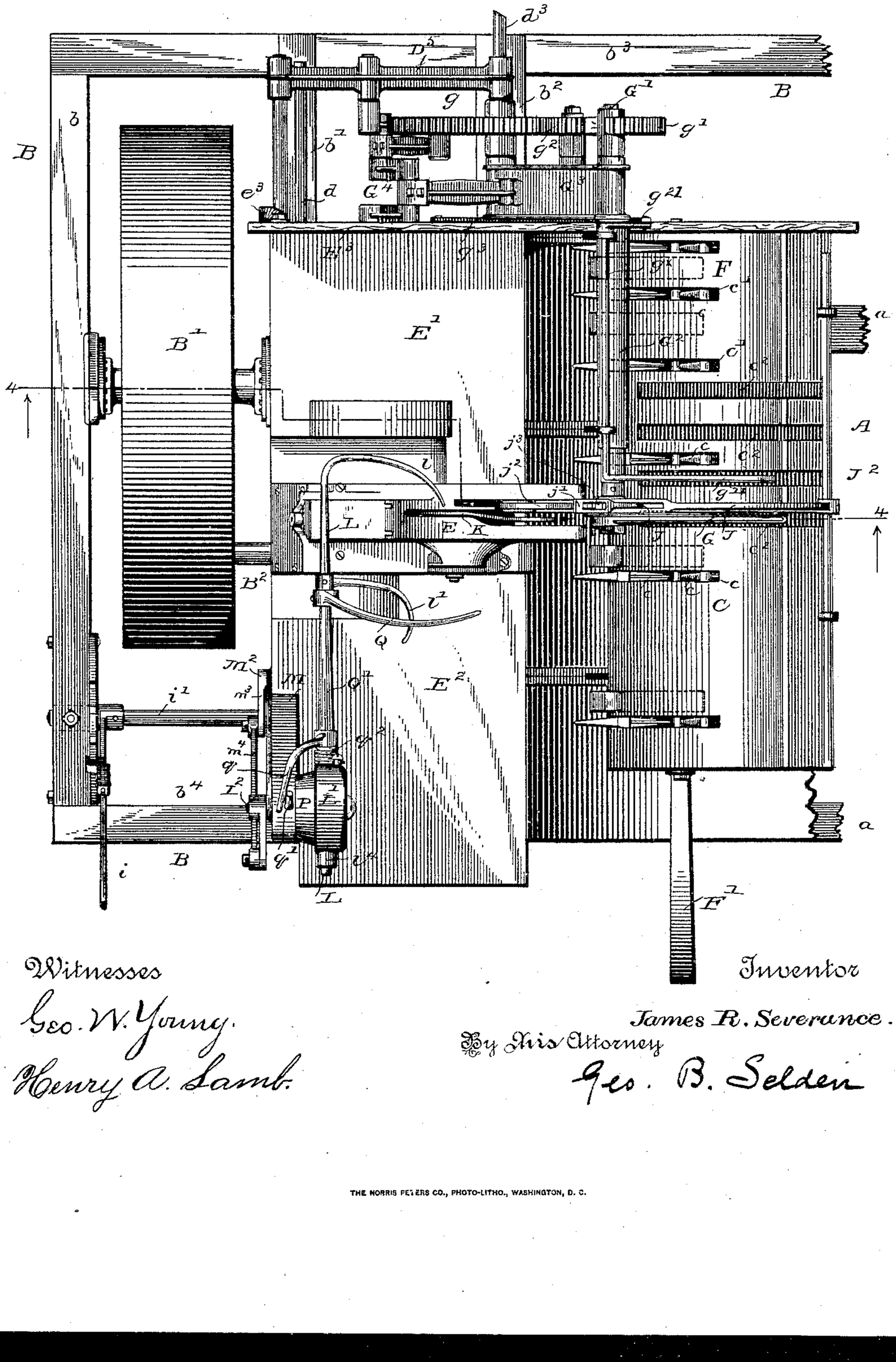
(No Model.) 5 Sheets—Sheet 1.

J. R. SEVERANCE.

GRAIN BINDER.

No. 458,553. Patented Aug. 25, 1891.

Fig. 1.



Witnesses

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(No Model.) 5 Sheets—Sheet 2.

J. R. SEVERANCE.

GRAIN BINDER.

No. 458,553. Patented Aug. 25, 1891.

Fig. 2.

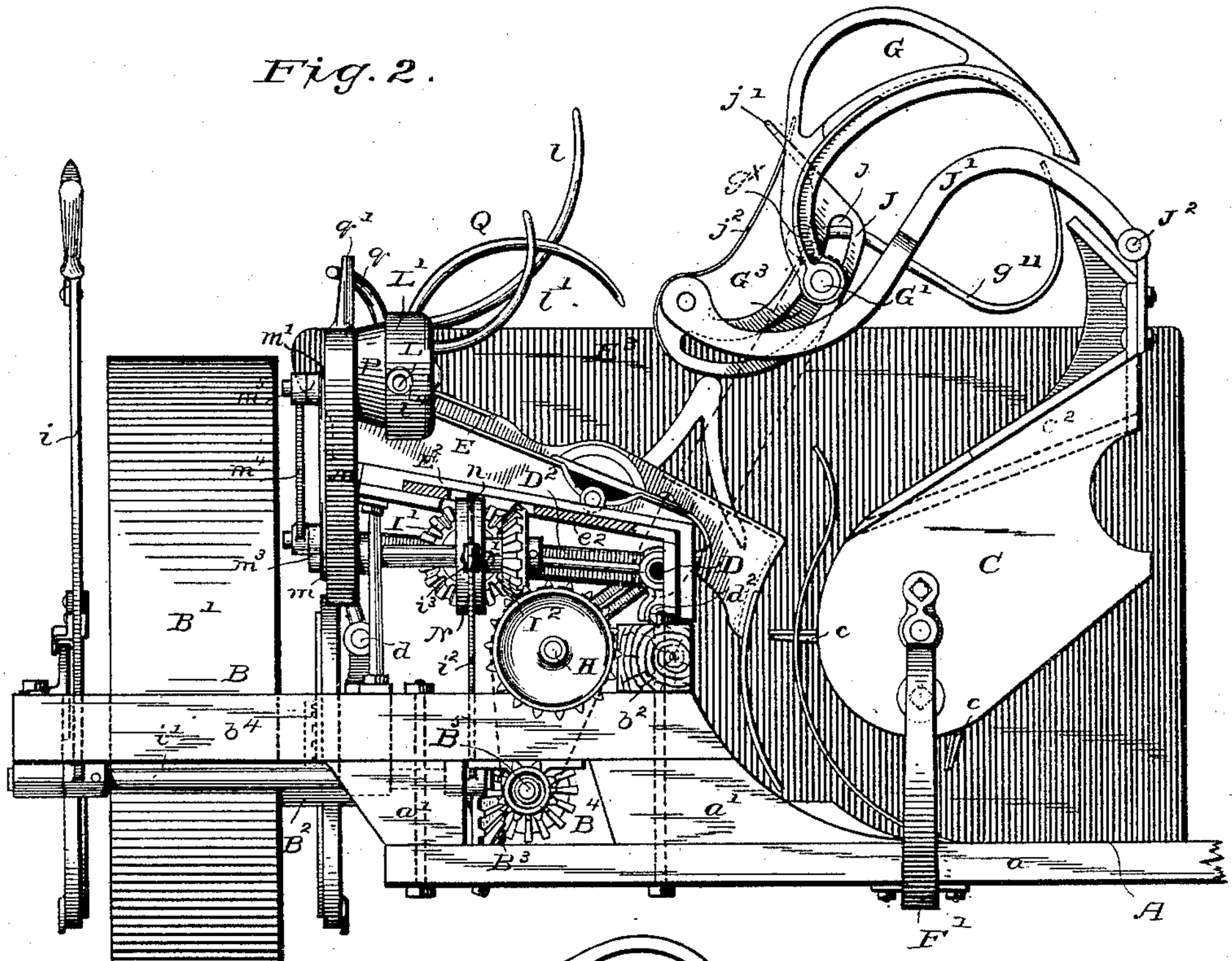


Fig. 3.

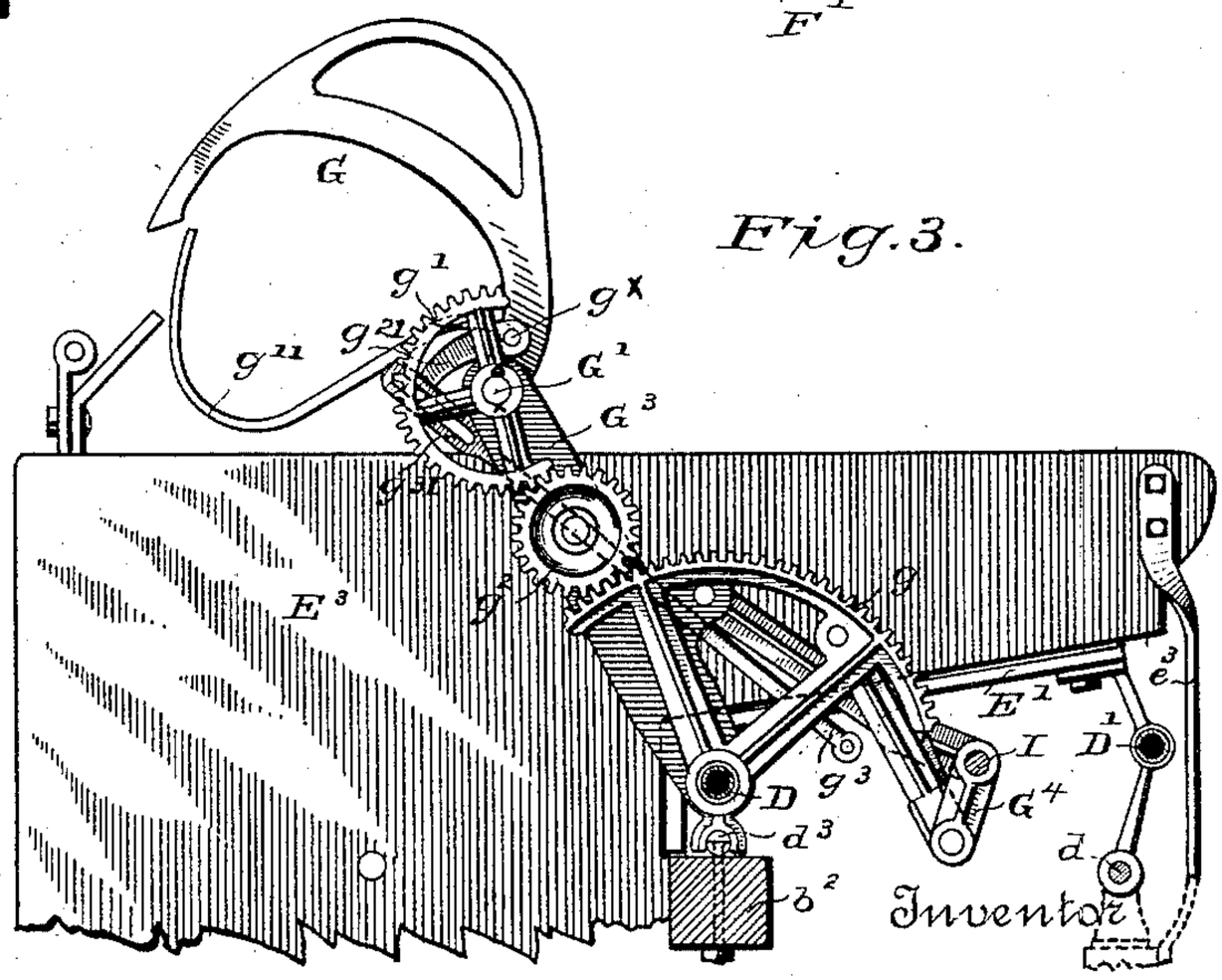
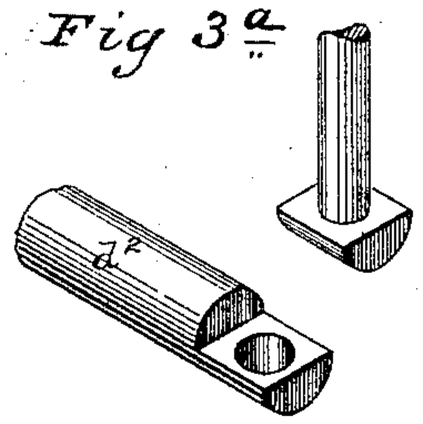


Fig 3a.



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(No Model.) 5 Sheets—Sheet 3.

J. R. SEVERANCE.

GRAIN BINDER.

No. 458,553. Patented Aug. 25, 1891.

Fig. 4.

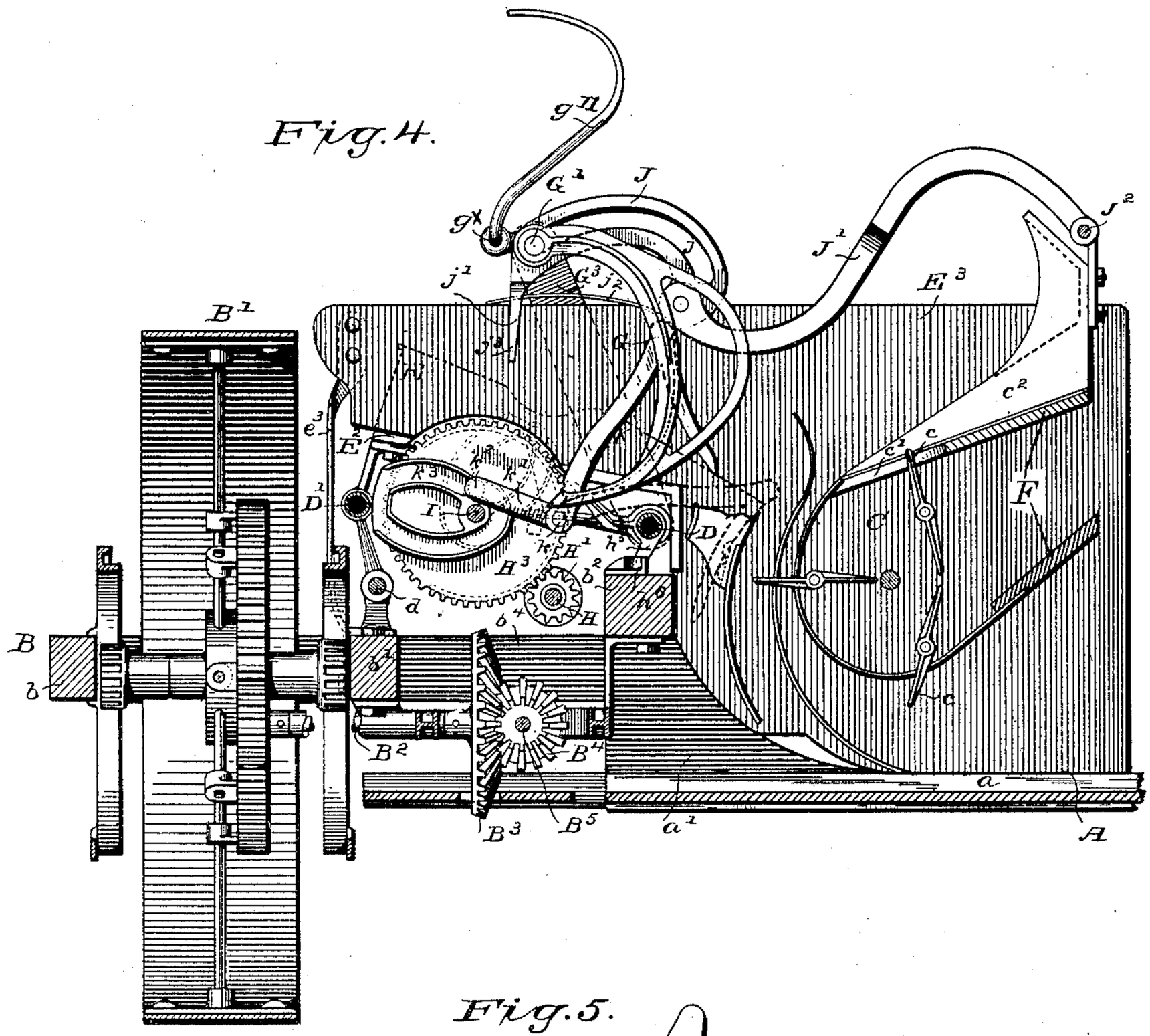


Fig. 5.

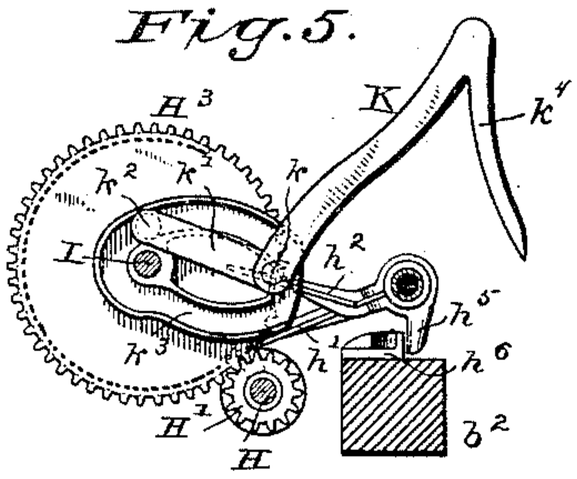


Fig. 6.

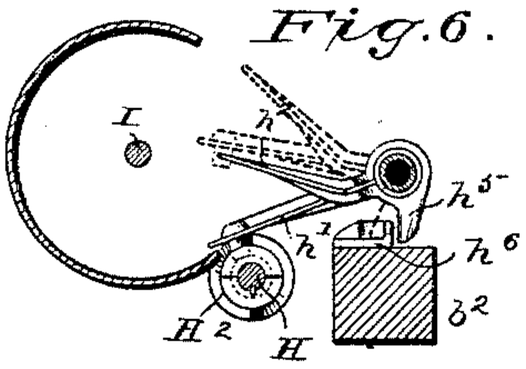


Fig. 7.

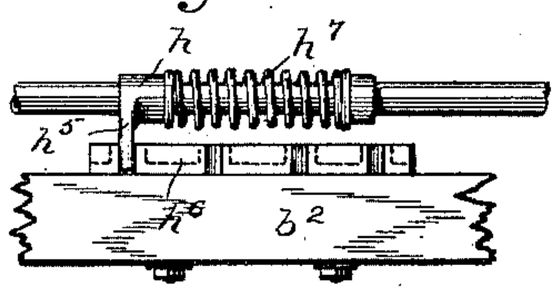
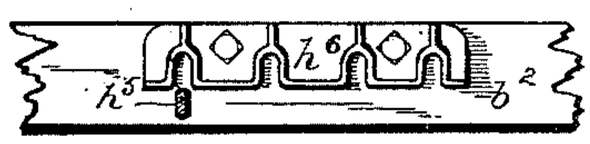


Fig. 8.



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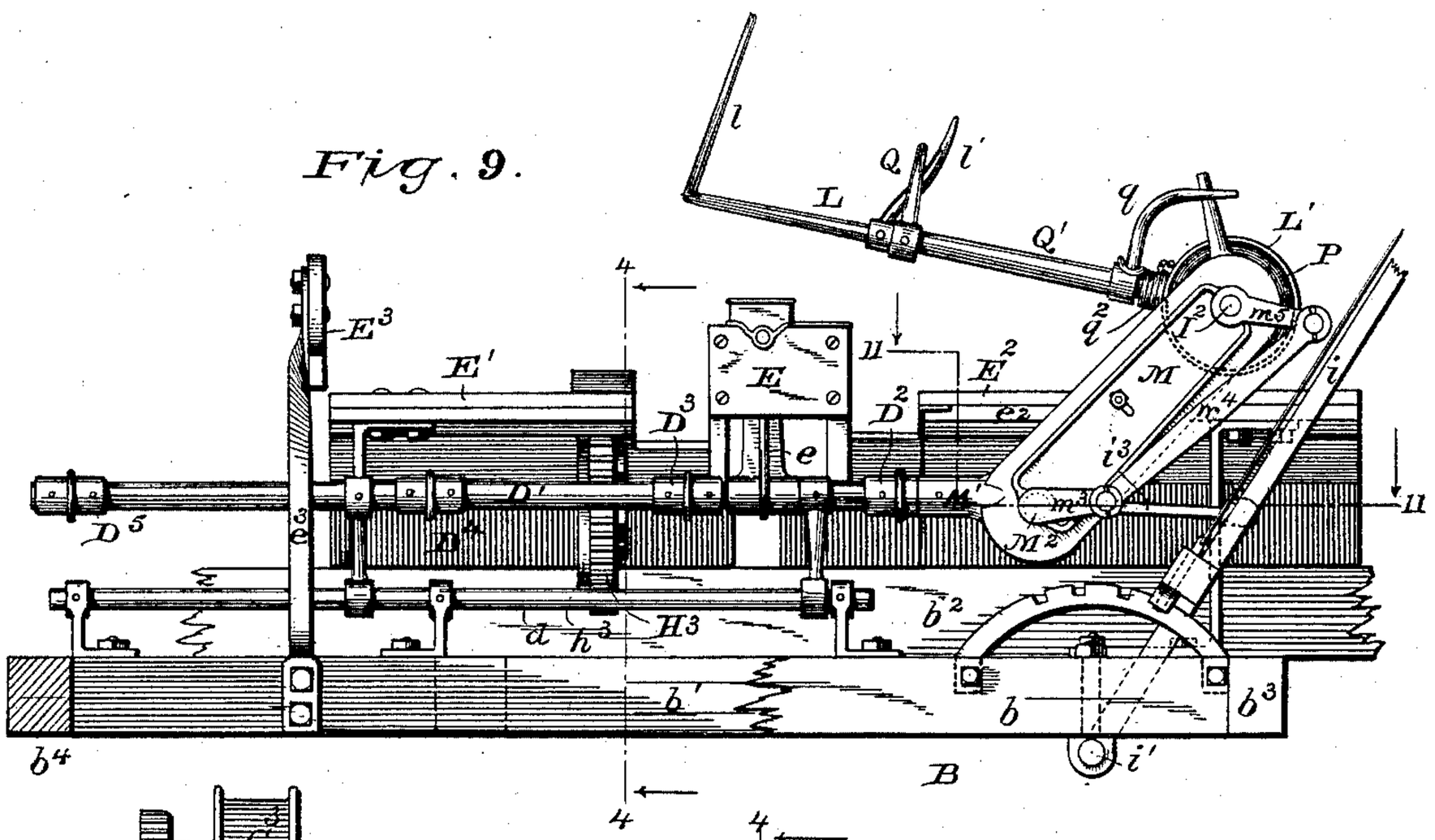
(No Model.) 5 Sheets—Sheet 4.

J. R. SEVERANCE.

GRAIN BINDER.

No. 458,553. Patented Aug. 25, 1891.

Fig. 9.



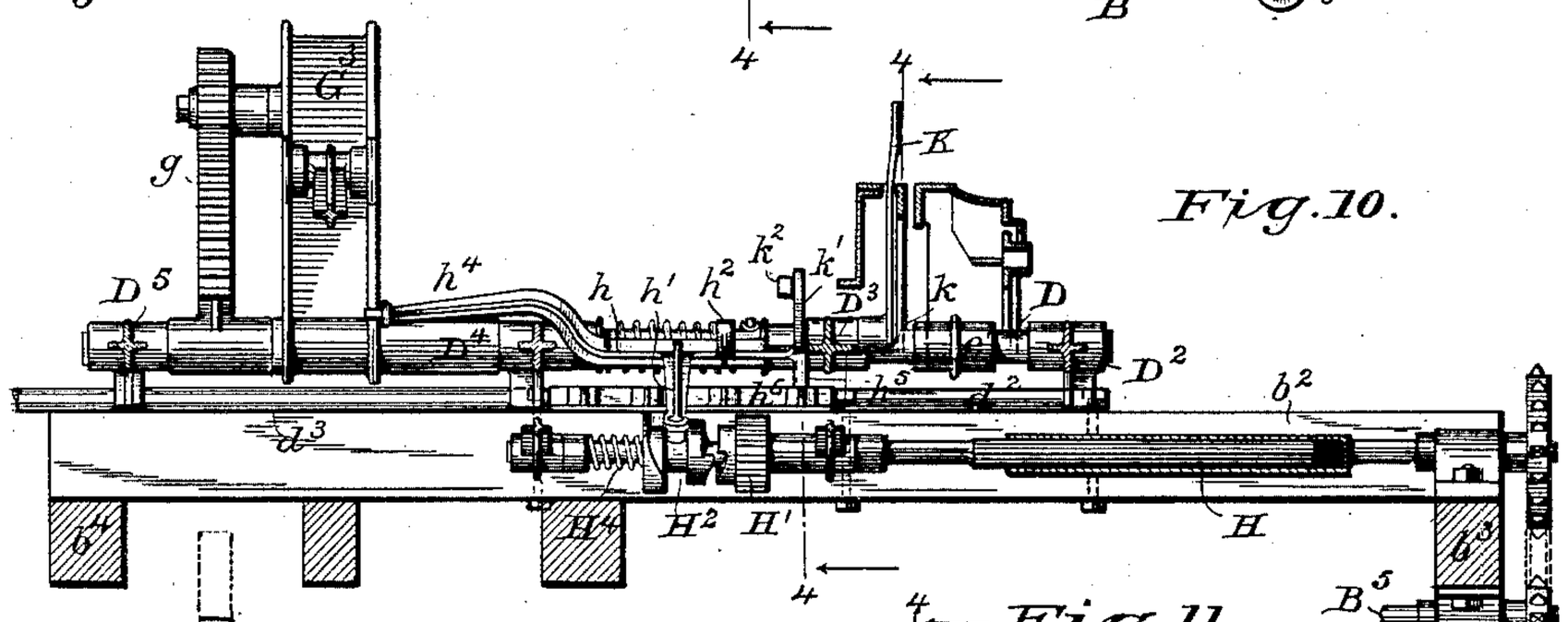
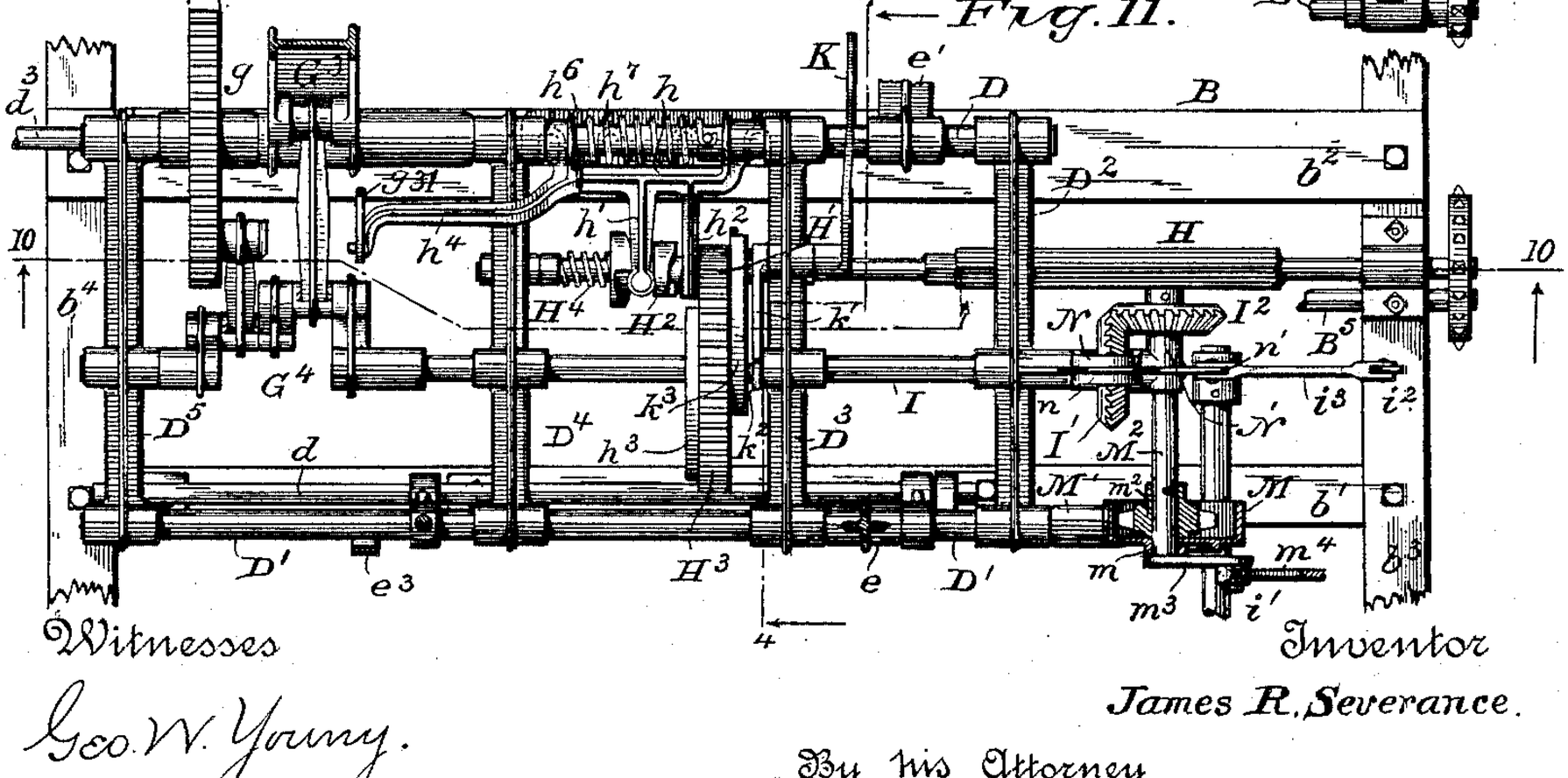


Fig. 10.

Fig. 11.



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(No Model.) 5 Sheets—Sheet 5.

J. R. SEVERANCE.

GRAIN BINDER.

No. 458,553. Patented Aug. 25, 1891.

Fig. 12.

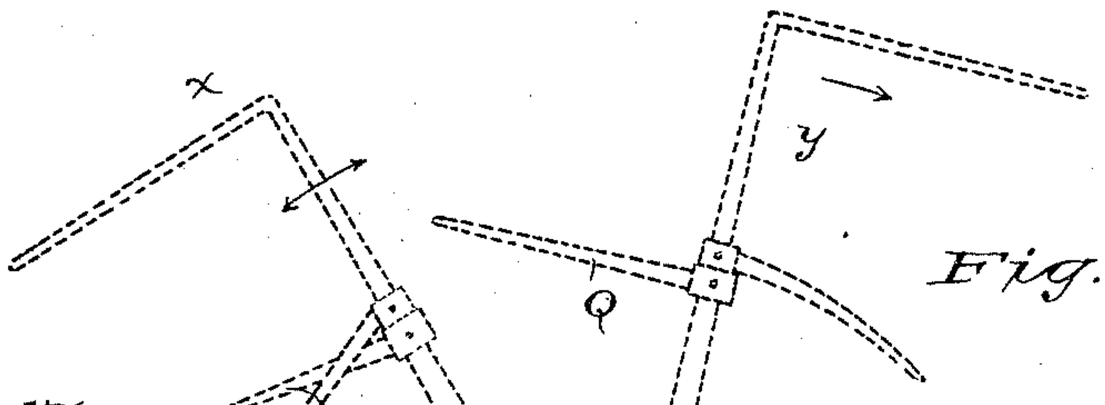


Fig. 17.

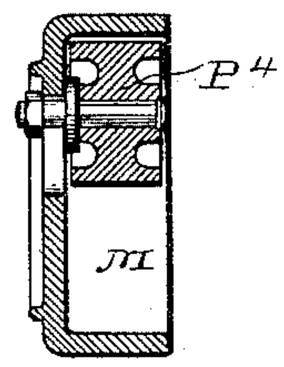
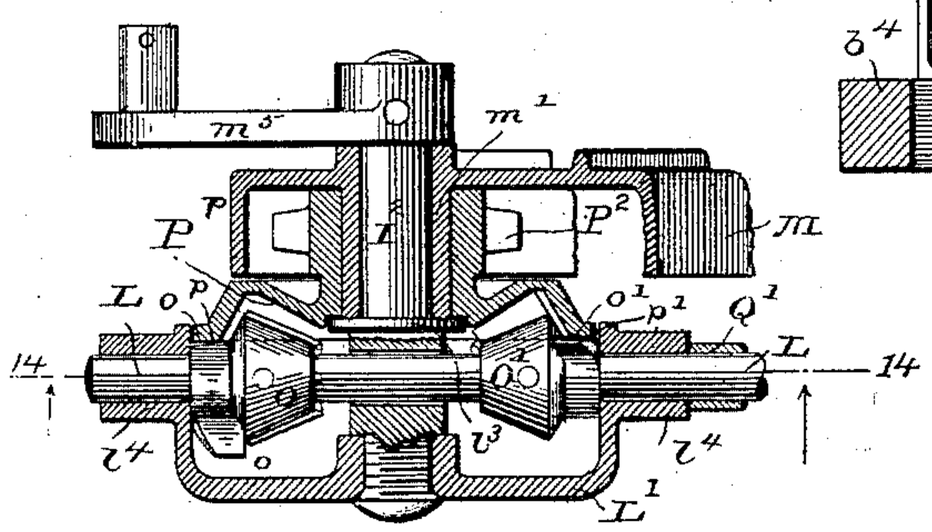


Fig. 13.



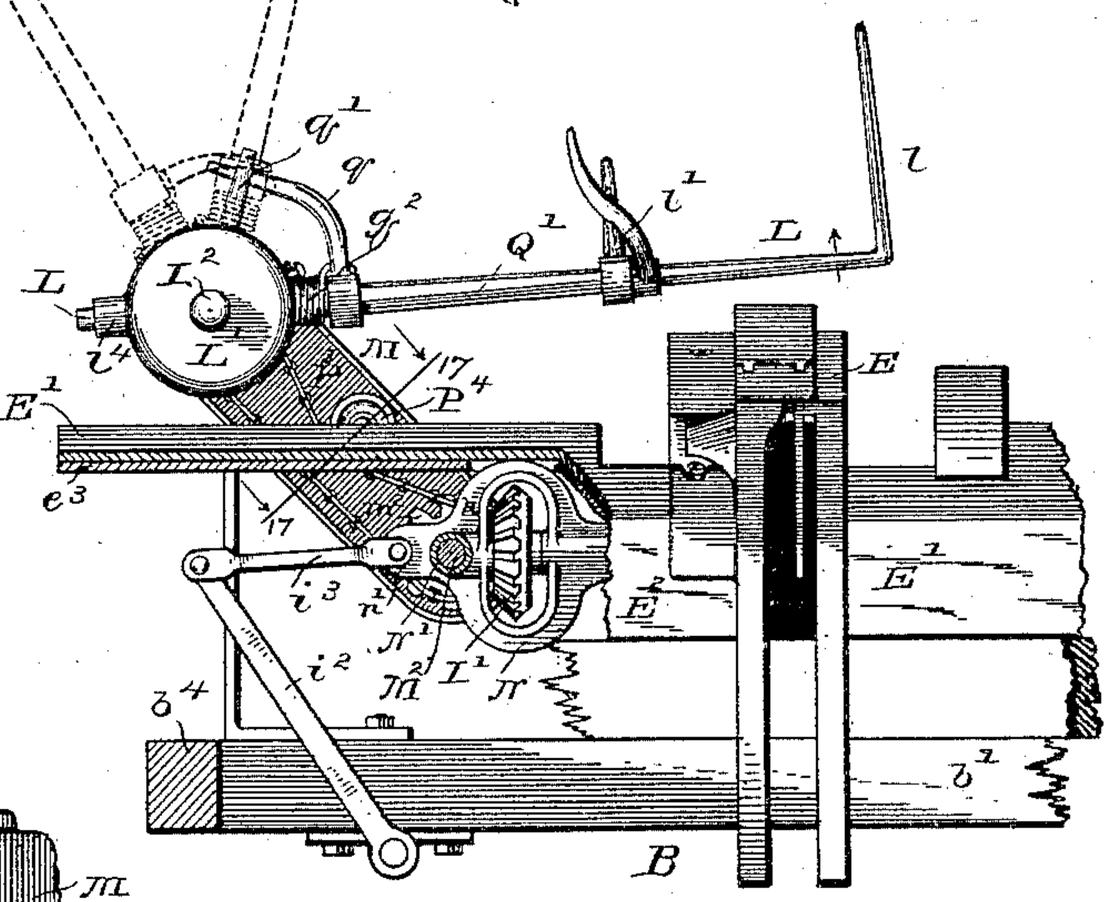


Fig 14

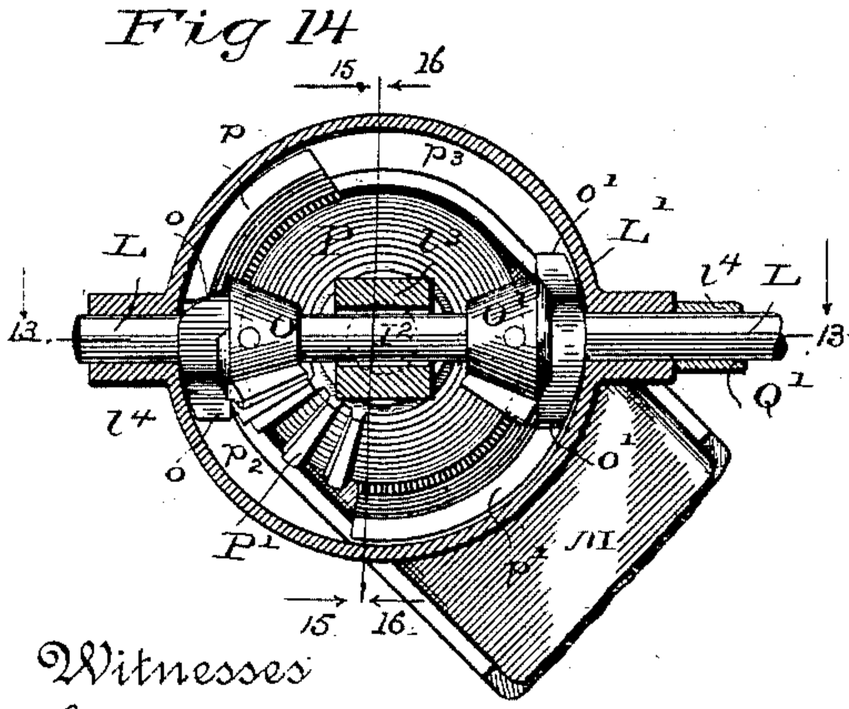


Fig. 15.

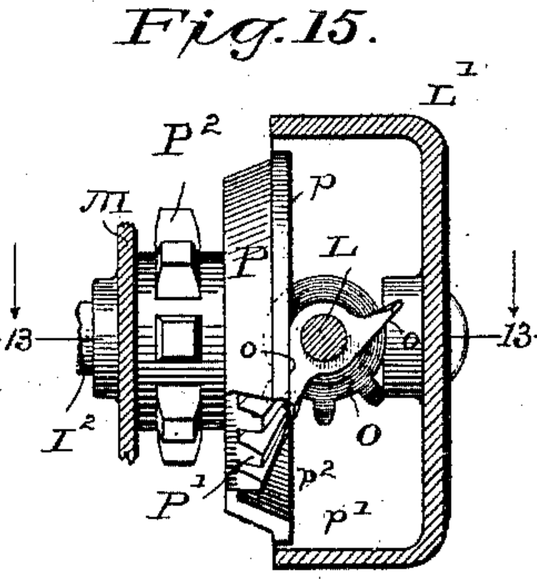
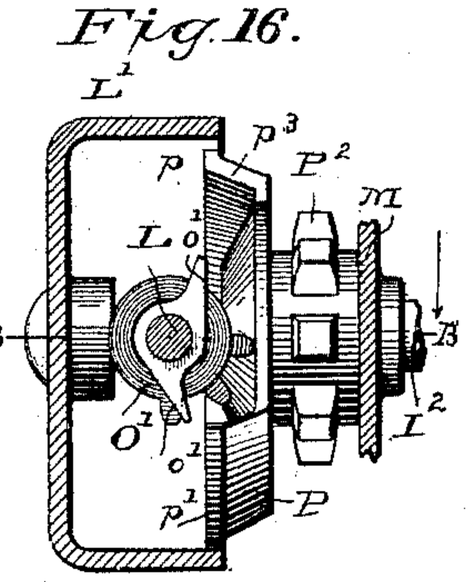


Fig. 16.



Witnesses

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UNITED STATES PATENT OFFICE.

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GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 458,553, dated August 25, 1891.

Application filed October 28, 1886. Serial No. 217,390. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. SEVERANCE, a citizen of the United States, residing at Hornellsville, in the county of Steuben, State of New York, have invented certain new and useful Improvements in Grain-Binders, of which the following is a description.

My invention relates to the improvement of grain-binding harvesters of the class generally known as "low-down binders," and its several features are improvements on or are particularly applicable to the form or pattern of binder for which Letters Patent Nos. 237,135 and 277,356 were granted to me February 1, 1881, and May 8, 1883, respectively, and also Letters Patent No. 345,546, issued July 13, 1886; but I do not of course intend to restrict their use to any of these forms, as some of them may with slight obvious modifications be readily adapted to use with many of the well-known binders now in the market.

The objects of my invention are to improve the arrangement of parts and provide means whereby large capacity may be secured in a compact machine and a more complete separation of bundles may be effected; to improve the structure of the frame of the binder; to provide means for adjusting it longitudinally to suit different lengths of grain; to prevent its being moved during the binding operation; to compel its being moved to one of several predetermined points before the binder can be thrown into gear with its driving mechanism, and to improve the details of the binding, compressing, and discharging mechanisms and the organization of all the parts, as will hereinafter be fully set forth.

In the accompanying drawings, which show my invention in the best form now known to me, Figure 1 is a plan view of a harvester-frame with a binder embodying my improvements mounted thereon. Fig. 2 is a rear elevation, and Fig. 3 a front elevation, of the same. Fig. 3^a is a perspective view of the guide-rail upon which the binder slides and the bolt by which it is secured to the frame. Fig. 4 is a vertical transverse section on the lines 4 4 of Figs. 1, 9, 10, and 11. Figs. 5, 6, 7, and 8 are detail views of the trip-locking devices and other details of the mechanism immediately adjacent thereto. Fig. 9 is an outside elevation of the binder-frame, ejector, &c., showing the under side of the binding-table, but omitting portions of the mechanism. Fig. 10 is a vertical longitudinal section of the same on the line 10 of Fig. 11. Fig. 11 is a plan view of the binding mechanism with the cover or binding-table removed and the discharger-supporting post in section on the line 11 11 on Fig. 9. Fig. 12 is an inside elevation of the binding-table, discharger, &c., the table being shown as partly broken away for the purpose of better illustrating the parts lying beneath it and several of the stages or points in the progress of the discharger shown in dotted lines. Fig. 13 is a detail view, on an enlarged scale and partly in section on the line 13 13 of Figs. 14, 15, and 16, of the discharger-head and the gearing through which the discharger is intermittingly and reversely actuated. Fig. 14 is a vertical section of the same on the line 14 14 of Fig. 13. Fig. 15 is a section on the line 15 15 of Fig. 14, and Fig. 16 is a similar view on the line 16 16 of the same figure. Fig. 17 is a cross-sectional view of the discharger-standard on the line 17 17 of Fig. 12, showing the way of mounting the compensating idle-roller.

The grain-platform A is provided with an endless carrier or conveyer of any ordinary or preferred construction.

Upon the outer ends of the sill-bars a a of the platform are spacing-blocks a' a', on the tops of which rests the main frame B, the parts being securely bolted together, as shown, to form a light rigid structure well adapted to carry the mechanism superimposed thereon. The main frame consists of three bars b b' b^2, running transversely to the length of the platform and united at their ends by bars b^3 b^4, the former lying in a plane above and somewhat in advance of the front platform-sill, to which it is connected at its inner end by an iron brace, as shown in Patent No. 297,723. The rear bar b^4 rests upon the spacing-blocks and is united to the rear sill-bar, as just described. As thus constructed the main frame is divided by the bar b' into two compartments, in the outer one of which is mounted the main driving-wheel B', with its guide-

yokes and gear-racks or other suitable mechanism for adjusting the height of the frame thereon, while within and above the inner compartment is mounted the binding mechanism and the shafts and gearing by which it is actuated.

The packing devices C here employed are essentially like those shown in Patent No. 281,570, granted to me July 17, 1883, and Patent No. 345,546, July 13, 1886, in which a set of shafts within a semi-cylindrical casing revolve around a central shaft and are armed with teeth or fingers *c*, which project through slots *c'* in the casing and act upon the grain deposited in the entrance to the throat by the endless carriers, the said revolving shafts being given independent rotation around their own axes by means of planetary gearing, as described in said patents. The gaveling-chamber is formed above the packing devices, the casing which incloses the packer-shafts constituting its bottom. The gaveling-chamber should be constructed so as to permit the binder-arm to pass around the grain when adjusted to different positions lengthwise thereof, and for this purpose I provide it with an opening wide enough for this purpose, or I form in it a series of slots or grooves c^2, through any one of which the binder-arm may move.

The binder-frame consists of two parallel bars D D', preferably wrought-iron tubes, united at suitable intervals by cast-metal cross-bars D^2 D^3 D^4 D^5, formed with cylindrical ends which encircle the tubes and are securely fastened thereto. This frame, which carries the binding mechanism and table, is mounted upon suitable guideways on the main frame, so as to move freely back and forth to permit adjustment of the binding mechanism to suit varying lengths of grain. These guideways consist, as shown, of plain round bars of iron, the outer one *d* of which is supported from the main frame by three standards, (see Fig. 9,) while the inner one is in two sections d^2 d^3, lying upon the main frame and securely held thereto by bolts having semi-cylindrical heads, which are halved into the bar and conformed to its outline, as shown in Figs. 2, 3, and 10, to permit the free passage of the slides of the binder-frame. The inner slides are cast upon the cross-bars of the binder-frame, while the outer ones are formed on the lower ends of standards which support the binding-table and are secured upon the outer frame-bar D', as shown.

Knot-tying mechanism is mounted upon the binder-frame between the cross-bars; but it constitutes no part of this application, being the subject of my patent, No. 382,773, dated May 15, 1888. The casing within which it is contained, however, forms a part of the binding-table or bottom of the binding-receptacle, and it is therefore shown and described herein. This casing E is supported upon the binder-frame by standards *e e'* and constitutes the raised or central portion of the binding-table, upon which the waist of the bundle lies during the binding operation, the lower or depressed portions of the table at each side affording room for the more expanded heads and butts of the bundle. These depressed portions E' E^2 of the binding-table are supported at their adjacent edges upon the knotter-casing or flanges depending therefrom and by suitable standards mounted upon the binder-frame.

In order to protect the underlying portions of the mechanism from straws, dirt, &c., and to preserve the continuity of the binding-table, I make the rear section in two parts lying one above the other, the lower part e^2 being rigidly supported upon the main frame, while the upper part E^2 is supported by the binder-frame and moves with it in its back-and-forth adjustments, sliding or telescoping over the lower fixed part. This is an ordinary construction in this class of machines, and consequently requires no further description here. A pitman on the crank on the forward end of the crank-shaft B^5 operates the knife-bar.

The front of the binding and gaveling chambers is closed by a board or shield E^3, supported upon the platform and main frame and overhanging the binding-table, against the top of which it snugly fits, the table slipping along beneath it when the binder is being adjusted. A brace e^3 from the main frame supports the overhanging end of the shield. The front end of the packer-casing F is supported by this shield and the overhanging rear end by a curved brace or yoke F' from the platform-frame.

The needle-arm G, its rock-shaft G', mounted in bearings in an arm or sleeve G^2, overhanging the binding-receptacle, the vibrating post G^3, to which the sleeve is attached, the train of segmental-geared racks *g g'* and pinion g^2 for operating the needle-arm, and the double crank G^4 on the binder-shaft, with pitman connections to the gearing and vibrating post, respectively, are similar in their general construction and resulting operation to those described in my before-mentioned patents and applications, and need not therefore be described in detail here, except in so far as they relate to my present improvements.

The post G^3 and segmental rack *g* are mounted and rock upon the tubular frame-bar D, which I turn or finish for this purpose. I am thus enabled to dispense with the special shaft mounted in bearings in the frame shown for this purpose in Patent No. 345,546.

In the construction shown in the said patent the frame-work consists of flat bars, and a special shaft is provided on which or with which the post rocks. In the present arrangement the hub of the post is bored, so as to turn freely on the tubular frame-bar D.

Motion is imparted to the binding mechanism from the driving-wheel B' by the counter-shaft B^2, bevel-wheel and pinion B^3 B^4, and

crank-shaft B^5. A sprocket-wheel on the rear end of the latter shaft is connected by a driving-chain to a similar wheel on the projecting end of the constantly-running binder-driving shaft H, supported at its rear end in a bearing on the main frame and at its front end in bearings formed in brackets depending from the binder-frame cross-bars D^3 D^4. Mounted upon the shaft between these last-mentioned bearings is the clutch mechanism consisting of a loose pinion H′, having a clutch-faced hub, a feathered sliding collar H^2, clutch-faced to correspond with and engage the pinion and provided with cammed and plain grooves, by means of which a suitable trip-latch withdraws it from and holds it out of engagement with the pinion and a spring tending to urge it into such engagement. These parts are like those constituting the clutch shown in my patent, No. 345,546, and will be fully understood by reference thereto. The loose pinion engages a spur-wheel H^3 on the binder-shaft I and rotates it when the pinion is clutched to the driving-shaft H, which is made telescopic, as shown, to allow for endwise adjustment of the binder.

The trip-latch or clutch-controller consists of a frame or yoke h, pivoted on the binder-frame bar D, and has projecting from it an arm h', provided with a roller-stud which takes into the cam-grooves of the sliding clutch-collar, an arm h^2, which rides upon an annular flange h^3 on the face of the wheel H^3 to restrain the latch from engaging the clutch during the binding operation, an arm or forward extension h^4, by means of which it is connected to the tripping mechanism in the gaveling-chamber, and a spring h^7 to urge it into engagement with the sliding clutch-collar. As before stated, the bottom of the gaveling-chamber is provided with an opening or with a series of slots or grooves c^2, through one of which the needle-arm passes when it encircles the gavel. When the slots are used and the binder is adjusted longitudinally, it must be brought to rest at such a point that the needle-arm will sweep through one or the other of these slots. This longitudinal adjustment is effected by means of a hand-lever i, mounted upon one end of a rock-shaft i', supported in bearings on the main frame within easy reach of the driver and provided with a detent and a rack the notches in which correspond with the grooves in the gaveling-chamber, while at the other end of the rock-shaft is an arm or lever i^2, connected by a link i^3 to the binder-frame. If the operator in effecting this adjustment should fail to give the binder its full throw to the desired point and leave it in such position that the binder-arm when started would not pass into one of the grooves provided for it, the point of the arm would strike upon the casing and probably cause disaster. In order to provide against this contingency, and also to prevent shifting of the mechanism during the binding operation, I have provided means for locking the tripping mechanism until the binder is brought to a proper position, and also for locking the binding mechanism during the binding operation.

On top of the overhanging arm G^2, I mount a rock-shaft $g^\times$, provided at its rear end with a curved arm or float g^{11}, which projects into the gaveling-chamber, as shown in Figs. 2 and 3. Upon the front end of the rock-shaft is a small arm or lever g^{21}, connected by a link g^{31} with the arm or extension h^4 of the trip-latch, before described. As the grain is urged into the gaveling-chamber by the packing devices it will press against and gradually lift the float, which through its connections will operate the trip-latch h, lifting it out of engagement with the clutch-collar H^2, which then engages the loose pinion H′ on the driving shaft, and so starts the binding mechanism. When at rest, the arm h^2 of the trip-latch lies in a recess or cut-away portion of the flange h^3 on the spur-wheel H^3, as shown in Figs. 5, 6, and 11, permitting the latch to fall into engagement with the sliding collar. The instant the mechanism is started, however, this flange rolls under the arm h^2, lifting the latch high out of engagement with the clutch and holding it in its elevated position (see Fig. 4 and dotted lines in Fig. 6) during the binding operation. As the latch is lifted much higher by this flange than it would be by a tripping-lever alone, I slot the upper end of the connecting-link g^{31} and connect it to the short lever-arm g^{21} by a stud over which the link slides to compensate for the excess of motion of the tripping-latch.

In order to lock the tripping mechanism against untimely action, or when the binder-frame is not resting at one or the other of its proper predetermined points, I provide the latch with a depending lug or toe h^5 and secure upon the binder-frame beneath it a casting or plate h^6, provided with a series of notches or pockets which coincide with the grooves in the bottom of the gaveling-chamber. When the binder-frame is brought to rest in its proper position, this toe registers with or lies before one of the pockets in the casting, (see Figs. 4 to 8, inclusive,) and when the tripping-latch is raised is rocked or sweeps into it. Should the binder-frame accidentally be left at an intermediate point, the latch cannot be operated, because this toe will strike the upright face of the casting between the pockets. During the binding operation the latch is held up and the toe lies deeply in one of the pockets and of course prevents any adjustment of the binder before the completion of the binding operation.

In my patent, No. 345,546, I showed compressing mechanism consisting of a yielding arm supported on a rock-shaft mounted in suitable bearings at the outer side of the binding-chamber. While I find that this compressor works admirably, it would somewhat impede the operation of the bundle-discharger I here employ, and in order to obviate this

objection I substitute for it the compressing mechanism shown in the drawings. Supported above the binding-receptacle by the overhanging arm G^2 is a vibrating compressor-arm J, pivoted at one end to a curved link or radius-bar J′, mounted at its inner end on a rock-shaft J^2, supported in bearings on the top of the packer-casing. The link is curved, as shown, and forms the top or breast-plate of the gaveling-chamber and feeding-throat, and is bifurcated at its outer free end to embrace the compressor-arm, which is pivoted between its forks. This latter arm is peculiarly shaped, as shown in the drawings, and is provided with a cam-shaped slot *j*, which embraces the needle-supporting shaft G′, a slotted projecting bill *j′*, and a stiff spring j^2, connected to the arm at its pivotal end and playing in the slot j^3 in the bill. A swinging gate K is mounted upon a rock-shaft *k*, supported below the binding-receptacle in a bearing in the cross-arm D of the binder-frame. At the front end of this rock-shaft is an arm or lever *k′*, carrying a stud-roller k^2, which takes into a cam-groove k^3 on the face of the binder-wheel H^3 and actuates the gate K. When the binder is at rest, as shown in Figs. 2 and 5, the gate stands erect and bars the entrance to the binding-receptacle, its controlling-cam k^3 being so shaped that at the first movement of the binder the gate rocks down and lies below the path of the gavel, (see dotted lines in Fig. 4,) and remains down until the needle-arm and the gavel embraced thereby has passed across, when it rises and advances toward the binding-receptacle, urging the grain ahead of it and relieving the point or lower end of the needle-arm from severe strain of compression. When the gate has reached a sufficient elevation, its actuating-roller passes into a concentric portion of the cam-groove, holding it motionless during the operation of the knotter. When the binder is at rest, the several parts stand in the position shown in Figs. 1, 2, 3, 5, and 6, the compressor-arm J resting upon the gate K and supporting the outer free end of the link J′. When the binder starts, the gate drops, as before described, to a position across the throat, and the link is supported by the underlying gavel until the gate again rises, when the link rests upon it and supports the overhanging end of the compressor. The post G^3 meanwhile swings over from the position shown in Figs. 1, 2, and 3 to that shown in Fig. 4, and the needle-shaft supported thereby traverses the slot *j* in the compressor-arm first in the direction of the pivoted end of the arm, throwing it over, and then moving out toward the free end, passing first through an eccentric portion of the slot and producing a gradually-increasing compression on the bundle, and finally through a portion of the slot which (with the arm in the position then attained) is nearly concentric with the pivotal point about which the post swings, holding the arm in its advanced position in the receptacle and maintaining the pressure upon the bundle until the completion of the knotting operation, when the post rocks back to its starting-point and the compressor-arm is thrown back and out of the way of the bundle-discharger, as shown in Fig. 2. The compressor-arm J does not bear directly upon the bundle, as it might safely do if absolute uniformity in the size of bundles could be attained; but they will vary in size, and as the compressor-arm has a positive and practically unvarying range of movement I find it desirable to interpose the spring j^2, which, bearing on the bundle, will yield to excessive pressure. The rock-shaft J^2, which forms the pivot of the link J′, is loosely mounted in bearings on the packer-casing, in which it is free to move longitudinally to follow the end-wise adjustments of the binder-frame. The swinging gate K is provided on its inner side with a depending arm or guard k^4, the point or end of which lies below the plane of the knotter-box top. This guard prevents the grain from getting too close behind the gate, and also acts as a clearer when the gate descends, so that the grain will not be caught under it and borne down below the path of the needle-arm. The bundle-discharger shown in the drawings grasps the bundle and discharges it from the machine in a manner similar to a bundle-discharger for which Letters Patent No. 277,356 were granted to me May 6, 1883, except that the discharger, being pivoted on a standard projecting upward from the frame of the binding mechanism at a point above the level on which the bundle is bound, the discharger always acts to deliver the bundles with their butt-ends down on the ground or stubble, and No. 424,507, issued April 1, 1890, and also in my pending application, No. 362,829, filed August 23, 1890, the last-mentioned case being a division of the present application. The discharger consists of a bar or shank L, pivoted at the outer rear corner of the binding-receptacle and vibrating in a vertical plane parallel to the path of motion of the harvester. The free end of the shank has two side projecting arms or spurs *l l′*, which slip under the bound bundle lying in the binding receptacle, and on the vibration of the discharger lift it therefrom and toss it behind the machine in such manner that it makes a half-turn before striking the ground and lands gently on the butts. In two respects, however, this discharger differs materially from those above referred to: first, in that it is positively operated and in no way dependent upon a spring for its movement; second, in being provided with an upper or supplementary spring-actuated arm which bears upon the top of the bundle with a yielding pressure and holds it upon the lower prongs of the fork during a greater portion of the discharging movement, and then swings out of the way to permit the ejectment of the bundle from the embrace of the discharger.

Upon the rear projecting end of the tubular frame-bar D′ is mounted the discharger-standard M, a cylindrical socket or boss M′ on the lower end of the standard slipping over the end of the pipe and being securely fastened thereto. By means of this standard or post the discharger I^2 is raised above the lever of the knotter-casing on which the bundle is bound, which enables me to lift the bundle free with a shorter discharger-arm, and consequently better leverage, than was possible when the pivot was lower than the bundle, as shown in my said former patent, No. 277,356, and also secures the important advantage that the bundles in all kinds of grain and under all circumstances are deposited so that the butt-ends strike the ground first, thereby avoiding the shelling of the kernels and leaving the head-ends in the most favorable position for drying. The bundle in this case turns completely over and in many cases remains upright in the stubble.

The bearing of the binder-shaft I is cast upon the cross-bar D^2 of the frame and is formed at its rear end with a double yoke N, within which lies a beveled wheel I′, mounted on the binder-shaft. Outside of this bevel-wheel the yoke supports a short boss or bearing for the end of the binder-shaft and another bearing N′, at right angles to the first, in which is mounted the discharger-actuating shaft M^2, a bevel-wheel I^2 on the inner end of which engages the wheel I′ on the binder-shaft. The rib or web *n*, which follows the curvature of the yoke and strengthens it, is provided with a rearwardly-projecting lug *n*′, to which the link i^3, connecting the binder-adjusting lever to the binder-frame, is attached.

The discharger-standard consists of a cast-metal shell open on its inner face and provided at its lower and upper ends with suitable bearings *m m*′ for the actuating-shaft M^2 and the discharger rock shaft or pivot I^2, respectively.

Upon the shaft M^2, within the shell of the standard, is mounted a sprocket-wheel m^2, and upon its projecting end, outside of the casing, is a crank-arm m^3, connected by a link m^4 to a similar but longer crank m^5 on the discharger-pivot I^2. The bearing *m*′ extends beyond the rear face of the standard, and a projecting flange or collar l^3 on the pivot bears against its end. Beyond this collar the pivot is formed with a large head extending across the path of the discharger-shank L (the axial line of which intersects that of the pivot) and rigidly supports at its outer extremity a cylindrical hood or cap L′, provided on opposite sides of its periphery with projecting bosses l^4, in which the discharger-shank is mounted, the enlarged head of the pivot being perforated for its passage. As will be easily understood, the rotation of the crank m^2 imparts, through the link m^3 and crank m^4, a rocking motion to the pivot and the cap rigidly supported at its end and the discharger-arm mounted in bearings therein, vibrating them through an arc equal to about three-eighths of a circle, or one hundred and thirty-five degrees.

The discharger is rocked on its pivot by the means just described; but in order to rock the shank L upon its own axis and give it the compound motion necessary for it to dip toward the binder with the points of its prongs in advance of the shank and then rock them on the axis of the shank while passing beneath the bundle until they attain a position at right angles to the path of vibration of the shank and retain them in that position until the bundle is discharged, when they are again thrown back in advance of the shank on the next downward move, I employ the following means: Upon the discharger-shank within the hood L′, I securely fasten two mutilated pinions O O′, provided with the delay-shoes *o o*′, as shown. These pinions are engaged at proper intervals by a beveled gear-rack P′ on the face of a disk P, mounted upon the exterior of the boss or sleeve *m*′ on the standard, and they are held from rotation by the delay ledges or tracks *p p*′ on the face of the disk, against which the delay-shoes and the pinions ride. Upon the hub of the disk is cast or otherwise securely fastened a chain sprocket-wheel P^2, connected by a driving-chain P^3 to the sprocket-wheel m^2 on the actuating-shaft. Any slackness occurring in this chain may be taken up or compensated for by an adjustable idle-roller P^4, mounted on a pivot adjustably secured to the discharger-standard, as shown by Figs. 12 and 17. The discharger is shown in the several figures at or about its normal position of rest, and the bundle of grain should be within its embrace preparatory to being ejected from the machine. Upon starting the discharger is vibrated to the position shown by dotted lines *x*, Fig. 12, by means of the crank-and-pitman connection from the actuating-shaft to the pivot and supporting-cap. At the same time the cam-disk is rotated in the same direction that the discharger is vibrated by means of the sprocket-wheels and chain. As the vibration and rotation of these parts proceed in the same direction and at nearly the same rate of speed, no change occurs in the relative positions of the parts until just before the position *x* is reached, when the reduced speed of vibration of the discharger permits the cam-disk, the speed of which is uniform throughout its revolution, to gradually overtake it, so that when the discharger-arm begins or is about to begin its return movement the gear-rack P′ on the disk engages the mutilated pinion O′, giving the discharger-shank a quick partial rotation, pulling or jerking the prongs *l l*′ away from the bundle, which then falls to the ground, as before described. Should the prongs be entangled in any way with the bundle, this quick withdrawal of the discharger would tend to free them. The discharger now continues its inward or retract-

ing movement toward the binding receptacle, advancing prongs first, as shown in position *y*, Fig. 12, until it has nearly reached the limit of its downward throw, when the gear-teeth on the disk engage the teeth on the pinion O and quickly revolve the shank back to its original or starting position with the prongs beneath the bundle. The ledges *p p'* on the cam disk are so shaped that the delay-shoes on the pinions will swing into the spaces or mutilations p^2 p^3 of the ledge at such times as the discharger-shank is to revolve, while at other times they trail over the ledges and prevent accidental or untimely rotation. It will thus be seen that the vibratory movements of the discharger-shank and the positions of its prongs, whether working or feathered, are positively controlled by mechanism within the discharger-head, and that no springs are employed to impart or assist any of these movements.

In order to avoid undue rapidity of movement on the part of the discharger, I permit the bundle when bound to remain in the binding-receptacle until the next actuation of the binding mechanism, it being, however, within the grasp or embrace of the discharger. During its initiatory movement, while the needle-arm is passing around the gavel and sweeping it over into the binding-chamber, the binding mechanism has but little work to do, and consequently requires but little power, and it is during this period that the discharger performs its work, beginning its lift simultaneously with the starting of the binding mechanism and discharging the bundle by or before the time the new bundle is put under compression. It will thus be seen that the work on the driving-power is more evenly distributed than would otherwise be the case, while the fact that the bundle lies in the receptacle between the actuations of the binding mechanism is not at all objectionable in practical work.

To more securely hold the bundle upon the discharger-prongs, I provide a yielding arm or prong Q on the discharger, which bears upon the top of the bundle and holds it securely on the discharger-prongs *l l'* until it is properly ejected. This prong Q is mounted on the outer end of a cylindrical sleeve Q', rocking on the discharger-shank between its inner prong *l'* and the supporting-cap L'. At the inner end of the sleeve is secured a cam toe or projection *q*, which rides against the fixed stud *q'* on top of the discharger-standard. A coil-spring q^2, secured at one end to the supporting-cap and at the other to the base of the cam-toe, tends to urge the prong Q toward the prongs *l l'* of the discharger and contract the space between them, its normal position being such that the space is smaller than would be occupied by an ordinary bundle, thus insuring pressure of this prong upon a bundle within the embrace of the discharger. This spring movement is limited by the cam-toe and fixed stud. When the discharger is vibrated to throw off the bundle, the cam-toe slides against the fixed stud, and it is so shaped that just before the termination of the outward movement of the discharger it suddenly swings back the prong and leaves the bundle free to be thrown off the discharger-fork.

I do not claim herein the construction or arrangement of the bundle-discharger described in my said patent, No. 277,356; nor do I claim herein the construction of the bundle-discharger shown in my said pending application, No. 362,829, filed August 23, 1890.

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

1. The combination of the grain-platform, a throat or passage-way leading therefrom, a gaveling-chamber located at one side of the terminus of said throat and a binding-chamber located at the other side, a needle-arm which embraces the grain in the gaveling-chamber and carries it across the throat and into the binding-chamber, a pivoted positively-actuated gate which during the passage of the gavel across the throat occupies a position below the path of the gavel, and suitable connecting mechanism arranged to operate the gate at the proper time relative to the motion of the needle, substantially as described.

2. The combination of the grain-platform, a throat or passage-way leading therefrom, the packing device located at one side of the throat at the end of the platform and having a fixed relation thereto, the gaveling-chamber located above the packing device and provided with an opening or openings which permit the movement of the needle in different planes, the endwise-adjustable binding-table, and mechanism located on the side of the throat opposite the gaveling-chamber and provided with a pivoted positively-actuated gate which during the passage of the needle-arm occupies a position below the path of the gavel, substantially as described.

3. The combination, with the binding mechanism of a grain-binder provided with a supporting-frame and a knotter-casing on which the bundle is bound, of the vertically-vibrating rear-discharge ejector-arm pivoted on a standard arising from the frame at a point above the level of the knotter-casing, whereby the reversal of the bundles during the delivery operation is secured, so that they strike the ground butt-ends first, substantially as described.

4. In a low-down grain-binder, the combination of the main frame with the main driving-wheel located at its outer end, the grain-platform, a throat or passage-way leading therefrom, the packing device located at the end of the platform, the gaveling-chamber located above the packing device and provided with an opening or openings which permit the movement of the binder-arm in dif-

ferent planes, the binding-table and mechanism located outside the throat and adjustable lengthwise of the grain, a positively-actuated swinging gate which during the movement of the binder-arm occupies a position below the path of the gavel, and a rear-discharge bundle-ejector consisting of a vertically-vibrating arm pivoted to the rear of the binder-frame and adjustable therewith, substantially as described.

5 The combination of a throat or passageway with gaveling and binding chambers located on opposite sides of its terminus, a binder-arm which carries the grain from the gaveling to the binding chamber across the throat, and an arm or gate pivoted below the binding-receptacle and operated by suitable mechanism driven by the binder-shaft in such manner that the gate assists in supporting the gavel as it crosses the throat and then rises toward the binding-receptacle and with the needle-arm acts as a compressor, substantially as described.

6. The combination of the binding-chamber, the bundle-discharger located outside of said chamber, the needle-arm and the vibrating post on which it is supported, and the vibrating compressor-arm J, supported at a point above and inside of the binding-chamber by a link and provided with a cam-slot which embraces the needle-arm shaft, substantially as and for the purpose set forth.

7. The combination of the binding-chamber, the needle-arm and the vibrating post, upon which it is supported, the vibrating compressor-arm J, embracing the needle-shaft, and the pivoted link J′, to the free end of which the compressor is pivotally connected, substantially as shown and described.

8. The combination of the endwise-adjustable binder-frame, the needle-arm and the vibrating post, upon which it is supported from the frame, the compressor-arm J, embracing the needle-shaft, the pivoted link J′, connected to the compressor, and the endwise-moving rock-shaft J^2, upon which the link is mounted, substantially as shown, and for the purpose set forth.

9. The combination, with the binding mechanism of a grain-binder provided with a supporting-frame and a knotter-casing on which the bundle is bound, of the vertically vibrating and rolling rear-discharge ejector-arm pivoted on a standard arising from the frame at a point above the level of the knotter-casing, and mechanism carried by the standard for vibrating and rolling the said ejector-arm, substantially as described.

10. The combination, with a binder-frame, of a standard secured to said frame at or near the rear of a binding-receptacle and rising above said receptacle, and the vertically-vibrating discharge ejector-arm having its axis of oscillation formed in said standard at a point above said binding-receptacle for the purpose of reversing the bundle as it is delivered, substantially as set forth.

11. The combination of a fixed gaveling-chamber having a grooved or slotted bottom, a longitudinally-adjustable binder-frame, and a vibrating needle-arm mounted thereon, the point of which passes through one of said grooves when embracing a gavel, with means for locking the binder-frame against adjustment during the binding operation, substantially as described.

12. The combination of a fixed gaveling-chamber having a grooved or slotted bottom, a needle-arm the point of which passes through one of said grooves when embracing a gavel mounted on a longitudinally-adjustable binder-frame, a tripping device to start the binder, and means for locking it against tripping unless the binder is placed at one of its predetermined positions, substantially as hereinbefore set forth.

13. The combination of the adjustable binder-frame, the wheel H^3 on the binder-shaft, having a mutilated flange h^3, the trip-latch h, having an arm which lies in the path of the flange h^3, a toe or projection h^5, and the fixed notched plate h^6, lying in the path of the toe h^5, substantially as and for the purpose set forth.

14. The combination of the adjustable binder-frame, the sliding clutch on the driving-shaft, the trip-latch h, with its toe h^5, and the fixed notched plate h^6, with means for holding the latch out of engagement with the clutch and the toe into one of the notches during the binding operation, substantially as and for the purpose hereinbefore set forth.

15. The combination of the rock-shaft I^2, supporting bearings in which the shank of the rocking discharger-fork L is mounted, the revolving cam P, the projections on the discharger-shank engaged by said cam, the driving-shaft M^2, and mechanical connections, substantially as described, whereby it communicates rocking and rotary motion to the shaft I^2 and cam P, substantially as and for the purpose set forth.

16. The combination of the rock-shaft I^2 and its rigidly-attached hood L′, the rocking discharger-shank L, mounted in bearings in the hood and provided with mutilated pinions having delay-shoes, the revolving cam provided with a segmental rack alternately engaging the teeth of the pinions, and a mutilated ledge or track which engages the delay-shoes on the pinions and locks the discharger-shank or permits it to turn at the proper time and place, substantially as described.

17. The combination of the rock-shaft I^2, the rocking discharger-shank axially intersecting the axis of the rock-shaft, the mutilated pinions on the shank, the revolving cam mounted concentrically with the rock-shaft, and the hood L′, which is rigidly attached to the rock-shaft, being provided with bearings for the shank and constituting a casing for the gearing by which said shank is rocked, substantially as set forth.

18. The combination of a vibrating and rocking discharger-arm L, having prongs upon which the bundles lie, with a spring-actuated retainer finger or fork which presses upon the bundle, substantially as described.

19. The combination of the discharger-standard, the rock-shaft I², mounted therein, the vibrating and rocking discharger-fork supported thereby, the spring-actuated retainer-finger mounted on the fork and urged toward its prongs, with a cam toe or projection q on the shank of the retainer-finger, and a fixed stud q' on the standard, substantially as and for the purpose set forth.

JAMES R. SEVERANCE.

Witnesses:
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