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Tube-Machines.

No. 196,853. Patented Nov. 6, 1877.

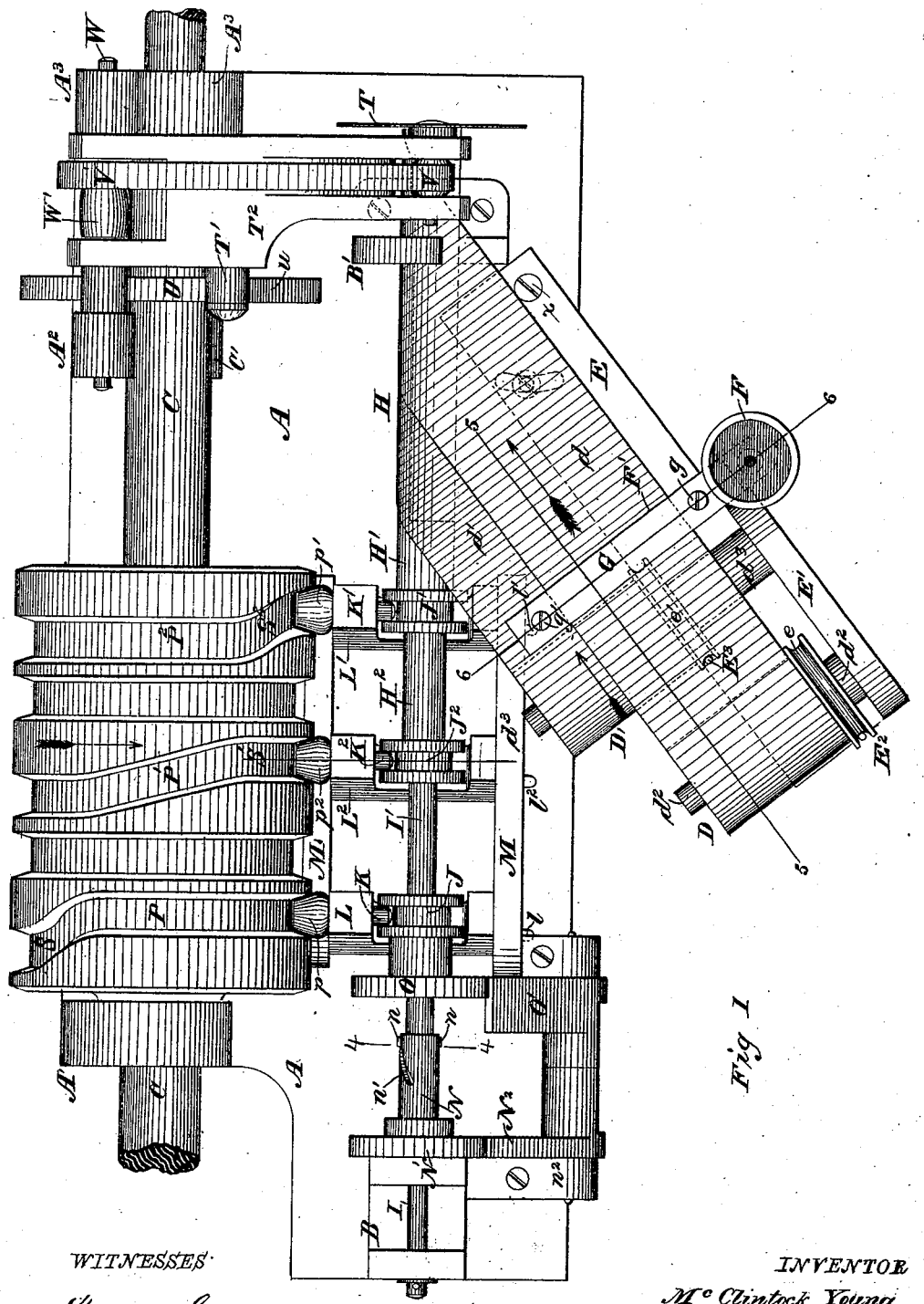

Fig 1

WITNESSES:

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Geo. W. Breck.

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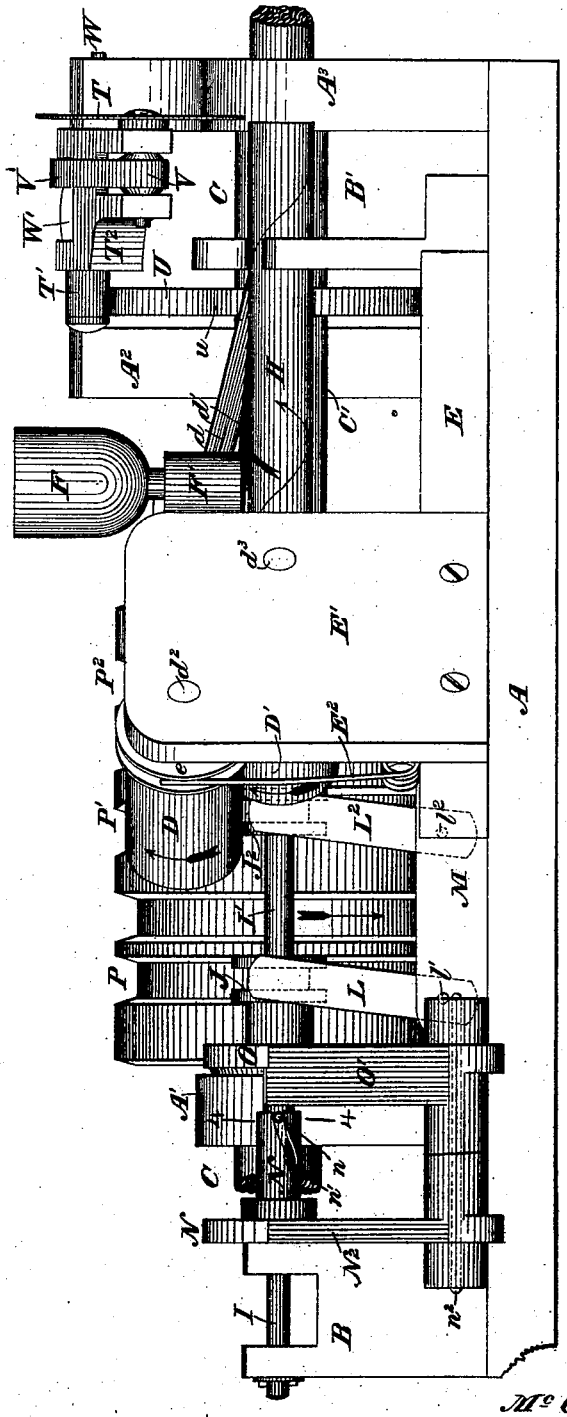

Fig 2

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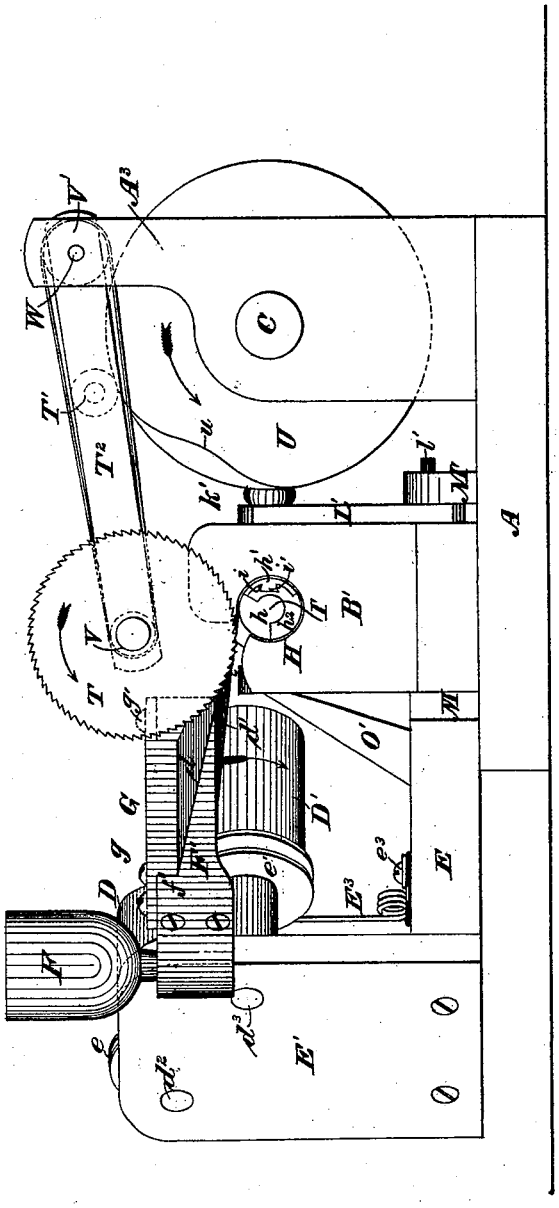
Fig 3



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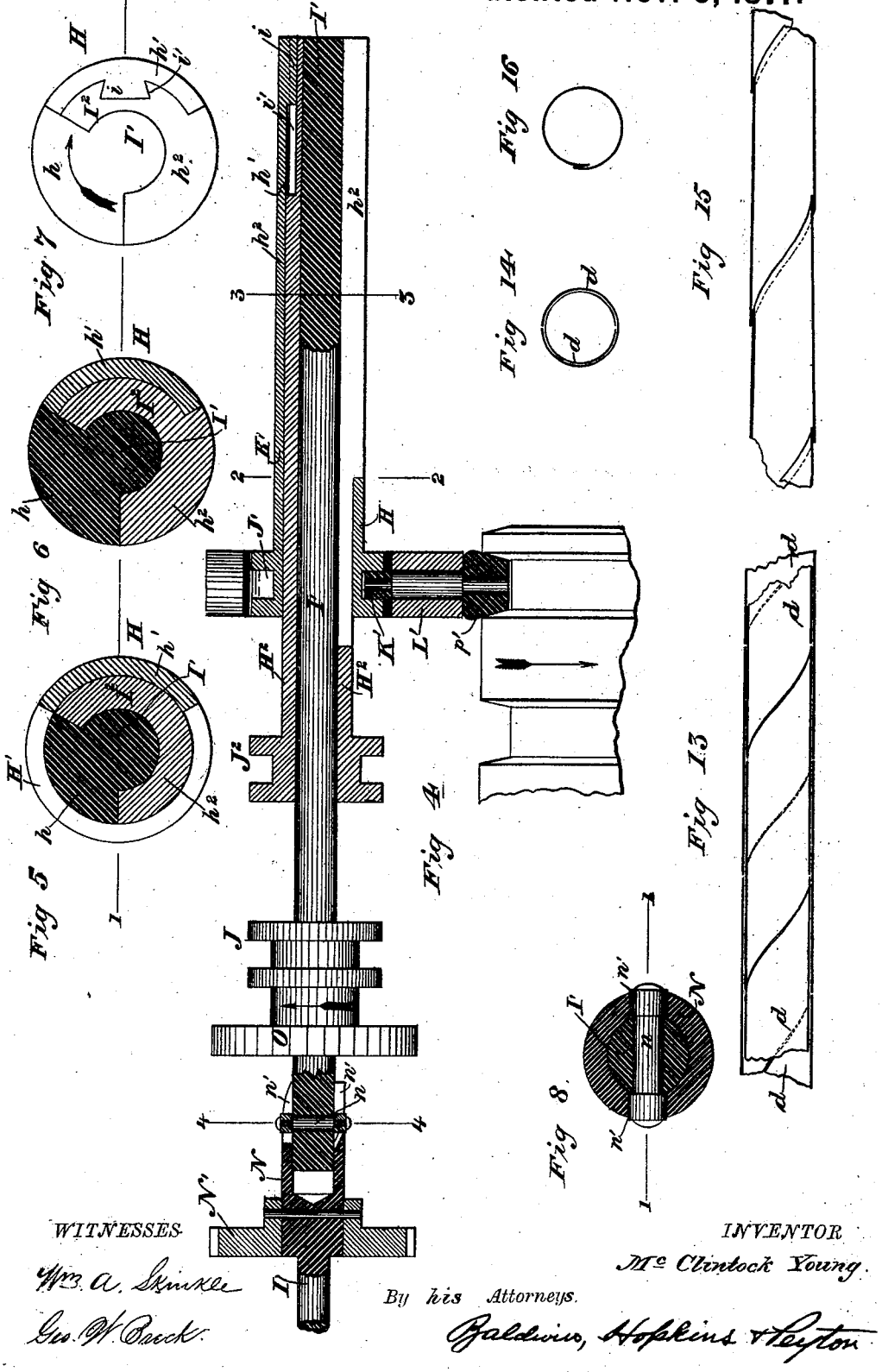

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Tube-Machines.

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Fig 9.

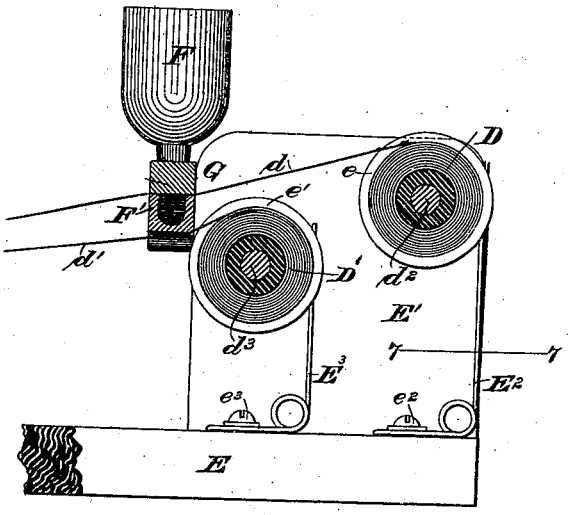


Fig 10.

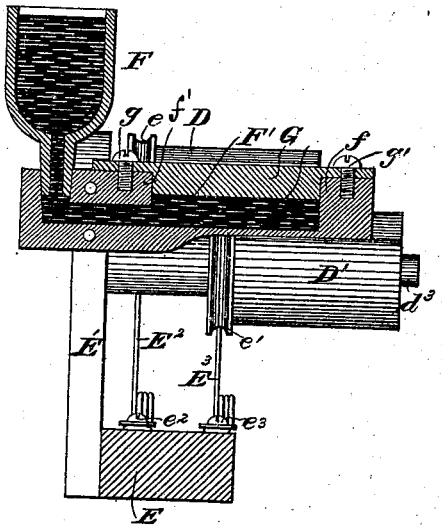


Fig 11

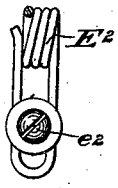
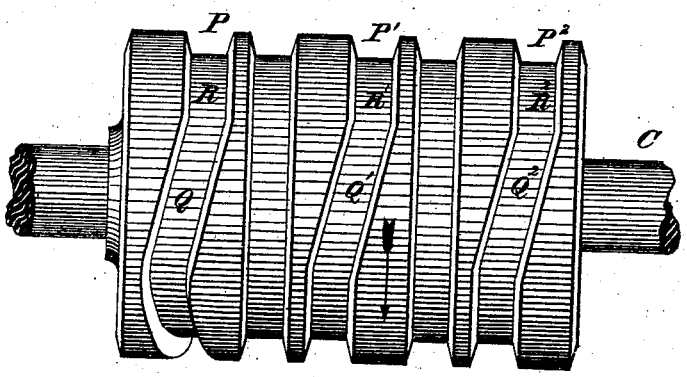


Fig 12.



WITNESSES

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UNITED STATES PATENT OFFICE.

McCLINTOCK YOUNG, OF FREDERICK, MARYLAND.

IMPROVEMENT IN TUBE-MACHINES.

Specification forming part of Letters Patent No. **196,853**, dated November 6, 1877; application filed May 18, 1877.

To all whom it may concern:

Be it known that I, McCLINTOCK YOUNG, of Frederick, in the county of Frederick and State of Maryland, have invented certain new and useful Improvements in Manufacturing Paper Tubes, of which the following is a specification:

The object of my invention, mainly, is to manufacture tubes from a strip or strips of paper by one continuous connected operation; and, further, to sever the tube into blanks of lengths suitable for boxes by automatically-operating mechanism.

My invention consists in a novel organization of mechanism, and in certain constructions of parts and combinations of devices, which will hereinafter specifically be designated.

In the accompanying drawings I have shown all my improvements as embodied in the best way now known to me. Obviously, however, some of the parts may be used without the others, and in machines differing somewhat from the one therein shown and herein described.

The details of construction of portions of the mechanism for carrying out my invention may be varied in some respects without departing from the spirit of my invention, which variations would be readily suggested to skillful mechanics, or those skilled in the art to which my invention pertains, simply by reading this specification and examining the drawings, in which—

Figure 1 is a plan or top view with the cam-drum in the position assumed just previous to the time of retracting the mandrel-section first withdrawn; Fig. 2, a side elevation with the cam-drum in the same position; Fig. 3, an elevation of the delivery end of the machine, or that at which the tube is severed into blanks, showing the cutter as just having been elevated. Fig. 4 is a view of portions of the machine on a slightly-enlarged scale, partly in plan and partly in section, on the lines 1 1 of Figs. 5, 6, 7, and 8, which figures are on an enlarged scale, the mandrel being represented as in the advanced position. Fig. 5 is a transverse section on the line 2 2 of Fig. 4; Fig. 6, a similar section on the line 3 3 of Fig. 4; Fig. 7, an end view of the mandrel; Fig. 8, a transverse section on the lines 4 4 of Figs. 1, 2, and 4. Fig. 9 is a section on the line 5 5 of Fig. 1. Fig. 10 is a section on the line 6 6 of Fig. 1. Fig. 11 is a view, partly in plan and partly in section, on the line 7 7 of Fig. 9, showing the adjustable tension-spring for one of the paper-rolls. Fig. 12 is an elevation of the three-track cam drum or roller, showing it on that portion of its revolution during which the cam-grooves are acting together to advance the mandrel. Fig. 13 shows a portion of a tube composed of two strips coiled concentrically, the edges of each strip abutting to make smooth, close joints; Fig. 14, a transverse section of Fig. 13. Fig. 15 is a longitudinal view of a section of tube composed of a single strip, with lapping edges; and Fig. 16, a transverse section therethrough.

The mechanism is mounted in a strong frame, preferably of metal, in this instance composed of a base-plate, A, uprights A^1, A^2, A^3, B, and B′. A main shaft or cam-shaft, C, is mounted in suitable bearings in the uprights A^1 A^3. This shaft is also shown as supported in a recess or half-box bearing, C′, in the upright A^2, and other supports may be provided. Cams on this shaft operate a reciprocating mandrel, as will hereinafter be explained.

Rollers D and D′, each having a web or strip of paper, d d^1, wound upon it, are loosely mounted in a frame at the side of the base-plate or before-described frame for supporting the operating mechanism. This auxiliary or roller-carrying frame is preferably constructed, as shown, of a horizontal base-bar, E, detachably secured at its inner end to the base-plate A, and projecting therefrom at an acute angle therewith, and an upright, E^1, parallel with this bar E. Overhanging shafts d^2 d^3, secured to this upright, support the spools or rollers D D′. Pulleys or grooved collars e e^1 on the inner ends of the rollers are engaged by the upper ends of adjustable tension-springs E^2 E^3. At their lower ends these springs are horizontally bent or forked and coiled, as clearly shown in the drawings. Set-screws e^2 e^3 and washers, or, if preferred, simple pinch-screws, serve to hold the springs in any position in which they may be adjusted. By loosening the screws and sliding the springs on the base E of the roller-frame, and then tightening the screws, the degree of force with which the

upper ends of the springs bear against the rollers may be increased or diminished at will, and the tension on the paper as it is drawn from the rolls varied as desired. The paper-roller D is mounted slightly above and behind the roller D′, and is preferably so located relatively thereto that one edge of the paper drawn from the rear roll laps just half-way across the strip wound upon and fed from the lower or front roll; or, in other words, the strips wound on the two rollers are of equal width, and the outer end of the rear roll comes opposite the center of the front roll of paper.

When the tube is formed of two strips of paper fed from the rollers D D′, in the manner described, the entire under surface of the strip drawn from the rear roller is gummed or pasted by suitable liquid gum or paste—such, for instance, as gum-arabic. The gum is supplied from a reservoir, F, on the roller-frame, through an opening or tubular shank at its bottom, to a trough or channel, F′, projecting from the upright support E¹, parallel with the shaft d^2 of the roller D.

The paper passes over the top of the paste-trough, and is drawn along with its edges close to or in contact with the end f and the downward projection or guide-flange f'. (See Fig. 10.) Obviously, the outer end f or the flange f' might be made adjustable, to adapt the pasting device to different widths of paper by increasing or lessening the length of the way for the paper over the trough. A detachable and adjustable cap bar or cover, G, is provided for the paste-channel. The paper passes between this cover and the channel, and the degree of pressure upon the paper may be varied by means of screws g g', or other equivalent securing devices.

By causing the cover to bear hard upon the paper there is but a slight coating of paste allowed to adhere to its under surface, while by decreasing the pressure, by slightly loosening the screws, a thicker coating is given. By removing the cover access may be had to the interior of the trough.

By the means described, the supply of gum to the paper may be varied to a considerable extent, for the cap-bar may be caused to bear with any amount of pressure upon the paper, between a degree of pressure so great as to prevent the drawing forward of the strip and that degree of pressure which would allow the paste to ooze out beneath the paper and be wasted by not adhering thereto.

The paper strips are formed into tubes by a longitudinally-reciprocating and intermittently-rotating mandrel, H, shown as composed of longitudinal sections h h^1 h^2, which are caused to advance simultaneously, and at the same time make a partial revolution to draw forward and spirally wind the paper, and then retract separately and successively, without rotating. By this manner of drawing back the mandrel, part at a time, for a new forward movement, all tendency to give a retrograde movement to the tube is overcome, and the necessity of employing clamps, nippers, or pressure-rolls is avoided, as there is at all times during the backward stroke of the mandrel a stationary surface thereof in contact with the tube of larger area than that portion being retracted.

The mandrel is supported near its forward end in the upright B′, and at its rear end in the upright B, by means of an extension or shaft, I, in line with the mandrel, and with which it is coupled, as will hereinafter be explained.

In the drawings the mandrel is shown as of a length barely sufficient to give one complete turn to the paper about it by the time it reaches its outer end; but, in practice, this mandrel is made much longer, preferably from eight to ten feet, thus giving ample time for the gum to set or become sufficiently dry; and when the mandrel is so lengthened, one or more additional uprights, like that B′, may be provided to steady and support it, as well as aid in preserving the form of the tube while the paste is wet. The mandrel H, in this instance, is constructed and operated in the following manner: Its surface, as before described, is made up of three equal or nearly equal longitudinal sections, h h^1 h^2. This surface division extends from a point in rear of that at which the paper is first received to its forward end. The section h is formed with or securely attached to a core or central bar, I¹, the section h^1 is formed with or secured at its rear end to a roller or sleeve, H¹, and the section h^2, in like manner, terminates at its rear in a sleeve or tubular collar, H¹, enveloping the core I¹, and in turn surrounded by the sleeve H¹. By means of this telescopic-slide connection between the sections, they may be moved independently of each other to draw back the mandrel piece by piece. To prevent any possibility of the sections spreading or separating laterally, and thus varying the size of the mandrel, the section h^2 is made to embrace the core I¹ by a shell, I², which about two-thirds envelops the core, and is thus braced against lateral movement, and the section h^1 is held properly in place by means of a dovetail-slide connection with the section h^2, the connection being made by a rib or tenon, i, on the inner surface of the section h^2, working in a corresponding groove or mortise, i', in the inner shell I².

The core or central bar I¹, carrying the section h, is rigidly connected, near its rear end, with an annularly-grooved wheel or doubly-flanged collar, J. The sleeve H² at the rear end of the section h^2 is in like manner provided with a collar, J², and the sleeve H¹ of the remaining section h^1 has a similar collar, J¹, attached to it. Pins or roller-studs K K¹ K² project into the grooves of the collars J J¹ J², and are carried by a series of rocking arms or oscillating frames, L L¹ L², which are independently pivoted at the lower ends, by rods l l^1 l^2, to lugs or ribs M M′ on the base-plate A,

or otherwise suitably hinged to the frame so as to be capable of rocking vertically independently of each other. A series of cams or a three-track cam-drum fast on the main shaft C rock these frames to impart the desired movements to the mandrel H. The frames have their forward movement imparted to them simultaneously, and are in turn moved backward, to withdraw the mandrel-sections, successively, by the independent action of the series of cams. On the forward movement of the mandrel, a partial rotation is imparted to it (all the sections caused to turn together by reason of their abutting edges) by means of a pin or roller-stud, n, secured to the end of the core I^1, and engaging with a spiral slot, n^1, in a hollow shaft or sleeve, N, rigidly connected with or forming part of the shaft I, before mentioned. This tubular shaft N is held stationary during the advance of the mandrel, and prevented from rotating in the wrong direction, by a ratchet-wheel, N^1, and pawl N^2, pivoted at n^2 to the frame or base-plate in suitable manner. This pawl is kept in contact with the ratchet by its weight alone; but a spring may be employed, if desired. To prevent accidental rotation of the mandrel in the wrong direction, and guard against its revolving on the backward movement, a ratchet-wheel, O, is fastened on the central bar I^1, and engaged by a broad-faced pawl, O′, which admits of the reciprocation of the mandrel without clearing the wheel from the pawl, as well as allows the mandrel freely to be revolved in the proper direction. The same pivot, n^2, as that by which the pawl N^2 is hinged to the frame serves also to support this pawl O′. It will be seen that on the advance of the mandrel the sleeve N is held from rotating by its pawl, and the mandrel forced to revolve, while on the return stroke the sleeve revolves, and the mandrel is prevented from turning. By increasing or lessening the length of the slot n^1, and giving a longer or shorter stroke to the mandrel, or by giving a greater or less pitch to this slot, the amount of turn given to the mandrel may be increased or diminished at will, as is well understood. The pivoted frames L L^1 L^2 carry rollers p p^1 p^2, respectively, which project into the tracks or grooves P P^1 P^2 of the cam-drum on the driving-shaft C. A corresponding portion, Q Q^1 Q^2, of each groove is formed alike to operate on the rollers of the respective frames, to advance the mandrel-sections together. When thus advanced, the straight parts R R^1 R^2 of the grooves come in contact with the rollers simultaneously, and hold the mandrel stationary in its advanced position for a short while. At this moment a cutter severs from the tube that portion of its length projecting beyond the mandrel, as will presently be explained. Next, the inclined portion S^2 of the track P^2 acts on the roller p^1, vibrates the frame L^1 backward, and retracts the section h^1; next, the corresponding portion S^1 of the track P^1 comes in contact with the roller of the frame L^2, and withdraws the section h^2; and, finally, a like portion, S, of the cam P runs on the roller p, and moves back the section h, thus completing the backward reciprocation of the mandrel, and leaving it ready to be again advanced, as described, to repeat its reciprocation. The blanks are severed from the tube by a cutter, T, (shown as composed of a circular saw or toothed disk,) which is thrown into operation at the proper time—that is, when the mandrel is advanced so as to cut close to its end, and prevent injury to the tube. When the cut-away or recessed part u of a cam, U, on the shaft C comes in contact with a roller, T^1, on the saw-frame T^2, the weight of the frame causes it to descend and bring the saw to the tube advanced from the mandrel. The frame is held elevated while the roller moves in contact with the regular surface of the cam. The cutter is rapidly rotated by a belt passing around a pulley, V, on the saw-arbor, and around a corresponding pulley, V′, on the shaft W, on which the cutter-frame rocks. A pulley, W^4, on this shaft is driven by a belt passing from the driving-shaft, or driven in any other suitable way.

The operation of my machine will readily be seen from the foregoing description, it being understood that the main shaft is revolved by power applied in any of the usual ways. As described, by my improvements a tube is automatically formed and severed into lengths suitable for box-blanks from two strips of paper passing to the mandrel at an acute angle therewith, and drawn forward and wound thereon in such manner that the edges of each strip abut but do not overlap, the top strip being caused to adhere throughout its entire under surface to the inner strip, and thus form tubes of a double thickness of paper, with smooth, close joints. It is obvious, however, that by changing the location of the paper-carrying frame relatively to that of the mandrel the strips might be caused to lap at their edges, and this lap be increased to any desired extent, simply by adjusting the paper-carrying frame or roller to a position which will cause the paper to be presented to the mandrel more nearly at a right angle therewith. It is also manifest that a tube may be made up of a single strip of paper by applying the paste to the under side of the overlapping front edge of the strip. Obviously the paste-trough may be lessened in length to so apply the paste.

Three or even more strips may be wound upon the mandrel together, and paste applied to the under surface of all except the inner one, to make very strong tubes; or a series of strips, each pasted upon itself at its overlapping edges, with or without uniting layers of paste between the different tubes, may be made.

The angle formed by the paper-carrying or roller frame and the mandrel may readily be changed by means of a slot and set-screw, as shown in dotted lines in Fig. 1, the pin or

screw x (shown in full lines in said figure) serving as a center around which to adjust the frame.

A second mandrel may be operated by the same set of cams to form a second series of blanks of the same size as, or of a different size from, those made by the mandrel described; or blanks to form covers for the boxes may be so made.

Bottoms may be inserted in the box-blanks in the manner shown and described in Letters Patent of the United States granted me June 6, 1876, No. 178,499.

The form of the mandrel may be changed so as to make square or other shaped blanks, and the blanks may be used for making bags as well as boxes.

Should it be desired to make tubes of a square, oval, or other than round shape in cross-section, a rotating bearing should be employed, having an opening for the mandrel corresponding in shape with it, and large enough to admit of the reciprocation of the mandrel with the tube around it, and be provided with a circular groove or flange to adapt it to rotate and properly support the mandrel in the upright B′.

The mandrel-core or center bar obviously may be made tubular, thus rendering it lighter and stiffer, and admitting of a current of heated air or steam being passed through it to heat the mandrel and aid in drying or setting the paste.

I claim as my invention—

1. The reciprocating intermittently-rotating mandrel, to which the strip is fed at an acute angle, and by which it is wound spirally, substantially as hereinbefore set forth.

2. The combination, substantially as hereinbefore set forth, of a paper-carrying roller, a mandrel upon which the paper strip is wound, and to which it passes at an acute angle therewith, and a paste-reservoir intermediate the roller and mandrel, whereby a spiral tube is formed and its coils united.

3. The combination, substantially as hereinbefore set forth, of a mandrel for spirally winding the paper, two paper-carrying rollers, from each of which the strip of paper passes to the mandrel at an acute angle therewith, and a paste-reservoir for supplying paste to the paper on the way to the mandrel, whereby a tube of double thickness is formed and its coils united.

4. The combination of the two paper-carrying rollers, arranged relatively to each other, so that the strip fed from one roller half-way overlaps that drawn from the other, a pasting device for supplying paste to the inner surface of one of the strips, and a mandrel to which both strips pass at an acute angle, these members being constructed and operating substantially as hereinbefore set forth, whereby two united tubes are formed, each with abutting edges and close joints.

5. The combination, substantially as hereinbefore set forth, of the paste-trough over which, and in contact with the paste therein, the paper strip is drawn, and the cap bar or cover, under which the paper passes, adjustably secured in position, whereby more or less paste may be caused to adhere to the paper, as set forth.

6. The combination, substantially as hereinbefore set forth, of an intermittently-rotating mandrel, having an endwise to-and-fro motion imparted to it at intervals, a roll or rolls from which the paper is fed to and spirally wound upon the mandrel, and a cutter for severing blanks from the tube.

7. The combination of the grooved roller, the coiled tension-spring, bent or forked at its lower end, and the set-screw to both hold and adjust the spring, these members being constructed and operating substantially as hereinbefore set forth.

8. The mandrel composed of longitudinal sections, reciprocated to advance and turn the sections together, and then retract them, one at a time, by mechanism substantially such as described, whereby a retrograde movement of the tube on the mandrel is avoided.

9. The combination, substantially as hereinbefore set forth, of the long core or center bar, to which one section of the mandrel is secured, a sleeve sliding on said core, and carrying another section of the mandrel, and a second sleeve sliding over the first, and carrying the remaining mandrel-section.

10. The combination of the series of cams, the mandrel-sections, their collars, the rocking frames engaging with the collars, and rollers carried by the frames and engaging the cams, these members being constructed and operating substantially as hereinbefore set forth.

11. The combination of the sectional mandrel, the center bar thereof, its ratchet-wheel and pawl, the pin in the bar end, the tubular slotted shaft and its detent, these members being constructed and operating substantially as hereinbefore set forth.

In testimony whereof I have hereunto subscribed my name.

McCLINTOCK YOUNG.

Witnesses:

A. M. JOHNSON,

HELM YOUNG.