H. C. ELDREDGE.

BOOKBINDER'S ROUNDING AND BACKING MACHINE.

APPLICATION FILED DEC. 11, 1912.

1,097,012.

Patented May 19, 1914.

3 SHEETS—SHEET 1.

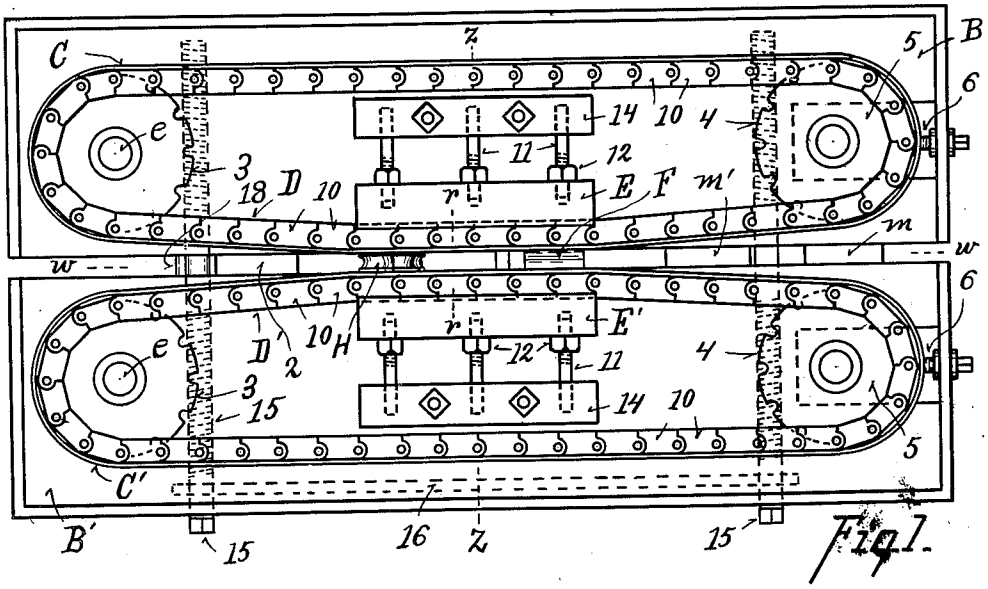


Fig. 1.

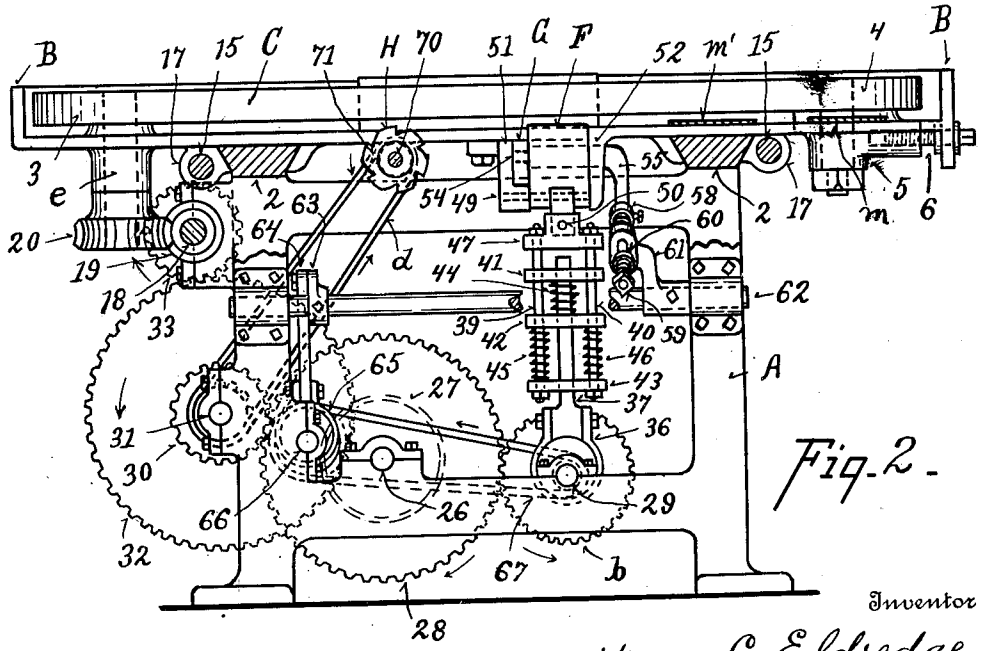


Fig. 2.

Witnesses

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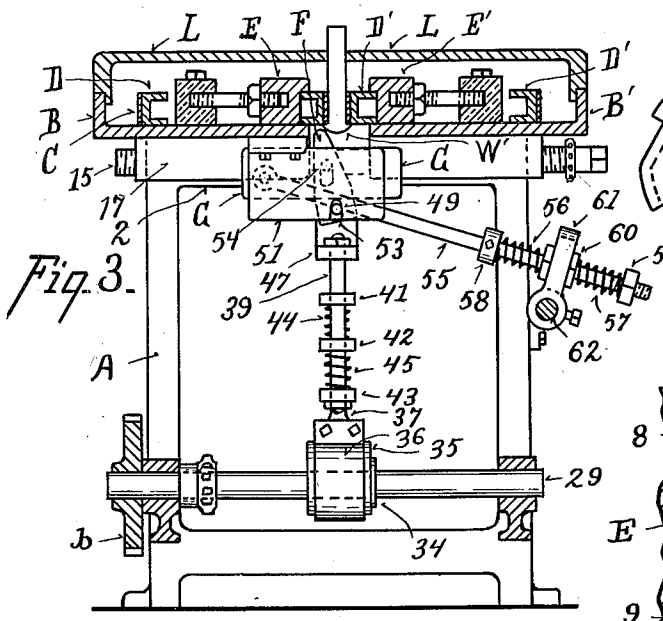


Fig. 3.

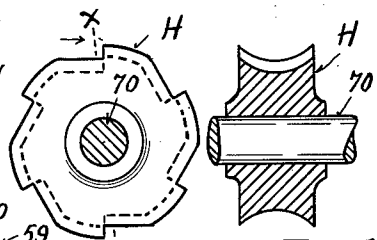


Fig. 10. Fig. 11.

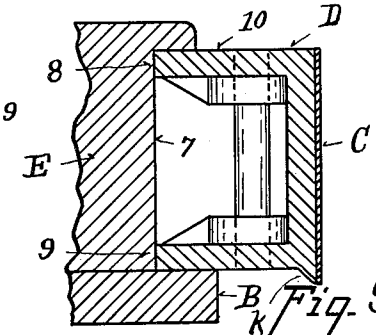


Fig. 9.

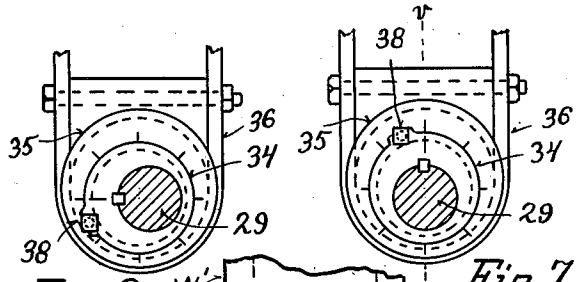


Fig. 6. Fig. 7.

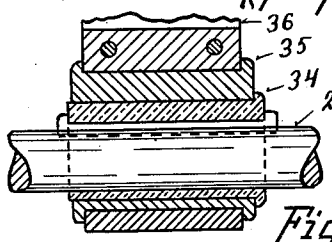


Fig. 8.

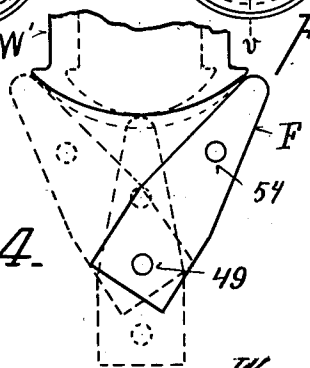


Fig. 4.

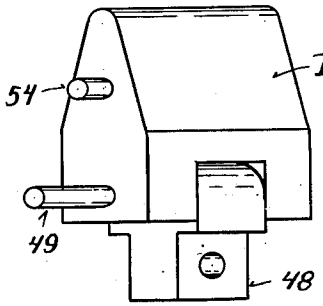


Fig. 5.

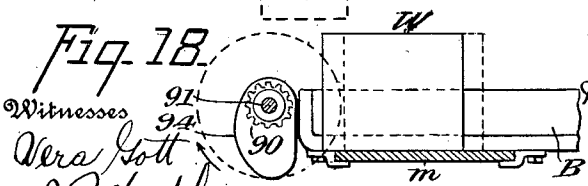


Fig. 18.

Witnesses

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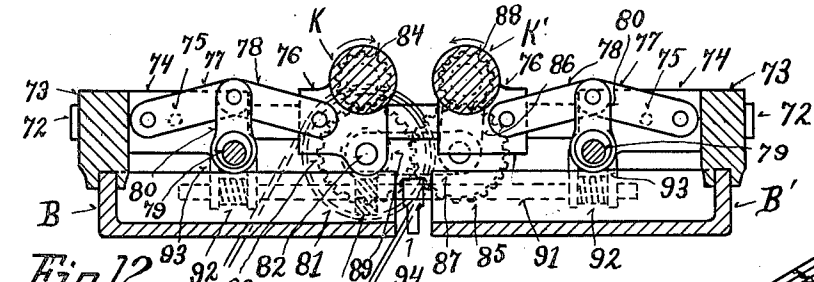


Fig. 12.

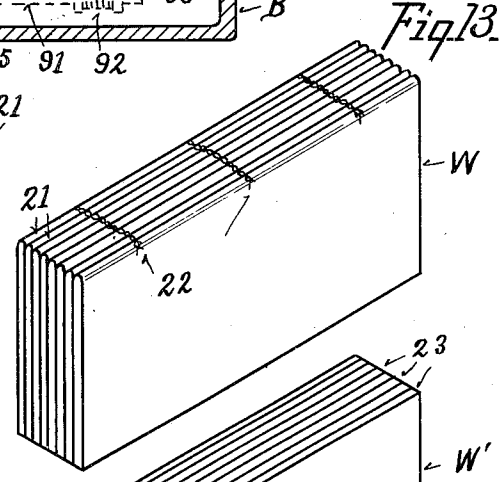


Fig. 13.

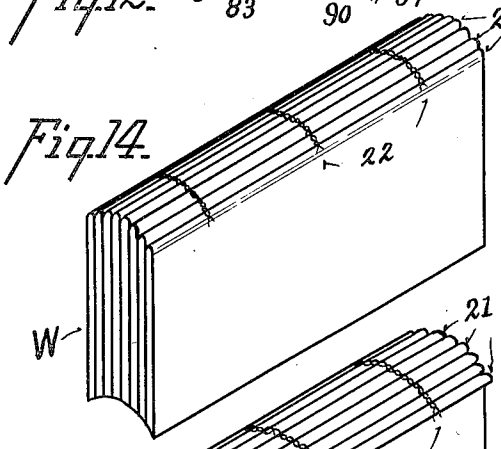


Fig. 14.

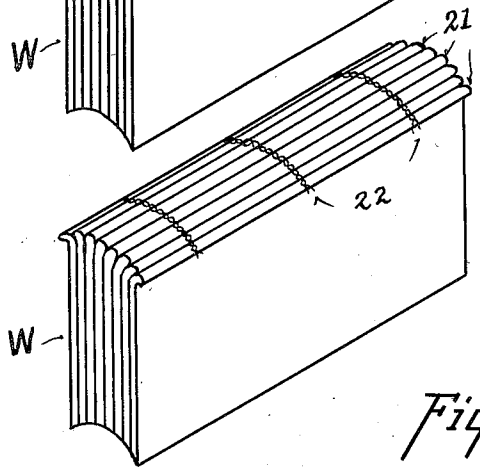


Fig. 15.

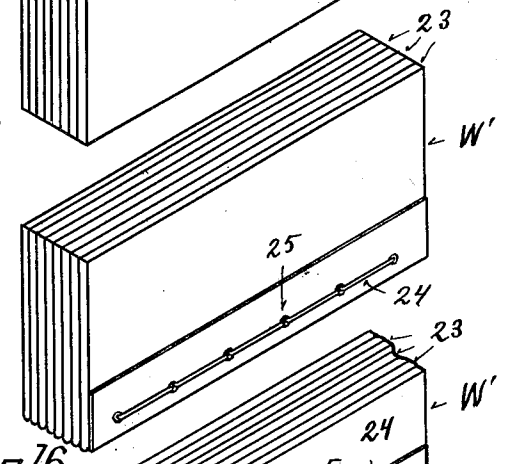


Fig. 16.

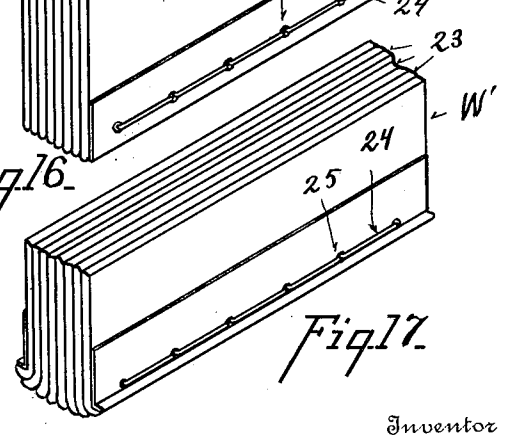


Fig. 17.

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UNITED STATES PATENT OFFICE.

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BOOKBINDER'S ROUNDING AND BACKING MACHINE.

1,097,012. Specification of Letters Patent. Patented May 19, 1914.

Application filed December 11, 1912. Serial No. 736,103.

To all whom it may concern:

Be it known that I, HENRY C. ELDREDGE, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Bookbinders' Rounding and Backing Machines, of which the following is a specification.

My invention relates to improvements in book binders' rounding and backing mechanism.

One of its objects is to provide improved mechanism to shape the book or assembled signatures preparatory to applying the covers and backing thereto.

Another object is to provide mechanism for shaping the assembled signatures to receive the covers irrespective of the manner in which the signatures are united.

Another object is to provide shaping mechanism in which the assembled signatures may be successively and continuously fed into and through the mechanism.

Another object is to provide mechanism whereby the back of the book may be shaped or outwardly curved with or without inwardly curving the front of the book.

Another object is to provide mechanism to shape the backs of comparatively thin books, and those in which the signatures are bound together by lacings or metal fastenings.

My invention also comprises certain details of form, combination and arrangement, all of which will be fully set forth in the description of the accompanying drawings, in which:

Figure 1 is a top plan view of my improved mechanism with the cover and shaping rollers detached. Fig. 2 is a side elevation of the same partly in central vertical section on line *w w* of Fig. 1. Fig. 3 is a central vertical section on line *z z* of Fig. 1. Fig. 4 is a detail of the shaping mechanism, illustrating its operation upon the back of the book. Fig. 5 is a perspective view of the shaping head detached. Figs. 6 and 7 are end views of an adjustable eccentric to control the movements of the shaping head Fig. 5. Fig. 8 is a sectional detail on line *v v* of Fig. 7. Fig. 9 is an enlarged sectional detail on line *r r* of Fig. 1 through one of the gripping chains and its backing support. Fig. 10 is a side elevation of a smoothing or burnishing member detached. Fig. 11 is a sectional detail of the same on line *x x* of Fig. 10. Fig. 12 is a central vertical section through a pair of shaping rollers, to be mounted at one end above the gripping chains and employed on sewed books to primarily "round" the assembled signatures. Fig. 13 is a perspective view of a sewed book or assembly of signatures prior to shaping treatment. Fig. 14 is a similar view after treatment by the shaping rolls. Fig. 15 is a similar view after shaping and when ready to receive the back and covers. Fig. 16 is a perspective view of a book or assembly of signatures in which the signatures are laced together (or attached by metal fastenings in place of laces if desired) as distinguished from a sewed book. Fig. 17 is a similar view of the same partly broken away after shaping, and ready to receive the covers and backing. Fig. 18 is a sectional detail illustrating the relative positions of the support *m* and cam 94.

The work to be treated comprises two general classes, first the larger and usually more carefully bound books W, in which the separate sheets of each signature 21 are sewed together, and then the threads binding the sheets of respective signatures together are severally caught up and sewed together by lines of stitching 22, as indicated in Figs. 13 to 15; and second books *w'*, usually thinner or of smaller size and less expensively bound, in which the signatures 23 are assembled and secured together by means of laces 24 passed from one side to the other through perforations 25, (or by metal fastening member not shown, used in place of the laces 24,) as indicated in Figs. 16 and 17. Imperfect and expensive mechanism has been heretofore employed to change the shape of work of the first class, one piece at a time, from that illustrated in Fig. 13 to that illustrated in Fig. 15. With books of the second class the general practice has been to apply the covers and back to the signatures assembled as illustrated in Fig. 16, without shaping the back thereof.

The accompanying drawings represent the preferred embodiment of my invention, in which A represents the frame of the machine provided with two transverse dovetail guide ways 2.

B and B′ represent two frame sections which are mounted upon the guides 2 and adjustable thereon to and from each other to enable books of different thickness to be operated upon.

D and D′ represent endless link conveyer or gripping chains which are respectively mounted upon driving sprockets 3 carried by shafts *e* and idler sprockets 4, said idler sprockets being journaled in adjustable carriages 5 which are adjustable by screws 6 to take up slack in said chains. The adjacent faces of the chains D and D′ travel in the same direction and are supported by adjustable blocks or guides E, E′, having guide ways 7 along which the rear faces 8 and 9 of the chain links 10 slide. The guides E, E′, are adjustable by means of stud bolts 11 and nuts 12 to and from the blocks 14 which are firmly bolted to members B and B′.

C and C′ represent thin flexible endless bands loosely in contact with the outer faces of the link chains D and D′ to enable the books to be firmly grasped between the link chains without leaving marks or impressions of the links on the books. The links 10 are preferably provided with downwardly projecting edges *k* see Fig. 9, over which the edges of the back of the book are shaped or rounded.

The members B and B′ are adjustable to and from each other upon the ways 2 by means of right and left hand threaded screw rods 15 which are preferably connected together by means of a sprocket chain 16 carried over sprocket wheels on said rods 15 to enable said rods to be adjusted in unison, said rods 15 being threaded into ears 17 projecting from members B and B′. A shaft 18 provided with worms 19 to engage worm wheels 20 on the shafts of sprocket wheels 3 enables said sprocket wheels to be positively driven irrespective of the adjusted positions of members B and B′.

A driving shaft 26 is journaled to frame A and power transmitted thereto by means of a belt over belt pulley 27. A spur gear 28 on shaft 26 engages a spur gear *b* on shaft 29 to drive said shaft 29, and also engages a spur gear 30 on shaft 31 which it also drives. Shaft 31 carries a gear 32 which engages a gear 33 on shaft 18 which in turn drives the sprocket wheels 3, and chains D and D′.

Mounted on the shaft 29 and keyed thereto is an eccentric sleeve 34 over which is closely fitted an eccentric sleeve 35 which is embraced by an eccentric strap 36 attached to a rod or pitman 37 which is reciprocated endwise by said eccentric. In order to vary the amount of reciprocation of rod 37, the eccentric sleeve 35 is adjustable upon the eccentric sleeve 34 as indicated in Figs. 6 and 7 to secure any desired throw of pitman 37, said sleeves 34 and 35 being locked together after adjustment by a bolt 38. Rods 39 and 40 are mounted upon the rod 37 by means of cross bars 41, 42, 43, and cushioned by springs 44, 45, 46, and a cross head 47 secured to the upper ends of rods 39 and 40.

F represents a reciprocating head which is mounted upon the cross head 47 by means of a coupling member 48 pivoted by a pin 49 to the head F and by a pin 50 at right angles to pin 49 to the cross head 47. The head F travels between brackets 51 and 52 supported beneath the members B, B′, and the forward end of pin 49 rides up and down in a vertical slot 53 in bracket 51.

G represents a slide movable transversely in a recess in the bracket 51, and having a vertical slot engaging a pin 54 carried by the head F to shift the upper end of said head F transversely. The slide G is actuated by means of a rod or link 55 which is provided with springs 56 and 57 held in place by means of a collar 58, and a nut 59 to hold said springs in engagement with a sleeve 60 engaged in a slot in a crank arm 61 mounted on the rock shaft 62. The sleeve 60 can be adjustably locked in the slot of the crank arm 61 to secure a longer or shorter throw of rod 55, and the rod 55 has a movement endwise through the sleeve 60, while the springs 56 and 57 cushion the thrust of the crank arm 61.

If desired the rod 55 may be positively connected pivotally to the crank arm 61, dispensing with the springs 56, 57.

The rock shaft 62 is rocked by means of a crank arm 63, a link 64, and an eccentric 65 which is of the same construction as illustrated in Figs. 6, 7 and 8, and is mounted on a shaft 66 journaled to frame A and driven in a ratio of one to two from shaft 29 by means of a sprocket chain 67 mounted upon sprocket wheels carried respectively by the shafts 29 and 66, thereby causing the head F to be alternately inclined in opposite directions when it reaches the upward limit of its stroke.

The effect of the combined movement of the two eccentrics 65 and 35 is to cause the nose or upper end of the head F to swing between upward thrusts first to one side and then to the opposite side beneath and in contact with the backs of the assembled signatures as indicated in full and dotted lines Fig. 4, while held in the grip of chains D, D′, and to break or bend said signatures over from the positions Figs. 14, and 16, into substantially the position illustrated in Figs. 15 and 17. By adjusting the position of the respective eccentrics, and the throw of the rod 55 relative to the crank arm 61 the upper end of head F may be caused to describe any desired arc of a circle required such as indicated for instance by the

full and dotted lines of Fig. 4, thereby enabling books of various thickness to be treated.

Immediately following the head F is a burnishing member H to smooth and firmly press the backs of the signatures into the desired position and to cause them to retain the desired position. The action of this member should be such as not to break or injure the threads 22 on the backs of the sewed books. For this purpose I preferably employ a shaft 70 on which is detachably mounted a notched or cam shaped burnishing tool or roller having a concave face to fit the outwardly curved back, the face of said burnisher in contact with the back moving in the same direction as the back and at somewhat greater speed than the back to be burnished. The notched or cam shaped face of the burnisher tends to spread as well as burnish the backs. Other tools having the desired burnishing and shaping effect may be employed in place of the roll illustrated. The shaft 70 carries a sprocket wheel 71 by means of which the shaft 70 may be driven by a sprocket chain *d* from a sprocket wheel on the shaft 31 for instance. Burnishing rollers with faces of different curvature are interchangeably employed for books of different dimensions.

In shaping books of the sewn type of any considerable thickness it is desirable preliminary to their being grasped between the chains D D′ and treated as heretofore described to give them a preliminary shaping from that illustrated in Fig. 13 to that illustrated in Fig. 14, for which purpose a pair of positively driven rollers K K′ are employed and mounted upon a frame comprising two cross bars 72 adjustably locked to end plates 73 which in turn are rigidly, either permanently or detachably, attached to members B B′ above the sprockets 4. The bars 72 are rectangular in cross section and form ways for the adjustment of the blocks 76 in which the rollers K K′ are journaled. Blocks 74 are also adjustable upon the ways or bars 72, and locked to different positions thereon by pins 75. The blocks 74 and 76 are connected together by means of links 77 and 78 forming toggle joints by means of which the rollers K K′ may be adjusted to and from each other. In order to actuate the toggle joints I provide eccentric shafts 79 which are provided with links 80, which are pivotally connected at one end to the meeting ends of the links 77 and 78, and at the opposite ends are provided with eyes to encircle the eccentrics of said eccentric shafts. The shafts 79 are journaled to the blocks 74.

The rollers K K′ are positively and continuously driven by means of an independent belt on a belt pulley 81 mounted on a shaft 82 journaled to one of the blocks 76 and overhanging the end of members B B′. A gear 83 on shaft 82 engages and drives a gear 84 on the end of roller K, and also engages and drives a gear 85 supported on a stud shaft carried by links 86 from the end of roller K′ and also by links 87 from the shaft 82. These links 86 and 87 hold the gear 85 in mesh with gear 83 and also with a gear 88 on the end of roller K′, and also permit the rollers K K′ to be adjusted to and from each other. The shaft 82 also carries a spiral gear 89 which engages a spiral gear 90 on shaft 91 which in turn by means of worms 92 splined to shaft 91, and worm wheels 93 carried by the eccentric shafts 79 alternately shifts said rollers K K′, to and from each other. A hand lever or other means may be employed if desired to actuate the eccentric shafts or to actuate the toggle joints. Detachable lids or covers L are provided to fit over the members B B′ to protect the operator, and also to protect the mechanism.

The operation is as follows: Where thick sewed books are to be shaped, the rollers K K′ are preferably employed, and the books or assembled signatures as illustrated in Fig. 13 are inserted by the operator between the rollers K K′ one at a time so as to be grasped between the rollers as they close together at a point just above the back. The rollers K K′ press tightly upon opposite faces and feed the book down between the chains D D′ opposite the sprockets 4 where they rest upon a support *m* forming a bridge between the members B, B′, until a cam 94 carried by shaft 91 engages the book and forces it along until it is engaged and gripped between the chains D D′. The passage of the sewed book between the rollers K K′ imparts the form Fig. 14 thereto, outwardly curving the back and inwardly curving the front. When the book is grasped between the converging portions of the chains D D′, said chains feed the book along at a uniform rate and when opposite the supports E, E′, the book is firmly gripped between said chains and its downwardly projecting back is first subjected to the action of the reciprocating head F which spreads the back to approximately the form shown in Fig. 15 which is further burnished and finished by the succeeding action of the burnishing member H. The book is finally carried by the chains past the supports E, E′, to the diverging portions of the chain where it is automatically released by the chains and removed by the operator.

Thin sewed books and laced books are not subjected to the action of the rollers K, K′, but are directly fed by the operator in the condition illustrated in Fig. 16 into position upon a support *m′* and where they will be grasped by the converging chains D, D′, whereupon the action of the head F and bur-

nisher H, is substantially as indicated in Fig. 17 leaving the front edge of the book straight across as in Fig. 16, instead of inwardly curved as in Fig. 14. The books may be fed close together and continuously through between the chains, thus enabling large quantities of work to be treated, and laced or metal clipped books as well as sewed books treated.

The rollers K, K′, and their supports and driving mechanism may be detached if desired where the books are to be fed directly to the chains or the books may be fed between the rollers K, K′, or in advance of said rollers.

The mechanism herein illustrated and described is capable of considerable modification without departing from the principle of my invention.

Having described my invention, what I claim is;

1. A book backing mechanism comprising two positively and continuously driven gripping members to grip and feed work and a reciprocating head to act upon and round the back of the work while in the grip ot said gripping and feeding members.

2. A book backing mechanism comprising two positively and continuously driven gripping members to grip and feed the work, a reciprocating head to act upon and round the back of the work while in the grip of said gripping and feeding members, and a burnishing member to act upon said work while in the grip of said gripping and feeding members, subsequently to the action thereon of said reciprocating head.

3. A book backing mechanism comprising a plurality of positively and continuously driven gripping and feeding members to grip and feed the work and a reciprocating head to round the back of the work having a movement to and from the work and a movement transversely of the face of the work while in the grip of said gripping and feeding members.

4. A book backing mechanism comprising a pair of adjustable shaping rollers, a plurality of positively and continuously driven gripping and feeding members to receive work from said shaping rollers and to grip and feed the work and a reciprocating head to act upon and round the back of the work while in the grip of said gripping and feeding members.

5. A book backing mechanism comprising a pair of adjustable positively driven shaping rollers, a plurality of continuously driven gripping and feeding members to receive work from said shaping rollers and to grip and feed the work, and a reciprocating head to act upon and round the back of the work while in the grip of said gripping and feeding members.

6. A book backing mechanism comprising a pair of continuously traveling endless conveyers to grip and feed the work and a reciprocating head to act upon and round the back of the work while being gripped and fed by said conveyers.

7. A book backing mechanism comprising a pair of endless conveyers adjustable to and from each other to grip and feed work of varying thickness, and a reciprocating head to act upon and round the back of the work while being gripped and fed by said conveyers.

8. A book backing mechanism comprising a pair of endless converging conveyers to successively and automatically grip and release the work, a reciprocating head movable to and from the work and movable transversely across the face of the work, and adjustable means to vary the extent of each of said movements of said reciprocating head, said head acting upon the work while being gripped and fed by said conveyers.

9. A book backing mechanism comprising a pair of endless conveyers to grip and feed the work, and a member to engage and round the back of the work while gripped between said conveyer members.

10. A book backing mechanism comprising two positively and continuously driven gripping members movable parallel to each other to grip and feed the work and a rounding member to engage and round the back of the work while gripped and being fed by said gripping members.

11. A book backing mechanism comprising a pair of endless conveyers to grip and feed work, supports for said conveyers at the point where the work is to be gripped, and a member to engage and round the back of the work while gripped and being fed by said conveyers.

12. A book backing mechanism comprising a pair of endless converging conveyers to automatically grip, feed and release the work, supports for said conveyers at the point where the work is gripped, and a member to engage and round the back of the work while gripped by said conveyers.

13. A book backing mechanism comprising a pair of positively and continuously driven longitudinally movable gripping members to grip and feed the work, supports for said gripping members at the point where the work is gripped, and a member to engage and round the back of the work while gripped by said gripping members.

14. A book backing mechanism comprising a main frame, supplemental frames supported upon said main frame and adjustable to and from each other thereon, endless conveyers carried by said supplemental frames to grip and feed the work, and a reciprocating head to act upon and round the back of the work while in the grip of said conveyers.

15. A book backing mechanism compris-

ing a main frame, supplemental frames supported upon said main frame and adjustable to and from each other thereon endless conveyers carried respectively by said supplemental frames to grip and feed the work, a member to engage and round the back of the work while gripped by said conveyers, and a worm shaft and worm wheels to drive said conveyers irrespective of the positions of said supplemental frames.

16. A book backing mechanism comprising a main frame, supplemental frames supported upon said main frame and adjustable to and from each other thereon, endless conveyers carried respectively by said supplemental frames, supports for said respective conveyers carried by said supplemental frames to cause said conveyers to converge toward each other to grip the work between said conveyers, and a member to engage and round the back of the work while gripped between said conveyers.

17. A book backing mechanism comprising a pair of continuously traveling gripping members, to grip the work, a yieldingly supported reciprocating member to engage and round the back of the work while held by said gripping members, said reciprocating member having a movement to and from the backs of said work, and a movement transversely of the backs of said work.

18. A book backing mechanism comprising a pair of continuously traveling gripping members to grip the work, a reciprocating member to engage and round the back of the work while held by said gripping members, means adjustable to vary the movement of said reciprocating member to and from the work, and means adjustable to vary the movement of said reciprocating member transversely of said work.

19. A book backing mechanism comprising a pair of continuously traveling gripping members to grip the work, a reciprocating member to engage and round the back of the work, while held by said gripping members, mechanism adjustable to vary the movement of said reciprocating member to and from the work, mechanism adjustable to vary the movement of said reciprocating member transversely of said work and a burnishing member to act upon said work subsequently to the action of said reciprocating member.

20. A book backing mechanism comprising a pair of continuously traveling gripping members to grip the work, said gripping members having projecting ledges adjacent to the back of said work, and a member to engage and round the back of said work while gripped by said gripping members.

21. A book backing mechanism comprising a pair of positively and continuously driven conveyers to grip the work said conveyers having projecting ledges adjacent to the backs of the work, and a member to engage and round the backs of said work while gripped and fed by said conveyers.

22. A book backing mechanism comprising a pair of positively driven link conveyers, to grip and feed the work, means interposed between said link conveyers and the face of the work to prevent said link conveyers marking the work, and a member to engage and round the back of the work while gripped by said conveyers.

23. A book backing mechanism comprising a pair of positively driven link conveyers to grip and feed the work, endless sheet metal bands interposed between said link conveyers and said work to prevent said link conveyers marking the face of the work, and a member to engage and round the back of said work while gripped by said conveyers.

24. A book backing mechanism, comprising a pair of positively driven converging conveyers to grip and feed the work, a member to guide the work uniformly to position between said converging conveyers, and a member to engage and round the back of said work while gripped by said conveyers.

25. A book backing mechanism comprising mechanism to curve the front and back of stitched work, a pair of positively and continuously driven conveyers in position to grip and feed said work, means to guide said work uniformly to position relative to said conveyers, and a member to engage and round the back of said work while gripped by said conveyers.

In testimony whereof I have affixed my signature in presence of two witnesses.

HENRY C. ELDREDGE.

Witnesses:
C. W. MILES,
U. THORNTON BOGERT.