

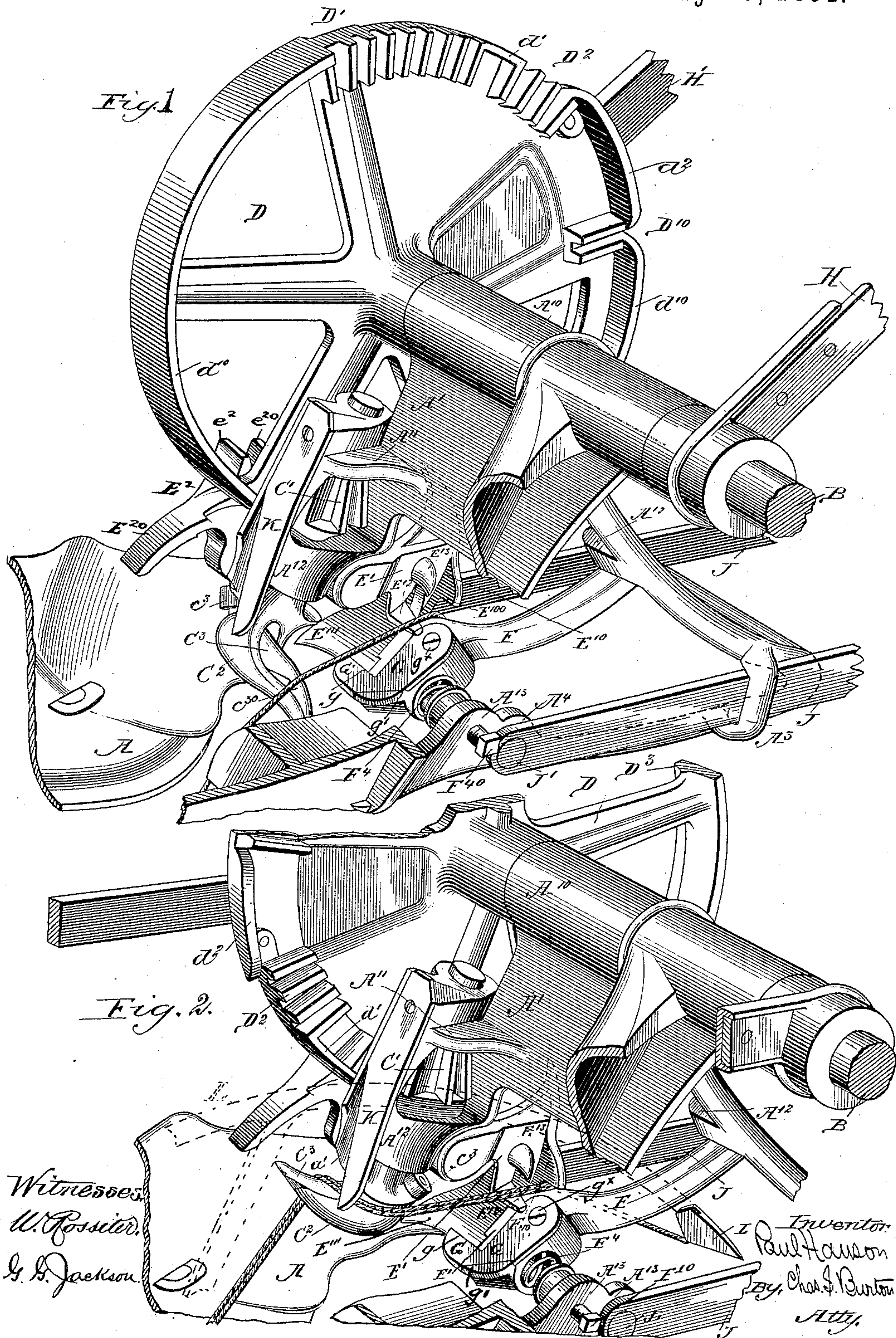
(No Model.)

4 Sheets—Sheet 1.

P. HANSON.
GRAIN BINDER.

No. 452,843.

Patented May 26, 1891.



Witnesses
W. Rossiter.
G. B. Jackson.

Inventor:
Paul Hanson
By, Char. S. Burton
Att'y.

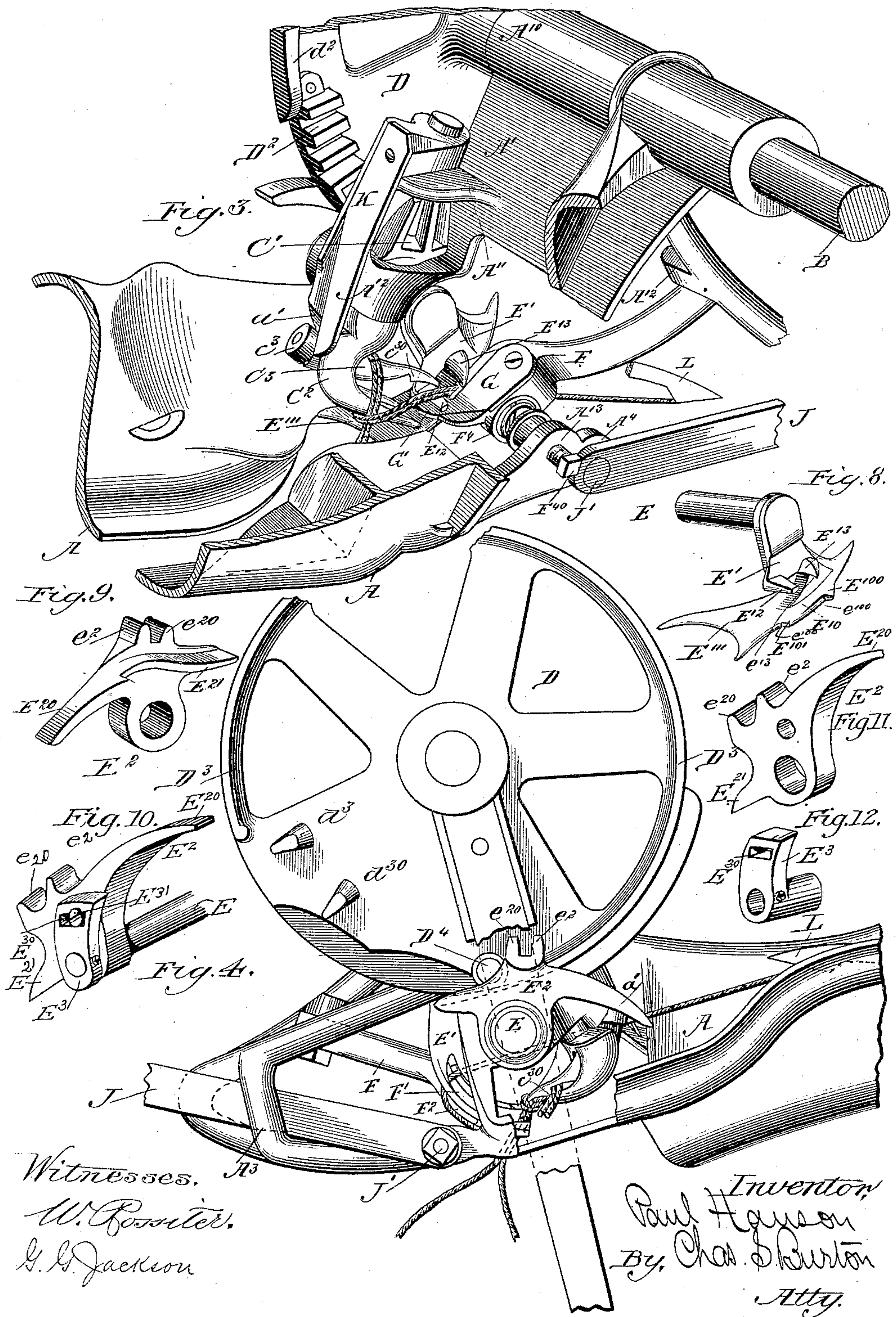
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4 Sheets—Sheet 2.

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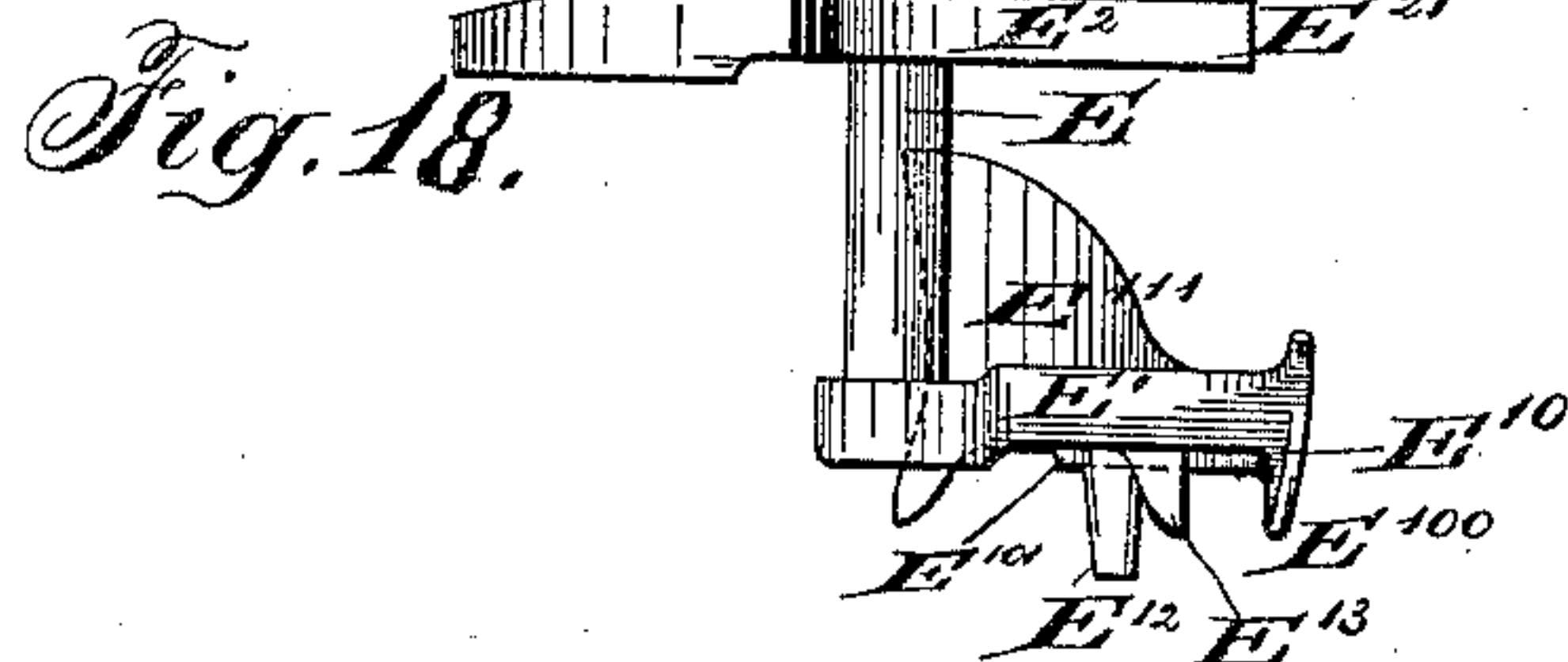
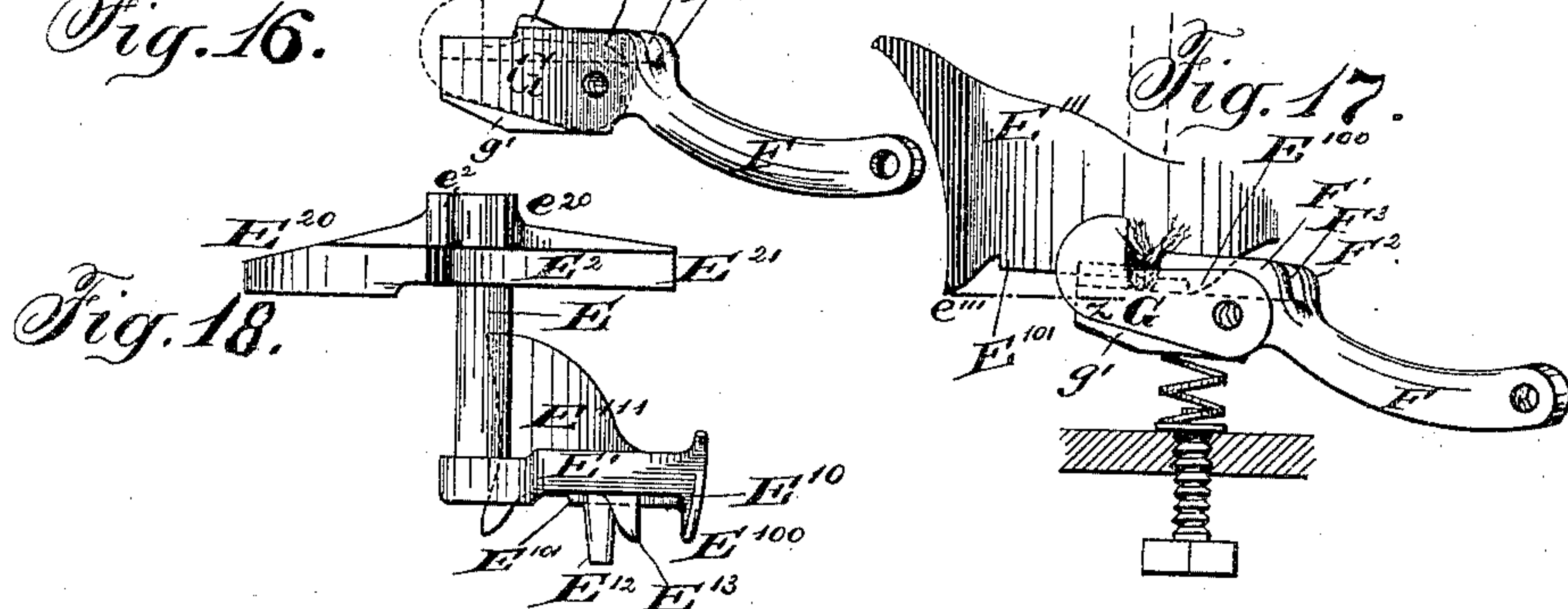
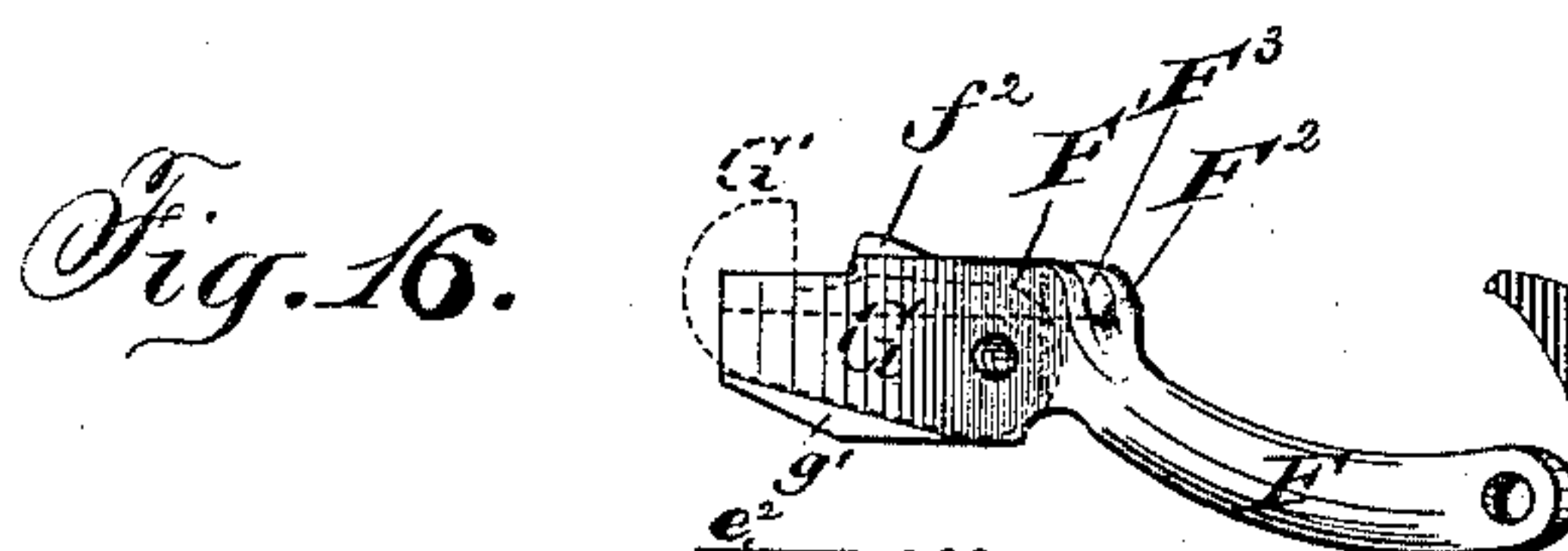
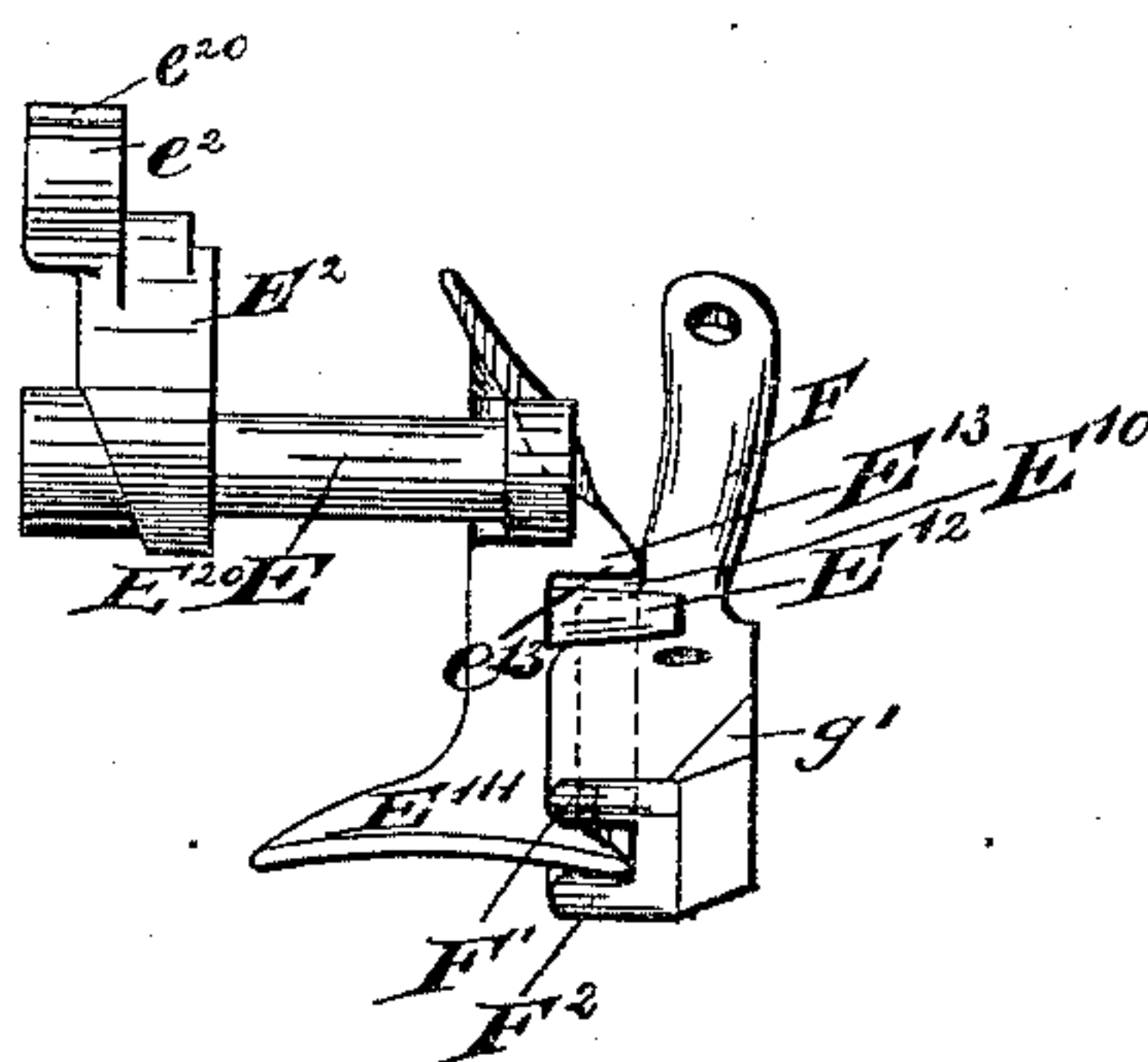
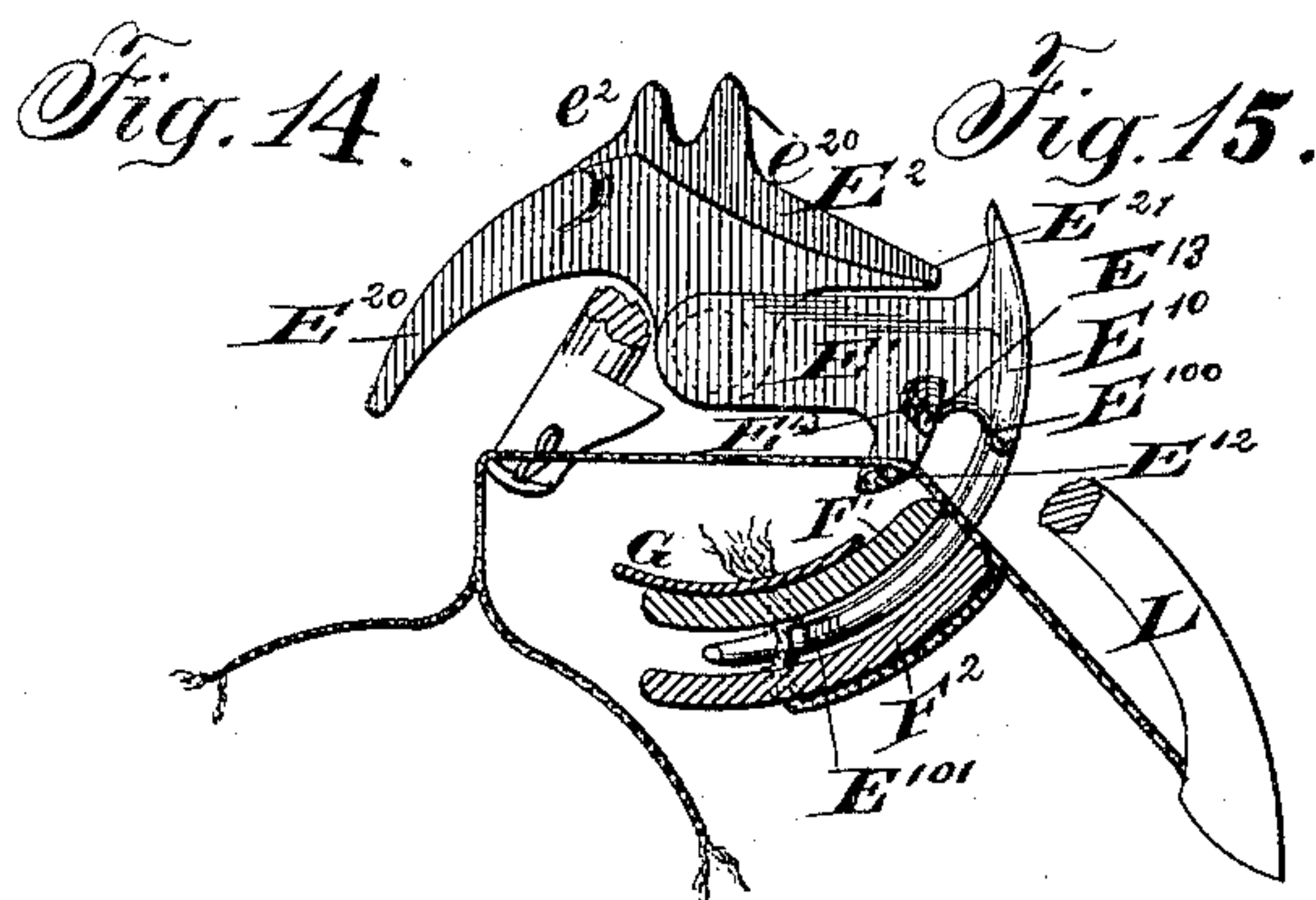
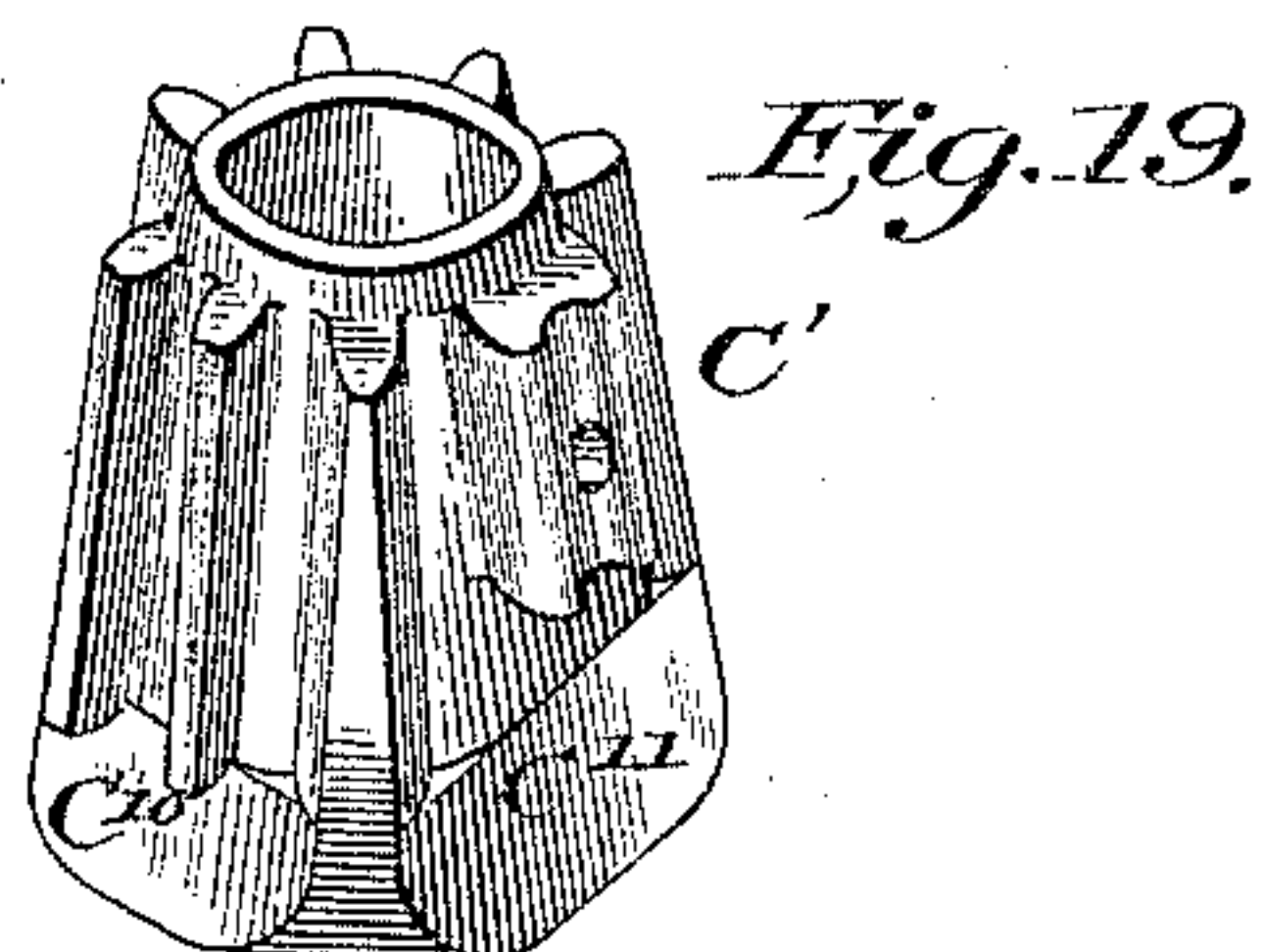
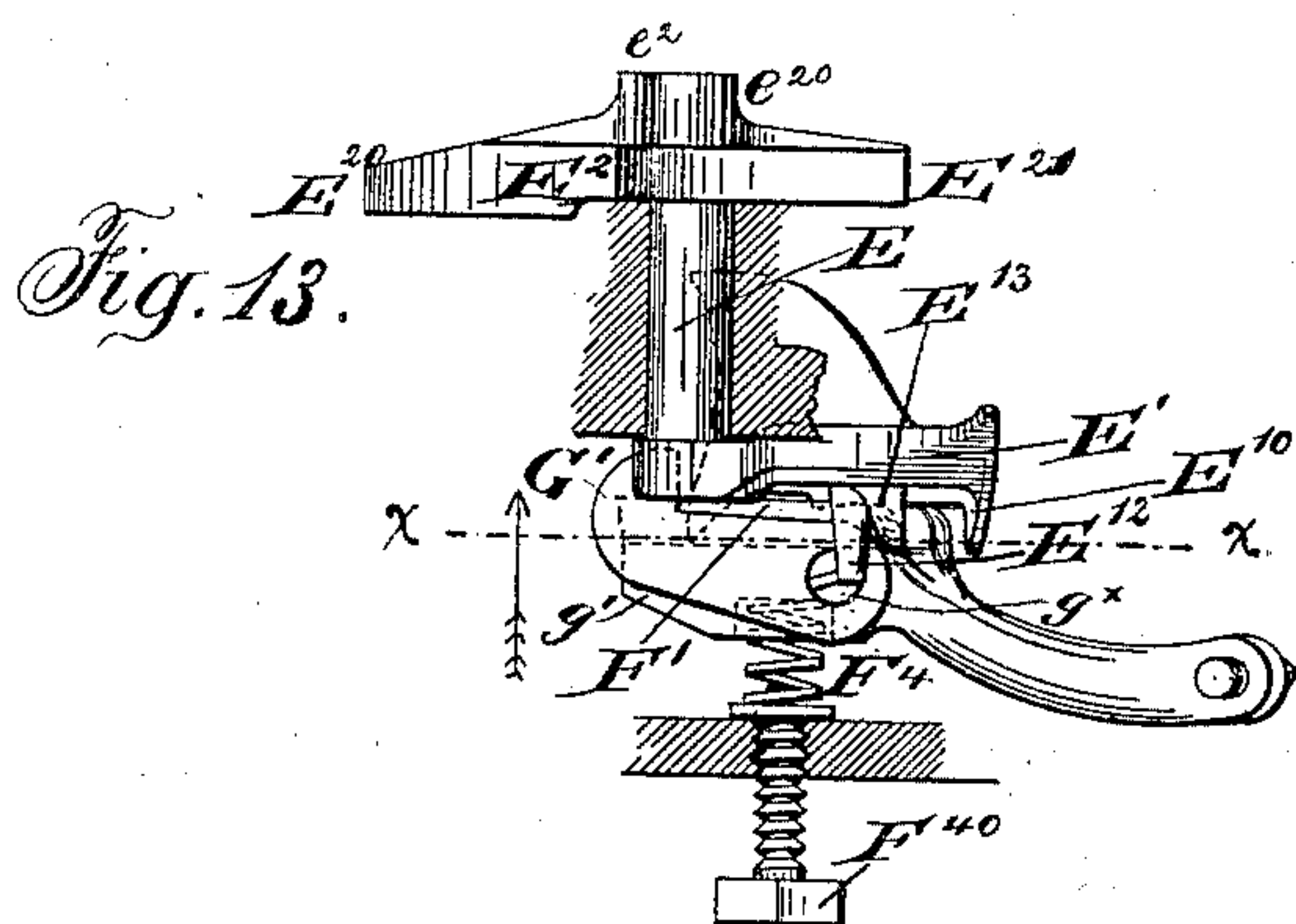
(No Model.)

4 Sheets—Sheet 4.

P. HANSON.
GRAIN BINDER.

No. 452,843.

Patented May 26, 1891.



Witnesses:
John B. Caspare
Elvie Halverson

Inventor
Paul Hanson.

UNITED STATES PATENT OFFICE.

PAUL HANSON, OF ST. PAUL, MINNESOTA.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 452,843, dated May 26, 1891.

Application filed July 14, 1886. Serial No. 207,977. (No model.)

To all whom it may concern:

Be it known that I, PAUL HANSON, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Grain-Binders, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to simplify the construction of the cord-knotting mechanism of grain-binders; and it relates to the construction and operation of both the cord-looping device, commonly called the "bill," and the cord-holder, which I give also an additional new function.

In the drawings, Figure 1 is a perspective view from the front inner quarter, the parts being in the position of rest in the intervals of binding. Fig. 2 is a similar view with some parts broken away, showing the parts in position after the needle has laid the second strand over the looper and into the holder-notch and the looper has made one-quarter revolution. Fig. 3 is a similar view with some parts broken away after the looper has made nearly one full revolution. Fig. 4 is a rear elevation showing the position after the looper has made one and three-quarters revolution. Fig. 5 is a perspective from the rear inner quarter, showing the position of the parts when the looper has made one revolution and the cord is about to be severed. Fig. 6 is a direct sectional plan of the breastplate and holder. Fig. 7 is a reverse plan of the same parts. Fig. 8 is a perspective of the cord-holder segment and its rock-shaft separated from the remaining mechanism. Fig. 9 is a perspective of the cam on the cord-holder rock-shaft. Figs. 10 and 11 are perspectives of a form of the cord-holder cam slightly modified in order to render it adjustable on the cord-holder rock-shaft. Fig. 12 is a perspective of an intermediate piece used in making such adjustable connection. Fig. 13 is a detail plan of the holder and clamp and the holder-actuating cam. Fig. 14 is a sectional elevation of the same parts, the section being taken at the line $x\ x$ on Fig. 13 and the view looking in the direction indicated by the arrow-head, the looper and the needle being also partly shown with the cord, the position of the parts

being as at the commencement of the knot. Fig. 15 is a discharge side elevation of the holder and clamp and actuating-cam. Fig. 16 is a detail plan of the clamp, the cutter being also shown in dotted line. Fig. 17 is a detail plan of the holder and its actuating-cam and rock-shaft. Fig. 18 is a detail plan of the clamp and part of the holder and the cutter, the position being as at the finish of the knot. Fig. 19 is a perspective of the looper-pinion detached.

A is the breastplate, which is illustrated and preferably constructed integral with the frame which has the bearings of the knotter mechanism, commonly called the "knotter-frame." I have claimed such integral construction in my application now pending, filed August 13, 1885, Serial No. 174,275. The said knotter-frame comprises the hanger A', which terminates at the upper end in the sleeve A¹⁰, which is placed on the main shaft of the binder B, which thereby sustains the knotter-frame and mechanism in the customary manner.

C² C³ is the cord-looper or knotter-bill. It is journaled in the lugs A¹¹ A¹² on the hanger A', having between said lugs the mutilated pinion C', whereby it receives motion from the knotter-actuating wheel D, as more fully hereinafter explained in detail.

E' is the cord-holder. It is fixed on the inner end of the short rock-shaft E, which is journaled in the knotter-frame parallel to the main shaft of the binder B below the knotter-actuating wheel D and extends beyond the planes of both faces of said wheel and has rigidly fixed to it at its outer end the cam E², which is engaged by suitable devices on the front face of the wheel D, as hereinafter explained, and thereby communicates motion to the cord-holder. The said holder E' is in form substantially a sectoral flange on the rock-shaft E and in action a lever-arm of said shaft. At its outer periphery it has the lateral flange E¹⁰, which is the arc of a cylinder whose axis is that of the rock-shaft E. Said flange E¹⁰ has the notches e¹⁰⁰, alternating with the teeth or lugs E¹⁰⁰ and E¹⁰¹ for the purpose of engaging the cord, as hereinafter explained. The flange E¹⁰ is extended inward and expanded laterally on both sides of the plane of the sectoral flange of the holder

and forms the lip or blade which, from its function, I call the "cord-bridge" E^{11} . Said holder, besides the lateral flanges, has also the lugs E^{12} E^{13} projecting laterally on the same side as the flange E^{10} , but within the arc of the latter, to serve purposes, respectively, which will hereinafter be explained.

F is the cord-holder clamp, which is in the usual saddle form, having the lips or wings F' F^2 , forming between them the groove F^3 , in which the holder-flange E^{10} reciprocates and by its teeth or lugs E^{100} and E^{101} carries the cord. The clamp is pivoted on the lug A^{12} of the knoter-frame, and is thereby adapted to oscillate toward and from the holder to clamp the cord more or less closely, and the spring F^4 is placed back of said clamp between it and the lug A^{13} on the frame to force the clamp yieldingly toward the holder-flange E^{10} . The screw F^{40} , set through lug A^{13} against the spring F^4 , serves to regulate the pressure of the latter upon the clamp, as found needful.

To the upper side of the cord-holder clamp is secured rigidly the cord-cutter or knife G . It is fastened to the clamp by a screw g^x and rendered more secure by a slight projection g' from the clamp g , which stops the cutter from turning on the screw g . This cutter is an L-shaped blade, of which the arm G' projects across the vertical plane of the cord above the upper lip F' of the clamp, and has the edge sharpened by being beveled on the under side.

The looper-pinion C' has the delay-surfaces C^{10} C^{11} , and the wheel D has on its rear face the longer gear-segment comprising two parts D' and D^2 , separated by a short delay-surface d' and a shorter segment D^{10} and two delay-surfaces d^2 and d^{10} , separating said gear-segments, which cause the pinion C' to make two full revolutions in three stages separated by intervals, for purposes which will fully hereinafter appear.

The holder-cam E^2 comprises two arms E^{20} and E^{21} of the nature of lever-arms of the rock-shaft E and has formed on it also two gear-teeth e^2 and e^{20} . The wheel D has on its forward face the incomplete annular flange D^3 , which forms a delay-surface for the cam E^2 , and at the interval between the ends of said incomplete flange the said wheel has two teeth d^3 and d^{30} and at one end of the flange the stud and roll D^4 , which engage the cam and its gear-teeth, as hereinafter explained.

The looper C has the customary rigid jaw C^2 and the vibrating jaw C^3 , provided with a heel carrying the roll c^3 , which is engaged by the cam-surface a' on the frame A' and causes the jaws to open at proper time.

K is a spring secured to the bearings of the looper C and projecting downward into position to engage the roll c^3 on the outside and force the jaws shut at proper time. This spring, as will hereinafter appear, is merely precautionary, and is not needed for the purpose when the knoter is in actual operation with the cord. The upper vibrating jaw C^3 is

made longer than the lower rigid jaw and projects beyond it and is curved or hooked downward over the end of said rigid jaw. The purpose and effect of this extension are hereinafter explained. Said upper jaw has also a barb c^{30} on the under edge for the purpose of assisting the process of putting the end of the cord through the loop in finishing the knot.

H is the forward discharger, which is secured rigidly to the shaft B in front of the sleeve A^{10} .

H' is the rear discharger, secured to the rear face of the wheel D .

J J are bundle-strippers, for which the loop-sockets A^3 A^3 are provided on the breastplate, said strippers being inserted through the tops and secured at the inner end by the removable bolt or pin J' to the lugs A^4 A^4 on the breastplate. When not in use, in order to reduce the compass of the machine, the bolt J' being withdrawn, the strippers J J may be removed, and, if desired for convenience, they may be fastened again to the lugs A^4 by reinserting the bolt, but without being inserted through the loops. They will thus hang down out of the way.

L is the needle.

The operation of this mechanism is as follows: The parts being in the position of rest shown in Fig. 1, one end of the cord secured in the holder and extending thence from the notch e^{100} , over the lug E^{12} , under the lug E^{13} , thence inward over the looper-jaws, and down to the point of the needle, the binder being tripped into action, the needle rises, encircling the gavel, and lays the second strand of cord over the looper-jaws, thence onto the upper edge of the lugs E^{13} and E^{100} , respectively, which by their slope cause it to slip past them and rest on the lug E^{12} and in the notch e^{100} and across the ends of the lips and slot F' , F^2 , and F^3 , respectively. The gear-segment D' on the wheel D now comes into engagement with the pinion C' and revolves it to the position shown in Fig. 2. During the first part of this action the holder E' has been held in the position of rest shown in Fig. 1 by the engagement of the arm E^{21} of the cam E^2 with the delay-surface or flange D^3 on the rear face of the wheel D , the position of the cam being as seen in Fig. 4; but at about the instant at which the looper began to be revolved by the gear-segment D' the tooth d^3 on the rear face of the wheel D became engaged between the teeth e^2 and e^{20} of the cam E^2 and rocked the holder on the rock-shaft E , carrying the lug E^{100} of the flange E^{10} toward the jaws of the holder-clamp F , as seen in Fig. 2, and as the looper continues its revolution to the position shown in Fig. 3 (the jaws of the looper being meanwhile opened by the engagement of the roll c^3 with the cam a') the holder is further rocked by the still-continuing engagement of the tooth d^3 of the wheel D between the teeth e^2 and e^{20} of the cam E^2 , and the lug E^{100} is forced between the lips of the holder-clamp and se-

curely binds both strands of the cord therein. The same movement of the holder brings the bridge E^{111} inward against the cords between the looper and the bundle. This position is shown in Fig. 3. The bridge E^{111} by thus obstructing the cords at this stage prevents the loop from being pulled out of the looper-jaws, as would be liable to occur without such preventive, because the weight of the bundle tends to draw the cords off while the bill is pointing outward, and at a little later stage the pressure of the dischargers increases the same tendency. The movement of the holder-flange between the lips of the holder-clamp, as just described, also carries the cord toward the knife G ; but it is necessary to guard against cutting the cords at this stage, and for that purpose the lug E^{12} is provided, projecting from the flange E' at a distance from the flange E^{10} sufficient to bring it above the knife G when the last-described movement of the holder occurs, so that, as seen in Fig. 3, the cord by lying over it is held off from the edge of the knife so long as the holder occupies that position. The looper, continuing its revolution, takes the ends of the cords between the open jaws, and after it passes again the position at which it started, as seen in Fig. 1, the roll c^3 runs off the cam a' and allows the jaws to close, the strain of the cords over them compelling them to close as soon as permitted by the release of the roll e^3 from the cam. As the revolution of the looper continues toward the position shown in Fig. 4, the tooth d^{30} on the rear face of the wheel D engages the tooth e^2 of the cam and further rocks the holder, carrying the lug E^{12} from the position where it has been guarding the edge of the knife G , and so uncovering the latter and bringing the lug E^{13} , which has a flat under face and a sharp or angular corner e^{13} , close over the edge of the knife and causing it to sever the cord. The cord at this stage being folded over the edge of the knife and being subjected to the strain due to the revolution of the looper, which is winding up the cord around its shank, would be severed without the co-operation of the lug E^{13} ; but as a precaution in case the knife is dull I prefer to use said lug, and so get the shearing effect described. The cord now being severed and the loops fully formed on the looper-jaws, the knot is ready to be stripped off, and while the looper is making the second and third quarters of its second revolution the cam-roll D^4 on the rear face of the wheel D engages the long arm E^{20} of the cam E^2 and rocks the holder back to the position shown in Fig. 4, (the position of the holder in that view being the same as in Fig. 1,) and thus withdraws the bridge E^{111} from the path of the cords. The discharger is now in position to act on the bundle and press it outward, and the looper having reached the position pointing outward (see Fig. 4) the said pressure of the discharger draws the loops off the jaws and completes the knot. During this

last action the looper is held stationary by the engagement of the pinion with the delay-surface d^2 of the wheel D , and after the discharge has been effected the gear-teeth D^{10} engage with the pinion and complete its second revolution and bring it to rest in the initial position, with its jaws standing across the plane of the path of the needle, as seen in Fig. 1.

Reviewing the above action, the following peculiarities should be observed: The movement of the holder to enter the clamp occurs simultaneously with the first revolution of the looper, and said movement of the holder being toward the looper affords to the looper the cord necessary to form the loop. This may be most easily understood by comparing the position of the cord in Figs. 2 and 3 and noting how much nearer to the looper is the lug E^{12} in the latter than in the former figure. The under wing or lip F^2 of the holder-clamp has the tooth f^2 , which engages the cord as soon as it is pushed past it by the tooth of the flange E^{10} and prevents the end of the cord from being carried out of the clamp by the reverse movement of the holder.

The location of the teeth d^3 and d^{30} of the wheel D is such that the movement of the holder caused by the first ceases and leaves the holder stationary for an instant before the second engages the cam-tooth e^2 and further rocks the holder. This interval is that in which the lug E^{12} stands, covering the edge of the knife G , and the looper is making the last quarter of its first revolution. This is the time when the jaws are receiving and closing on the ends of the cord and are revolving away from the holder. The holder, being stationary, is yielding no cord to the looper, and the strain on the cords therefore caused by the revolution of the looper away from the holder tends to close the jaws, as is desired at this stage, and the cam a' permitting the jaws to close they in closing yield as much cord as is required by the revolution of the jaws away from the holder. When the jaws are closed, no more cord can be yielded by them, and at this point the short delay-surface d' in the midst of the gear-segment $D' D^2$ reaches the pinion C' , and the latter halts in its motion for an instant, and at that instant the tooth d^{30} on the rear face of the wheel D , engaging the tooth e^2 of the cam E^2 , moves the holder a short distance and causes it to yield a little cord; but the cord being by that slight movement brought to the edge of the knife the further movement of the holder at once takes up the little slack thus caused and it forms the bight of cord folded over the edge of the knife. The short delay-surface d' having passed the pinion, the gear-teeth of the segment D^2 again engage the pinion C' and revolve the looper, which having no slack cord to draw upon, pulls the bight of cord which lies over the knife-edge against said edge, as above described. The form of the looper-jaws is adapted to dis-

pense with any necessity of a spring to close them when the machine is in actual operation with the cord. The upper jaw is elongated, so that its point hangs over the end of the lower jaw, and when the loop is being stripped off by the pressure of the dischargers against the bundle the loop which encircles the jaws clears the lower jaw before it clears the upper jaw, and the weight and pressure of the bundle are then wholly exerted on the upper jaw to hold it down on the lower jaw, thereby preventing the escape of the ends of the cord from between the jaws until the knot has been pulled tight. If by reason of the wearing of the barb on the vibrating jaw or for any other purpose the strain of the cord over the jaw should not be sufficient to insure the ends being held while the loop is stripped off, such deficiency shall be supplied by the spring.

The flange E^{10} has, besides the tooth E^{100} , whose action has been described, a shorter tooth E^{101} , which, when the holder is retracted, engages the looser end of cord, and at the next forward movement of the holder discharges the same from the clamp.

The cam E^2 may be connected to the rock-shaft E by means of the arm E^3 , which is suitably made rigid on the end of the rock-shaft and has near the end the slotted hole E^{30} , through which the clamp-screw E^{31} is set into the face of the cam E^2 , and, being loosened, permits the adjustment of the cam to the limit of the slot E^{30} .

I claim—

1. In combination with the needle and the looper, a cord-holder pivoted to the knotter-frame on a pivot parallel to the needle rock-shaft, and thereby adapted to oscillate in a plane parallel to the vertical plane of the needle, and having a notched flange projecting laterally across such plane, and the clamp secured to the knotter-frame and standing adjacent to the path of oscillation of the flange, whereby it co-operates therewith to hold the cord, substantially as set forth.

2. In combination with the needle and the looper, a cord-holder pivoted to the knotter-frame on a pivot whose axis is transverse to the plane of the path of the needle, said holder being located in the vicinity of the looper-spindle, whereby it is adapted to oscillate toward and from the looper, and a clamp secured to the knotter-frame and located adjacent to the path of oscillation of the holder, whereby it co-operates therewith to hold the cord, substantially as set forth.

3. In combination with the needle, the looper, and the wheel which actuates the latter, the cord-holder formed as an arm of a rock-shaft journaled parallel to the needle rock-shaft and which has another arm engaged by suitable projections on the looper-actuating wheel, said cord-holder having a lateral flange projecting into the plane of the path of the needle, and a clamp co-operating with the said flange to hold the cord.

4. In combination with the looper-actuating wheel D , the cord-holder rock-shaft extending transversely to the vertical plane of said wheel and having the holder rigid with it located on one side of said plane, and having on the other side an arm which is engaged by the wheel D to actuate the holder rock-shaft and holder, substantially as set forth.

5. In combination with the needle, the looper, and the wheel which actuates the latter, the cord-holder clamp secured on the knotter-frame, the cord-holder having a rock-shaft journaled parallel to the needle rock-shaft and having a cord-engaging flange which co-operates with the clamp to hold the cord, and means, substantially as set forth, whereby the looper-actuating wheel rocks the holder positively in both directions.

6. In combination with the needle and the looper, the cord-holder pivoted to the frame on a pivot parallel to the needle rock-shaft and located in the vicinity of the looper, whereby it is adapted to oscillate toward and from the axial line of the looper, and having an inward extension, as E^{111} , expanded across the vertical plane of the needle and forming an obstruction across the path of the cord under the looper, substantially as set forth.

7. In combination with the cord-holder vibrating in a plane parallel to that of the needle and having the lateral flange notched to engage the cord, the stationary holder-clamp having its flange or lip provided with a tooth f^2 to detain the cord during the retraction of the holder, substantially as set forth.

8. In combination with the vibrating cord-holder having the notched flange to engage the cord, a clamp striding said flange and the knife rigidly secured to one lip of the clamp, said holder having a lug, as E^{12} , projecting therefrom in position to vibrate over the edge of the knife, substantially as described.

9. In combination with the cord-looper, the needle, and the mechanism which revolves it twice for each complete action of the binder, the cord-holder having its rock-shaft journaled parallel to that of the needle and having the extension E^{111} , forming an obstruction to the cord, and mechanism, substantially as described, which rocks the holder which moves and holds said projection between the looper and the bundle while the former is receiving the cord between its jaws, substantially as set forth.

10. In combination, substantially as set forth, the needle, the looper, the wheel which actuates the latter, the cord-holder reciprocating in a plane parallel to the plane of the needle toward and from the looper, the stationary clamp co-operating with the holder, the looper standing at rest, with its jaws transverse to the vertical plane of the needle, and the mechanism which moves the holder toward the looper while the latter makes one revolution, whereby the holder grasps the

10 cords and yields slack for the looper by the same movement.

11. In combination with the reciprocating cord-holder having the lateral notched flange 5 E^{10} and the laterally-projecting lug E^{12} , the stationary holder-clamp having rigid with it the knife G, located between the path of the lug E^{12} and that of the flange E^{10} , substantially as set forth.

12. In combination, substantially as set forth, the wheel D and the holder having the rock-shaft parallel to that of the wheel, the former having the gear-teeth d^3 d^{80} and the latter having the arm provided with the teeth 15 e^2 e^{20} .

13. In combination, substantially as set forth, the wheel D and the holder having its rock-shaft parallel to that of the wheel, the

former having an abutment, as the stud and roll D^4 , and the latter having the cam pro- 20 vided with the arm, as E^{20} , whereby the rock-shaft is rocked in a direction opposite to that in which the wheel revolves.

14. In combination with the breast-plate having the loop-sockets, as A^3 A^3 , the stripper- 25 arms removably inserted through such sockets and detachably secured to the breast-plate, substantially as set forth.

In testimony whereof I have hereunto set my hand, this 8th day of July, A. D. 1886, in 30 the presence of two witnesses, at St. Paul, Minnesota.

PAUL HANSON.

Witnesses:

J. H. RANDALL,
A. J. GALBRAITH.