

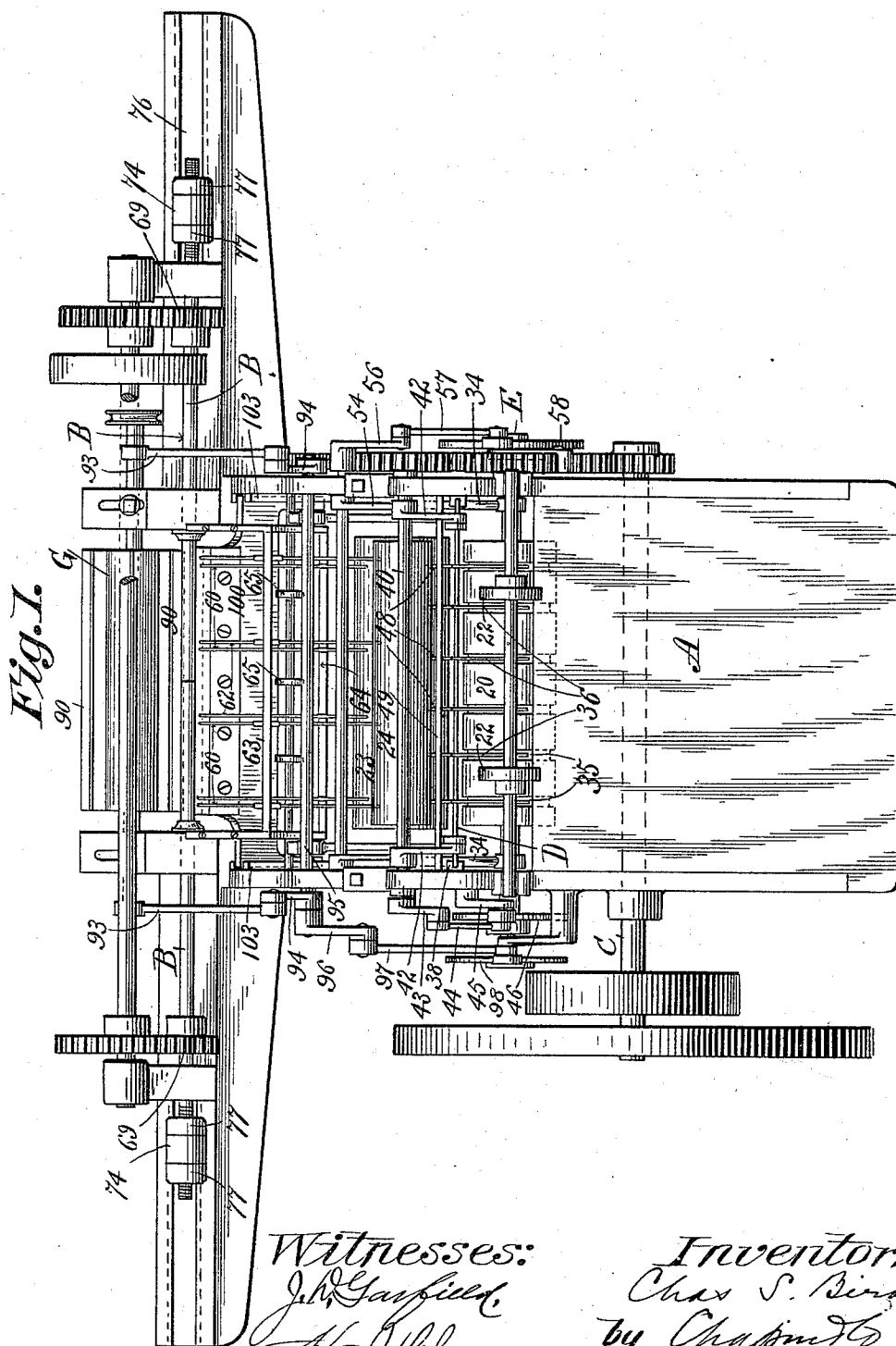
(No Model.)

7 Sheets—Sheet 1.

C. S. BIRD.
MACHINE FOR MAKING PAPER TUBES.

No. 537,560.

Patented Apr. 16, 1895.



Witnesses:
J. R. Garfield
H. J. Clemore

Inventor:
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by *Chapman & Co*
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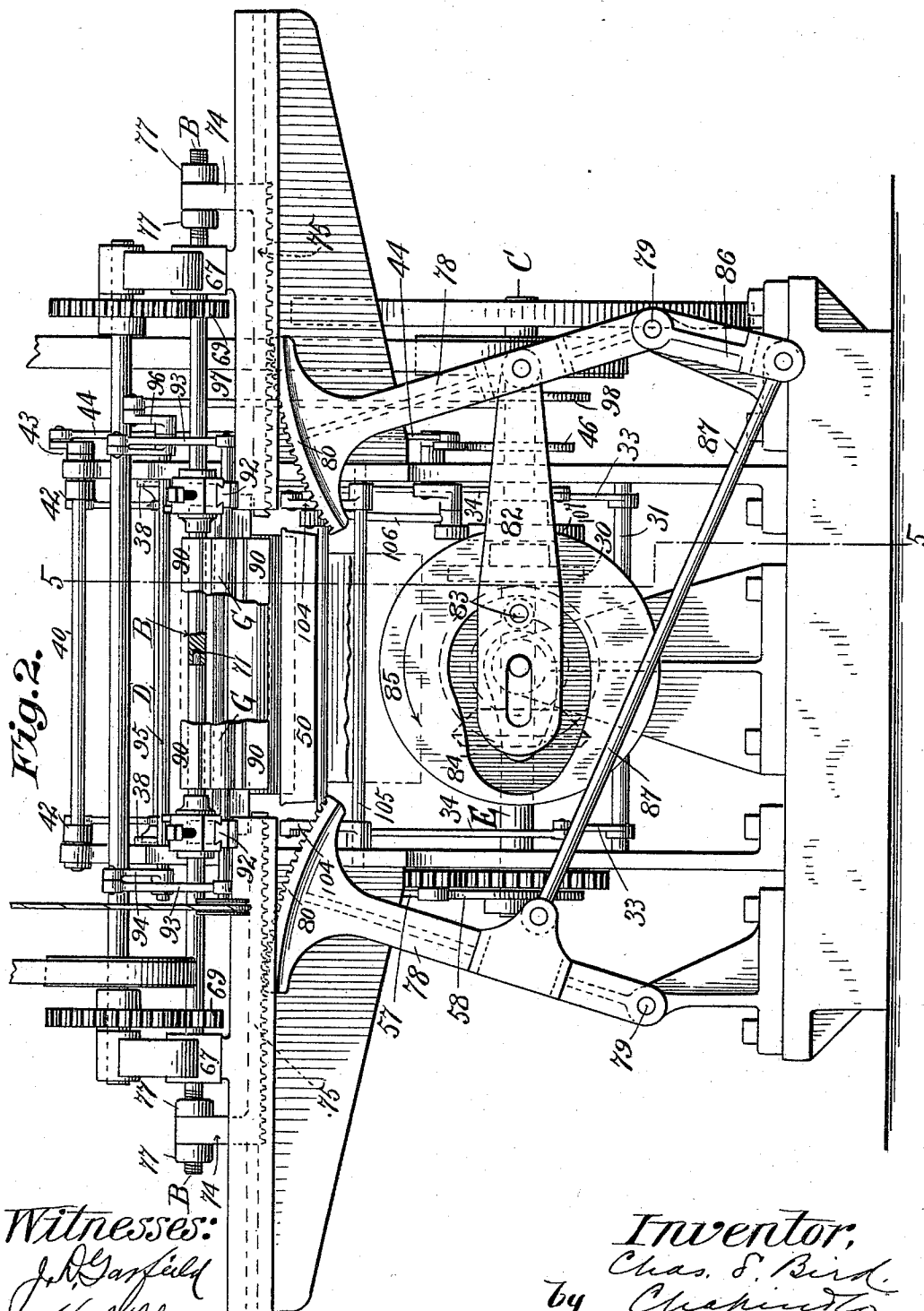
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7 Sheets—Sheet 2.

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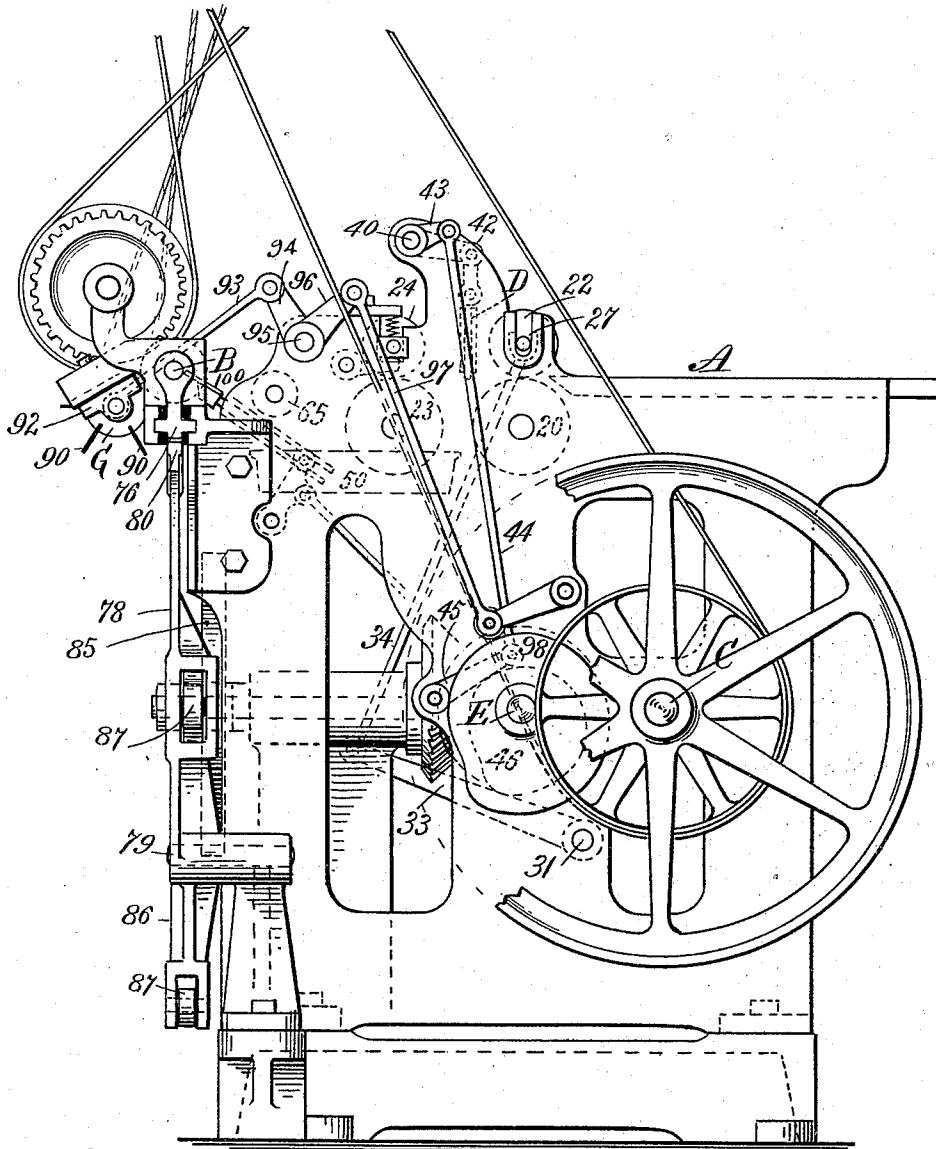
7 Sheets—Sheet 3.

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Fig. 3.



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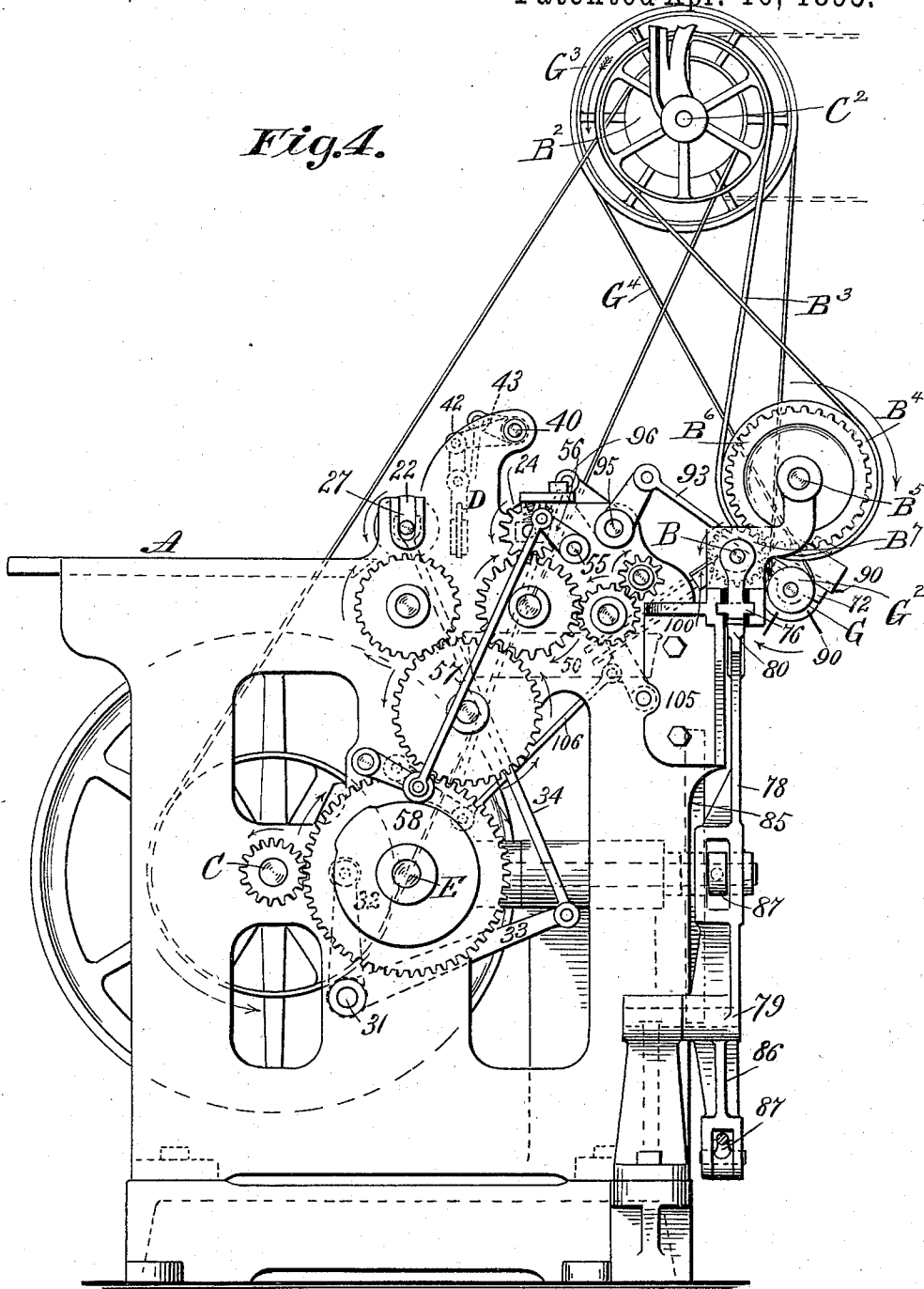
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Fig. 4.



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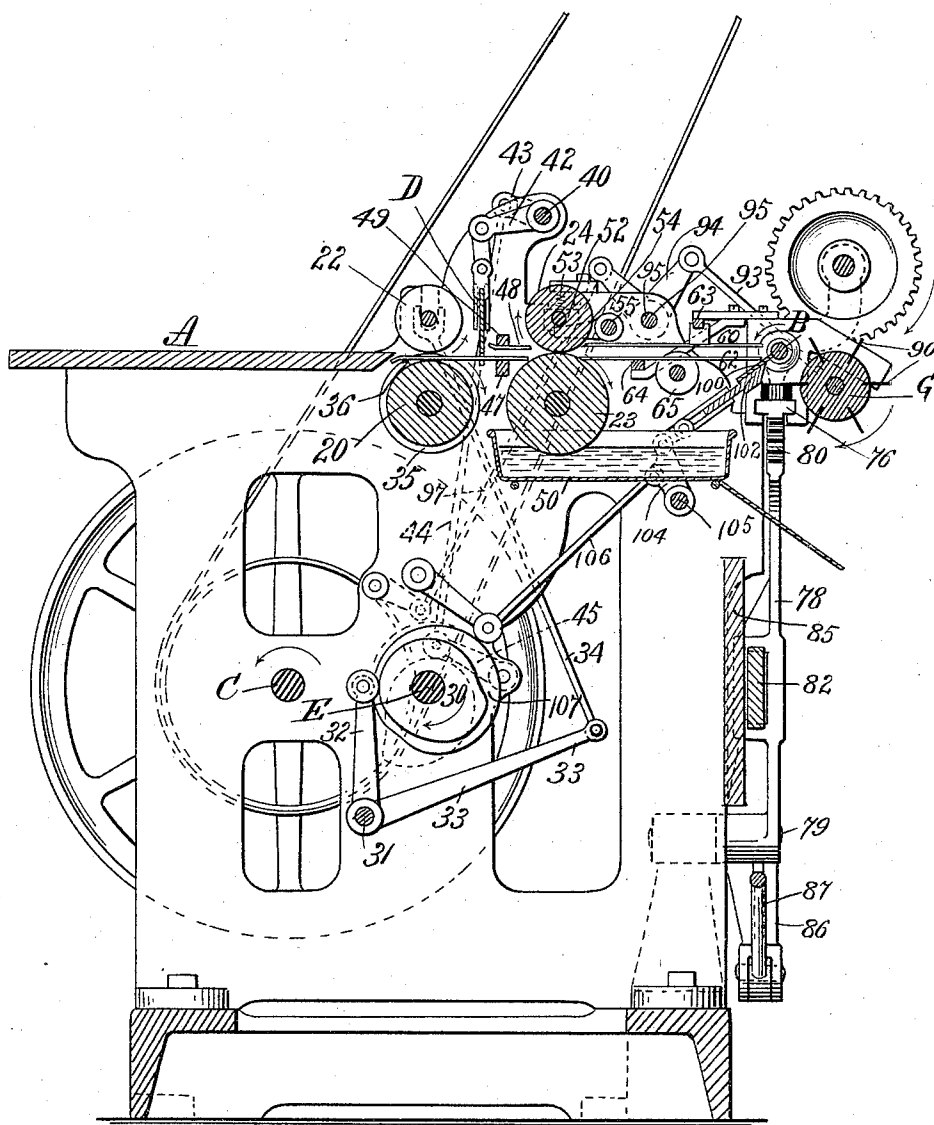
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Fig. 5.



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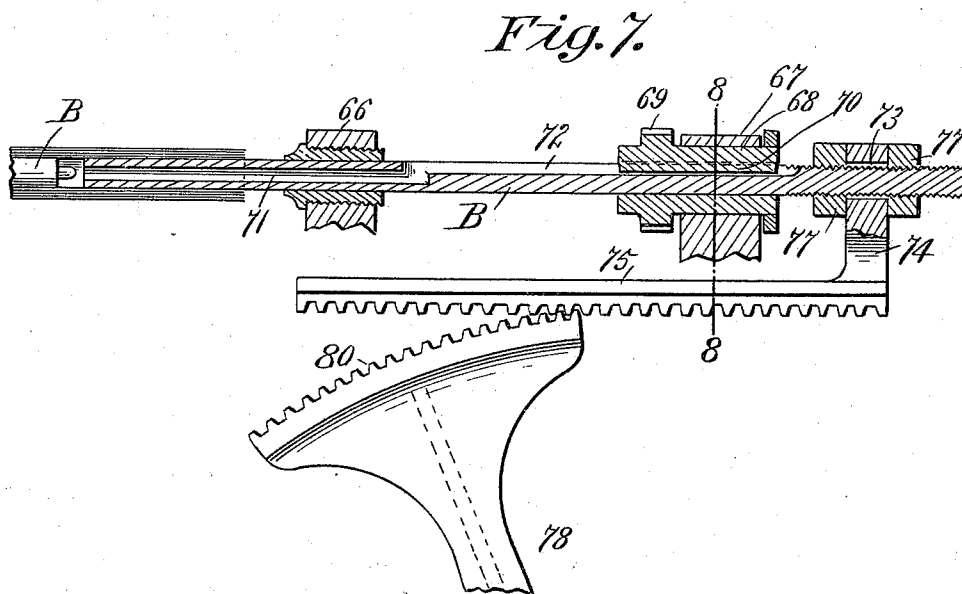
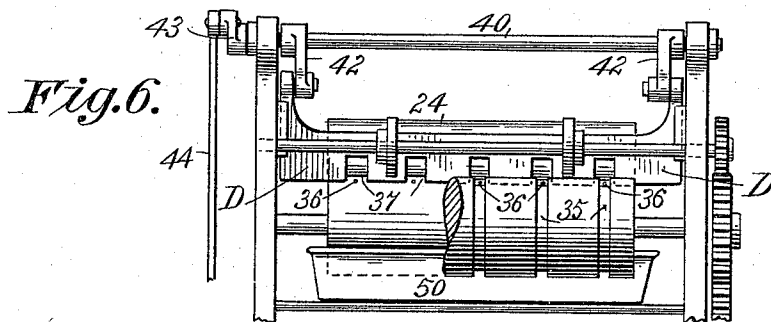
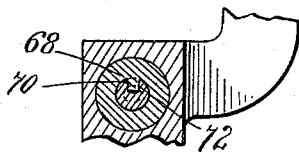


Fig. 8.



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Fig. 9.

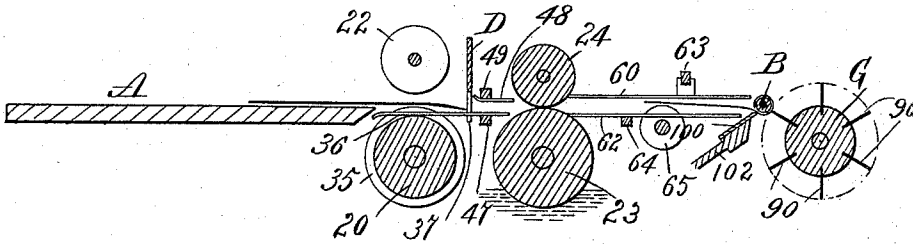


Fig. 10.

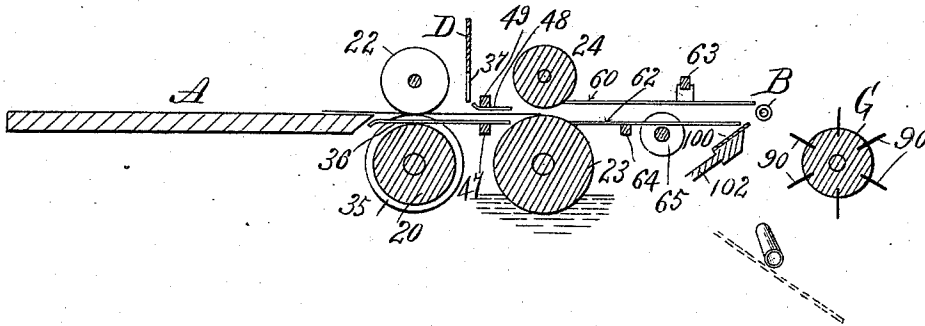
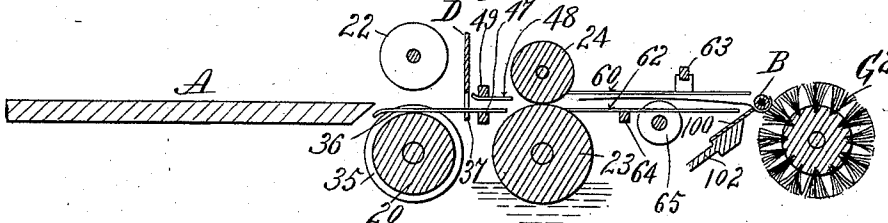


Fig. 11.



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UNITED STATES PATENT OFFICE.

CHARLES S. BIRD, OF WALPOLE, MASSACHUSETTS.

MACHINE FOR MAKING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 537,560, dated April 16, 1895.

Application filed October 22, 1894. Serial No. 526,595. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. BIRD, a citizen of the United States of America, residing at Walpole, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Machines for Making Paper Tubes, of which the following is a specification.

The object of this invention is to produce a machine which will most rapidly and efficiently make paper tubes from sheets of paper fed into the machine, and more particularly relates to the means for feeding the paper properly to the pasting and then to the winding mechanism; to the improved pasting mechanism; to the improved winding mechanism and to means whereby the completed tube will be discharged from the machine; and the invention furthermore relates to other improved features of construction, all substantially as will hereinafter more fully appear.

The machine of this invention is composed, in substance, of a feed table for the sheet of paper from which the tube is to be produced, feed rollers to the rear thereof, and a gate-gage, paste rollers for applying the adhesive to the paper, feed and guide mechanism for carrying the pasted sheet to the winding mandrel, means for causing the edge of the paper to immediately take its winding engagement with the mandrel, an automatically and intermittently operating device for bearing on the paper being wound to press the convolutions closely together and to scrape off all excess of paste, and mechanism operative to effect the withdrawal of the mandrel from the completed tube permitting the discharge of the tube, together with means for intermittently causing the separation of the feed rollers, the raising of the gate-gage and the separation of the paste rollers, although it is not to be understood that the invention is limited to a machine necessarily comprising, at once, all of the devices or mechanisms aforementioned, for the invention consists in certain various combinations or arrangements of devices and parts and the construction of certain of the devices and parts, all substantially as will be hereinafter fully described and set forth in the claims.

Reference is to be had to the accompanying drawings, in which Figure 1 is a plan view of the improved machine. Fig. 2 is a rear elevation; and Figs. 3 and 4 are elevations at opposite ends of the machine. Fig. 5 is a vertical section of the machine taken from front to rear. Fig. 6 is a front elevation of an upper part of the machine taken just to the rear of the feed table looking rearwardly. Fig. 7 is a sectional view through one of the winding mandrels and the carrier therefor, and a part of the operating mechanism therefor. Fig. 8 is a cross section on line 8—8, Fig. 7. Figs. 9, 10 and 11 are views or diagrams in the nature of vertical cross sections to show the different relative positions of the parts which directly operate upon the sheet of paper to produce the tube at different stages of the tube forming action.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents the feed table at the forward part of the machine located at a convenient height, at the level and to the rear of which are operative surfaces of the feed rolls, 20, 22, the pasting rolls, 23, 24, and the winding mechanism comprising the mandrel, B, or, strictly speaking, as the machine is constructed, the two mandrels which are in axial alignment and arranged and operated for intermittent endwise separation.

Of the two feed rolls, 20, 22, one, 22, is above and the other, 20, below the level of the in-feed of the paper, while the vertically movable gate-gage, D, is next to the rear of these rollers; and the upper feed roll is intermittently vertically movable so that when the gate-gage is in its lowered position, the sheet of paper may be freely slid by hand, so as to "square it" against the gate while the roller is elevated. Then as the gate is raised, to permit the paper to be moved rearwardly, the upper feed roller is brought down to contact with its fellow to insure such feed.

The upper feed roll, 22, has its gudgeons set in the vertically elongated journal socket seen at 27 in Figs. 4 and 5, and its properly timed intermittent movement is effected by means, as follows:—The rotary cam-carrying counter-shaft, E, which is to the rear of the main-shaft, C, has the cam, 30, thereon, against

which impinges one lever arm, 32, of a rock-shaft, 31, while to the other lever arm, 33, of such rock-shaft, is connected the lower end of the thrust-rod, 34, the upper end of which has a lifting engagement with the one end gudgeon of the roller. This cam-actuated mechanism is duplicated for the manifest action at each end of the roll.

The lower feed-roll is grooved circumferentially, as seen at 35, so that the horizontal supporting and guide-rods, 36, may have their positions properly below the plane of the contact between the feed-rolls. The gate-gate, D, is apertured at its lower edge, as seen at 37, most especially in Fig. 6, so that its vertical movements will not be interfered with by said rods which extend rearwardly beyond the gate-gage.

The gate-gage, which moves in slide-ways, 38, therefor at its ends, has its vertical movements intermittently and in proper time imparted thereto by means, as follows:—The horizontal rock-shaft, 40, has duplicated radial arms, 42, which are linked to the end portions of the gate. To another radial arm, 43, of the rock-shaft is attached one end of the connecting rod, 44, which has its other end secured to the lever, 45, which has the operative engagement with the cam, 46. The support and guide-rods, 36, for the rearwardly fed sheet of paper are supported on the horizontal bar, 47; and above these rods, 36, 36, and between the gate and the paste rolls, are a second shorter series of rods, 48, 48, which are supported by the bar, 49. These rods serve to prevent the paper from unduly curling up or wrinkling.

Of the two paste rolls, 23, 24, the lower one rotates with its lower portion in the paste-box, 50, while the upper paste roll has its end gudgeons journaled in boxes, 52, which by the spring, 53, are downwardly pressed. A lever-arm, 54, extended from rock-shaft, 55, projects for a lifting engagement under each upper paste-roll-journal. Said rock-shaft derives its rocking movement periodically by reason of the connection with its lever-arm, 56, of the thrust-rod, 57, which is subject to the action of the cam, 58, which is most clearly seen in Fig. 4, and which has its prominent portion of but slight extent circumferentially so as to only lift the upper paste-roll for a short period of time.

The reason for the lifting of the upper paste-roll which occurs just before the forward edge of the sheet of paper or tube-blank comes to the line of the contacting surfaces of the two rolls, is to avoid the undue accumulation of paste at the "throat" of the rolls, whereby the front edge portion of the paper would receive an excessive amount of the adhesive. Furthermore, the avoidance of the excess of paste at the throat permits the edge of the paper which is usually of reduced thickness to readily pass between the paste rolls. Between the paste rolls and the mandrel are the upper and lower sets of runners

or supports and guide rods, 60, 62, ranging horizontally fore and aft just below and above the level of the feed of the paper, they being supported on the transverse bars, 63, 64, and also between the paste rolls and the mandrel is the series of feed disks or rollers, 65, all on the common shaft which is suitably rotated.

The rotary winding mandrel is formed separable, that is in two lengths, B, B, arranged in a common line with their ends in, or about in, abutment, and adapted to be moved axially away from each other each drawing out from the roll which had been wound thereon. The mandrel sections, B, B, are mounted to rotate and also to slide through bearing supports of the frame of the machine, seen at 66 and 67. One of the bearing supports, 67, for each mandrel section has its journal opening larger than the mandrel for the accommodation of the sleeve, 68, which surrounds such section, so that the sleeve may have its free rotation as imparted thereto by the engagement with the gear-wheel, 69, thereon, of other gearing, as seen in the end elevations, although of course the sleeves surrounding the mandrels may derive their continuous rotary movements in any other manner. Each sleeve, 68, has the internal feather, 70, which engages in the spline-groove, 72, of the mandrel section, B, so that while the section will be continuously rotated by the rotary sleeve, 68, it may have its endwise movements independently of, and without impediment by, such sleeve.

The means here shown for imparting the endwise movement to the mandrel sections to periodically draw them endwise apart and then return them to endwise contact, or proximity, consists, as to each mandrel, of parts and arrangements as follows: The screw-threaded outer extremity of the mandrel-section is passed loosely through the opening, 73 (Fig. 7) in the upstanding member, 74, of a rack-bar, 75, which has slide bearing supports horizontally in ways, 76, of the machine-frame, below and parallel with the mandrel. The nuts, 77, 77, screw onto the said threaded portion of the mandrel at each side of the upstanding member, 74, of the rack-bar, so that, while the mandrel is free to rotate independently of the member, 74, when the rack-bar moves endwise, the mandrel must correspondingly move. The lever, 78, corresponding to each mandrel, has a lower portion thereof pivoted on the framing at 79, and has its upper extremity formed into the sector-gear, 80, which engages the rack-bar. Both of these sector-provided levers receive their simultaneous movements thus, reference being particularly had to Fig. 2. The bar, or rod, 82, has one end secured to one of the levers, 78, and receives reciprocatory movement by having the roller stud, 83, thereof engaging within the cam-slot, 84, of the disk, or wheel, 85, which receives its continuous rotary motion in any ordinary manner. The one sector-lever, 78, has below its pivot the

extension arm, 86, with which is attached the connecting rod, 87, which at its other end has a connection with the other sector-lever above the pivot thereof. Hence the two sector levers simultaneously have their swinging movements toward and from each other.

Just to the rear, and with its axis a little below the sectional mandrel, B, B, is a roll, G, having longitudinal outstanding flexible blades, 90, 90, which may be of rubber. This bladed roll is journaled in slide blocks, 92, 92, (Fig. 2) movable in ways of the frame, so that the roll may intermittently be brought to lap or impinge against the mandrel, or, rather, against the forward edge of the paper, just as it reaches the mandrel, for the purpose of causing the forward edge of the surface-pasted paper to immediately take its winding engagement with the mandrel. The movements of the carrier slides for this bladed roll are imparted by the attachment to each end of the arbor of the bladed roll of a connecting-rod, 93, each of which is also connected to an arm, 94, of rock-shaft, 95, to another arm, 96, of which rock-shaft is connected the thrust-rod, 97, which derives its reciprocatory movements in the proper time by the cam, 98.

The bladed roll, G, is so speeded that the blades thereof have their revoluble movements faster than the circumferential motion of the mandrel. Hence the paper will be wiped with absolute certainty against the mandrel.

As here shown as a means for effecting the relative speeding of the wiper roll and the mandrel, specified, the counter-shaft, C², is driven by belt and pulley from the main shaft, C. Now the mandrel has imparted thereto its given rotation at the proper rapidity by the pulley, B², on the counter-shaft, C², the belt, B³, passing around said pulley, B², and around the pulley, B⁴, on the shaft, B⁵, which has thereon the gear-wheel, B⁶, that meshes into the pinion, B⁷, on the mandrel. The bladed roll or wiper, G, has on its end the small pulley, G²; and the counter-shaft, C², has thereon the much larger pulley, G³, around both of which pass the driving band, G⁴. Therefore it will be plain that as the diameter of the pulley, G³, is so much greater than that of the one, G², and so proportionately greater than the diameter of gear-wheel, B⁴, relative to pinion, B⁷, on the mandrel, that the greater rapidity of speeding of the wiper is required. This result may of course be insured by divers other mechanical means which would not be matters of invention, but of ordinary mechanical expedients.

About simultaneously with the coaction with the mandrel of the bladed roll, G, the presser and scraper-bar or blade, 100, is moved to contact against the convolutions of the paper as they are being wound to insure firmness and closeness of winding, and also the removal of excessive quantities of paste. This presser and scraper blade is carried by a bar, 102, which is arranged to have sliding

movements transversely of its length diagonally, rearwardly and upwardly above and relative to the paste-box, 50.

103 represents the slide-ways for the bar, 100, and the bar derives its movements of presentation against, and withdrawal from, the mandrel by reason of the link-connection therewith of the arm, 104, of the rock-shaft, 105, which is operated by the thrust-rod, 106, which latter receives its impulse from the cam, 107. By reason of the position and inclination of the said presser and scraper-bar, 100, relative to the paste-box any excess of paste of which the paper tube is relieved runs back into the paste-box.

The operation and effect of the machine is rendered manifest in and by the descriptions and explanations hereinabove given, and are rendered still clearer by reason of the drawings on Sheet 7, in which—

Fig. 9 shows, while one paper blank is being wound on the mandrel with the blade-roll, G, and the scraper in operative proximity thereto, the paste-rolls, 23, 24, are running in peripheral contact whereby the upper roller also receives its coating of paste from the lower roll, the gage-gate is in its lower position so that the next paper blank may be squared, and at this time the upper feed roll, 22, is lifted so that the paper may be properly squared against the gate.

Fig. 10 shows the relative positions of the parts when the sections of the mandrel are separated to insure the discharge of the completed tube,—the bladed-roll and scraper, 100, being carried out of their positions for contact with the mandrel, and the gate-gage is raised, the upper feed-roll, 22, is lowered to feed the paper-blank to and between the gum rolls, the upper one of which, just as the forward edge of the blank comes thereunder, is also raised,—such upper gum roll descending, however, immediately the edge of the blank has fairly come under its lower central portion so that the extreme edge of such blank receives paste as well as all the rest of the superficial area of both sides thereof.

Fig. 11 shows the substitution for the bladed upper roll, G, of a brush-roll, G², which may perform the same function.

In practice, the distance between the paste-rolls and winding mandrel is somewhat less than the width of the blank from which the tube is to be formed. Therefore the paper which has been squarely fed between the paste-rolls has a portion thereof still between such rolls at and somewhat after the instant that the forward edge of the paper is wiped to its engagement on the winding mandrel.

It will be seen, on reference to Fig. 7, that one of the mandrel sections, B, has the passage, 71, from its inner end leading longitudinally therethrough for a distance greater than the length of the portion of the mandrel which is to be surrounded by the tube; and this passage has communication with the exterior of the mandrel as by leading to the

spline-groove, 72. Therefore, as the mandrels separate for their withdrawal from the completed tube no vacuum will be produced within the tube to collapse it, or to cause it to unduly adhere upon the mandrel.

It will be here mentioned that in the event of the paper tube having a tendency to remain on the one mandrel section while the other is withdrawn therefrom, it will, by having its end brought against the bearing support, 66, be prevented from moving endwise with the first mandrel section, so that the latter may also be drawn out therefrom.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for making paper tubes, the combination with a rotary winding mandrel, of a rotary wiper having applied thereto, means for positively imparting a speed which is circumferentially different from that of the mandrel, and means for imparting, periodically, a reciprocatory movement to the rotary wiper, transversely of the length thereof and of the mandrel, substantially as described.

2. In a paper tube machine in combination, a pair of feed rolls, a gage-gate to the rear thereof, the paste rolls and a rotary winding mandrel, and means for periodically lifting one of the feed rolls from its fellow and permitting it to return and means for lifting the gate on such return of the feed roll, substantially as described.

3. In a paper tube machine, the combination with the winding mandrel, the paste box, the paste rolls and feeding mechanism for carrying the paper to the mandrel, of the pressure and scraper blade, 100, having a position to bear against the paper being wound on the mandrel and arranged above and with a downward inclination toward the paste-box, substantially as and for the purposes set forth.

4. In a paper tube machine, the combination with the winding mandrel and pairs of feed and paste rolls, for running the paper toward the mandrel, the lower one of the feed-rolls being circumferentially grooved, the horizontal rods extending fore-and-aft in a plane below the level of the contacting surfaces of said rolls, and having their forward extremities lying within the said peripheral grooves, the gage-gate between the feed and paste rolls, adapted to be raised and lowered and having its lower edge apertured to accommodate said rods, and means for intermittently operating the gate, substantially as described.

5. In a paper tube machine, the combina-

tion with a rotary winding mandrel of the rotary wiper roll, slide supports in which it is journaled, a rotary cam and a medium of connection between the cam and said slide-supported wiper-roll for imparting intermittently thereto its movements sidewise toward and then away from the mandrel, substantially as described.

6. In a paper-tube machine, in combination, a winding mandrel and a pair of rotary feed-rolls for feeding the paper toward the mandrel, the upper one of which is journaled for vertical movements away from and toward its fellow, a gage-gate to the rear of the feed roll, and means for intermittently raising it, and the duplicated mechanism consisting of the cam, 30, the rock-shaft, 31, with the lever arms, 32 and 33, and the thrust-rod connected to said lever, 33, and having a lifting engagement with one of the journals of the said movably mounted feed roll, substantially as described.

7. In a paper tube machine, the combination with a winding-mandrel, and feed and paste rolls, the upper one of the feed rolls being vertically movable and means for intermittently vertically moving it,—of the vertically movable gage-gate between the feed and paste rolls, the rock-shaft, 40, having the lever arm connected to the gate, and having the arm, 43, the thrust-rod, 44, connected to the latter arm and a cam, 46, for impelling said thrust-rod, substantially as described.

8. In a paper tube machine, the combination with a winding mandrel and the two paste rolls, for the upper one of which are provided vertically movable journals, of the rock-shaft, 55, having the lever-arms which have a lifting engagement with said paste roll journals, the lever-arm, 56, projecting from said rock-shaft, the cam, 58, and the thrust-rod, 57, operated by the said cam and engaging the said rock-shaft-arm, 56, substantially as described.

9. In a paper tube machine, the combination with a winding mandrel, and a pair of paste-rolls, of a presser and scraper blade and a carrier therefor which has movements toward and from the mandrel, the rock-shaft, 105, provided with the lever arm, 104, which is linked to said blade-carrier, the cam, 107, and thrust-rod, 106, operated thereby and connected to the said arm, 104, substantially as described.

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