(Model.)

3 Sheets—Sheet 1.

L. MILLER.

GRAIN BINDER.

No. 249,656. Patented Nov. 15, 1881.

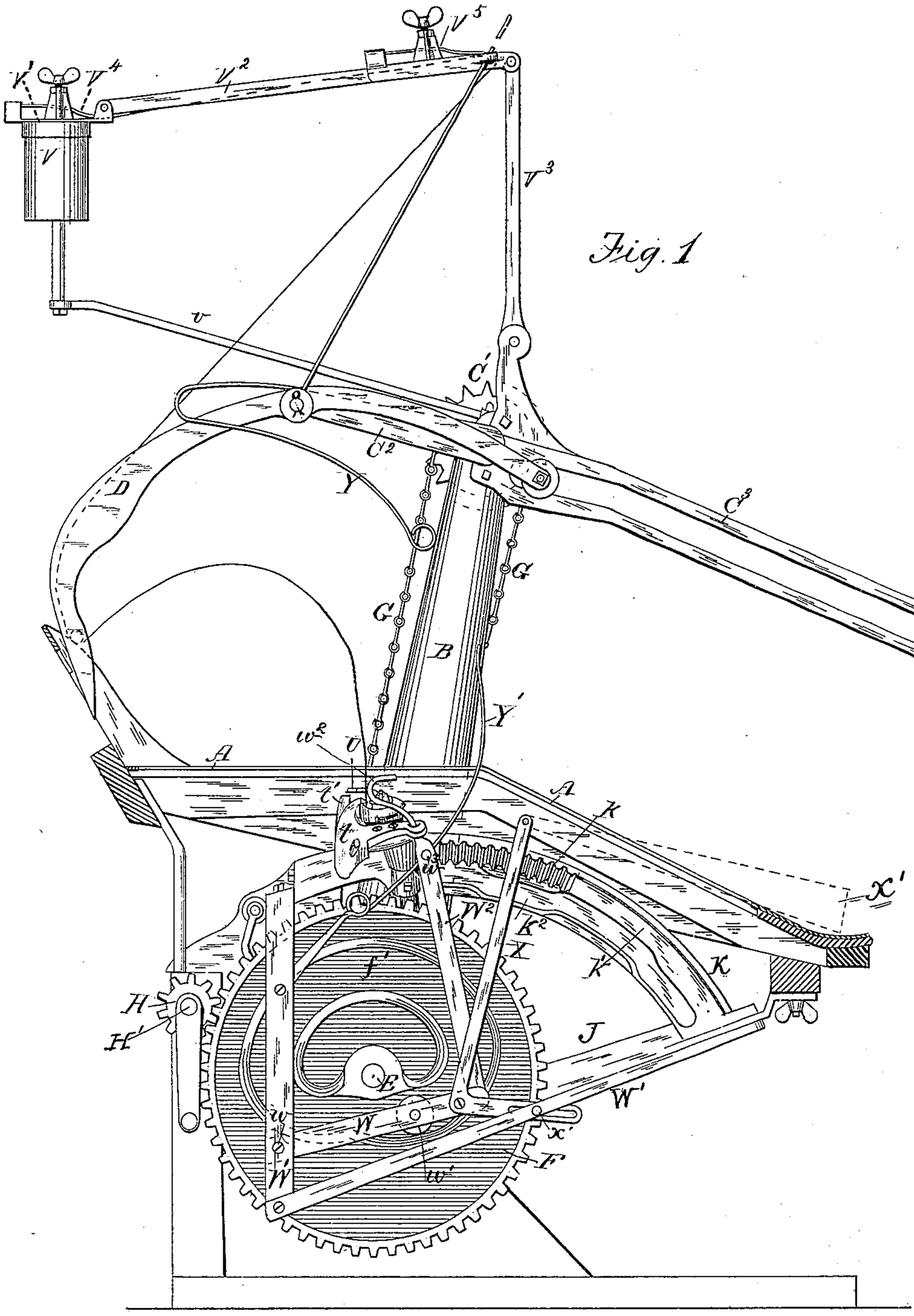

Fig. 1

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(Model.)

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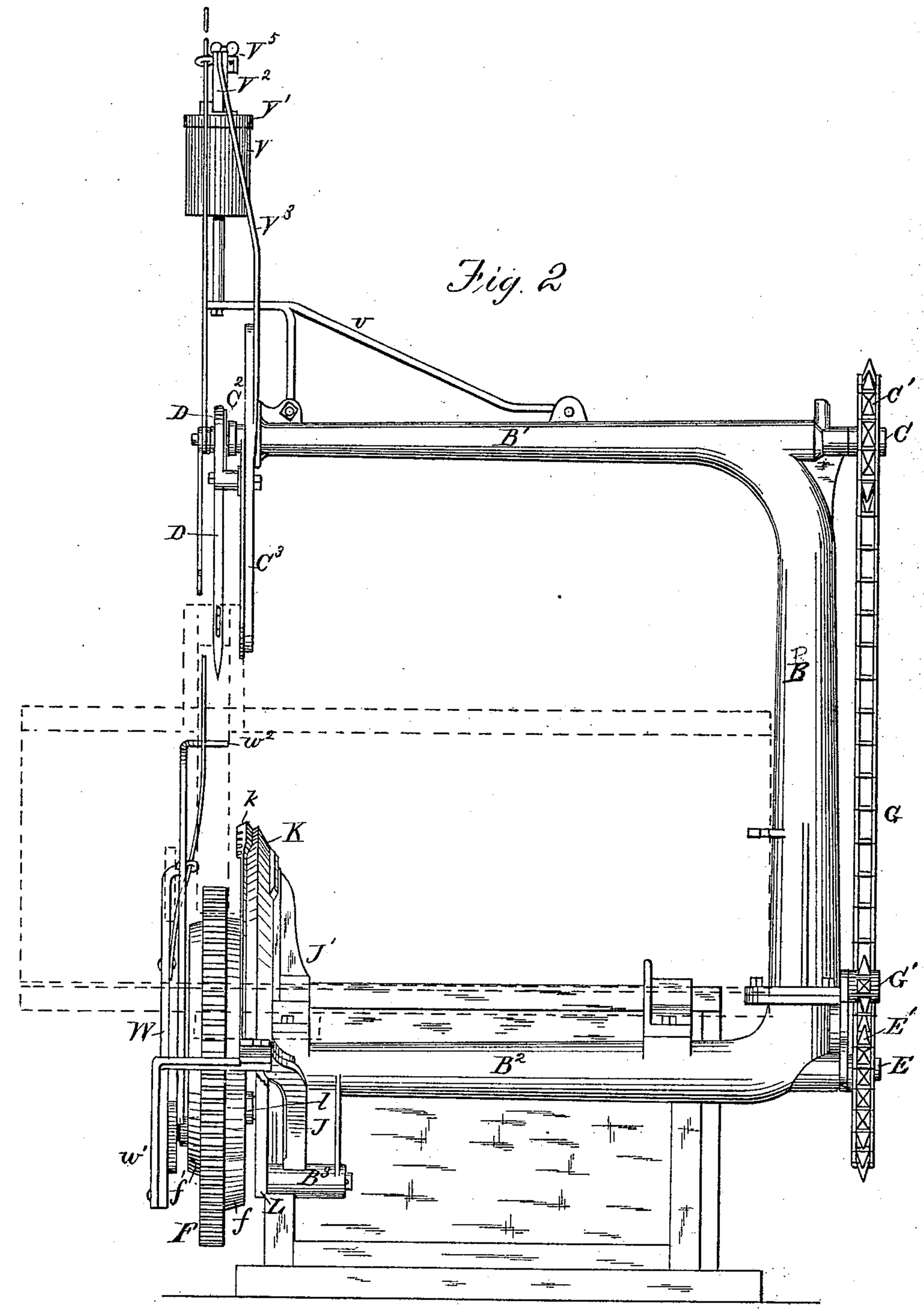
Fig. 2



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(Model.)

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GRAIN BINDER.

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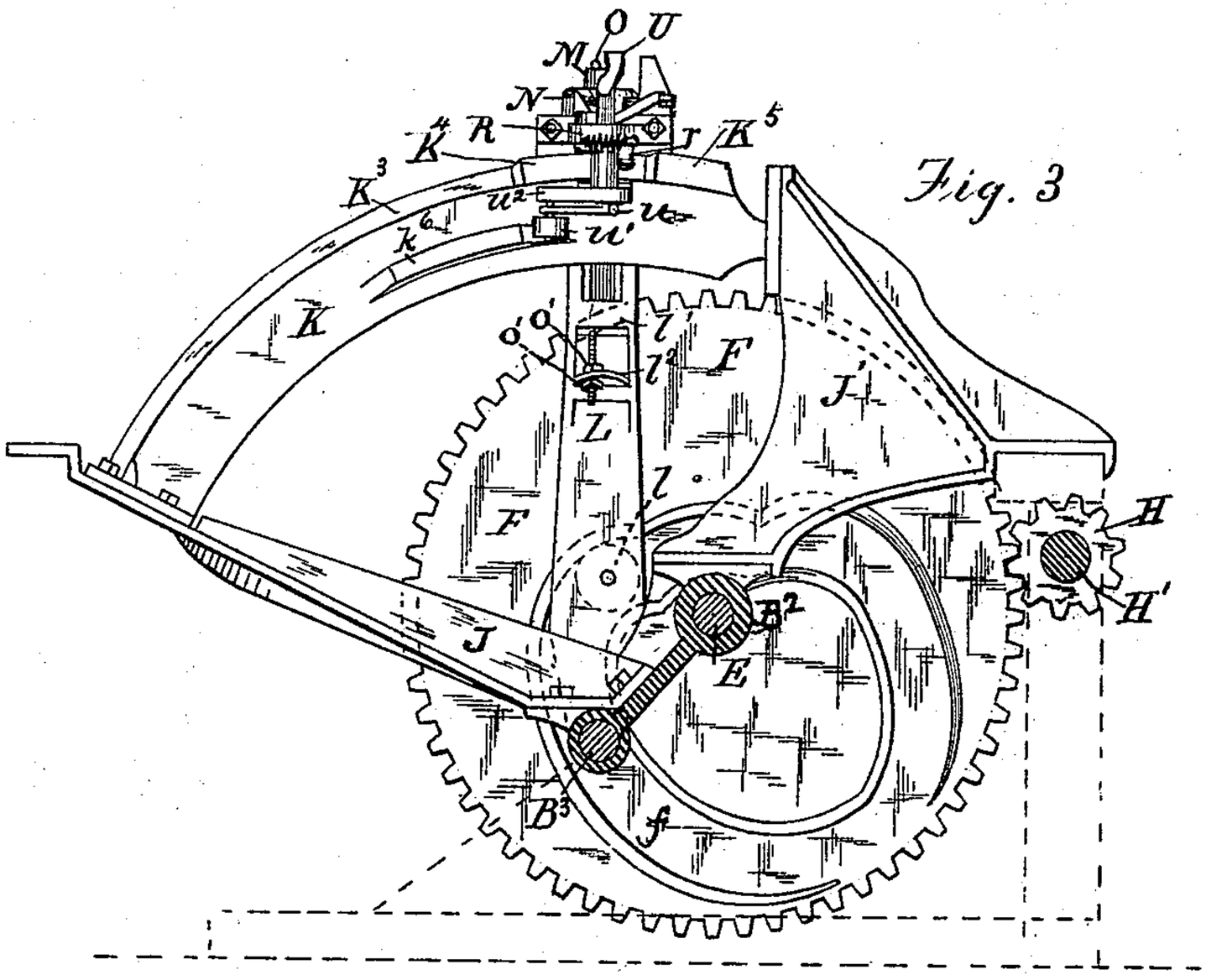

Fig. 3

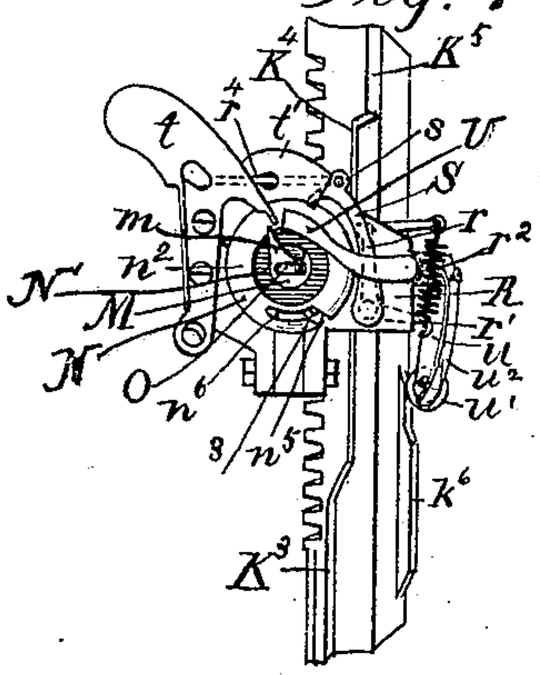

Fig. 4

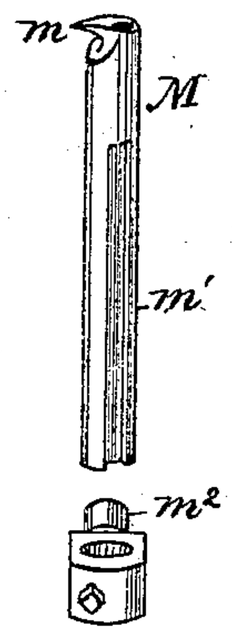

Fig. 5

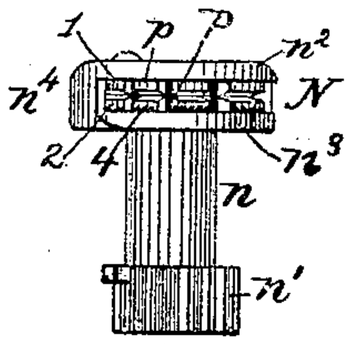

Fig. 6

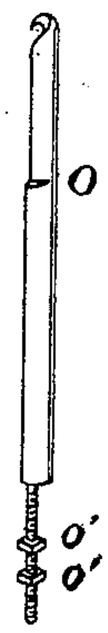

Fig. 7

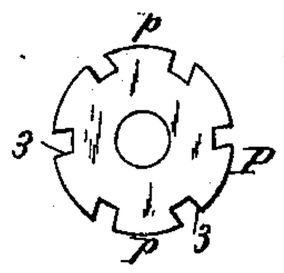

Fig. 8

WITNESSES

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UNITED STATES PATENT OFFICE.

LEWIS MILLER, OF AKRON, OHIO.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 249,656, dated November 15, 1881.

Application filed June 24, 1881. (Model.)

To all whom it may concern:

Be it known that I, LEWIS MILLER, of Akron, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Grain-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 an end elevation, the binding-table being represented in section. Fig. 2 is a side elevation. Fig. 3 is an elevation showing the opposite side of the looping and tying mechanism shown in Fig. 1. Fig. 4 is a top-plan view of the looping and tying mechanism. Fig. 5 is a side view of the non-rotating but vertically-sliding head. Fig. 6 is a side view of the rotating cord-carrying head. Fig. 7 is a side view of the stationary hook-bar. Fig. 8 is a plan view of the clamping and cutting plate.

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

This invention relates particularly to that class of grain-binders in which the grain is gathered and compressed into a bundle and the band applied at the side of the binding-platform where the grain is delivered, and in which the band is tied while the bundle is being swept over the platform on its way to be discharged from the machine.

The invention consists, primarily, in the novel construction of the mechanism for tying the band; secondly, in the novel construction of the gathering and compressing devices; and, thirdly, in certain improved details of construction and combination of parts, which will be hereinafter fully set forth.

In the drawings, A represents the binding-platform; B, a U-shaped metal frame, having one arm, B′, projecting over the top of the platform A, and the other arm, B^2, extending under said platform, as shown. The upper arm, B′, is made hollow and is adapted to contain a shaft, C, which carries upon its outer end a sprocket-wheel, C′, and upon its inner end a crank, C^2, on the wrist of which the binding-arm D is mounted.

C^3 is a slotted guide-arm for guiding and controlling the binding-arm when rotated by the crank. The lower arm, B^2, of the frame is also hollow, and is adapted to contain a shaft, E, which has on its outer end a sprocket-wheel, E′, and on its inner end a main actuating-wheel, F, for operating the tying mechanism. An endless drive-chain, G, passes around the two sprocket-wheels C′ and E′ and is kept at the proper tension by means of a tightening toothed wheel, G′, mounted in an adjustable arm on the frame.

H is a pinion gearing into the toothed periphery of the actuating-wheel and mounted upon a shaft, H′, to which rotation is given directly or indirectly by the main drive-wheel of the harvesting-machine, to which the binder is attached.

J J′ are two brackets bolted to the lower arm, B^2, of the metal frame, and supporting between them a curved segmental rack-bar, K.

L is a vibrating arm or lever, fulcrumed at its lower end in an offset, B^3, of the metal frame, and carrying upon its upper end the tying mechanism. This lever is adapted to be vibrated back and forth from end to end of the segmental bar K by means of a stud on its side, carrying a friction-roller, *l*, and engaging with a cam-groove, *f*, on the inner side of the actuating-wheel F, as shown in Figs. 2 and 3.

The principal elements of the tying mechanism are, first, a non-rotating but vertically-sliding head, M, around which the cord is wound to form the loop in the knot-tying operation; secondly, a rotating head or carrier, N, for catching the cord and winding it about the head M, to form the loop; thirdly, a central stationary bar, O, having a hooked upper end for grasping the strands of cord which lie across the loop and drawing them within the head M to complete the knot; and, fourthly, a combined cutting and clamping plate, P, co-operating with the head N to cut the cord and clamp and retain one end of the same. These several parts or elements are shown detached in Figs. 5 to 8, inclusive.

The rotary head or carrier N has a long tubular bearing, *n*, and is provided with a pinion, *n′*, at its lower end, which is adapted to engage with a series of teeth, *k*, on the segmental rack-bar K when the cam-lever is vibrated. There are about one and one-half as many teeth in the rack-bar as there are in the pinion, and, consequently, each time the pinion traverses

the rack-teeth the head N is rotated about one and one-half time to the right or to the left, as the case may be. Several of the teeth on one side of the pinion are cut partly away, as shown in Fig. 6, in order that they may slide in contact with a smooth track, k', on the segmental rack-bar when the pinion has left the rack-teeth and hold the pinion and the head N from further rotation. The head N has an upper flange, n^2, a lower flange, n^3, and a peripheral flange, n^4, uniting said upper and lower flanges and extending not quite half-way round the head.

Between the upper and lower flanges, and mounted loosely upon the shank of the vertically-sliding head M, is the cutting and clamping plate P, consisting of a central portion and a number of radial arms or projections, p p, &c., each of which is slotted or divided, so as to form an upper portion, 1, and a lower portion, 2, the former having a cutting-edge, 3, and the latter a series of notches or serrations, 4, in its under side, all as shown in Figs. 6 and 8.

A diagonal slot, n^5, is made in the head N through its top, bottom, and peripheral flanges, for the admittance of the binding-cord, and at the inner end of the slot there is formed a cutting-edge, n^6, which co-operates with one or the other of the cutting-edges 3 of the plate P, to sever the cord when the plate is held and the head is rotated, as will be hereinafter fully explained. The serrated side 4 of one or the other of the arms or projections p of said plate P operates to clamp and hold the end of the cord between it and the lower flange of the head N immediately after the severance of the cord takes place, as will be explained more at length farther on.

The head M has a laterally-projecting hook, m, provided with a long cylindrical shank, m', which extends down through the tubular shank of the head N and also through the portion l' of the vibrating lever L, as shown in Fig. 3. Below the pinion on the shank of head N the said shank m' has secured to it a laterally-projecting stud, which is provided with an inclosing friction sleeve or roller, m^2, which works within a cam groove or track, k^2, in the side of the segmental bar K, as seen in Fig. 1. As the vibratory lever is moved back and forth the stud, co-operating with the cam-groove, causes that longitudinal sliding movement of the head M which is necessary to the formation of the knot, as will appear farther on. The stationary central hook-bar, O, extends down through the head M and through a groove in the side of the shank of said head, and is secured at its lower end to a lug, l^2, on the lever L by nuts o' o'.

Journaled in a bracket, R, on the inside of the upper end of the lever L, is a pawl, S, the point s of which is adapted, at certain times, to engage with the plate P and stop its rotation, while the head N continues to rotate. To the shank of this pawl, under the bracket R, is secured a small bell-crank lever, one arm, r, of which is adapted to travel against a cam-track, K^3 K^4 K^5, on the inner side of the segmental bar K, while its other arm, r', is connected to a small spring, r^2, which operates to hold the arm r at all times in contact with the cam-track. The outer end of the pawl has articulated to it a bolt, r^4, which is adapted to play through perforations in two guarding and guiding flanges, t and t', as shown in Fig. 4. When the bell-crank lever of the pawl is engaged with the portion K^3 of the cam-track the bolt rests in the openings in both flanges, completely barring the passage between said flanges; but when said bell-crank lever is engaged with the portion K^4 of the track the point of the bolt is withdrawn from the flange t, but remains in flange t', and projected across in close proximity to said flange t. When, however, it is engaged with the portion K^5 of the cam-track the point of the bolt is retracted within the flange t' and leaves the passage-way entirely clear for the passage of the cord.

Journaled also in the bracket R is a finger, U, extending over the head N, the function of which finger is to guide the strands of cord into the groove beside the hook m of the head N and hold them there till the loop is completed. To the shank of this finger is attached a short crank, u, carrying a friction-roller, u', pressed normally toward the inner side of the bar L by a spring, u^2, but adapted to be thrown out at stated times, so as to vibrate the finger by engagement with a cam-projection, K^6, as shown.

The box-receptacle V, containing the binding-cord, is mounted upon a bifurcated support, v, extending from the upper part of the metal frame, and has a cover, V', to which is articulated an arm, V^2, which, in turn, is articulated to a second arm, V^3. The cord passes up through the cover of the box and under an adjustable spring-tension brake, V^4, thence under a second spring-tension brake, V^5, on the arm V^2, thence through a guide-loop on the said arm, thence over the back of the binding-arm and through an eye near the point of the same, and finally to the tying mechanism, where its end is securely held between one of the serrated surfaces of the plate P and the under flange of the head N, as before explained.

By the novel arrangement of the cover V' and arms V^2 and V^3 the stress on the cord applied to the arm V^2 operates to cause said arm to hold the cover firmly down in place and prevent it from working or being pulled off.

W is a lever, pivoted at w to a part of a frame, W', on the outer side of the main actuating-wheel, and having a friction-roller, w', mounted on a stud projecting from its inner side, and which works within a cam-groove, f', on the outer side of the main actuating-wheel. To this lever is articulated a bar, W^2, the upper end of which passes up through a guide on the vibratory lever L and terminates in a laterally-projecting arm, w^2, above the heads M

and N. Just before the tying operation begins this arm w^2 is elevated, as shown in Fig. 1, and operates to support the strands of cord and insure their proper engagement with the looping devices; but as the tying operation continues it descends out of the way. Connected also to the lever W is a bell-crank lever, X, the short arm of which is slotted and plays back and forth upon a pin, x', projecting from the frame W′, while its long arm is articulated to a kicker, X′, which operates through a slot in the binding-platform, to discharge the bound bundle from the latter.

An elastic compressing-arm, Y, is mounted upon the wrist of the crank C^2 on the outside of the binding-arm, with its curved portion projecting below said crank, and its long shank extending up through a guide on the arm V^2, as shown. Pivoted to the frame W′, below the table, and working up through the slot in the latter, is another curved elastic compressor-arm, Y′, the same being guided and operated by a guide-loop, w^3, on the bar W^2, and adapted to co-operate with the compressor Y and binding-arm to gather the grain and compress it into a bundle preparatory to binding.

The several parts of the machine having been thus detailed, its operation as a whole will be readily understood from the following statement, viz: Before operating the machine for actual binding in the field it is of course necessary that it be prepared by first getting the end of the cord clamped in the tying mechanism. This is accomplished by the operator's drawing the end of the cord through the eye of the binding-arm a considerable distance and holding it in his hand above the platform while the machine is set in motion. The vibratory lever, carrying the tying mechanism, remains stationary at the upper end of the segmental rack until the binding-arm descends and carries the strand of cord between the guide-flanges $t\ t'$ into the entrance of the diagonal slot in the head N beside the hook of the head M, the part held by the hand passing over the elevated arm w^2. Immediately after this takes place the vibratory lever begins to move toward the lower end of the segmental rack-bar and the head N begins to rotate and wind the cord around the head M. As the arm of the bell-crank of the pawl S rides off of the portion K^5 of the cam-track onto the portion K^4, the bolt r^4 is projected from the flange t' across between the two flanges and with its point in close proximity to the flange t, and as it passes from portion K^4 to portion K^3 of the track it is projected within the flange t. As soon, therefore, as the binding-arm recedes from between the flanges the said bolt-bars complete the passage between the flanges and prevent any grain or other foreign matter which may fall through the slot in the platform from passing in and being caught in the rotating looping-head N. When the roller w' on the crank of the finger U strikes the cam-projection K^6 on the segmental bar it presses the finger forward, causing it to engage with that portion of the cord leading to the table and to press it into the groove beside the hook m of the head M. Immediately thereafter the head M is retracted, so as to withdraw its hook into a recess, N′, in the top of the head N, expose the hook of the stationary bar O, and allow the head N to carry the cord over the hook of head M under the hook of the central stationary hook-bar O. After these operations have been accomplished the bell-crank of the pawl S rides off the portion K^4 of the cam-track onto the portion K^3, thereby causing the pawl to engage with the cutting and clamping-plate P and hold said plate stationary, while the head N continues its rotation a little farther. The strand of cord, it will be remembered, is still in the slot of the head N. Consequently, when the plate P is thus arrested and the head N continues to farther move, the strand of cord is caught between the cutting-edge of one of the arms or projections of the said plate and the cutting-edge of the head, and is severed thereby, the end of the main cord below the point of cutting being carried in and clamped between the serrated under surface of the said arm of the plate and the lower flange of the head, and there securely clamped and held, as before explained. Subsequent to this the head M rises, causing the strand of cord to be drawn into it by the hook-bar O and through the loop of cord which is around the head, after which the loop is drawn off the head, to complete the knot. The head M then is depressed again, releasing the end of the cord and permitting the cord with the knot in it to be removed and thrown away.

The machine is now ready for the actual binding of grain, the tying mechanisms being at the lowest part of the segmental rack-bar, the binding-arm being elevated, just ready to descend, and the cord extending from the clamping devices under the projected bolt r^4 to the eye of the binding-arm. As the binding-arm descends the vibratory lever L and its mechanism start back to the upper end of the segmental rack-bar, and a few turns of the cord, which in the previous operation was wound about the shank of the rotary head N, begins to unwind, the slack occasioned thereby being taken up by the grain being gathered. In this backward movement the bolt r^4 performs the important function of so holding down the cord below the lower flange of the head N as to prevent the cord from being caught by said head; but when the upper end of the segmental bar is reached the said bolt r^4 is withdrawn, and the cord is permitted to enter the slot in the head N, which is then presented opposite the passage between the flanges $t\ t'$, as at the start. Upon the starting back of the lever L the bar W^2 and the lower compressor-arm, Y′, both rise, the former so that its arm W^2 projects above the heads M and N, and the latter up through a slot in the binding-

platform, in position to assist in gathering the grain into a bundle. The descending binding-arm passes the cord about the gathered bundle and into the diagonal slot of the rotary head N, as before, the upper compressor, Y, co-operating with it and the lower compressor, Y′, to properly compress and hold the bundle. The elevated arm w^2 holds both strands of the cord in position until the rotating head begins to operate, when said arm gradually descends out of the way. As the bundle is being carried over the table a repetition of the tying operation before described takes place, two strands of cord being acted upon instead of one. Arriving at the outer edge of the table, the bound and detached bundle stops a moment until the kicker X′ operates to push it from the machine.

Having thus described my invention, I claim as new—

1. The combination of the non-rotating but vertically-sliding head around which the cord is wound, the rotating head for catching the cord and winding it about the non-rotating head, and a central stationary bar having a hooked upper end for grasping the strands of cord and drawing them through the loop and within the non-rotating head to complete the knot, substantially as described.

2. The combination of the non-rotating but vertically-sliding head, the rotating cord-carrying head, the central stationary bar having a hooked upper end, and the cutting and clamping plate within the rotating head, substantially as described.

3. The combination, substantially as described, of the rotating cord-carrying head and the cutting and clamping plate, having the radial arms or projections, with cutting-edges and serrated clamping-surfaces, with means for rotating the head, and the pawl for engaging the plate to arrest its rotation while the head continues to rotate.

4. The combination, substantially as described, of the rotating head, the non-rotating head, and the hook-bar with the vibrating finger, for holding the cord in the recess at the side of the hook of the non-rotating head while the rotating head rotates.

5. The combination of the pawl and the sliding bolt articulated thereto with the bell-crank and spring on the pawl-shank and the cam-track K^3 K^4 K^5, substantially as described.

6. The combination, with the heads M and N, of the vibratory finger, the crank on its shank, and the cam-projection for throwing it, substantially as described.

7. In combination with the heads M N, the bar W^2, having the arm w^2, adapted to project over said heads and serve as a support for the strands of cord before the knotting mechanism begins to operate, and means by which it is depressed as such operation progresses, substantially as described.

8. The combination of the binding-arm with the upper compressor having the curved elastic portion and the long shank guided as described, the lower elastic compressor constructed and arranged as described, and the bar W^2, with its actuating mechanism, by which the lower compressor is operated, substantially as described, for the purpose specified.

9. The combination, with the cord-receptacle and its support, of the arm articulated to its cover and carrying the tension device and the pivoted arm to which said last-mentioned arm is in turn articulated, whereby the stress of the cord between the receptacle and binding-arm operates to hold the cover of the receptacle firmly in place, substantially as described.

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