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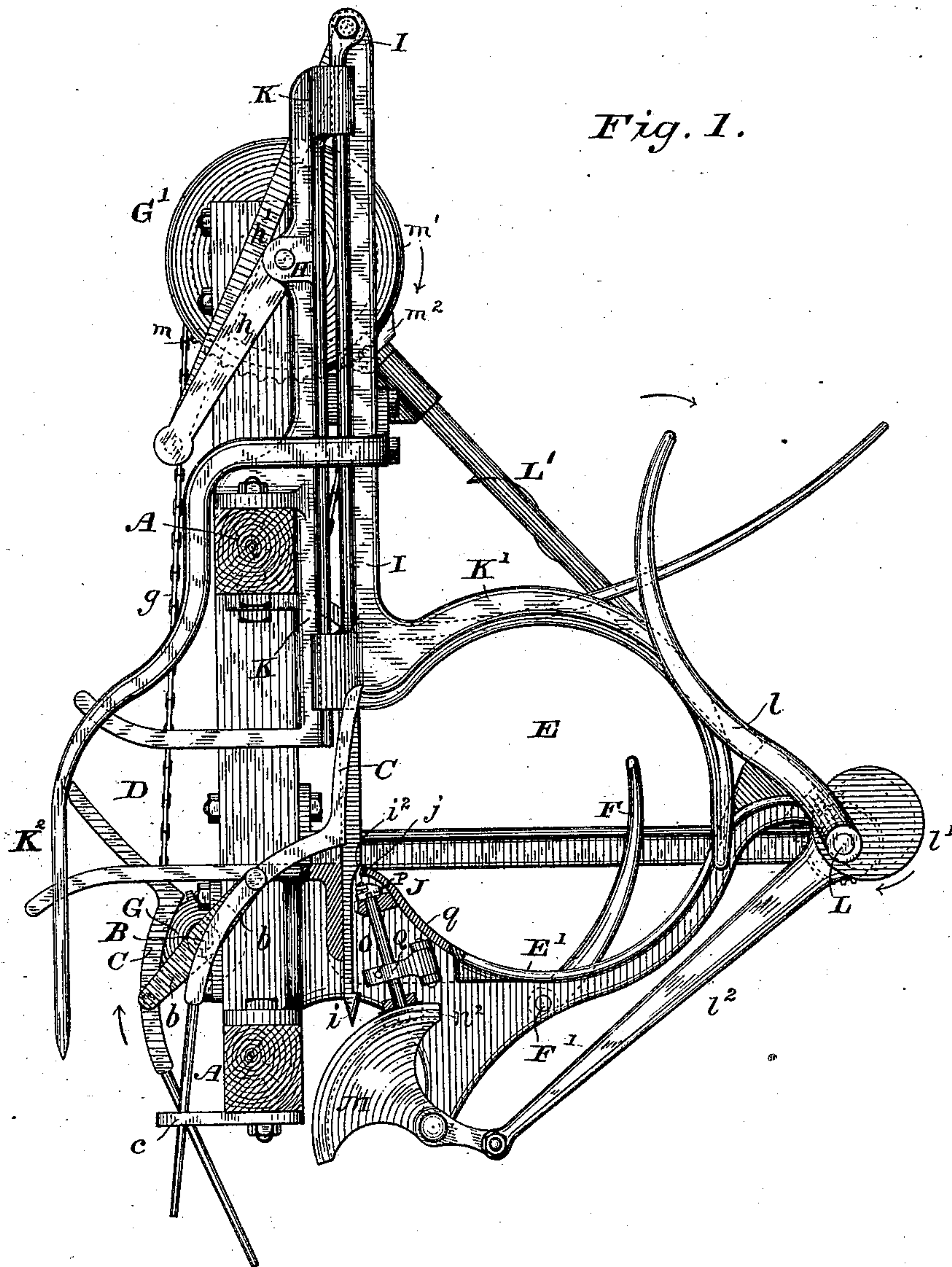
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E. W. JENKINS.

GRAIN BINDER FOR HARVESTERS.

No. 360,962.

Patented Apr. 12, 1887.



WITNESSES

Wm A. Skink
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INVENTOR

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(No Model.)

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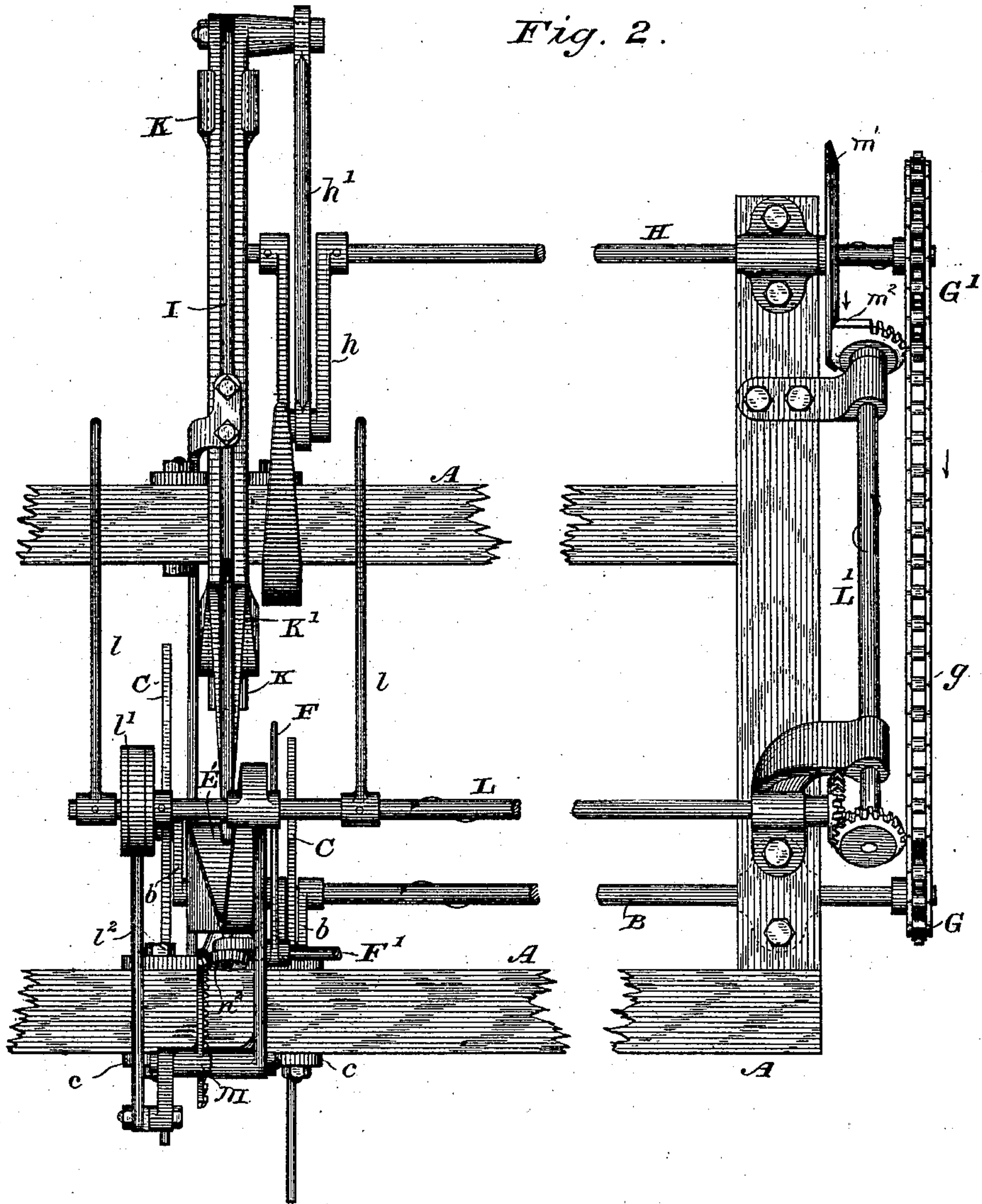
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Fig. 2.



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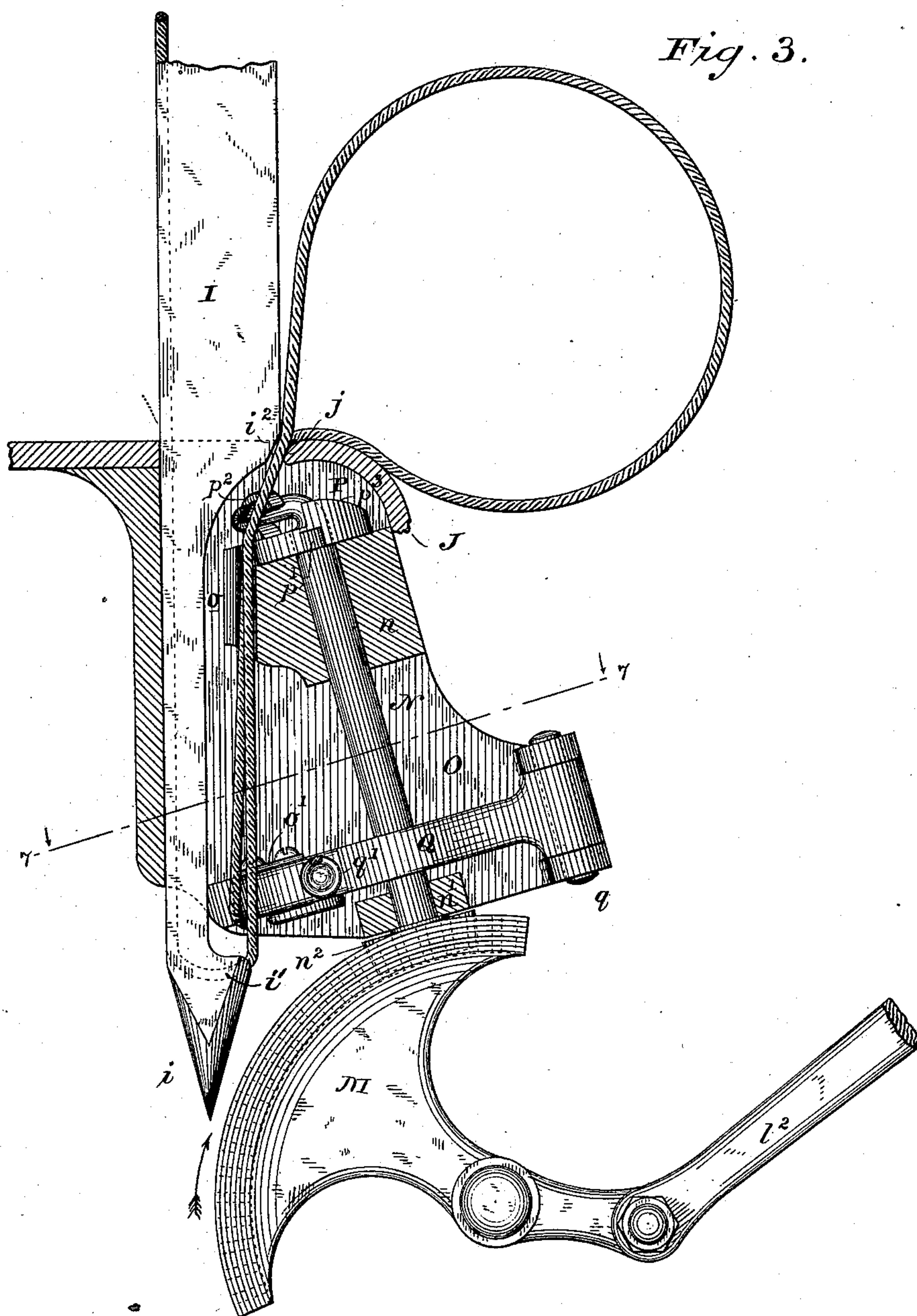
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4 Sheets—Sheet 4.

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Fig. 7.

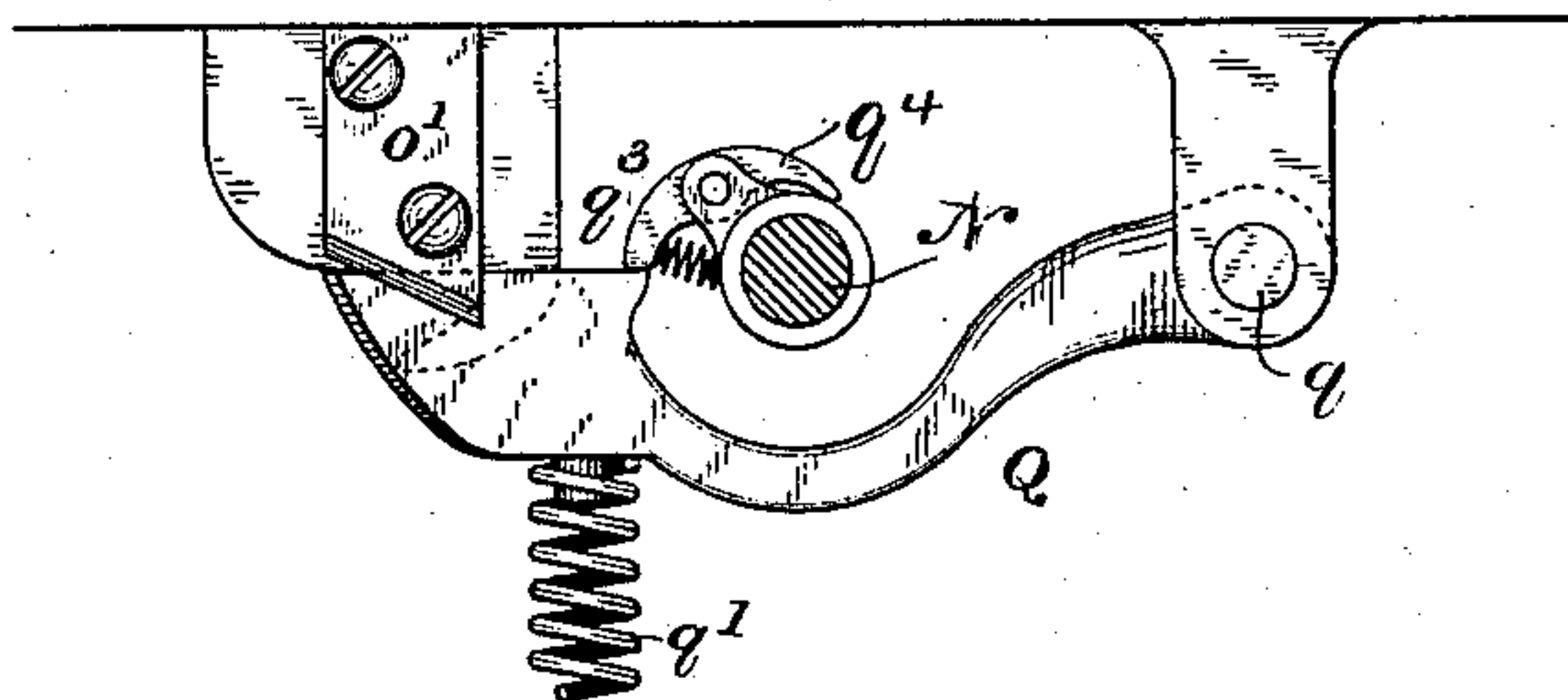


Fig. 4.

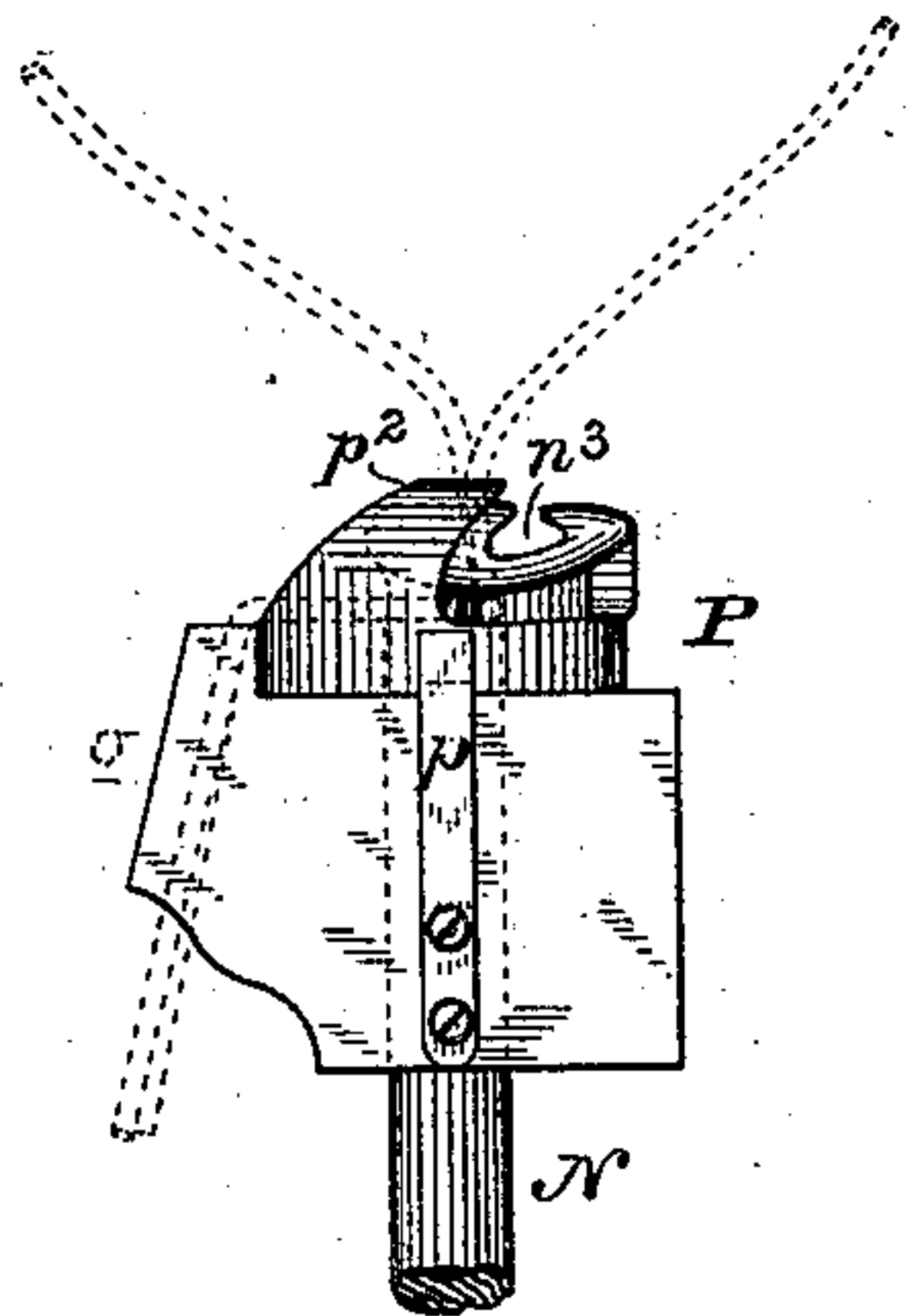


Fig. 5.

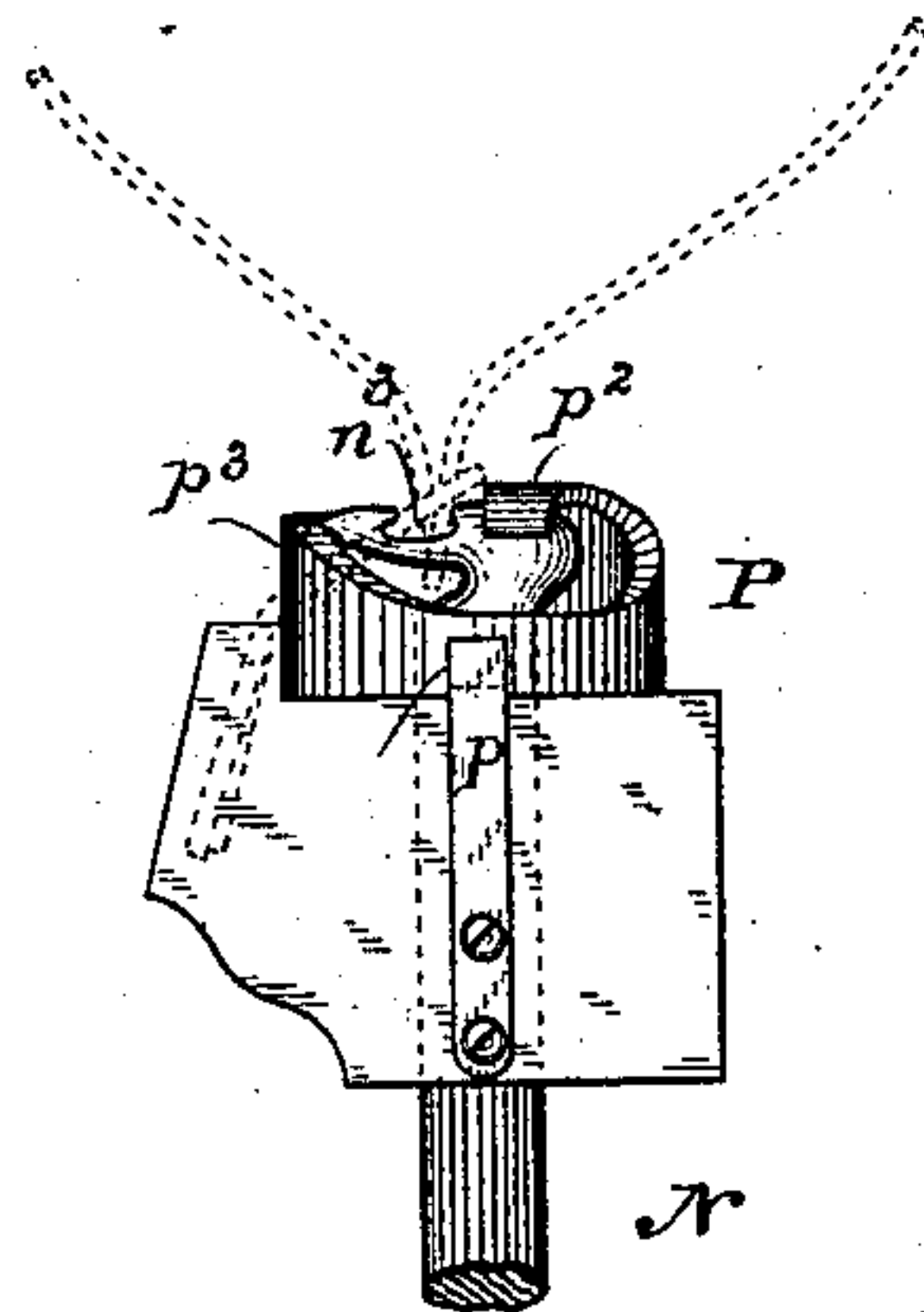
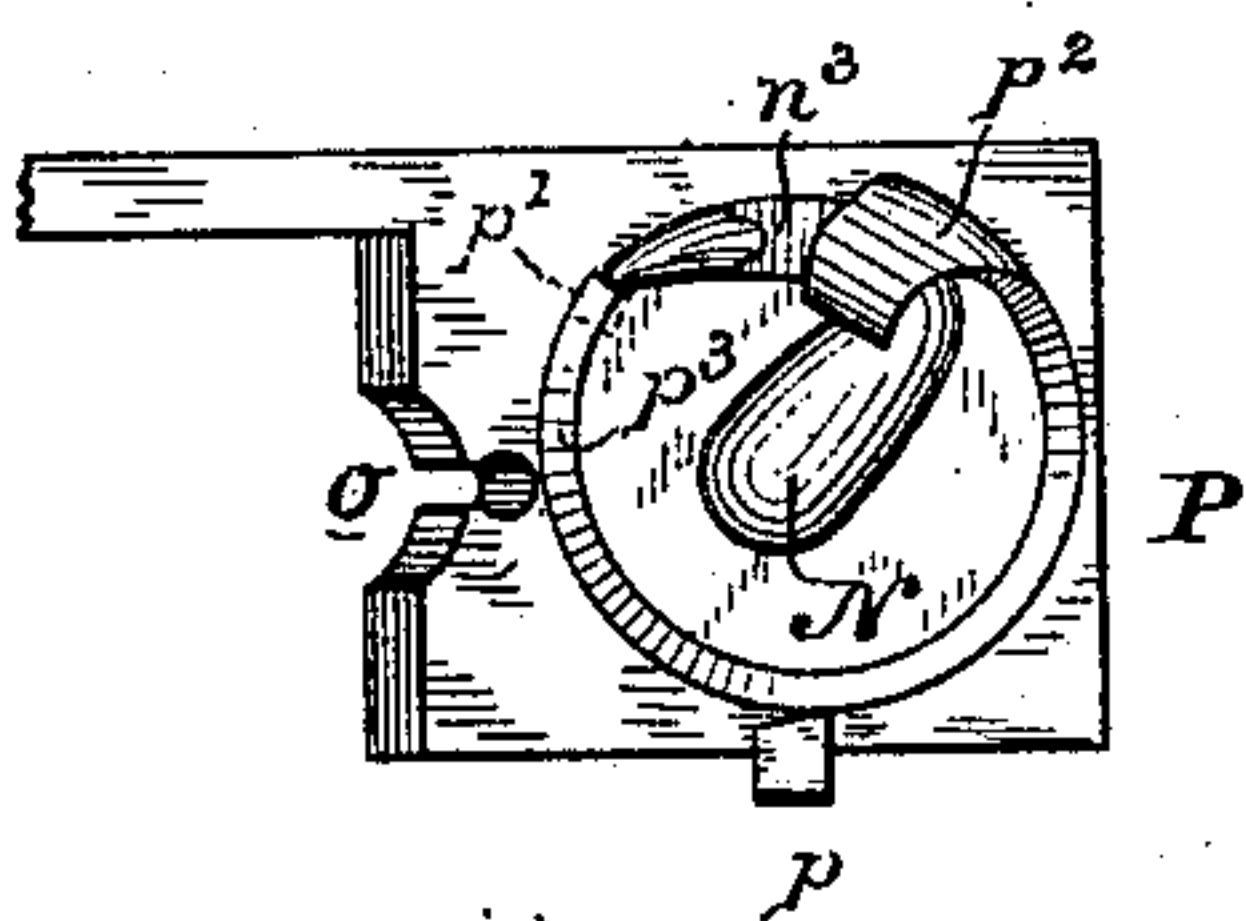


Fig. 6.



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UNITED STATES PATENT OFFICE.

EDWARD W. JENKINS, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE McCORMICK HARVESTING MACHINE COMPANY, OF SAME PLACE.

GRAIN-BINDER FOR HARVESTERS.

SPECIFICATION forming part of Letters Patent No. 360,962, dated April 12, 1887.

Application filed February 12, 1883. Serial No. 84,730. (No model.)

To all whom it may concern:

Be it known that I, EDWARD W. JENKINS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Grain-Binders for Harvesters, of which the following is a specification.

My invention has for its object in part to simplify the construction of grain-binding attachments for harvesters, either "low-level"
10 or "elevator" harvesters, as heretofore used, and in part to improve the knotting mechanism and the holding and cutting mechanism and the combinations into which they enter; and it consists in combining with a grain-receptacle automatic packing-arms delivering
15 the grain thereto piecemeal, a yielding tripping-arm which receives the pressure of the accumulating gavel and gives way before it, a needle-arm which descends on the inner side
20 of the gavel to carry the band around and into the band-securing devices, a compressor attached to or integral with said needle-arm to sit over and compress the gavel, and a tine or tines, also attached to or integral with said needle-arm, which, in the movement of the latter,
25 descend through the grain-chute or throatway inside of the packer-arms and cut off the incoming grain therefrom; in combining with the knotter or band-uniting devices an actuating-segment driven by an eccentric on a rotating shaft and ejecting-fingers fast to said
30 shaft and arranged thereupon in such manner that they come into effective action immediately after the ends of the band have been united and severed; in a cord-knotting device consisting of an oscillating hook combined with an intermittingly-rotating disk having cam
35 flanges or guides; in an improved holding and cutting device operated by the shaft of the knotting-hook, and in the various other combinations and details of construction hereinafter described.

For the purpose of my invention the binding attachment only is shown. The harvester itself
45 may be of any approved construction congruent with the action of the binding mechanism and its accessories.

In the drawings, Figure 1 is an end view of an attachment embodying my invention; Fig.
50 2, a front elevation from the stubble side of the machine; Fig. 3, an enlarged detail of the

knotter and its actuating-segment, showing, also, a portion of the knotter-casing and the lower part of the needle; Figs. 4 and 5, the knotter in successive stages of action; Fig. 6,
55 a top plan view of said knotter, and Fig. 7 a horizontal section on the line indicated in Fig. 3 to show the cord-holder and its yielding tappet.

A represents longitudinal sills and end pieces
60 of the binding attachment supporting its mechanism and intended for affixing to a harvester or forming a part of said harvester-frame.

B is the main driving-shaft of the binder, put in motion from the harvester in any suitable or approved manner, and *b* are double
65 cranks upon this shaft placed opposite to each other and pivoted or journaled midway of arms C, which serve as packers, these latter arms being guided at their heel ends in slotted
70 or perforated bars *c*, or else attached to links in a well-known manner, so as to give their upper straight or curved ends an orbital movement to sweep the throatway D, through which
75 the grain passes from the harvester to the binding-receptacle. This receptacle E is formed either by a curved casting, E', bolted to the lower sills or one of them, or else by any suitable decking, and into it projects a
80 tripping-arm, F, keyed to a rock-shaft, F', which operates as it yields before the incoming gavel, the immediate devices controlling the tripping-clutch, so as to start the binder. These devices may be of any approved construction as in the machines now familiar to
85 the public under the various titles of Spaulding, Gorham, Appleby, and others, and they are not, therefore, herein shown.

The main shaft, which is constantly driven, operates by means of a sprocket-wheel, G, intermittingly clutched thereto by the tripping
90 devices and by a connecting-chain, *g*, taking over a sprocket-wheel, G', fast to the overhead shaft H, this latter overhanging the grain-receptacle and extending to the point
95 at which the waist or center of the gavel will come ordinarily, where it is provided with a crank, *h*, connected by a link, *h'*, with the head of the needle-arm I, so as to reciprocate
100 the latter as the shaft is given its intermittent movement by the tripping devices. The casting K, bolted to one of the upper sills of the

binding attachment immediately over the throatway for the grain, affords guides for this needle-arm as it is caused to reciprocate up and down by the crank. Said arm terminates, as usual, in needle-arms heretofore used, in contradistinction to orbitally-moving binding-arms, in a point, *i*, which pierces through the grain, and above this is perforated, as at *i'*, for the passage of the cord or twine. Immediately above said perforation the arm is cut away or recessed for the operation of the cord holding and cutting and the knotting devices, as will hereinafter appear, and then at the point where the recess terminates it has a shoulder or beveled portion, *i''*, which clamps the ends of the cord after they have been brought about the gavel and close to said gavel against a shoulder, *j*, on the cap or casing J, which covers said knotter to prevent them from escape by the expansion of the gavel after they have been severed and while the knotter is acting.

Upon the needle-arm, either riveted thereto or integral therewith, is a curved compressing-arm, K', arranged to oppose the cradle casting or decking, which forms the grain-receptacle, and to descend upon the gavel therein and compress it into a circular form as the needle is forced down. Ordinarily one compressing-arm will be sufficient; but, if desired, there may be more. On the other side of the needle, so secured thereto as to be rigid therewith, but not interfere with its motion, and of such shape as to avoid the sills or other intermediate devices, and to descend through the throatway between the packers and the delivery mechanism of the harvester, is a tine or tines, K², the object of which is to cut off the inflowing grain and allow the packers, constantly driven from the main shaft, to work idly from the moment that the binder is started. Thus, whenever the needle is caused to descend, it will carry the band around the gavel, compressing the latter at the same time by means of its attached compressing-arm, and also cutting off the inflowing stream by means of the tines.

Supported in bearings at the outer end of the outer side of the grain receptacle or casting E', and in a corresponding bracket from the front post of the attachment, is a shaft, L, driven from the intermittingly-rotating needle-arm shaft by means of an intermediate shaft, L', and suitable bevel-gearing. Upon this latter shaft, L, are ejecting-fingers *l*, which take the bound sheaf from the receptacle at the moment the needle rises, and discharge it upon the ground. This shaft has also an eccentric, *l'*, near its inner end between the two ejecting-fingers, if there are two, which is connected by means of a strap and a link, *l''*, with the heel end of the pivoted segment-rack M, so as to move the latter in the direction indicated by the arrow to actuate the knotting mechanism in the tying operation before the ejecting-fingers reach their active position.

Were the shaft L to be driven at the same

speed as or co-ordinately with the needle-arm shaft, the action of the knotter and ejecting-fingers would be distributed over the whole period of movement of the needle, which, manifestly, would vitiate the functions of the machine. The action of the knotter is required to take place at the moment the needle is down and in that short period of rest permitted it while its crank is passing the lower dead-center; and the ejector-fingers in their action may be said to succeed the movement of the knotter just as the needle starts upon its rise. The bevel-wheel on the needle-shaft, by which said transmitting-shaft is driven, will therefore have at the proper point a gear-segment, *m*, of sufficient length to give the pinion on the transmitter one complete revolution, and for the remainder of its circumference will be provided with a delay-surface, *m'*, upon which a shoe, *m''*, from the pinion will ride to lock said pinion and its shaft and the mechanism to which it communicates motion against movement. The connection between the transmitting-shaft and the ejector-shaft will of course be by means of equal intermeshing bevel-gears, so that one revolution of the former shall impart a full revolution to the latter.

As to the packers, also, it is desirable, for the purpose of making a clean separation and to avoid liability of breaking, that the needle should in its descent pass alongside the effective portion of that one which at the moment is in advance, whichever it may be. In machines of different construction—that is, with curved packers and a curved binding-arm on the same side of the grain-receptacle—the same object has been accomplished by making the binding-arm act alongside the packer which is at the moment completing its movement, and the clutch arrangement by which it is done is familiar. Herein, however, the needle-arm being straight and on the opposite side of the receptacle from the packers, it is necessary to give to the effective portions of the latter such a contour, straight, or substantially so, that they shall at the end of their movement be upright and parallel with the path of the needle, so that it may descend alongside as they are slowly withdrawn for the return-stroke.

The spindle N of the knotter is supported in suitable bearings, *n n'*, in a block or casting, O. It has at its lower end a pinion, *n''*, which meshes with the segment-rack, so that the spindle will be driven while the latter is moved by its eccentric, or by whatever other means may be substituted for said eccentric. In the present organization the spindle is made to incline upward and inward toward the needle-arm, so as to bring the knotting-hook at its upper end into the recess in said arm, right beneath and close to the shoulder, by which it clamps the band against the slotted cover or casing. The upper bearing of the spindle is made sufficiently thick or large to afford a sort of head, and upon its planed top surface is placed a cam-disk, P, bored centrally to re-

ceive the spindle, without, however, being keyed thereto, stopped against motion, except in one direction, by a pawl, p , which takes into a recess, p' , in its side and restrains it normally from movement even in said direction, and provided with two cam-flanges or inclines, one of them, p^2 , curved up and into crown the knotting-hook and allow it to play beneath, while the other, p^3 , rises to a less height and terminates in an abrupt shoulder opposed to the point of said hook, and receiving its impact at certain times. The hook itself starts laterally from the spindle at sufficient height above the body-surface of the disk to admit the cord between the two. Its outline may vary to a considerable extent, that indicated in Figs. 3 and 6 being deemed preferable. Near its point it is recessed in the upper side, to form a bracket, finger, or catch, n^3 , which serves in the retrograde movement of the hook to draw the ends of the cord through the loop.

When the hook is started from the position indicated in Fig. 3, it first gathers in beneath it the ends of the cord about the gavel, which, as before explained, are clamped close to said gavel and immediately above the knotter. As it continues its movement, it reaches the shouldered incline p^3 and strikes it, starting the disk P , which until this moment has been held stationary by its pawl, and forcing it thenceforth to partake of the revolution. The two revolving together reach the position indicated in Fig. 4, when the ends of the cord slide up the incline or cam-flange p^2 above the hook and are crossed upon the strands coming immediately from the gavel, the object of this incline being to keep these ends, or that portion of them which forms the loop, out of the recess in the knotting-hook. The loop having been thus partially formed, the second incline, p^3 , now reaches the ends and lifts them above the point of the hook, which is in contact with and pushing against its shoulder, so that they cannot drop beneath, as in the initial movement, but will ride over its upper surface until they reach the recess in said hook and fall behind the catch or finger, which is accomplished just at the moment when the disk has completed a full revolution and the pawl has dropped into its seat to delay it until the ensuing knotting operation. The actuating-segment now begins its reverse movement, carrying the knotting-hook back away from the shouldered incline, and the ends caught in the recess are drawn through the loop, which is still lifted above the hook by means of the bridging-cam on the disk, and is restrained by said cam against the stress or tug of said hook until the knot is drawn tight. Finally, the hook having reached its normal position, the knot is completed, and, the needle-arm rising, the bound sheaf will be thrown to the ground. This improved knotter may of course be used with various forms of cord holding and cutting mechanism; and with certain forms it may be found immaterial to have the cord clamped between the gavel and the knotter.

In the present instance I propose to sever the cord—both ends of it—entirely, immediately after the hook begins its movement, from all connection with the holder, leaving them free to be drawn up by the hook, although under some slight restraint, so that they may not escape from its grasp; and for this purpose I employ a holding and cutting device operated by the spindle of the knotter in such manner that as the knotter starts the holder will be thrown open, the old end of the cord released, the new end or spool end immediately seized and severed from the gavel portion, thus leaving the two gavel-strands free; but intermediate between this holder and the knotter they pass through a long and narrow groove or crevice, o , in the side of the upper bearing of the spindle, being drawn into this groove by the needle as it descends, or, as to the old portion or end, laid there by the needle in its ascent. In this groove or crevice, which is rounded out to afford space for the two strands and has a narrow or contracted entrance, so that they may not readily escape, they are held while the knotter draws upon them and are pulled slowly up through it, keeping taut and in position for the accurate action of the knotting instrumentalities.

The holder itself consists of a bar, Q , pivoted to the block or casting O by a pivot-pin, q , parallel or substantially parallel with the spindle of the knotter and forming the movable jaw. From its pivot it passes across the knotter-spindle to a point where its free end will be in position to receive the cord from the needle-arm, the second or stationary jaw being afforded by the wall of the casting itself, or by a suitable projection therefrom. A spring, q' , holds the movable jaw forcibly against the stationary jaw, and a tappet, q^1 , on the knotter-spindle is arranged to come against a projection or shoulder, q^3 , on this jaw to force it momentarily away from said fixed jaw and from the knife o' , which overlies its upper face.

The tappet is arranged at such point upon the periphery of the spindle that it opens the movable jaw at the moment the point of the knotting-hook comes against the shouldered incline on the disk. This movement releases the old end of the cord, and, the tappet the next instant passing out of contact with the shoulder, the jaw will be carried back by its spring and grasp the new end or spool end, shearing the remaining gavel end therefrom against the knife, leaving it also free with its companion to be drawn upon by the knotter.

Were the tappet on the knotter-spindle rigid, it would open the movable jaw once in both the forward and reverse rotation, or twice to each binding operation, thus releasing the spool-strand after it had once been grasped, and without the possibility of regaining it. To obviate this, the tappet may be made in the form of a spring-pressed pawl, q^4 , which will operate the jaw in the forward rotation of the spindle only, and will yield to the su-

perior resistance of said jaw in the reverse rotation and pass it without throwing it open.

Now, to summarize the operation of the machine, grain is gradually packed into the receptacle by the constantly-driven packing-arms until the trip-arm has been pushed sufficiently far back to start the binding mechanism. The needle immediately descends, bringing with it the compressor and the cut-off tines, and carrying the cord around the gavel into the holder, clamping it firmly against the shouldered casing close to the gavel. At this moment the knoter starts, the cord is severed, and the spool end seized, the knot is formed and completed, the needlerises, and the ejector-arms carry the bound sheaf from the machine out of the way of the incoming stream, which the packers immediately recommence to send forward.

I claim—

1. The combination, substantially as hereinbefore set forth, of a grain-receptacle, automatic packing-arms delivering the grain thereto, the yielding trip which receives the pressure of the accumulating gavel and gives way before it, a needle which descends on the inner side of the gavel to carry the band around it and into the securing devices, the compressor attached to or integral with said needle to sit over and compress the gavel, and a tine or tines, also attached to or integral with said needle, which, in the movement of the latter, descend through the grain-chute or throatway inside of the packer-arms and cut off the incoming grain therefrom.

2. The combination, substantially as hereinbefore set forth, with the knoter or band-uniting devices, of an actuating-segment driven by an eccentric on a rotating shaft, and ejecting-fingers fast to said shaft and arranged thereupon in such manner that they come into effective action immediately after the ends of the band have been united.

3. The combination, substantially as hereinbefore set forth, of the main shaft, the packers, the automatic tripping devices starting the needle-arm shaft, and the shaft bearing the eccentric for operating the knoter, geared with said needle-arm shaft by delay-gearing, so that it may operate suddenly and quickly as the needle-arm crank is passing its lower dead-center.

4. The combination, substantially as hereinbefore set forth, of the segment-rack operating the knoter, the link connecting said segment with an eccentric upon the intermittingly-rotating shaft, and the ejector-arms on said shaft to remove the bound sheaf after the knot has been tied.

5. The combination, substantially as hereinbefore set forth, of the main shaft, the needle-arm shaft, the chain-connection between the two, the ejector-shaft, and the bevel delay-gearing connecting it with the needle-arm shaft.

6. The combination, substantially as hereinbefore set forth, to form a cord-knotting device, of an oscillating hook and an intermittingly-rotating disk having cam-flanges or guides to guide and deflect the cord and accompanying the hook during the period of its own revolution.

7. The combination, substantially as hereinbefore set forth, to form a cord-knotter, of an oscillating hook recessed upon its upper face to form a catch for the cord ends, a disk underlying said hook and having the same axis, formed with cam-flanges or inclines to direct the cord and deflect it over the hook, and a pawl which detains said disk until it is forced to rotate by contact between the hook and a portion of itself, and which prohibits rotation except in one direction.

8. The combination, substantially as hereinbefore set forth, of the oscillating knotting-hook recessed on its upper face to form a catch for the cord ends, the disk underlying said hook, detained by a pawl, so that it can be forcibly rotated in one direction only, the bridging cam-flange on said disk to cover the hook and its recess, and the shouldered incline against which the point of the hook comes and which serves to lift the extreme ends to cause them to reach and drop into the recess.

9. The combination, substantially as hereinbefore set forth, with the knotting devices and with a holder and cutter that releases both ends of the band while the knotting action is taking place, of the long channel or crevice in the bearing-block in which the cord is laid by the needle and in which it is retained against lateral escape.

10. The combination, substantially as hereinbefore set forth, with the knotting devices and with holding and cutting devices which release the band ends entirely at the outset of the knotting action, of the shoulder on the needle, the converse shoulder on the casing, and the long channel or crevice in the upper bearing-block in which the band ends are retained against lateral escape, while free to be pulled longitudinally therethrough by the action of the knoter.

11. The combination, with the oscillating knoter-spindle, of the movable jaw pivoted to the casting at one side of the spindle and extending thereacross to a converse stationary jaw fast to or integral with the casting, the spring urging said movable jaw against the other, the tappet on the knoter-spindle, and the shoulder bearing-surface on said movable jaw, whereby it is operated by the revolution of the knoter.

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Witnesses:

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