(No Model.) 3 Sheets—Sheet 1.

W. M. HOLMES.

GRAIN BINDER.

No. 509,470. Patented Nov. 28, 1893.

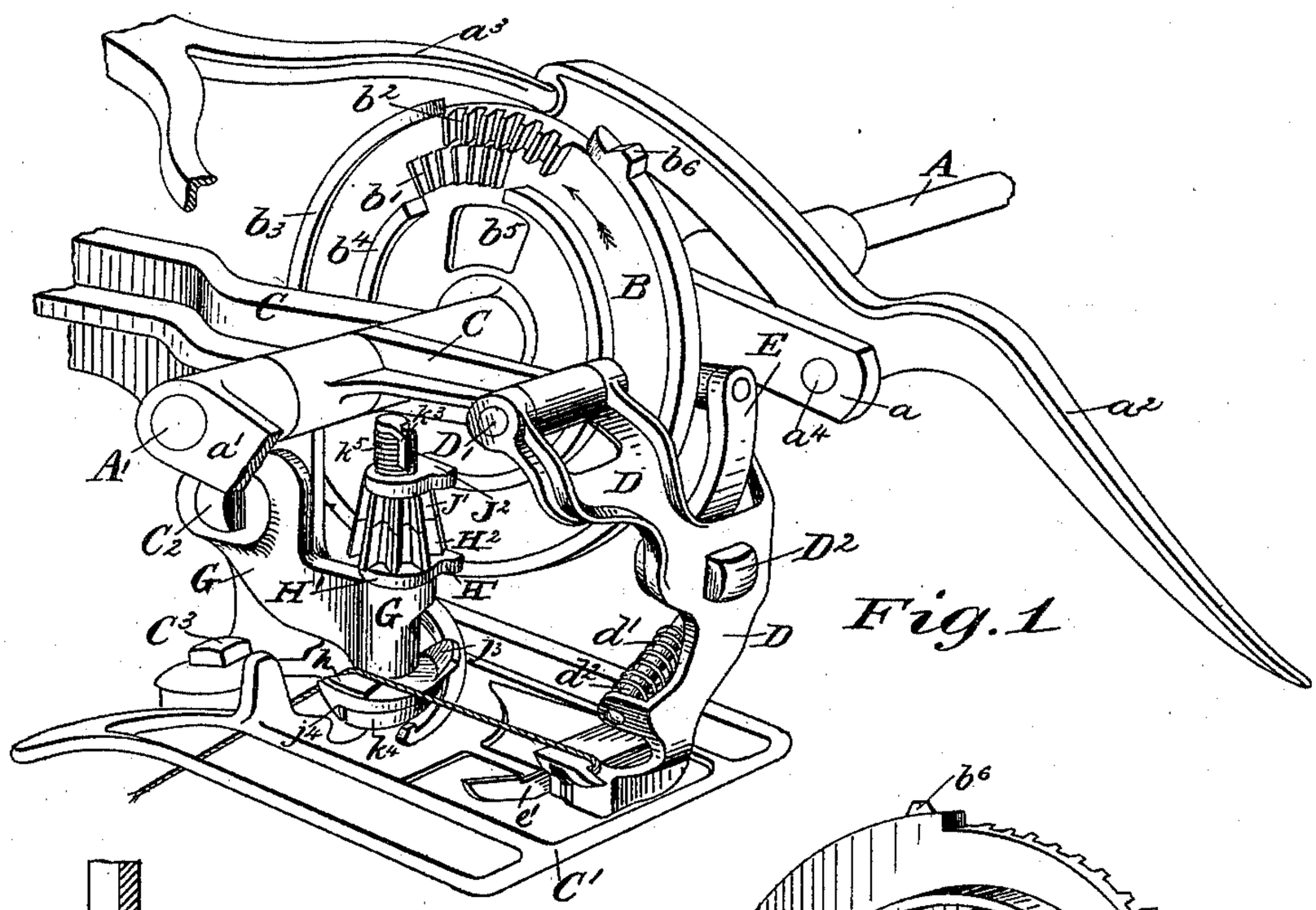

Fig. 1

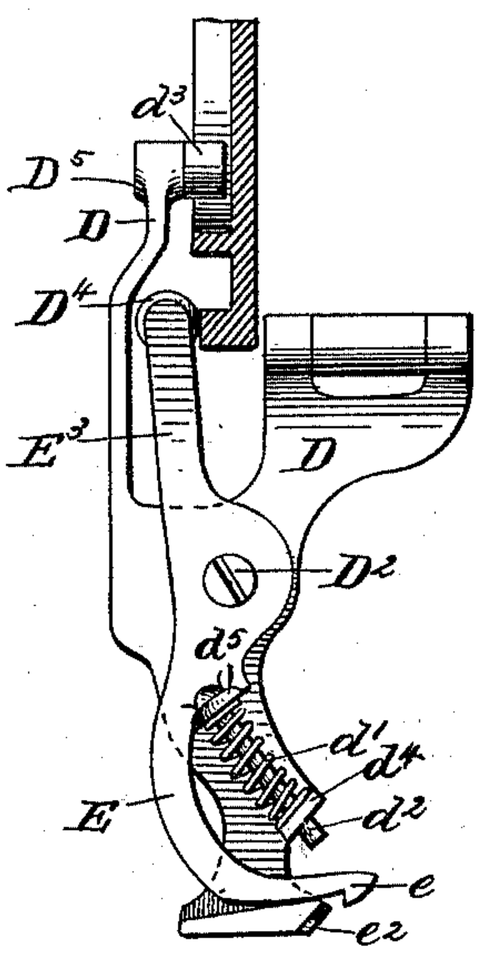

Fig. 2

Fig. 3

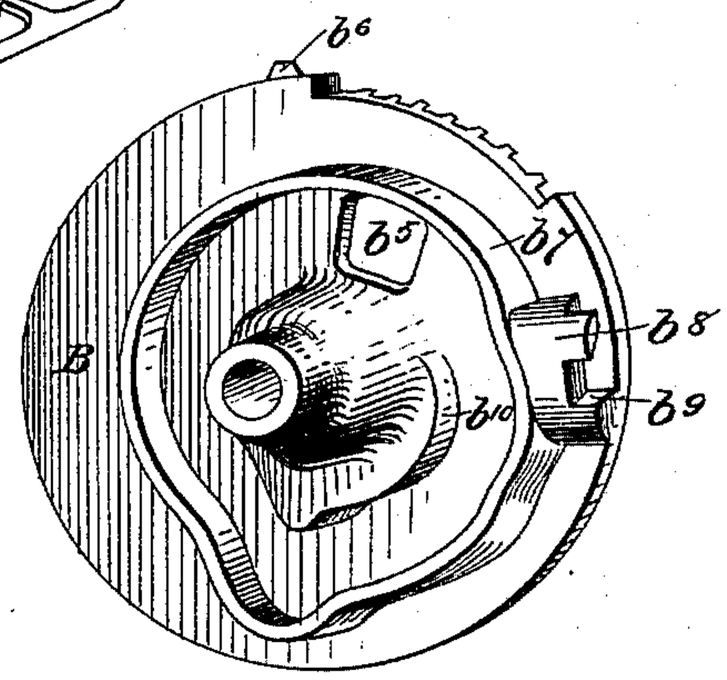

Fig. 4

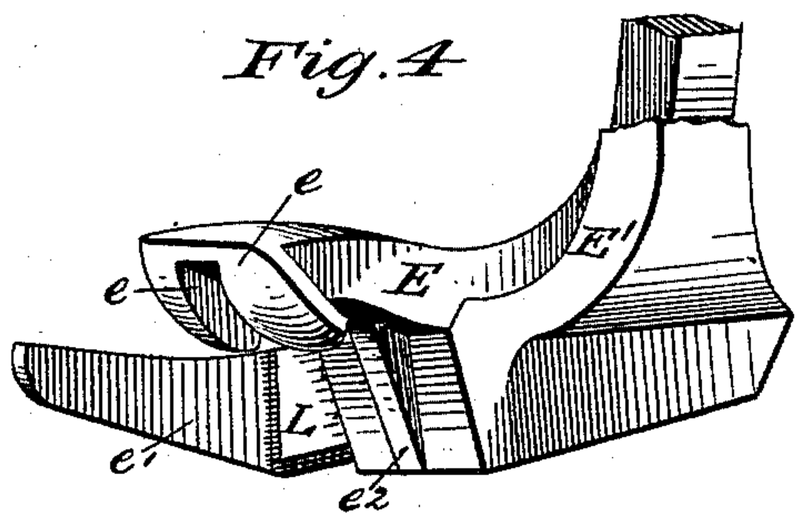

Fig. 5

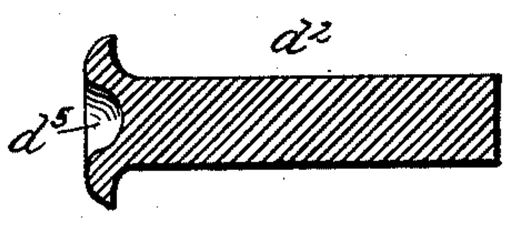

Fig. 6

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(No Model.)

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W. M. HOLMES.

GRAIN BINDER.

No. 509,470. Patented Nov. 28, 1893.

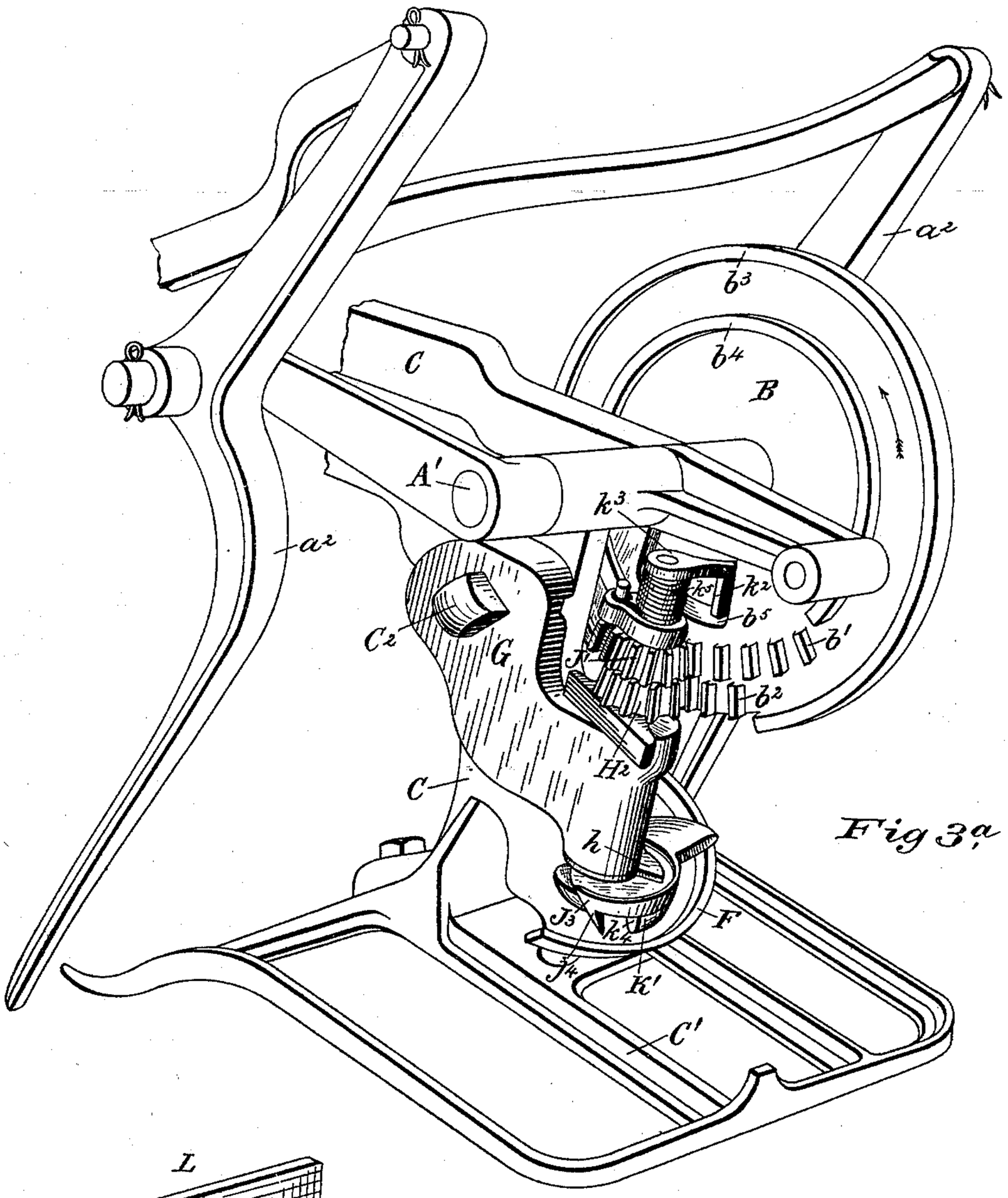

Fig 3ª

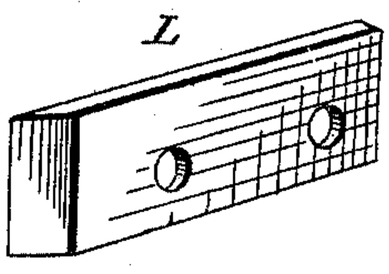

Fig. 5ª

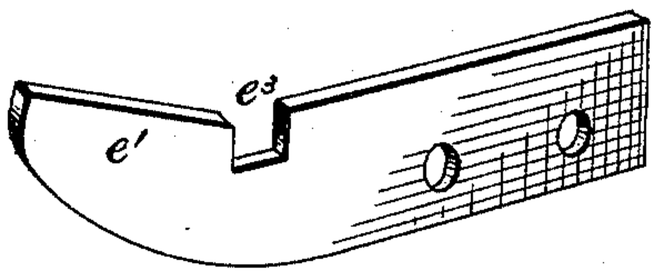

Fig 5b

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GRAIN BINDER.

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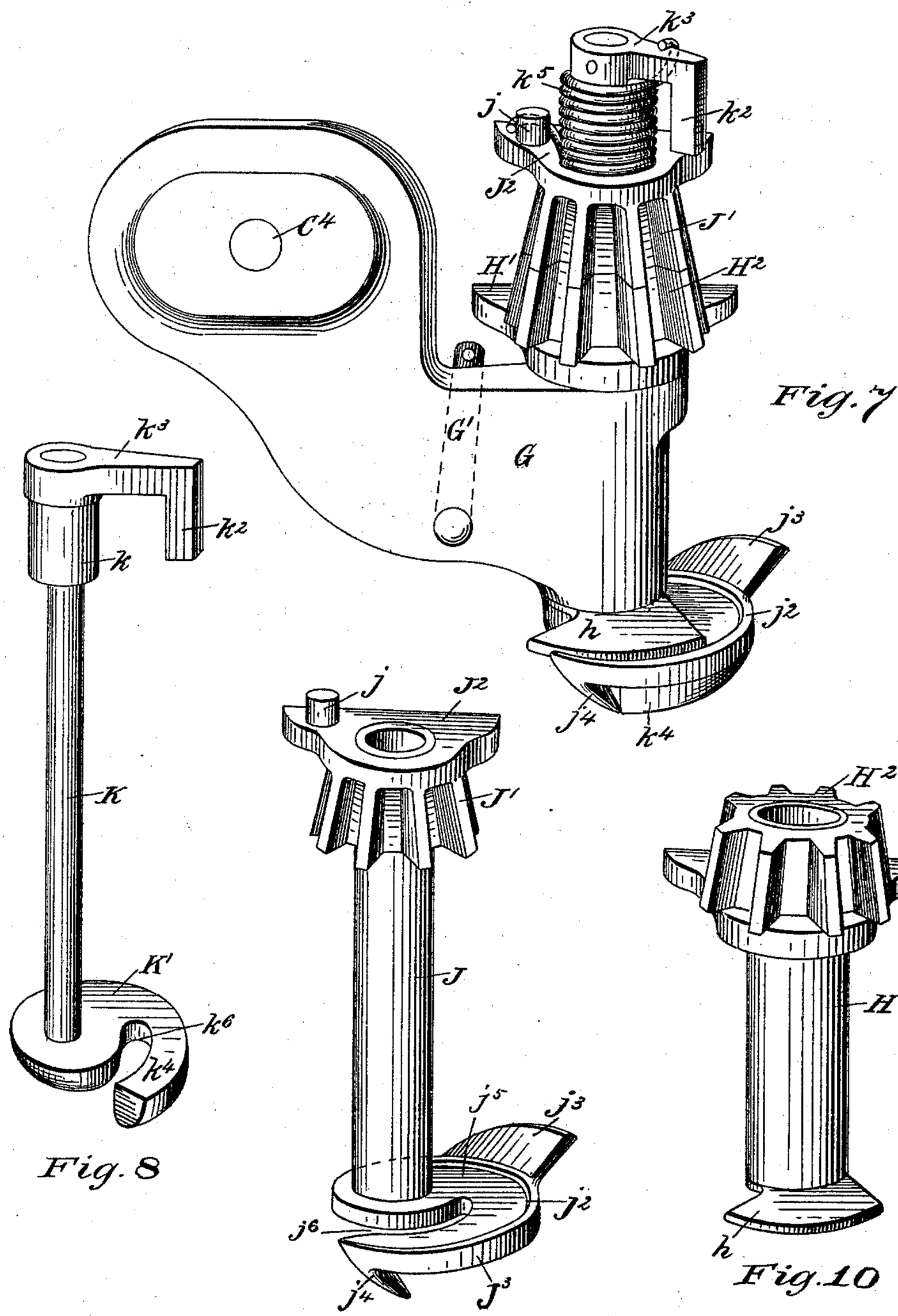

Fig. 7

Fig. 8

Fig. 9

Fig. 10

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UNITED STATES PATENT OFFICE.

WATSON M. HOLMES, OF HOOSICK FALLS, NEW YORK.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 509,470, dated November 28, 1893.

Application filed March 2, 1888. Serial No. 265,991. (No model.)

To all whom it may concern:

Be it known that I, WATSON M. HOLMES, a citizen of the United States, residing at Hoosick Falls, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Grain-Binders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to the knotting, and grasping devices of automatic grain binders and will be more fully hereinafter described and pointed out in the claims.

Referring to the accompanying drawings, in which only so much of a grain binder is shown as is necessary to illustrate my invention, and in which similar letters of reference indicate like parts:—Figure 1. is a rear perspective view of my invention. Fig. 2. is a view partly in elevation and partly in vertical section of the grasping and band severing mechanism. Fig. 3. is a perspective of the tucker detached. Fig. 3^a is a perspective view showing the knotter hooks or jaws separated. Fig. 4. is a front perspective of the knotter driving disk. Fig. 5 is an enlarged view of the grasper and band severer, broken away. Figs. 5^a and 5^b are details of the grasper and knife. Fig. 6. is a vertical longitudinal section through a pin which forms part of the grasper. Fig. 7. is a perspective of the knotter. Figs. 8 and 9 are details of the knotter. Fig. 10. is a perspective of the detaching hook detached.

A is the intermittently operated binder shaft revolving in bearings on the upper limb of the binder frame. The frame C is also secured to the upper limb of the binder frame, and has journaled therein the short supplemental shaft A′. The shaft A on its inner or rear end is formed or otherwise provided with a crank arm, and the shaft A′, has an opposing crank arm a, and the two crank arms are connected by the pin a^4, on which the discharging arm a^2 is pivoted at about the middle of its length, and is also pivoted to the link a^3, a second discharging arm being similarly pivoted to the link a^3 and to the crank arm a', which is shown broken away in Fig. 1. The link a^3 is pivoted to some portion of the machine.

It is evident from the preceding description, that as the shaft A revolves, the shaft A′ will turn with it, and the discharging arms be raised up over the bundle which is formed beneath the breast plate C′, and on the further revolution of the shaft A, will eject the bundle from the machine.

Firmly secured to the shaft A′, so as to revolve therewith is the disk B. The disk B is provided on its rear face with the segmental racks b' b^2, the circular tracks b^3 b^4 projecting out from the face of the disk, and cut away opposite and adjacent to the segmental racks b' b^2; the opening b^5 toward the center of the disk from the segmental racks; and on its periphery with the cam b^6. On the front side of the disk are formed the cam ledges b^7 b^{10} and the projections b^8 and b^9. The disk revolves in the direction indicated by the arrow Fig. 1. The breast plate C′, has a slot through which the needle passes in carrying the cord to the knotter and is bolted to the frame C, at C^3. The knotter frame G is rigidly secured to the frame C, a bolt C^2 passing through the hole C^4. The frame C extends forward or out from the shaft A′, and has pivoted thereto by the pin D′ the swinging grasper frame D.

The hollow spindle H (see Fig. 10) is journaled in the forward end of the knotter frame G, and revolves freely therein, the plate H′ resting upon the top of the knotter frame G. The spindle H carries on its lower end the plate h, or detaching hook, and the bevel pinion H^2 is secured to the upper end of the spindle H. The hollow spindle J, passes through the hollow spindle H, and the bevel pinion J′, which is secured to the spindle J, forms a continuation of and rests upon the bevel pinion H^3 on spindle H. A plate or shoulder J^2, similar to plate H′ is secured to the spindle J, and has the projection j. To the lower end of the hollow spindle J is secured the hook J^3, and the detaching hook h secured to the lower end of the spindle H, rests upon the upper surface j^5 of the hook J^3, and is flush with the shoulder j^2 formed on the hook J^3. The hook J^3 is formed with the notch j^6, the projection j^3, and the beveled hook j^4, at its forward end and on its under side. The spindle K (Fig. 8) turns within the hollow spindle J, and its shoulder k rests

upon the plate J^2 of spindle J. The arm K^3 is pinned securely to the spindle K, and projects downwardly at K^2. A strong spiral spring K^5 is secured to the projection *j*, on the spindle J, and surrounding the upper end of the spindle K, is also secured to the arm K^3. The lower end of the spindle K is formed or provided with a hook K′, having a notch K^6 corresponding to the notch j^6 in hook J^3 and the upper face of the hook K′ bears against the under side of the hook J^3, and the spiral spring K^5 forces the forward end K^4 of hook K′ up against the hook j^4, the spindle K, turning freely within the hollow spindle J. The straight vertical edges of the plates H′ and J^2 resting respectively on the circular tracks b^3 and b^4, prevent the spindles to which they are secured from revolving except when the pinion H^2 and J′ come in contact with the racks b^2 b', when the tracks are cut away. It will be noticed from an inspection of Fig. 1, that as the disk B, revolves the rack b' will come in contact with the pinion J′, before the rack b^2 is in mesh with the pinion H^2, and that the pinion H^2 will be revolved after the pinion J′ has ceased to revolve; and that in this way the hooks J^3 and K′, which through the tension of the spring K^5 revolves with J^3, will be started in advance of the stripper *h*, which will continue to revolve after the hooks J^3 and K′ have come to rest in order to strip the knot formed around the hooks therefrom. The downwardly extending portion K^2 of the arm K^3 takes into the opening b^5 as the disk B revolves, and inasmuch as the rack b' by which the pinion J′ is driven is nearer the periphery of the disk than the opening b^5 is, it is evident that the revolution of the spindle K will be retarded, and the spiral spring K^5 be compressed and that the hook J^3 will advance ahead of the hook K′, until the opening b^5 has passed the arm K^2, when the spring K^5 will again force the forward end K^4 of the hook K′ up against the hook j^4. In order that the bands may be by the tucker pushed between the upper and lower hooks of the knotter the following mechanism is employed to separate the hooks. The lower hook is caused to revolve with the upper hook by means of the spring connection between the driving pinion of the upper hook and the spindle of the lower hook. The parts are so timed that when the knotter has made about three quarters of one revolution the portion K^2 of the arm K^3 overtakes the opening b^5 in the disk, and strikes against the side of the opening. This it is enabled to do inasmuch as the arm K^3 projects beyond the knotter driving pinion, and the portion K^2 will consequently thereby move faster than the pinion, and for the further reason that the opening b^5 is farther toward the center of the disk than the rack by which the knotter pinion is driven and consequently moves slower. It is evident therefore that the portion K^3 will enter the opening b^5 and striking against the side thereof, will consequently be delayed thereby, and the spiral spring K^5 will be compressed; and during such delay the upper hook will advance ahead of the lower hook. During this separation of the hooks J^3 and K′ the grasper ends of the band have been placed between j^4 and K^4, (see Fig. 3^a) as will be more fully hereinafter pointed out.

F is the tucker. It is pivoted on the stud G′, secured in the knotter frame G, and has the curved arm f^3 extending around in front of the knotter, and the heel f^2, which at the proper time is depressed by the lug b^6 on the periphery of the disk B, to elevate the arm f^3, and tuck the strands of the band which rest upon its upper surface between the hooks J^3 and K′.

The grasper frame D is pivoted as before stated to the frame C at D′. Its lower end (see Figs. 2 and 5) is formed with the shoulder e^2, over which the bifurcated hooked beveled end of the grasper E passes, one of the forks *e e* passing each side of the shoulder e^2. The side of the grasper frame adjacent to the knotter is provided with the knife L, and the fork *e* adjacent to the knife, as it is moved up against the grasper frame, severs the band against the knife, the band having been caught by the hooked forks *e e*. The grasper frame D has at its lower end adjacent to the knotter the projecting piece *e′* secured thereto, and the projection *e′* has the notch e^3, in which the band rests, when the grasper frame has been swung up toward the knotter, in order that as the grasper E is moved outwardly from the frame D, it will not push the band with it, so that the hooked forks *e e*, when the grasper E is swung in toward the frame D, will not catch the band which is to be severed and held in the grasper for the succeeding bundle. The grasper E is pivoted at D^2 to the grasper frame D, and has a swinging movement toward the knotter with the frame D, and is also swung transversely to the movement of the frame D. The grasper frame D has a projection d^4, through a hole in which the pin d^2 freely passes, and the grasper E is also formed with a ball projection which takes into the socket d^5 in the head of the pin d^2. A spiral spring *d′* is interposed between the head of the pin d^2 and the projection d^4 on the frame D, and its action is to force the grasper E, up against the grasper frame. It will be noticed from an inspection of Fig. 2, that when the grasper E is moved away from the frame D, the points D^2, d^5 and d^4 are more nearly in line than when the grasper is closed. In the former case the force of the spring *d′* is exerted directly toward the pivot D^2 and in the latter away therefrom. The spring thus exerts its greatest force when the grasper is closed, and the force necessary to overcome the action of the spring decreases as the grasper is opened. The grasper E carries on its upper end above its pivot D^2, a friction roller D^4, which rides on the forward face of the disk B, near its outer edge, and so as to be actuated by the

cams b^9 and b^8. The arm D^5 of the frame D also carries a friction roller d^3 which rides between the cams b^7 b^{10}, on the forward face of the disk B. The office of the friction roller and cams b^7 b^{10} is to move the grasper frame up toward the knotter to give sufficient slack to wrap the hook; and that of the roller D^4 and cams b^8 b^9 to open and close the grasper. The cam b^8 stands out from the face of the disk B, and the friction roller rides over the cam b^9 to open the grasper and then between the face of the disk and the cam b^8 to close the grasper; so that the grasper is both opened and closed positively. Ordinarily the spring d' would close the grasper but I prefer to employ positive mechanism to both close and open it.

The operation of my invention is as follows:—Suppose the devices to be in position as represented in Fig. 1; the binding cord being held between the shoulder e^2 on the frame D, and the grasper E, and passing up over the grasper E, over the stripper h, which is somewhat in advance of the hook J^3, and down through the needle arm and the tension device. The grain is forced against the band and a trip mechanism, constructed in any suitable well known way, until enough has accumulated to impart motion to the shaft A, which causes the binder arm to rise and encircle the gavel with the band placing it over the detaching hook h, which rests on the hook J^3. As the disk B revolves the plates H J^2 ride upon the tracks b^3 b^4, and the pinions H^2 J' do not revolve, until the rack b' comes in mesh with the pinion J', the hooks J^3 and K' start to revolve ahead of the stripper h, and the bands are caught in the notches in the hooks. The projection j^3 then carries the bands leading from the knotter to the grasper over the bands around the bundle, the bands leading to the grasper slipping down under the knotter, and the grasper frame D being moved up toward the knotter by the cams b^7 b^{10} and friction roller d^3. The rack b^2 comes in contact with the pinion H^2 and the stripper hook h commences to revolve. The arms K^2 taking into the opening b^5 the revolution of the spindle K is retarded and the hook J^3 advances ahead of the hook K', the opening between the hooks being opposite the grasper, so that the projection b^6 at this time depressing the heel f^2 elevates the arm f^3 of the tucker F, and pushes the bands between K^4 and j^4, and when the arm K^2 has been released from the opening b^5, the spring K^5 again moves K^4 up against j^4, clamping the bands between them. After the pinion J' has ceased to revolve the rack b^2 is still in mesh with the pinion H^2, and the stripper continues to revolve past the hook J^3, in order that it may push the loop off the hook and over the ends of the band held between j^4 and K^4, the under face of the hook K' being flush with the hook j^4, in order that the loop may slide therefrom. At the proper time during the revolution of the knotter hook and the formation of the knot, the roller D^4 coming in contact with the cam b^9 the grasper E is swung outwardly releasing the old end of the band and the forks e e pass over the main band now lying in the notch e^3 and the cam b^8 then swings the grasper jaw E in the reverse direction closing it, and the main band is caught by the hooks e e, severed against the knife, and held for the succeeding bundle over the shoulder e^2. The discharging arms a^2 have during this operation been moved up over and behind the gavel and on their further revolution eject it from the machine, pulling the ends of the band from between j^4 and K^4; the needle arm descends and the machine is brought to rest ready for the succeeding bundle.

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

1. The combination with the knotter hook, its spring jaw formed with a projecting arm, and the stripper, of the knotter driving disk, formed with the segmental racks to revolve the knotter in advance of the stripper, and to continue the revolution of the stripper after the knotter has ceased to revolve, and an opening in the knotter driving disk into which the projecting arm of the spring jaw takes to retard the revolution of the spring jaw of the knotter, substantially as and for the purpose described.

2. The combination with the knotter hook and its spring jaw, of the knotter driving disk, its segmental rack for operating the knotter, the projecting arm of the spring jaw of the knotter, the opening in the disk for retarding the revolution of the spring jaw, the tucker and a lug on the periphery of the knotter driving disk to operate the tucker, substantially as and for the purpose specified.

3. The combination with the hollow spindle of the stripper hook and its pinion, of the hollow knotter hook spindle revolving or turning in the spindle of the stripper hook, and provided with a pinion, of the spindle of the spring jaw of the knotter turning within the spindle of the knotter hook, the knotter driving disk and its racks to engage the pinions of the knotter and detaching hooks substantially as and for the purpose specified.

4. The combination with the knotter driving disk, and the knotter supporting frame, of the grasper frame pivoted thereon, an inwardly extending arm on the grasper frame, a cam groove on the disk into which the arm takes to positively reciprocate the grasper frame, the grasper jaw pivoted to the grasper frame transversely to the movement of the latter, and a cam on the driving disk to positively open and close the grasper jaw, substantially as and for the purpose specified.

5. The combination with the knotter driving disk and the knotter supporting frame, of the grasper frame pivoted thereon, an inwardly extending arm on the grasper frame, a cam groove on the disk into which the arm

takes to positively reciprocate the grasper frame, the grasper jaw pivoted to the grasper frame transversely to the movement of the latter, a cam on the driving disk to positively open and close the grasper jaw, and a spring interposed between the pivoted grasper jaw and the grasper frame, to hold the grasper jaw closed during the formation of the bundle, as specified.

6. The combination with the knotter, its spring jaw and the projecting arm of the latter, of a stop against which the arm of the spring jaw abuts to delay the rotation of the spring jaw, the tucker, the swinging grasper frame, and its transversely pivoted grasper jaw, the knotter driving disk formed with a segmental rack to operate the knotter, a lug to operate the tucker, a cam to swing the grasper frame, and a second cam to operate the grasper jaw, substantially as and for the purpose specified.

7. The combination of the grasper jaw pivoted to the grasper frame, the pin sliding through a projection on the grasper frame, and a spring surrounding the sliding pin and interposed between its head articulating by a universal joint with the grasper jaw, and the projection on the grasper frame, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand this 21st day of February, 1888.

WATSON M. HOLMES.

Witnesses:
DANFORTH GEER,
HUGH POMEROY BLACKINTON.