2 Sheets—Sheet 1.

R. K. & J. LARAWAY.

Grain Binder.

No. 230,292. Patented July 20, 1880.

Fig. 1

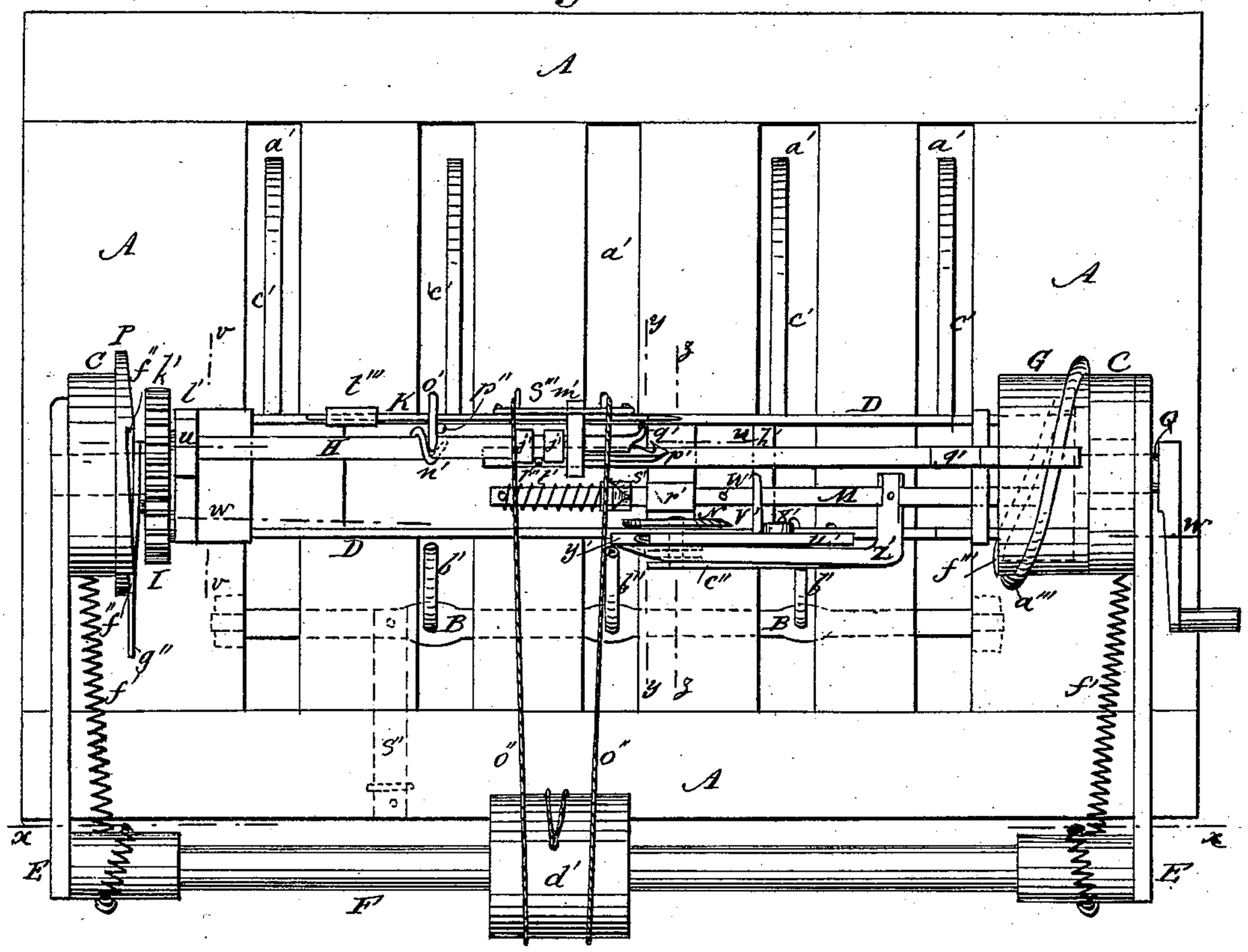
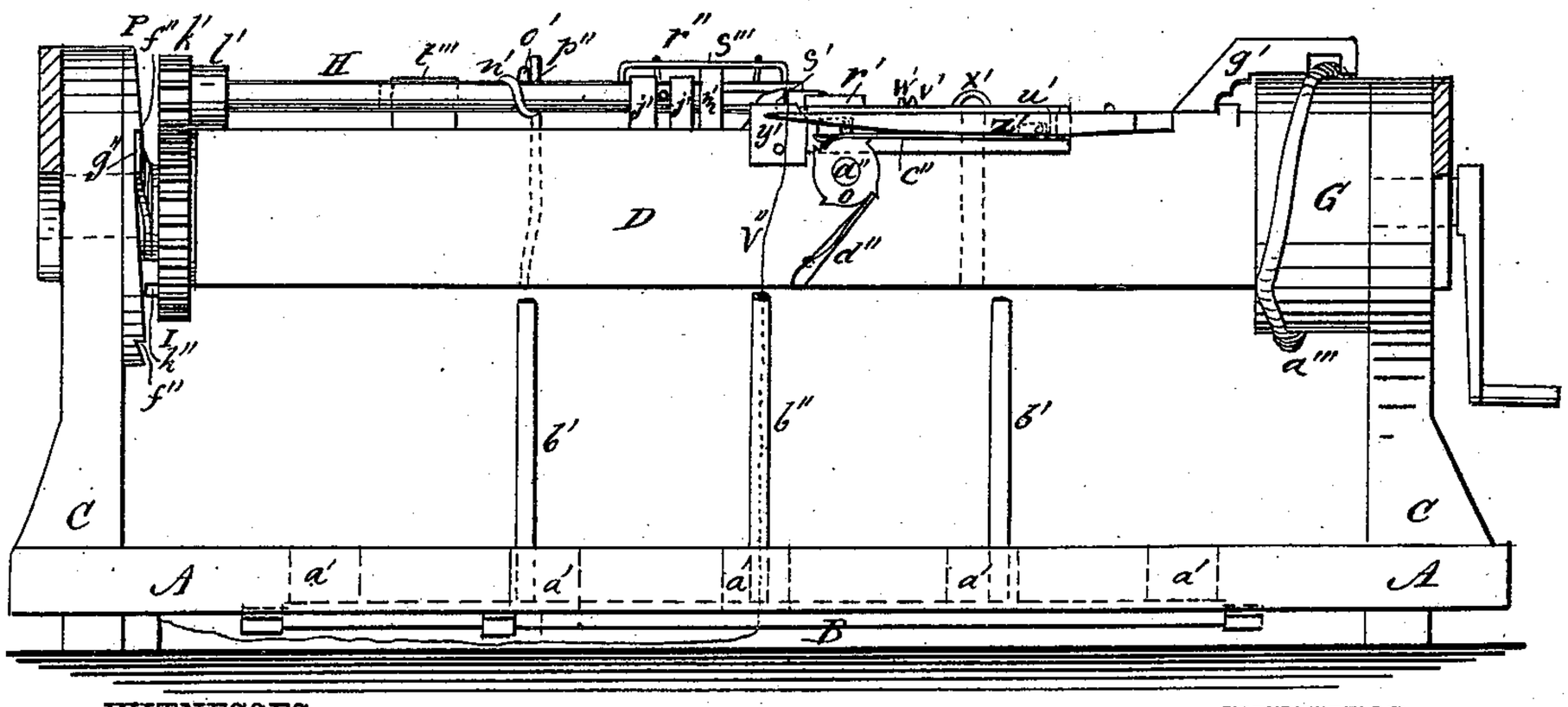


Fig. 2



WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

R. K. Laraway

J. Laraway

BY Munn & Co

ATTORNEYS.

2 Sheets—Sheet 2.

R. K. & J. LARAWAY.

Grain Binder.

No. 230,292. **Patented July 20, 1880.**

Fig. 3

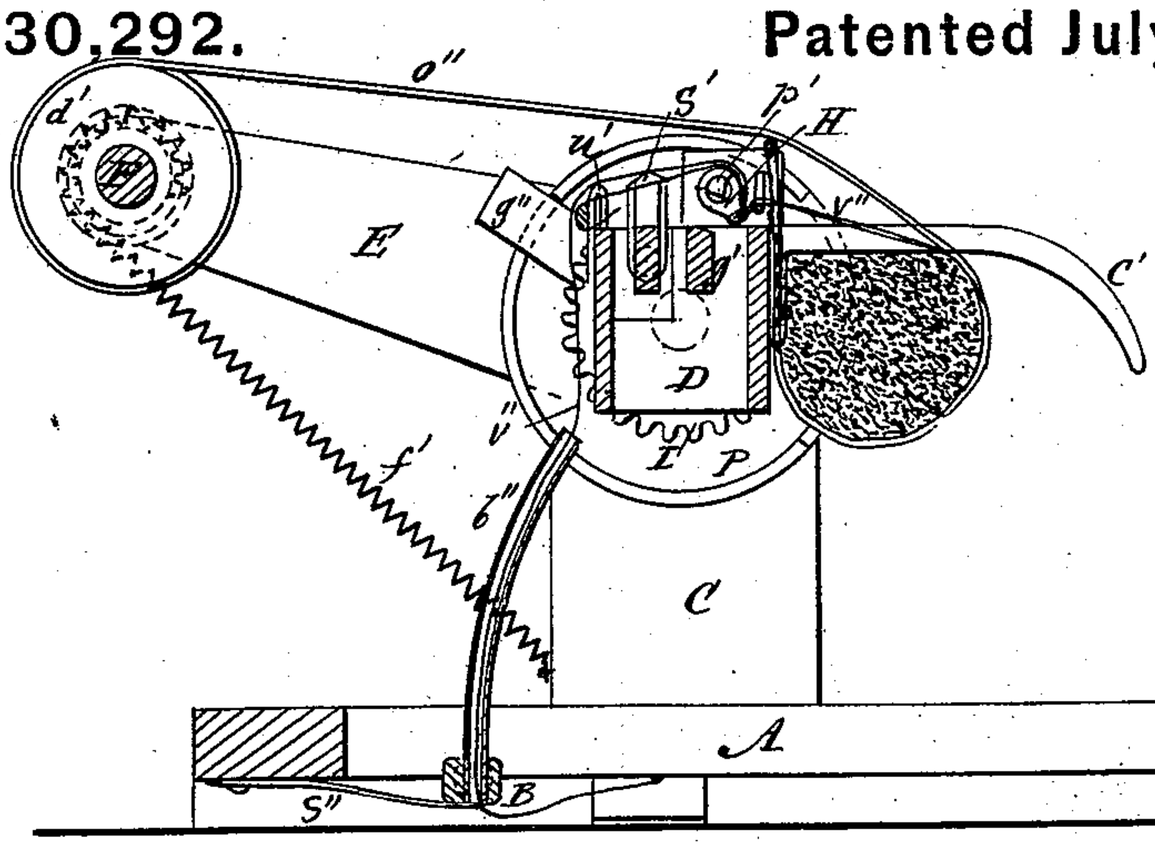


Fig. 4

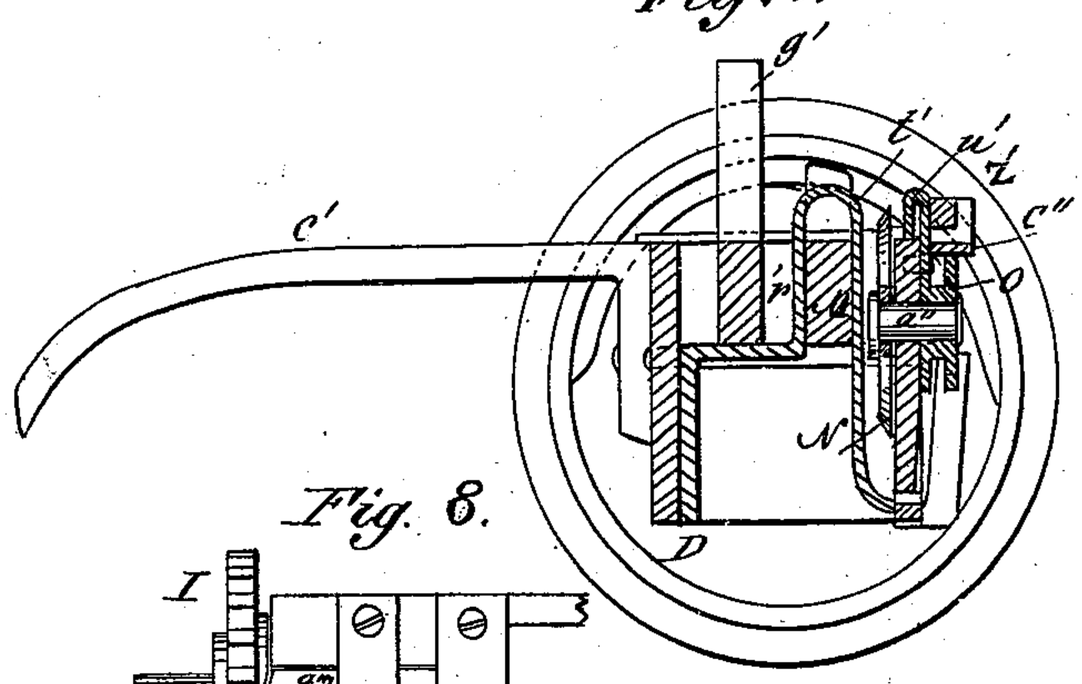


Fig. 5

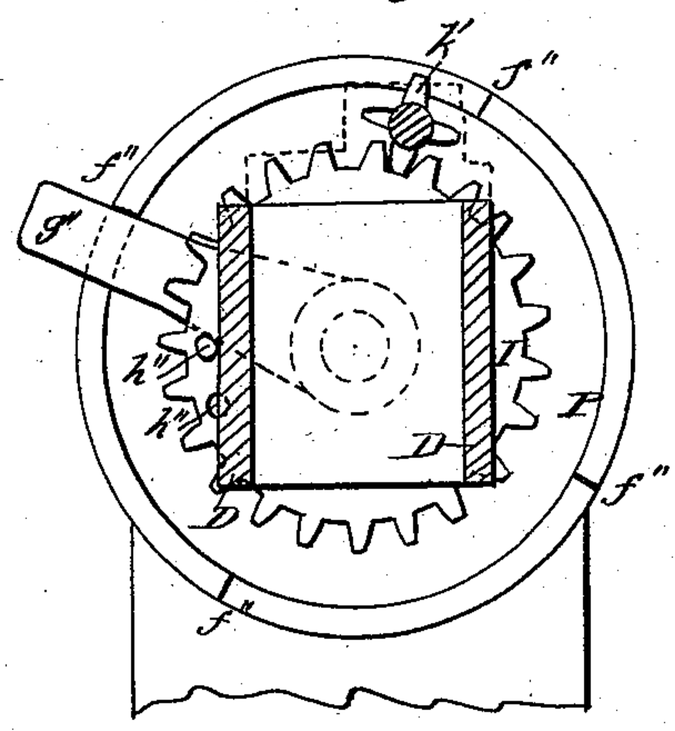


Fig. 8.

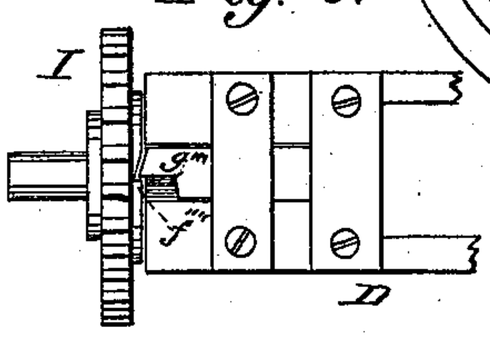


Fig. 6

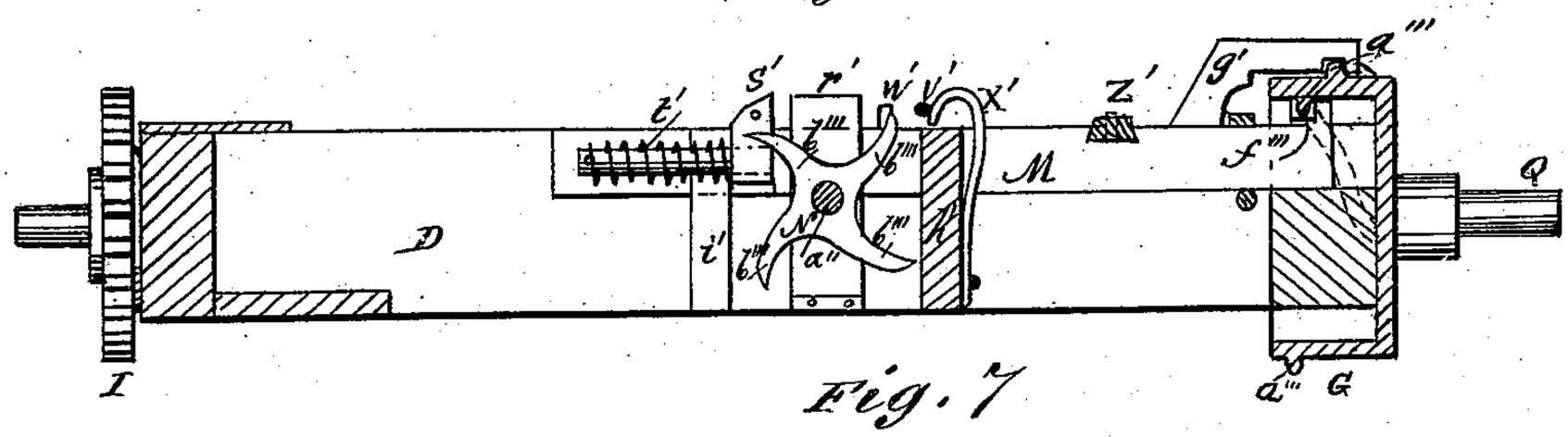
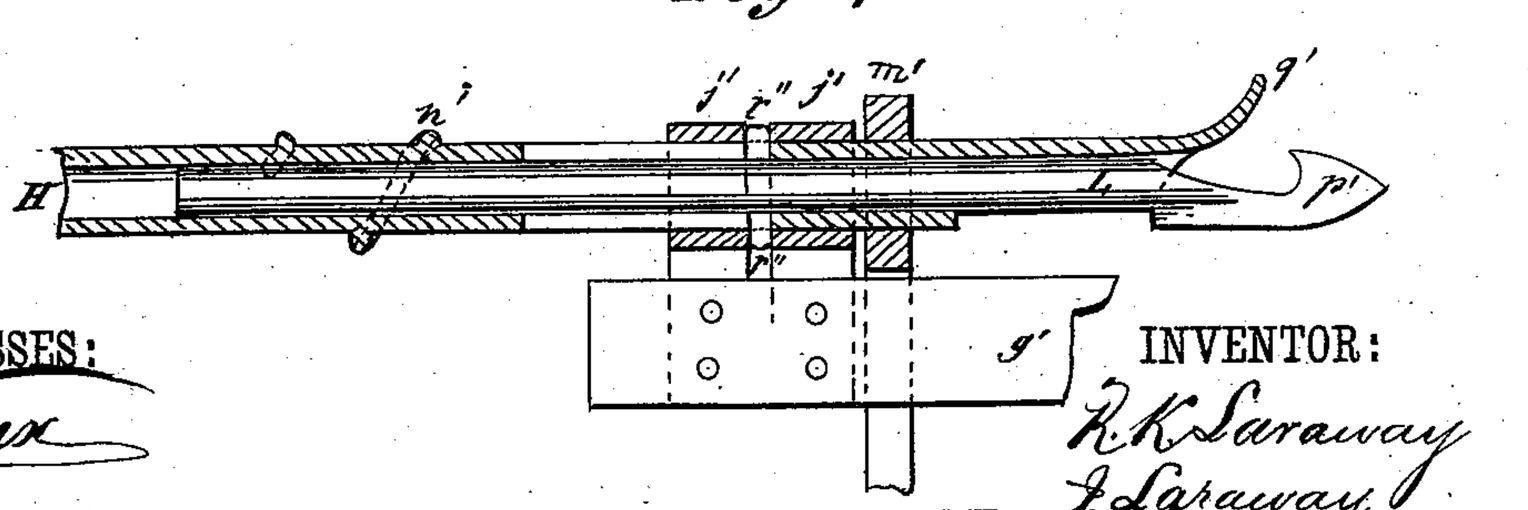


Fig. 7



WITNESSES:

C. Nevenx

C. Sedgwick

INVENTOR:

R. K. Laraway

J. Laraway

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

RANSOM K. LARAWAY AND JEROME LARAWAY, OF BATTLE CREEK, MICH.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 230,292, dated July 20, 1880.

Application filed July 3, 1879.

To all whom it may concern:

Be it known that we, RANSOM K. LARAWAY and JEROME LARAWAY, of Battle Creek, in the county of Calhoun and State of Michigan, have invented a new and Improved Grain-Binder; and we do hereby declare that the following is 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 plan of the device. Fig. 2 is an elevation of the same on line *x x* of Fig. 1. Fig. 3 is a sectional elevation on line *y y*, Fig. 1. Fig. 4 is a sectional elevation on line *z z*, Fig. 1. Fig. 5 is a sectional elevation on line *v v*, Fig. 1. Fig. 6 is a sectional elevation on line *w w*, Fig. 1. Fig. 7 is an enlarged sectional elevation of the tyer. Fig. 8 is an inverted plan of a section of the revolving shaft.

This invention relates particularly to that class of grain-binders which bind the gavel with a string or twine by tying a knot in it, although the devices herein described are capable of doing the same work with fine wire.

It is also more especially designed for and applicable to the so-called "self-rake" harvester or reaper; its object being to dispense with the usual heavy draft, cumbersome and expensive mechanism of gathering and binding machines which make use of agitators, elevators, endless aprons, &c., whereby much of the ripened grain is lost in consequence of unnecessary shaking in traveling and in elevating the grain and of the bundle violently striking the ground in falling; and, in lieu of these defective devices, to provide for attachment to any of the reapers now made of a simple, compact, light-draft, and effective binder that shall automatically grasp the gathered gavel without violence and without releasing it until it is securely bound and the knot tied, and lay the completed sheaves on the stubble-field at the level of the reaper-knife, out of the way, as gently as when the same is done by the most careful human hands and as fast as the grain is cut.

This invention consists of a slotted table, to which is secured two upright standards carrying between them a rotating hollow shaft or box, which bears the curved prongs or arms that grasp the gavel, and in and upon which are secured the tyer, the twine holders and cutter, and their auxiliary parts, whose construction and uses will be hereinafter described.

It further consists of a drum immovably fixed to the forward side of the rear standard, and encircling that end of the hollow shaft which is provided with outer and inner spiral rings or flanges or cams, that, as the shaft rotates, cause the pitmen engaged with them to move backward and forward, and give proper motions to the operating parts with which they are connected.

It further consists of a notched or ratchet faced disk secured to the rear face of the forward standard, with which engages a latch or stop that, acting in union or combination with yet another notched or ratchet disk at that end of the machine, regulates and determines the movement of the cog-wheel and its connections on the forward end of the shaft.

It further consists of a pinion which engages with and travels around a cog-wheel which is provided with a notched or ratchet rear face or disk, with which engages a dog or spring-bolt that, as the shaft rotates, aids and assists the standard-disk in governing the movements of the twine-twister or knot-tyer and its dependent connections on the forward end of the shaft.

It further consists of a compressor-cord and drum, which last is held by two arms projecting from the standards and carries the compressor-cord.

In the drawings, A represents the table, provided with slots *a'*, and having secured in suitable bearings on its under side the rocking bar B, in which are firmly fixed a curved tubular prong, *b''*, and two or more curved prongs, *b'*, that project upward through the slots. The spring *s''*, acting on the bar B, maintains the prongs in an upright position, but allows them to yield to permit the passage of the gavel.

The standards C support between them the hollow shaft or box D, from one side of which project the curved prongs or arms *c'*, whose function it is to grasp the gavel, and with the aid of the flexible prongs or teeth *b' b''*, and the compressing cords or bands *o''*, and the binding-twine *v''*, to hold it until it is tied.

Set loosely on the ends of the axles, outside of the standards and projecting to the left, are

the arms E, which support between their extreme ends the revolving compressor-shaft F, on which, midway of its length, is fixed the drum d', to which is fastened one end of the compressing cords or bands o'', which are passed over the support s''', and whose other ends are secured to the shaft D. Made fast on the side of the shaft F, and reaching from each end of the shaft to the feet of the standards, are the two springs f' f', that serve to turn the shaft backward in order that it may take up the slack of the compressor-bands.

Rigidly fixed on the forward side of the rear standard, and encircling that end of the hollow shaft, is the hollow drum G, provided on the outside with a spiral ring or cam, a''', and on the inside with a spiral ring or cam, f''', the former of which, as the hollow shaft rotates, causes the pitman g' to give a horizontal reciprocating motion to the tyer-spindle L, while the inside cam gives motion, through the pitman M, to the twine holders and cutter.

The pitman g' moves in slots in the blocks h' and i', and by them and its yokes j' j', which loosely embrace the tyer-sleeve H, it is held in position.

The sleeve H is held in position and revolves in the blocks or boxes l' and m', that are fixed in the hollow shaft, and at the forward end of the sleeve is keyed the pinion k', that engages with, and at certain times travels around or on, the cog-wheel I.

On the outside of the sleeve H is a screw flange or cam, n', that engages with the pin o', that projects from the moving slide K, and it is also provided at its free end with a curved lip, q'. It is also slotted longitudinally, and through the slot projects the pin r'' of the tyer-spindle L, that is inside of the sleeve, said pin r'' engaging with the yokes j' j', by which the pitman g' actuates said spindle. This spindle is furnished with a terminal hook, p', and, with the sleeve, forms the tyer.

The slide K moves in the socket t''' and the block m'. The pitman M is held in position in the block h' and yoke r', the latter serving as the fixed point, against which the twine-holder s' closes. This twine-holder is carried on the pitman M, by which it is actuated through the spiral spring t', that is fixed around the end of the pitman. Set on an edge of the hollow shaft is the twine-holder w', from which projects a pin or finger, v', with which the stud w' of the pitman M engages, in order to open this twine-holder to release the twine when necessary. The spring x', that is fastened to the block h', operates to close this twine-holder.

y' is the fixed block on the side of the hollow shaft, against which the twine-holder w' closes. Rigidly secured upon the pitman M is the bent tapering-pointed rod z', whose function it is to hold the slack twine for the use of the tyer. Upon a pin, a'', that revolves in the side of the hollow shaft, is fixed the revolving twine-cutter N, provided with several knives, b'''. On the outer end of the pin a'' is fixed a ratchet-wheel, o.

In the operation of this device the pawl c'', which is secured to the under side of the rod z', engages in the teeth of the ratchet and pushes it around, thereby causing the cutter N to operate, the pawl d'', immediately underneath, acting as a detent to the ratchet.

On the rearward face of the forward standard is fixed a circular plate, P, whose rear crown rim is provided with four equidistant notches or ratchet-teeth, f'', and set loosely on the shaft is a stop or latch, g'', against which the stud h'' of the cog-wheel I comes in contact at certain times during the revolution of the shaft, the latch g'' acting as a pawl to the ratchet when the shaft is turned to the right, by engaging in the notch or tooth it first meets, thereby locking, for the time being, the cog-wheel I to the standard. The rear face of the cog-wheel I is also provided with four equidistant notches or ratchet-teeth, f'''', in which the dog or spring-bolt g''', that is fixed on the shaft, engages at certain times during the revolution of the shaft to the left, the bolt g''' thereby locking the pinion and cog-wheel together, so that they shall remain stationary relative to each other at certain times and in unison with the movements of the ratchet-plate P and its connections.

This attachment for reapers is designed to operate with the hollow shaft in line with the track of the reaper and to the left of the heel of the reaper-knife, the cog-wheel end being forward or next thereto, so that the grasping-arms, as they descend to the right, may embrace the gavel at the point and moment of its delivery by the reaper-rake, the gavel being clasped, compressed, embraced by the binding-twine, and the knot partially tied during the revolution of the shaft to the right, when a reverse or retrograde movement finishes the knot and cuts the twine while the bundle is being carried over and downward, where it is delivered, by coming in contact with the back of the prongs b' b'', and gently laid on the stubble-field, entirely out of the track of the reaper on its next course around the field.

In order to understand the operation of this invention, let us suppose it attached to a Wood reaper by supplying the necessary machinery to impart the requisite forward and retrograde rotation of the hollow shaft.

Its operation will be as follows, viz: Placing the hollow shaft D in such a position that the revolving arms c' shall hang vertically below the shaft, when the twine-holder w' y' will be on the upper edge of the shaft, open, ready for the reception of the binding twine. Now, having placed the end of the binding-twine v'' within the open jaws of the holder w' y', a quarter-revolution of the shaft to the left, which is the retrograde movement, closes this twine-holder on the end of the twine, and it is carried by the continued revolution of the shaft over the pointed rod z'. At the complete retrograde revolution of the hollow shaft the twine has passed over the back of the sleeve H, forward of its curved lip q', and between the

latter and the fingered rear end of the moving slide K. At a little more than one revolution of the shaft D the latch g'' is carried over one of the ratchet notches or teeth of the plate P by means of its engagement with the stud h'' of the cog-wheel I. At one and one-quarter revolution the arms c' have reached a horizontal position on the right, where they are ready to descend in the reverse direction in order to grasp the gavel of grain.

The foregoing movements, although they are repeated with the binding of every bundle, have been merely preliminary movements necessary for the purpose of getting the twine and machinery in proper position and readiness for the work in hand—that of grasping and binding the gavels of grain. The hollow shaft now rotates to the right, carrying the grasping-arms c' downward, and during the first quarter of the revolution the gavel has been clasped by the revolving arms and carried to and pressed against the prongs or teeth b' b''.

At the half-revolution of the shaft the arms c' have been carried upward beyond the teeth, the twine has nearly encircled, and the compressor-bands o'' are beginning to act on the gavel. At three-quarters of revolution the gavel rests in the uplifted arms c' on the top of the hollow shaft, held tightly by both the compressor-bands and binding-twine, while the latter has now a second time passed over the sleeve H, forward of its lip q', and in rear of the end of the moving slide K. At the complete revolution the compressor-bands have fully embraced the gavel, the twine has been carried between the open jaws of the twine-holder s' r', which has closed upon it. The latch g'' now becomes engaged by one of the studs h'' of the cog-wheel I, and is thereby carried around on the face of the disk or fixed crown-plate until its opposite side engages in one of the teeth of the plate P, by which means the cog-wheel I is locked firmly to the forward standard, in consequence whereof the continued revolution of the hollow shaft causes the pinion k' to travel on and around the cog-wheel I, having been released therefrom by the disengagement of the beveled end of the spring-bolt g''' from one of the ratchet-teeth of the cog-wheel I, that until this time has held the two together and at rest relative to each other. The pinion k' now travels one-quarter around the cog-wheel I and performs one complete revolution on its own axis, thereby imparting a corresponding movement to the sleeve H and hook q', thus forming the loop in the twine and aiding in tying the knot. At the beginning of the rotary movement of the sleeve H the shoulder on the rear end of the moving slide K engages with the twine v'' to push it rearward, in order that the lip q' may take hold of the twine in its rotary movement to form a loop around the sleeve H and spindle L, and at the same time to allow the hook p' to engage with the twine.

As will be seen, the twine is so held by the curved lip q' and end of the slide K that the loop is formed while the sleeve H is revolving and the spindle L is being protruded by means of the pitman g'. In revolving the sleeve H its lip q' has carried the binding-twine around the sleeve until it has come in contact with and crosses itself immediately behind the lip q'. At the complete revolution of the sleeve H, by means of the traveling pinion k', the twine has passed into and become engaged by the hook p' of the spindle L, while the twine-rod z' has drawn back in order to release this end of the twine for the use of the tyer, which is now forcibly pulling it through the cushioned twine-holder s' r', which is thus made sufficiently elastic to give proper tension to the end of the twine while the knot is being tied. The spring-bolt g''' has now engaged in one of the ratchet-teeth of the cog-wheel I, again locking the pinion and cog-wheel together, and the twine has again passed into the opening jaws of the holder w' y', ready to be again engaged by it and the rod z', while the pawl c'' has been drawn back, ready to perform its function of turning the ratchet that operates the cutter N. The hollow shaft has now reached such a position that the grasping-arms c' hang vertically underneath the shaft, and the gavel, tightly embraced by both the compressor-bands and binding-twine, is held close up underneath. At this point the shaft is reversed or revolves to the left, the twine-holder w' y' closes during the first quarter of the revolution, and the tapering rod z' is pushed forward. While the spindle L is drawn within the sleeve, its terminal hook p', being engaged with and drawing tightly on the twine, draws it through the loop on the sleeve H and spindle L, thereby tying the knot.

At the half-retrograde revolution of the hollow shaft the pawl c'' has been pushed forward by the pitman M, causing the cutter N to revolve, cutting the twine, while the twine-holder s' r' has opened. At the third quarter of the revolution the twine has been carried over the rod z', and the gavel, now a bundle of bound grain, rests in the uplifted but descending arms c' of the hollow shaft. At the complete retrograde revolution the spindle L has been protruded; the now loosened end of the binding-band of the bundle drops off of the pendent side of the lip q' and hook p', while the twine to be used for binding the next gavel, passing over the rod z' and engaged by the holder u' y', has been again drawn over the sleeve H, between its lip q' and the terminal end of the moving slide K.

At the moment of the delivery of the bundle, by its contact with the back of the prongs b' b'', the stud h'' has been again engaged with the latch g'', pushing it about one-quarter around on the plate P, or until the latch g'' drops over and passes one of the ratchet-teeth f''. The retrograde revolution of the hollow shaft continues until the bundle is released and delivered by contact with the prongs b' b'' at the level of the stubble-field, and the shaft returns to its primary position, with its arms extended,

ready to descend to grasp and bind the next gavel of grain.

Having thus described my invention, what I claim as new is—

1. The combination of the rotary reciprocating shaft D, provided with the grasping-arms c', the yielding rock-shaft B, provided with the teeth or prongs b' b'', and the compressor-bands o'', substantially as and for the purpose set forth.

2. The tyer composed of the hollow slotted sleeve H, provided with the lip q' and the pinion k', and the spindle L, provided with stud r'' and hook p', in combination with the cog-wheel I, the pitman g', the drum G, and cam a''', substantially as described.

3. In combination with the sleeve H, provided with the screw-flange n', the slide K, provided with the pin o', substantially as and for the purpose set forth.

4. The revolving cutter N, the ratchet-wheel o, and the bent pointed rod z', provided with the pawl c'', in combination with the pitman M and drum G, having cam f''', substantially as and for the purpose set forth.

5. In combination with the revolving shaft D, the pitman M and twine-holders s' r' and w' y', substantially as and for the purpose set forth.

6. The combination of the notched plate P with stop g'' and cog-wheel I, provided with stud h'', substantially as and for the purpose set forth.

7. The combination of the cog-wheel I, provided with the ratchet-teeth f'''' and the spring-bolt g''', with the revolving shaft D, substantially as and for the purpose set forth.

8. The hollow drum G, provided with the external spiral ring or cam a''' and the internal ring or cam f''', in combination with the pitmen g' M and the shaft D, substantially as and for the purpose set forth.

9. The arms E, the shaft F, drum d', compressor cords or bands o'', and the springs f' f', in combination with the revolving shaft D, substantially as and for the purpose set forth.

10. A grain-binder composed of slotted table A, rocking shaft B, provided with teeth b' b'', spring s', standards C, and hollow shaft D, carrying upon or within it the pitman, twine-holders, tyer, slide, cutter, ratchet-wheel, bent and pointed rod, pawl, and blocks, constructed and arranged substantially as herein shown and described.

RANSOM K. LARAWAY.
JAROME LARAWAY.

Witnesses:
SAMUEL B. NICHOLS,
JOHN MEACHEM.