

(No Model.)

4 Sheets—Sheet 1.

L. W. FIFIELD.
BOOK BINDING MACHINE.

No. 338,726.

Patented Mar. 30, 1886.

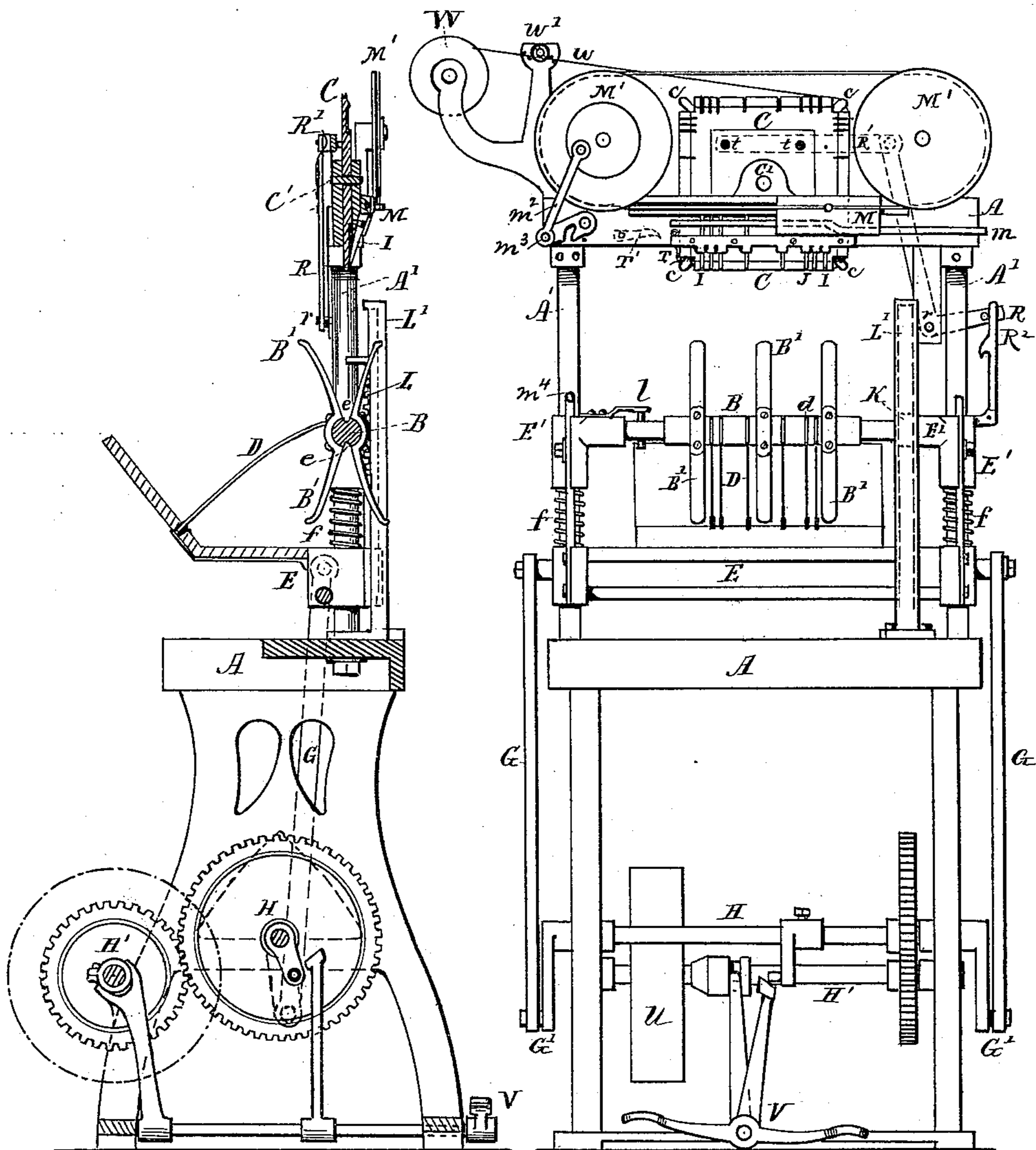


FIG. 1

FIG. 2

WITNESSES.

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INVENTOR.

Levi W. Fifield
By Chas. H. Burlingame
Attorney

(No Model.)

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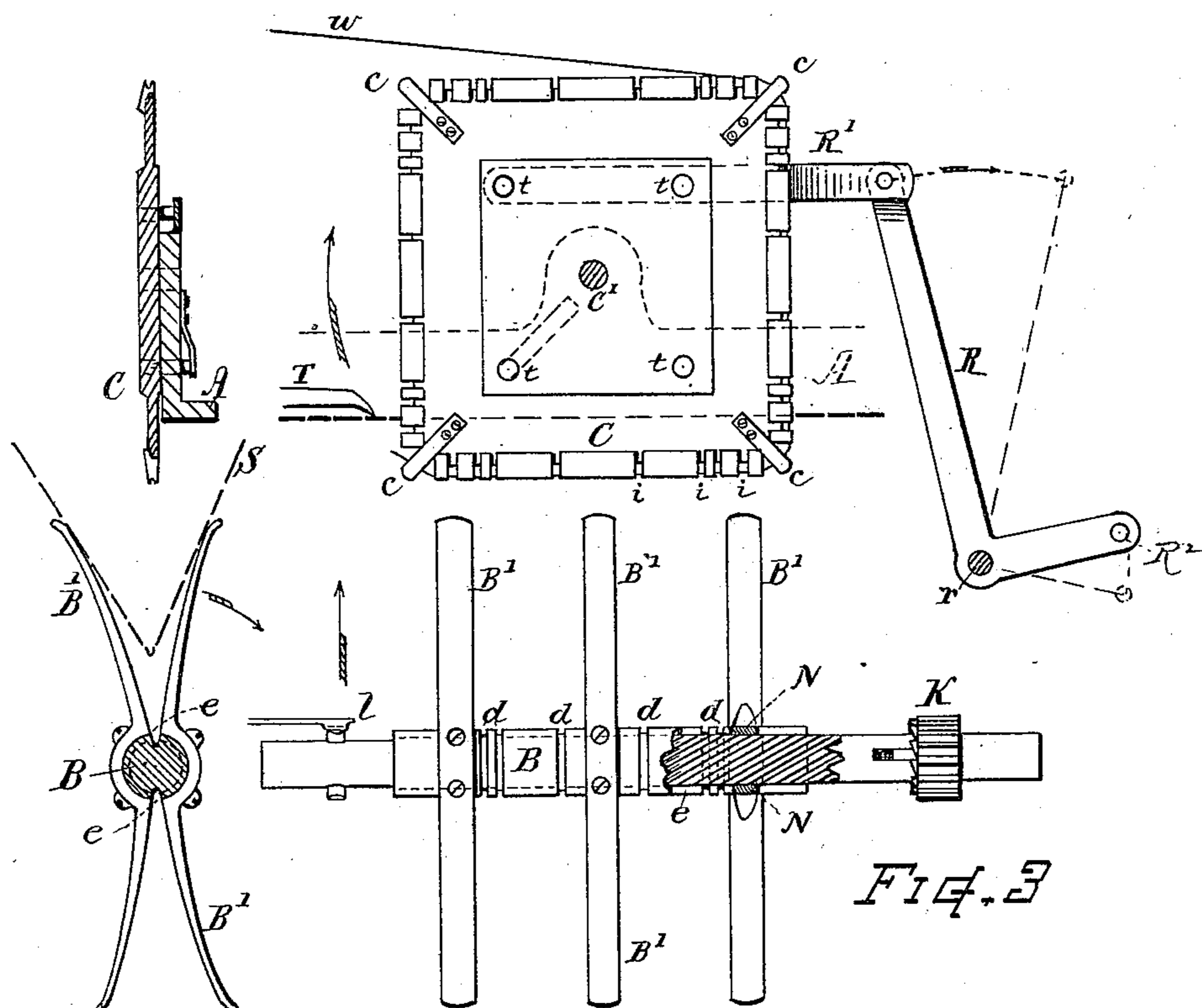


FIG. 4

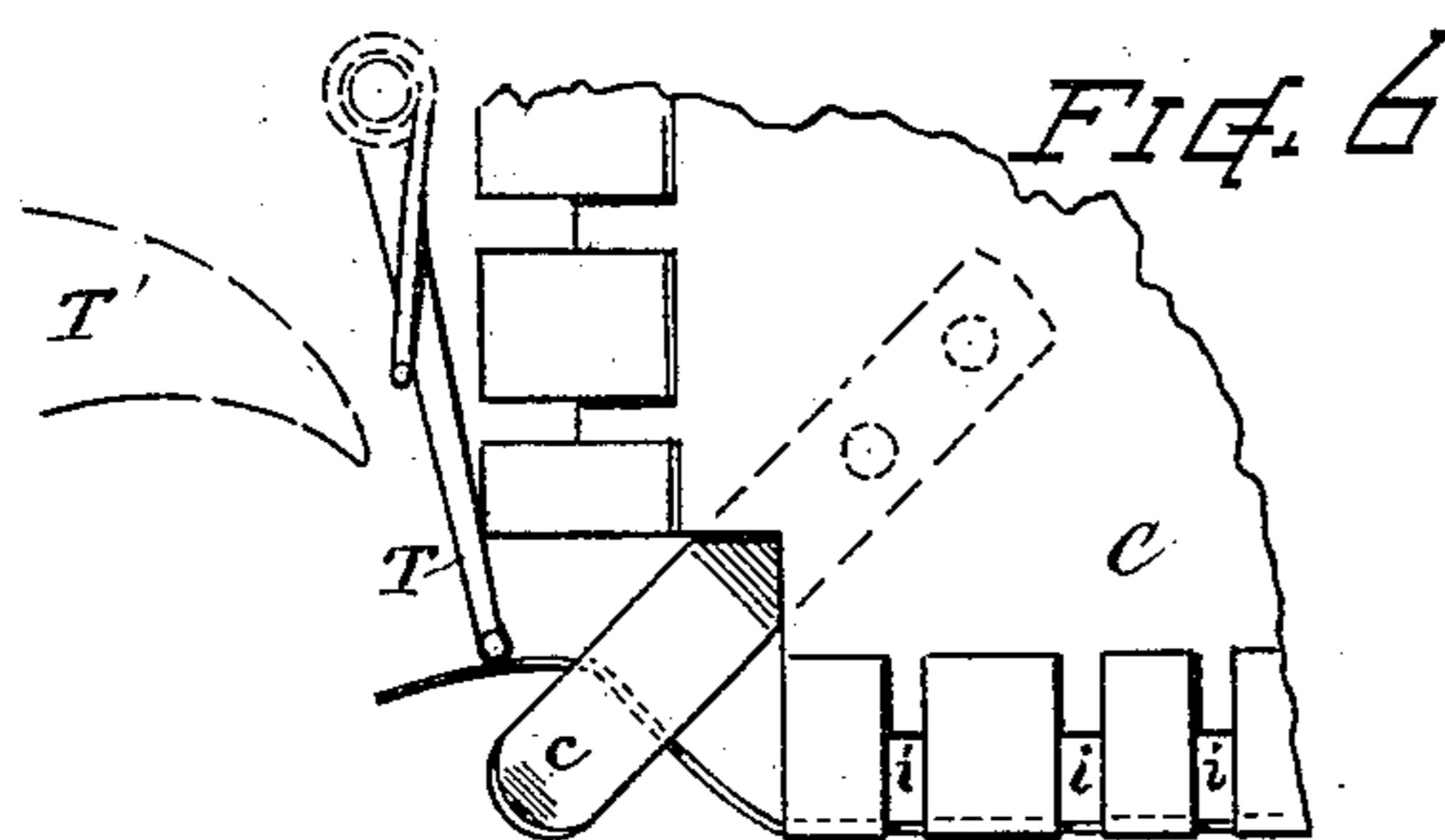


FIG. 6

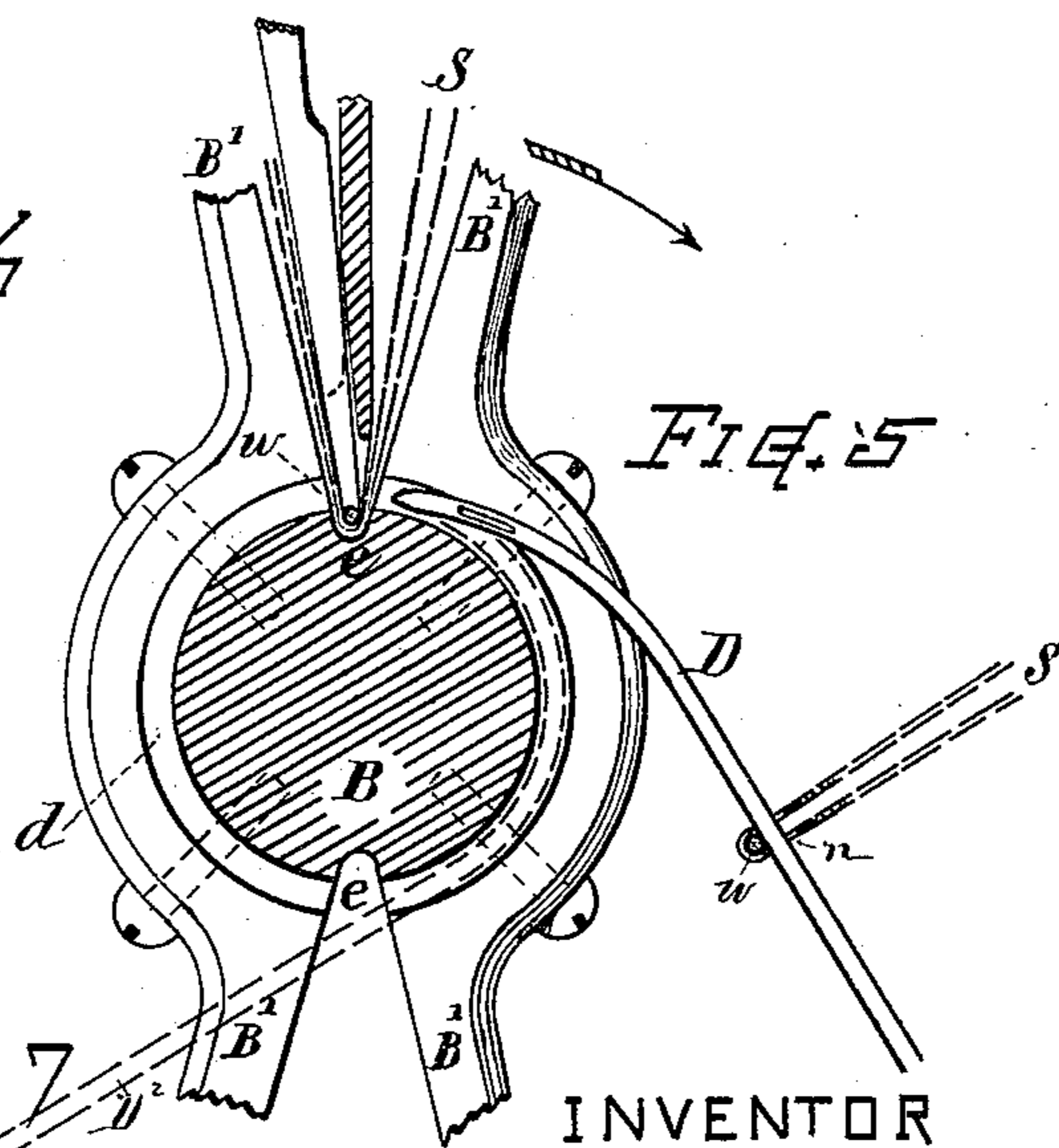


FIG. 5



FIG. 7

WITNESSES.

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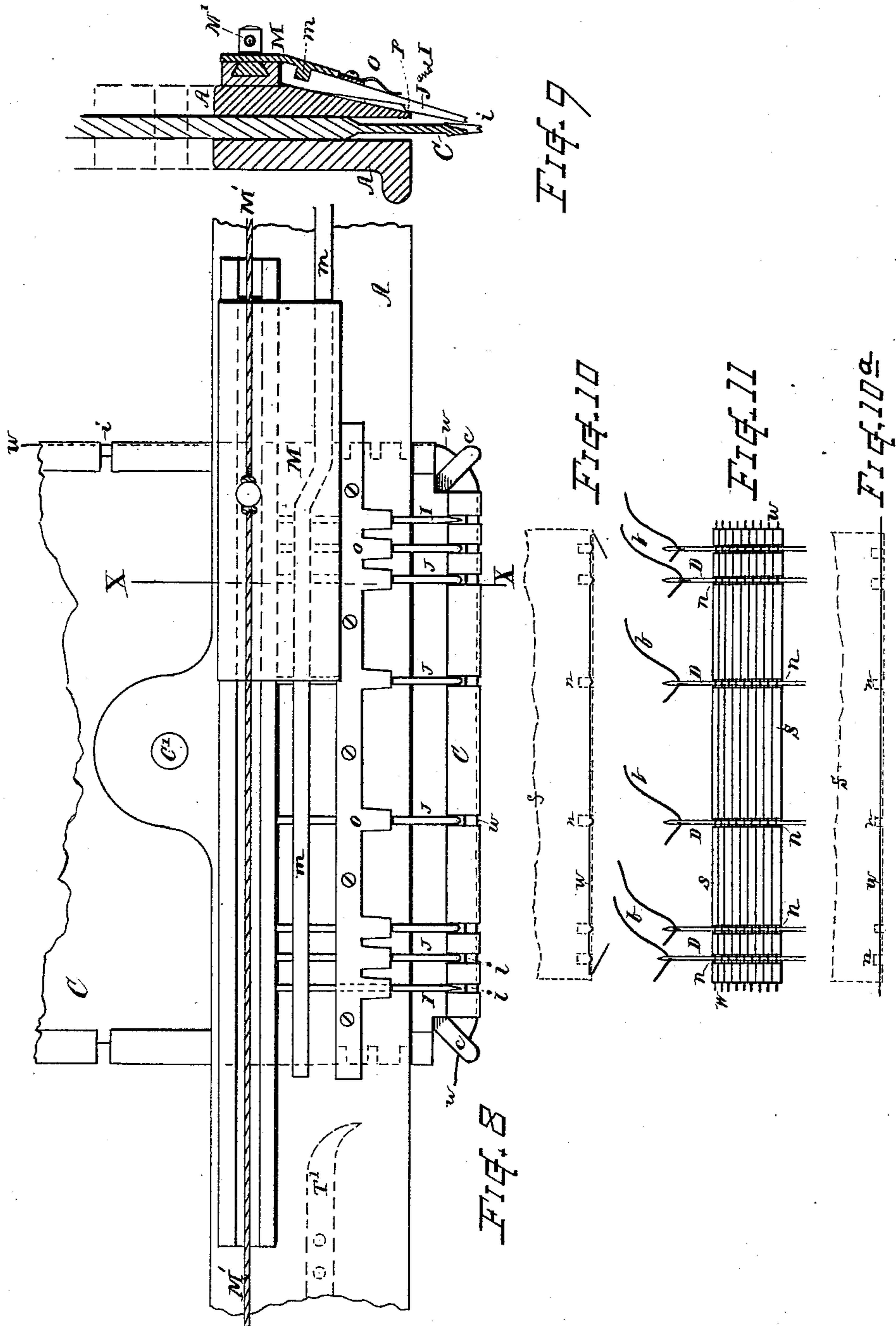
4 Sheets—Sheet 3.

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WITNESSES

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(No Model.)

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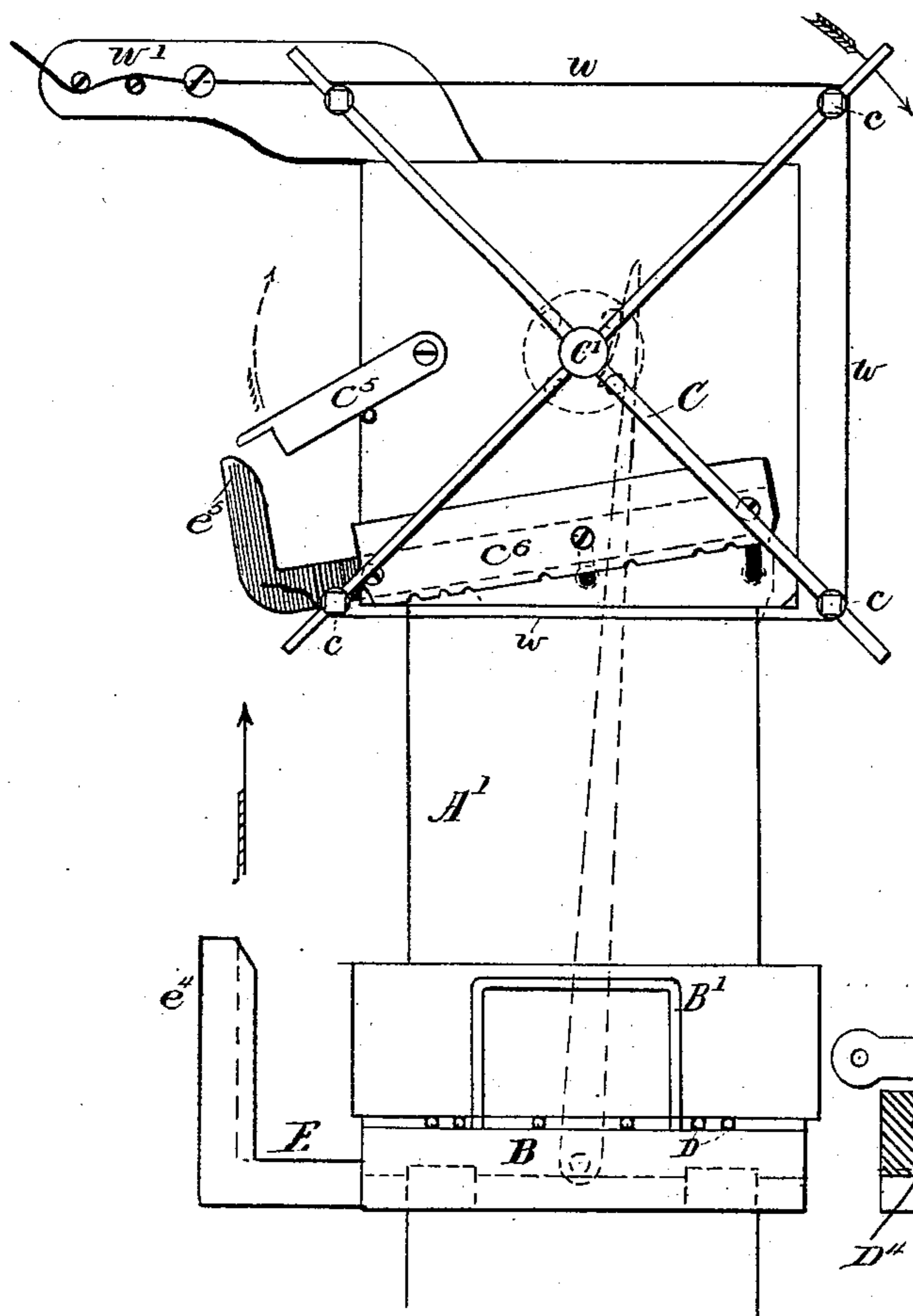


Fig. 12

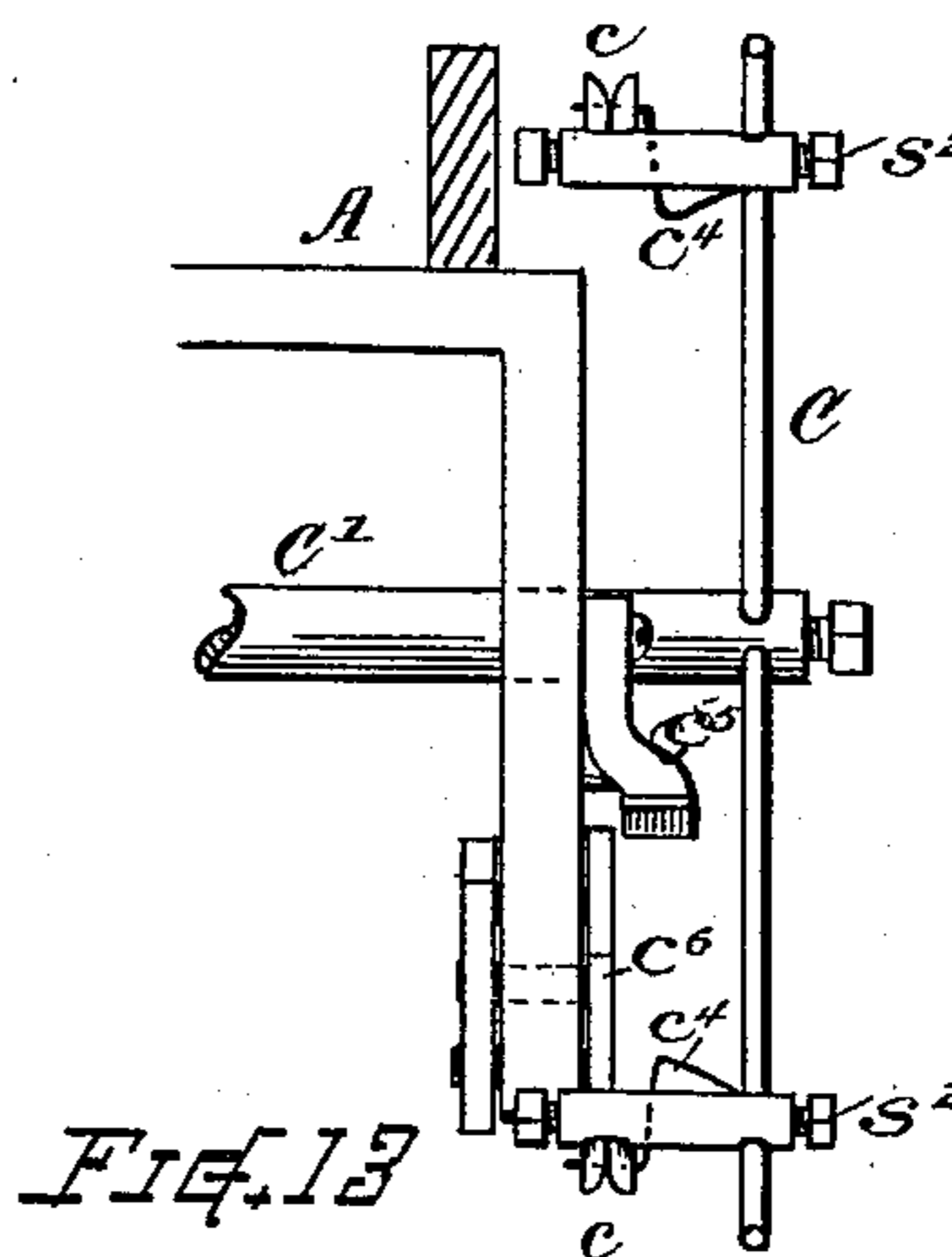


Fig. 13

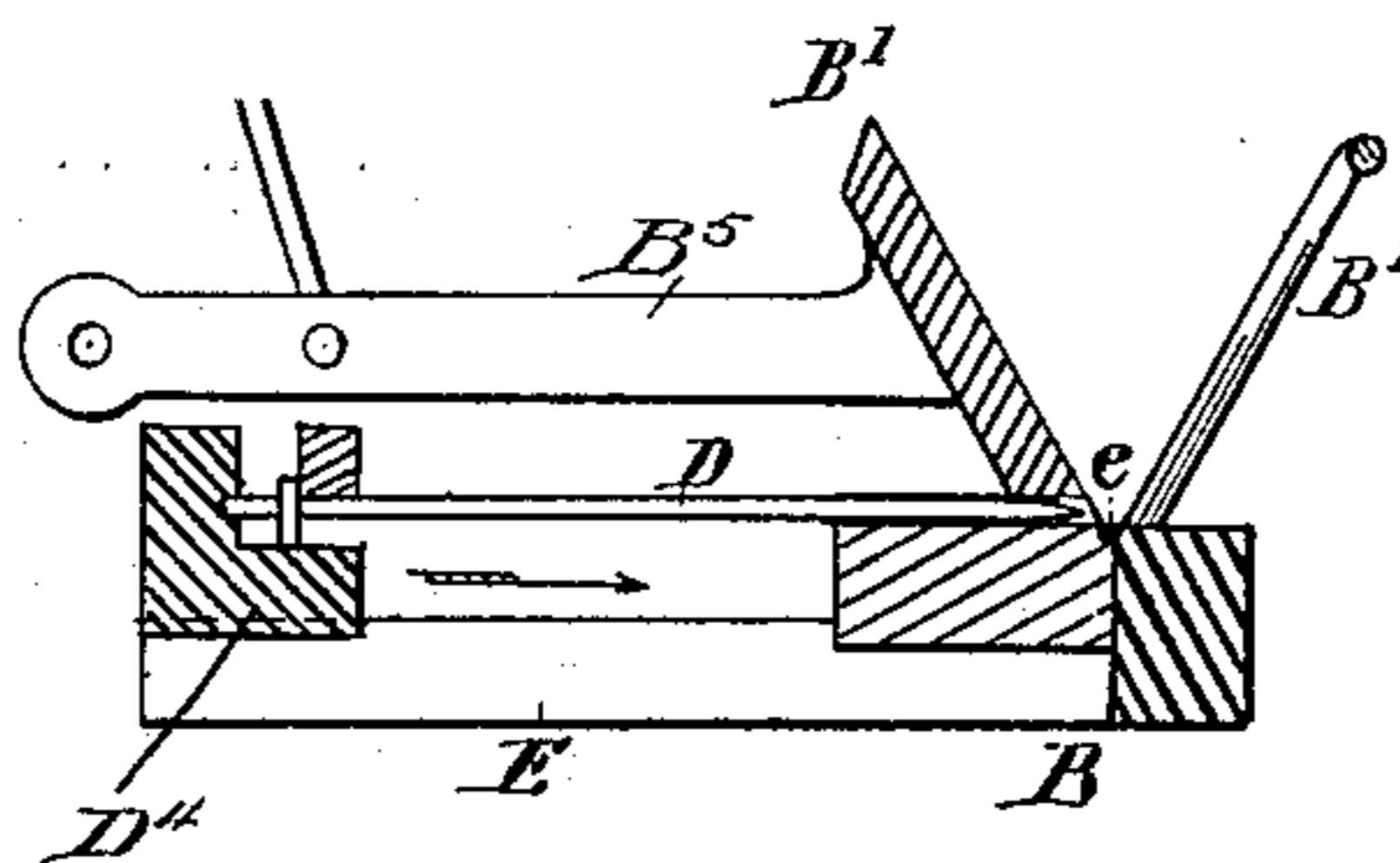


Fig. 14

WITNESSES

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UNITED STATES PATENT OFFICE.

LEVI W. FIFIELD, OF WORCESTER, MASSACHUSETTS.

BOOK-BINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 338,726, dated March 30, 1886.

Application filed September 13, 1884. Serial No. 142,982. (No model.)

To all whom it may concern:

Be it known that I, LEVI W. FIFIELD, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Book-Binding Machines; and I declare the following to be a description of my said invention sufficiently full, clear, and exact to enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

The objects of my present invention are to provide means for delivering from a spool or continuous coil a binding strand, wire, or cord and laying the same longitudinally into the back of folded signatures of a book; also, to provide means for passing a series of needles through the backs of the signatures for carrying the holding-bands beneath said longitudinal binding-strands, and for securing the several signatures together, and to afford facilities for retaining the strand at proper intervals, and for severing it at positions desired. I attain these objects by mechanism the nature, construction, and operation of which are illustrated in the drawings, and explained in the following description, the particular subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a vertical section, and Fig. 2 a front view, of a machine embracing the features of my invention. Fig. 3 is a front view of the devices for delivering and laying the longitudinal binding-strands, and the devices for supporting the signatures, shown separate from other portions of the mechanism, and on somewhat larger scale. Fig. 4 is a vertical sectional view of the cylinder and plate shown in Fig. 3. Fig. 5 is a sectional view, on larger scale, illustrating the manner of laying the binding-strands into the signatures, and showing the points of the needles for passing the transverse bands or cords through the backs of the signatures. Fig. 6 is a front view of a gripping device for holding the extended strand at the angles of the carrier-plate. Fig. 7 is a plan view, of the same. Fig. 8 is a front view, showing the

punch and chisel rods for pressing down and cutting off the longitudinal binding-strands, and the devices for operating the same. Fig. 9 is a vertical section of the same at line X X. Fig. 10 shows the manner in which a wire strand may be laid longitudinally into the signatures and bent at intervals corresponding with the nicks or cuts for the bands. Fig. 10^a shows the manner in which a wire or cord strand may be laid into the fold without the bends at the nicks. Fig. 11 is a back view of the book, showing the series of signatures as passed onto the transverse needles. Fig. 12 is a front view, illustrating a modified construction of the strand-carrier, the signature-bed, and the gripping mechanism. Fig. 13 is a side view of the strand-carrier devices similar to Fig. 12, and Fig. 14 is a sectional view showing a modified construction of signature-supporter and needle-brace.

In referring to the drawings, the parts marked A represent the frame, which may be of any suitable form to properly support the operating mechanism.

B indicates a bed or cylinder for receiving and supporting the folded signatures while being operated upon.

C denotes the revoluble strand-carrier or device for feeding and placing the thread, wire, or binding-strand *w* longitudinally within the fold of the signature, and D indicates the needles for receiving the series of signatures and for drawing the transverse bands or tapes *b* through the nicks *n* beneath the binding-strands *w*. The strand-carrier C is made with a number of straight sides or divisions corresponding in length to the dimensions required for extending portions of the binding-strand *w* the length of the signatures, and is provided at its several angles with suitable grippers or spring-jaws, *c*, for holding the said strands extended in a direct line along the side or edge of the carrier. The binding-strand *w* may be of fine wire, linen cord, or other suitable material, and is taken from a spool or continuous coil, W, and led onto the carrier C through a suitable guide, *w'*, and tension device, so as to be taken by the several grippers as they are respectively brought into position by the revolution of the carrier C, as

indicated, the strand being thus wound onto the carrier at one side as fast as it is used off at the other side. In the present instance the strand-carrier C is made as a rectangular plate. If preferred, it could be made pentagonal, hexagonal, triangular, or of other polygonal form, the length of its sides being in each case such as required for extending the length of strand properly to be laid into the signatures of the books. The outer edges of the plate are beveled off and fitted with a small groove for the reception of the strand *w*, which is laid therein as it is drawn from the spool or coil W. This carrier-plate C is mounted to revolve on a central axis or stud, C', and suitable mechanism is combined therewith for imparting an intermittent rotative action thereto, and also a latch-dog or means for confining it at the several positions of adjustment with its sides parallel to the bed or cylinder B. The cylinder B is provided with longitudinal grooves *e* to receive the back of the signatures, and a series of fingers, B', extend outward from said grooves in a manner to form a V-shaped guide or cradle for receiving the folded signatures S. Annular grooves *d* are formed around the cylinder, in which lie the points of the needles D. The cylinder B is mounted for rotative action in bearings E', that are movable on guides A', so that the cylinder B and strand-carrier C can be brought into contact with each other. The bearings E' have connection with the reciprocating table E, which latter is operated toward and from the carrier C by means of connections G, cranks or cams G', and operating-shafts H H', or other suitable mechanism for effecting equivalent advancing and receding action of the bed B. The needles D are supported in connection with the table E, so as to follow the action of the cylinder B. Said needles D are provided with eyes, into which the cords or bands *b* are rove, so as to be drawn into the notches *n* as the needles are pulled through the same when removing the book therefrom. Suitable springs, *f f*, are arranged beneath the bearings E' to give yielding action as the cylinder meets the carrier C.

K indicates a gear fitted upon the cylinder B, with a ratchet and pawl, and meshing with a rack, L, on the standard L'. When the cylinder is moved upward, the pawl slips and the gear turns without revolving the cylinder; but when the cylinder descends the pawl engages and the cylinder is given a half-revolution, reversing the position of the fingers B' and bringing the opposite set of fingers into working position. A latch or spring-stop, *l*, is provided in connection with one of the bearings E', for retaining the cylinder at positions of adjustment.

II indicate cutters for severing the wire or strand *w* when properly laid into the folds of the signatures, and J J indicate punches for bending wire strands *w* outward at the nicks or spaces *n* in the back of the signature. These punches J are not essential to the practical

operation of the machine, and can in ordinary cases be omitted, but for working the particular kind of binding described in Patent No. 286,254 said punches are desirable, and may be used. The form and action of the punches J and cutters I are similar, one being blunt and the other sharp. They are severally mounted for reciprocative movement in inclined grooves on the frame, at the front of the carrier-plate, and so that their ends will pass down into line with the edge of said plate, suitable recesses, *i*, being formed therein, as indicated. The cutters I are moved up and down by a cam-rod, *m*, which is fixed to the slide-plate M, that works back and forth on a suitable guideway on the head of the machine, motion being imparted thereto by a band attached to the wheels M' and to the plate M. The parts are actuated by the crank and rod *m*² and tumbler *m*³, which latter is engaged and forced upward, when the cylinder is elevated, by a stud, *m*⁴, that projects from a portion of the movable cylinder-supporting frame. A piece of rawhide, N, or other suitable material, may be arranged on the cylinder, against which the edge of the chisel or cutter I operates for severing the strand. The cam-rod *m* runs in a notch at the upper end of the cutter-shank, as indicated in Figs. 8 and 9. The cutters are pressed back into their grooves by the spring-plate *o*, and an offset, *p*, on the back of the bars, serves, by striking on the frame, to throw their lower end outward clear of the carrier-plate C when said bars I and J are raised, so that the carrier can be revolved without interfering therewith.

R indicates a lever fulcrumed at *r*, one arm of which is provided with a spring-link, R', having at its end a lug or pin that latches into the openings *t* in the plate C. One side of this pin is beveled off so that it will slip from the opening *t* when the link moves back, the parts acting in the manner of a ratchet. The opposite arm of the lever R is engaged by a suitable catch on the moving bearing E', so as to effect the intermittent rotation of the strand-carrier C, to bring its several sides consecutively into position to receive the strand *w* and to lay it into the folds of the respective signatures as the latter are brought into place by the cylinder or bed B.

T indicates a spring-finger for bending the end of the wire *w* away from the corner of the plate C, and T' denotes a point or prong arranged to enter between the jaws *c*, for discharging the portion of the strand *w* which is cut off and left within said jaws. The prong T' opens the jaws when the latter are brought in contact therewith by the rotation of the plate C.

On the driving-shaft H' is a friction-clutch pulley, U, for the driving-belt, and in connection therewith is a treadle device, V, for throwing it into and out of action, and a trip-dog and lever operating with the crank-shaft H, for throwing off the clutch when the shaft H has made one revolution.

The operation of my improved machine is as follows: The signatures S, after they are folded and prepared with the notches *n*, are laid upon the bed or cylinder B, between the rows of fingers B', one at a time, and with the fold or back toward the bed, as indicated in Fig. 4, the notches *n* being placed so as to correspond in position with the annular grooves *d*, and the line of the fold being parallel with the longitudinal groove *e*, while the leaves lie open from the fold in V shape and rest against the sides of the cradle. The placing of the signatures may be facilitated by a suitable guide attached to the bed and against which the heads of the signatures are placed. When the signature is in place, the attendant depresses the treadle to throw the clutch into action with the driving-pulley, and as the machine is started the bed or cylinder B and the strand-carrier C are, by the action of suitable mechanism, brought together, in the manner of a press, so that the edge of the carrier-plate, with the extended strand *w*, presses the signature into the groove *e*, and delivers the strand *w* closely into the fold throughout the length thereof. As the bed approaches the strand-carrier, the stud *m*⁴ comes in contact with and raises the tumbler *m*³ and rod *m*², thus operating the wheels M' and slide M, causing the cam-rod *m* to actuate the cutters I, which latter are forced down upon the strand *w* and sever it at each end, so that the portion laid into the fold is freed from the carrier and remains lying longitudinally in the signature after the mechanism recedes. The punches J, when employed, are also forced down in the same manner as the cutters I, and press the strand *w* through the nicks *n*. With the receding action of the bed-cylinder the ratchet of the gear K engages, and said gear causes the cylinder to turn one-half revolution. This carries the back of the signature toward the needles D, the points of which lie in the grooves *d*, and as the cylinder turns over the needle-points pass through the nicks *n* above the strand *w*, and the signature is transferred from the cylinder to the needles, and slides back out of the way of the fingers B', which are ready to receive the next signature. During the time of the above action the hook engages the lever R, and by swinging said lever effects, through the aid of the latching-arm R', the partial rotation of the strand-carrier C, to bring another of its sides, with a new portion of extended strand *w*, into position to receive the next movement of the bed and signature. At the rotation of the carrier the gripping devices are brought into action with the opening devices, and the short piece of strand material cut off and left in the grip-jaws is discharged therefrom, so that the grippers are ready to again receive the strand when brought up to the line where said strand is wound onto the carrier. When the desired number of signatures has been passed onto the needles D, the bands *b* are threaded into the eyes of the needles D, and as the book is removed from the

needles the bands are drawn into the notches *n*, beneath the strands *w* across the back. The ends of the strands *w* may be turned back over the ends of the signatures and be glued down upon the back, or said ends can be otherwise disposed of, as desired.

The machine can be employed with either wire, linen twine, or other material for the strand *w*.

The modification illustrated in Figs. 12 and 13 is to show the strand-carrier C capable of adjustment. In this modification the carrier C is made with a series of arms radiating from a central revoluble shaft or axis, C', and upon said arms the grippers *c* are adjustably attached in such manner that they can be moved to or from the center C', for increasing or diminishing the extent of side or span.

The grippers *c* can be made, as indicated, with V-shaped jaws for holding the strand, and with springs *c*⁴ for discharging the end of the strand therefrom when said spring is brought into contact with the arm C⁵ as the carrier C revolves.

Set-screw *s*² may be arranged for clamping the grippers in place upon the arms.

A presser or grooved follower, C⁶, in separate piece from the strand-carrier may be arranged for forcing down the strand into the fold of the signatures, said follower being operated by action of the mechanism as the bed B is moved up to the carrier C, or vice versa, the arm *e*⁴ coming in contact with the arm *e*⁵ of the follower.

The bed B may be reciprocative to and from the carrier by crank-shaft and connecting-link, in similar manner to that of Fig. 2, or by any convenient mechanism.

The modifications also show a bed for supporting the signatures, which is not revoluble, for transferring the signatures to the transverse needles D, but in which said needles are projected forward through the nicks *n* above the strands *w*, the parts being disposed, as in Fig. 14, wherein B⁴ indicates a bar for supporting the needles D, which bar may be moved forward and back by any suitable mechanism, as desired, to carry the points of the needles through the backs of the signatures, and the signatures being then allowed to pass back on the needles by the raising of the rear side of the cradle or signature-supporting device, which can be effected by mechanism connected to the arms B⁵ to operate as the bed descends. This lifting mechanism is not herein shown, as it is unimportant what form of mechanism is employed therefor.

The needles can be curved about the bed-cylinder, as indicated in dotted line of D², Fig. 5, so that the signature will be delivered at the other side of the bed, if desired.

What I claim as of my invention, to be herein secured by Letters Patent, is—

1. The combination of the revoluble strand-carrier with a series of gripping devices, substantially as described, for receiving the binding-strand from a continuous coil or spool, and

for holding portions thereof extended for delivery to the fold of the signatures, substantially as hereinbefore set forth.

2. A revoluble strand-carrier having a plurality of grooved sides for supporting a binding-strand as extended for delivery, and provided with a series of grippers for holding said strand at the angles of said carrier, in combination with mechanism, substantially as described, for imparting an intermittent rotative action to consecutively bring the respective sides of the carrier to a given position, substantially as hereinbefore set forth.

3. A rotative cylinder, as B, provided with series of fingers, as B', extending outward from the periphery in the manner described, and forming V-shaped spaces for supporting signatures in a book-binding machine, substantially as set forth.

4. The combination, with the bed or cylinder having guards or fingers for supporting signatures, and provided with a series of transversely-arranged grooves, of a series of band-carrying needles having their points arranged in said grooves for receiving the signatures and collecting them into books, substantially as hereinbefore set forth.

5. A rotative cylinder, as B, provided with annular grooves *d*, longitudinal grooves *e*, and projecting fingers B', for supporting the signatures, in combination with the strand-carrier C and transverse needles D, substantially as and for the purposes set forth.

6. The combination, hereinbefore described, of the revoluble strand-carrier having gripping devices for retaining a wire or cord there-

on, the reciprocating bed or cylinder having guards or fingers for supporting signatures, actuating mechanism, substantially as described, for advancing and receding the bed to and from the strand-carrier, and for intermittently rotating said carrier and cutters for severing the binding-strand, for the purposes set forth.

7. The combination, with the strand-carrier C and rotative cylinder B, having guards or fingers B' at opposite sides thereof, of the reciprocating support-bearings E', ratchet-connected gear K, rack L, catch device R², and carrier-actuating devices, substantially as described, whereby change of position of said carrier and bed-cylinder is effected, for the purposes set forth.

8. The combination, with the strand-carrier C and bed-cylinder B, of the cutters I and punches J, substantially as and for the purposes set forth.

9. The combination of the strand-carrier C, the bed B, the cutters I, the cam-rod *m*, the slide-plate M, the sheaves M', carrying a band connected with said plate, and means, substantially as described, for effecting partial rotation of said sheaves, substantially as set forth.

10. A grip-opener, as T', in combination with the rotative strand-carrier and gripping devices *c*, for the purpose set forth.

Witness my hand this 2d day of August, A. D. 1884.

LEVI W. FIFIELD.

Witnesses:

CHAS. H. BURLEIGH,
S. R. BARTON.