(Model.)

4 Sheets—Sheet 1.

S. JOHNSTON.

GRAIN BINDER.

No. 251,053. Patented Dec. 20, 1881.

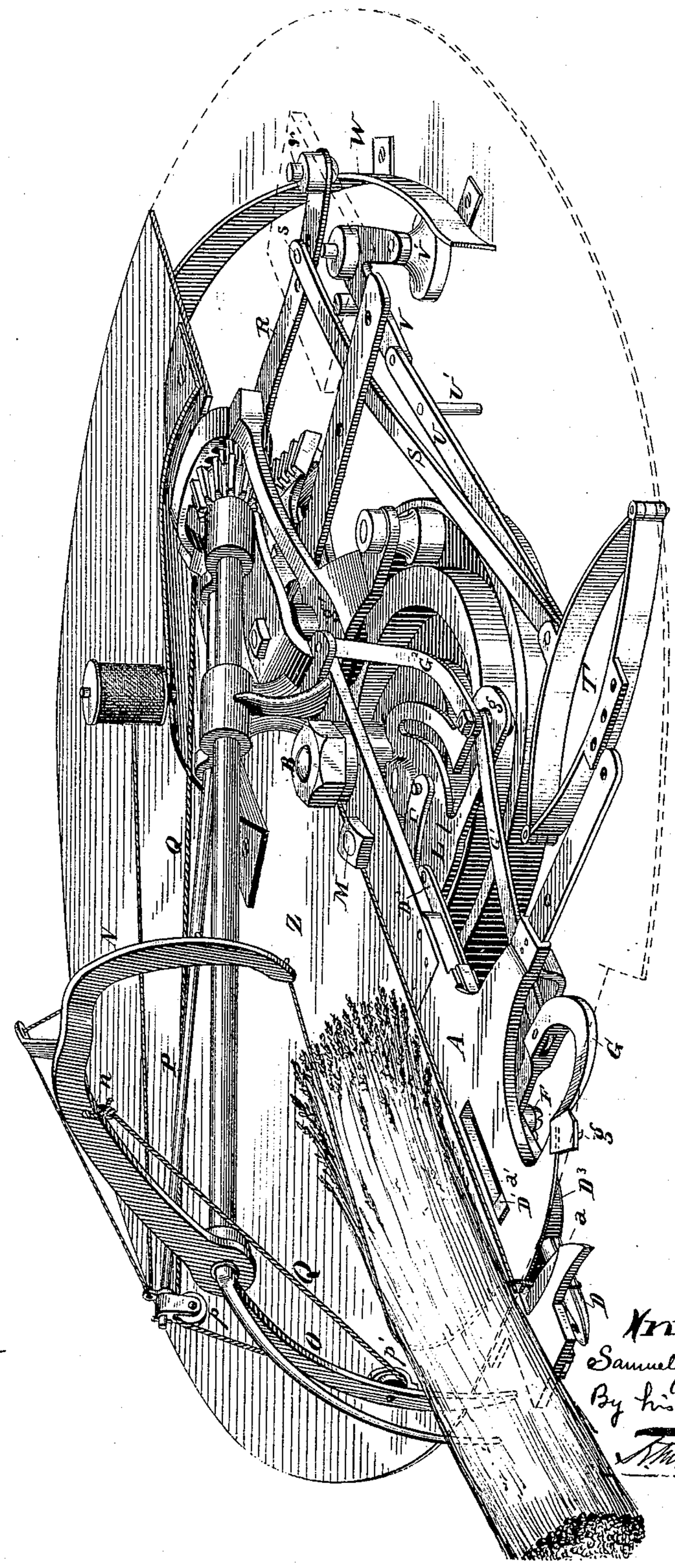

Fig. 1

Attest:

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Inventor

Samuel Johnston

By his atty

S. P. Johnston

(Model.)

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S. JOHNSTON.

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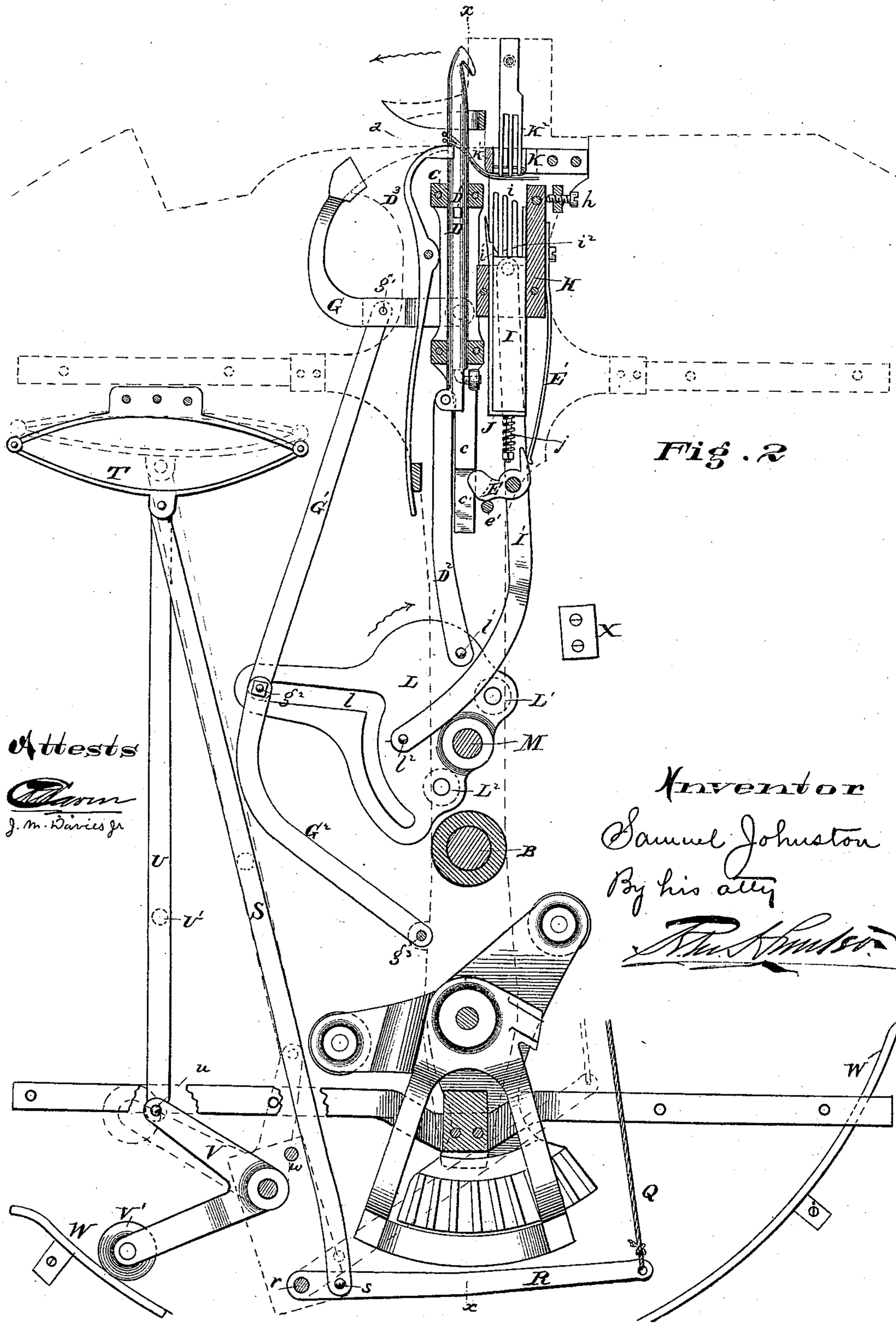

Fig. 2

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(Model.)

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S. JOHNSTON.

GRAIN BINDER.

No. 251,053. Patented Dec. 20, 1881.

Fig 4

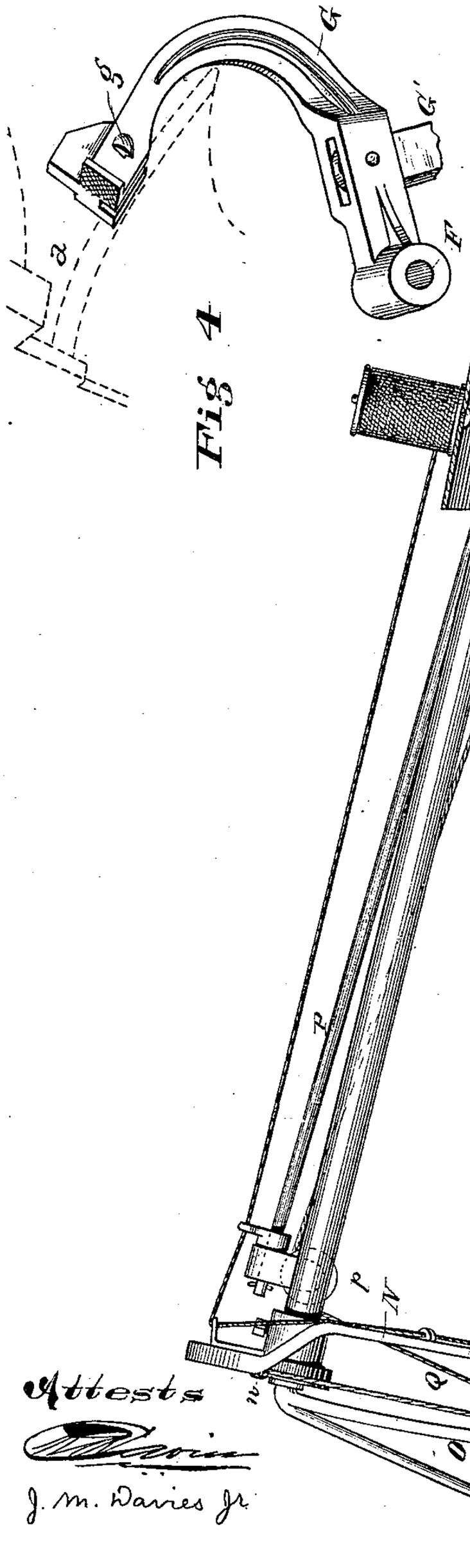
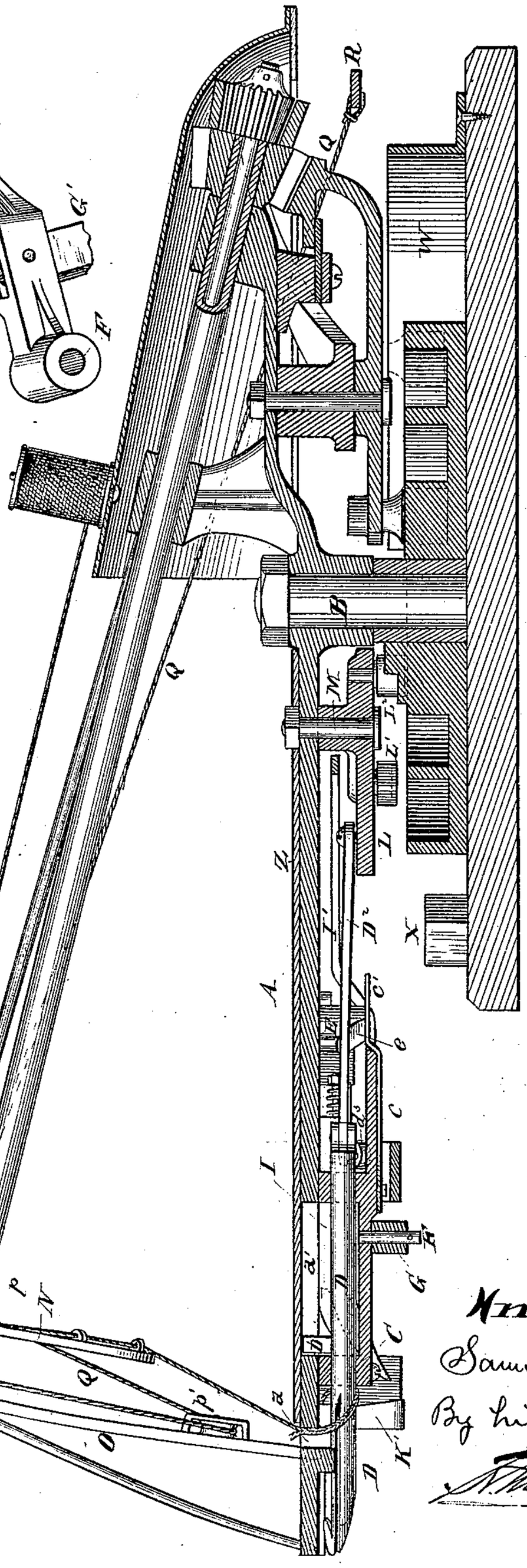


Fig. 3



Witnesses:

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(Model.) 4 Sheets—Sheet 4.

S. JOHNSTON.

GRAIN BINDER.

No. 251,053. Patented Dec. 20, 1881.

Fig. 5

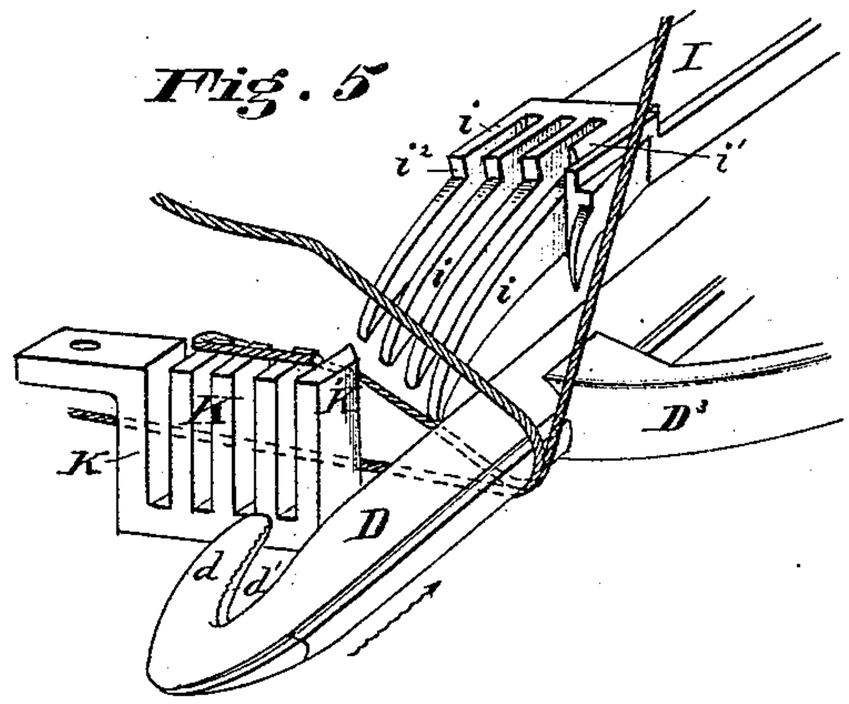


Fig. 6

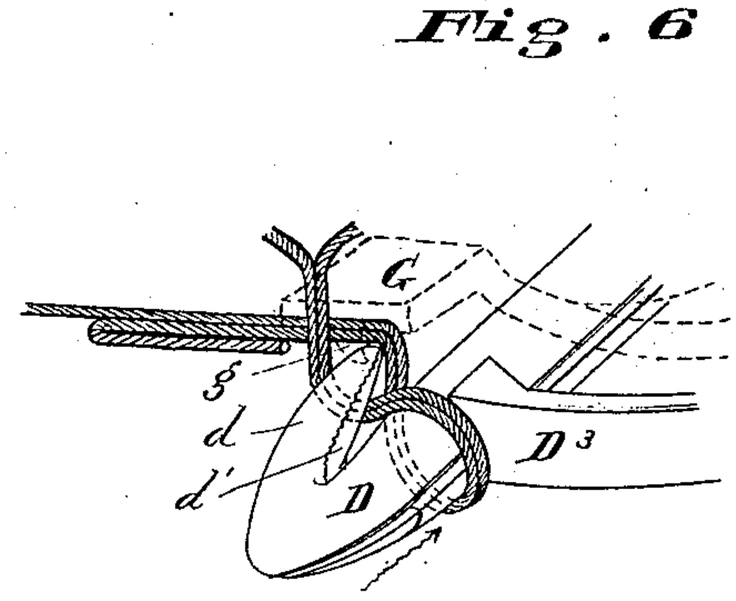


Fig. 7

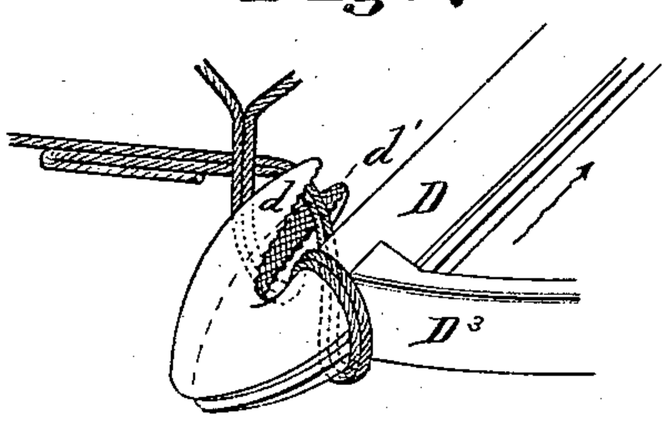


Fig. 8

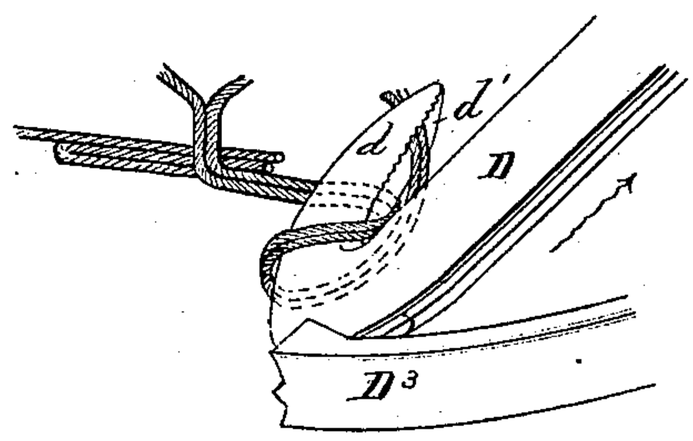


Fig. 9

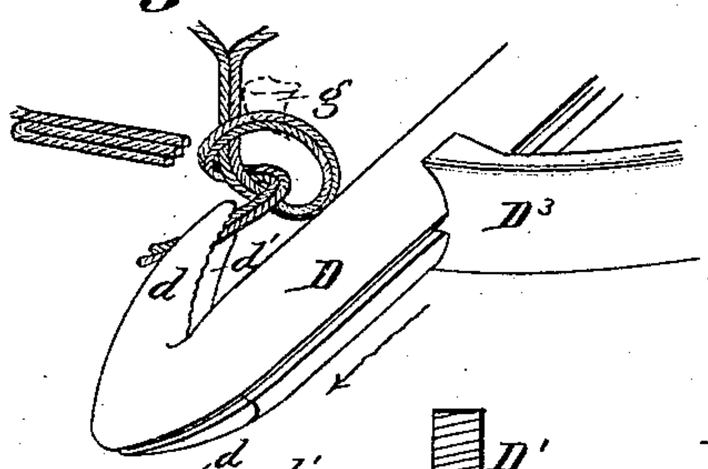


Fig. 10

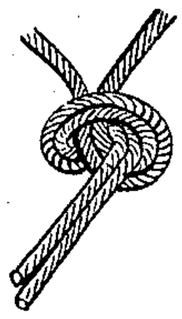
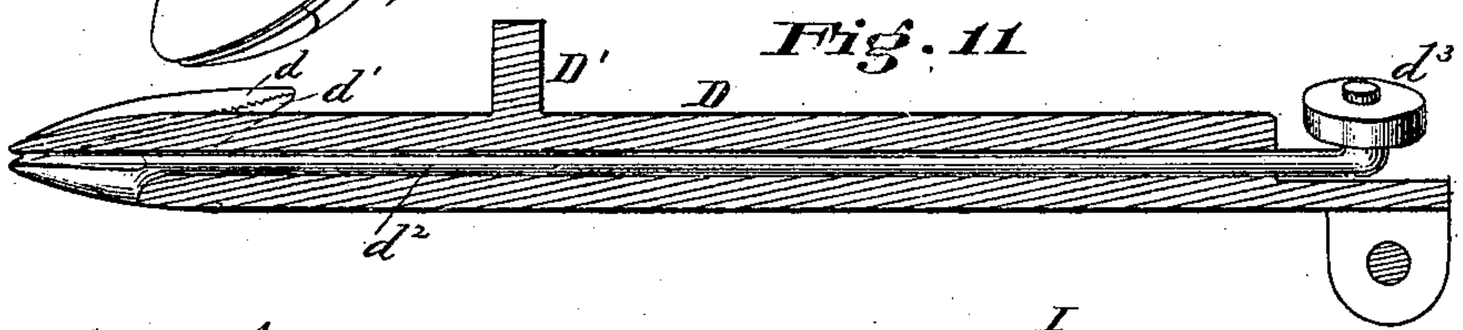
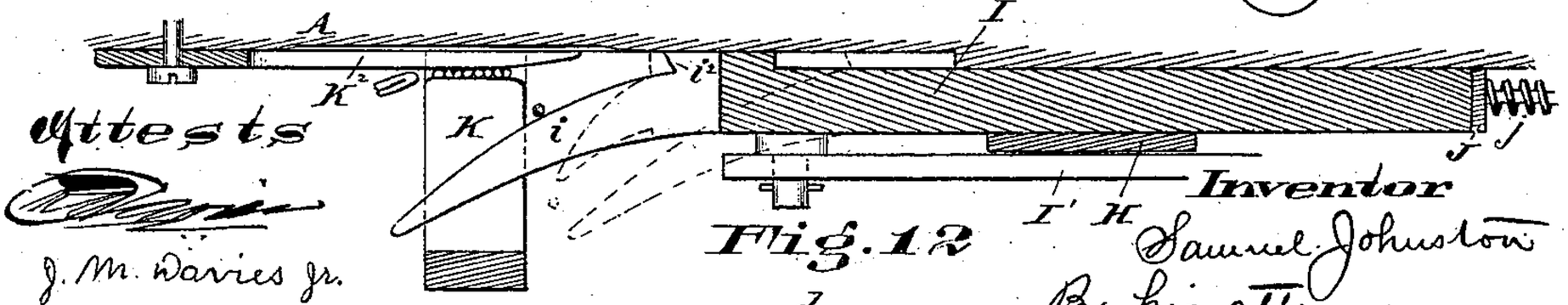


Fig. 11





Attests

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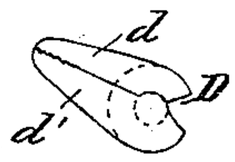
By his atty

Fig. 12

Fig. 13



UNITED STATES PATENT OFFICE.

SAMUEL JOHNSTON, OF BROCKPORT, NEW YORK.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 251,053, dated December 20, 1881.

Application filed April 29, 1880. (Model.)

To all whom it may concern:

Be it known that I, SAMUEL JOHNSTON, of Brockport, in the county of Monroe and State of New York, have invented an Improvement in Grain-Binders, of which the following is a specification.

My invention relates to mechanism constituting grain-binders in general, but more particularly to the grain-binding harvesters patented to me December 16, 1879, and numbered respectively 222,632 and 222,633; and my invention consists in mechanism designed to pass a cord around a gavel and tie a knot thereon, securely binding the grain into a bundle; and, further, in mechanism whereby the bundle is compressed at the proper time and during binding, all of which mechanism is clearly described in the following specification, shown in the accompanying drawings, and referred to in the appended claims.

In the drawings, Figure 1 is a perspective view of mechanism embodying in it my invention. Fig. 2 is a plan of same with the binder-frame and table removed. Fig. 3 is a section of same on the line *x x* as shown on Fig. 2. Fig. 4 is a perspective view of the cord-gatherer. Figs. 5 to 10, inclusive, are perspective views, showing the movements of the looper and process of tying the knot. Fig. 11 is a longitudinal section of the looper. Fig. 12 is a longitudinal section of the cord-holder. Fig. 13 is an end elevation of the looper.

A is the binder-frame, and is allowed to rotate or oscillate upon the pin or spindle B. The end of the frame is provided with a guide-opening, *a*.

Situated below the frame A, and sliding in bearings C, is the looper D. The looper is composed of two looping-jaws, *d d'*, which, when closed, form a single hook. The jaw *d'* is attached to a spindle, d^2, provided at the end opposite the jaw with a bent piece and friction or cam roller, d^3. Secured to and forming part of the bearing C is a guide, *c*, and secured to the guide is a spring, *c'*. The looper D is provided with a projection, D', which slides in a slot, *a'*, in the binder-frame A, and it is thereby prevented from rotating.

Pivoted to the binder-frame, in the path of the roller d^3, is a cam-dog, E, provided with an inclined face, *e*. The dog in its normal position rests against a pin, *e'*, and is always returned to this position by the spring E'.

Pivoted at F is the cord-gatherer G, the jaw of which slides upon one side of the guideway *a*, as shown in Fig. 1, and upon the under side of said jaw is a projecting hook, *g*, Fig. 4.

Situated under the binder-frame A, and beside the looper, is the cord-holder proper. It is essentially composed of a stationary piece provided with fingers and a spring-piece with corresponding fingers.

The sliding piece I is provided with a series of curved fingers, *i i'*, which are furnished with shoulders i^2, designed to carry the cord between the fingers K K' and spring-fingers K^2, forming the holder, as shown in Fig. 12.

Attached to or sliding beside the piece I is a holding-clamp, J, which is designed to clamp the cord between the knife-edged finger K' and itself before *i'* and K' sever said cord. This clamp J is furnished with a spring, *j*, which, after the cord has been clamped, is compressed, allowing the piece I to still move forward until the cord has been severed.

Pivoted to the binder-frame A, at M, and between the spindle B and the looper, is the oscillating cam-piece L, which is provided with two friction or cam rollers L', and L^2, which govern its oscillations by working upon a cam. This cam-piece is also provided with a cam-slot, *l*, in which the friction-roller g^2 moves. This roller g^2 is connected to the gatherer G, at *g'*, by the bar G', and is also connected with the pin g^3 on frame A by bar G^2. The rear end of the looper is connected to the crank-pin *l'* on the cam-piece L by the bar D^2, and the crank-pin l^2 is connected to and operates the sliding piece I and its appended parts by bar I'. Situated over and actuated by mechanism fully set forth in the aforementioned patents are the compressing and binding arms. The binder-arm N carries the binding-cord around the bundle, as shown in Figs. 1 and 3.

Secured to the binder-frame A is a spring-arm, P, carrying on the end a pulley, *p*.

Attached to the binder-arm N, at *n*, is the compressor-band Q, which then passes under the idler-pulley *p'* on the compressor-arm O and over the pulley *p* on the spring-arm P, and is attached to the lever R, having its fulcrum at *r*. This lever R is connected to the elliptical

spring T by the bar S. The spring T is secured to the platform Z or to the binder-frame. Also secured to the frame or platform is the bell-crank lever V, one arm of which is provided with a friction-roller, V′, and the other is connected, at *u*, with a bar, U, the opposite end of which is attached to the spring T. This bar U is provided with a pin, U′. When the bell-crank is thrown into the position indicated by dotted lines, Fig. 2, it rests against a pin, *w*, and is then locked. The roller V′ runs upon the camway W, which is secured to the body of the harvester. Also secured to the body of the harvester is the cam-projection X.

The looper D has resting against one side of it a spring-lever, D^3, which performs the function of pushing the loop over the end of the looper during the formation of the knot. This spring-lever D^3 remains in a fixed position with relation to the binder-frame.

The operation of the mechanism is as follows: One end of the cord is supposed to be held in the holder, or, in other words, between the fingers K′ and K^2. As the platform or binder-frame rotates the gavel is laid, and is gathered in by the compressor-arm O, Fig. 1. Then the binder-arm N descends, carrying the cord around the gavel or bundle and around the looper, as shown in Fig. 5, and finally between the curved fingers *i i′* and the holder proper. As the frame still rotates the roller L^2 strikes the cam, and the cam-piece L is rotated in the direction indicated by the arrow, Fig. 2. This action closes the gatherer G, thereby gathering the cords between the looper and bundle and directly above the latter, so that the hook of the looper can pass above said cords, and at the same time the curved fingers *i i′* gather the binding-cord and carry it between the fingers K and spring-fingers K^2, forming the cord-holder, and the looper D is drawn back, the cord being prevented from changing its position by the spring-lever D^3, and the looper and cord is in the position shown in Fig. 6. As the motion still continues the looper-jaws open and take in the cords next to the knife-edged fingers *i′* and K′, as shown in Fig. 7. This is caused by the friction-roller d^3 striking the cam-dog E and running up the inclined face *e* of same and compressing the spring *c*, thereby oscillating the rod d^2 and depressing the jaw *d′*. On continuing the motion, the roller d^3 passes over the cam-dog E, and is forced down by the spring *c′*, closing the jaw *d′* upon the jaw *d* and biting upon the cord, and at the same time the knife-edge *i′* passes the knife-edge K′ and severs the cord, and, as the looper still moves back, the spring-lever D^3 pushes the loop over the end of the looper, as shown in Fig. 8. Now, the roller L′ comes in contact with the cam and oscillates the cam-piece L in the opposite direction, thereby reversing all the movements, only in the opposite order. As the looper returns to its original position the roller d^3 presses back the cam-dog E, and the loop is caught by the hook *g* on the gatherer G, and the jaws *d d′* of the looper pull the ends of the cord through the loop, as shown in Fig. 9, and upon continuing the movement the knot is tightened, and appears as shown in Fig. 10. At this instant the gatherer G moves back and the binder-arm ascends, and the bound gavel is discharged from the platform, and the machine is ready for another gavel. The compressor acts in conjunction with the knot-tyer. During the time when the gavel is being laid and gathered the roller V′ is running upon the cam W, and is gradually brought to the locking position shown in dotted lines, Fig. 2, thereby compressing the spring T. This compression or storing of power takes place slowly and when the machine is doing the least work, and as soon as the bundle requires to be compressed, and almost simultaneous (preferably a short time before) with the tying of the knot, the pin U′ strikes the cam-piece X, which is firmly secured to the frame of the reaper and is stationary, and lies in the path of movement of the pin U′ when in its position after the spring T is compressed, and liberates all of this stored-up energy or power at the exact moment it is required, and compresses the gavel or bundle through the agency of the compressor-band Q.

It has been the practice to compress the bundle during the binding by some power at that moment generated; but a compressor attached to a grain-binder has never been so constructed, to my knowledge, in which the power is gradually stored up when the binder of the machine is not doing work. The great advantage of this compressor is in the fact that a power much greater than the traction power can be stored up to be liberated at the proper instant, whereas with the compressors now in use, which generate and use the power on the instant, their greatest power cannot be more than the traction power produced by the weight of the machine less the power required to run the binding mechanism, &c., and if the resistance offered in compressing a large gavel is greater than the power generated, the driving-wheels will slip, the cutter-bar will cease to vibrate, and the whole machine will be stopped, whereas with my improvement in compressors, consisting in storing up energy, these difficulties are entirely overcome.

I do not confine myself to any particular construction of mechanism, but claim to be new the principle of storing up power when the harvester is doing the least work, to be liberated and utilized in compressing the grain forming the bundle during or just previous to binding. and when the machine is doing its greatest work.

It is also evident that by a suitable construction of mechanism the power exerted by the compressor need not be derived from the machine during binding at all, thereby giving more power to perform that work and when it is most needed.

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

1. Mechanism in a grain-binder for storing up power when the machine is gathering a gavel or doing the least work, in combination with mechanism for liberating such power to compress the grain when the bundle is being formed and knot tied and when the machine is doing its greatest work.

2. In a grain-binder, a looper or knotting-head which completes the loop after the cord has been properly delivered to it by a movement in one direction and knots the cord and tightens the knot by a movement in the opposite direction, said looper or knotting-head completing the loop and knotting the cord by a single reciprocating movement and without rotary motion, in combination with operating mechanism, as and for the purpose specified.

3. In a grain-binder, a stationary holder, in combination with operating mechanism and a looper or knotter which completes the loop after the cord has been properly delivered to it by a movement in one direction and knots the cord and tightens the knot by a movement in the opposite direction, said looper or knotter completing the loop and knotting the cord by a single reciprocating movement and without rotary motion, as and for the purpose specified.

4. In a knot-tyer, a looper having reciprocating motion without rotary motion, provided with two jaws, one of which is movable relatively to the other, and which, when closed, form a single hook, substantially as and for the purpose specified.

5. In a knot-tyer, the combination of looper D, provided with jaws *d d'*, spindle d^2, friction-roller d^3, or its equivalent, cam-dog E, and spring *c'*, and mechanism to reciprocate the looper, substantially as and for the purpose specified.

6. In a knot-tyer, the looper D, having reciprocating motion to the exclusion of rotary motion, in combination with the stationary cord-holder, composed of rigid fingers K, forming a fork, and spring-fingers K^2, forming a spring-fork resting upon ends of fingers K, substantially as and for the purpose specified.

7. In a knot-tyer, the combination of a reciprocating looper, D, which forms the loop by a single reciprocating motion to the exclusion of rotary motion, with a cord-holder composed of rigid fingers K, forming a fork, and spring-fingers K^2, forming a spring-fork, and a reciprocating slide provided with curved gathering-fingers *i*, the fingers of which correspond to the openings between fingers K, substantially as and for the purpose specified.

8. In a knot-tyer, the reciprocating looper D, provided with hooked jaws *d d'*, in combination with a spring-lever, D^3, which presses against the sides of the looper opposite the jaws and acts to push the loop over the end as the looper reciprocates before it, as described.

9. In a knot-tyer, the looper D, in combination with spring-lever D^3, a stationary cord-holder, and a sliding gathering-piece, I, provided with curved fingers, and the knives $K' i'$, substantially as and for the purpose specified.

10. In a grain-binder, a looper which forms the loop and ties the knot after the cord has been wrapped about it by the binder-arm, cord-gatherer, and cord-holder by a single reciprocating movement and without rotary motion, in combination with a stationary holder, a gatherer to collect the cords over the looper, a binder-arm, or its equivalent, and operating mechanism, substantially as shown and described, and for the purpose specified.

11. In a knot-tyer, the reciprocating looper D, in combination with spring-lever D^3, stationary holder composed of fingers K and K^2, sliding piece I, provided with gathering-fingers *i*, knives *i'* and K', bars D^2 and I', cam-piece L, and a gatherer adapted to gather the binding-cord and carry it over the looper, all operating substantially in the manner and for the purpose specified.

12. In a grain-binder, a compressor composed of a spring, T, bar U, provided with pin U', cam X, or its equivalent, bell-crank V, and camway W, in combination with bar S, lever R, cord Q, and compressing-arms adapted to clamp and compress the grain through the action of said cord, substantially as and for the purpose specified.

13. In a grain-binder, a compressor composed of spring T, bar U, provided with pin U', bell-crank V, camway W, cam-projection X, bar S, lever R, and compressor-cord Q, in combination with compressor-arm O and binder-arm N, for the purpose of compressing the gavel after it has been gathered into a bundle, substantially as and for the purpose specified.

14. The compressor O and binder-arm N, in combination with compressor-band Q, spring-arm P, and mechanism to operate the compressor-band to compress the bundle, substantially in the manner and for the purpose specified.

15. In a knot-tyer, a cord-gatherer, G, provided with a projecting hook, *g*, substantially as and for the purpose specified.

16. In a knot-tyer, the reciprocating looper D, in combination with the projecting hook *g*, attached to the gatherer, and before which the looper reciprocates, and which holds the loop as the jaws of the looper pull the ends through the loop and tighten the knot, substantially as and for the purpose specified.

17. In a knot-tyer, the reciprocating looper D, in combination with spring-lever D^3, projecting hook *g*, a binder-arm, N, and a suitable stationary cord-holder composed of fingers K and K^2, substantially as and for the purpose specified.

18. In a grain-binder, a compressor which stores up power when the machine is laying a gavel and uses the power when the bundle is being made and bound, in combination with a knot-tyer which ties a knot by a reciprocat-

ing movement of the looper to the exclusion of rotary motion, and operating mechanism, substantially as and for the purpose specified.

19. In a knot-tyer, a looper, D, provided with hooked jaws *d d'*, and which forms the loop and ties the knot after the cord-holder and gatherer have wrapped the cord about it, by a single reciprocating movement and without rotary motion, said looper reciprocating before the knife K', in combination with a cord-holder and knife-edges K' and *i'*, substantially as and for the purpose specified.

20. The gathering-arm which consists of a pivoted lever, G, provided on the clamping end with a downwardly-projecting edge or flange integral therewith to depress the cords under the hooked jaws of the looping-head, substantially as shown.

In testimony of which invention I hereunto set my hand.

SAMUEL JOHNSTON.

Witnesses:

JOHN H. KINGSBURY,

MORTON MINOT.