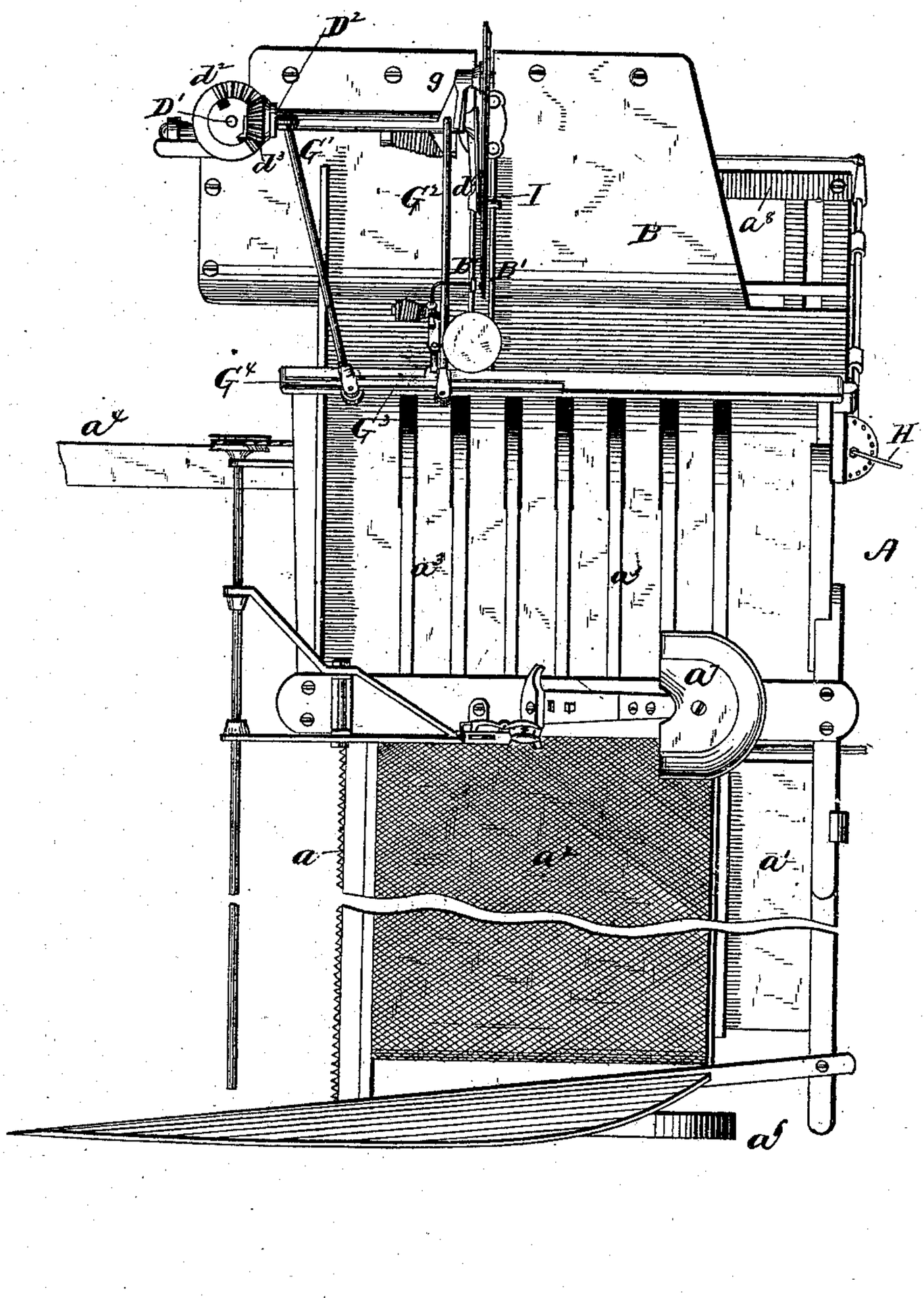
5 Sheets—Sheet 1.

S. D. LOCKE.
Harvester Binder.

No. 238,939. Patented March 15, 1881.

Fig. 1.



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W. Blackstock.

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Sylvanus D. Locke
by Le. Hill
His Attorney.

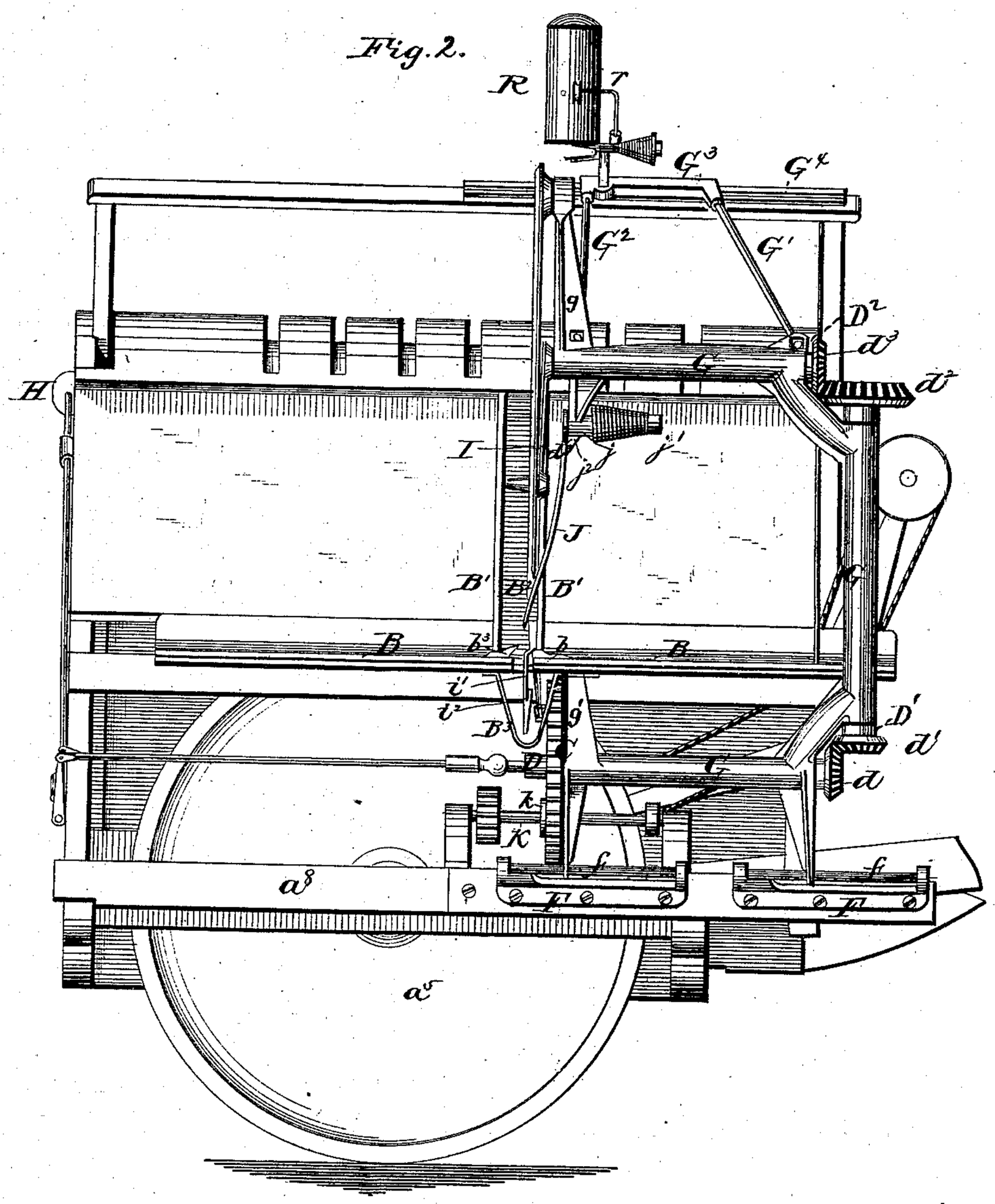
5 Sheets—Sheet 2.

S. D. LOCKE.

Harvester Binder.

No. 238,939. Patented March 15, 1881.

Fig. 2.



WITNESSES

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W. Blackstock.

INVENTOR

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By Le. Hill,

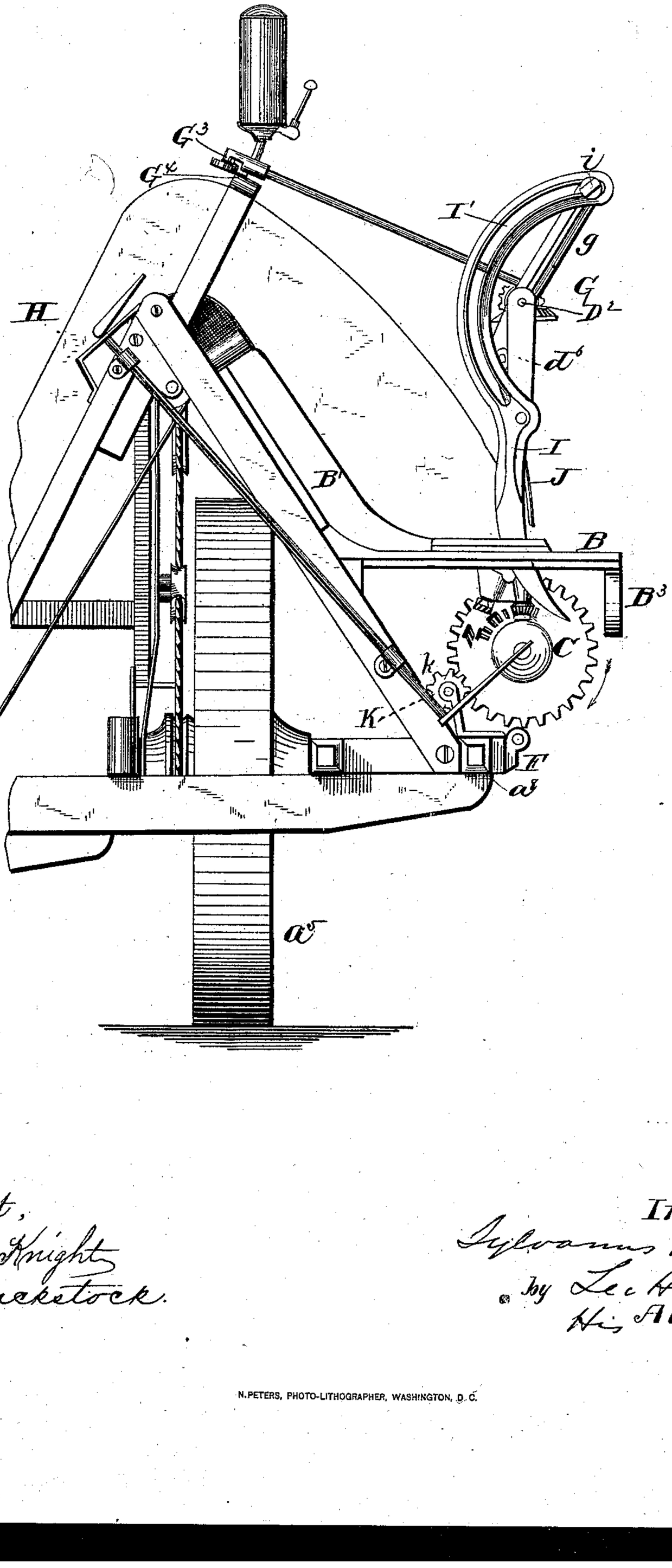
His ATTORNEY.

5 Sheets—Sheet 3.

S. D. LOCKE.
Harvester Binder.

No. 238,939. **Patented March 15, 1881.**

Fig. 3.



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5 Sheets—Sheet 4.

S. D. LOCKE.
Harvester Binder.

No. 238,939. Patented March 15, 1881.

Fig. 4.

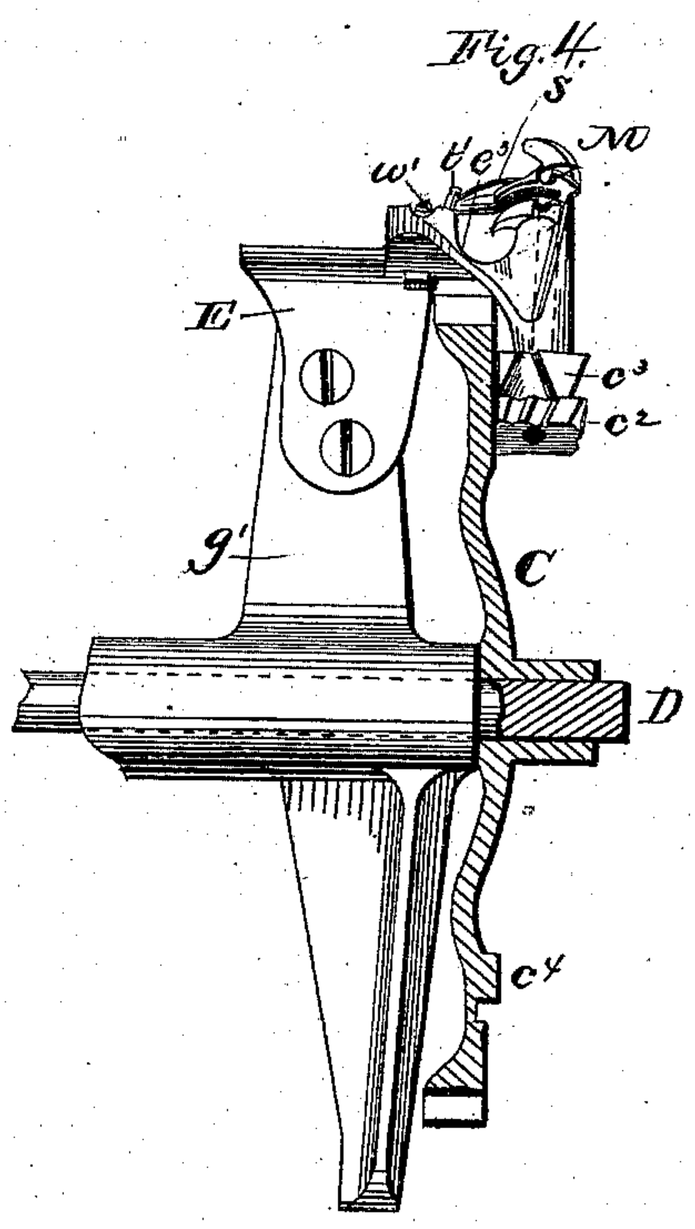


Fig. 5.

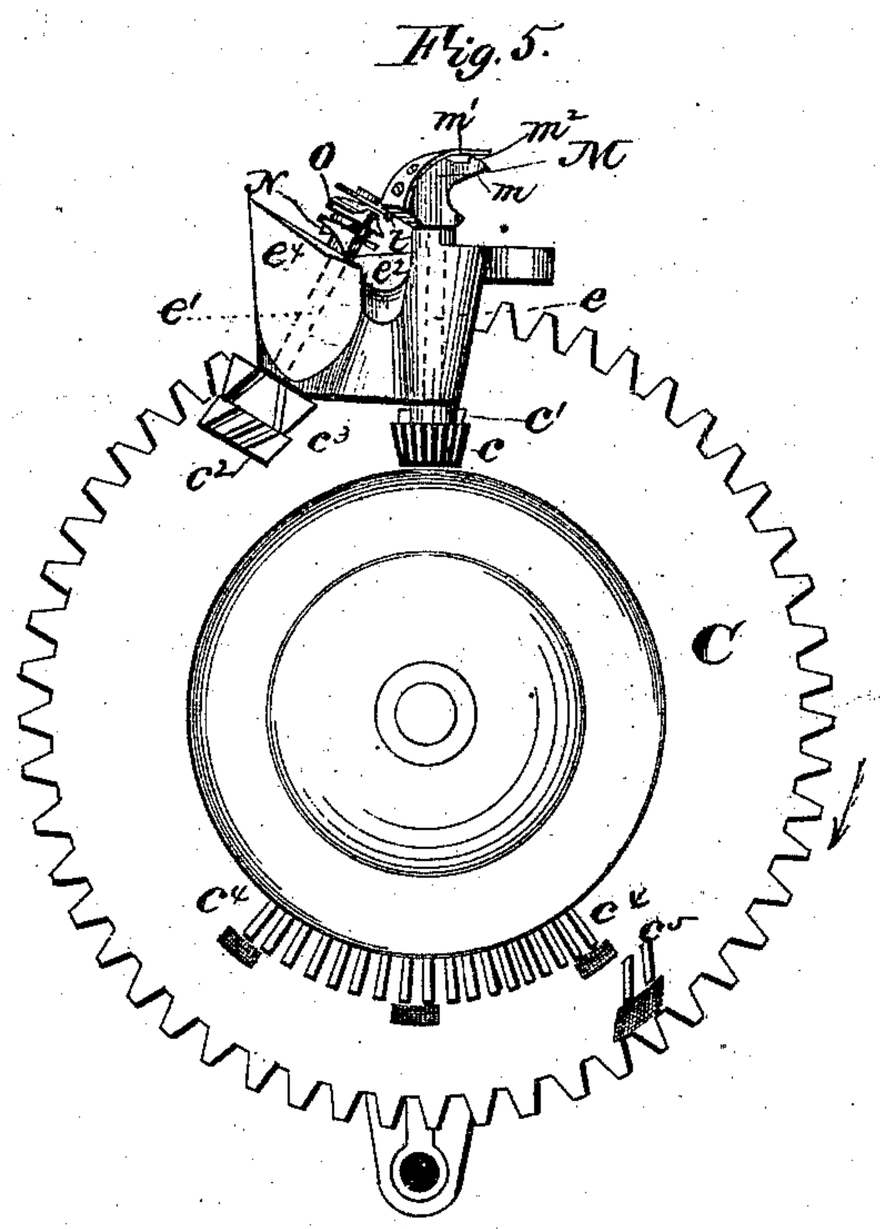


Fig. 6.

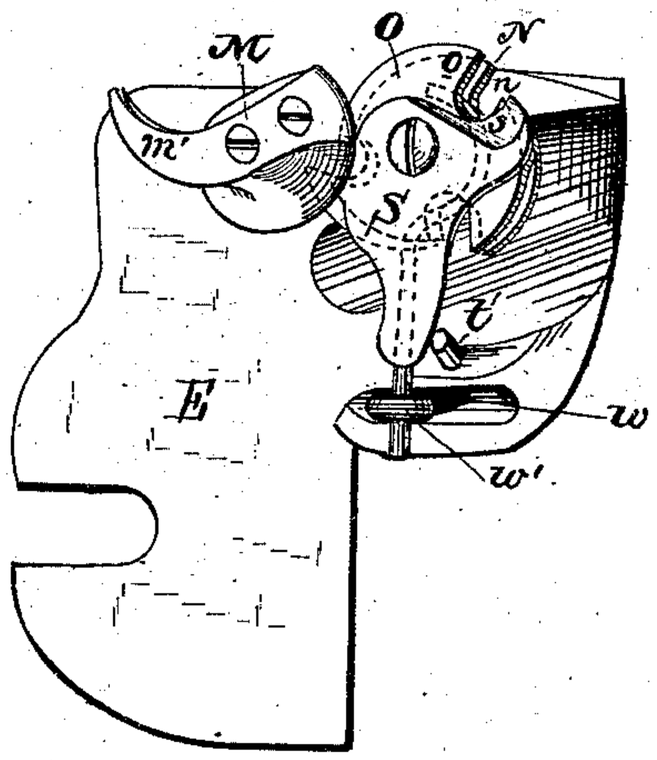


Fig. 7.

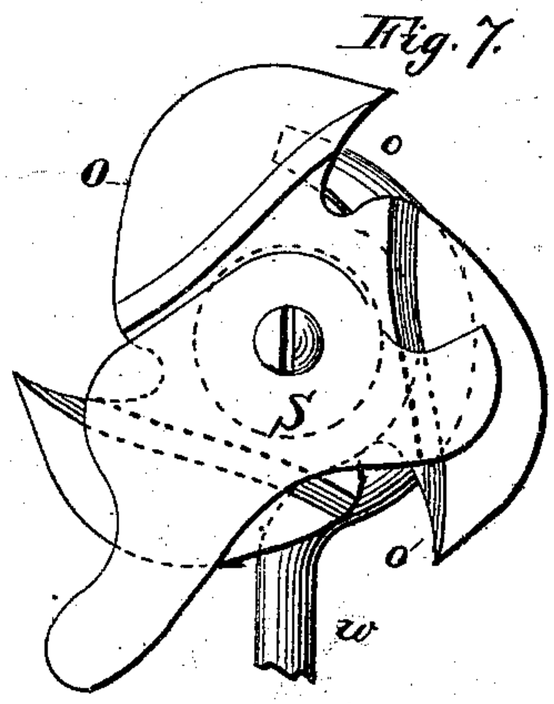
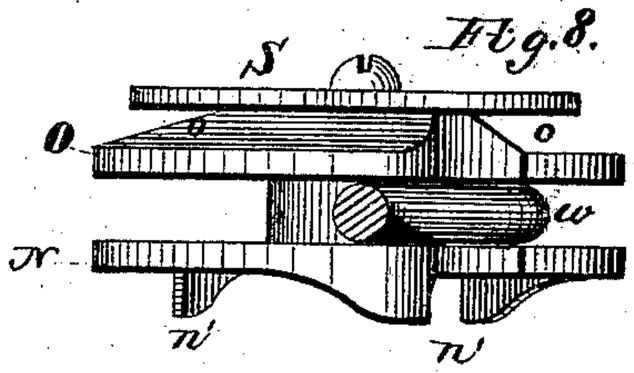


Fig. 8.



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by L. Hill,
His Attorney.

5 Sheets—Sheet 5.

S. D. LOCKE.
Harvester Binder.

No. 238,939. Patented March 15, 1881.

Fig. 9.

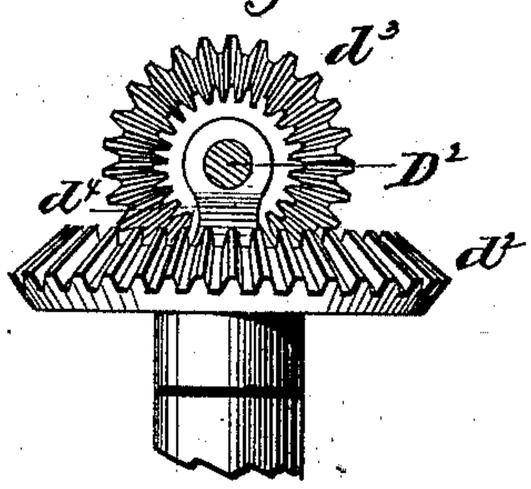


Fig. 10.

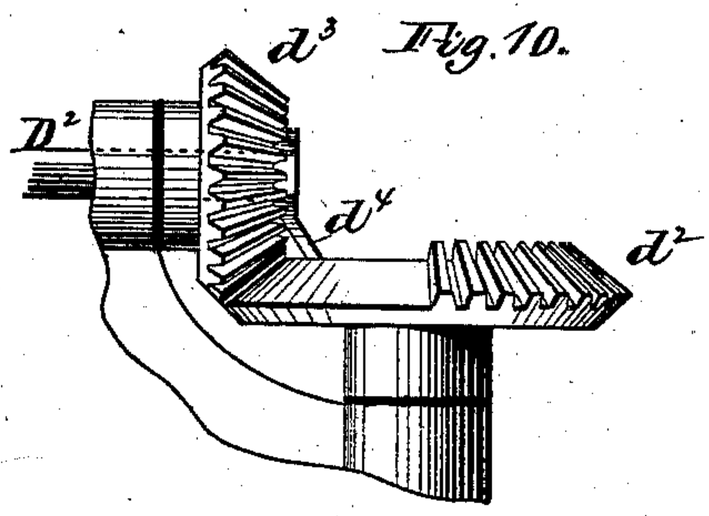


Fig. 12.

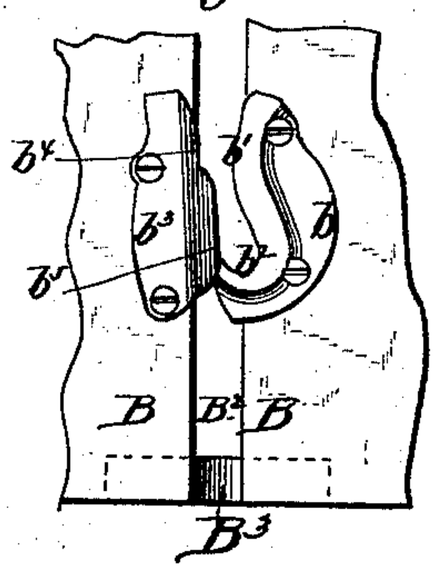


Fig. 11.

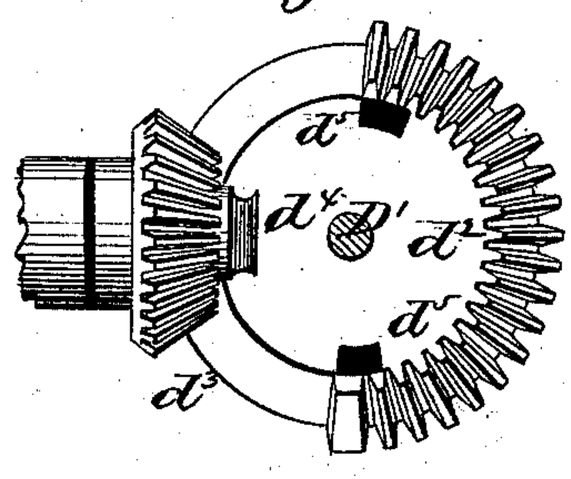


Fig. 13.

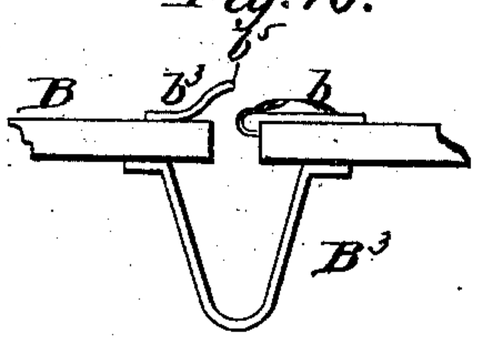
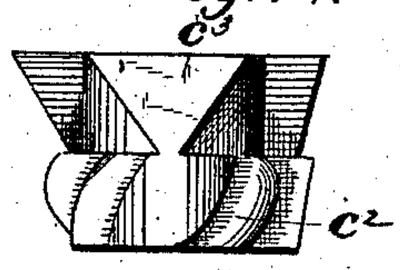


Fig. 14.



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W. Blackstock.

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Sylvanus D. Locke,
by Le Huie
His Attorney.

UNITED STATES PATENT OFFICE.

SYLVANUS D. LOCKE, OF HOOSICK FALLS, NEW YORK.

HARVESTER-BINDER.

SPECIFICATION forming part of Letters Patent No. 238,939, dated March 15, 1881.

Application filed June 17, 1879.

To all whom it may concern:

Be it known that I, SYLVANUS D. LOCKE, of Hoosick Falls, in the county of Renssalaer and State of New York, have invented a certain new and useful Improvement in Harvester-Binders; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top-plan view of a harvester provided with my improvements. Fig. 2 is an end view of the same. Fig. 3 is a rear view of a portion of the same. Figs. 4, 5, and 6 are views of the looping, tying, and cutting mechanism. Figs. 7 and 8 are detail views of the rotating holding disks and cutter. Figs. 9, 10, and 11 are views showing the gearing by which shaft D^2 is driven from shaft D'. Figs. 12 and 13 are detail views of the plates b b^3, and Fig. 14 is a view showing the construction of the gear-wheel c^2 and delay-surfaces c^3.

Similar letters of reference denote the same parts in the several figures.

This invention relates to that class of automatic grain-binding machines in which a cord or flexible band is applied around the gavel and secured by a knot; and it consists, first, in an improved combination of devices for actuating and controlling the movements of the band-carrying arm or needle; secondly, in an improved cord-holding mechanism; thirdly, in an improved mode of operating the cord holding and tying mechanism; fourthly, in the devices for carrying said last-mentioned mode of operation into practice; fifthly, in an inclined or oblique rotary holding plate or device combined with a rotating tying-hook, whereby the inclination of the cord-holder presents the cord properly to the hook; sixthly, in an improved construction of the driving-wheel, to adapt it to the inclined holding device and the rotary hook; seventhly, in the mode of operating the reciprocating knife or cord cutter by means of the rotation of the tying-head; eighthly, in the combination of a rotating tying device and a rotating cord holder or clamp with a rotating driving-wheel, whereby both the tying device and the cord-clamping device are actuated directly by one and the same driving-wheel; ninthly, in a band-carrying arm having a movement to encompass the gavel with the band, a delay or rest to allow the clamping, tying, and cutting mechanism to operate, and then a farther forward movement to complete the knot, release it from the tying mechanism, and discharge the bound gavel from the machine; tenthly, in the combination of the band-carrier with a peculiar gateway and cord-detent; eleventhly, in the combination of the looping and tying devices and guides, with mechanism for moving the gavel therefrom and thereby completing the knot.

In the drawings, A represents the harvester, which, in the form here shown, contains the usual cutter a, the platform a', an endless apron-carrier a^2, an elevator, a^3, draft-tongue a^4, carrying-wheels a^5 a^6, driver's seat a^7, and binding table or platform B, these several parts, with their necessary and usual accessories, being of any approved form and construction.

Upon an offset, a^8, of the harvester-frame there are attached, by screws or otherwise, two castings, F F, supporting traveler-rods f f. An adjustable frame, G, is mounted upon and guided by said rods, the purpose of which frame is to support the binding-platform B, the band-carrying arm, and the binding and tying mechanism, and enable them all to be adjusted with relation to the length of the grain or its position on the binding-table. This frame and its traveler-rods are not claimed herein, for the reason that they are shown and claimed in other pending applications filed by me for Letters Patent thereon. By means of a lever, H, the driver, from his seat, slides the frame G back and forth upon the traveler-rods, and as the binding-table is supported by the frame G and secured thereto it is adjusted back and forth with said frame, and thus always maintains the proper position relative to the binding mechanism. The top of the frame G is stayed by braces G' G^2, extending to a sliding plate or block, G^3, guided by a rail, G^4, on the top of the harvester-frame; but said braces and guide-plate are not claimed herein because claimed in another of my pending applications for Letters Patent.

C is the main driving-wheel, which actuates the holding and tying mechanism and the

band-carrying arm. It is continuously rotated in the direction of the arrow, by means of circumferential cogs meshing into a sliding feathered pinion or trundle, *k*, on a shaft, K, which, in turn, is driven by any suitable connection to the main power shaft or wheel of the harvester. The sliding pinion *k* automatically adjusts itself on its shaft to the position of the main wheel C, as the latter may be, from time to time, moved back and forth by the lever H. The shaft D of wheel C passes horizontally through the lower arm of the frame G, and, projecting at the angle or corner thereof, is provided with a bevel-pinion, *d*. The latter meshes into a similar pinion, *d'*, on the lower end of a vertical shaft, D', which has its bearings in the upright part of the frame. At the upper end of the vertical shaft is another bevel-gear wheel, d^2, having only a mutilated gear-rim, which drives intermittingly a bevel-gear, d^3, on the end of a horizontal shaft, D^2, having its bearings in the upper arm of the frame. The bevel-gear d^3 is provided with a delay-plate, d^4, to hold it from rotating except when actuated by the gear-teeth on wheel d^2. Openings d^5 are made through the wheel d^2, to permit said delay-plate to go into and out of engagement, and to allow any dirt or dust that may lodge on the wheel d^2 to drop through and escape, instead of clogging the gears. At the opposite end the shaft D^2 is provided with a crank, d^6, which actuates the band-carrying arm I. The latter is curved, as shown, and is, at its upper end above the crank d^6, constructed with a curved and slotted extension, I', into or through the slot of which extends a headed bolt or pin, *i*, from an upright standard, *g*, of frame G, extending above the axis of the crank d^6. The pin *i* and crank-shaft D^2 are arranged nearly or quite in the same vertical plane, from which arrangement several advantages result—viz., first, in that the needle-arm and the standard of the frame are prevented from projecting laterally or horizontally and catching against fences or other obstacle which might inflict damage; secondly, in that the binding-table can, with this arrangement, be constructed narrower and more compact than heretofore; and, thirdly, in that the vertical arrangement of the operating-crank and controlling guide-pin above it impart to the needle or band-carrying arm a peculiar sweep or movement not otherwise attained.

A grain-separator and compressor, J, oscillating on an arm, *j*, and held back normally by a spring, *j'*, against a stop, j^2, serves to compact the gavel and to separate the old gavel from the new one about to be formed; but, as this device is described and claimed in another pending application filed by me, it is not claimed herein.

The looping and tying mechanism is supported upon a bracket, E, formed upon or affixed to an upright standard, *g'*, projecting up from the lower part of the frame G by the side of the wheel C. This bracket extends over the top of the wheel and down on the opposite side thereof, as shown, and is provided with two bearings, in which are arranged two small shafts, *e e'*, both projecting at their upper and lower ends from their bearings. The shaft *e* carries the tying-head M at its upper end and a gear-wheel, *c*, and delay-plate *c'*, at its lower end. The shaft *e'* carries the holding and cutting devices at its upper end and a gear-wheel, c^2, and two or more suitable delay-surfaces, c^3, at its lower end. The gear-wheel *c* is driven by a long gear-rim, c^4, on the side of wheel C, and the gear-wheel c^2 is driven by gear-teeth c^5, arranged on the same side of said wheel, but preferably farther from its center, suitable recesses being provided for the delay-surfaces. The bearing of shaft *e* is longer than that of shaft *e'*, so as to bring the lower end of the looping and tying head nearly on a line with the upper end of the holding and cutting device, and between the upper ends of the two bearings. The bracket E is recessed or concaved, as shown at e^2, to prevent entanglement of the tying and holding mechanism with grain and fiber from the band, which obstructions are by this means allowed to drop and escape. The bracket E extends backward and upward, as shown at e^3, to prevent the cord from accidentally entangling with the holding mechanism.

The holding and cutting devices are constructed as follows:

N is a nearly-circular plate or disk affixed to the shaft *e'*, so as to rotate therewith, and provided with notches *n*, preferably three in number, and with angular under hanging flanges *n'* below its edges and immediately in front of the notches, the lower points or corners of said flanges just clearing the upper edge of the flange e^4 as the holding mechanism rotates. Above this disk, and separated from it by an annular groove or recess, is another nearly-circular disk, O, affixed to the same shaft and rotating therewith. This disk is provided with corresponding notches *o*, arranged, respectively, in line with the notches *n* of the lower disk. In each disk the corners of the metal at the rear edges of the notches project somewhat farther outward or from the center than the corners at the front side of the notches, so as to insure catching the cord and carrying it properly around as the holding device rotates.

A spring shoe or presser, *w*, secured to the bracket E by any suitable means—as, for example, by an eye-bolt, *w'*—extends to the shaft *e'*, and is hooked partially around the same in the recess or groove between the two disks in such manner that the pointed end of the presser shall be presented forward or toward the front shaft, *e*, on the side which is toward the path of the band-carrying arm and immediately behind the notch that is presented to receive the cord, the object of this shoe or presser being to clamp and hold the end of the cord.

A cutter, S, is pivoted on the end of the shaft *e'*, or centrally of the disk O, and is pro-

vided with a projecting knife-edge, *s*. This cutter is actuated by a spur, *t*, under the looping-head, and is limited in its movements by a stop-pin, *t'*, projecting from the bracket E, as shown.

The looping and tying head M is constructed in the form shown in the drawings, Figs. 5 and 6, and is provided with projecting fixed jaw *m*, and a thin spring-jaw, *m'*, extending over the fixed jaw and co-operating therewith to seize and hold the cross-strand of the loop while the loop draws off of the head, thereby drawing the cross-strand through the loop and forming the knot. To enable it to hold with greater certainty, one of the jaws may be provided with a minute spur or projection, m^2, which will partially obstruct the egress of the cord, but not sufficiently to prevent the escape thereof when the knot has been fully tied and the gavel is ejected from the machine.

The binding-table is provided with the usual guides B' B', slot B^2, and yoke B^3. Two metal plates, *b* b^3, are secured upon it at opposite sides of the slot, as shown. The plate *b* has an upwardly-inclined flange, *b'*, which extends partially over the slot, and it is also provided with a hook-shaped notch or shoulder, b^2, which is designed to arrest and hold the cord as the needle moves forward and present it properly to the clamping, looping, and tying mechanism beneath. The opposite plate, b^3, has an upwardly-inclined flange, b^4, which is elongated at b^5, so as to guide the band over toward the plate *b* and insure its engagement in the hook-notch b^2. The edge of the flange b^5, it will be observed, nearly covers the point of the hook forming the notch b^2, and to allow the needle or band-carrying arm to pass, the said arm is constructed with a bend or offset at *i'*, which runs under the flange b^5 and clears the projecting point at b^2, while the band, running through the end i^2 of the arm underneath, is drawn directly in line with the hook b^2, and its engagement therewith is assured. The two flanged plates *b* b^3 serve the further purpose of deflecting loose grain, dirt, &c., away from the slot and from the mechanism below, and, by nearly closing the slot above the said mechanism, they greatly conduce to the protection of the parts from the access of grain, straw, and other obstructions.

The cord is supplied and kept at the proper tension by any suitable means, the particular device here shown for such purpose being a cylindrical cord-holder, R, with spring tension-arm *r*, as described and claimed in another pending application filed by me for Letters Patent thereon.

The operation of this improved machine is as follows: The cord is first put through the end of the arm I, and its extremity is either held by the hand or is fastened to a pin or other suitable device on the band-carrying arm at or above the crank-connection. The machine is then operated, causing the arm I to descend into the slot B^2 and sweep forward to a point opposite to the tying mechanism, where it stops temporarily, by reason of the unmeshing of gear-wheels d^2 d^3. This movement of the needle or arm I brings the cord into one of the notches *n o* of the disks N O, or directly opposite to such notches. The tying-head then revolves, catching around over the cord, forcing it securely into the notches, and looping it around the head. Just as one revolution of the looper is completed the shaft *e'* and its disks N O begin to rotate, perform a part of a revolution equal to the distance between the notches, and stop, thereby forcing the cord under the presser *w*, which clamps it in the recess between the two disks. The movement of the mechanism, as described, bends the cord at an abrupt angle around and under the edge of the notch in the lower disk, and thus increases the friction upon it, and contributes to prevent its being afterward accidentally drawn out of the clamp. It will now be noticed that the axis of rotation of the disks N O is inclined to the axis of rotation of the looper, the lower edge of the disks being next to the looping-head. It will also be noticed that when the cord entered the notches *n o* said notches were at or near the lower edge of the disks and near the looper, so that the strand of cord was held so low that the rotating looper-jaws passed over it and it simply looped around the head; but now, by the rotation of the disks one-third around, or a distance equal to the distance between notches, as described, the strand has been raised so as to bring it in line with the opening between the looper-jaws, and the further revolution of the looper causes these jaws to seize said raised strand between them and carry it around with them to the end of their revolution. Immediately before they stop at the end of their revolution the spur *t*, under the looper-head, strikes the pivoted cutter S and causes it to sever the cord above the clamping-wire *w*, leaving the lower end of the cord clamped and held by such wire. The severed portion of the cord is then pulled out by hand and thrown away; or, if fastened to the arm, the progress of the latter will withdraw it; but as the loop draws off of the jaws it closes on the strand held between them, and thereby forms a secure knot in the waste piece thrown away. The machine is now put into the grain. The cut grain dumped by the conveyer upon the binding-table piles up against the separating and compressing arm J. The needle or band carrying arm I passes upward and backward over the grain and descends into the slot B^2, separating the quantity of grain necessary to form a gavel, and sweeping it forward against the compressor, which yields and lies against the front and upper side of the bundle, when the arm I arrives at the tying mechanism and stops as before. The two strands are now caught in the next succeeding notches *n o*; the looping-head revolves to loop them around itself; the holding-disks revolve, as before, to clamp and raise the cord; the jaws then come

around, seize it, and hold it; the cutter severs the cord above the disks, and the needle, commencing again to move forward, pushes onward the bound gavel, thereby drawing the loop from the looping and tying head and forming the knot in the band, as above described, after which the gavel, by the continued movements of the needle, is ejected or dropped from the machine. As the bundle passes out from under the compressing arm or rod J the latter quickly springs back, effectually separating the coming grain from the old discharging gavel, in which work it is aided by the inclined position and rising movement of the cord held by the end of the band-carrying arm. As the latter moves forward and upward the cord carried by it swings upward and backward over the inclined face of the retaining-shoulder into the notch b^2, whereby it is maintained in proper relation to the tying and holding mechanism during their subsequent operation.

The two opposing plates (b, with its flange b' and retaining-shoulder b^2, and b^3, with its flange b^4 and b^5,) taken together form a peculiar gateway through which the arm freely passes outwardly to discharge the bundle, and through which the binding-strand also freely enters to take position with reference to the band-securing mechanism, but from which position the said gateway, with its rigid walls, does not allow of escape.

It will be seen that by the simple expedient of inclining the rotary holding-disks or surface to the axis of the looper, I dispense with any independent device for raising or guiding the cord, and cause the mere rotation of said disks not only to clamp the cord, but to present it first in such position as only to loop around the head, and afterward in such position as to pass between the tying-jaws. This inclination of the holding to the looping and tying devices is an important feature of my invention, and I desire to claim it without limitation to the particular construction here shown, but as covering all structures where the principle is applied in substantially the same way—that is to say, where the inclination accomplishes the same result.

In the construction here shown one of the shafts, e, is arranged radially to the wheel C, while the other, e', is quite oblique thereto. Either or both of said shafts may be arranged obliquely, however, the inclination of the driving-cogs on wheel C and on the driven pinions being regulated according to the degree of such obliquity in every case. I do not, however, confine myself to driving the holding and tying mechanisms by this particular mechanism.

Inasmuch as the disks are provided with three sets of notches, n o, and therefore only move forward one-third of a revolution at a time, the driving-gear must be arranged accordingly, and the pinion of shaft e' is for that purpose divided into three oblique cog-segments, each having its appropriate delay-surface, as shown. The arrangement of the disks to turn half-way around, or to any other practicable extent, may be substituted for the one-third turn, if preferred; but the arrangement herein shown and described is recommended. A single disk and cutter, with any form of clamp, will, if inclined to the tying-head for the purposes described, be regarded as coming within the limits of my invention.

While I have shown the band-carrier as the device that not only draws the knot tight by moving the gavel away from the position occupied by it during the looping, but also ejects the bound gavel from the machine, it is evident that an independent ejector might be employed for this latter function.

By the term "continuously-rotating wheel C" I do not desire to be restricted to a driving-wheel which at all times is constantly in rotation, inasmuch as the essential feature is only that its rotation should be continuous during the looping and tying of the cord, and it is in this sense that I employ the expression herein.

I claim as my invention—

1. The band-carrying arm I, having the curved slotted extension I′ above the crank-pin, in combination with the crank d^6 and the pin or bolt i, arranged vertically, or nearly vertically, above the crank-axis, substantially as described.

2. The combination of the continuously-rotating driving-wheel, the shafts that connect it to the needle-crank, the intermittingly-operating gear-wheels d^2 d^3, the needle or arm I, having the curved slotted extension I′, and the pin or bolt i, arranged above the crank-axis, substantially as described.

3. The rotating looping and tying head and the rotating cord-holding device, combined and operating substantially as described, whereby the rotation of the cord-holding device raises and depresses the cord, so that the end of the looping-hook will engage with or clear it, as necessary, for the purpose of forming the knot.

4. A rotating looping and tying head combined with a rotating cord-holding device arranged with its axis of rotation inclined to that of the looping and tying head, so as to raise and depress the cord relatively to the latter, substantially as and for the purpose herein set forth.

5. The combination of the continuously-rotating driving-wheel, the two shafts e e', inclined to each other, the rotating holding-disks N O, the clamping device, and the rotating looping and tying head, substantially as described.

6. The combination of the rotary looping and tying head with the inclined guiding-disks N O, and with the clamping device, substantially as described.

7. The driving-wheel C, having the two lines or segments of lateral gear-teeth inclined to each other, for the purpose of intermittingly

driving the two oblique shafts, and having the cog-rim by which it is continuously driven, substantially as described.

8. The driving-wheel C, having the two lines or segments of lateral gear-teeth inclined to each other, and the delay-surfaces, in combination with the oblique twister and holder shafts and their pinions and delay-shoes, substantially as described.

9. The combination of a vibrating cord-cutter, a rotating looping and tying head, and an inclined rotary holding device, acting to raise and depress the cord relatively to the looping-hook and carry it into position to be severed by the cutter, substantially as described.

10. The combination of the radial-armed rotary holder, the vibrating cutter mounted in position to shear against the arms of said holder as they are intermittently brought around, and mechanism whereby the cutter is positively actuated in its movement to sever the cord.

11. The combination of the radial-armed rotary holder, the vibrating cutter mounted upon the axis of said holder, and the rotary tying-head, having a pin or projection which strikes said cutter and actuates it to sever the cord against an arm of the holder.

12. The combination of the rotary tying-head, the inclined rotary holding device by which the cord is presented to the action of the tyer, and a vibrating cord-cutter mounted upon the axis of the holder, and actuated by a pin or projection upon the head in the revolution of the latter to sever the cord.

13. The combination of a band-carrier having a final movement for discharging the bound bundle with a rotating looping and tying device, on which the ends of the band are looped, and a guide or support for retaining the ends of the band in a certain relation thereto, whereby the final movement of the band-carrier effects the completion of the knot and withdraws it from the tyer.

14. The combination of a band-carrier moving in its orbit outward beyond the band-securing mechanism with a guide or gateway, whereby the strand of cord or wire is directed upon its rearward swing to encircle a fresh gavel and stopped in position over the securing mechanism.

15. The guide or gateway consisting of the lower curved and hooked plate, secured to one side of the slot in the grain-table, and the upper overlapping curved plate, secured to the other side of said slot, substantially as described.

16. The combination of a rotating looping and tying device on which the ends of the band are looped, a guide or support for retaining the ends of the band in a certain relation thereto, and mechanism for moving the gavel away therefrom at the moment the strands are laid in position for forming the knot to effect the completion of the knot and withdraw it from the tyer.

17. The band-carrying arm I, having the lateral bend to adapt it to pass under the flanged plate b^3, substantially as described.

18. The flanged and notched plate b, in combination with the band-carrying arm, substantially as described.

SYLVANUS D. LOCKE.

Witnesses:
M. CHURCH,
W. BLACKSTOCK.