 is a similar elevation, partly in section, on the line 4 4 of Fig. 1. Only a small portion of the gear-plate, upon which the moving mechanism is mounted, is shown in this figure, the remainder being omitted to secure clearness of illustration. The mechanism is shown in the position assumed at a different stage of the operation from that illustrated in the preceding figures. Fig. 5 is an outside elevation, partly in irregular section, on the line 5 5 of Fig. 3. Fig. 6 is a plan view of the spring-dog that locks the main binder-wheel against accidental rotation. Fig. 7 is a detached view, in front elevation, of the cut-off cam-wheel and its tripping mechanism. Fig. 8 is a section through the same on the line 8 8 of Figs. 3 and 7. Fig. 9 is a horizontal section through the main binder-wheel on the line 9 9 of Fig. 4. Fig. 10 is a plan view of the slide-plate which starts and stops the binder, detached. Fig. 11 is a sectional view on the line 11 11 of Fig. 4 of the cut-off bell-crank lever, detached. Fig. 12 is a sectional view taken on the line 12 12 of Fig. 3.

The supporting-frame upon which my present binder is mounted resembles more or less closely those shown in the several patents on grain-binding harvesters granted to me since 1881, while special reference might be made to my patents numbered 274,441 and 311,420, dated March 20, 1883, and January 27, 1885, respectively, to which this my present invention is closely allied in the objects it is sought to accomplish.

As in my former inventions, the binder-frame sill-bars A A′ extend across the outer end of the platform, resting upon and secured

to the angle-iron finger-beam A^2 in any suitable manner, and, projecting forward in advance of the finger-beam, are provided with upturned front ends, as shown. Upon the sills, between the finger-beam and their upturned ends, is mounted the binder-plate B, suitably shaped, as shown in the drawings, to afford supports for the moving parts of the mechanism, and provided with feet *b*, by means of which it is securely bolted to the sill-bars. From the front upturned end of the sill-bar A a brace-rod *a* extends to the top of the binder-plate, to which it is securely and adjustably clamped by screw-nuts, as shown. An upright post or bar A^3 is bolted to the front upturned portion of the sill-bar A′, as shown, and secured to it at a suitable height above the binding mechanism is a rearwardly-extending rail-bar A^4, which is suitably supported at its rear end (not shown in the drawings) and carries one end of the breast-bars C C′, which constitute the top of the binding-receptacle. The other ends of the breast-bars are attached to a rearwardly-extending rail-bar A^5, which is bolted at its front end to the top of the binder-plate, as shown. The bottom of the binding-receptacle is composed of spring fingers or bars D, securely bolted to the inner sill-bars A′ and extending above and beyond the outer sill-bar, as illustrated in Figs. 1 and 3.

The platform-carrier consists of a series of narrow belts E, which pass through the spaces between the spring-fingers D to the driving-roller E′, located beneath the binding-receptacle, and deposit the grain which they bring in from the platform upon these fingers within reach of packing devices mounted upon the continuously-rotating packer-shafts F. These packers may be of any suitable kind; but I prefer to use packers like those illustrated in my patents, No. 283,866, August 28, 1883, and No. 388,642, August 28, 1888. The packer-shaft is driven continuously from the main actuating-shaft E^2 by means of the wheels and pinions *e*, *e′*, G, and F′, the former being attached to the shaft E^2 and the latter to the packer-shaft F, while the intermediate wheels *e′* G revolve on stud-axles projecting from the front face of the binder-plate B. The main binder-gear H meshes into and is actuated at intervals by the pinion G, as will be hereinafter described.

The main purpose of this invention, like that of my patent of March 20, 1883, No. 274,441, is to effect a wide separation of the bundle that is being bound in the receptacle from the incoming grain on the platform, and to accomplish this I locate on the platform below the surface of the carrier-belts a series of cut-off fingers, which, when raised, intersect and stop the incoming grain at a point on the platform out of reach of the packing devices. These fingers are raised and the inflow of grain checked for a sufficient period before the binding mechanism is started to permit the packing devices to clear up and urge into the receptacle all the grain which has passed the cut-off fingers before they are raised, the fingers being held in their upright position, opposing the entrance of more grain into the receptacle until the completion of the binding operation. The mechanism by which this cut-off is actuated has two distinct movements: It is first tripped and started by a lever or float I (depending into the binding-receptacle and lifted by the pressure of the gavel packed therein) and makes a half-revolution, during which it raises the cut-off arms on the platform and holds them in opposition to the incoming grain, disconnects or throws out of operation the mechanism through which it was tripped by the float, and before the termination of its movement trips the binding mechanism into action. It then comes to rest and holds the cut-off arms up until the completion of the binding operation, when it is again tripped into action by the final movement of the binder and returns to its normal position of rest, lowering the cut-off arms below the plane of the carrier-belts and restoring the float-tripping mechanism to its active position.

The constantly-revolving packer-shaft F, mounted in bearing *b′* on the binder-plate, has keyed upon it, in close proximity to said plate, a ratchet-wheel F^2. A cam plate or disk J is loosely mounted upon this shaft adjacent to the ratchet-wheel F^2, between which and a cross-pin and washer F^3 on the shaft it is held from endwise movement thereon. Pivoted upon the front face of this disk is a hooked latch-piece *f*, which, when released, engages the ratchet F^2 and compels rotation of the disk J therewith. A spring *f′*, which urges the latch into engagement with the ratchet, is located on the rear side of the disk, and acts upon a stud f^2, projecting from the rear side of the latch through a slot in the disk and perforated to slip over a pin f^3, which guides the spring. The latch has a long tail or extension which terminates in a hook or catch f^4, and is guided by a pin f^5, fixed to the disk and playing in a slot, curved concentrically with the pivot of the latch. At a point near the pivot the dog is also provided with another catch-hook f^6 at the end of an incline f^7 on its outer side. These hooks f^4 f^6 are alternately caught and the latch drawn out of engagement with the ratchet-wheel F′ by a dog K, pivoted between suitable lugs on the binder gear-plate B, and normally held in the path of the latch by means of its spring *k′*, acting upon the upward extension *k*. The parts are shown in Figs. 1, 2, 3, 5, and 7 in their normal position of rest and the cut-off mechanism ready to start on its initial movement when tripped by the float I in the binding-receptacle. This float consists of a bar loosely pivoted upon the packer-shaft F and depending into the receptacle below the breast-bars C C′, as shown in Figs. 1, 3, and 5.

Loosely pivoted in a bracket formed by

lugs c' c', rising from one of the breast-bars C' above the receptacle, is a bell-crank lever I', the long arm of which extends horizontally to a point above the float and is connected thereto by a link i, the point of connection being made adjustable by means of a cross-pin i', taking into a series of holes in the upper end of the link to permit of variation in the sizes of the gavels to be accumulated before the mechanism is tripped. A spring i^2 on the sleeved shank of the bell-crank normally acts to hold the crank in the position shown, and its stress must be acted against when the float is being raised by the pressure of the gavel. The short arm of the bell-crank is connected to a sliding link or thrust-bar I^2, which has at its front end a projecting finger i^3, which rests upon the top of the projection k of the trip-dog K, and an abrupt shoulder i^4, which bears against said projection when the link is thrust forward and swings the dog upon its pivot, carrying its hooked projection k^2 out of the path of the latch f, releasing and allowing it to engage the ratchet F^2 and start the cut-off mechanism on its first movement.

As will be readily understood, the packing of the gavel into the receptacle will, when sufficient grain has been accumulated, raise the free end of the float, rock the bell-crank lever on its pivot, and move the push-bar which rocks the trip-dog and hold said push-bar forward until the gavel is bound and ejected from the receptacle. The first movement of the cut-off mechanism consists of but a half-revolution of the cam-plate, and its latch f at the completion of this first movement must be disconnected from the ratchet by the trip-dog K. In order to release this dog from the float-tripping mechanism by which it was first pushed out of engagement with the latch f, that it may swing back and re-engage with the latch by its hooked extremity f^4, I support the front or free end of the push-bar I^2 in an aperture or suitable guideway l on a bar L, pivoted at l' to the binder-plate and trailing at its free end on a cam L' on the cam-disk J. When the disk J is connected to the ratchet F^2 by its latch and begins to revolve, this cam L' raises the free end of the bar L, which in turn raises the end of the push-bar F^2 and lifts it above and out of contact with the projection k on the trip-dog, freeing the latter and permitting its hooked end k^2 to swing back into the path of the latch f, which it engages with at the completion of the half-revolution of the cam and draws it out of engagement with the ratchet. When the dog K first trips the latch f, it does so by riding or sliding upon the inclined surface f^7, forcing that portion of the latch in toward the ratchet-wheel and raising its catch-hook out of the teeth thereon. The hook f^6 merely serves as a dead lock or stop to prevent the cam-plate from overrunning its desired position through the momentum acquired by its movement.

A spring K', bolted to the binder-frame, falls behind projections k^3 k^3 on the plate, preventing backlash or retrograde movement of the plate when it is brought to a stop by the catch-dog K. The hook f^4 is so situated relatively to the pivotal point of the latch that an incline like f^7 is unnecessary, and the latch is pulled out of engagement with the ratchet and the plate brought to a dead stop by the engagement of the dog K with this hook.

The main binder-wheel H and the mechanism which it actuates are tripped into action by the cut-off mechanism, in a manner that will hereinafter be fully described. On the rear face of this binder-wheel is a cam ledge or projection h, having a sharp rise h', which, shortly before the completion of the revolution of the wheel, acts upon an anti-friction roller k^4, mounted upon the end of an arm or rigid stud k^5, projecting from the stop-dog K, swinging it sidewise and throwing its hooked end k^2 out of engagement with the latch f, which is permitted to again engage with the ratchet-wheel and carry the cam J through its final half-revolution. The cam-ledge terminates abruptly, as shown at h^2 in Figs. 5 and 9, and permits the trip-dog K to fall back into the path of the latch f in time to ride upon its incline f^7 and again pull it out of engagement with the ratchet and into the position shown in Figs. 2, 7, and 9, which is the final position of rest. The cut-off fingers M are mounted upon a rock-shaft M', which extends across the platform from front to rear and is journaled in suitable bearings. These fingers lie in the spaces between the belts, and when down, as shown by full lines in Figs. 1 and 3, are entirely below the plane of their top surface. A crank arm or lever M^2 at the front end of the rock-shaft is connected by a link M^3 to one arm of a bell-crank lever M^4, pivoted at M^5 on the binder-frame. The other arm of this lever carries an anti-friction stud-roller M^6, which takes into a cam-groove on the face of the disk J. In the position shown in Fig. 3 this roller lies in that part m of the cam-track nearest the axis of the shaft F; but at the commencement of the movement of the cut-off mechanism it is moved away from the shaft by the quickly-rising portion m' of the cam-track. From this point the cam-track is concentric to the point m^2, and holds the bell-crank roller in its position most remote from the shaft, which it continues to do throughout the first movement, the result of which is that the cut-off arms are thrown up into the position shown by dotted lines in Fig. 3, and full lines in Fig. 4, as soon as the machine is tripped, and are held in this position until the completion of the binding operation.

The construction of the bell-crank lever M^4 and the stud-pin M^5, upon which it is pivoted, is shown in Fig. 11. The shank m^3 of the stud-pin passes through the binder-plate and is secured by a nut at its end. The strengthening brace or rib m^4 on the bell-crank con-

tacts with a stop-lug m^5 on the binder-plate when the cut-off arms are elevated, and prevents the roller M^6 from accidentally passing out of the cam-track at the opening p^6 placed therein, for a purpose to be hereinafter explained. As before stated, the cut-off arms are thrown up to their elevated position at a predetermined time before the binding mechanism is tripped into action by the cut-off mechanism in its first movement. The means by which this is accomplished I will now describe. The binder gear-wheel H, when revolved, is engaged by the pinion G, as before stated; but when the binder mechanism is in its position of rest this pinion, which is constantly revolving, moves in a space formed by the omission of three of the teeth from the periphery of the binder-wheel. A sliding bolt H′, suitably housed by a casing on the outer face of the wheel, has a tooth formed at its outer end, which, when projected from the casing, extends into the path of the two side projecting teeth $g\ g$ on the pinion and compels rotation of the binder gear-wheel far enough to bring its fixed teeth into mesh with those of the pinion. At its inner end this bolt is provided with a stud-pin H^2, which projects through a slot h^3 in the face of the wheel and into the path of cams projecting from the inner face of a sliding bar N. (Fully shown in detail in Figs. 1, 2, 3, 4, 5, and 10.) This bar is housed in a suitable guideway $B^\times$, formed in the binder-frame and held therein by a strap or plate b^2 at its outer end, and is slotted, as shown, to embrace the boss B′, extending from the gear-plate, in which is fastened the stud-axle B^3 of the main wheel. Extending forward from its front face are two cam-ledges $n\ n'$, between which the stud H^2, projecting from the sliding bolt, is embraced when the binding mechanism is at rest, and by means of which the bolt may be drawn forward to engage the pinion or held back out of its path, as determined by the position of the bar N. At its inner end the bar is connected to the upper end of a swinging arm O, pivoted at O′ on the binder-frame and urged to its retracted position, as shown by full lines in Fig. 4, by a spring O^2, wound about its hub and engaging pins on the arm and binder-frame, as shown in the drawings. An anti-friction roller O^3 is mounted upon the pivot-pin n^2, which connects it to the sliding bar N, and bears, when the machine is at rest, against a peripheral ledge P on the cam-plate J, which ledge holds the bar forward against the stress of the spring O^2, as in the positions shown by full lines in Fig. 3. At the termination of the first movement of the cut-off mechanism the roller, which has been bearing against the concentric flange P, runs off its point p, and the bar is retracted by the spring O^2 to the position shown in full lines in Fig. 4, projecting the bolt H′ into the path of the teeth of the pinion G. To prevent mishap in the event of the breakage or failure to work of the spring O^2, I provide an eccentric cam-ledge P′ on the cam-disk J, which passes outside of the roller O^3 at the end of the sliding bar and positively retracts it to the position shown in Fig. 4. This ledge is eccentric from its point p^2 to p^3, and concentric from there to its end p^4, and is not so high as the concentric ledge P, which holds the sliding bar forward. On the final movement of the cut-off mechanism the end p^5 of the ledge P contacts with the end n^3 of the sliding bar N, and shoves it forward to such a position that when the stud H^2 of the sliding bolt passes between its two projecting cams $n\ n'$ it will be withdrawn into its casing and out of the path of the pinion G. At the same time the anti-friction roller O^3 passes out of the opening p^6, between the points p^4 and p^5 of the ledges, and rides against the outer side of the ledge P, as before described.

In Fig. 4 the parts are shown in the positions they assume at the moment the cut-off mechanism has completed its first movement and come to rest until the completion of the binding operation. The sliding plate N has been drawn in by the action of the spring O^2 or the eccentric ledge P′, or both, and the sliding tooth H′ projected into the path of one of the extension-teeth on the pinion G, by which it will presently be engaged and the binder put into operation.

Immediately after starting the binder-wheel the stud H^2 passes from between the ledges $n\ n'$, and the bolt H′ is then free to slip back and forth, being limited in its movement by the length of the slot h^3. Before the completion of the revolution of the binder-wheel it trips the cut-off mechanism into its second actuation, as before described, and this almost instantly moves the sliding plate N from the position shown in Fig. 4 back to the starting position shown in Figs. 2 and 3. It will be observed that the cam-ledge n on the bolt is concentric with the axis of the wheel when the bar is pushed back, and that the ledge n' is eccentric, as shown, to present a wide opening n^2 between them for the entrance of the stud H^2. When the wheel H has been revolved to a point that brings the bolt H′ above its axis, if the bolt is loose in its housing it will drop by gravity until the stud H′ falls upon the cam-ledge n and follows it around to the position shown in Figs. 2, 3, and 9; but if too tightly fitted to move in this way it will be positively drawn back by its sliding contact with cam-ledge n'.

In order to abruptly check the forward rotation of the wheel H at the completion of its movement, I form upon its rear face a projecting ledge or stop-lug h^4, which strikes against a lug n^4, projecting from the bar N when the latter is in its normal position, as shown in Figs. 2, 3, and 5. When, however, the bar is moved to the position shown in Fig. 4 to throw the bolt H′ and start the binder, the lug n^4 is moved out of the path of the lug h^4 on the wheel, leaving it free to revolve. In order to prevent accidental rotation,

through jarring or otherwise, the moment the wheel is unlocked, and also to prevent backlash or rebound when the wheel is suddenly checked in its rotation, I employ a yielding stop. (Shown in detail in Figs. 1, 2, 3, and 4.)

A ledge H^3 at the side of the teeth on the wheel projects above their ends and is notched or indented at h^5 to receive an anti-friction roller R on the end of a dog R′, pivoted at r on the binder-frame by means of the stay-bolt a and a spacing-thimble r^2, as shown. A stud-pin projecting from the front of the dog is borne upon by a spring S, fastened to the frame, while a stop-lug r^3 strikes upon the top of the frame and limits the downward movement of the dog. The roller R takes far enough into the notch to insure a firm hold on the wheel and prevent accidental rotation, but not enough to restrain it from being positively actuated when thrown into gear with the pinion G.

The pivot of the swinging arm O is coincident with the axis of the pinion e', and they are mounted as shown in Fig. 12. Upon one side of the frame is a spacing-thimble e^2 and an end washer for the reception of the pinion e', while upon the other side of the frame is a spacing-thimble o, upon which is mounted the arm O, as shown, a single bolt o' passing through both thimbles and the frame, clamping them firmly together.

In order to guard against throwing the sliding bolt H′ forward into action at a time when its end would strike the end of one of the teeth g on the driving-pinion G, I arrange the gearing and ratchet-wheel F^2 as follows: The pinion G has an even number of teeth—in this instance fourteen—and the projecting teeth or spurs g are an even number of teeth apart—viz., six on one side and eight on the other. The gear-wheel F′ has an even number of teeth also—in this instance thirty—while the ratchet-wheel F^2, keyed on the same shaft, has but fifteen teeth, or half as many as there are in the wheel F′. With this arrangement the bolt may be tripped into action at any one of fifteen points relatively to the wheel F′ with its thirty teeth, and also with the pinion G, which will pass thirty teeth by a given point for each revolution of the wheel F′. It will thus be seen that the bolt can only be tripped into action at fifteen out of thirty points or teeth, or at every odd tooth, so that if the gears are properly enmeshed and the extension-spurs g on the "even" teeth the bolt cannot be tripped so as to strike upon their ends—in fact, cannot be thrust into their path when they are nearer than one space away from it. With this in view seven extension-spurs might be employed on the wheel G, being half of the whole number of its teeth and each two teeth apart.

The prime number or factor upon which this system is based must be the relative number of teeth in the wheel F′ and the ratchet F^2. In this case the wheel has thirty teeth and the ratchet fifteen, or half as many as the wheel, so that the factor is one-half, or two teeth. Now, the number of teeth in the wheel and also in the pinion must be divisible by two and the extension-spurs on the pinion at least two teeth, or some multiple thereof, apart.

An arrangement where the prime factor would be three instead of two would be as follows: wheel F′, thirty teeth; ratchet, ten teeth; pinion, fifteen teeth. In this case the ratchet would start the trip at ten points out of the thirty on the wheel F′, or once for every three teeth on said wheel, and also on the pinion, the fifteen teeth or spaces of which being divided by three would permit of five extension-spurs three teeth apart each; or if a less number be employed they must be spaced at some multiple of three.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of the binding-receptacle, the pivoted float depending therein, latch f and ratchet-wheel, the trip-dog K, the bell-crank lever, and push-bar operating against the dog, with the link adjustably connecting the float and bell-crank lever, substantially as and for the purpose set forth.

2. The combination of the float, the cam-disk J, the dog K and its retractile spring k', the push-bar I^2, operated by the float to trip the dog, with the bar L and cam L′ on the disk, substantially as and for the purpose hereinbefore set forth.

3. The combination of the constantly-revolving packer-shaft and its rigidly-attached ratchet-wheel, the cam-disk J, loosely mounted on the shaft, the latch f, pivoted on the disk, the spring f', urging it into engagement with the ratchet, the two projections $f^4 f^7$ on the latch, and the trip-dog K, which operates upon said projections to disengage the latch from the ratchet twice during each revolution of the cam-disk, substantially as and for the purpose hereinbefore set forth.

4. The combination of a trip-dog and a ratchet-wheel with the cam-disk J, the latch f, pivoted thereon and provided with projections $f^4 f^7$ on its outer side, located at substantially opposite sides of the axis of the cam-disk, as and for the purpose hereinbefore set forth.

5. The combination of a trip-dog and a ratchet-wheel with the cam-disk J, the latch f, pivoted thereon and provided with projections $f^4 f^7$ on substantially opposite sides of the axis of the disk, with the guide-slot and pin f^5, to steady and guide the long end of the latch and limit its movement, substantially as hereinbefore set forth.

6. The combination of the constantly-revolving ratchet-wheel, the cam-disk with its shoulders k^3 loosely mounted on the shaft of the ratchet-wheel, the latch pivoted on the disk and engaging the ratchet to revolve the cam, the trip-dog K, pivoted on the frame and engaging the projections on the latch to with-

draw it from the ratchet and positively stop the forward revolution of the cam, and the spring K′, which falls behind the shoulders and prevents retrograde motion of the cam, substantially as hereinbefore set forth.

7. The combination of the main binder-wheel with its starting-bolt, the sliding plate N, which holds and controls the bolt, and the cut-off-actuating disk with its cam-ledges P P′, which engage a stud-roller at the end of the plate N, substantially as and for the purpose hereinbefore set forth.

8. The combination of the main binder-wheel with its starting-bolt, the sliding plate N, which controls the bolt, the cut-off-actuating disk with its cam-ledges P P′, the stud-roller on the plate N, engaged by the ledges, and a supplementary spring, which holds the roller in firm contact with the ledges, substantially as hereinbefore set forth.

9. The combination of the main binder-wheel and its projecting lug h^4, with the sliding plate N and its lug n^4, and means by which it is actuated, substantially as and for the purpose hereinbefore set forth.

10. The combination of the cut-off-actuating mechanism and the ratchet-wheel, the latch by which they are connected, the trip-dog which restrains the latch and stops the cut-off mechanism, the arm k^5 on the trip-dog, the main binder-wheel, and its cam-ledge h, which trips the dog to start the cut-off mechanism, substantially as hereinbefore set forth.

11. The combination of the main binder-wheel, the cam-ledge H^3 thereon, with its recess or pocket, the spring-pressed dog R′, having a roller which normally rests in the pocket, and the stop r^3, which strikes the frame and limits the downward movement of the dog, substantially as set forth.

12. The combination of the cut-off fingers, the bell-crank lever M^4 and its stud-roller, the cam-disk by which it is actuated, having the cam-ledge cut away at one side, as at p^6, and the stop-lugs m^4 and m^5 on the lever and the binder-frame, respectively, substantially as and for the purpose set forth.

13. The combination of the driving-pinion G, having side extension-spurs g, the main binder-wheel with its sliding bolt H′, to engage said spurs, the spur-wheel F′, meshing with the pinion, the ratchet F^2, having half as many teeth as the wheel F′ and revolving with it, and the cam-disk intermittently connected to the ratchet and by suitable connections positively throwing the bolt H′ into the path of the spurs g on the pinion, said spurs being located on the pinion at every second tooth, or any multiple thereof, all the parts being relatively proportioned and arranged to operate substantially as hereinbefore set forth.

In testimony whereof I hereto affix my signature in presence of two witnesses.

JOHN STENGER DAVIS.

Witnesses:

HENRY W. WELKER,

A. J. GALVIN.