(No Model.) 5 Sheets—Sheet 1.

C. YOUNG.

GRAIN BINDING MACHINE.

No. 382,203. Patented May 1, 1888.

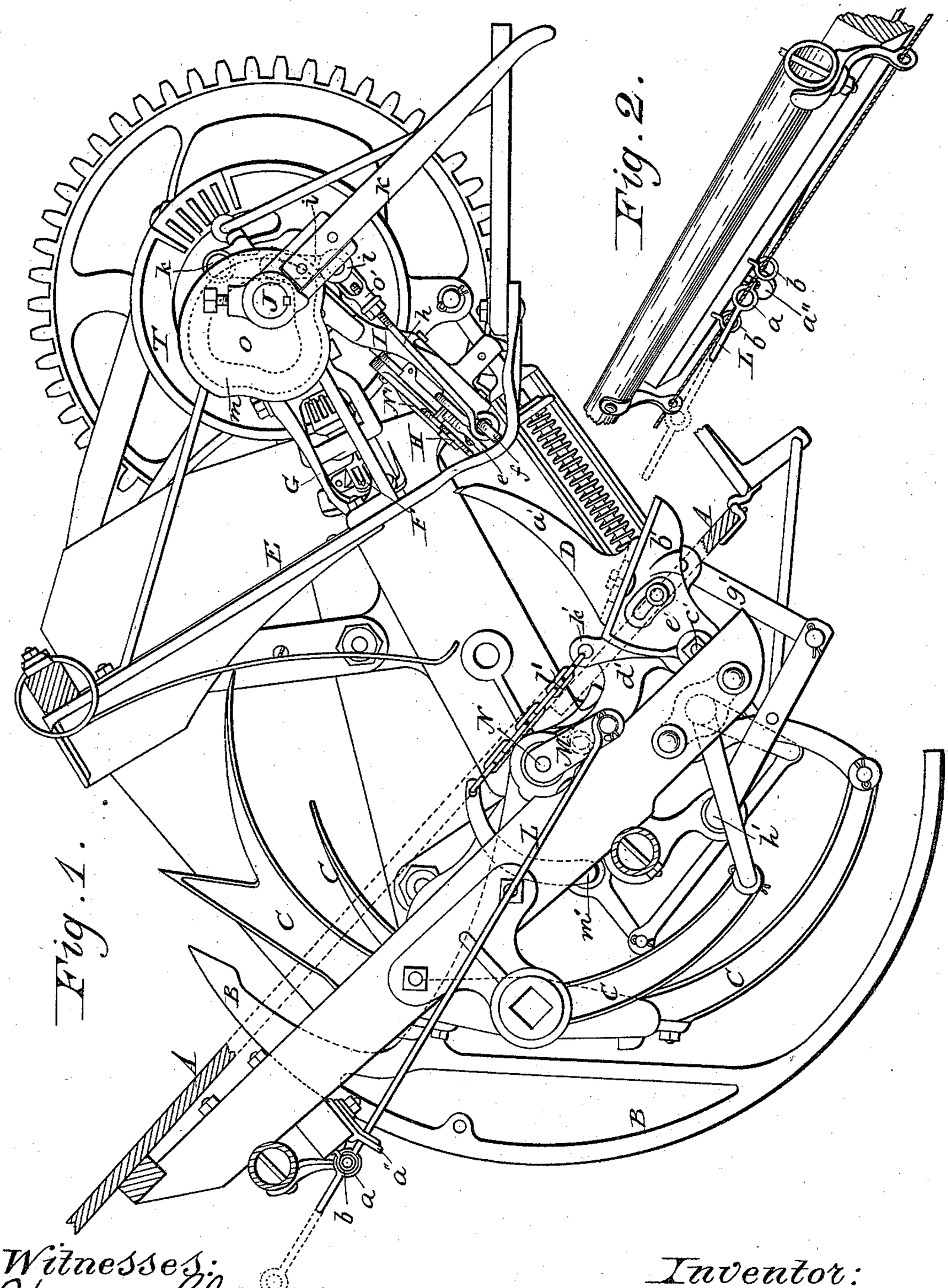

Fig. 1.

Fig. 2.

Witnesses:
Harry Shipley.
Newton Wyckoff.

Inventor:
Calvin Young
By Philip T. Dodge Atty.

(No Model.) 5 Sheets—Sheet 2.

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GRAIN BINDING MACHINE.

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Fig. 3.

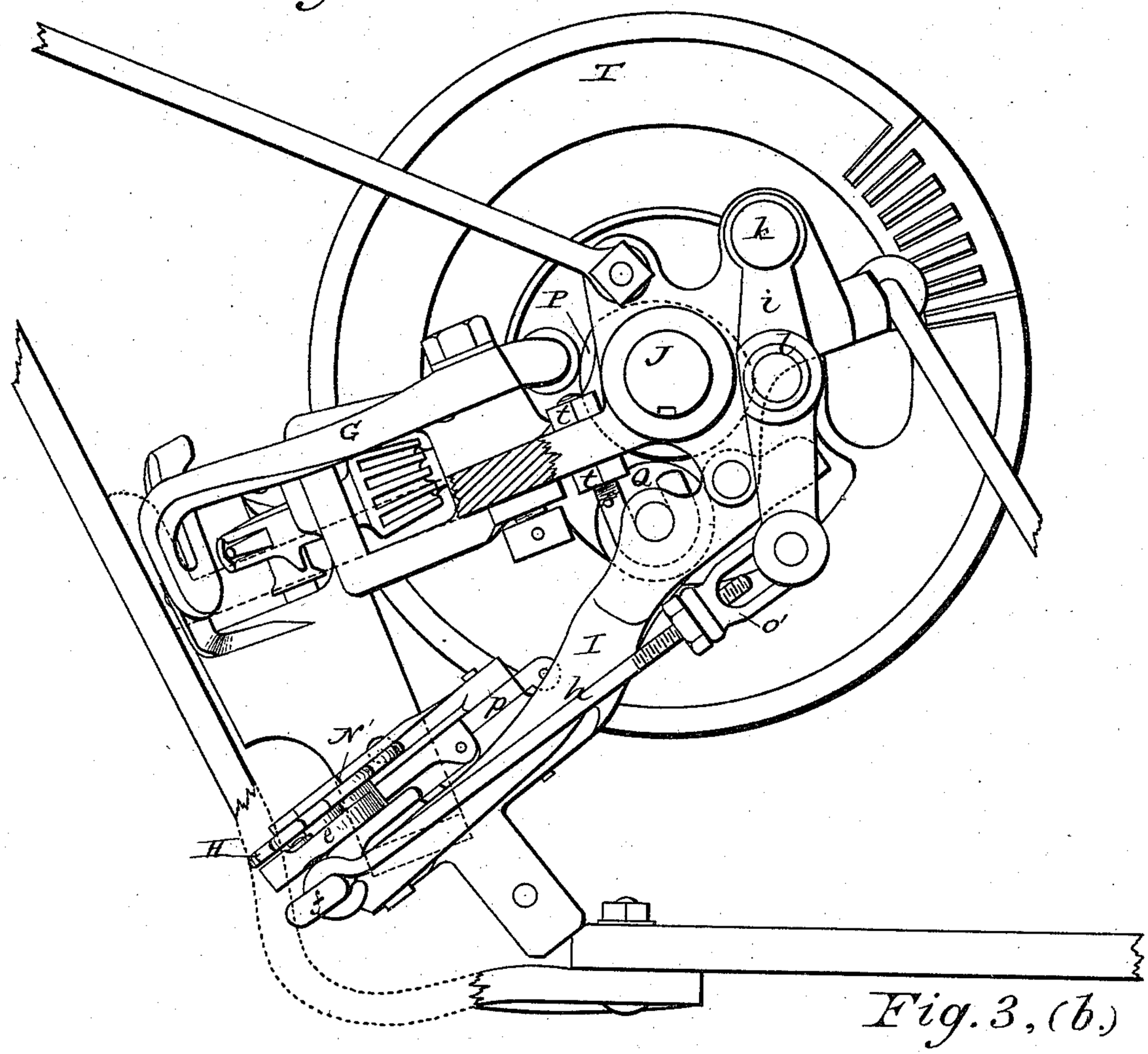
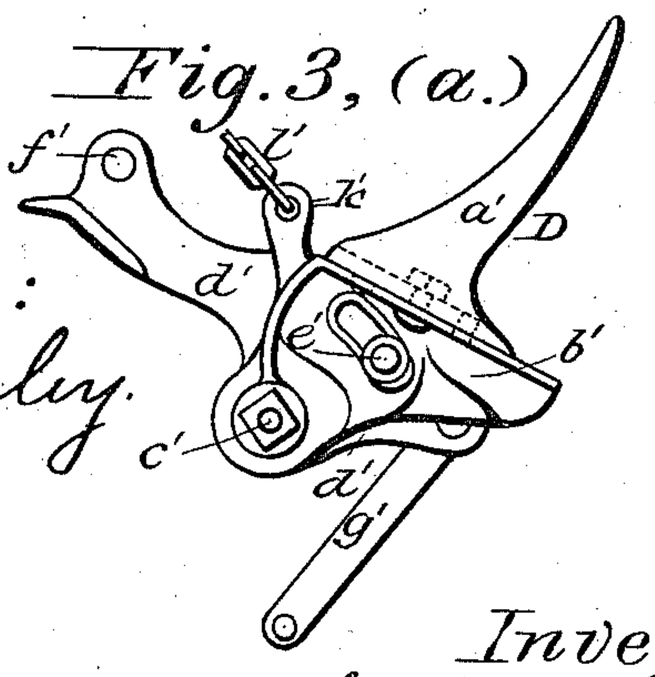
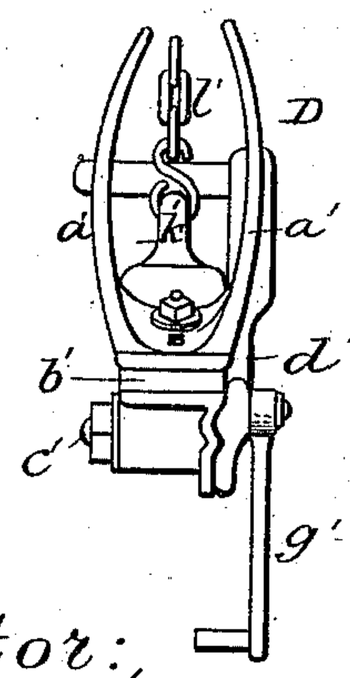


Fig. 3, (b.)

Fig. 3, (a.)





Witnesses:
Harry Shipley.
Newton Hyckoff.

Inventor:
Calvin Young.
By Philip T. Dodge.
Attorney.

(No Model.) 5 Sheets—Sheet 3.

C. YOUNG.

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Fig. 4.

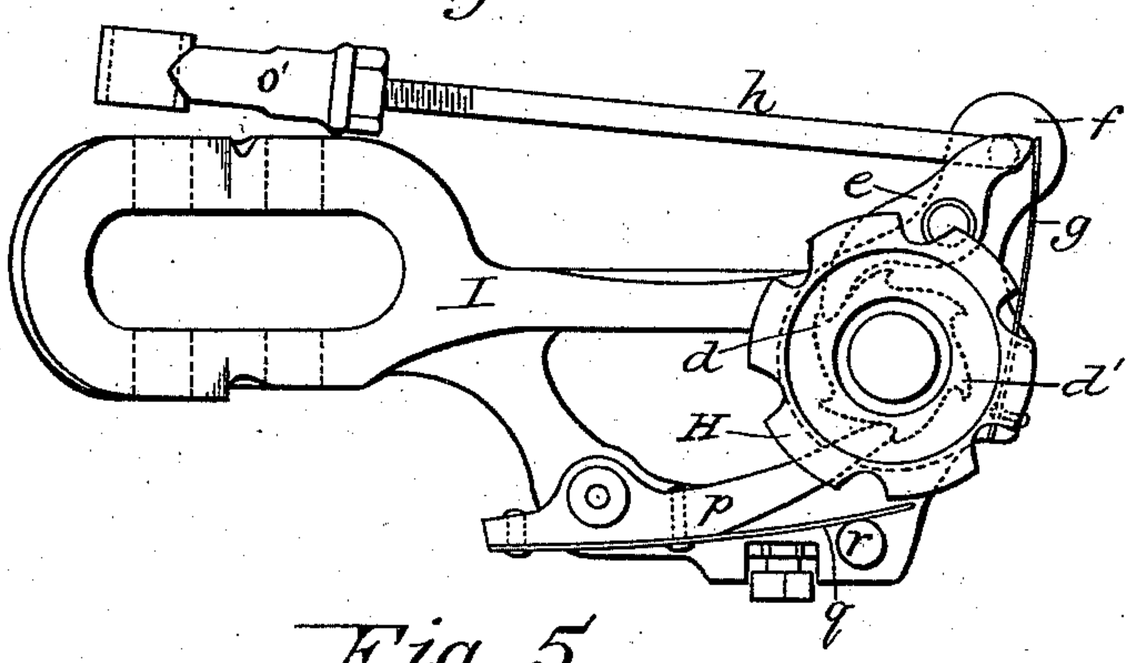


Fig. 5.

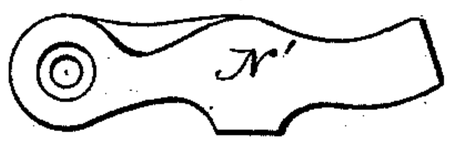


Fig. 6.

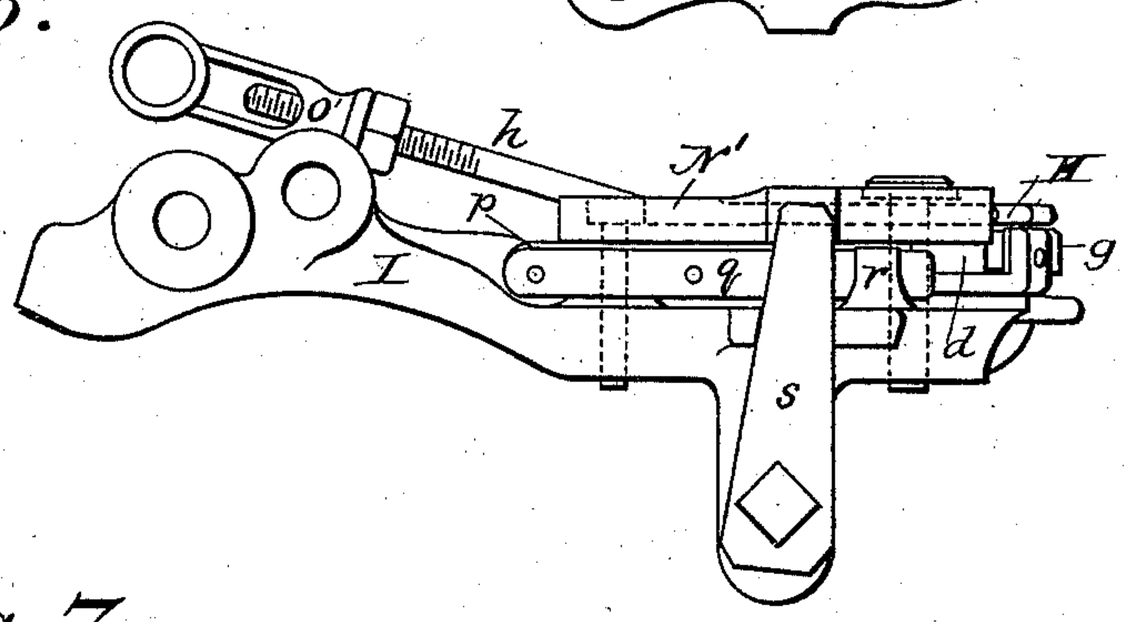


Fig. 7.

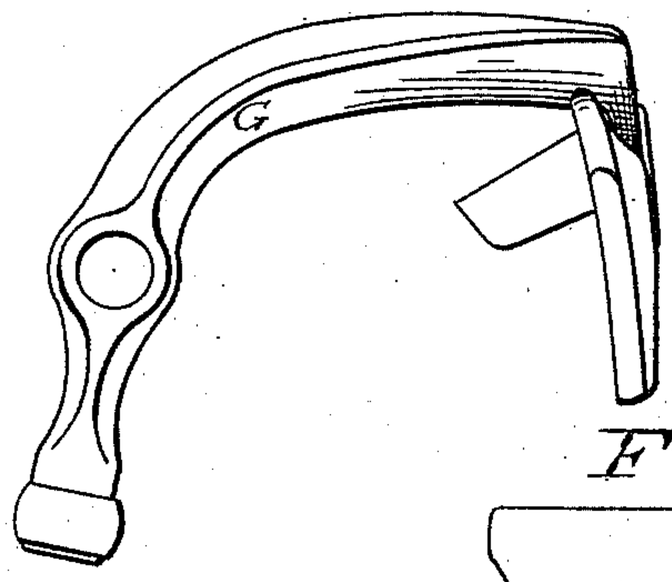


Fig. 8.

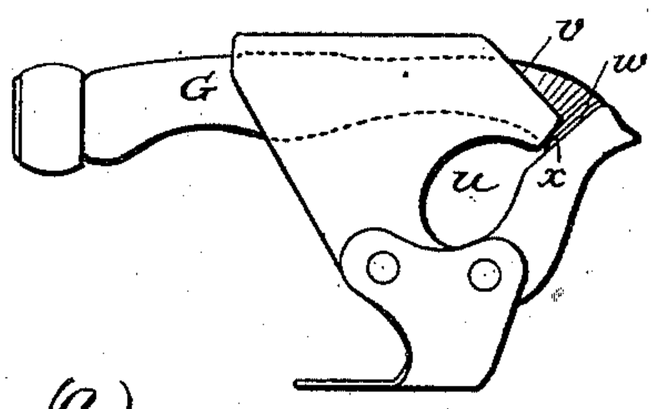
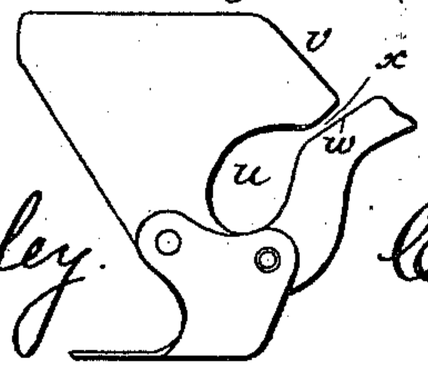


Fig. 8, (a.)



Witnesses:
Harry Shipley.
Newton Wyckoff.

Inventor:
Calvin Young.
By his attorney.
Philip T. Dodge

(No Model.) 5 Sheets—Sheet 4.

C. YOUNG.

GRAIN BINDING MACHINE.

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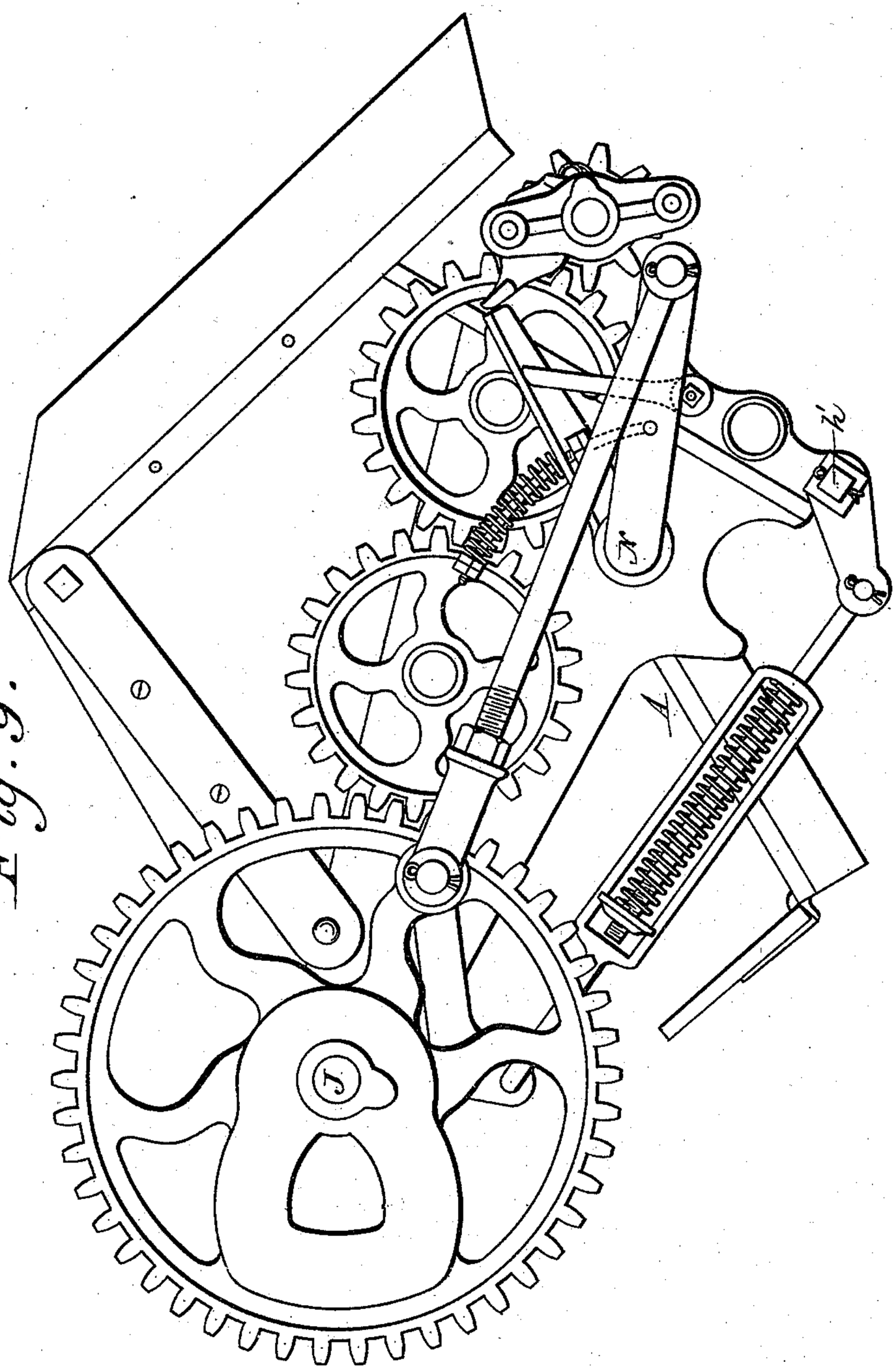

Fig. 9.

Witnesses:
Harry Shipley.
Newton Hyckoff.

Inventor:
Calvin Young.
By his attorney
Philip T. Dodge.

(No Model.) 5 Sheets—Sheet 5.

C. YOUNG.

GRAIN BINDING MACHINE.

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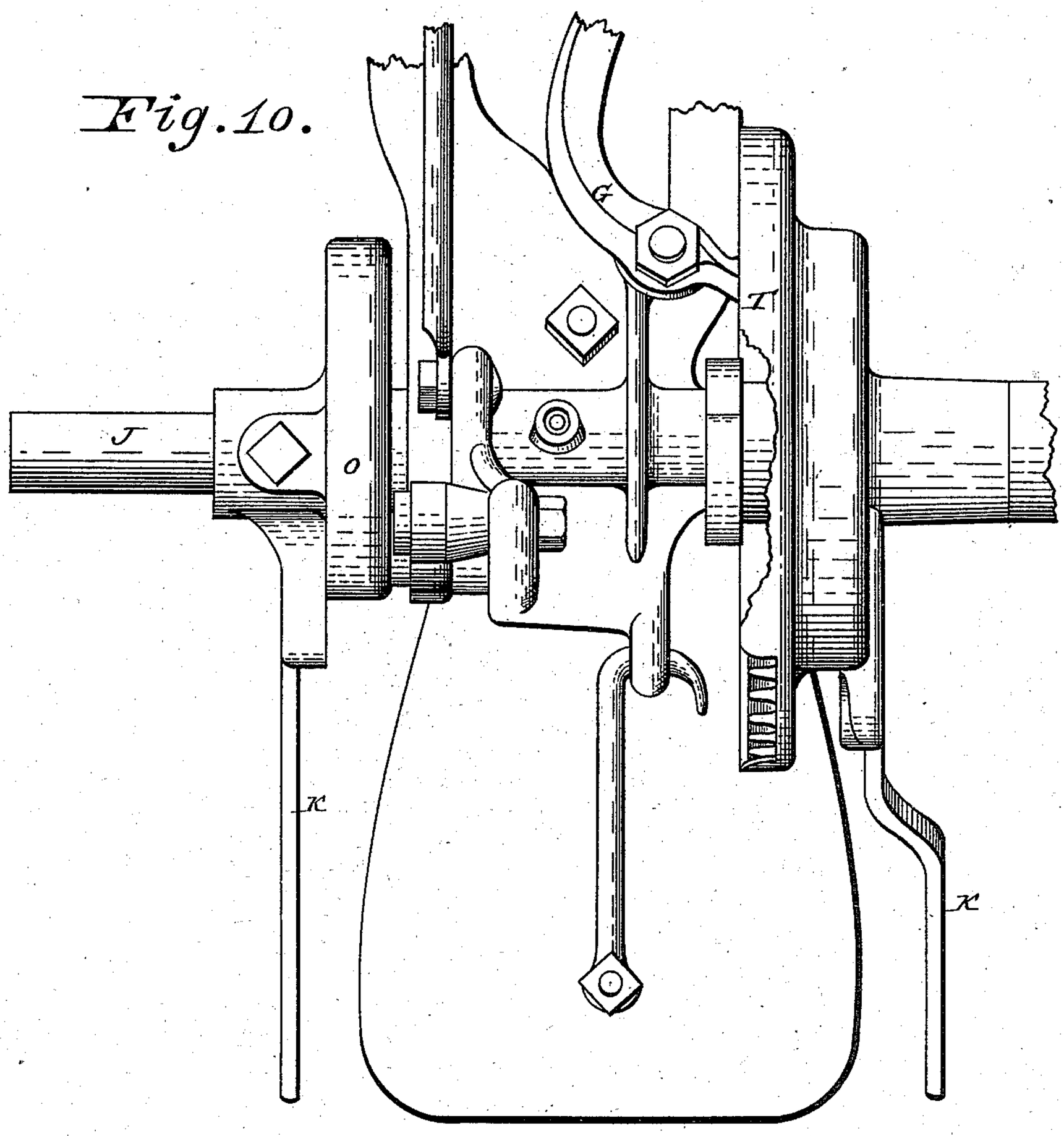
Fig. 10.



Witnesses:

Harry Shipley.
Newton Wyckoff.

Inventor:

Calvin Young.
By his attorney
Philip T. Dodge.

UNITED STATES PATENT OFFICE.

CALVIN YOUNG, OF AUBURN, ASSIGNOR OF ONE-HALF TO D. M. OSBORNE & COMPANY, OF NEW YORK, N. Y.

GRAIN-BINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 382,203, dated May 1, 1888.

Application filed July 7, 1883. Renewed October 14, 1887. Serial No. 252,318. (No model.)

To all whom it may concern:

Be it known that I, CALVIN YOUNG, of Auburn, in the county of Cayuga and State of New York, have invented certain improvements in Grain-Binding Machines, of which the following is a specification.

The present invention has reference more particularly to what are known in the art as "Appleby" binders, represented in their leading features in Letters Patent of the United States, No. 212,420.

The invention relates to various improvements in the details of the machines, whereby they are rendered more satisfactory in operation.

The improvements consist, principally, in a slack-arm of peculiar arrangement for the purpose of controlling the tension of the cord or other binding material; in an improved arrangement of mechanism for operating the cord-clamping disk, and in an improved construction and arrangement of the compressor-arm, against which the compression of the gavel is effected, and by which the machine is automatically tripped into action through the pressure of the grain.

Referring to the accompanying drawings, Figure 1 represents a vertical section through an Appleby binder having my improvements embodied therein, the section being taken in a plane parallel with the binder-arm. Fig. 2 is a perspective view, illustrating the arrangement of the slack-arm. Fig. 3 is a side elevation, showing the cord-tying and clamping mechanism and the attendant parts. Fig. 3ª is a side elevation of the compressor-arm and its supporting-link. Fig. 3ᵇ is an end elevation of the same. Fig. 4 is a top plan view of the cord-clamping disk and the parts operating in immediate connection therewith. Fig. 5 is a top plan view of the jaw or clamp used in connection with the clamping-disk. Fig. 6 is an edge view of the devices represented in Fig. 4, with the clamp or jaw in position. Fig. 7 is a top plan view of the cord-placing and knife-carrying arm. Fig. 8 is an end view of the same, looking in the direction indicated by the arrow in Fig. 7; Fig. 8ª, a like view, with the rear arm broken away to give a clearer view of the guiding-surfaces. Fig. 9 is a front elevation of the binding-machine, illustrating the driving-gear. Fig. 10 is a top plan view, illustrating the cam and gearing for operating the knotter and cord-clamping devices.

Referring to the drawings, A represents the inclined binding-table upon which the loose grain is delivered; B, the vibratory needle or binding-arm arranged to ascend through the table and pass the cord around the gavel to the tyer; C, the circulatory packers, by means of which the grain is forced downward to form the gavel; D, the upright compressor, located at the lower edge of the binding-table, for the purpose of assisting in the compression of the grain and of throwing the binder-driving mechanism into action when the gavel has received the required degree of compression; E, the stationary breast-plate, located above the binding-table for the purpose of confining the grain from above and assisting in its compression; F, the rotary tying-bill; G, the vibratory cord-guiding and knife-carrying arm; H, the cord-clamping disk; I, the vertically-swinging frame by which said disk is supported and carried; J, the rotary main shaft, from which motion is imparted through intermediate mechanism to the tying, clamping, and cutting devices; and K, one of the rotary ejector-arms carried by the shaft J, for the purpose of removing the bound bundles from the machine.

The above parts are constructed and arranged to operate in essentially the same manner as described in the Appleby patent above alluded to, certain minor differences being hereinafter described in detail.

The first part of the invention relates to means for controlling the delivery and tension of the cord; and it consists in a guide, commonly known as a "slack-arm," connected with the needle or binder-arm shaft in such manner as to slacken the cord after the binding of each bundle, and thus permit the loose grain to pass freely into the receiver and lie down in a natural position during the accumulation of the gavel, after which the device strains the cord and increases its tension during the tying operation. This slack-arm is clearly represented at L in Figs. 1 and 2. At its lower end it is mounted on a crank, M, se-

cured to and extending downward from the shaft N of the binder arm or needle, so that as the arm ascends to encircle the gavel with twine the crank M is caused to move the slack-arm inward or backward. At its upper end the slack-arm slides through a guide, *a''*, and is provided with an eye, *a*, through which the cord passes in its course to the needle. This end of the slack-arm is located between two fixed guides or eyes, *b*, through which the cord also passes, so that the slack-arm, being moved backward during the ascent of the needle, bends the cord backward between the guides *b*, thereby causing additional cord to be drawn from the ball or spool, and at the same time straining or increasing the tension of the cord, so as to apply the greatest strain thereto during the time that the tying device is forming the knot. After the binding of each bundle has been completed the needle descends, during which action the crank M is restored to its original position and the slack-arm drawn downward or forward, bringing its eye *a* again into line with the guides *b*, the effect of which is to slacken or loosen the cord and permit the surplus portion, which was drawn from the spool by the backward movement of the slack-arm, to pass freely downward beneath the action of the loose grain delivered upon the binding-table. Thus it will be seen that by means of the arm L the cord is tightened upon the bundle and an additional supply drawn from the spool during the binding action, and that, on the other hand, during the accumulation of the gavel, while the loose grain is flowing inward, the cord is slackened and permitted to pass freely to the gavel.

Passing now to the cord-clamping disk and its operating devices, which constitute the second feature of the invention, attention is particularly directed to Figs. 1, 3, 4, 5, and 6. The clamping-disk H, notched in the periphery to admit the cord, is journaled centrally upon the vertically-swinging frame I, hinged below the main shaft, this arrangement permitting the lower end of the frame, with the disk thereon, to rise and approach the tying-bill F during the formation of the knot, for the purpose of slackening the cord thereto, as in other machines of the present day. The disk co-operates to hold the cord with a swinging jaw or clamp, N', grooved to receive one edge of the disk, as usual. For the purpose of imparting the necessary intermitting rotation to the clamping-disk, it is provided, as shown in Fig. 4, on the under side with a series of ratchet-teeth, *d*, acted upon by a pawl or dog, *e*, mounted on a swinging arm, *f*, which is journaled upon the supporting-frame I, concentric with the disk. The dog *e* is acted upon at its rear end by a spring, *g*, secured to the arm, whereby it is caused to engage with the ratchet-teeth during its forward movement. The vibration of the pawl-carrying arm *f* is effected by means of a rod, *h*, one end of which is jointed to said arm, while the opposite end is connected, as shown in Figs. 1 and 3, to a lever, *i*, this lever being in turn connected at its upper end by a pivot, *k*, to the main standard or frame of the machine. The lever *i* receives a vibratory motion through a roller, *l*, mounted upon its middle and arranged to enter a cam-groove, *m*, formed in the side face of a disk, *o*, secured upon the main shaft J, as represented in Fig. 1, the groove *m* being of such form as to operate the lever *i* when the disk is to be turned, and to hold the same at rest during the intervening periods. The disk-operating rod *h* is preferably connected to the lever *i* through the medium of a head or end piece, *o'*, screwed upon the end of the rod and secured by a jam-nut, as shown in Fig. 3, this construction permitting the position of the pawl-operating lever with respect to the lever *i* to be adjusted as may be required in order to turn and stop the disk at the exact points demanded. The backward rotation of the disk during the retrograde movement of the driving-pawl *e* is prevented by means of a pawl, *p*, pivoted upon the frame I, and actuated by a spring, *q*, one end of which is riveted to the pawl, while the opposite end bears against a fixed stud, *r*, cast on the frame. This pawl *p* swings upon the same pivot which supports the cord-clamping jaw of the plate N'. The jaw N' is urged against the disk by means of an upright spring, *s*, the lower end of which is bolted to an arm depending from the frame I.

The disk-supporting frame I is depressed, but permitted to rise at the proper time by means of an eccentric or cam, P, mounted on the main shaft, as shown in Figs. 3 and 10, and arranged to bear upon a roller, Q, journaled in the frame I. The downward-swinging motion of the disk-carrying frame I is limited by means of a vertically-adjustable suspension-hook, S, the stem of which is threaded and passed through the main standard and secured by nuts *t* above and below the same, as shown in Fig. 3. The hook engages beneath the pivot or journal of the roller Q. By adjusting the nuts the descent of the frame and clamping-disk may be arrested at any desired point. While it is preferred to retain the hook S as the most simple means of limiting the motion of the parts, any equivalent form of suspension device may be employed.

Passing next to the cord-placing and knife-carrying arm, attention is directed to Figs. 1, 3, 7, and 8. The arm, pivoted near its upper end to the main standard, and vibrated by means of a cam-groove in the face of the main wheel T, has its lower end notched and arranged to vibrate past the end of the rotary tyer, substantially as in former machines. Instead, however, of giving the end of this arm the usual V form to receive the cord, I construct the same in the peculiar form represented in Figs. 7 and 8, with a central cord-receiving opening, *u*, and with two inclined surfaces, *v* and *w*, standing at substantially right angles to each other and communicating with the opening *u* by a narrow slot or passage, *x*. The faces *v* and *w* are inclined on opposite

sides of the perpendicular and on opposite sides of the slot *x*, so that when the cord is laid in position by the needle the surfaces *v* and *w* will serve to guide the same in a positive manner to the slot *x*, and thus insure its passage downward into the opening *u*, where it is securely confined in such position that the proper action of the tying-bill thereon is secured.

Referring next to the construction and arrangement of the compressor D, reference is made to Figs. 1 and 3ª. The upright arm or compressor proper, *a'*, against which the grain acts, is secured at its base by means of a bolt upon the upper surface of a plate, *b'*, upon which it may be adjusted lengthwise, in order to produce an increased or diminished grain-space between the compressor and binder-arm, and thus vary the size of the bundles. The plate *b'* is pivoted at *c'* to the side of a vertically-vibrating arm, *d'*, its motion being limited by a stud or pin, *e'*, passing through a slot therein, as shown, this arrangement permitting the plate *b'* and the compressor proper to be tipped backward to trip the driving mechanism into action in a manner which will be hereinafter explained. The arm *d'* is pivoted at its forward end, *f'*, to the hub of the needle, and is moved vertically at the proper times in order to maintain the elevation of the compressor above the table during the binding operation and to depress the same below the table when the bundle is to be discharged. The vertical motion of the compressor-carrying arm *d'* may be effected by means of a link, *g'*, connecting with a rock-shaft, *h'*, in the same manner that the compressor-arms of the ordinary machines are operated, or by any other equivalent actuating mechanism. The swinging plate *b'* is provided with an ear, *k'*, connected by a chain or other device, *l'*, to the usual rock-shaft, *m'*, by which the driving mechanism is tripped into action. During the binding of the bundle the arm *d'* remains fixed in position, with the compressor standing above the table to sustain the grain. When the pressure of the grain against the compressor exceeds the predetermined limit, the arm *a'* and plate *b'* swing backward together around the pivot *c'*, the arm *d'* remaining for the time being unmoved, the result being, through the intermediate devices, to set the binder in action. After the completion of the binding operation the arm *d'* is permitted to swing downward, thereby lowering the arm *a'* below the table and discharging the bundle, subsequent to which the parts resume their original positions, as usual in this class of machines.

The present invention is restricted to those matters and things which are hereinafter claimed.

It is to be noted that in this machine, as in others of its kind, the position of the cord with respect to the bills of the rotary tyer is determined in part by the clamping-wheel, the rotation of which has the effect of moving the cord laterally; hence it is of the highest importance that the disk shall be turned to and stopped in a particular position. The adjustable connection between the pawl-carrying arm and the vibratory lever through which it receives motion is a valuable feature, since it will compensate for the wear of the operative parts and permit an exact adjustment of the disk, notwithstanding those variations in the form, size, and location of the parts which inevitably occur in the course of manufacture.

Having thus described my invention, what I claim is—

1. In combination with a needle-arm and a crank mounted on its shaft, a reciprocating cord-controlling arm mounted upon and actuated by said crank, as described.

2. In combination with the vibratory needle-arm, the crank M thereon, the reciprocating slack-arm L, and the fixed cord-guides, substantially as described.

3. The needle-arm, its rock-shaft, and the crank upon said shaft, in combination with the reciprocating slack-arm having an eye therein and mounted on said crank, and the fixed cord-guides arranged on opposite sides of said arm.

4. The cord-clamping disk provided with ratchet-teeth, in combination with the swinging arm *f*, the spring-actuated pawl thereon, the rod *h*, to operate said arm, the lever *i*, operating said rod, and the cam-wheel grooved in its side face and acting directly upon a stud or roller on the lever.

5. In combination with the vertically-swinging frame I, the operating cam *o*, the lever *i*, the clamping-wheel mounted on the swinging frame I and provided with ratchet-teeth, the swinging arm, also mounted on said frame, the spring-actuated pawl mounted on said arm to turn the clamping-wheel, and the rod extending from said arm to the lever *i*, whereby an intermitting rotary motion is imparted to the clamping-disk, while at the same time it is permitted to rise and fall with the swinging frame.

6. In combination with a rotary tying-bill of the type herein shown and described, the rotary cord-clamping disk, the pawl-carrying arm to rotate the disk, the vibratory lever and its actuating-cam, and the rod *h* and the head *o*, threaded thereon, the two forming an adjustable connection between the lever and pawl-carrying arm, substantially as described, whereby the rotation of the clamping-disk may be accurately adjusted and the presentation of the cord to the tyer properly controlled.

7. In combination with the cord-clamping disk having ratchet-teeth, the pawl *p*, to prevent a retrograde motion, and the cord-clamping jaw or plate N, the two mounted on one and the same pivot.

8. In combination with the fixed standard or frame and the vertically-swinging frame I, having the cord-clamp thereon, an adjustable stop, substantially as described, to limit the vertical motion of the said frame.

9. In combination with the vibratory frame

I, with the cord-clamp thereon, the fixed standard or frame, the stop S, to limit the motion of said frame, and the adjusting-nuts applied as described.

10. The combination of the vertically-swinging arm *d'*, the plate *e'*, united thereto by a pivot and slotted connection, and the compressor proper mounted upon said plate.

11. In a grain-binder, the combination of a rock-shaft, the binding-needle and the crank, both fixed on said shaft, and a reciprocating cord-controlling arm closely jointed to and moved in both directions by said crank.

CALVIN YOUNG.

Witnesses:
C. W. UPHAM,
P. T. DODGE.