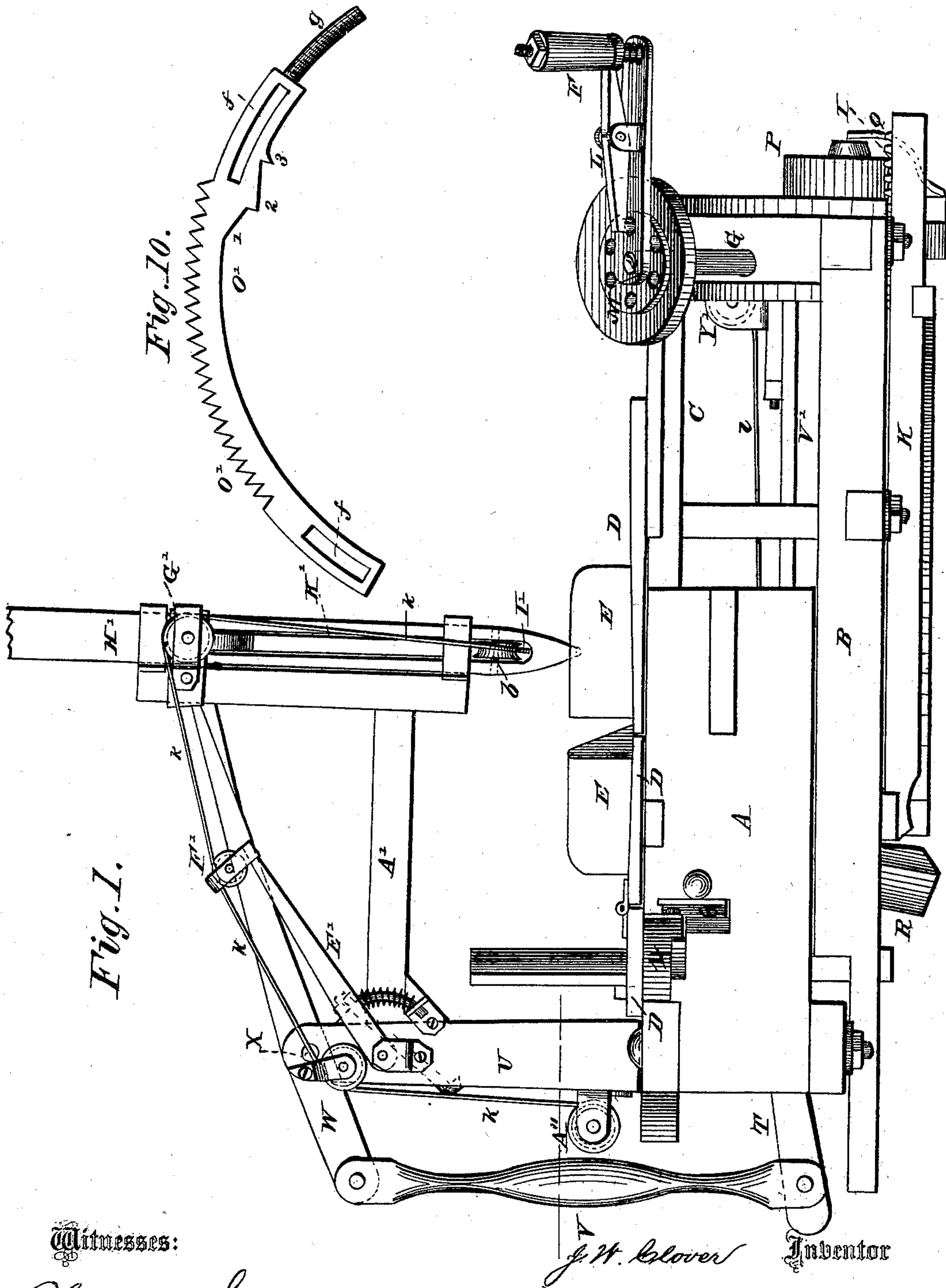


J. W. CLOVER.  
Grain-Binder.

No. 222,668.

Patented Dec. 16, 1879.



Witnesses:  
Alexander Scott  
Geo. S. Pindle

Per

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*Spencer* Attorney

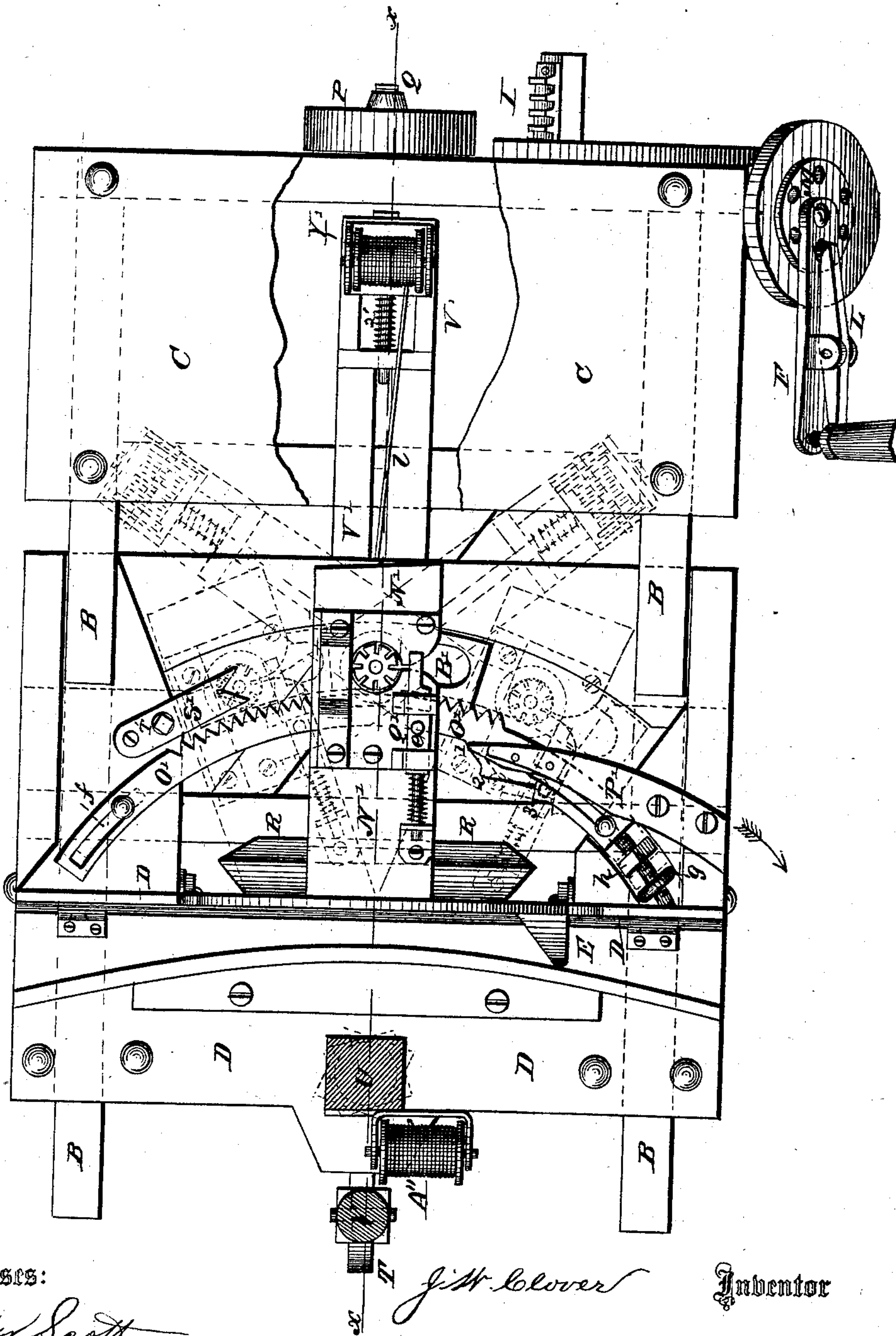
J. W. CLOVER.  
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4 Sheets—Sheet 2.

No. 222,668.

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Fig. 2.



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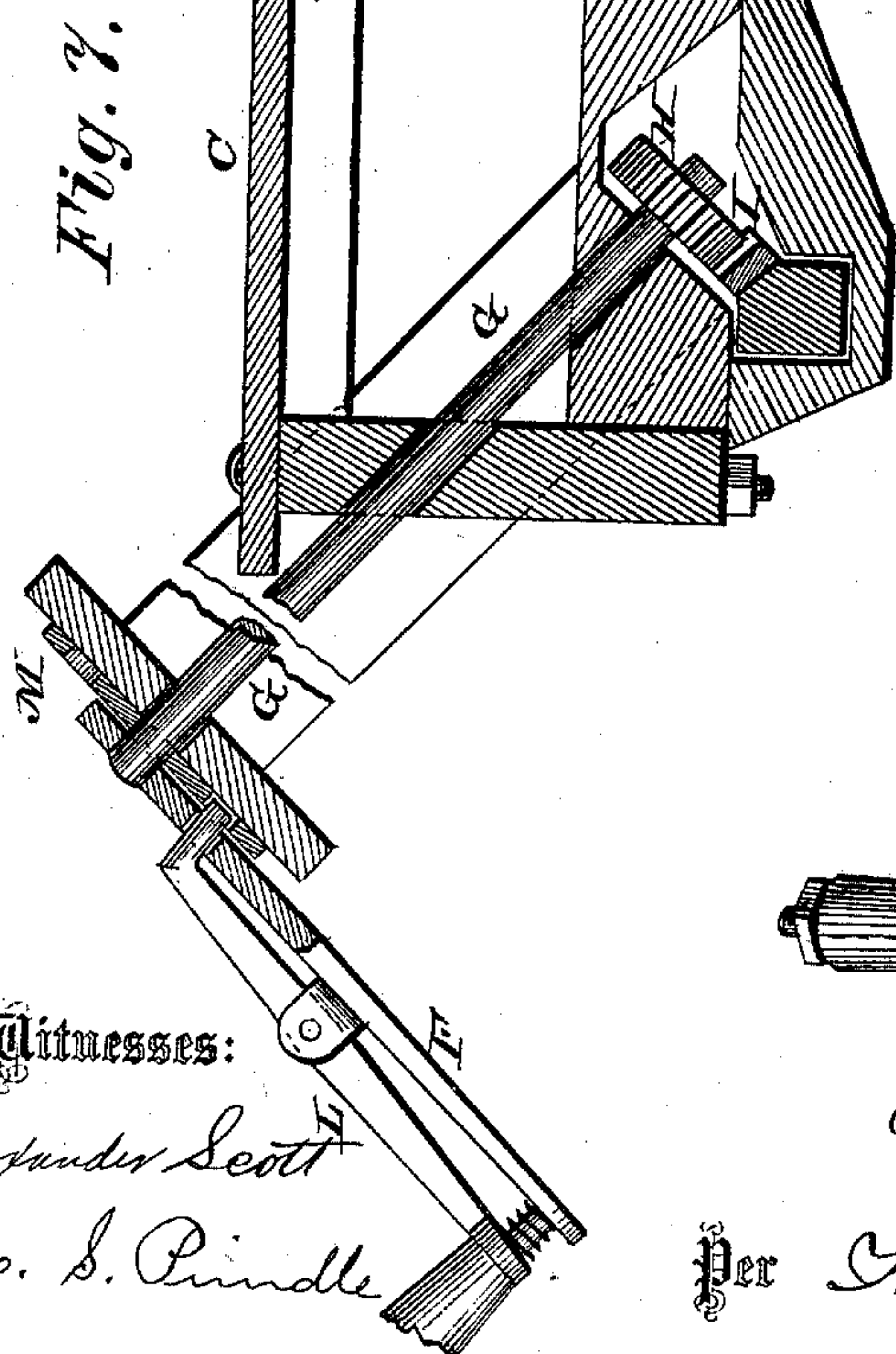
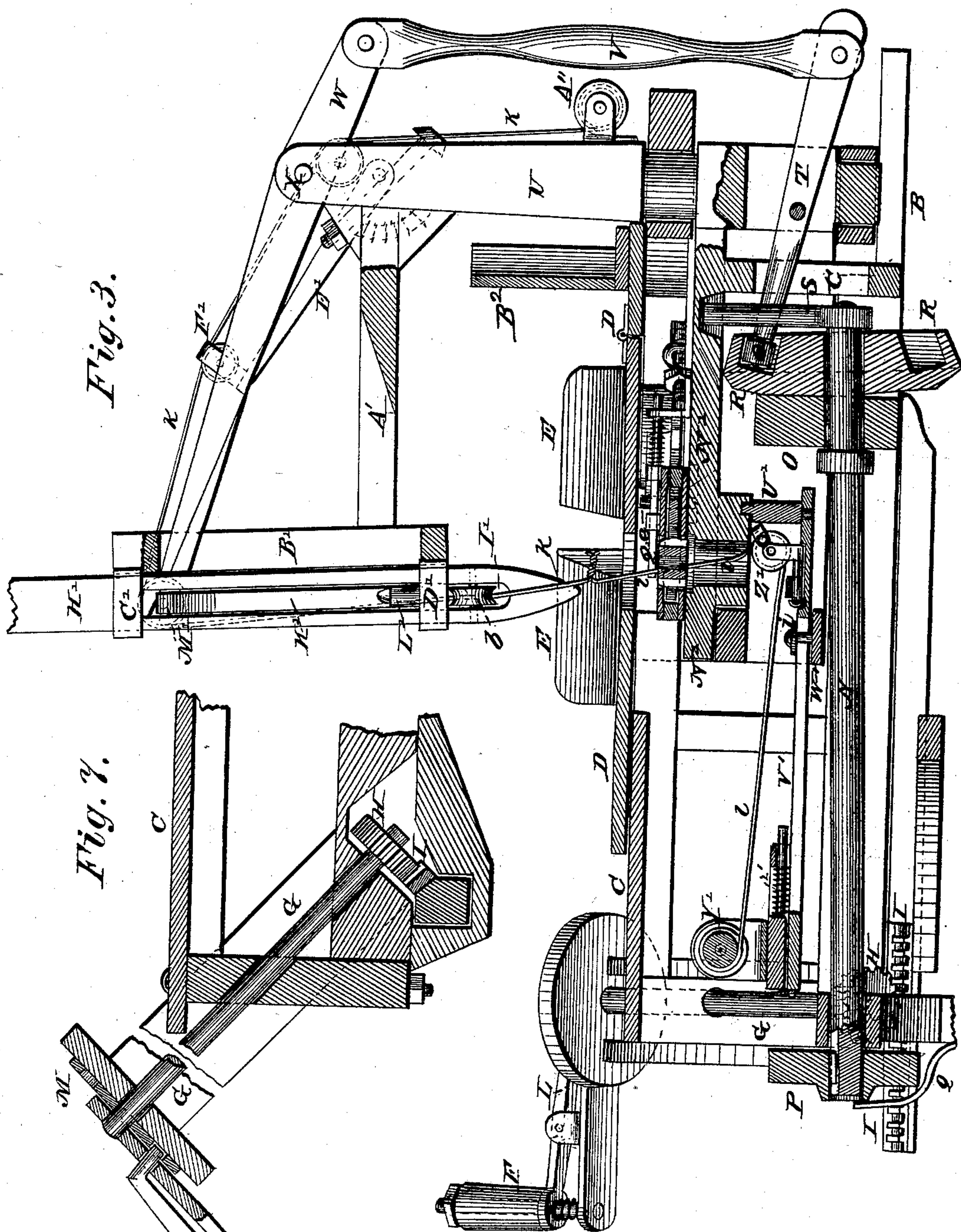


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Fig. 6.

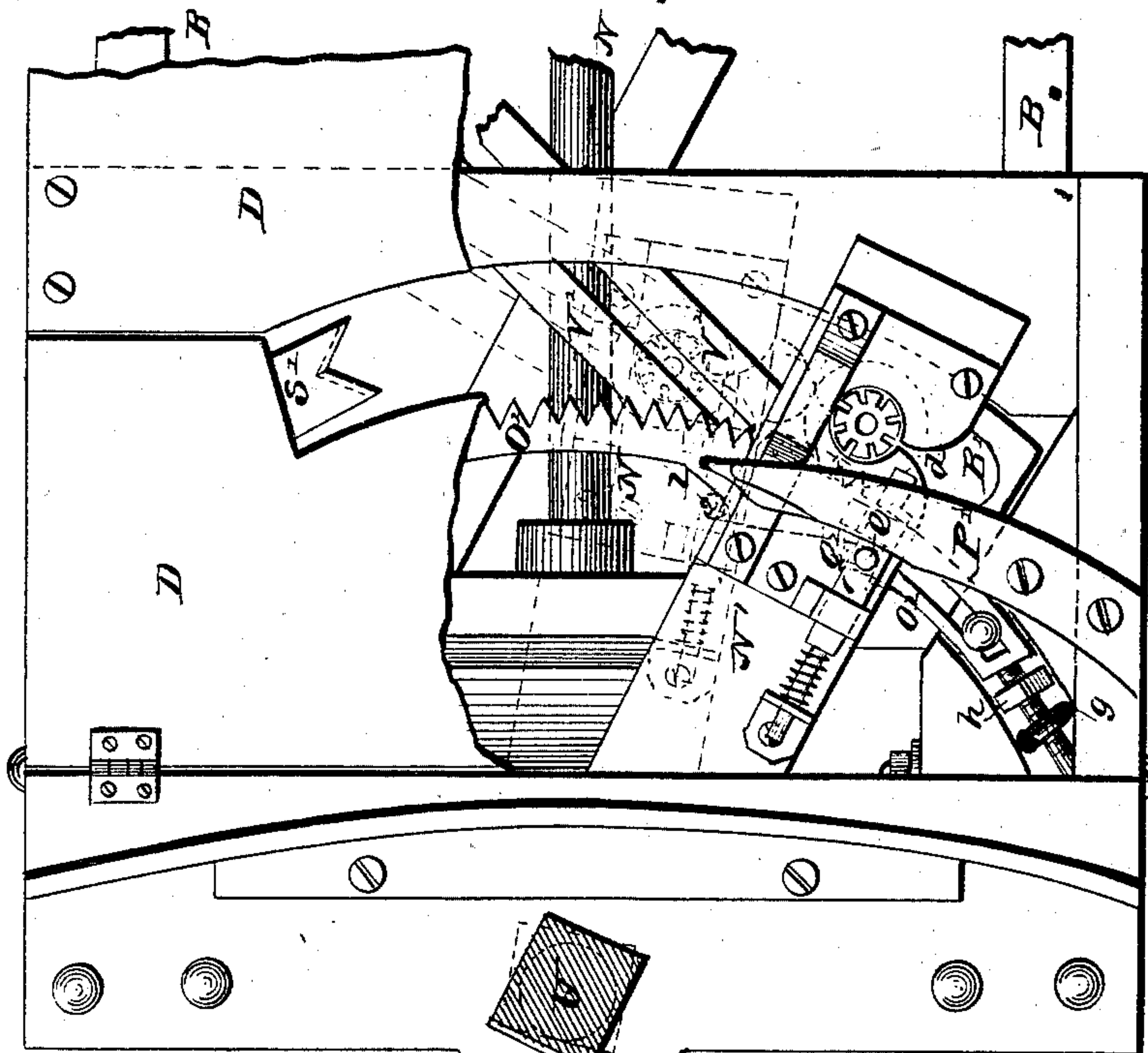


Fig. 9.

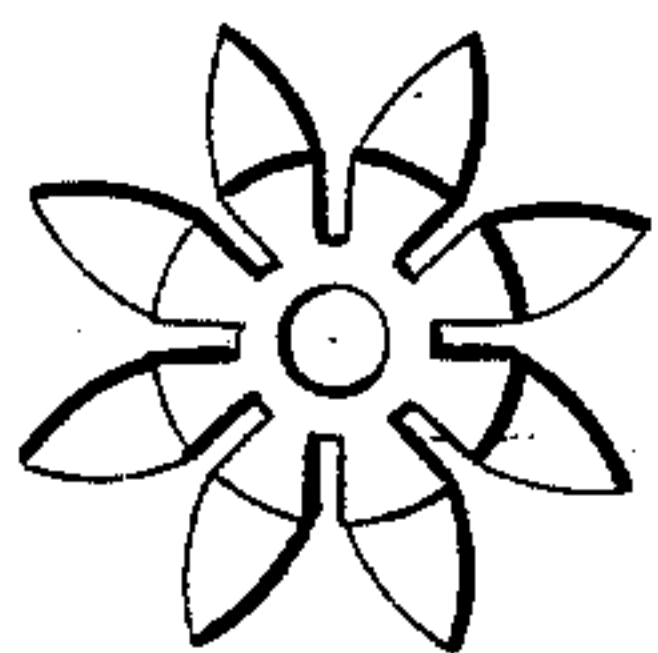


Fig. 5.

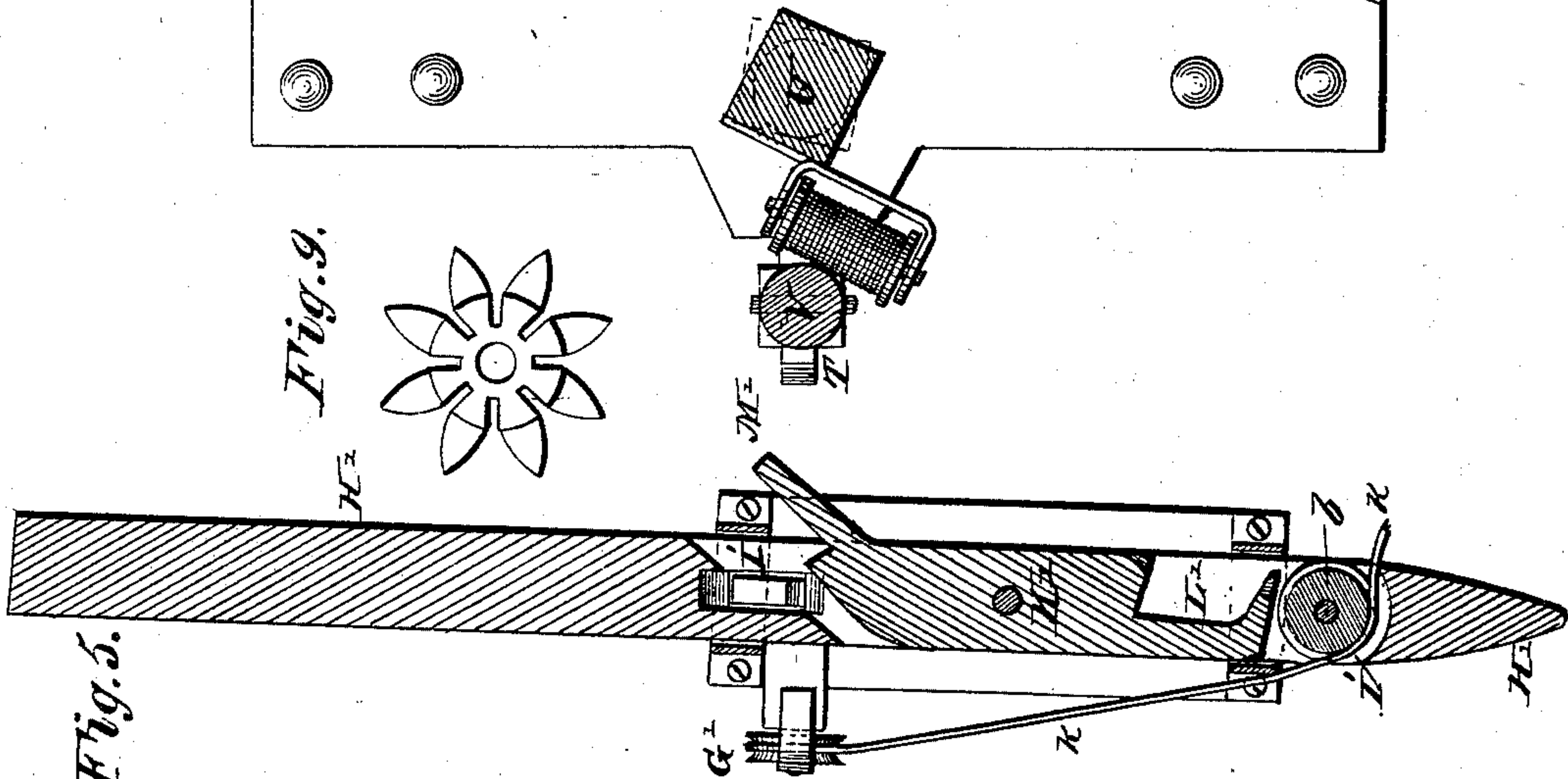


Fig. 4.

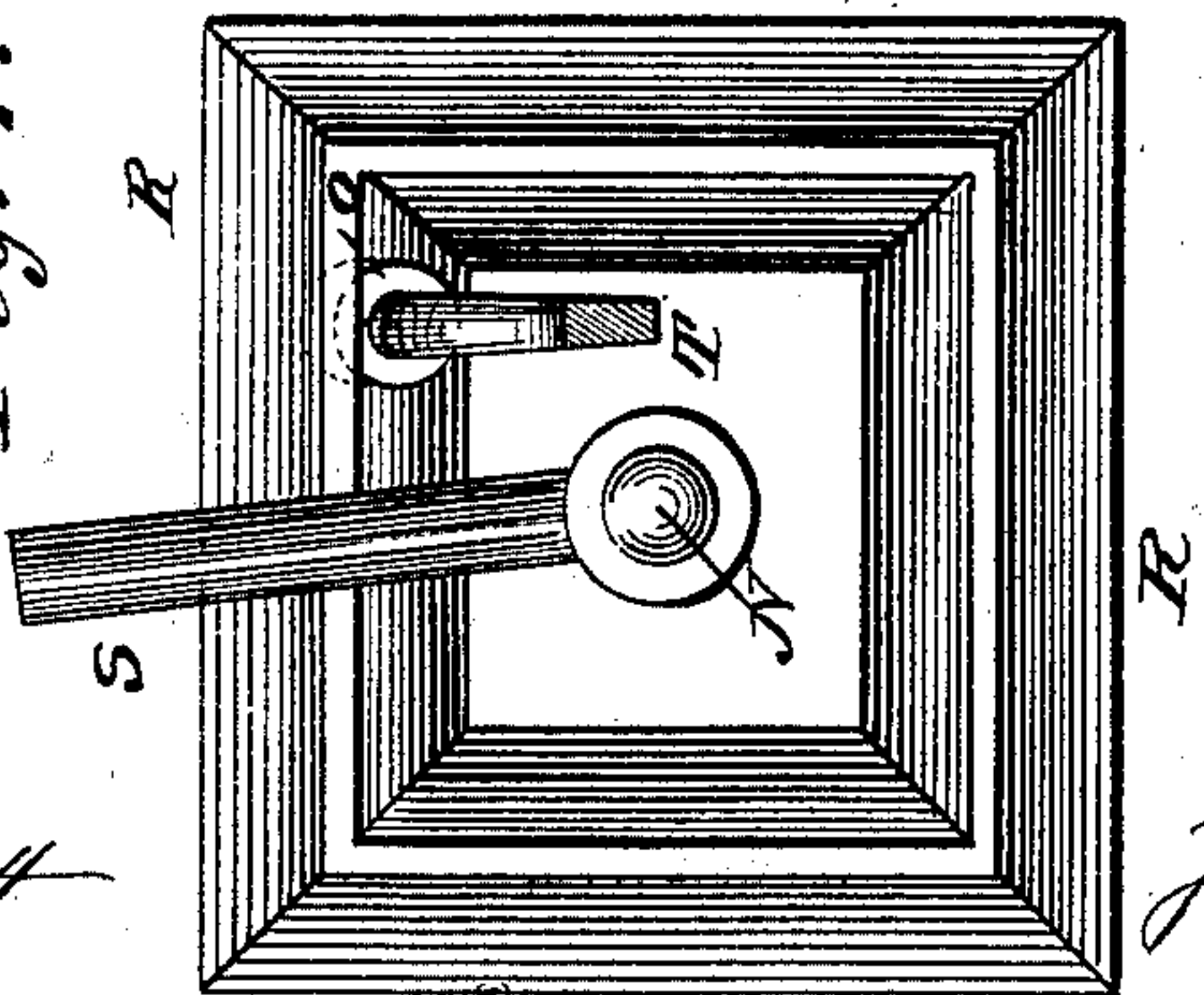
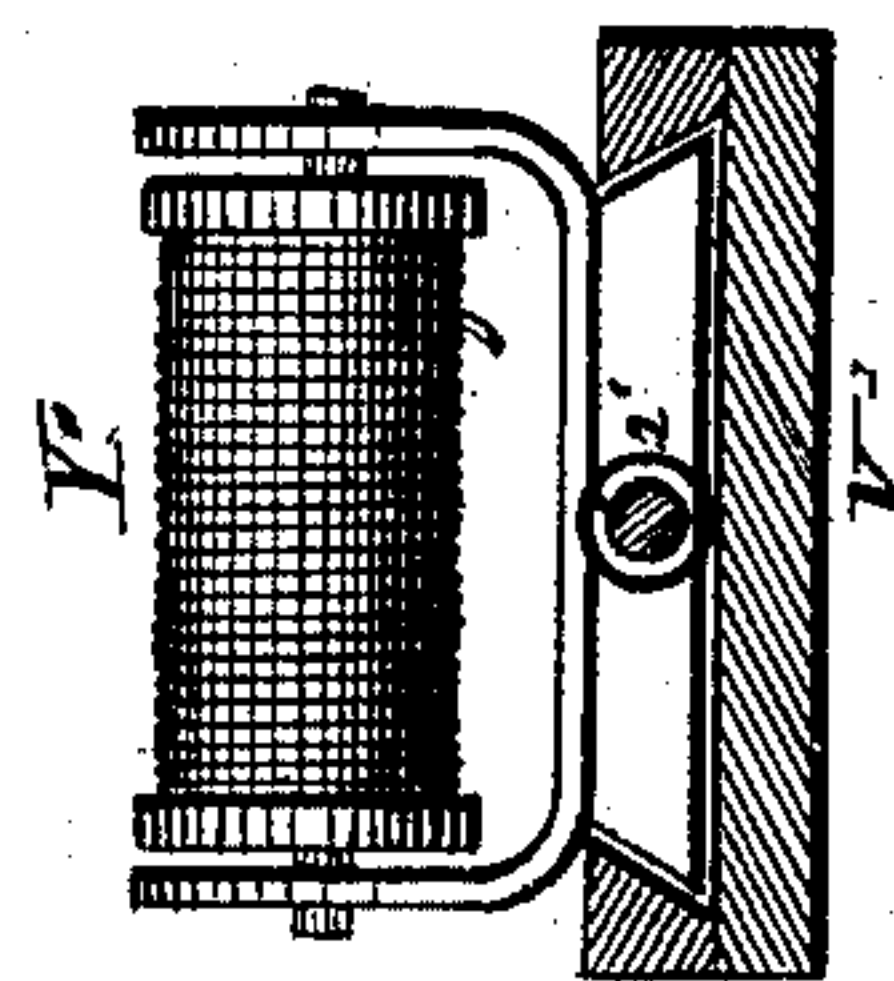


Fig. 8.



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# UNITED STATES PATENT OFFICE.

JAMES W. CLOVER, OF ALTON, OHIO.

## IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **222,668**, dated December 16, 1879; application filed March 18, 1879.

*To all whom it may concern:*

Be it known that I, JAMES W. CLOVER, of Alton, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Grain-Binders; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making a part of this specification.

My invention relates to certain novel improvements in grain-binders.

It has for its objects simplicity of construction and accuracy and perfection in operation; and it consists in the peculiar construction, arrangements, and combination of its several parts, as will be hereinafter and in detail explained.

In order that those skilled may understand the construction and operation of my improved grain-binder, I will proceed to describe the same, referring by letters to the accompanying drawings, in which—

Figure 1 is a side elevation of a machine embodying my invention. Fig. 2 is a top or plan view of the same with grain-table secured, the dotted lines showing the extreme portions of the twisting mechanism. Fig. 3 is a longitudinal vertical section at the line *xx* of Fig. 2. Fig. 4 is a detail rear elevation of the cam by which the needle-bar is operated. Fig. 5 is a central vertical section of the needle. Fig. 6 is a detail top view with standard cut away and top broken away, exposing the twister in position after the wire has entered one slot and been turned around. Fig. 7 is a detail section, showing the means for distending the frames. Fig. 8 is a cross-section of the rear portion of the twister-carrier, showing the wire reel and take-up. Fig. 9 is a detail top view of the twister-disk, showing the teeth which mesh with the segmental rack. Fig. 10 is a detail top view of the rack which operates the twister.

Similar letters denote like parts in the several figures.

A is the frame proper of the machine, in which are provided suitable bearings for the several parts of the mechanism hereinafter detailed, and B is an additional or auxiliary frame adapted to move longitudinally upon or within the frame A, and to form a bearing for

one end of the main driving-shaft. This auxiliary frame is provided with a table-top, C, and the main frame A is provided with a similar top, D, the latter with a circular slot through it for the passage of the wire-carrying needle. The table D overlaps the table C, so that the latter may move freely under the former, the object of such movement being to provide for the binding being made at different distances from the butts of the grain as it is delivered onto the table.

I have shown one-half of table D hinged, so that it may be raised up to afford access to the mechanism underneath.

E E are inclines adapted to lie adjacent to the harvester, and to cause the grain to fall into the proper position to be bound.

The frame B with its table is moved longitudinally, for the purpose set forth, by the driver through the medium of a lock-crank, F, and shaft G, provided with a pinion, H, meshing with a rack, I, on the forward end of a bar, K, extending from the frame A. This crank is arranged so that it shall be in reach of the driver, and is locked in any position desired by the spring-lever L and perforated disk M.

N is the main driving-shaft, which, as before stated, has one bearing in the front of the frame B and the other in a cross bar or plate, O, within the frame A.

The forward end of the shaft N is provided with a driving-pulley, P, provided with a feather fitting into a longitudinal groove in the said shaft, and said pulley is retained in position by a bracket, Q, or other suitable means, so that the frames A and B may have the longitudinal movement before described.

Power is applied to the pulley P directly from the harvester by means of a suitable belt or otherwise.

R is what I denominate a "right-angled cam," arranged behind the cross-bar O, and secured fixedly thereto, and the shaft N passes centrally through said cam, and is furnished at its rear end with a radial arm, S, which strikes against the forward end of an arm, T, pivoted near its center to a vertical standard, U, which, in turn, is capable of rotary motion within suitable bearings in the frame A.

The rear end of the arm T is pivoted to a pitman, V, the upper end of which is pivoted



to the rear end of a vibrating needle-bar, W, which, in turn, is pivoted at X to the top of the standard U.

From this construction it will be seen that the rotation of the main driving-shaft N will cause the arm S to travel around a circle, carrying with it the arm T, the forward end of which lies within the right-angled groove or cam in the block R, and is provided with a suitable anti-friction roller, o.

The travel of the end of the arm within said groove necessarily causes a vertical vibration of the arm T, and by the pitman-connection V a corresponding movement of the needle-bar W on its pivot X, while at the same time the travel of the front end of the arm T in the top and bottom horizontal and parallel grooves of the cam causes the standard U to rotate in its bearings to swing the needle in the arc of a circle, for the purposes presently explained, through the medium of a hanger-arm, e, which is slotted, and through which the arm T passes.

Extending forward from the standard U is a horizontal arm or bracket, A', to which is secured a needle frame or race, B', provided with straps or guides C' D'.

E' is a take-up bar secured to the standard U, and provided at its free end with a pulley or wire-guide, F'.

G' is another wire-guide pulley secured in a suitable manner to the needle H', which is caused to move up and down by the vibration of the needle-bar W, the forward end of which rests within a slot-bearing in the needle, and travels within a vertical slot or opening in the needle-frame B'.

The needle H' is slotted transversely to the longitudinal direction of the bar W, as clearly shown at I', Figs. 1, 3, and 5, and at or near the lower end of this slot is provided with a wire-pulley, b, between which and the solid point of the needle the wire is threaded.

Within the slot I' is pivoted a flat bar, K', the lower end of which is cut out at L' to form a hook, and the upper end has an inclined or angled extension, M', for the purpose presently explained.

Secured to the vertical standard U below the table D is a horizontal arm, N', which is caused to swing in the arc of a circle by its connection with the standard, and by the action of the arm T on the slotted hanger e depending from the under side of the arm N'. On the top forward end of arm N' is secured the wire-twister, consisting of a disk, with radial slots for reception of the wire and teeth to mesh with a segmental rack-bar, O', secured, as presently explained, to the frame of the machine.

The twister has a hub on each side of the slotted disk, which fits in bearings in the top and bottom of metallic plates, by which the device is secured to the arm N', as seen in section in Fig. 3, the segmental rack-bar O' being straddled by said plates.

The plates which confine the twister are secured to the arm N' by suitable screws or other-

wise, and are cut and beveled at d to cause the wire to be guided into the radial slots in the twister; and P' is a plate or bar designed to hold the wire well into the slot when it shall have turned around to a point opposite that at which it entered the twister.

Q' is a spring-bolt arranged upon the top plate, which plate is slotted longitudinally to allow longitudinal movement of a vertical cross-bar, e, extending above and below the top plate, and by which motion is given to said bolt to not only lock the wire within the twister, but to control its movements otherwise, as will be directly explained.

The segmental rack O' is secured to the frame A at one side by means of a bolt passing through a guide-slot, f, Fig. 2, the other end of said rack being rounded and threaded through part of its extent, and passing loosely through an eye or screw-ring, g, attached to the opposite side of frame A. On the screw-threaded portion of this rounded end of rack O' is secured a nut, h, to compensate for wear. In addition to the screw-ring, this end of the rack is secured in a similar manner to that described for connecting its opposite end to the frame. The extreme rounded end of the rack rests against a spring, 4, (see Fig. 1,) the tendency of which is to force the rack back to its normal position, but which will permit or yield to a thrust or movement in the opposite direction.

The back edge of the rack O' is formed with a short incline, 1, and two shoulders, 2 and 3, and above the said rack, and secured to the frame A, is a projecting incline, P', just sufficiently behind the incline 1 on the rack to strike the upper portion of bar e of bolt Q' and cause the bolt to be drawn far enough back to release the shoulder 2 of the rack from the lower portion of bar e, the rack, by the movement of the arm N', having been carried in the direction of the arrow (see Fig. 2) a sufficient distance, without moving the twister, to permit of the safe entry of the wire into the radial slot, which had been presented in alignment with the guide-opening in the twister-plates. The withdrawal of the bolt from the shoulder 2 and the return of the rack by the pressure of the spring against its end causes the twister to be partially rotated away from the guide-opening just described, and the continued movement of the arm N' still further rotates the twister until the wire in its slot is exactly opposite the point at which it entered, at which time the bar e of the bolt has reached shoulder 3 on rack O' and carried it along to the limit of its movement, at which time the cam R and its connections cause the needle to descend, with its wire, on the opposite side of the sheaf, which has been pressed against and has taken up partially the slack of the wire, the point of the needle entering an opening, B', in a block on the under side of arm N', which block holds the needle against any tendency of the grain to crowd it out of the line in which it moves, and by reason of the guiding action of which the wire is again caused to



enter the slot in the twister, which has been presented in line for its reception, the bolt Q' being held withdrawn at this time by the back edge of the rack-bar O' between the shoulders 2 and 3.

It will be particularly observed in this connection that the line through which the needle travels is slightly out of a true vertical line. The tendency of a needle so traveling is to cause the wire, by the tension exerted upon it, to draw into the slot in the twister. On the return movement of the arm N' the bolt Q is released and moves in place to close the wire-entrance to the twister, while the meshing of the teeth on the twister with those on the rack O' causes a rotation of the twister, which twists the wire above and also below the twister-disk, and, as the arm N' reaches the limit of its return movement, a knife, S', adjustably secured to the frame, passes underneath the lower plate of the twister and cuts the wire by a shearing cut, resulting from the fish-tail shape of the cutting-edges of said knife.

T', Fig. 2, is a set-screw for adjusting the knife to compensate for wear. Just as the wire is cut and the sheaf bound and released the needle ascends and brings the twist which is left in the wire up near the point of the needle and out of the way of the mechanism below the table. The tension-bar E' takes up any slack there may be.

U' is a rod or leg extending vertically from the under side of the arm N', to the lower end of which leg is pivoted one end of a flat plate or reel-carrier, V', which is slotted centrally and longitudinally, and through which slot passes a bolt, i, by which the said plate is pivotally secured to a cross-piece, W'.

Y' is a wire-reel secured to the free end of the carrier V'. This reel is secured to a dovetailed base-piece having longitudinal movement within a corresponding groove in the carrier V', a spring, 2', serving to take up slack, as clearly shown at Figs. 2, 3, and 8.

Z' is a guide-pulley at the opposite end of the reel-carrier, in a line about underneath the point of the needle. This pulley is so hinged or pivoted in place that as a strain is exerted upon it by reason of the changes in its position, as shown by dotted lines in Fig. 2, it can accommodate itself thereto.

A'' is another wire-reel secured to the standard U, and from which the wire k is fed over suitable guide-pulleys through the point of the needle, and the end connected with the end of the other wire, l, coming from the reel Y' by a twist by hand, the same connection being produced afterward by the action of the twister. B<sup>2</sup> is a shield, against which the butts of the sheaf rest.

The operation of my improved grain-binder is as follows: It is attached in a proper position to the harvester, so that the cut grain will be delivered in the usual way onto the binding table, and the main driving-shaft N is caused to rotate through the medium of the driving-pulley P and suitable belts or

other mechanism. The rotation of the shaft N causes the arm T to travel laterally in the top groove in the cam R. This arm bears against one side of the hanger e, which, in turn, causes the arm N' to swing in the arc of a circle, and by reason of its permanent attachment to the standard U this arm causes the latter to rotate in its bearings, carrying the needle-bar and needle to the right over the deposited grain. During the movement of the arm N' and needle-bar the twister has been carried also to the right and along with the needle, and one of its radial slots has been brought into alignment with the guide-opening d in its plates at the moment that the bolt Q' has been withdrawn by the incline 1 of the segmental rack. The wire k is then, by reason of the inclination of the needle and tension on the wire, as well as by the weight and pressure of the sheaf, forced into said radial groove in the twister. The bar e of the bolt now being against the first shoulder, 2, (see Figs. 2 and 10,) the continued movement of the arm N' causes the rack O' and twister to move together in the direction of the arrow, Fig. 2, until the bar e is pushed back by the incline on front end of plate P' to withdraw said bar e from the shoulder 2, when the spring at the end of the rack O' forces the latter backward until shoulder 3 comes in contact with bar e of the bolt. This return movement of the rack is sufficient to rotate the twister-disk just one half-revolution and bring the opposite slot in alignment with the guide-opening d in the plates. The bar e being in contact with the shoulder 3, the twister and rack again move together until the needle is caused to descend by the travel of the front end of the arm T in the vertical groove in the cam-block R in an obvious manner. (See Fig. 3.) As the needle descends the angled extension or incline M', coming in contact with the guide D', causes the bar K' to vibrate upon its pivot, throwing the lower end, L', toward the center of the twister, the double hook thereon carrying the wire positively into the slot in the twister, while the point of the needle arrives at its bearing B' in the block on the under side of arm N', which prevents the needle from being crowded out of line by the grain. During the descent of the needle the wire is, of course, carried around the sheaf. The front end of the arm T, having reached the limit of its movement in the vertical groove in cam-block R, is now forced into the lower horizontal groove, and, traveling backward in said groove, carries the standard U, needle-bar, and needle and twister, &c., also back to their former position. During this movement the teeth of the rack-bar O', meshing with those on the twister, have caused the twister to rotate rapidly and twist the wire both above and below the twister-disk, and as the parts all reach the limit of return movement the knife S', being brought under the twister-plate, has severed the wire at that point, and thereby released the sheaf, duly bound, while



leaving the wire still spliced by the twist below the twister, so that as the needle is caused to ascend before the next forward movement of the parts the twist in the wire is brought up, as before described, near the point of the needle and out of the way of the twisting mechanism. As the arm N' is vibrated the reel-carrying plate V' is rotated upon its pivot into the two extreme positions shown in dotted lines at Fig. 2, the longitudinal slot in the plate V' permitting the necessary longitudinal movement to keep the guide-pulley Z' in proper position under the twister, the hinged joint of the guide-pulley allowing it to accommodate itself to the strain upon the same. As the needle ascends the plate K', pivoted therein, is returned to its normal position by the incline behind the angle-piece M' coming in contact with the guide C'.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the driving-shaft N, with the cam R and radial arm S, with the arm T, hanger c, rock-shaft U, arm N', and slotted reel-carrying plate V', pivoted to the arm N', substantially as described, and for the purpose set forth.

2. The slotted reel-carrying plate V', pivoted to the arm N', in combination with the reel Y', secured to said plate by a dovetail bear-

ing take-up spring, 2', and pulley Z', pivoted to the plate V', substantially as described, and for the purpose set forth.

3. The combination, with the rack O', secured in position as described, and provided with teeth and with incline and shoulders 1 2 3, of arm N', the single twister, secured in position as described, the bolt Q', with its vertical bar e and the plate P', whereby the twister is rotated to receive the wire at opposite sides during the forward movement of the arm N', and to twist the same above and below the twister during the return movement of the arm N', substantially as and for the purposes set forth.

4. The needle H', provided near its point with guide-pulley b, and pivoted plate K', having the hook L' and angular projection M', in combination with the operating-guide D', arranged so as to cause the wire to be forced into the twister, substantially as shown and described.

Witness my hand and seal to the foregoing specification this 10th day of March, A. D. 1879.

JAMES W. CLOVER. [L. S.]

In presence of—

WILLIS SELLS,  
F. A. GUYOR.