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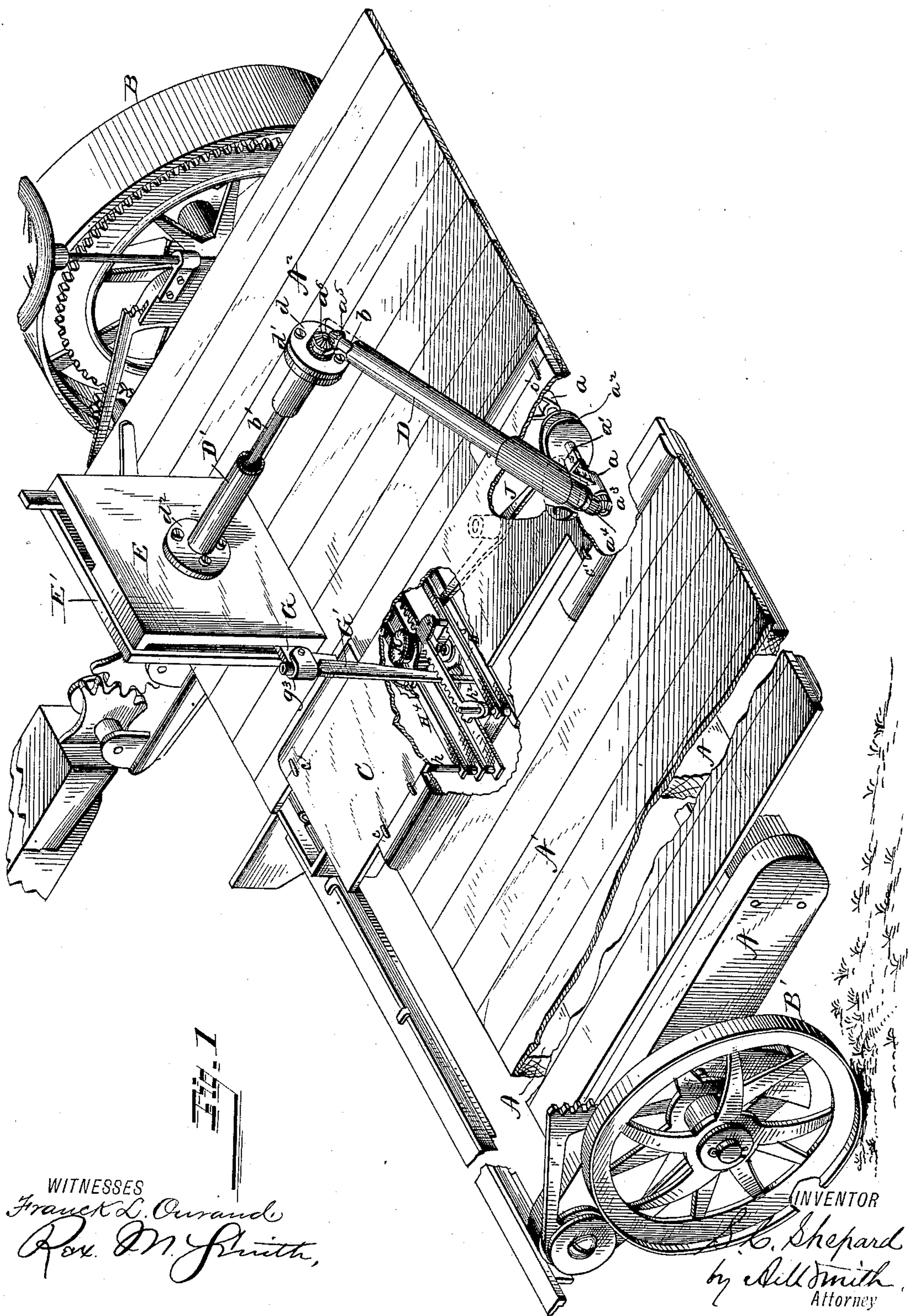
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S. C. SHEPARD.

GRAIN BINDER.

No. 322,015.

Patented July 14, 1885.



WITNESSES
Frank L. Curand
Rex M. Smith,

INVENTOR
S. C. Shepard
by A. L. Smith,
Attorney

(Model.)

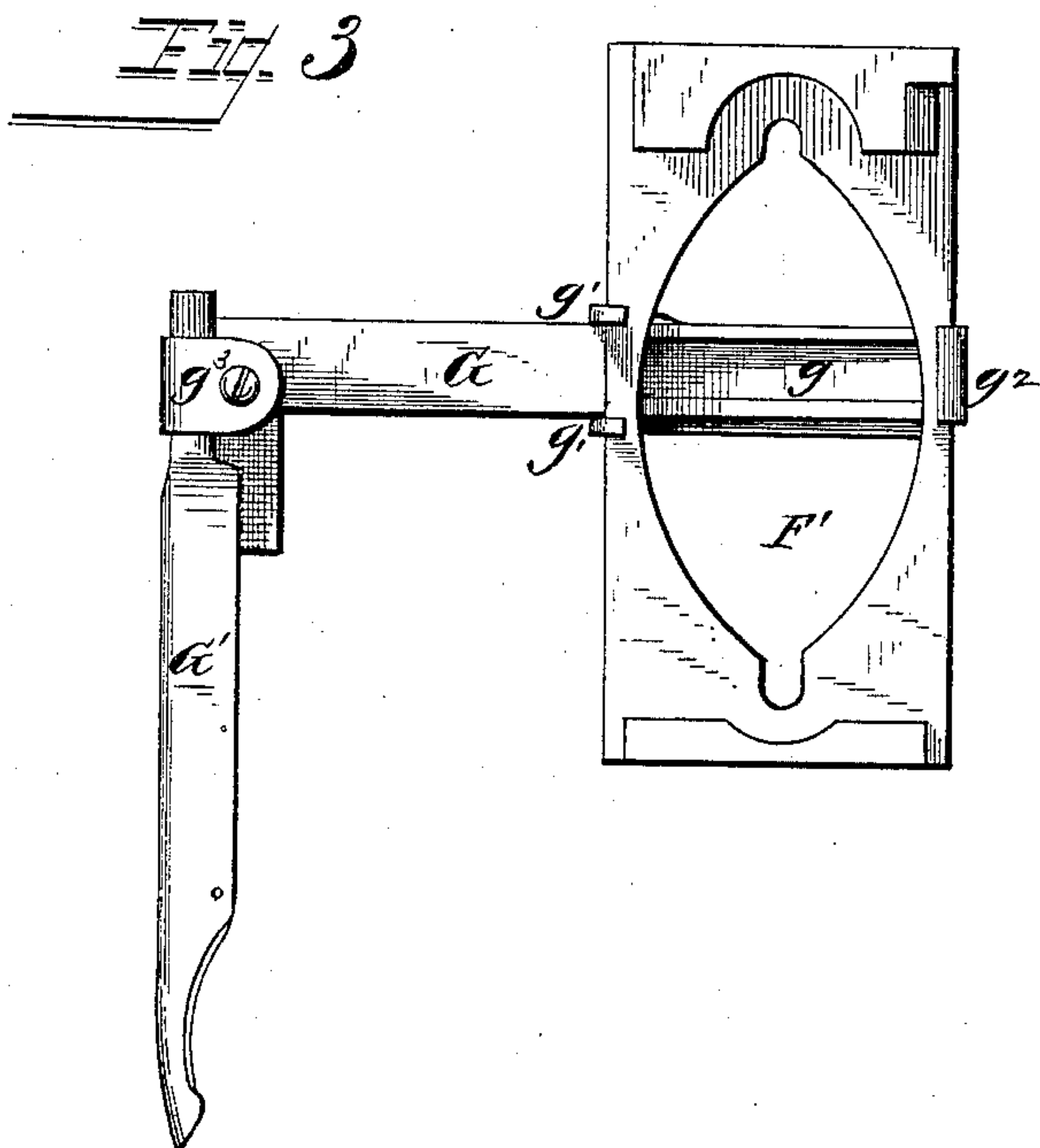
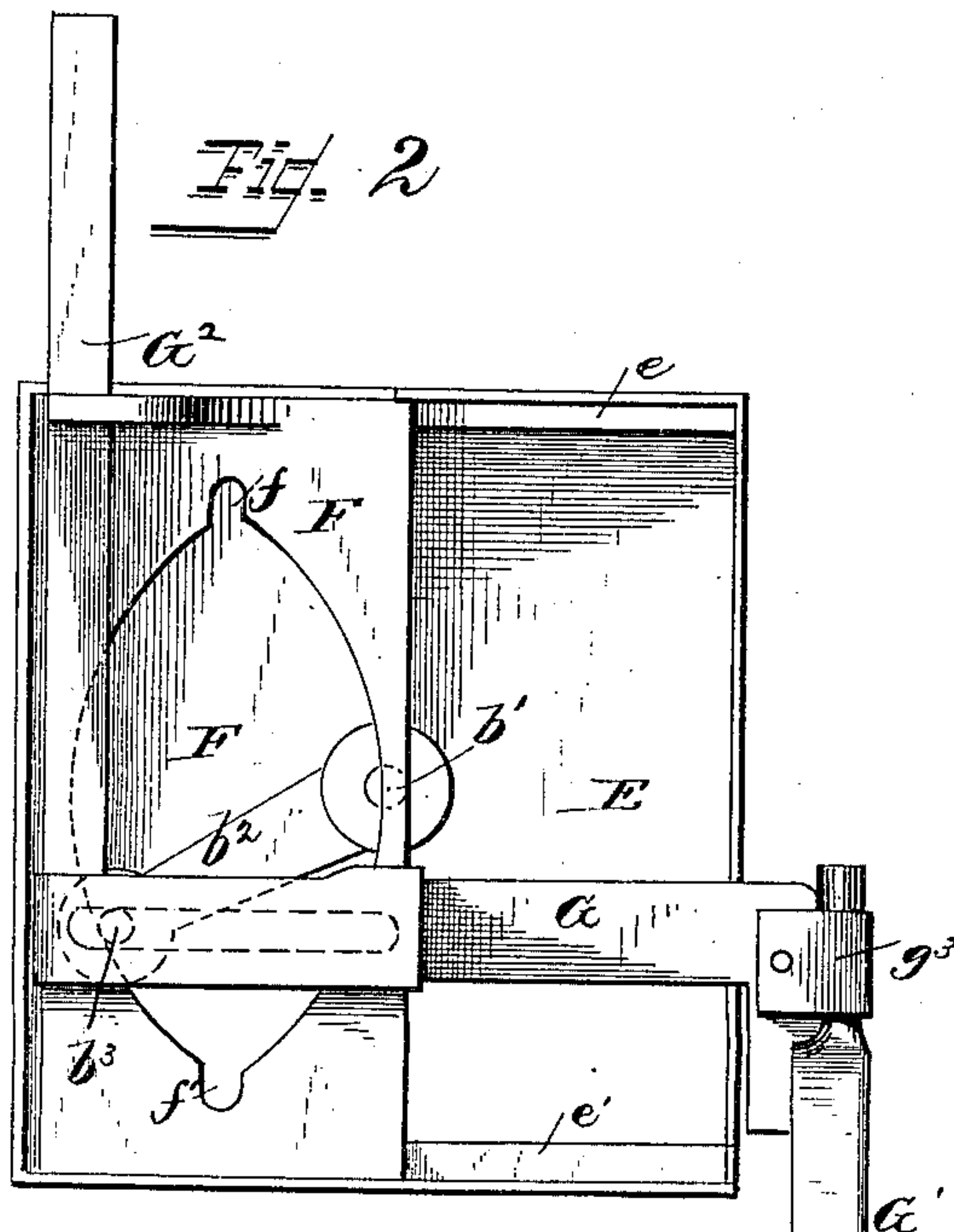
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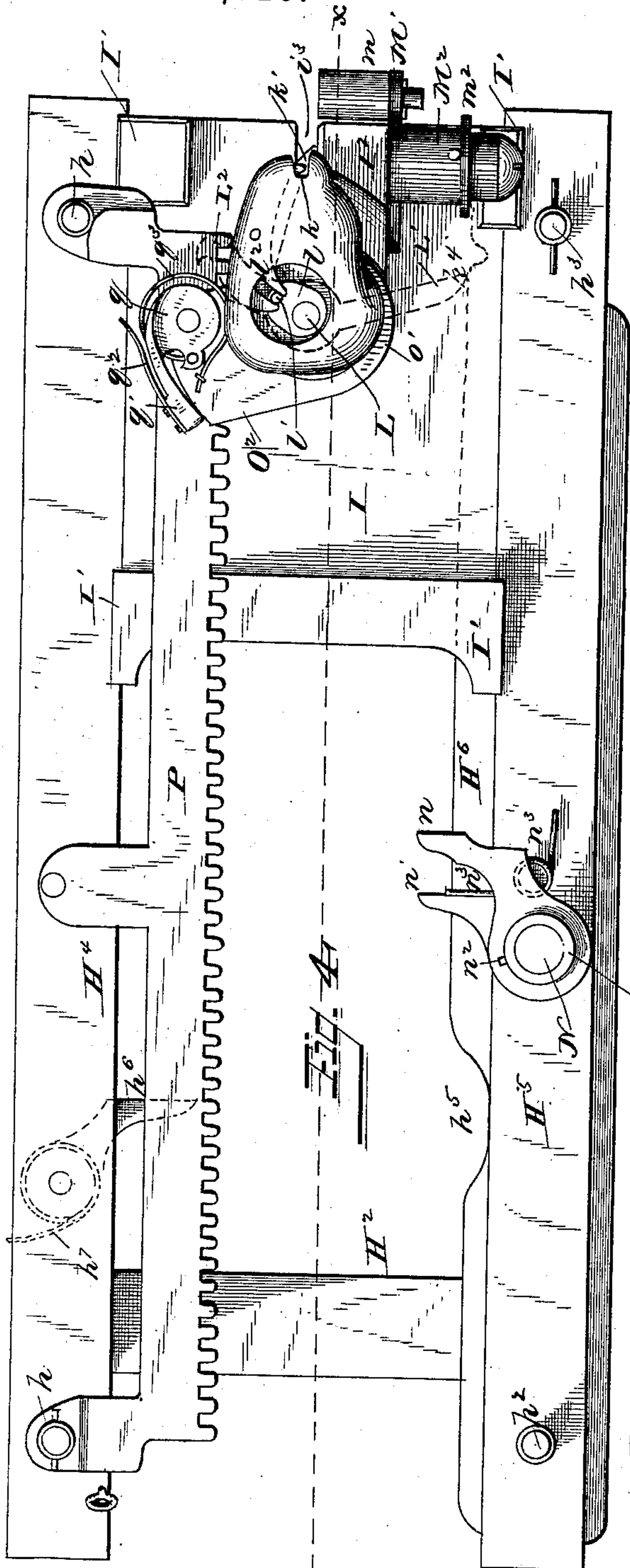
S. C. SHEPARD.

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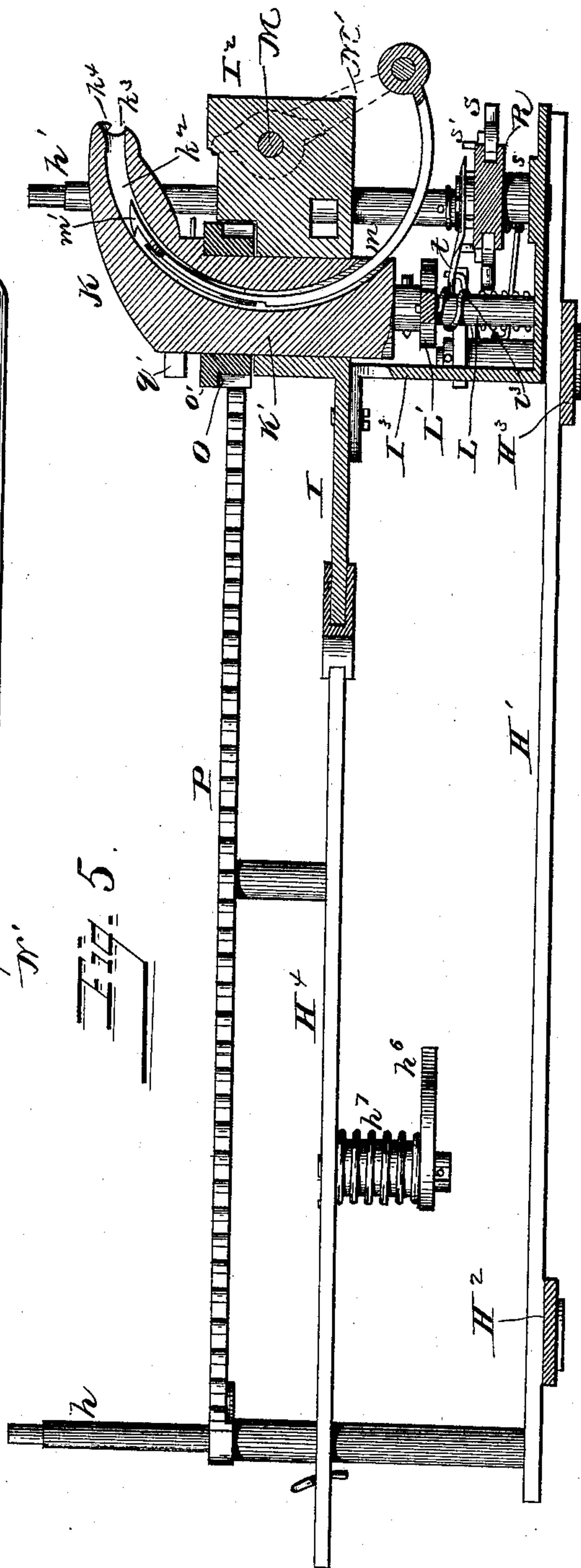
GRAIN BINDER.

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Patented July 14, 1885.



WITNESSES
Frank L. Curran
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(Model.)

4 Sheets—Sheet 4.

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Fig. 6.

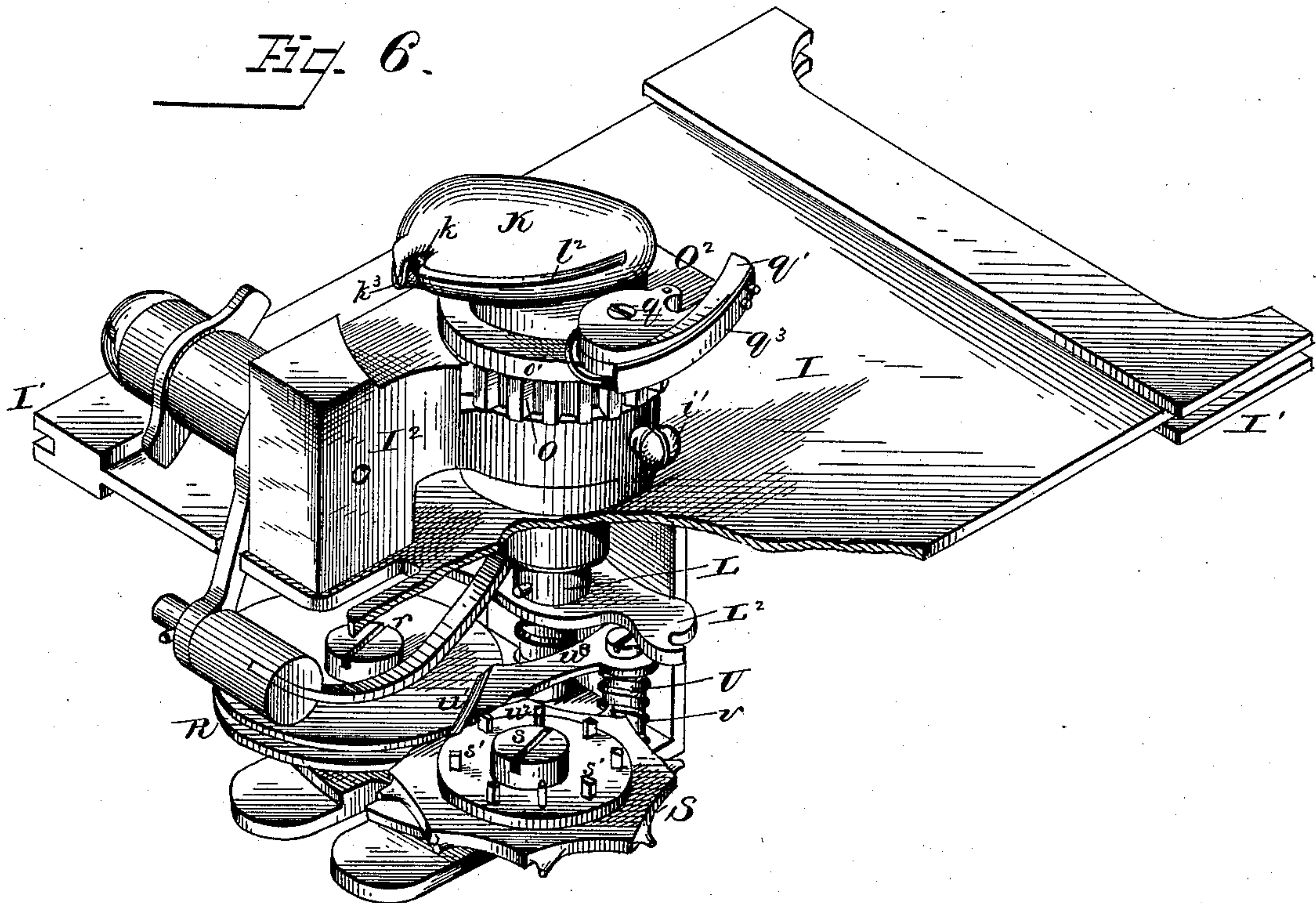
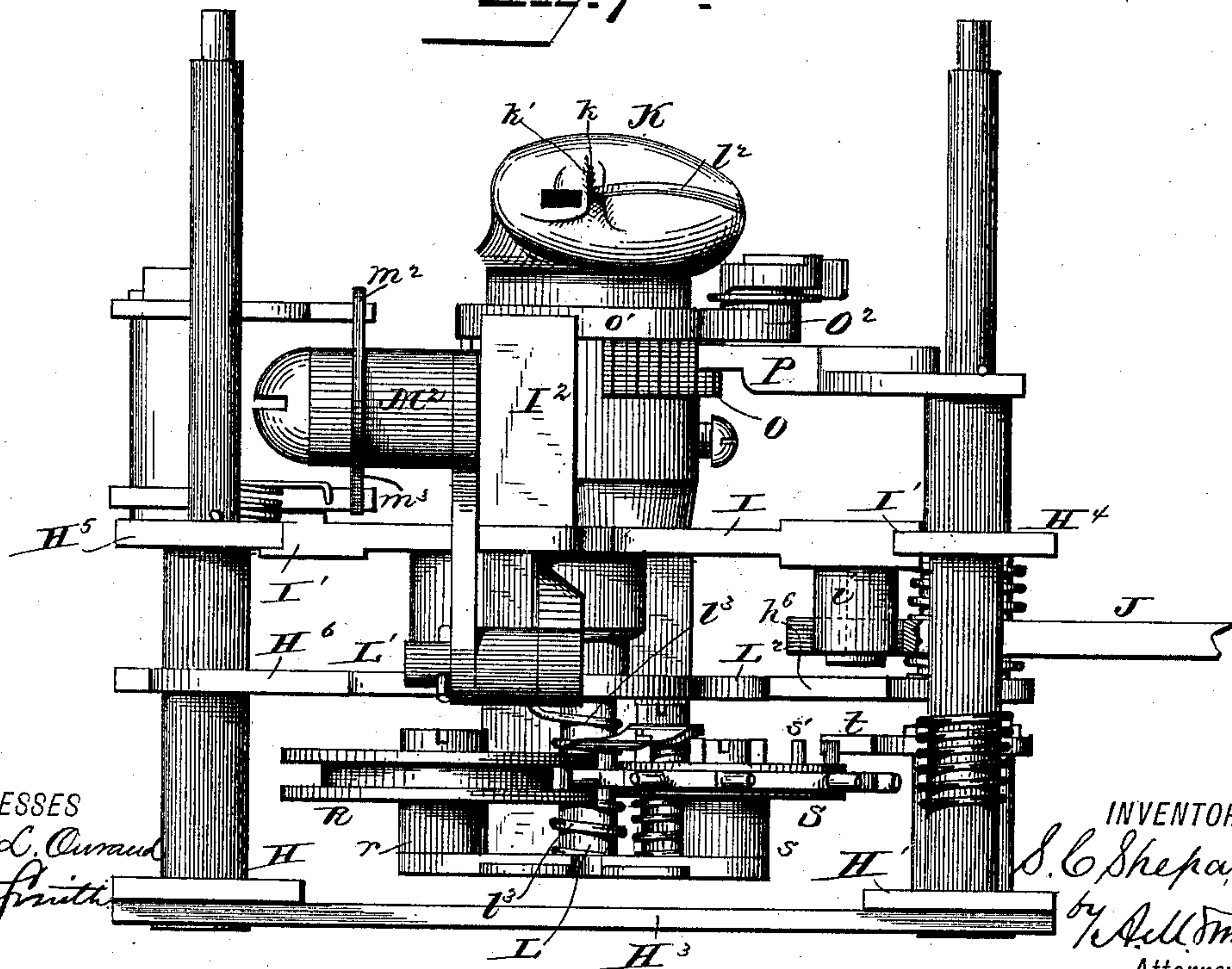


Fig. 7.



WITNESSES

Frank C. Curran
Per M. Smith

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UNITED STATES PATENT OFFICE.

SYLVANDER C. SHEPARD, OF AKRON, OHIO, ASSIGNOR OF ONE-HALF TO
LEWIS MILLER, OF SAME PLACE.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 322,015, dated July 14, 1885.

Application filed August 23, 1883. (Model.)

To all whom it may concern:

Be it known that I, SYLVANDER C. SHEPARD, of Akron, county of Summit, State of Ohio, have invented a new and useful Improvement in Grain-Binders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to a novel arrangement of "low-down" binder in relation to the grain-platform or platform-carrier and the bundle-receiving platform; to the means for and the manner of actuating the needle or binder arm; to a reciprocating non-rotating knotter hook or bill and to a rotating arm or jaw for carrying the ends of the band around and forming the loop therein upon said hook or bill; to the combination, with the non-rotating knotter hook or bill, of jaws for grasping and holding the ends of the band in close proximity to the bundle and between said bundle and the rotating looper arm or jaw, and also of a vibrating tongue or hook for seizing and drawing the ends of the band through the loop formed therein; to the combination of the non-rotating knotter hook or bill, the rotating looper-arm, and the cord-holding and cord-cutting devices with a reciprocating carriage, the movements of which are timed to the lateral vibrations of a needle moving in a rectangular path, and to certain details of construction and arrangement of parts, all of which will be clearly understood from the following description with reference to the drawings, in which—

Figure 1 is a perspective view of a portion of a harvesting-machine having my improvements applied, parts of the grain-platform, binder-table, needle-operating mechanism, supporting-sleeve, and sleeve-standard, &c., being broken away to show the arrangement of the parts of the binder. Fig. 2 is a front view of the needle-actuating mechanism and its inclosing-case, with the forward or face plate of said case removed. Fig. 3 is a rear view of the needle, its carrying-arm, and the slotted slide with which said needle-arm is connected. Fig. 4 is a plan or top view of the knotter, knotter-carriage, and its frame or ways, and its attachments. Fig. 5 represents a vertical section taken on the line $x-x$, Fig. 4. Fig. 6 is a perspective view of the knotting

mechanism and its carriage, the latter being partly broken away to show the parts beneath it; and Fig. 7 is an elevation of the knotting mechanism, its carriage, and of the ways or frame in which said carriage moves, taken from the grain or platform side of the machine.

The part designated by A represents the frame of the harvester; B, the main or driving wheel; B', the grain-wheel; A', the grain-receiving platform, which may be provided with any suitable or preferred form of rake or carrier for moving the grain inward toward the driving-wheel and depositing it on the binder-table, said parts being of any usual or preferred construction and arrangement. Upon the inner end of the frame A, which is extended in width for the purpose of accommodating it, is arranged a second platform, A², adjacent to the driving-wheel and in the same horizontal plane with the platform A', but sufficiently removed from the inner side or edge of the latter to permit the location of the binder-table C between and in the same horizontal plane, or thereabout, with the platforms A' and A², in such manner as to obviate the necessity of raising the grain either in getting it on said table or in removing the bundles therefrom. The table C is arranged to slide longitudinally or backward and forward in suitable ways, c c' , on the adjacent sides of the platforms A' A², or upon the bars of frame A, as may be preferred, and any suitable arrangement of means adapted to be actuated by the driver in his seat on the machine may be employed for effecting such adjustment and giving to the binding mechanism connected to and moving with said table the desired relation to the grain to be operated upon, according to the length of the straw.

In suitable pendent brackets, a , on the under side of the table C, is mounted a transverse shaft, a' , to which motion is imparted in any suitable manner from one of the shafts of the harvester, said shaft being provided with a cam, a^2 , for actuating the knotter-carriage, as hereinafter explained, and upon one end with a miter or bevel gear, a^3 , from which motion is imparted to a similar gear, a^4 , on a shaft, b , connected at its upper end by gears a^5 and a^6 in a similar manner to the needle-actuating shaft b' for driving the latter. The

shaft b is mounted in suitable bearings in a sleeve-standard, D , set inclining inward toward the driving-wheel, and provided at its lower end with an annular flange or foot (not shown). similar to those at d d' d^2 , through which said standard is secured to the binder-table C , the shaft b passing up through a perforation or opening in said table. The standard D has a hollow elbow formed on its upper end, covering and protecting the gears a^3 and a^6 , and the horizontal arm of said elbow is provided at its end with an annular flange, d , to which a similar flange, d' , on the rear end of the needle-shaft sleeve D' , is bolted or otherwise rigidly secured. The needle-shaft has its bearings in the sleeve D' , which in the present instance is shown projecting forward from its supporting-standard; but said standard may, if preferred, be arranged at the forward end of the table, in which case the sleeve D' will project rearward over the table C to a point at or near the center of the length of the latter from front to rear, and to said overhanging end, through a flange, d^2 , is secured a rectangular box or casing, E , provided on its open side with a removable lid or cover, E' , for giving access to the mechanism arranged therein for actuating the binder arm or needle. This box or casing is of merely sufficient depth from front to rear to accommodate the needle-actuating devices hereinafter explained, and is shown with the lid removed in Fig. 2, in which b^2 is a crank-arm on the forward end of shaft b' , provided at its outer end with a wrist or crank pin, b^3 , which projects through a slotted upright plate, F , and into the slot or groove in the rear face of a needle-supporting arm, G . The plate F extends from the top to the bottom (inside) of the box or case E , and is about one-half the width (more or less) of said box, and is adapted to slide laterally from side to side of the box on ways e e' therein as it is actuated by the crank b^2 . The slot or opening F' in the plate F , through which the crank-pin b^3 passes, approximates an elliptical form, its greatest width from side to side at the center of its length from top to bottom, added to the lateral throw or movement of the plate, being equal to the diameter of the circle in which the outer face of the crank-pin moves, and the walls of said slots at top and bottom are notched or recessed at f f' , which notches, added to the vertical length of the opening F' , make the length of the latter equal to the vertical throw of the crank-pin. Between said notches the side walls of the opening are curved each in an arc of a circle the radius of which is equal to the length of the crank-arm b^2 . The needle-carrying arm G is arranged on the side of the plate F , the crank-pin b^3 entering a horizontal slot or groove, g , on its inner face, and is provided with hooks or U-shaped arms g' g^2 , which engage with the vertical edges of the plate, adapting said arm G to slide up and down on the plate F , actuated by the crank-pin b^3 . The needle G' is secured to the outer end of the arm G , which

projects through a vertical slot formed in the platform side of the casing E , by means of a clamping-bracket, g^3 , or other suitable fastening, and said needle, by preference, is made tubular or U-shaped, to facilitate the passage through it and the proper guidance of the band to a perforation or eye in its point.

For steadying the movement of the arm G , it may be provided with a vertical arm, G^2 , passing through a slot in the upper wall of the casing E , as shown.

By the construction described, as the crank-arm b^2 is rotated, moving from its highest point, in which it engages the notch f in the plate F , outward toward the grain-platform, it carries the plate F and the needle-arm G , connected with said plate, outward in a right line, with the needle G' elevated for passing over the grain on the table, until the plate F reaches the limit of its outward throw and the crank-pin b^3 escapes from the notch f , from which point it moves downward in the arc of a circle, carrying the needle-arm G and needle G' with it. Owing to the engagement of the crank-pin with the arm G through the slot or groove, the needle G' is caused to descend in a right line, or nearly so, passing down outside of the grain on the table C and through a slot in the latter to the knotting and cord-holding devices hereinafter described, until the crank-pin enters the notch f' in the plate, when the latter is vibrated inward, carrying the needle-arm and needle with it, again moving horizontally in a right line until, the plate F having completed its inward throw, the pin b^3 escapes from the notch f' and moves inward, carrying the arm G and needle G' with it to the point of starting, the lateral play of the crank-pin in the groove g again serving to permit the vertical movement of the needle in a right line. The needle is thus moved through a rectangular path, one particularly adapted to the work the needle has to do, as facilitating its passage over the gavel, the movement of the same outward on the binder-table in the process of binding, the discharge of the bundle from said table upon the bundle-receiving platform, and the escape of the needle from said bundle.

The knotting and cord-holding devices are suspended from the lower face of the table in a shallow rectangular box or frame, or in parallel transverse bars secured to and upheld by pendent corner posts, h h' h^2 h^3 . The frame is shown as composed of parallel longitudinal bars H and H' , united by short transverse bars H^2 H^3 , and secured to the pendent corner posts.

Secured to the frame or corner posts above the bars H and H' , respectively, are two parallel bars, H^4 and H^5 , which serve as a track or way, upon which is mounted a reciprocating carriage, I , provided with suitable grooves or flanges, as indicated at I' , adapting it to be upheld by and to move upon the way H^4 H^5 . The carriage I has a pendent pin secured to its lower face, upon which is mounted a friction-roller, i , which enters a slot in the for-

ward end of the lever J, pivoted to the lower side of the table C, said lever at its rear end engaging the wave-cam a^2 on the shaft a' , above described, and serving thereby to impart a reciprocating movement to the carriage I in unison with the latter movement of the needle. Any suitable means for moving the carriage may, however, be employed in lieu of that above described.

The carriage consists, mainly, of a flat plate provided with guiding grooves or flanges, as shown and described, and is provided on its end, at or near the center of its width from front to rear, with an upright standard portion, I^2 , the inner end of which is cylindrical in form, and perforated vertically to receive a cylindrical shank, K' , of the knotter K, said shank being rigidly secured in place in its socket by set-screw i' , or other means permitting its adjustment.

The knotter-head is similar in configuration to others now in use, projecting, mainly, from one side of the shank, (in this case upon the grain or platform side,) and is rounded or convex from side to side and from its heel end upward and outward to its point on its upper face, as shown in the drawings, and its point has a vertical notch, k , having slightly-flaring side walls, into which the cord or band is carried by the needle G' in the descent of the latter, as above described. The shank K' is perforated vertically near its center, and within said perforation is mounted a rock-shaft, L , stepped at its lower end in a pendent angular bracket, I^3 , secured to the lower face of the carriage I. The shaft L has a crank, l , secured to its upper end, arranged within a chamber in the knotter-head, (said chamber being shown in Fig. 4 with the cap-plate removed,) and provided with a crank-pin, l' , which enters a slot in the rear end of a lever, l^2 , arranged within a horizontal slot in the rear side of the head K, (see Figs. 4, 6, and 7,) and which at its outer end opens into the notch k . The outer end of this short lever l^2 forms the movable jaw and the opposing wall k' of the notch k forms the fixed jaw of the knotter-head K.

To the shaft L , below the knotter-head, is secured a lever, L' , which is acted upon at or near each end of the throw of the knotter-carriage by means of a spring, l^3 , for opening the jaws to receive the cord or to release the same, said jaws being held firmly closed at intermediate points by a rail, H^6 , the lever L' sliding along the edge of rail H^6 and holding the jaws firmly closed. The spring l^3 wraps the lower end of rock-shaft L , and, being secured to the bracket I^3 , or other suitable support, and to the lever L' , serves by its tension to hold the latter in contact with the rail H^6 , and also to cause it to move or drop into depressions h^4 and h^5 in the rail for opening the jaws at the points indicated. The lever extends horizontally on each side of its shaft L , and its arm L' moves in contact with the rail H^6 , and just as the knotter-carriage is

completing its outward throw said arm enters a notch or depression, h^4 , allowing the jaw l^2 to be vibrated outward for permitting the band to pass between it and the fixed jaw k' . The rail H^6 is cut away also at h^5 , to permit the lever L' to be vibrated at the inner end of the throw of the knotter-carriage for again opening the jaw, this time to release the band, the lever in this case being acted upon through a heel-extension, L^2 , of the lever L' coming in contact with a spur or projection, h^6 , secured to one of the bars, as H^4 , of the knotter-supporting frame. This spur or projection h^6 is made rigid in the direction of the inward movement of the knotter-carriage, but by preference is adapted, by means of a spring, h^7 , or in other suitable manner, to yield to permit the arm L^2 to pass by it in its outward movement without being acted upon.

Just in front of the cylindrical perforation for shaft L in the knotter-shank is another perforation, at k^2 , formed in the arc of a vertical circle, of which a horizontal stud-shaft, M , secured to the standard I^2 near its outer end, is the center, said perforation extending from a point at or near the lower end of the shank K' to the point of the knotter, as shown, and within said perforation is a sliding curved rod, m , provided at its upper end with a barb or hook, m' , and pivotally connected at its lower end with a crank-arm, M' , formed on a sleeve, M^2 , pivoted on the shaft M . The sleeve M^2 is provided near its end with projecting arms m^2 m^3 , and to the rail H^5 is secured an upright stud or pivot, N , upon which is journaled a sleeve, N' , provided with arms n and n' , arranged one at or near its lower and the other near its upper end, and one in advance of the other relative to the movement of the knotter-carriage, said arms projecting, one, n , within the path of the upper arm, m^2 , and the other, n' , within the path of the arm m^3 of the sleeve M^2 for actuating the rod m , one for projecting the barb m' through the point of the knotter for seizing the ends of the band, and the other for retracting said rod and drawing the ends of the band through the loop formed on the knotter. The sleeve N' is provided with a short horizontal slot near its upper end, through which a pin, n^2 , fast in the stud or pin N , projects, said slot and pin permitting a slight rocking movement of the sleeve N' , with its arms n n' , sufficient to allow said arms to rock out of the way when acted upon by the arms m^2 m^3 in their outward or inoperative movement without acting on the rod m . A spring, n^3 , secured to the rail H^5 , serves to hold the arms n and n' in position to act on the arms m^2 and m^3 in the inward or operative throw of the knotting devices.

Upon the cylindrical shank K' of the knotter, just below the head K, is mounted a flanged spur-pinion, O , which engages with and is rotated by means of a rack-bar, P , secured by suitable arms or brackets to the rail H^4 . A flange, o' , on the upper side of this pinion, overhangs the

rack-teeth slightly, serving to steady the movements of the pinion and to keep it from catching the band or loose straw, said flange being expanded in width on one side, and forming an arm, O^2 , upon which is pivoted a disk or plate, q , provided with a tangentially-arranged curved arm, q' , to the outer swinging end of which is secured a yielding spring plate or jaw, q^2 , extending inward by the side of but diverging somewhat from the arm q , and forming, in connection with the latter, a jaw for grasping the ends of the band and carrying the same around the knotter-head for forming the loop on the same. The pivoted plate q is connected by a spring, q^3 , with the arm O^2 , arranged to hold the arm q' and its diverging jaw q^2 in proper position to seize the cord, and at the same time adapting the arms q' and q^2 to yield and swing inward under the tension of the ends of the band upon them for drawing said ends snugly into a horizontal notch, k^3 , in the point of the knotter. The upper wall of the notch k^3 has a pendent lip or hook, k^4 , which prevents the escape upward of the ends of the band under the action of the barb m' in being thrust outward to grasp said ends.

The cord-holding devices, consisting of a grooved wheel, R , and a notched wheel, S , in form similar to those now in use, are mounted upon vertical studs r and s , attached to the outer end of the horizontal arm of the pendent angular carriage-bracket, in such position that their interlapping inwardly-moving edges shall underline the vertical notch k in the point of the knotter in such manner that the needle passing down outside of said hook for carrying the cord thereto shall also carry it in proper position to be grasped and held by said cord-holding disks R and S . The notched disk S is provided with a series of spurs or pins, s' , one for each tooth or notch in the periphery of the disk, and arranged in a circle on its upper face, and which come in contact with an arm or spur, t , secured to the frame, as the knotter-carriage starts on its inward or operative throw, and serve to move the disk S , rotating it the distance of one notch or tooth for carrying the cord into the groove of the adjacent disk, and thereby grasping it and holding it.

Just inside of the disks R and S , upon a post secured to the bracket I^3 , is pivoted a knife, u , provided on its outer end with an oblique cutting-edge, u' , crossing the peripheries of the disks R and S where they interlap, and having a cam-face back or edge, u^2 , which rests against and is acted upon by the pins s' consecutively for vibrating said cutter. A spiral spring, v , surrounding the stud U , and connected with the knife, serves to retract the knife and hold it against and in position to be acted upon by the pins s' . The oblique cutting-edge u' rests in contact with the upper face of disk R , and the edge of the latter acts in connection with the edge u' as the disks are rotated inward and the knife is vibrated to sever the portions or ends of the band coming

from around the bundle, while the portion from the needle G' is caught and held between the disks R and S below the knife, extending from the lower faces thereof to the point of the needle. The arm t is made yielding, to permit the pins s' to pass in the outward or inoperative throw of the knotter-carriage without being acted upon for moving the wheel S . The carriage I is slotted at its outer edge, at i^3 , in the same vertical plane with the slot in the binder-table through which the needle G' passes, and with the vertical notch in the knotter and the point of engagement or intersection of the interlapping cord-holding disk.

The operation is as follows: The knotter-carriage being supposed to be near the end of its outward throw toward the grain-platform, the movable jaw l^2 , vibrated outward by the action of the crank-arm l , actuated by the lever L' engaging with the notch h^4 in the rail H^6 , and being vibrated thereby just as the carriage completes the outward throw, opens the jaw l^2 , to admit the ends or portion of the band coming from around the bundle. At the same instant the needle descends outside of the grain forming the bundle, and as the carriage starts backward on its operative throw the two strands of the cord passing from around the bundle are grasped in close proximity to the inclosed bundle by the movable jaw l^2 closing upon the fixed jaw k' , and are firmly held until the operation of tying the knot is completed. At about the same instant the cord from the needle is caught and held by the cord-holding disks, operating as described, and the portion of the cord extending between said disk and the jaws in the knotter is severed by the knife u , leaving the end pendent from jaws l^2 k' free. The inward movement of the carriage rotates the looping arm or jaw q' q^2 , which seizes the ends just as they are severed by the knife, and, carrying them around the knotter-shank, forms a loop on the knotter-head, and as said looping arm or jaw starts on a second partial revolution it draws the ends of the band into the horizontal notch k^3 in the point of the knotter and across or within the loop formed on said head by the previous revolution of the looping-arm q' . At this point the arm m^2 of the crank-sleeve M^2 comes in contact with the stop n , and the barb m' of the curved rod m is thrust out under the ends of the band, and being immediately retracted by the action of the arm m^3 coming in contact with the stop n' , said ends are caught by the barb or hook on the upper side of the curved rod m , and are drawn through the loop and into the head K until the loop slips from the point of the knotter and the knot is drawn tight. At this point the heel L^2 of the lever L' comes in contact with the stop h^6 and serves to vibrate the lever L^2 , opening the jaw in the knotter, and releasing the band and therewith the bundle, the latter being carried inward by the needle in the inward vibration of the latter with this knotter and deposited upon the bundle-receiving platform A^2 , from which it is

discharged upon the ground in the rear of the machine by any suitable means.

Having now described my invention, I claim as new—

5 1. The binder-table, in combination with the grain-receiving and bundle-carrying platforms arranged upon opposite sides of and in the same horizontal plane with said table, and the needle moving in a rectangular path for
10 taking the grain from the inner end of the grain-receiving platform and delivering it bound upon the bundle-carrying platform.

2. The grain-receiving and bundle-carrying platforms located on opposite sides of and in
15 combination with an interposed adjustable binder-table arranged in the same horizontal plane with said platforms, the rectangular moving needle, and the reciprocating knotting mechanism adjustable fore and aft with said
20 table for binding the grain thereon.

3. The binder arm or needle and its carrying-arm, in combination with and sliding upon the slotted reciprocating yoke or plate, and the crank actuating said yoke and needle-
25 carrying arm, substantially as described.

4. The needle or binder arm, in combination with mechanism for imparting a movement in a rectangular path to said needle, and a case inclosing said mechanism secured
30 to and upheld by the sleeve in which the needle-actuating shaft has its bearings, substantially as described.

5. The frame or case inclosing the mechanism for moving the needle in a rectangular
35 path, in combination with a supporting-sleeve and sleeve-standard, in which the shafts for actuating said needle-moving mechanism have their bearings, substantially as described.

6. The reciprocating knotter-carriage moving in right lines in a path underneath the
40 binder-table, in combination with a non-rotating knotter-head rigidly secured thereto and provided with the fixed and movable jaws, and the revolving looper for carrying
45 the ends of the band around the knotter-head, substantially as described.

7. The combination, with the non-rotating knotter-head, of the rotating looper, the head having a fixed relation to the reciprocating
50 carriage, and provided with the fixed and movable jaws for grasping the band between the looper and the bundle, substantially as described.

8. The fixed or non-rotating knotter-head
55 attached to a reciprocating carriage and provided with the fixed and movable jaws, in combination with the revolving looper for carrying the ends of the band around said head and forming the loop thereon, and the
60 barbed sliding rod for grasping the ends of the band and drawing the same through the loop, substantially as described.

9. The combination, with the reciprocating carriage, of the fixed knotter-head provided
65 with the fixed and movable jaws, the revolving looper, the band-holder, and the band-cut-

ter attached to and moving with said carriage, substantially as described.

10. The non-rotating knotter-head rigidly
70 attached to the reciprocating carriage and provided with the fixed and movable jaws, in combination with the revolving looper, the barbed sliding rod operating through said head, and means, substantially as described,
75 for vibrating said barbed rod during the outward movement only of the carriage, for causing it to grasp the ends of the cord and draw them through the loop, substantially as described.

11. The combination, with the reciprocating non-rotating knotter-head, of the fixed and
80 movable jaws for grasping and holding the ends of the band in close proximity to the bundle, the traveling looper, and the barbed curved sliding rod for seizing the ends of the
85 band and drawing the same through the loop, substantially as described.

12. The combination, with the reciprocating knotter-carriage, of the fixed or non-rotating knotter-head provided with the jaws for
90 holding the band, and the barbed curved sliding rod, and the rotating loop arm or hook for carrying the ends of the band around the knotter-hook and forming the loop thereon.

13. The combination, with the knotter-carriage, of the fixed knotter-head provided with the jaws for holding the band, and the barbed
95 curved sliding rod, the rotating looper, the band-holder, and the knife for severing the band material, substantially as described. 100

14. The combination, in a grain-binder, of a needle and mechanism for moving the same in a rectangular path at right angles to the
105 surface of the binder-table, a reciprocating knotter-carriage, and a non-rotating knotter-head having a fixed relation to said carriage, and provided with the fixed and movable jaws, substantially as described.

15. The combination, in a grain-binder, of a needle moving in a rectangular path at right
110 angles to the surface of the binder-table, a reciprocating non-rotating knotter-head, and a looper arm or jaw revolving around said knotter-head, substantially as described, and for the purpose specified. 115

16. The combination, in the grain-binder, of the needle and mechanism for moving the same in a rectangular path, the reciprocating
120 knotter-carriage provided with the stationary knotter-head, and having the band-holding jaws and the barbed vibrating curved sliding rod, the rotating looper-arm, the cord-holder, and the cord-cutter, all substantially as and for the purpose set forth.

In testimony whereof I have hereunto set
125 my hand this 14th day of August, A. D. 1883.

S. C. SHEPARD.

Witnesses:

H. S. RHODES,
O. L. SADLER.