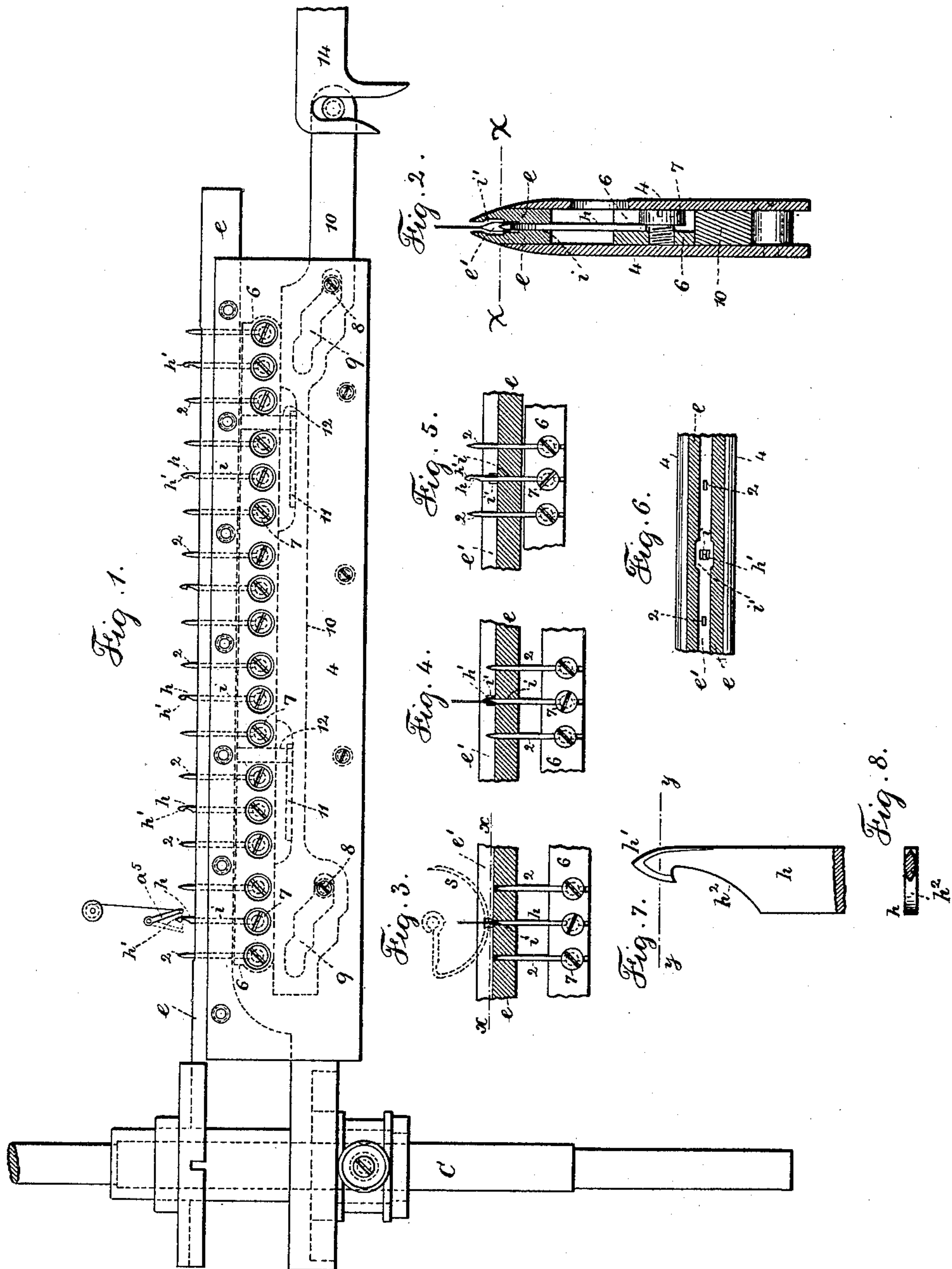


(No Model.)

J. R. REYNOLDS & A. I. JACOBS.
BOOK SEWING MACHINE.

No. 435,611.

Patented Sept. 2, 1890.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN R. REYNOLDS AND ARTHUR I. JACOBS, OF HARTFORD, CONNECTICUT,
ASSIGNORS TO THE SMYTH MANUFACTURING COMPANY, OF SAME PLACE.

BOOK-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 435,611, dated September 2, 1890.

Application filed November 21, 1888. Serial No. 291,441. (No model.)

To all whom it may concern:

Be it known that we, JOHN R. REYNOLDS and ARTHUR I. JACOBS, citizens of the United States, residing at the city of Hartford, in the county of Hartford and State of Connecticut, have invented an Improvement in Book-Sewing Machines, and the following is declared to be a full, clear, and exact description of the same.

Heretofore in book-sewing machines the signatures have been laid successively upon arms that project from a vertical shaft, and the signatures have been presented one at a time to the sewing mechanism by the progressive rotation of the shaft. These devices are shown in Letters Patent Nos. 220,312 and 366,793, and in this latter patent there is a range of perforators located within the sheet-holding bar, the perforators acting upwardly within the fold of the signature to perforate the paper for the easy passage of the sewing-needles. Semicircular needles have also been heretofore employed in book-sewing machines, and such are shown in Letters Patent Nos. 250,991, 262,325, 358,572, and 378,461, and reference is hereby made to said patents for such needles and their operating mechanism.

The above-named perforators have been used jointly with the curved needles to puncture the paper for the passage of the needles, because it was difficult to puncture the paper by the needles alone, as they were liable to spring or bend, and it had previously been usual to saw or notch the backs of the signatures for the needles. Straight needles have also been employed in book-sewing machines, and have been introduced into and parallel with the back fold of the signature, and reference is hereby made to Letters Patent Nos. 378,985, 378,467, and 378,984 for the same, and the aforesaid patents also show that threads have been looped or interlaced with the threads that pass across the back of the signatures.

In our present improvement we employ a vertical shaft and signature-holding bars, within which are perforators and their operating mechanism, such as set forth in Letters Patent No. 366,793, and we use circular nee-

dles and their operating mechanism, such as is set forth in Letters Patent No. 378,461.

Our present invention relates to hooked perforators that are thrust outwardly from within the signature and pass through the back of the fold of the same, and said hooked perforators are usually moved simultaneously with perforators such as described in Patent No. 366,793, and these hooked perforators are adapted to receive threads that cross the back of the book and are laid into these hooks by vibrating devices such as those shown in Letters Patent Nos. 250,991 and 338,000, and are by them drawn down into the signature-holding bar in the form of loops to receive longitudinal threads that are laid through such loops by needles. We also employ a sheet-holding bar that is grooved longitudinally for the passage of the sewing-machine needles and having recessed portions adjacent to the hooking devices, into which the loops of thread held by the hooking devices can spread to insure room for the passage of the needles.

Our improved hooked perforators have a three-part movement—viz., up through the signature upon the bar into position to receive threads, down into the signature-holding bar for drawing in the loops of thread, and partially up to release the loops of thread from the ends of the hooks.

In the drawings, Figure 1 is an elevation of one of the arms for supporting the signature and part of the vertical shaft for the same. Fig. 2 is a cross-section of said arm in larger size. Figs. 3, 4, and 5 are detached views representing the perforators in their several positions. Fig. 6 is a sectional plan at $x x$, showing part of the sheet-holding bar. Fig. 7 is an elevation in larger size, and Fig. 8 a sectional plan at $y y$ of one of the hooked perforators.

The vertical shaft C is revolved intermittently, as in said Patent No. 220,312, and projecting from said shaft are arms e , upon which the signatures are to be laid. The sewing mechanism is composed of nearly semicircular needles and the looping and take-up devices connected with the same, as represented in aforesaid patents. Each of

the arms *e* is made in the same manner. The arm *e* in the form of a metal bar extends out from the hub of the shaft C, and has through it vertical mortises for the passage of the perforators 2. These mortises and perforators are at the proper distances apart to perforate the paper at the places where the needles are to enter and leave the fold of the signature. Each perforator is in the form of a narrow thin blade with a sharp point at the upper end, and the mortises in the arm *e* are of the proper size for the perforators 2 to slide freely therein.

Beneath the arm *e* and between the plates 4 is a connecting-bar 6 that is grooved vertically for the reception of the lower ends of the perforators 2, and these are clamped to the said bar 6 by screws 7, so that said perforators are raised and lowered bodily by a movement given to the bar 6. The screws 8 pass through the plates 4 and also through the three-part-cam slots 9 in the reciprocating bar 10, and this bar 10 has longitudinal slots 11, that receive the L-shaped lower ends of the plates 12, that hang down from the connecting-bar 6 the same as in the aforesaid Patent No. 366,793, so that when this bar 10 is moved endwise by a suitable device—such as the hook 14—the cam-slots 9 cause this bar 10 to raise or lower, and with it the connecting-bar 6 is moved up and down bodily to project the perforators 2 above the top of the arm *e* or to withdraw the same below such arm. The signature or sheet-holding bar *e* is grooved longitudinally at *e'* for the passage of the sewing-needles, which needles carry in longitudinal threads within the signatures as the sewing is performed. One of these needles is illustrated by dotted lines at *s*.

The bar *e* has vertical mortises at *i* between the pairs of perforators 2, and within said mortises are vertically-moving hooked perforators *h*, consisting of blades of metal, the upper ends of which are pointed and have hooks *h'* and curved edges *h²*, and the hooked ends are elliptical in cross-section, as shown in Fig. 8, and the lower ends of said hooked perforators are fastened to the same bar 6 as are the perforators 2, and said perforators all have a movement up and down together from the slotted bar 10, as heretofore described.

The sheet-holding bar *e* is recessed at *i'*, at opposite sides of the slot *e'* above and at each side of the vertical mortises *i'*, as will be seen by reference to Figs. 2, 3, 4, 5, and 6. These recesses allow space for the loops of thread to expand as hereinafter described.

The operation of the mechanism is as follows: The folded signature to be sewed is laid over the sheet-holding bar *e* and is brought up to place, and the perforators 2 and hooking devices *h* are forced upwardly and outwardly through the folded back edge of the signature from within into the position shown in Fig. 1. Threads are now engaged with the hooked ends *h'* by devices such as are de-

scribed in the aforesaid patent, which consist of vibrating eyes α^5 , that carry the thread. (See Fig. 1). The perforators and hooking devices are now drawn down within the signatures to the position shown in Fig. 3, below the path of needles that lay in the longitudinal threads, the loops of thread being drawn down by the hooking devices and spreading within the recesses *i'*. The sewing mechanism is now operated and threads are carried by the sewing-needles within the folded signatures and through the loops of thread held by the hooking devices. After the withdrawal of the sewing-needles a small rising movement is imparted to the bars 10 and 6 to elevate the perforators 2 and hooking devices *h* to the position shown in Fig. 4, so that the loops of thread are disengaged from the hooked end *h'* by their lower ends being moved aside by the curved and inclined portions *h²* acting against such loops. Hence such loops of thread may be drawn up and tightened around the longitudinal threads without being caught by the hooks *h'*. In the normal position the perforators 2 and hooking devices *h* are in the position shown in Fig. 4, and their upper ends are entirely below the top edges of the arms *e*, and the signatures are laid upon the arms *e* as said arms come around successively, and when the arm with the sheet upon it arrives at the place where the sewing is performed and the shaft and arms are raised up as described in the aforesaid Patent No. 220,312, the sheet is held down upon the arm by stationary fingers projecting from the bar that supports the shafts of the needles and at this moment an end movement is given to the reciprocating bar 10 by any suitable device—such as the hook 14, acted upon by a cam—and the perforators 2 and hooking devices *h* are forced upwardly through the back of the signature into the positions shown in Figs. 1 and 5, thus perforating the signature for the sewing-needles and for the threads that the hooking devices draw down. The bar 10 is now reciprocated in the other direction, and the perforators and hooking devices are withdrawn and the sewing is proceeded with as heretofore described.

We claim as our invention—

1. The combination, in a book-sewing machine, with a signature or sheet holding bar and eye-pointed needles for laying threads longitudinally within the signature, of hooking devices standing vertically within the sheet-holding bar, mechanism, substantially as specified, for projecting the hooking devices outwardly through the back of the signature from within and for retracting the same, and thread-carriers for engaging other threads with the hooking devices, whereby loops of thread are drawn down within said signatures and the eye-pointed needles lay the longitudinal threads within the signatures and within the loops, substantially as set forth.

2. In a book-sewing machine, a signature or sheet holding bar or arm *e*, grooved or

channeled longitudinally at *e'* along its upper edge, and having vertical mortises at *i* and recesses at *i'* at opposite sides of the channel *e'* above and at the sides of the mortises, 5 and hooking devices *h* within the mortises *i*, and mechanism, substantially as specified, for moving the said hooking devices and projecting the hooks through and above the sheet upon the holder, and thread-supplying 10 devices for laying threads in the hooks, and needles for laying longitudinal threads within the signatures and through the loops of thread upon the hooks and within the recesses, substantially as set forth.

15 3. The combination, with the sheet holding bar or arm, of a pointed hook and perforators, and means for moving such hook and perforators to project them through the signature upon the bar or arm, a carrier for engaging 20 a thread with the hook, and an eye-pointed needle passing through the holes made by the perforators and laying a thread through

the loop drawn in by the hook, substantially as specified.

4. In a book-sewing machine, the combination, with a curved eye-pointed needle adapted to pass into and come out at the back of the signature, and a sheet-holding support or arm, of a perforating device acting at the fold of the sheet between the place where the 25 curved needle enters the signature and the place where it emerges therefrom, such perforating device being adapted to draw a loop of thread into the path of the curved needle so that such curved needle passes through 30 such loop to leave its own thread within such loop, substantially as set forth.

Signed by us this 10th day of October, A. D. 1888.

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ARTHUR I. JACOBS.

Witnesses:

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