No. 703,933. Patented July 1, 1902.

W. G. JOYCE, Jr., Dec'd.

W. JOYCE, Administrator.

BOOKBINDING MACHINE.

(Application filed May 17, 1901.)

(No Model.) 4 Sheets—Sheet 1.

FIG.1.

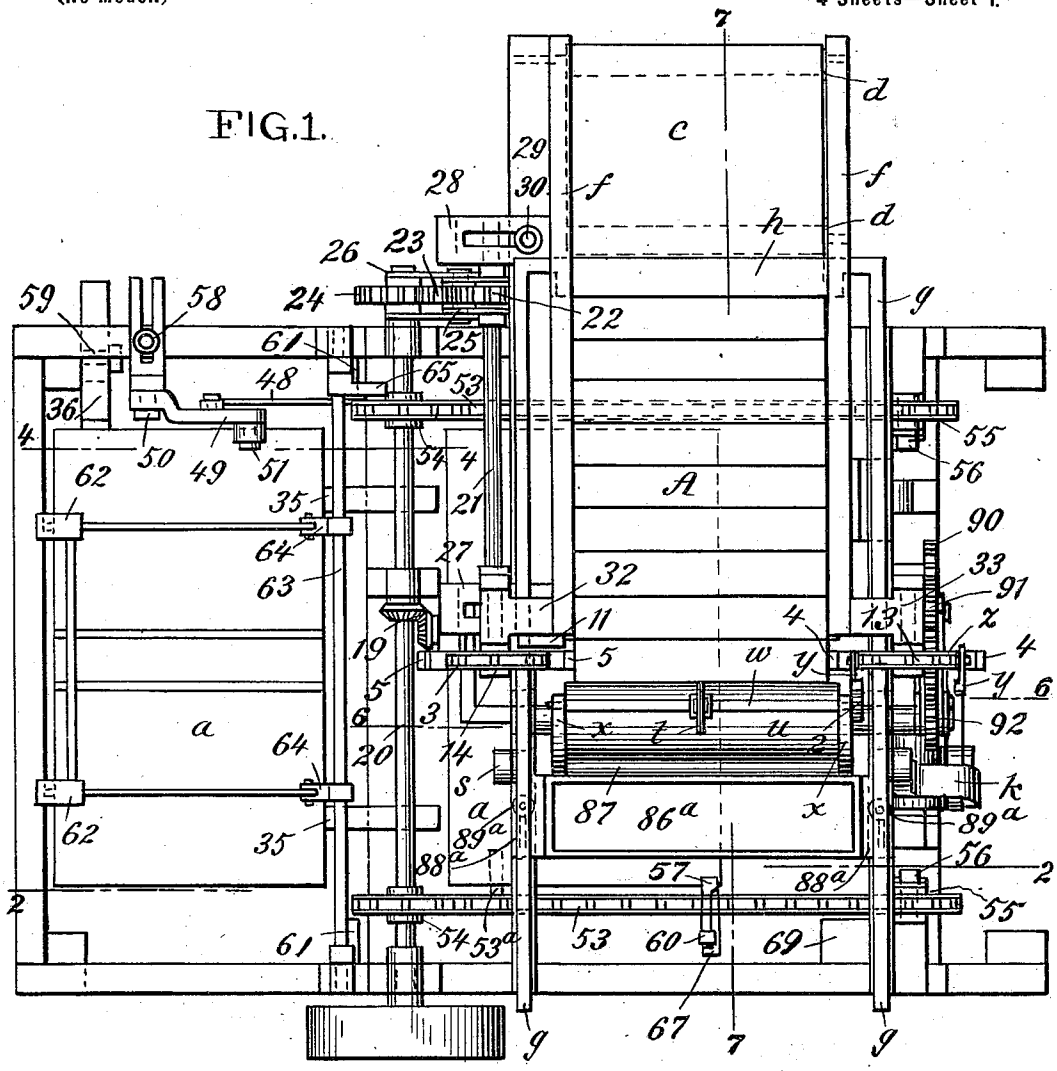
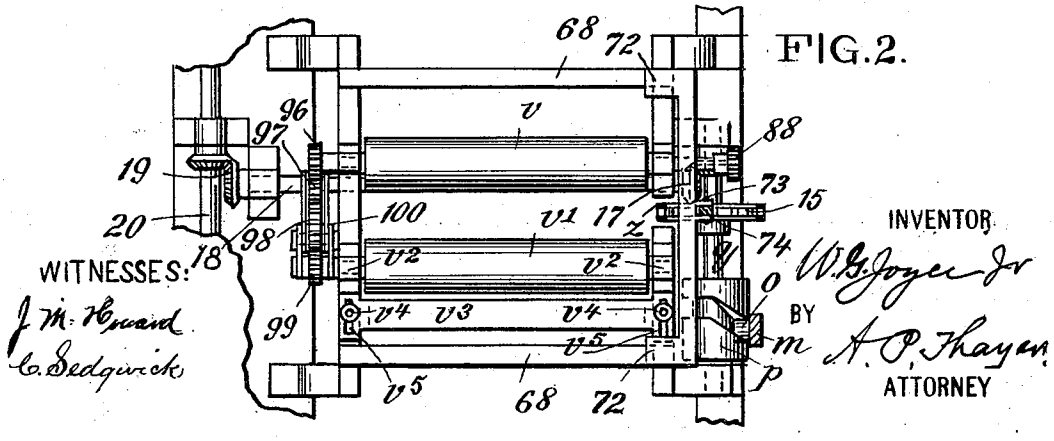


FIG.2.



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FIG.4.

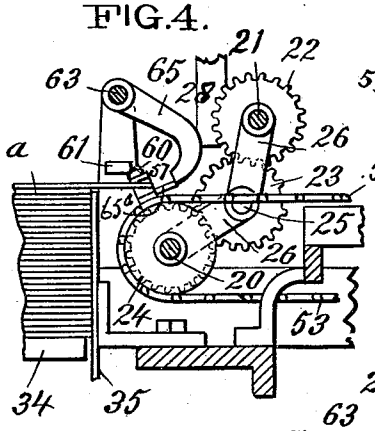


FIG.3.

FIG.14.

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(No Model.) 4 Sheets—Sheet 3.

FIG. 13.

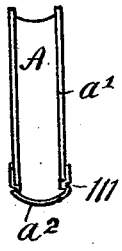


FIG. 12.

FIG. 5.

FIG. 6.

FIG. 7.

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(Application filed May 17, 1901.)

(No Model.) 4 Sheets—Sheet 4.

FIG. 9.

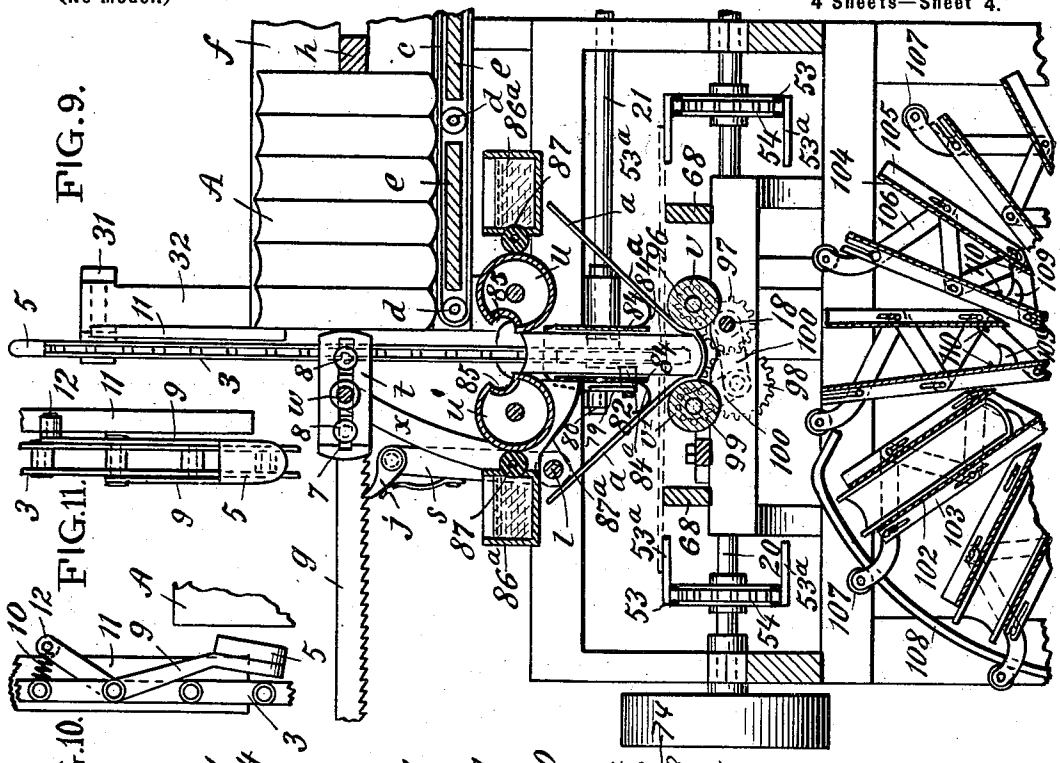


FIG. 11.

FIG. 10.

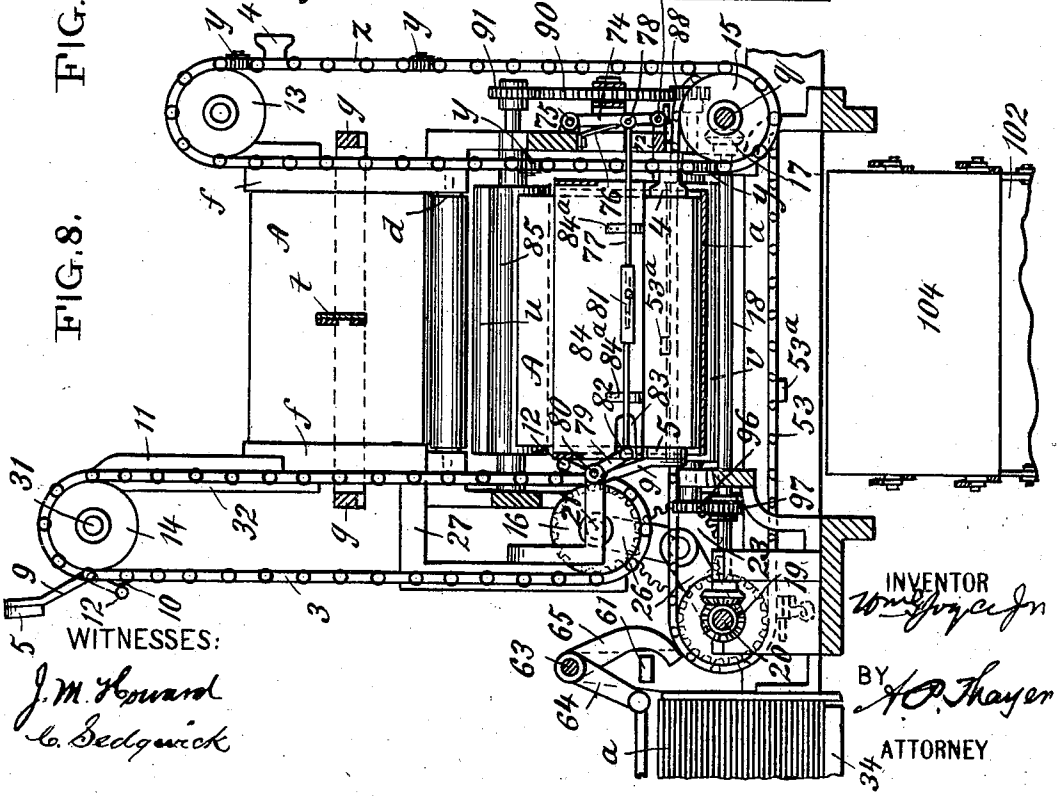


FIG. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM G. JOYCE, JR., OF NEW YORK, N. Y.; WILLIAM JOYCE ADMINISTRATOR OF SAID WILLIAM G. JOYCE, JR., DECEASED.

BOOKBINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 703,933, dated July 1, 1902.

Application filed May 17, 1901. Serial No. 60,723. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. JOYCE, Jr., a citizen of the United States of America, and a resident of New York city, county and State of New York, have invented certain new and useful Improvements in Bookbinding-Machines, of which the following is a specification.

My invention consists of various improvements in apparatus for automatically feeding and placing the covers, feeding and placing the unbound books in the covers, pressing and sticking the covers and books together, and delivering the bound books out of the machine, all as hereinafter described, reference being made to the accompanying drawings, in which—

Figure 1 is a plan view of my improved machine. Fig. 2 is a detail, mainly in plan view, but with some parts in horizontal section, showing the rolls by which the pasted covers and the partly-bound books are pressed after the books are placed in the covers. Fig. 3 is a vertical section partly on line 2 2 of Fig. 1 and partly in the transverse central plane of the cover-supporting apparatus. Fig. 4 is a detail in vertical section on line 4 4 of Fig. 1. Fig. 5 is a side elevation as seen looking from the right hand of Fig. 1, with part of the frame cut away on line 5 5, Fig. 3. Figs. 6 and 7 are two detail views of grippers for feeding in the book-covers. Fig. 8 is a vertical section of the upper part of the machine on line 6 6 of Fig. 1. Fig. 9 is a vertical section on line 7 7 of Fig. 1. Figs. 10 and 11 are side and front views, respectively, of details of the chain carriers, whereby the unbound books are transferred from the feeding-table on which the books are introduced into the machine and entered into the covers. Fig. 12 is an end view of a book and cover on an enlarged scale, showing the relations of the parts when the book leaves the pressing-rolls. Fig. 13 is a like view showing the completely bound and pressed book with the crease-joints of the cover and back as the book leaves the pressing and joint-creasing apparatus. Fig. 14 is a detail of the pressing and joint-creasing apparatus.

A represents a series of unbound books in the condition subsequent to the "rounding" process, whereby the backs are suitably rounded, as shown at the bottom of said series in Fig. 9, preparatory for being inserted in the covers *a*. They are placed upright on their backs side by side transversely of an endless feeding-apron *c*, carried on rolls *d* over a table *e* between side plates *f*. The books are shifted along intermittingly the thickness of one book at each movement by means of a feeder comprising a yoke, whereof the two parallel bars *g* and the cross-bar *h*, connecting them, form the parts. The cross-bar is placed in slideways of the side plates *f* behind the books, and the bars *g*, which are toothed racks, reach forward and rest on the retaining-pawls *i* and the feeding-pawls *j*. The pawl *j* of one side of the machine is carried on a lever *k*, pivoted on a shaft *l*, and at its lower end coupled to another lever *m*, pivoted at *n* and connected by a stud *o* with a groove in a rotating cam *p*, carried on a short shaft *q*. The pawl *j* of the other side of the machine is carried on an arm *s* of the pivot-shaft of lever *k*.

As represented in Fig. 9, the series of books in the feedway are at rest against a stop-gage *t*, preventing further advance of the books, while one, having passed the pasting-rolls *u*, has partly entered a cover *a*, which was previously lying on the rolls *v*, as indicated in dotted lines, which rolls *v* grip and press the cover onto the pasted sides of the book and discharge it preparatory to receiving another book.

For delivering the next book to the pasting-rolls the stop-gage *t* has first to be shifted a quarter of a revolution on its axis *w*, said axis being supported on standards *x*. The shifting is effected by a toothed spur *y* on the vertically-arranged endless chain *z*, engaging a toothed pinion 2 on the axis *w* in its downward course, said chain and another like chain 3 being employed to grip the books successively as they are delivered from the feedway and convey them downward into the bite of said pasting-rolls and thence into the covers. For so handling the books said chains are arranged in the central vertical plane between said pasting-rolls and also of the pressing-rolls *v* and at opposite sides of the feedway, respectively, in suitable proximity thereto for gripping-

pads, as 4, on the chain *z* and 5 on the chain 3 to grip the ends of the books and control them while descending into the pasting-rolls. The length of the chains is in this example and the other conditions such that each chain has two gripping-pads and is timed for synchronism with the feeding, pasting, and pressing operations.

Immediately after the books pass the lower end of the stop-gage *t* in their descent, said gage then occupying the position represented in Fig. 5, another toothed spur *y* on chain *z* engages pinion 2 and shifts said stop-gage into the position of Figs. 8 and 9 to prevent premature escape of the books from the feedway.

The gage *t* is automatically operated and serves the double purpose of, first, gaging the forward movement of the books, and, second, gaging the downward movement.

The stop-gage *t* is made extensible lengthwise, as indicated, by the slot 7 and clamping-screws 8 for accurate adjustment in that direction.

In the transverse direction of the stop-gage accuracy is not so essential.

On the side of the machine from which the covers *a* are introduced the end of the lower range of the chain 3 must be higher to avoid interference with their introduction than will permit of the use of book-gripping pads directly connected to the chain, as they are connected on the chain *z* of the other side. Consequently the pads 5 of chain 3 are connected thereto by arms 9, reaching lower than the said lower range of the chain, and said arms each have a spring 10 to effect the gripping pressure. At 11 is a cam-cleat fixed in a suitable position to retire the pads 5 through the instrumentality of a roller-stud 12, carried on the extremity of an arm 9 of each pad and running on said cam-cleat to enable the pads to pass the upper corners of the books, as shown in Fig. 10, without conflict. When said studs escape from the lower end of said cam-cleat, the pads 5 grip the book close to the lower edge, as shown in Fig. 8. The pads 4 of chain *z*, being positively connected to the chain, do not require such retiring movement to pass the upper covers of the books.

The chains *z* and 3 are carried on upper sprocket-wheels 13 and 14 and lower sprocket-wheels 15 and 16. Wheel 15 is carried on the short shaft *q*, which also carries the grooved cam *p*, that operates the lever *m*, to which lever *k* is coupled for operating the book-feeding yoke. This shaft *q* is geared by a pair of bevel-wheels 17 with a shaft 18, which is geared by a pair of bevel-wheels 19 with the main shaft 20.

The lower sprocket-wheel 16 of chain 3 is carried on a shaft 21, that is geared with the main shaft 20 by the spur-wheels 22, 23, and 24. The pivot 25 of the intermediate wheel 23 of this train is carried in links 26, coupling it with the axes of wheels 22 and 24, the latter being carried on shaft 20 to allow the chain 3 to be shifted toward and from chain *z* for adjusting them to handle books of different lengths. For so adjusting the chain 3 its shaft 21 is mounted on brackets 27 and 28, that are adjustably bolted on the frame-bar 29 at 30 and to which the side plate *f* of the feedway on that side of the machine is attached, so as to be shifted accordingly. The upper sprocket-wheel of this chain 3 is mounted on a pivot-stud 31, carried on a standard 32, also attached to the side plate *f* for adjustment together with the rest. The cam-cleat 11 for retiring the gripping-pad 5 is also mounted on this standard 32. The upper sprocket-wheel 13 of chain *z* is also mounted on a like standard 33, attached to the other side plate *f* of the feedway.

Prior to the escape of the books through the pasting-rolls *u* the covers *a* have to be brought in and properly lodged over the pressing-rolls *v* for reception of the books, as shown in Fig. 9. For this purpose they are stacked in quantities from time to time on a platform 34 in due relation to registering-gages 35 and 36, by which they are duly placed for proper entry into the machine. The covers are taken one by one from the top of the stack over the upper ends of the gages 35, the platform being made to rise to the extent of the thickness of a cover as each one is taken away, so that the gages 35 prevent more than one being taken at a time. For causing the rising movement of the stack of covers the platform 34 is mounted on the upper end of a vertical screw-threaded standard 37, which has support in the rotating screw-threaded nut 38, mounted in a supporting part 39 of the frame and being provided with a bevel toothed rim 39^a, with which a bevel-wheel 40 on the shaft 41 gears. The shaft 41 has a ratchet-wheel 42, by which a pawl on the lever *m* (see Figs. 3 and 5) shifts said shaft 41 and the nut 38 intermittingly in unison with the feeding of the covers *a*. The shaft 41 consists of two parts coupled by a clutch 43, with which an automatic uncoupling device is connected to take effect for temporarily interrupting the rise of the follower in case its rate of movement is greater than the rate of the feeding of the covers. The clutch is also used for disconnecting by hand to run the platform down quickly by the hand-wheel 44, and thus economize time when a fresh stack of covers is to be supplied. The automatic device may be contrived in various different ways, and I do not limit myself to any particular construction. That which I have represented consists of the bell-crank 45, pivoted at 46, with one arm connected with the shifting-hub 47 of the clutch and the other arm connected with one end of the rod 48, which is connected at its other end with a short lever 49, which is pivoted at 50 and carries a stud-pin 51 in its free end, reaching over the top of the stack of covers at one side, as shown in Figs. 1 and 3, so that in case the

covers rise higher than the proper level the bell-crank 45 will be shifted in the direction for disconnecting the clutch, and when the height of the stack is diminished by the feeding of the covers away and lever 49 is thereby permitted to fall a spring 52 will connect the clutch again for continuing the upward movement of the covers. This lever 49 is adjustable, as shown at 58, and the registering-gage 36 is also adjustable, as at 59, for covers of different widths.

For feeding the covers into the machine two endless chains 53 are used, said chains being operated by sprocket-wheels 54 on the main shaft 20 and running over carrying-wheels 55, turning on stud-pivots 56. These chains have gripping-jaws 57 to receive the covers, as shown in Fig. 5, and pull them along. The grippers are opened as they rise on the driving-wheels 54 by contact of the rollers 60 of the gripper-jaws with the stationary arms 61, under which said rollers pass, and the covers are thrust into the open jaws by pullers 62, hooking behind the rear edges of the covers and thrust forward by the rock-shaft 63, to which they are connected by arms 64; said rock-shaft being operated by an arm 65, against the free end of which a tappet 65^a on the tail end of the plates 67—by which the fixed jaws of the grippers 57 of one of the chains 53 are attached to it—makes contact at the moment the jaws are opened, the rollers 60 then escape from arms 61 and the jaws close on the covers and carry them along on the ways 68 until, having reached the right point, the rollers 60 of the jaws pass under opening-studs 69 and release the covers. The chains 53 also have lateral arms 53^a, supporting the covers at the outer edges. The grippers 57 are adjustable laterally on the chains to adapt them for covers *a* of different widths, as indicated by the slot 70 in Figs. 6 and 7, and by the fastening-bolt 71 in Fig. 6.

As the books vary a little in length and it is desirable to center the books in the covers lengthwise, I have contrived a centering device consisting of a movable gage 72, resting on the ways 68, along which the covers are brought in, against which gage the covers come to rest when released from the gripping-jaws. This gage 72 is jointed at 73 to a lever 74, which is at 75 jointed to a fulcrum-pivot. Said gage also has a spring 76 constantly bearing it to the right hand, Fig. 3, thus causing the covers to be fed a little farther than the center. A rod 77 is pivoted to said lever at 78, which traverses the space down which the books feed a little to one side of the feedway and is connected to a link 79, pivoted to a supporting-bracket at 80, said rod having an extension-joint 81. At the joint of the rod 77 with the link 79 is a roller corresponding to that shown at 82, (see Fig. 9,) projecting through the slot 83 into the path of the descending books, so that the books will at one end touch and push the roller back to escape it, which pulls the gage 72 through the rod 77, and thus pulls the covers back a little and centers them relatively to the books.

The aforesaid slot 83 is in one of a pair of thin plates 84, between which the books are guided onto the covers between pressing-rolls *v*, said guide-plates receiving the books from the pasting-rolls *u* and controlling them until well in the control of the pressing-rolls *v*. The plates 84 also serve to draw the pasted outer sheets of the books and smooth out any wrinkles that may be in them. To these plates buffer-springs 84^a are attached to check the covers, which would otherwise be thrust against said plates by the pressing-rolls with too much impact.

The pasting-rolls are represented in Fig. 9 as having just discharged the book below and being ready for receiving another. The grooves 85 in said rollers are intended to make free space for the bulging angles 86 (see Figs. 5 and 12) resulting from the rounding of the backs, which it is desirable to retain as usual in bookbinding for prominent ridges over which to crease the back into the spaces 86^b between said angles and the edges of the covers to form the joints of the covers with the backs.

In Fig. 5 it is to be observed that the pasting-rolls close on the sides of the books immediately above the bulging angles 86 and at the moment said angles have entered the grooves of the pasting-rolls under the angles of the upper sides of the grooves, considering the positions of the rolls in said figure, so that the sides of the books are pasted close into the bases of the bulging angles. The paste is applied to said pasting-rolls from paste-boxes 86^a by paste-feeding rolls 87, receiving the paste through slots in the sides of said boxes and transferring it onto the pasting-rolls against which they bear.

For driving the pasting-rolls a small pinion 88 on the shaft of the pressing-roll *v* gears with the spur-wheel 90, which gears with the pinion 91 on the shaft of the pasting-roll *u* at the right hand in Fig. 5, and the other pasting-roll is geared to said spur-wheel by its pinion 92 and an intermediate wheel 93, these being coupled by links 94 and 95, allowing the last-mentioned pasting-roll to be shifted toward and from the other to adjust them for books of different thickness.

The pressing-roll *v* is geared by a pinion 96 on it with a pinion 97 on shaft 18, with which an intermediate wheel 98 also gears, and said wheel 98 gears with a pinion 99 on pressing-roll *v'*, said wheels 99 98 and the pinion on shaft 18 being coupled by adjusting-links 100, allowing roll *v'* also to be adjusted for books of different thickness.

The adjustable pasting-roll *u'*, paste-box 86^a, standards *x*, carrying the stop-gage *t*, and the paper-smoothing plate 84 of the left-hand side of the descending feedway (see Fig. 9) are all connected by brackets 87^a for adjustment together for books of different thickness. They are secured in position on the

frame by flanges 88^a and bolts 89^a of the paste-box, as seen in Figs. 1 and 5. The spurs y on chain z are also adjustable laterally on the chain to accommodate the adjustment of the stop t. The adjustable pressing-roll v' is carried in boxes v^2, connected with the bar v^3, which is secured to the frame by bolts v^4 in slot-holes v^5, allowing said roll to be also adjusted for books of different thickness.

When the books escape from the pressing-rolls, they fall into pressing-racks on a rotating shaft 41, by which they are pressed and creased and carried intermittingly into proximity to an endless carrier 101 and discharged thereon for delivery to the place for receiving them. The racks consist of radiating plates 102, parallel to the shaft 41 and attached thereto, said plates being flanged at the ends, as 103, and other plates 104, also parallel to the shaft and flanged at the ends, as 105, the latter plates being connected at both ends to the former by the lazy-tongs links 106, whereof the outermost link at each end of the plates has a roller-stud 107, with which stationary cams 108 take effect at the moment the books are received between the two plates to grip the books for pressing and creasing them and at the same time to carry them to the place for discharging them, when by the escape of said studs from the cam the grip is relaxed and the books slide out onto the carrier 101, said cams and the carrier for receiving them being arranged for the release when the racks are suitably inclined for the books to slide out. The fixed plates 102 have a stop-rest 109, on which the books lodge when entered properly in the racks, and both of the rack-plates have a creasing-rib 110 to produce the joint-creases 111 in the covers.

What I claim as my invention is—

1. The combination of the book-feeding way adapted to receive the uncovered and back-rounded books in series and set upright on their backs, means for intermittingly feeding them along sidewise, vertical endless chains and gripping-pads thereon adapted to receive the books endwise successively at the end of the feedway, and pasting-rolls receiving the books from the chains and pasting the sides of the books preparatory to receiving the covers.

2. The combination of the book-feeding way adapted to receive the uncovered and back-rounded books in series and set upright on their backs, means for intermittingly feeding them along sidewise, vertical endless chains and gripping-pads thereon adapted to receive the books endwise successively at the end of the feedway, and the automatic gage at the end of the feedway controlling the books preparatory to their engagement by the chains.

3. The combination of the book-feedway adapted to receive the uncovered and back-rounded books in series and set upright on their backs, means for intermittingly feeding them along sidewise, vertical endless chains and gripping-pads thereon adapted to receive the books endwise successively at the end of the feedway, the automatic gage at the end of the feedway controlling the books preparatory to their engagement by the chains and while being delivered by the chains, said stop consisting of the rotating device having ends adapted for one effect and sides adapted for the other effect, and means for periodically shifting it by toothed spurs on the chain.

4. The combination of the book-feeding way adapted to receive the uncovered and back-rounded books in series and set upright on their backs, means for intermittingly feeding them along sidewise, vertical endless chains and gripping-pads thereon adapted to receive the books endwise successively at the end of the feedway, pasting-rolls receiving the books from the chains and pasting the sides of the books preparatory to receiving the covers, cover-pressing rolls under the pasting-rolls, and means for placing the covers on said pressing-rolls preparatory to receiving the books, and so as to be pressed on the books by said pressing-rolls.

5. The combination of the book-feeding way adapted to receive the uncovered and back-rounded books in series and set upright on their backs, means for intermittingly feeding them along sidewise, vertical endless chains and gripping-pads thereon adapted to receive the books endwise successively at the ends of the feedway, pasting-rolls receiving the books from the chains, and having the grooves for the bulging angles of the rounded books, said rolls adapted for pasting the uncovered sides of the books preparatory to receiving the covers.

6. The combination with the pasting-rolls, cover-pressing rolls, means for supplying the books and means for supplying the covers thereto, of the guide and paper smoothing and protecting plates intermediate of said pasting and pressing rolls.

7. The combination with the cover-pressing rolls, of the cover-receiving ways, cover-carrying chains, automatic closing grippers on said chains, means for opening the grippers and means for thrusting the covers into the grippers, and means for opening the grippers for release of the covers and the gage for stopping and centering the covers.

8. The combination with the cover-feeding chains and grippers thereon, of the gripper-opening studs, cover-pullers, rock-shaft and connections for operating the cover-pullers, and the tappets on the cover-grippers for operating the rock-shaft.

9. The combination with the feedway for the books through the pasting-rolls and with said pasting and cover-pressing rolls, of the cover-centering gage normally allowing over-feeding of the covers, and the roller-stud connected to said gage and subject to reverse movement by the books entering into the covers for centering said covers.

10. The combination with the pasting and

cover-pressing rolls, of the series of intermittingly-rotating book receiving and clamping racks adapted for successively receiving, pressing, carrying, and delivering the books and provided with creasing devices adapted for producing the joint-creases of the book-covers.

11. The combination with the pasting and cover-pressing rolls, of the series of intermittingly-rotating book receiving and clamping racks, each comprising a plate fixedly attached to the rotating shaft, parallel with and radially thereto, another plate parallel to the first-mentioned plate, and lazy-tongs links connecting the ends of the two plates, each system of links having a roller-stud terminal, and stationary cams engaging said studs to close the clamps to grip the books, and releasing the same for the discharge of the books.

12. The combination with the pasting-rolls, cover-pressing rolls, means for supplying the books, means for supplying the covers thereto, and the springs for checking the covers when thrust up by the pressing-rolls.

13. In a bookbinding-machine, the combination with feeding devices for the partly-bound books, of a pair of pasting-rolls, said rolls having the grooves for the bulging angles of the books, means for placing the covers under said rolls to receive the books, and rolls under the pasting-rolls for pressing the covers on the books.

Signed at New York city this 3d day of May, 1901.

WILLIAM G. JOYCE, JR.

Witnesses:
C. SEDGWICK,
J. M. HOWARD.