C. L. COOMBS.

BUNCHING MACHINE.

APPLICATION FILED OCT. 12, 1907.

917,549.

Patented Apr. 6, 1909.

5 SHEETS—SHEET 1.

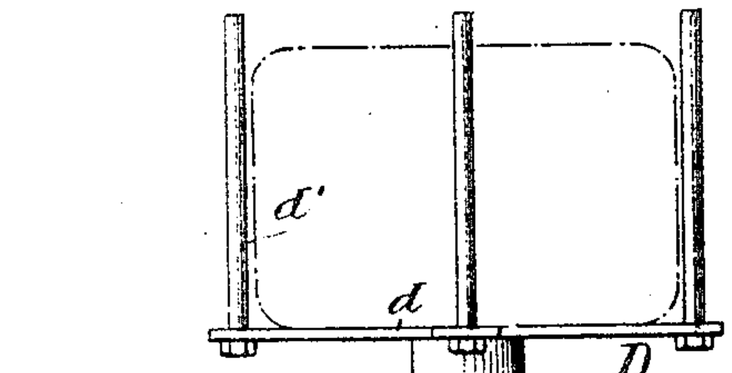

Fig. 1.

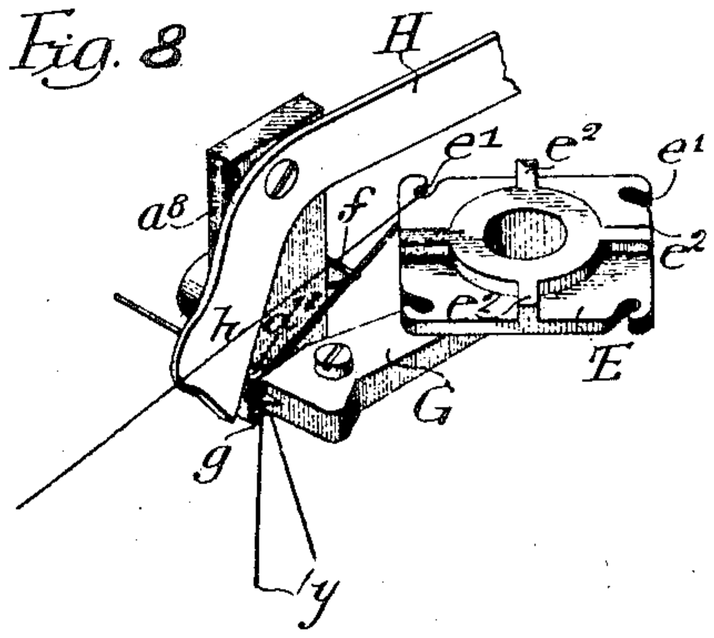

Fig. 8

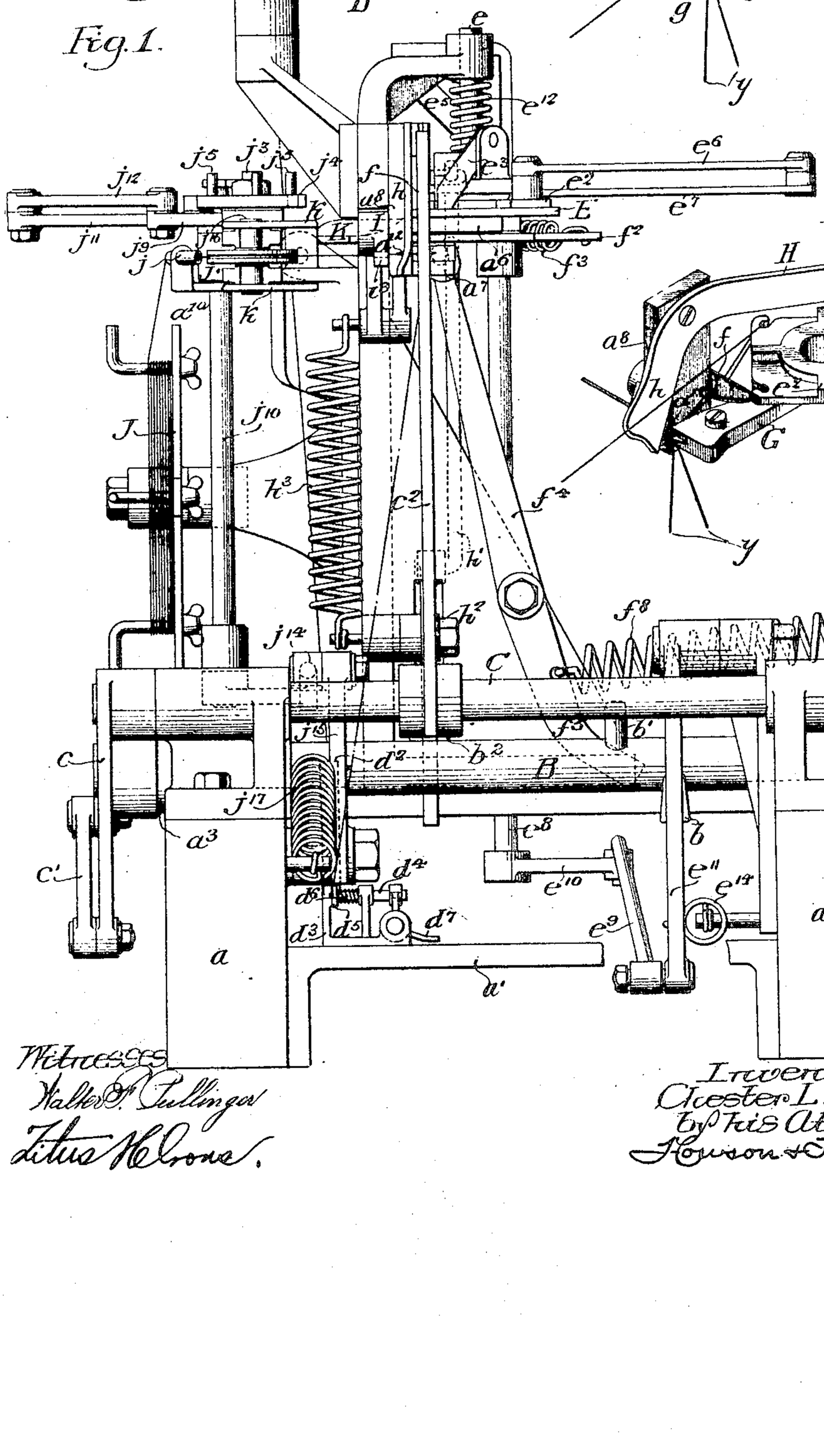

Fig. 9.

Witnesses
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Inventor.
Chester L. Coombs.
by his Attorneys.
Howson & Howson

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5 SHEETS—SHEET 2.

Fig. 13.

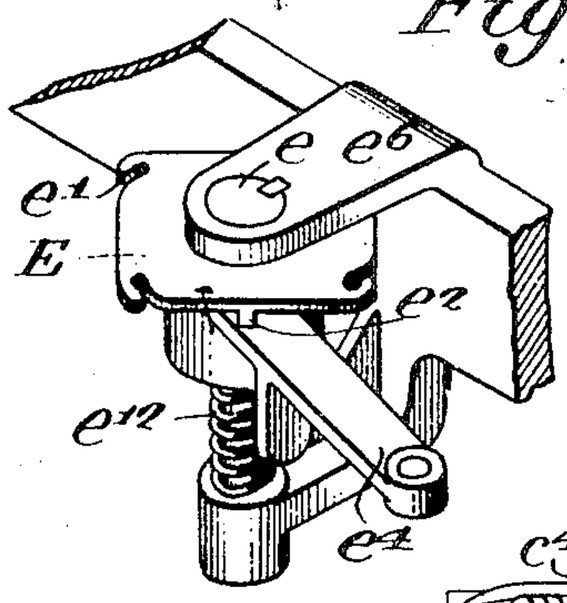

Fig. 2.

Witnesses:-
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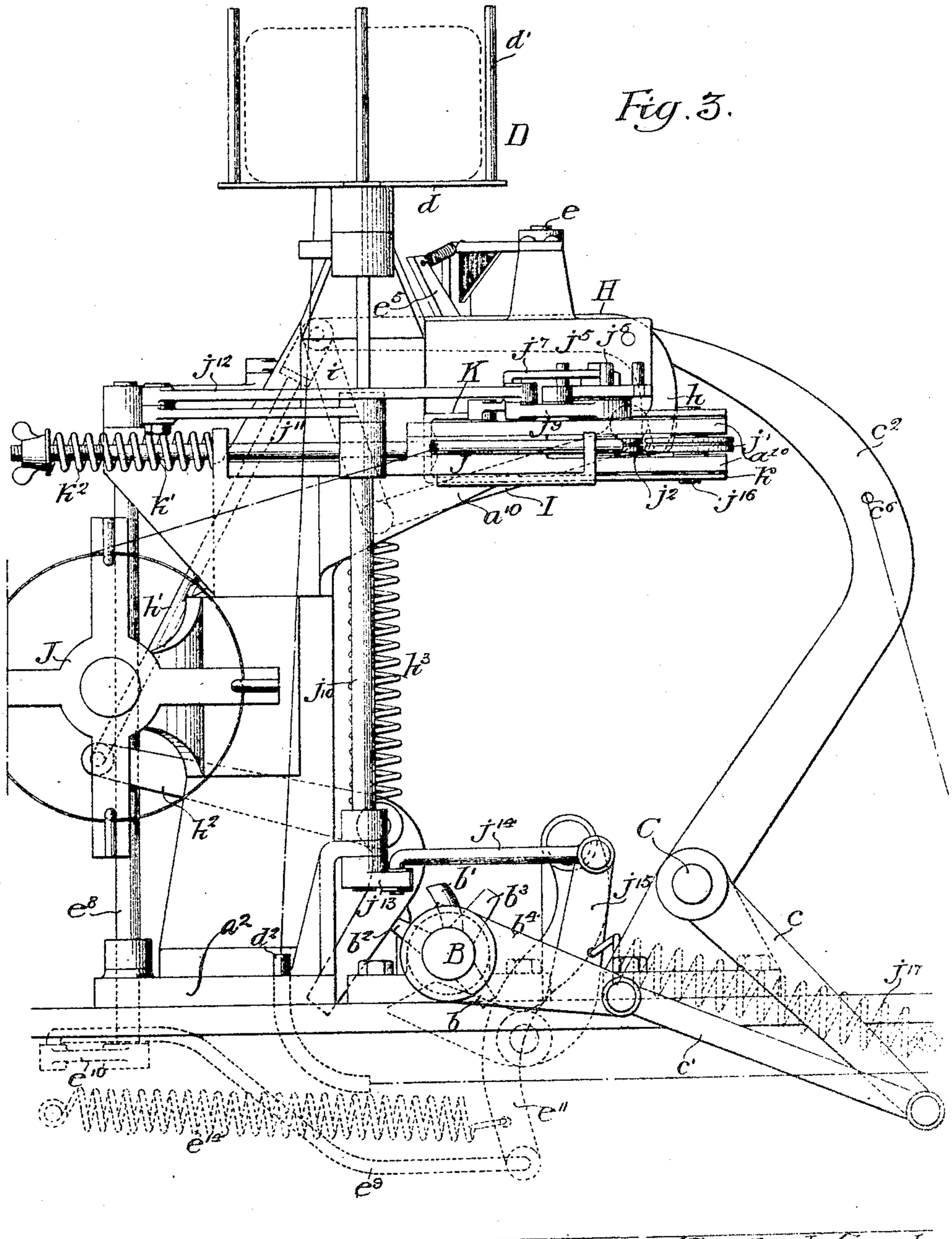
5 SHEETS—SHEET 3.

Fig. 3.



Witnesses:—
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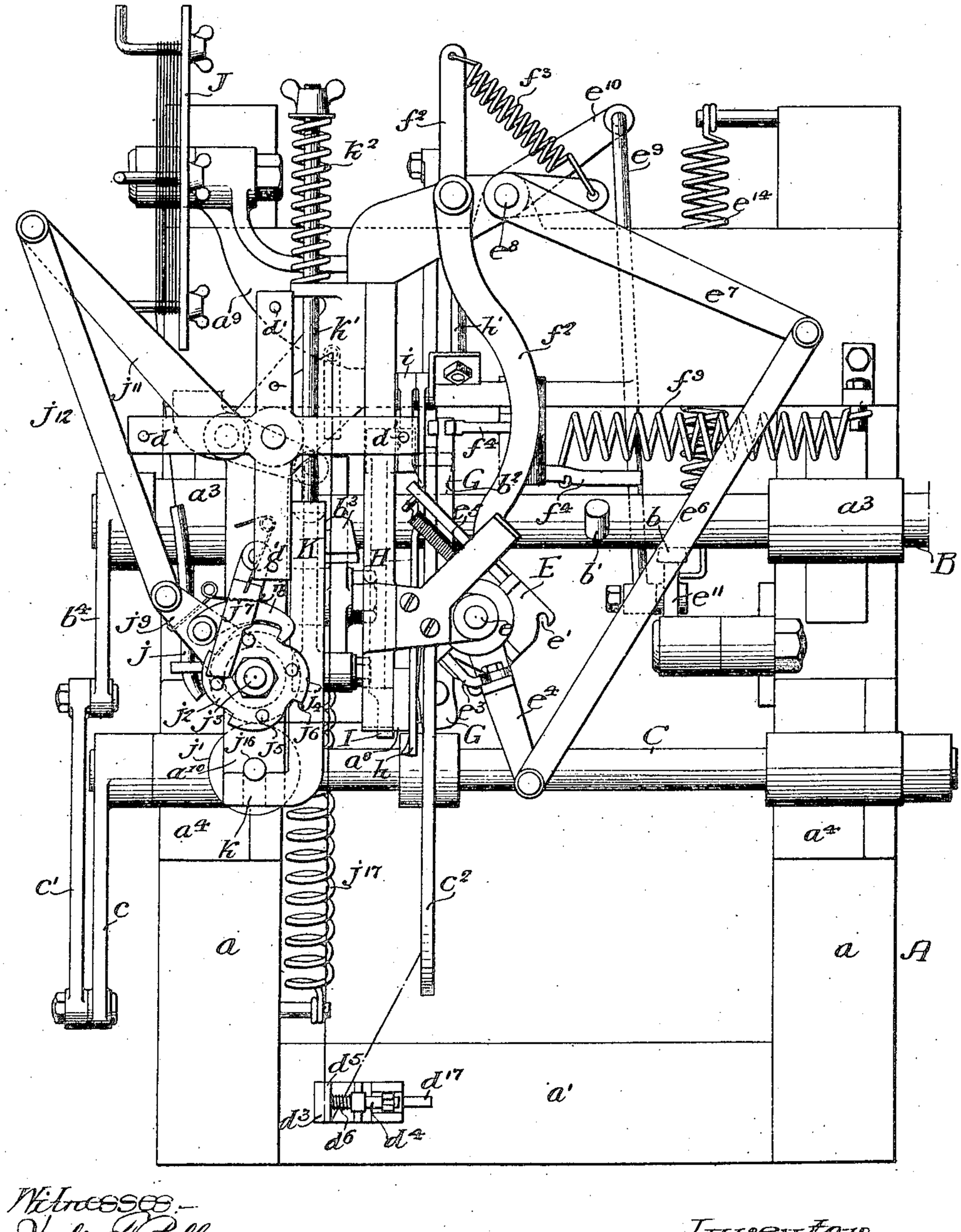
5 SHEETS—SHEET 4.

Fig. 4.



Witnesses.—
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6 SHEETS—SHEET 5.

Fig. 10.

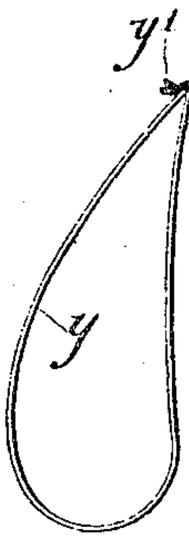


Fig. 5.

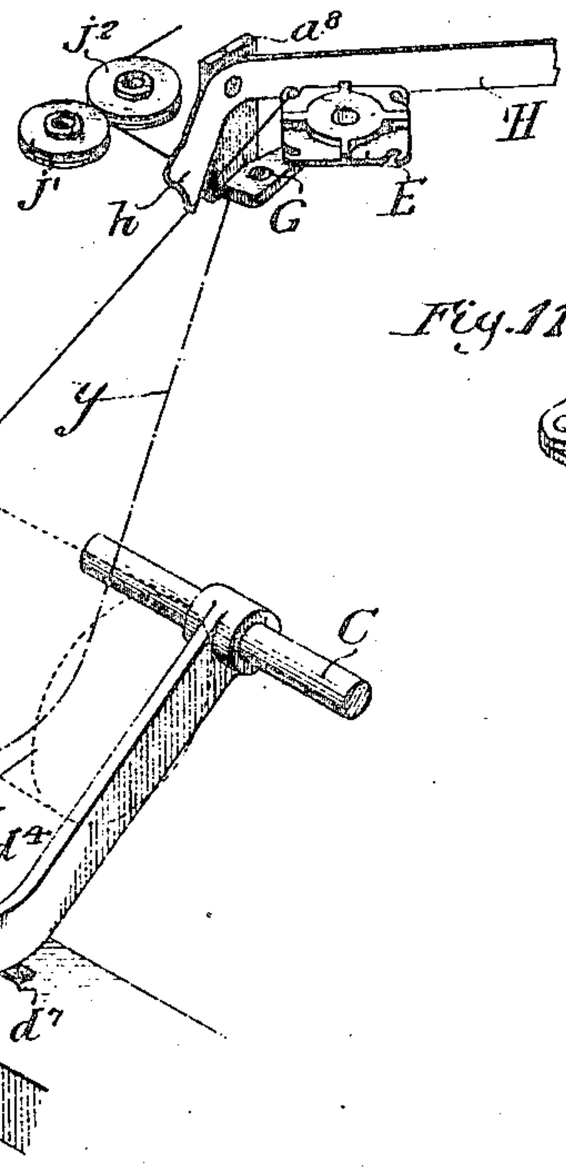


Fig. 11.

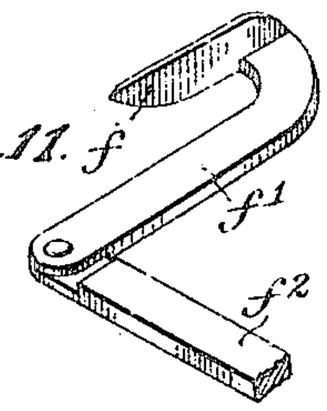


Fig 12

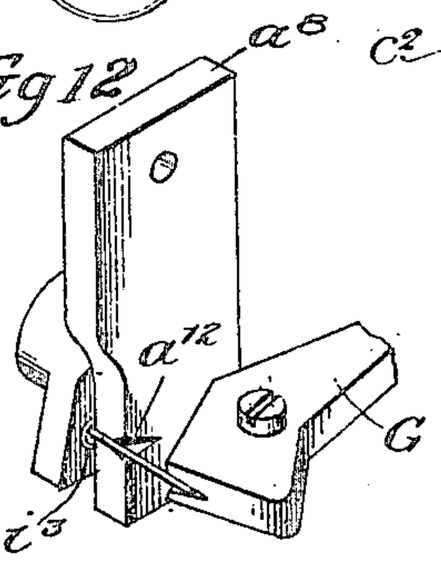


Fig. 6.

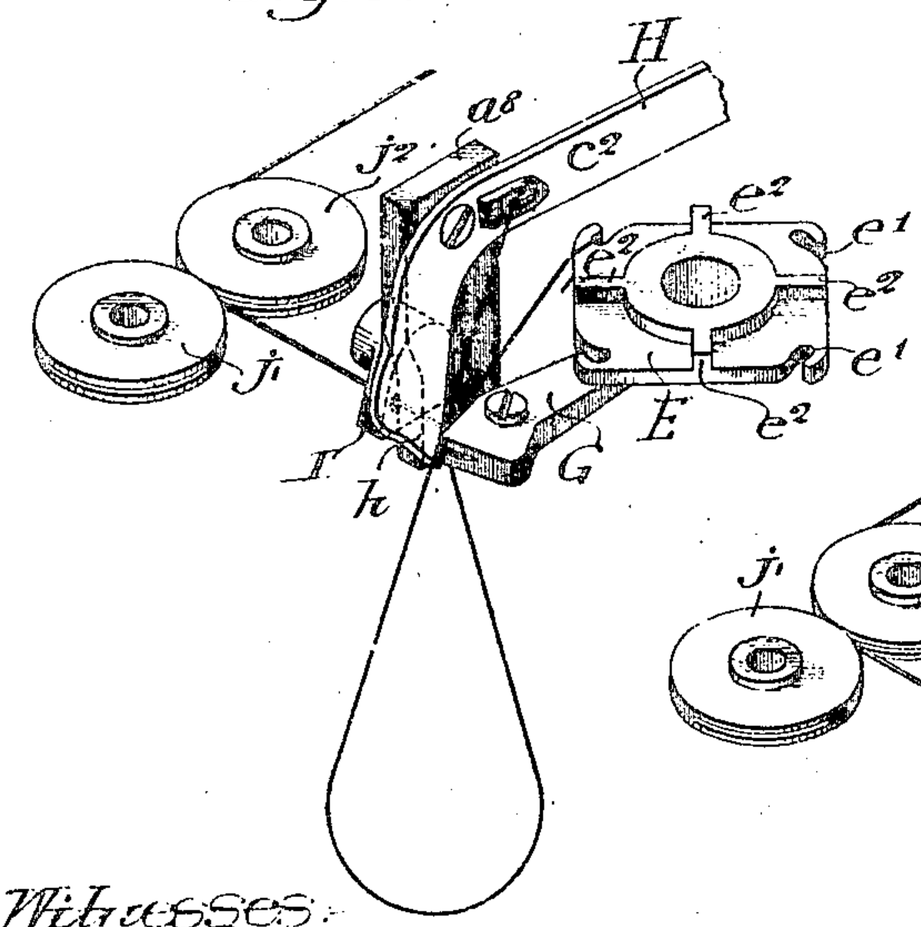
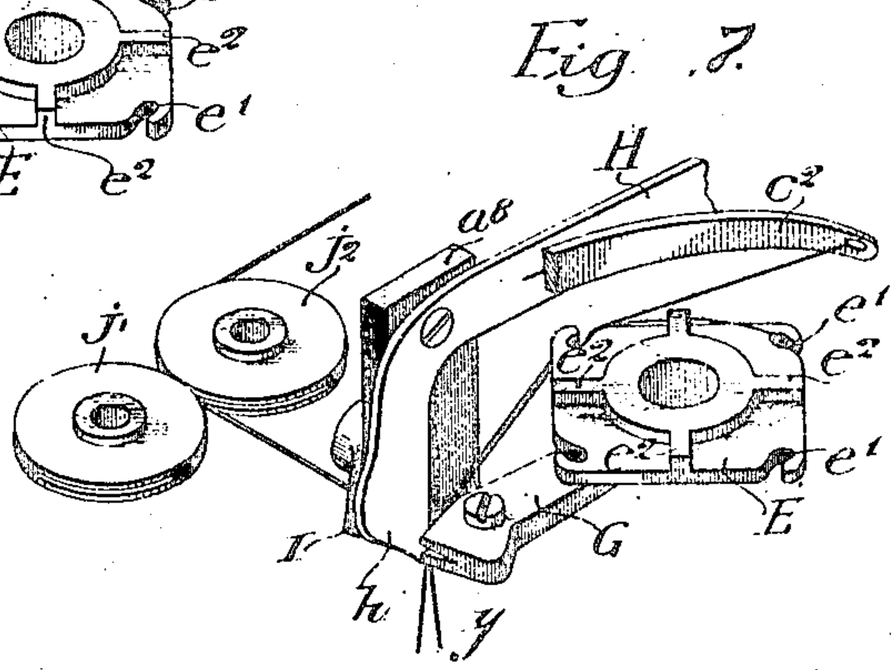


Fig. 7.



Witnesses:
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Inventor:
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by his Attorneys.
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UNITED STATES PATENT OFFICE.

CHESTER L. COOMBS, OF FAIRTON, NEW JERSEY.

BUNCHING-MACHINE.

No. 917,549. Specification of Letters Patent. Patented April 6, 1909.

Application filed October 12, 1907. Serial No. 397,141.

To all whom it may concern:

Be it known that I, CHESTER L. COOMBS, a citizen of the United States, residing in Fairton, Cumberland county, New Jersey, have invented certain Improvements in Bunching-Machines, of which the following is a specification.

My invention relates to that class of devices particularly designed to tie or otherwise fasten a length of string or cord around a bunch of material; one object of the invention being to provide a machine especially adapted for use in bunching vegetables, such as asparagus, rhubarb, and the like, which shall be comparatively inexpensive to construct and relatively simple as to its mechanical movements and general arrangement of parts.

It is further desired to provide a machine having the general characteristics above noted, which shall be capable of encircling a bunch or generally cylindrical body of any desired material with a length of string, and after fastening one end of string to the main body thereof by means of a wire clip, shall act to sever the loop of string around the material from said main body.

It is further desired to provide a bunching machine in which the various mechanical movements and apparatus for encircling the body of material with a string and fastening the ends of said string together shall be of such a nature as to require in their construction a minimum of lathe work.

These and other desirable ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which,

Figure 1, is a front elevation of my improved machine; Figs. 2 and 3, are respectively elevations of opposite sides of my improved machine; Fig. 4, is a plan; Figs. 5 to 9, inclusive, are fragmentary perspective views illustrating the devices for fastening together and cutting off the ends of the string in the principal positions occupied by them during one complete cycle of operations. Fig. 10, is a perspective view of a string loop showing the wire loop formed by my machine to hold together the ends of said string loops. Fig. 11 is a perspective view of the knife; Fig. 12 is a perspective view illustrating a detail of my invention. Fig. 13, is an inverted perspective view of the string holding plate and its associated parts.

Referring to Figs. 1 to 4 inclusive of the above drawings, A represents a supporting frame upon which are mounted the various devices constituting my machine, and it consists of two side members a held together and braced by two transverse members a' and a^2. Said side members are provided with bearings a^3 in which is mounted the transversely extending main shaft B to which the power for driving the machine may be applied either by hand or from any desired form of motor; it being designed to turn continuously in one direction. Upon this shaft between the side members of the frame are mounted four cams b, b', b^2 and b^3, while upon one of its ends, which is extended beyond the frame, is fixed an arm b^4. A second transverse shaft C is mounted in bearings a^4 on the frame and its end also projects beyond said frame for the reception of an arm c; there being a link c' connecting the end of this arm with the end of the arm b^4 of the shaft B. These two arms are so proportioned that the revolution of the arm b^4 in one direction will cause the oscillation of the arm c through an angle of about 90° so that a curved string carrier or needle c^2 rigidly fastened to the transverse shaft C is periodically moved toward and from certain mechanism hereafter described. This needle, as shown best in Fig. 2, has at its end a transverse hole or eye c^3 and at suitable intervals along its length are two other holes c^4 and c^6 through which openings is threaded the string for tying up or encircling bunches of vegetables or the like. The ball of string for this purpose is held within a suitable container which, in the present instance, consists of an open frame or cage D mounted upon a relatively heavy standard a^5 supported from the transverse member a^2 of the main frame of the machine. This cage is free to turn on a vertical axis and consists of a base portion d formed of two bars at right angles to each other, and each having rods d' extending upwardly from its ends. Mounted upon the transverse member a^2 of the frame directly under the string container D is placed a tube d^2 curved through an angle of about 90° so as to change the direction of the string from vertical to horizontal, while mounted upon the front transverse member a' of the frame is placed the tension device for the string. This, as shown in Figs. 1 to 4, consists of a frame d^3 provided with a bearing for a longitudinally movable rod d^4. This rod has a head d^5 provided with a groove for the reception of the string and placed to co-act with a portion of

the frame d^3 against which it is normally pressed by means of a spring d^6. Attached to the rod d^4 is one arm of a lever d^7 whose second arm is extended in such manner as to be engaged by the string carrier or needle c^2 when this occupies its extreme outward position. When so engaged by the needle the lever is turned on its supporting pivot and so moves the rod d^4 as to compress the spring d^6 and permit the string confined between the head d^5 and the frame d^3 to be fed freely. As soon, however, as the arm of the lever d^7 is released by the upward movement of the lever, tension is again applied to the string by the spring pressed rod d^4. For holding the free end of the string in the machine I provide a plate E mounted so as to be free to turn on a vertical spindle e and provided at each of its corners with a notch or recess e' whereby a hooked form is given to each of said corners. This plate is provided with a number of teeth e^2 designed to be engaged by a pawl e^3 carried by an arm e^4 loosely mounted upon the spindle e; there being also provided a holding pawl e^5 for said plate. The arm e^4 is connected by means of a link e^6 to an arm e^7 rigidly fastened to a vertically extending spindle e^8 and there is a link e^9 connecting the second arm e^{10} of this spindle with a lever e^{11} so supported from the frame A of the machine as to be periodically acted on by the cam b. A spring e^{14} serves to hold this lever toward the shaft B so that it is always in a position to be engaged by said cam.

As shown in Figs. 2 and 13, there is mounted upon the spindle e a coiled spring e^{12} designed to act between the upper bearing for said spindle and the arm e^4 so as to yieldingly press the plate E which is under said arm against the upper face of a fixed plate a^6 projecting from the bracket a^5. Immediately in front of the plate a^6 is a string cutting knife F which consists of a vertically placed blade f having an inclined edge and designed to be transversely moved immediately under the string holding plate E at predetermined times. The blade itself is attached to or formed integral with a flat bar f' pivoted to one end of a horizontally extending lever f^2, to one of whose arms is attached a spring f^3 designed to normally maintain said lever in such position that the knife blade is held at and tends to return to the left hand side of the string holding plate E. For the purpose of actuating this knife I provide a vertically extending lever f^4 pivotally mounted on the part a^5 of the frame so that its lower end f^5 is periodically engaged by the cam b' toward which it is at all times held by a spring f^9. The upper end of this lever also engages the long arm of a clip forming lever G, whose other end, as shown best in Figs. 5 to 10 inclusive, is provided with a triangular notch g for receiving and assisting in the formation of the wire clip which holds together the ends of the string loop encircling a bunch of material. This lever G is pivotally mounted upon a part a^7 of the frame which extends horizontally from the vertical plate a^8 forming part of and held to the standard a^5 in any desired manner. The lower portion of the plate a^8 is provided with a notch a^{12} placed opposite to the notch g of the lever G and of a shape similar thereto. The lever G is so mounted relatively to the plate a^8 that at one extremity of its movement its forwardly extending or short arm is moved practically into engagement therewith, so that a loop or clip of wire engaged between said plate and this end of the lever is closed up.

Pivoted to a portion of the plate a^8, as shown in Figs. 2 and 3, is a clip forming lever H, whose forward end h is bent downwardly so as to coöperate with said plate and the short arm of the lever G in forming a loop or clip of wire. The long arm of this lever H is connected through a link h' to an arm of a lever h^2 whose second arm is so placed as to be periodically engaged by the cam b^2 on the main shaft B. The various parts are so arranged that the arm h of the lever H is moved toward and between the plate a^8 and the short arm of the lever G when this latter is some distance from said plate.

A link i serves to connect the long arm of a lever I to the point of connection between the lever H and the link h', so that it also is actuated by the cam b^2. The lever I is itself pivoted to that side of the plate a^8 opposite that having the lever G and its short arm is provided with a transverse wire passage shown best in dotted lines in Fig. 2, at i^3. This passage is designed for the reception of the wire from which are formed the string holding clips and is so placed in the lever that one of its edges coacts with the edge of the stationary plate a^8 to form the cutter or shear for the wire.

A spring h^3 extends between any suitable point on the frame of the machine and the point of junction of the link i with the lever I so as to tend to maintain both this lever and the clip-forming lever H in the normal position of the former; *i. e.* with its wire receiving passage advanced in front of the shearing edge of the plate a^8 and the lever H with the end of its arm h swung forwardly away from the coacting parts of the lever G and the plate a^8.

For supporting the wire from which the clips are to be made I provide a bracket a^9 having a horizontal spindle or pivot upon which is mounted a wire carrying reel J. From this, as shown in Fig. 4, the wire extends to a tubular or other suitable guide j from whence it passes to a pair of feeding wheels or nip rolls j' and j^2, mounted upon a suitable bracket or extension a^{10} from the standard a^5. Each of these nip rolls is pro-

vided with a peripheral groove and is so placed that wire passing from the guide j between them will be delivered in a straight line to the passage i^3 of the lever I. For the purpose of periodically turning one of the nip rolls, I provide upon the spindle j^3 a wheel j^4 having upwardly projecting pins or teeth j^5 and also provided with peripheral teeth j^6. Of these the pins j^5 are designed to be engaged by a spring actuated holding pawl j^7 while the peripheral teeth are designed to be engaged by a hooked pawl j^8 pivoted to a lever j^9 loosely mounted on the spindle j^3. A vertically extending spindle j^{10} has at its upper end an arm j^{11} connected by a link j^{12} with the lever j^9 and at its lower end has an arm j^{13} connected through a link j^{14} with the lever j^{15}. This latter is so mounted on the frame of the machine as to be periodically engaged by the cam b^3 on the main shaft B toward which it is drawn by a spring j^{17}.

For the purpose of yieldingly pressing together the two nip rolls or wire feeding wheels j' and j^2 I slot the end of the bracket a^{10} for the reception of the spindle j^{16} of the roller or wheel j', and provide a double hooked structure K having two parallel arms k whose ends engage the spindle j^{16} and whose main portions after extending at right angles to said ends are finally united. A bolt k' engages the rear end of the part K and has confined between its ends and a projection of the main frame which serves as a bearing, a compression spring k^2 whereby the arms k of said part K are caused at all times to draw the wheel j' toward the wheel j^2.

In using my machine a ball of string is placed in the container D and its end after passing through the tubular guide d^2 and between the two members d^3 and d^5 of the tension device is passed through the opening c^6 of the needle and then along the side of the needle through the opening c^4 to the other side thereof, from whence it finally passes through the eye c^3 in the end of the needle. The end of the wire is taken from a coil thereof supported on the reel J through the wire guide j and after passing between the two nip or feed rollers j' and j^2 is run through the passage i^3 in the short arm of the lever I, being permitted to project therefrom beyond the edge of the stationary plate a^8 and the notch g in the lever G. The end of the string is then placed in the most forward of the notches of the plate E and this latter is turned on its axis, to the extent of a quarter of a revolution in the present instance, by turning the lever e^4 by hand so that the end of the string is tightly held between said plate E and the adjacent face of the horizontal plate a^6 of the frame. The bunch of material to be tied up is then placed in the loop formed by forcing downwardly the string extending between the end of the needle c^2 and the plate E into the position shown in dotted lines in Fig. 5. If now, the main shaft B be turned while the bunch of material occupies the position indicated at X in Fig. 5, the shaft C is also turned and the needle c^2 is swung forward so that its end occupies the position illustrated in Fig. 6. Shortly before the needle reaches the end of its inward stroke the lever H is so acted upon that its end h engages the end of the wire and forces this into the notches in the plate a^8 and lever G and then between these two parts, thereby giving it an approximately U-shaped form. At the same time the lever I is turned on its pivot so that the wire passage i^3 is moved past the cutting edge of the plate a^8 thereby severing the U-shaped clip; the various parts being in the positions illustrated in Fig. 6 just before this action. At this time the two ends of the length of string encircling the bunch of material extend substantially parallel with each other and between the two arms of the wire clip cut off and held between the plate a^8 and the end of the lever G. The continued revolution of the main shaft B now causes the plate E to be given a quarter turn, with the result that the end of the string engaged by it is drawn farther into the machine while the other end of the length encircling the bunch is likewise drawn in by the continued inward movement of this lever. As a consequence, the loop of string around the bunch is shortened and consequently tightened, until finally, as shown in Fig. 7, a second hook formed by one of the recesses in the plate E engages the two ends encircling the bunch finally stopping its movement with said ends held tightly between it and the stationary plate a^6. The cams are so arranged on the main shaft that immediately after this operation the arm h of the lever H starts to move outwardly from between the plate a^8 and the end of the lever G, as does also the lever c^2, and as soon as this arm has moved out a sufficient distance the lever G is so actuated that the sides of the clip are tightly compressed upon the two pieces of string leading from the loop around the bunch so as to permanently hold these together; it being understood that the wire is sufficiently stiff to prevent the ends of the string being easily pulled out of the wire clip. Just before the completion of the closing of the wire clip, around the two lengths of string, the lever f^2 is so actuated as to draw forward the knife F whose inclined edge then acts to sever the tightly stretched lengths of string. It should be noted, however, that the cam b' and its co-acting lever f^4 are so arranged and constructed that under the action of the spring f^8 said lever is suddenly restored to its normal position after its engagement with said cam, and consequently the knife F,

which is attached to said lever as well as the lever G also actuated therefrom, are both almost instantaneously restored to their normal positions when such action occurs. The tied up bunch of material is now free to be removed from the machine, while the needle continues and completes the remainder of its backward stroke thereby drawing out the length of string between its end and the plate E into the position shown in Fig. 5. A loop of string y with the wire clip y' holding its ends together, is shown in Fig. 10. Just before the beginning of another stroke by the needle c^2 the cam b^3 acts upon the lever j^{15} and its connected parts so that the lever j^9 is oscillated, thereby turning the nip or feed roll j^2 through a partial revolution and feeding forward a predetermined length of wire across the front of the plate a^8 and the end of the lever G. At the completion of its backward stroke the needle c^2 strikes the lever d^7 of the tension device, thereby drawing the rod d^4 away from the upper part of the frame d^3 and, as a consequence, removing the tension from the string. It is thus possible to easily depress the length of string stretched between the plate E and the end of the needle into the position shown in dotted lines in Fig. 5, though as soon as the needle is started on its forward stroke the pressure on the lever d^7 is removed and since the head d^5 is pressed by its spring d^6 against the frame d^3, the spring is again placed under tension.

I claim:—

1. The combination in a bunching machine of means for holding one end of a length of string, a string carrying needle, means for moving the needle toward and from the string holding means, a pair of jaws, a lever capable of entering between said jaws, means for feeding a length of wire across the jaws, said lever having means for causing it to press said piece of wire between the jaws into a U-shaped clip around the string and afterward move from between the jaws while leaving the clip between the same, with means for causing said jaws to be moved together to finally compress the clip around the string.

2. A bunching machine consisting of means for holding one end of a length of string, a needle engaging the string some distance from its end, means for operating said holding means to cause it to engage the string at a point distant from its end, a pair of jaws and a member for forcing a length of wire between the same to form a substantially U-shaped clip of wire around the two portions of string adjacent to said holding means, and means for operating the jaws to force the side portions of the clip toward each other so that they remain substantially parallel while permanently connecting said portions of string.

3. The combination of a fixed structure, a lever mounted adjacent thereto, means for feeding a length of wire adjacent to the lever and said structure, means for forming said wire into a U-shaped loop between the structure and the lever, means for placing two lengths of string in the loop of wire, and means for operating the lever to cause it to close said loop upon the string.

4. The combination of a fixed structure, a lever pivoted adjacent thereto, means for feeding a length of wire adjacent to said structure and said lever, a second lever, means for operating said second lever to cause it to force a predetermined length of wire between the first lever and the fixed structure, means for placing a string across the wire, and means for operating the first lever to cause it to form a wire clip around the string.

5. The combination of a fixed structure, a lever coacting therewith to form a wire shear, a second lever adjacent to the fixed structure having an arm capable of being moved toward and from the same, means for feeding a piece of wire past the shear and across the space between the second lever and the fixed structure, a third lever, means for causing it to force a predetermined length of wire between the fixed structure and the second lever, means for placing a plurality of portions of string between the fixed lever and the second lever, and means for operating the second lever to close the piece of wire upon the string.

6. The combination of two structures spaced apart, a lever adjacent thereto, means for feeding a predetermined length of wire adjacent to the space between said structures, means for operating the lever to force the wire into a U-shaped form between the two structures, means for holding the end of a piece of string so that it will pass through the space between the structures, a needle for placing a second portion of the string between the structures, with means for moving one of the structures toward the other to close the wire around the string.

7. The combination of a rotary structure provided with a projection or projections, a fixed structure co-acting with a projection to hold a piece of string, a needle also engaging the string, a pair of jaws, means for delivering a length of wire across said jaws, a pivoted arm, means for turning said arm on its pivot to cause it with a length of wire to enter between the jaws, and means for subsequently moving together said jaws to cause them to clamp said wire upon the string.

8. The combination of a rotary structure having a series of hooked projections, means for intermittently turning said structure, a fixed structure co-acting with the hooked structure to hold a piece of string, a needle

engaging another portion of the piece of string, means for forming a clip around the portions of string respectively held by said rotary structure and said needle, a device for cutting off a length of wire, two jaws, means for forcing said wire between the jaws to give it a substantially U-shaped form, and means for thereafter forcing said jaws together to cause them to permanently connect the ends of the piece of string.

9. The combination of a rotary structure having a series of projecting hooks, a fixed structure coöperating with said hooks to hold a piece of string, a needle engaging another portion of the length of string, means for operating said needle to carry said second string section into a position to be engaged by one of the hooks of the rotary structure, means for intermittently turning said structure, and means for forming a clip around the two portions of string after they have been engaged by one of the hooked projections of the rotary structure, said means including a device for cutting off a length of wire, a pair of jaws, means for forcing said wire between the jaws, and means for moving one of said jaws toward the other to close the wire on the string.

10. The combination of a fixed structure, a lever mounted adjacent thereto, means for forcing a predetermined length of wire between the structure and the lever to form a clip, means for placing a plurality of string portions in said clip, means for cutting the said string portions adjacent to the clip, and a device common to the lever and to the string cutting means for operating said lever to close the wire loop around the string.

11. The combination of a fixed structure, a wire shear and a movable structure adjacent thereto, means for feeding a length of wire past the shear across the space between the two structures, a lever for forcing a predetermined length of the wire between the two structures, and means common to the shear and to said lever for operating the same to cut off and form a wire clip.

12. The combination of a structure having a fixed plate, a lever having a passage through it coöperating with said plate to form a shear, a second lever having an arm movable toward and from the plate, means for periodically feeding a predetermined length of wire through the passage in the first lever and across the space between the second lever and the plate, a third lever having operating means for forming said length of wire into a U-shaped clip between the plate and the second lever, means for placing a plurality of lengths of string between the plate and the second lever, and means for operating said second lever to close the wire clip around said portions of string.

13. The combination of a device for holding one end of a length of string, a shaft having a curved needle also engaging said string, means for moving said needle so as to cause its point to draw out a length of string between it and said holding device, a fixed and a movable structure placed to receive between them the end of the string adjacent to where it is held and also to receive it adjacent to the end of the needle, means for feeding a predetermined length of wire across the space between said structures before the string is placed therein, with means for cutting off and closing a length of said wire around the two sections of string.

14. The combination in a bunching machine, of means including a needle for supporting a body of string, mechanism for fastening together the ends of a loop of said string, and a tension device normally operative on the string to govern its delivery, said device having a member placed to be periodically moved by said needle and including a plate connected to said member and supported to engage the string, with a spring normally acting to press the plate against the string and oppose movement of said member.

15. The combination in a bunching machine of means for supporting a body of string, means for fastening together the ends of a loop of said string including a string carrying needle, and a tension device operative on the string between the needle and the string supporting means, said tension device being placed to be operated on by the needle so as to release the string under predetermined conditions.

16. The combination in a bunching machine of a frame, means for supporting a body of string thereon, mechanism for fastening together the ends of a loop of string around the bunch of material, said fastening means including an oscillatory string carrying needle, a tension device for the string including two members yieldingly pressed together, a lever operatively connected to one of said members and placed to be engaged by the needle when the latter is at one extremity of its path of movement so as to relieve pressure upon the string.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

CHESTER L. COOMBS.

Witnesses:
JOHN S. MITCHELL,
N. B. OGDEN.