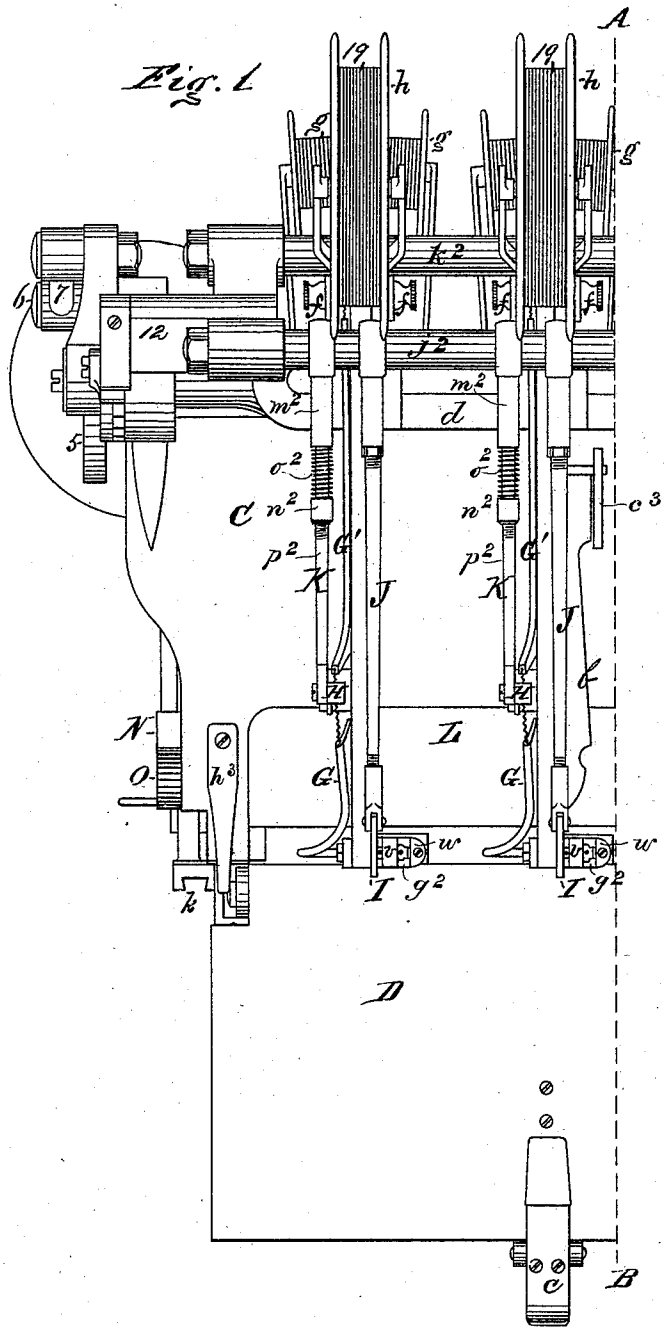
8 Sheets—Sheet 1.

# E. S. BOYNTON.

## Book-Sewing Machine.

**No. 203,530.** **Patented May 14, 1878.**

Fig. 1.




Witnesses
W. G. Bennem
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Inventor
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Fig. 1.*

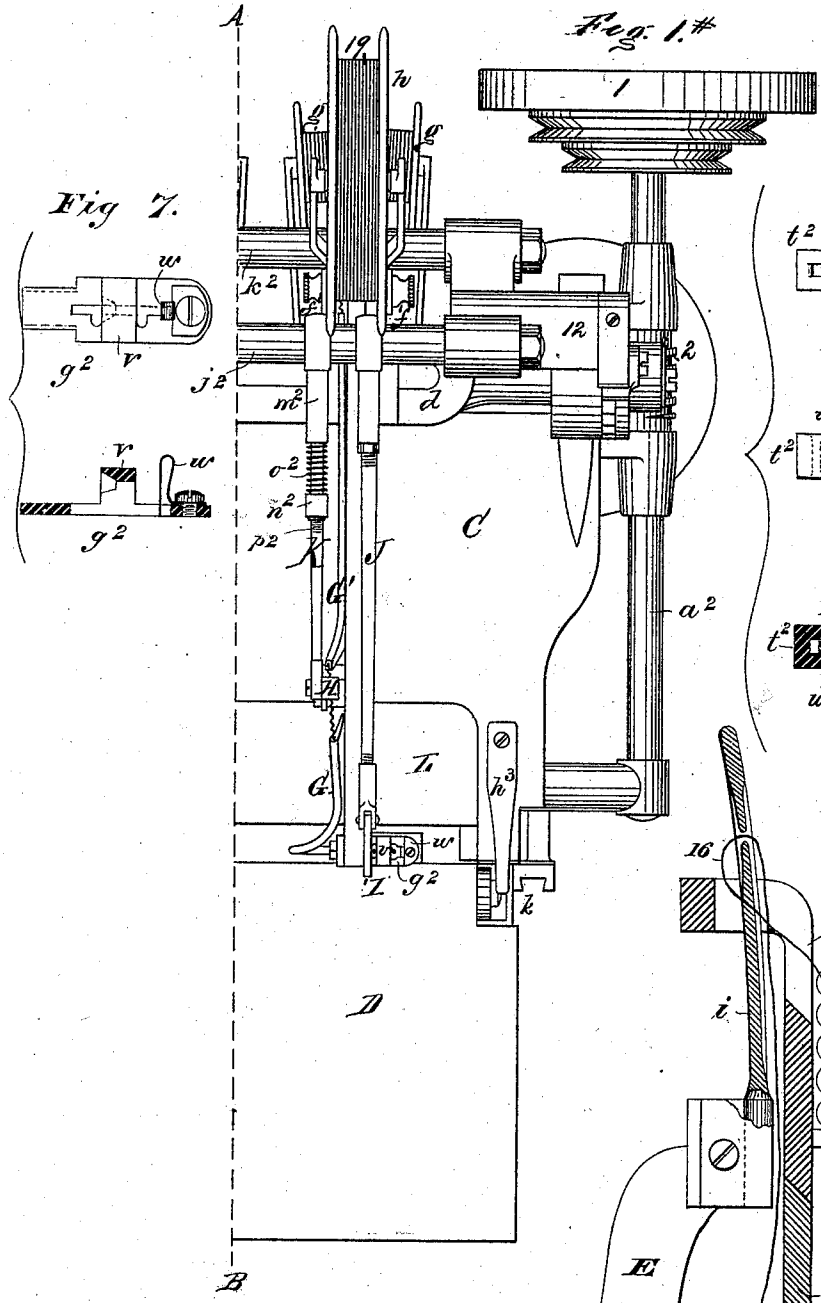



Fig 7.




Fig 8.

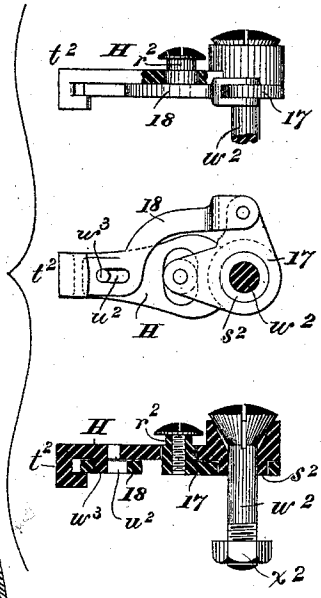
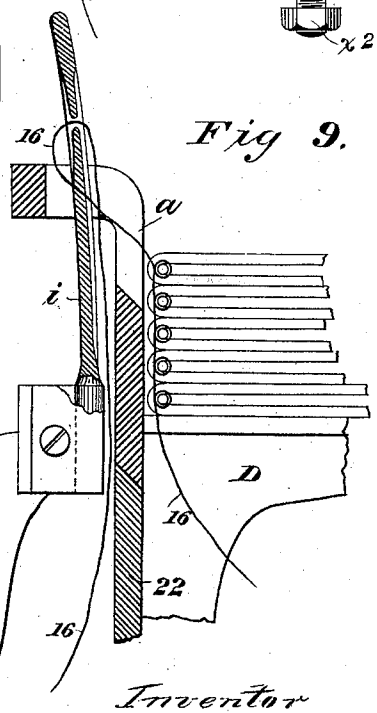



Fig 9.




Witnesses
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8 Sheets—Sheet 3.

# E. S. BOYNTON.

## Book-Sewing Machine.

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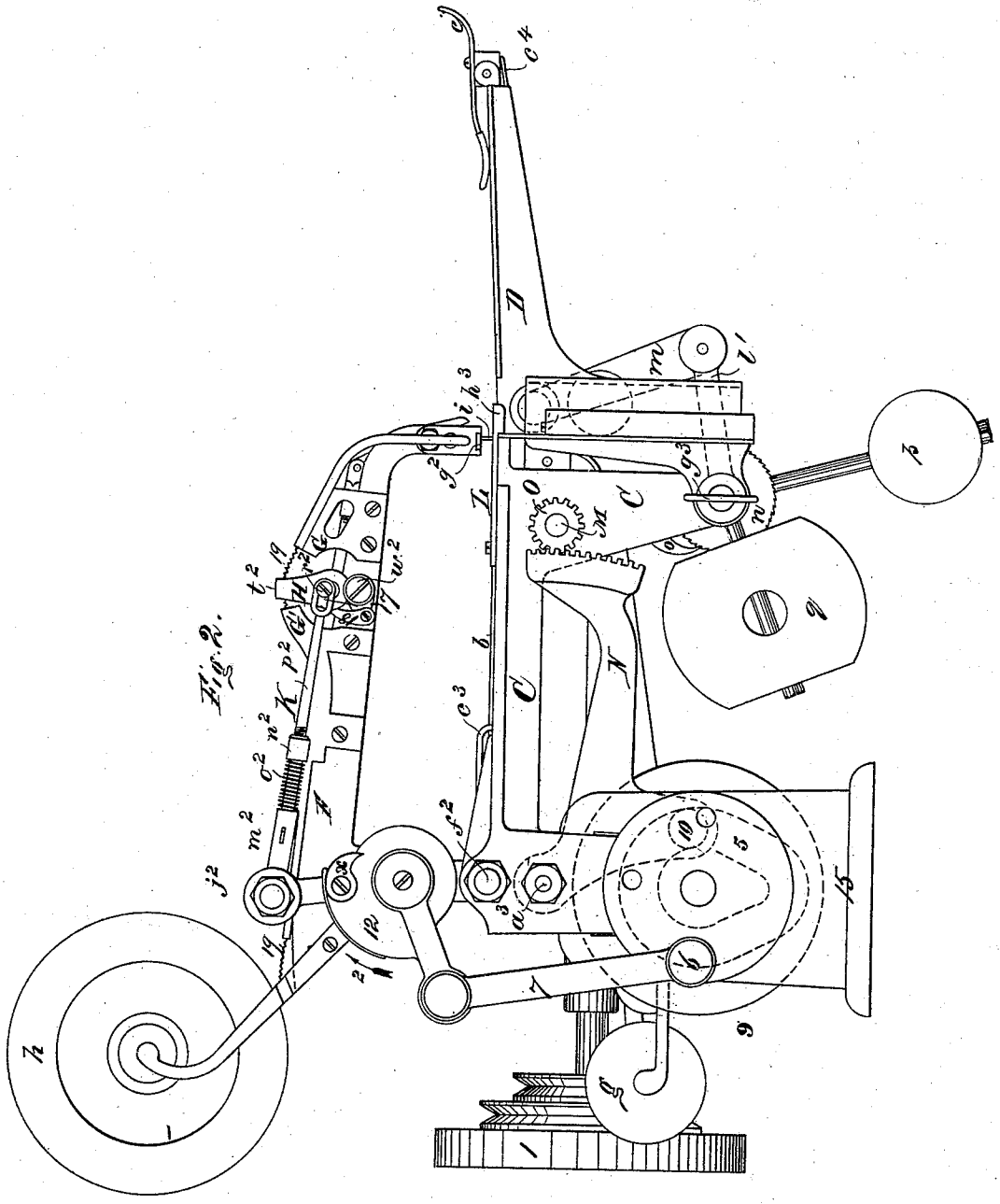

Witnesses
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# E. S. BOYNTON.

## Book-Sewing Machine.

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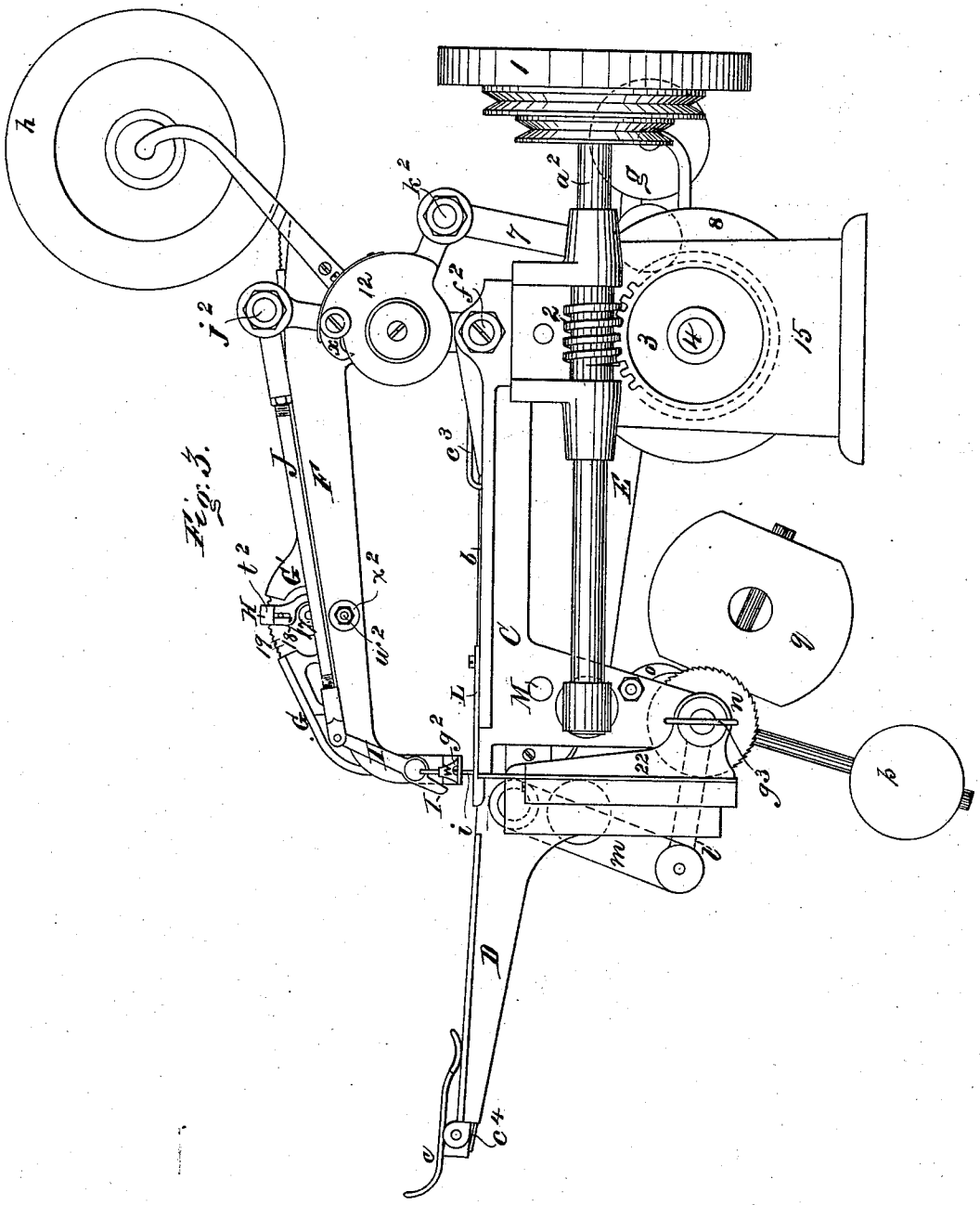

Fig. 5.

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8 Sheets—Sheet 5.

# E. S. BOYNTON.

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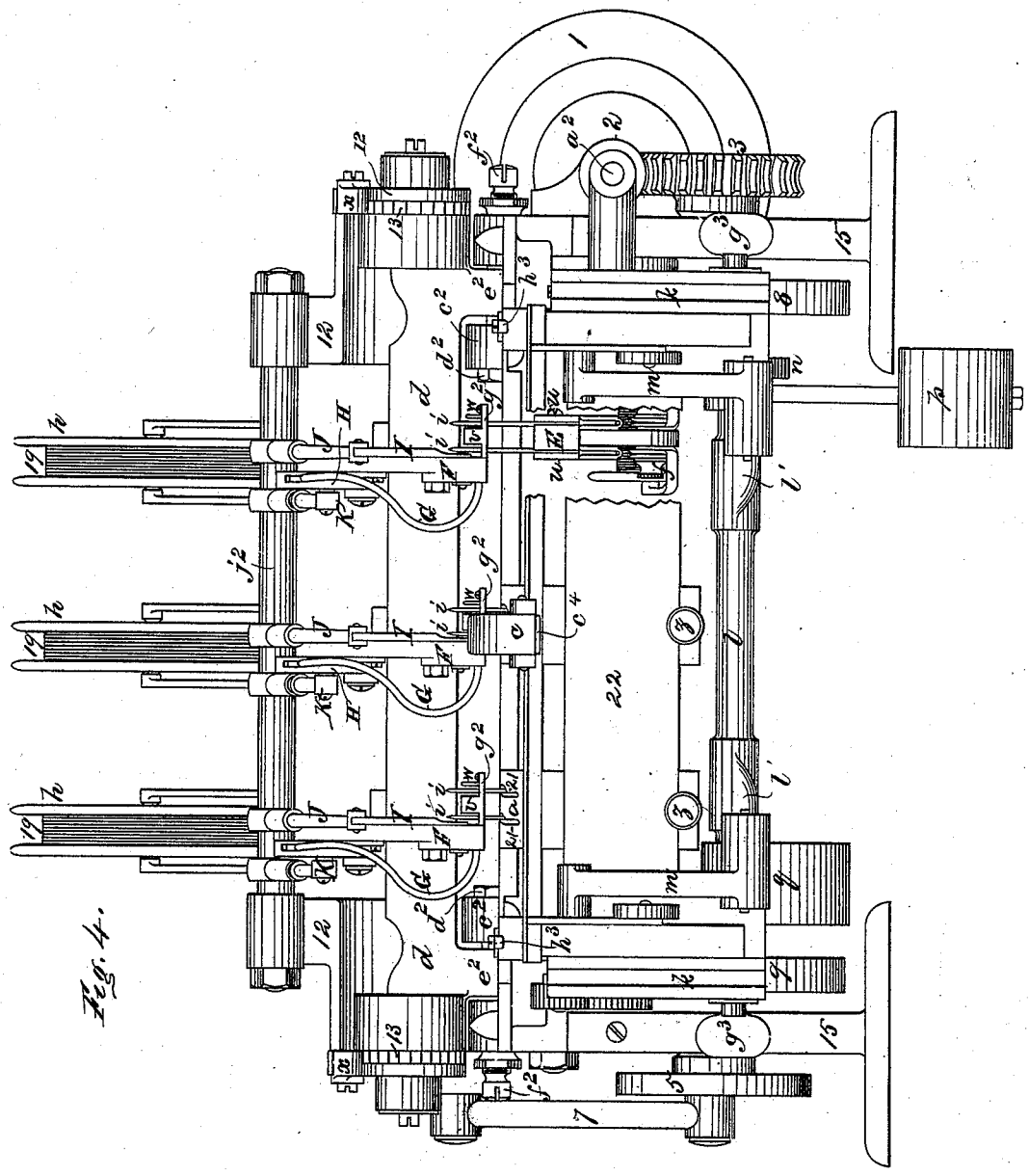

Fig. 4.

Witnesses
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## Book-Sewing Machine.

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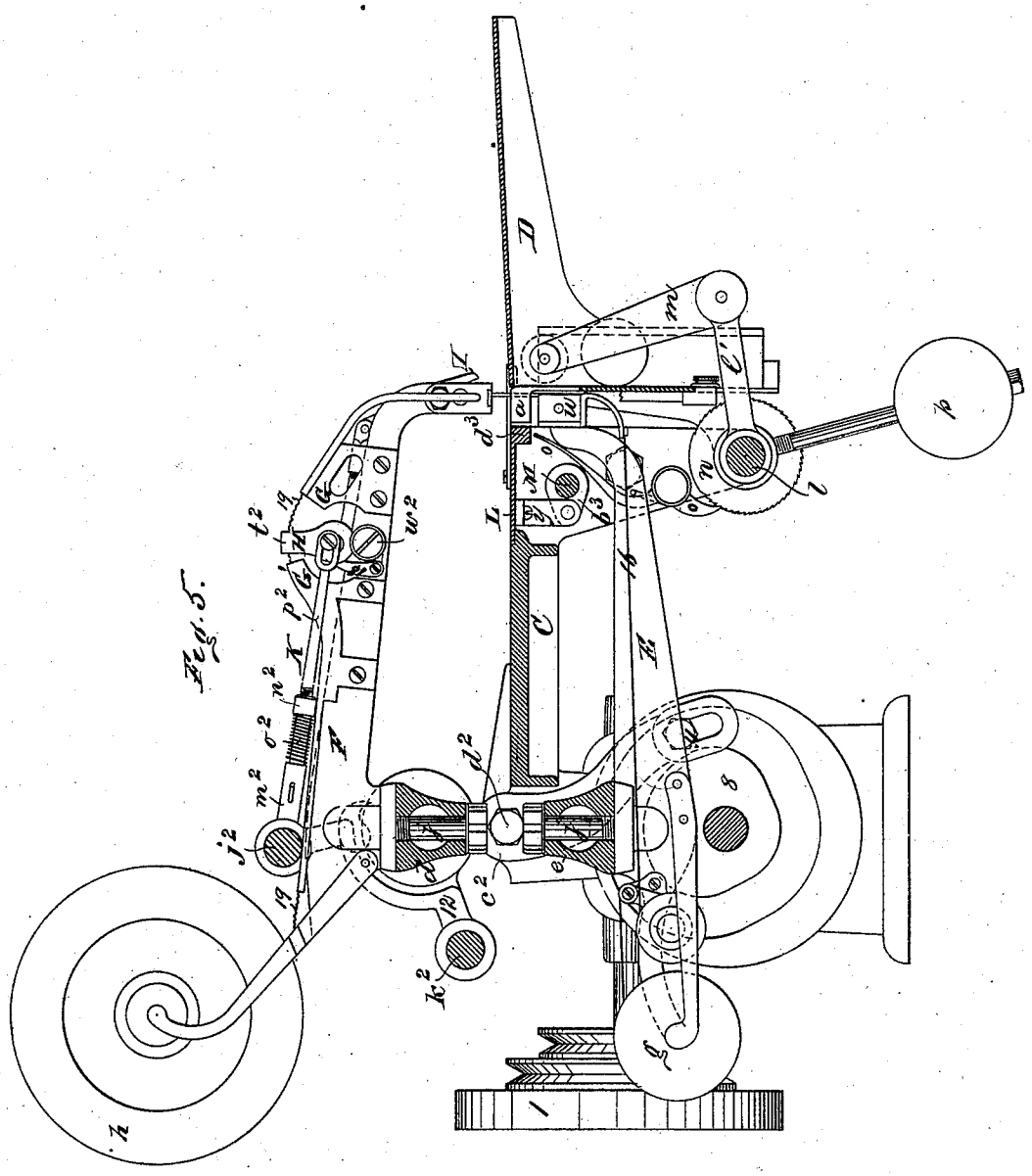

Witnesses
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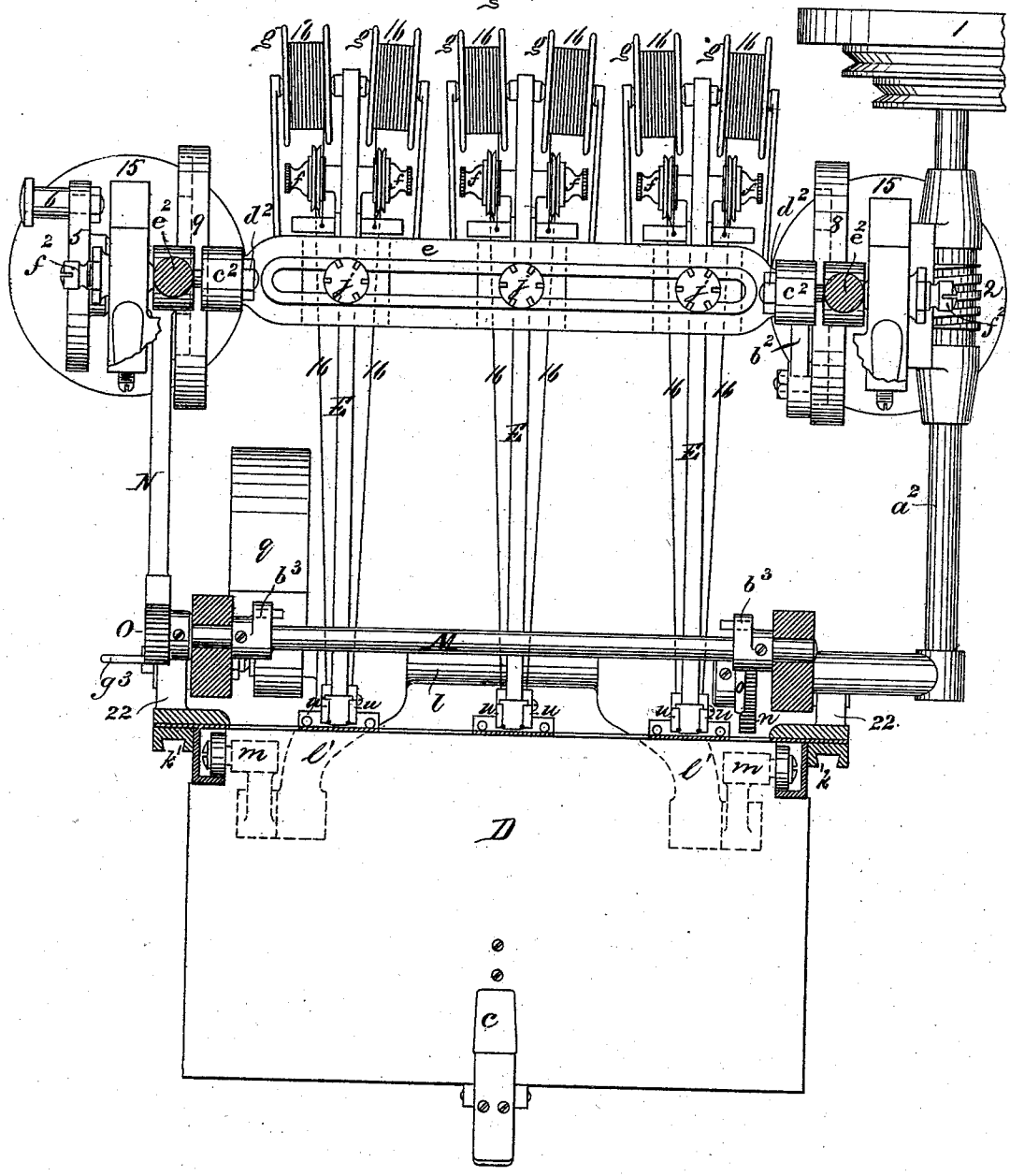
8 Sheets—Sheet 7.

# E. S. BOYNTON.

## Book-Sewing Machine.

**No. 203,530.** **Patented May 14, 1878.**

*Fig. 6.*




Witnesses
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8 Sheets—Sheet 8.

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## Book-Sewing Machine.

No. 203,530 Patented May 14, 1878.

Fig. 11.

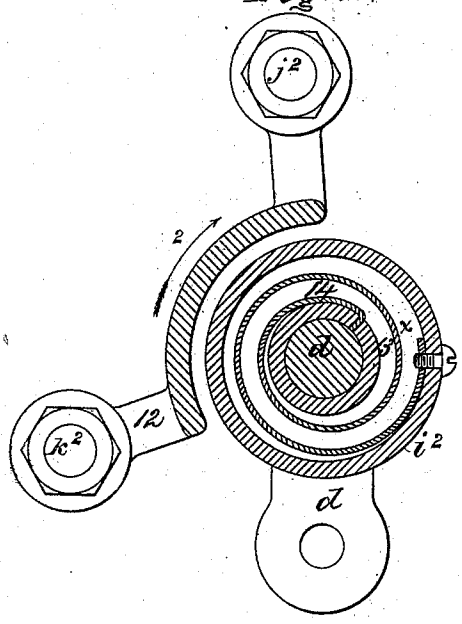


Fig. 10.

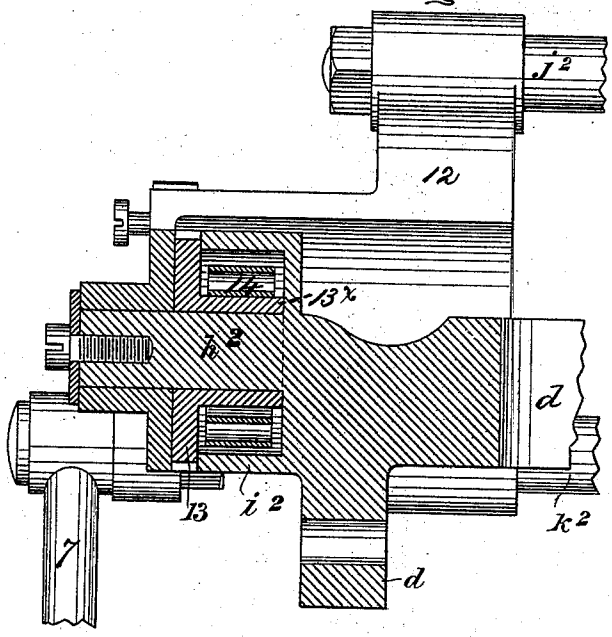


Fig. 12.

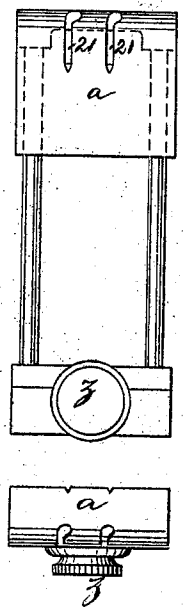


Fig. 13.

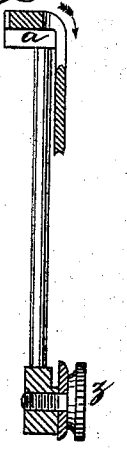


Fig. 14.




Witnesses
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Inventor
Edward S. Boynton

# UNITED STATES PATENT OFFICE.

EDWARD S. BOYNTON, OF BRIDGEPORT, CONN., ASSIGNOR TO WHEELER & WILSON MANUFACTURING COMPANY, OF SAME PLACE.

## IMPROVEMENT IN BOOK-SEWING MACHINES.

Specification forming part of Letters Patent No. **203,530**, dated May 14, 1878; application filed December 8, 1877.

*To all whom it may concern:*

Be it known that I, EDWARD STANLEY BOYNTON, of Bridgeport, Fairfield county, State of Connecticut, assignor to the WHEELER & WILSON MANUFACTURING COMPANY, of Bridgeport, Connecticut, have invented a new and useful Improvement in Machinery for Sewing Books, which is fully set forth in the following specification and accompanying drawings, in which—

Figures 1 and 1⅌ constitute a plan view of my improved machine. Fig. 2 is a left-hand side elevation; Fig. 3, a right-hand side elevation. Fig. 4 is a front elevation; Fig. 5, a vertical cross-section of Fig. 1; Fig. 6, a sectional plan view with bed removed; Fig. 7, detail views of the presser-foot; Fig. 8, detail views of the clamp feeding mechanism; Fig. 9, a sectional detail representing the method of coiling the band-thread about the securing-pins; Figs. 10 and 11, sectional details of the presser-operating rock-shaft and mechanism co-operating therewith; and Figs. 12, 13, and 14, front elevation, section, and plan of the throat-plate.

The machine herein described is adapted to sew or unite together the signatures to form a book, the uniting means being band-threads inserted through the saw-cuts to form loops, into which, within the signature, are projected securing-pins to hold such loops, the open signatures during such operation being held between pressers and throat-plates, after which the pressers are lifted sufficiently high to permit the clear movement of one half of the signature upon the other by the action of a folding-blade.

The invention consists in various combinations, as hereinafter set forth, at the close of the specification.

The frame of the machine is of suitable shape to sustain the working parts. The main or driven shaft $a^2$, provided with a pulley, 1, adapted to be rotated in any usual way, has a worm, 2, which engages a worm-toothed pinion, 3, on and rotates the cam-shaft 4, which is provided with a cam-grooved disk, 8. (See Fig. 5.) The groove of this disk receives a roller-stud, 11, on an arm, $b^2$, projecting from the needle-arm rock-shaft $e$, the latter being provided with ears $c^2$, in which are center-pins $d^2$, the points of which enter corresponding concavities in the ears $e^2$, which project downward from the presser-operating rock-shaft $d$. The rock-shaft $d$ has its center-pins $f^2$ in line with the center-pins $d^2$; consequently the two rock-shafts vibrate from the same center, whereby the presser-feet $g^2$, which bear upon the open signature, are enabled to adapt themselves to their varying thicknesses, so as always to be in correct position with reference to the loops thrown outward from the needles $i$ to insure the entrance into such loops of the securing-pin.

The needles $i$, eye-pointed and supplied each with a band-thread led from a suitable spool, $g$, over tension devices $f$, are carried at the ends of arms E, projecting from the needle-arm rock-shaft, there being one or more needles to each arm—preferably two. The cam-groove which imparts movement to the needle-arms is so shaped as to cause the needles to rise slowly as they enter the saw-cuts in the open signature laid one half upon the bed C, while the other half projects forward over the book-support D. After the presser-feet bear upon the open signature and bring it down upon the throat-plates $a$ the needles stop and recede far enough to throw out at their rear the necessary loops for the entrance of the securing-pins, after which the needles are caused to recede quickly.

Each needle is curved so that its arc corresponds with the radius of its carrying-arm, is grooved deeply upon its convexed face, and is threaded from that side, so that the thread emerges from the eye on the concaved side of the needle, and from such eye passes to and encircles a securing-pin within a signature.

The presser-operating rock-shaft $d$ (see Figs. 10 and 11) has a bearing, $h^2$, which receives upon it a ratchet, 13, provided with a hub, 13×, to which is secured one end of a strong spring, 14, the outer end of the spring being attached to a fixed part, $i^2$, of the shaft $d$. Upon the bearings $h^2$ at the ends of the shaft $d$, and beyond the ratchet, are placed the sockets 12, which, at their upper and lower ends, are connected rigidly by shafts $j^2$ $k^2$. These sockets 12, at one or both ends, according to the number of needles being used, have a spring-held

pawl, X, which engages the teeth of the spring-ratchet 13. One of these sockets 12 is connected by link 7 with an adjustable pin, 6, on a disk, 5, at the end of shaft 4. As the sockets are moved by the shaft 4 in the direction of the arrow 2, the pawl X engages the ratchet on the bearing projection $h^2$, and applies to such bearing projection the power necessary to rock the shaft $d$ on its centers $f$.

The presser-operating rock-shaft $d$ has adjustably attached to it a series of presser-arms, F, provided at their outer ends with removable presser-feet $g^2$, suitably slotted to receive the needles. Each presser-foot, as shown in Fig. 7, has a pin-directing block, $v$, near the sides of which the needles $i$ rise. These blocks assist in retaining the loops of band-thread in proper position to be entered by the securing-pin, which is guided, when passing from one to the other loop, by a guideway in the block, the entrance to the guideway being countersunk to insure the proper entrance and direction of the wire into the loops. Each presser has a spring-stop, $w$, against which the free end of the securing-pin strikes before it is severed to be left in the loop of band-thread, such stop preventing longitudinal movement of the pin under the action of the cutters, and serving as a guide for the pin as it is being drawn down to the signature by the band-loop.

The shaft $j^2$ at the upper end of the sockets 12 has placed upon it, in line with each presser-arm, a link, J, to operate a securing-pin cutter, I, shown in this instance as a lever pivoted upon the arm F, the stationary member to co-operate with I being a small centrally-bored steel die secured in arm F. This shaft $j^2$ has also a link, K, in this instance shown as a three-part link. One part, $m^2$, of this link is made as a socket, to receive within it loosely the reduced end of the second part, $n^2$, about which, and between the end of $m^2$ and the internally-threaded larger portion of $n^2$, is placed a spiral spring, $o^2$. The part $n^2$ is provided with a pin to enter a slot in $m^2$, (see Fig. 5,) whereby the parts are prevented from becoming separated. The third part, $p^2$, of K is screw-threaded at one end to enter the internal screw-thread of $n^2$, and slotted at its outer end to fit a stud, $r^2$, on a bell-crank, 17, having its fulcrum on a hub, $s^2$, projecting from the main jaw $t^2$ of the clamping feeding device H, that moves the material 19, from which the securing-pins are cut, such material being led from suitable reels or spools $h$.

The auxiliary jaw 18, connected with one end of the elbow-lever 17, is slotted at $w^2$, to receive a guide-pin, $w^3$, projecting from $t^2$, and the upper end of 18 enters a recess or groove formed at the top of $t^2$, the material 19 passing between them, so that it is held against lateral deflection when not positively clamped.

The main jaw has its fulcrum on an adjustable friction-bolt, $w^2$, held in the arm F, the bolt having a conical split head, which enters a more acute-angled conical recess in the main jaw, so that by tightening the nut $x^2$ (see Figs. 3 and 8) the main jaw may be held upon the bolt $w^2$ with more or less force, to cause a sufficient amount of resistance against movement thereon as may be necessary to insure its proper co-operation as a clamp with the movable jaw 18. The stiffer the material 19 the greater the resistance, and vice versa.

Lengthening the link K by screwing $p^2$ into $n$ shortens the quantity of material fed forward for each securing-pin. The spiral spring $o^2$ permits the clamp feeding device H, after the passage of the securing-pin into the loops, to remain stationary in its forward position, (it then resting against the end of the wire-guide G,) while the shaft $j^2$, carried by the sockets 12, is moved far enough to cause the link J to operate the cutting device to sever the securing-pin from the coil of material, such pin being cut from the material when the crank operating the sockets 12 is capable of exerting its greatest power. As the sockets recede, and with them the shaft $j^2$, the elbow-lever is first moved by the link K, to cause the auxiliary jaw to release its hold upon the material 19, and then both jaws move back together along over the material preparatory to again engaging it at a new place to again carry it forward. The guides G G′, which receive and direct the material 19 from the spool to the clamp feeding device, and then to the presser-foot guide $v$ to enter the band-loops, are curved in opposite directions, whereby a proper amount of friction is always exerted upon the material 19 to hold it while the feeding mechanism recedes, which insures a uniform length of pin or forward feed of, and obviates the use of a dog or clamp to hold, the material.

The presser-feet, after clamping the open signature upon the throat-plates $a$, remain at rest, while the sockets continue to advance, and, through shaft $j^2$ and its connections, feed forward the material 19 and sever it into pins. The connecting-spring 14, between the ratchet 13 and the bearing portion $h^2$, permits the presser to so stop its motion and to remain held by a yielding pressure.

It will be seen that the pressers, feeding devices, and cutting mechanism are all operated from a single connection with the cam-shaft; and it will be obvious that, instead of a crank-disk, the sockets may be moved by a grooved cam.

The presser-arms F on the presser-operating rock-shaft $d$ are of such length, and the shaft is so pivoted with relation to the bed C and the throat-plates, and so operated through the sockets described, that the pressers are always lifted above the throat-plates to a distance substantially equal to the width of the plate C, whereby ample space is furnished for the clear passage from under the presser-arms after the insertion of the securing-pins of that half of the signature then above the table C.

The shaft 4 has a cam-grooved disk, 9, which receives a roller-stud, 10, on the short arm of

a sector-lever, N, pivoted at $a^3$, Fig. 2. The toothed end of this sector engages a pinion, O, on shaft M, extended across the machine, and rocks the shaft so that its cranks $b^3$, connected with ears $y$ on the folding-plate L, raise such plate after the pressers are elevated, and carry it forward, causing the folder to move upward and outward to lift that part of the signature lying above it, and cause it to fold over upon the other half of the signature outside the needles.

The folder is kept in nearly a horizontal position by means of a tail-piece, $b$, suitably controlled by guides $c^3$. When the folder reaches its forward position one of the cranks $b^3$ strikes the upper end of a spring-pawl, $o$, and disengages it from the teeth of a ratchet, $n$, on a shaft, $l$, provided with arms $l'$, connected by links $m$ with the book-supporting plate D, adapted to be guided vertically in suitable ways of the frame. The weight of the table D is counterbalanced by weight $q$, and the weight of the sewed signatures is counterbalanced by the weight $p$, and when pawl $o$ is disengaged the plate D is kept up only by $p$.

The folder-blade at the under portion of its forward edge has a lip, $d^3$, which, as the folder passes forward over the top of the throat-plate $a$, descends upon the signature just folded by it and placed upon the book-pile, and crowds such book-pile and plate D down until the signature just united and folded is brought to such a level below the front of the throat-plate that the latter and the book-pile are at the proper level to receive a new signature.

These throat-plates are diagonally slotted at front, as shown in Fig. 12 at 21, to permit the top signature of the book-pile to pass below the top surfaces of the throats, so that when the band-threads are drawn taut by the descending needles the full pull of the thread is exerted directly upon the securing-pins to draw the top signature firmly down upon and close to the next signature of the book-pile, while the pawl $o$ holds the plate D stationary. The band-threads, as they pass down through the diagonal slots 21, are each moved laterally to one side of the paths in which the needles move, so that the needles always rise at the same side of the band-threads, and cause the "purl" of the stitches to run in the same direction.

The throat-plates $a$ are, by a set-screw, $z$, made horizontally adjustable to correspond in position with the presser and needles, they being also adjustable with relation each to the other by suitable set-screws, to correspond with the distances apart of the band-slots in different-sized books.

The material 19, from which the securing-pins are formed, will preferably be of corrugated wire.

The book united by this machine will be substantially such a book as described in a patent granted to me, No. 193,109, July 17, 1877, to which reference may be had. The securing-pins are inserted within the band-loops formed or projected from the concave or rear side of the curved needles; but as the needles descend to tighten the loops about the pins such pins are moved from the rear to the front side of the needle-holes, or across and down in front of the throat-plates in the direction of the arrow, Fig. 13.

It will be noticed, when the securing-pins are being inserted in the band-thread loops, that the threads extend from the securing-pins in the top signature of the book-pile in front of the needles, and thence to the rear of the needles, through the eyes, and down along the convex face of the needle, as shown in Fig. 9, and consequently each securing-pin is placed within a twisted loop, so that when the loop is tightened the band-thread is found to have a turn about the securing-pin. If the needle-eye were threaded in the opposite direction, and the pins were inserted at the opposite or front side of the needles, this twist of the band-thread about the pin would not be gained.

It will be noticed in a book connected in the manner described that the wider the book is opened the more the bands are loosened, and as the book is closed the bands are tightened.

The back plate 22, to which are attached the throat-plates $a$ and the plate D, is supported by screws $g^3$, Fig. 4, which permits the back plate and its connected parts to be turned away from it, so as to gain access to the needles to adjust or thread them, which is very essential to the rapid and practical operation of the machine. The locking-springs $h^3$ hold the plate 22 in upright position.

In this machine it is obvious that the details of the parts may be variously modified, as by the employment of any well-known equivalents, without departing from this invention.

The plate D has at its outer margin a signature-griper, $c$, suitably pivoted to permit the introduction under it of a signature, and provided with a spring, $c^4$, to hold it pressed down thereon. This griper, by pressure upon the lower signatures, prevents them from being moved laterally away from the throat-plates, thereby always retaining the lower signatures close up to the throats and back plate, so as to insure a rigid base for the tightening of the stitch.

I claim—

1. In a book-sewing machine, the needles, throat-plate, presser-feet, and feeding and cutting mechanism for the material to form the securing-pins, in combination with the folding-blade, to operate substantially as described.

2. The combination, with the throat-plate and needles, of the book-supporting plate and mechanism, substantially as described, to lock and release it, whereby the supporting-plate is held positively, and prevented from descending while the thread is drawn taut, as and for the purpose set forth.

3. The rounded and slotted throat-plates

and book-supporting plate, in combination with the needles, whereby the signature last folded is made to rest directly upon a signature below it when the needles draw the band-threads about the securing-pins last projected into their loops, substantially as described.

4. The throat-plates provided with diagonal slots, leading from the needle-openings, to operate upon the band-threads carried by the needles, substantially as described.

5. The throat-plates and book-supporting plate, combined with the movable back plate 22, to permit access to the needles, substantially as described.

6. The rounded and slotted throat-plates, combined with the folder, provided with a lip to operate upon the signatures, substantially as described.

7. The book-supporting plate and mechanism, substantially as described, to hold or release it, in combination with thread-carrying needles, pressers, the curved guides to receive, and the feeding and cutting mechanism to feed forward and sever, the securing-pin material when placed in the loops of the band-thread, substantially as described.

8. The combination, with the presser, of two band-thread-carrying needles and a guide to direct the end of the securing-pin into two loops consecutively, substantially as described.

9. The combination, with the vibrating presser-arm and presser-foot, provided with a pin-directing block and needle-holes, of a cutting-blade attached to the presser-arm, to sever the securing-pin from the length of material, substantially as described.

10. The combination, with the presser-foot and guide thereon, of the spring-stop, substantially as described.

11. The combination, with the presser-foot, of a guide-block, *v*, located thereon as shown, to operate substantially as described with relation to the needles and securing-pin.

12. The combination, with the clamping feed mechanism, of guides curved in different directions, to hold against return movement the material to be cut up into securing-pins, substantially as described.

13. The combination, with the throat-plate and vibrating presser, of the guides curved in different directions and the clamping feed mechanism, substantially as described.

14. The combination, with the clamp feeding mechanism, of the yielding and adjustable connecting-link and a stop for the feeding-clamp, to permit it to remain at rest while the shaft $j^2$ continues its movement to sever a pin from the material, substantially as described.

15. The feeding-clamp composed of the main and auxiliary jaws, and elbow-lever supported upon a hub projecting from the main jaw, substantially as described.

16. The main jaw of the clamp feeding mechanism, in combination with a friction-bolt fitted thereto, to operate substantially as described.

17. In a book-sewing machine, the combination, with the throat-plates, of the presser and needle-carrying arms having their centers of vibration in the same axial line, to operate substantially as described.

18. The presser-operating rock-shaft and its bearing portion, combined with a ratchet and spring placed thereon, substantially as and for the purpose described.

19. The presser-operating rock-shaft, its bearing portion, and the ratchet and spring, in combination with the sockets and their connecting-shafts, to actuate the feeding and cutting mechanisms after the presser-feet clamp the open signature upon the throat, substantially as and for the purpose described.

20. The presser-operating rock-shaft and shaft $j^2$, adapted to move in an arc concentric with the axis of such rock-shaft, and also rock upon an independent bearing of the rock-shaft, in combination with the links J and K, to operate the cutting and feeding devices, substantially as described.

21. In a book-sewing machine, the book-supporting plate and needles grooved on their outer sides next such plate, and threaded from their grooved outer sides, as described, combined with feeding and cutting mechanisms to place securing-pins into loops formed at the rear sides of the needles, whereby, when the needles are withdrawn to tighten the loops of band-thread and draw the signatures together, the band-thread is made to completely encircle the securing-pins, substantially as described.

22. In a book-sewing machine, the combination, with the shafts to actuate the presser and needle-carrying arms, and the back plate 22, of presser and needle-carrying arms and throat-plates, and set-screws to adjust them laterally to enter the band-slots in various sized books.

23. The combination, with the throat-plates and book-supporting plate, of the signature-griper, to operate substantially as described.

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Witnesses:
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