2 Sheets—Sheet 1.

C. B. STILWELL.

Paper-Tube Machine.

No. 206,637. **Patented July 30, 1878.**

Fig 1.

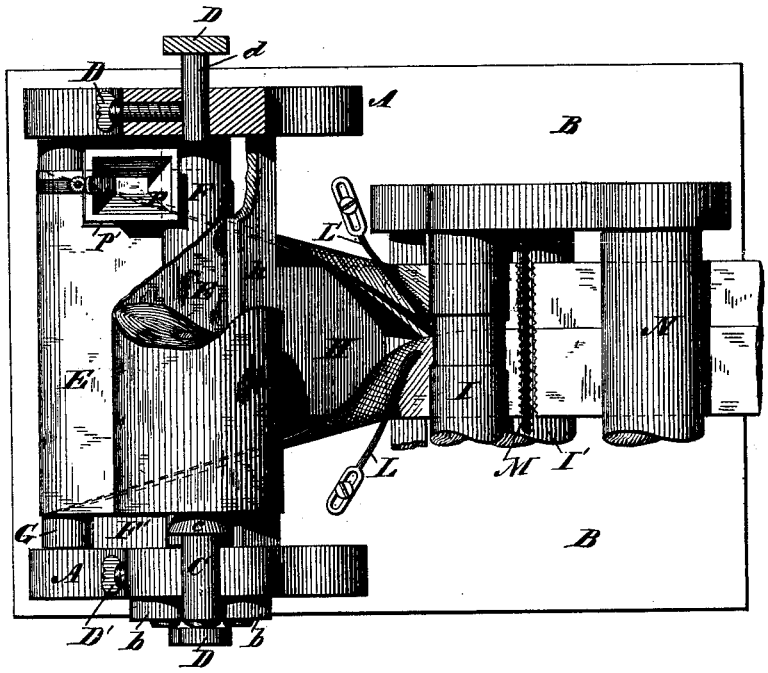


Fig 4.

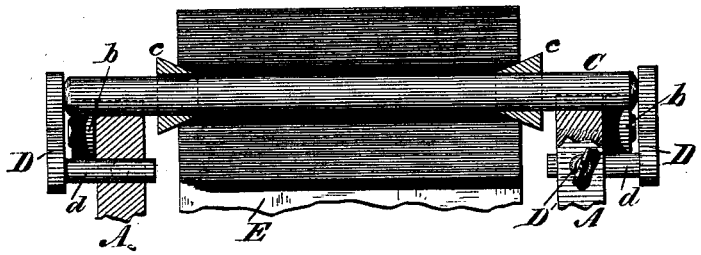
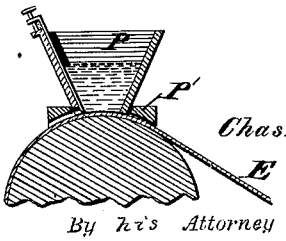


Fig 6.



WITNESSES

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2 Sheets—Sheet 2.

C. B. STILWELL.

Paper-Tube Machine.

No. 206,637. **Patented July 30, 1878.**

Fig 2

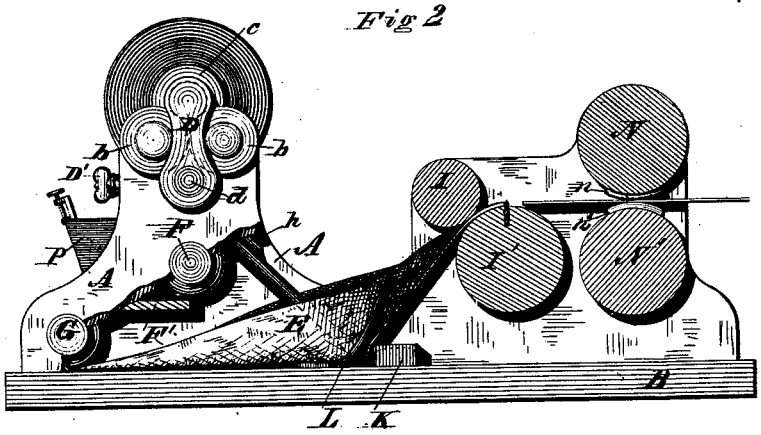


Fig 3.

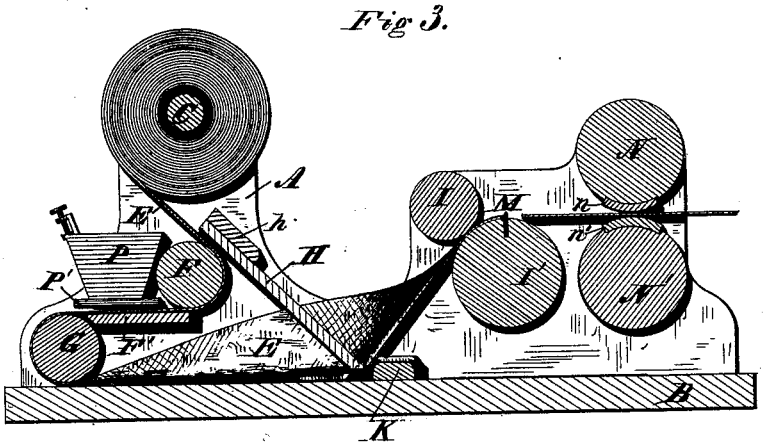
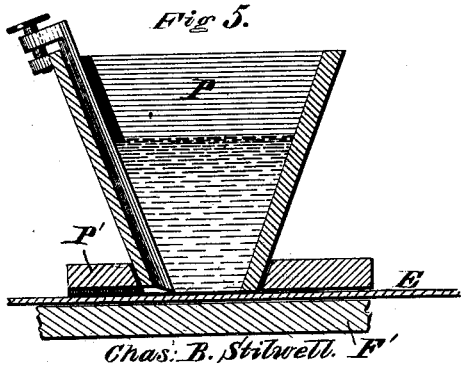


Fig 5.



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UNITED STATES PATENT OFFICE.

CHARLES B. STILWELL, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO ALFRED ADAMS, OF CLEVELAND, OHIO, AND B. B. TAGGART, OF WATERTOWN, NEW YORK.

IMPROVEMENT IN PAPER-TUBE MACHINES.

Specification forming part of Letters Patent No. **206,637**, dated July 30, 1878; application filed May 3, 1875.

To all whom it may concern:

Be it known that I, CHARLES B. STILWELL, of the city and county of Worcester, in the State of Massachusetts, have invented certain new and useful Improvements in Machinery for Making Paper Tubes, of which the following is a specification:

My invention relates to mechanism by which a web or strip of paper is fed continuously from a roll past a pasting device, which applies the paste in a continuous line to one side of the paper, near its edge, then under a depressing plate or shoe, and then between actuating compressing-rolls, the effect of the conjoint operation of said shoe and rolls being such, when the end of the strip is once folded into a tube, as to form a flattened tube of uniform width simply by the strain upon the paper as it is drawn through the machine, and by which the formed tube may be severed into blanks.

The objects of my invention are to provide simple and positive means for changing, within narrow limits, the strip of paper into a flattened tube of uniform width; to provide simple and positively-acting pasting and folding devices; to provide simple and positive mechanism for severing the tube into desired lengths.

The subject-matter claimed is hereinafter specifically designated.

The accompanying drawings illustrate all my improvements as embodied in one machine in the best way now known to me. Obviously, however, some of the improvements therein shown and herein described may be used without the others, and, in machines differing somewhat in construction, without departing from the spirit of my invention.

Figure 1 represents a plan or top view of so much of my improved apparatus as is necessary to illustrate the subject-matter herein claimed, with a portion of the mechanism broken away to show other portions more clearly. Fig. 2 represents a side view of the same, partly in section. Fig. 3 represents a vertical longitudinal section through the apparatus; Fig. 4, a vertical transverse section, showing the details of the paper-roll-adjusting mechanism; Fig. 5, a vertical section through the pasting apparatus; Fig. 6, a modification thereof, showing the paste-reservoir as having its base conformed to the curved surface of the tension-roller instead of being flat.

Supports A A, mounted upon a bed-plate, B, carry friction-rollers *b b b b*, which support a shaft, C. This shaft is provided with cones *c c*, for securing the roll of paper thereon in a well-known way. The roll being mounted, the shaft is laid in its bearings upon the friction-rollers *b b b b*, where it is adjusted so as to bring the paper roll in the proper position, centrally between the uprights A A, in which place it is retained by adjustable stops D D, against which the ends of the shaft C abut, the stops being provided with arms *d d*, sliding in openings in the uprights, and held in the desired position by means of set-screws D′ D′.

I have found the above-described apparatus to work well in practice; but other well known equivalent devices might be used with good effect.

The strip of paper E is, by preference, passed down under a tension bar or roller, F, over a horizontal plate, F′, and around a bar or roller, G, whence it passes to a depressing shoe or plate, H, in this instance made of one solid flat rectangular piece, projecting downward at an angle from its supporting-piece *h*, secured between the uprights A A. The paper is carried under the lower edge of this plate, which is of a width corresponding to that of the tube to be made, and presents to the strip a square-cornered or sharp-edged surface, and thence upward to actuating or feed rolls I I′. Before it enters between these rolls the sides or edges of the paper are folded inward upon the central portion of the strip so as slightly to lap each other.

It will be noticed that while the central portion of the strip travels from the roll G to the feed-rolls by an indirect path formed by two straight lines, making a sharp obtuse angle at the point where it comes in contact with the lower edge of the depressing-shoe, the edges of the strip are drawn from the roll G to the feed-rolls in a much more direct line. The dis-

tance, therefore, traveled by the edges, being less than that traversed by the body or central portion of the strip, allows the slack thus formed in the edges of the paper naturally to assume the desired form.

While, however, the extreme edges of the paper are thus gradually turned upward and inward between the roll G and the feed-rollers, the paper which forms the edges of the tube is abruptly folded into a flattened condition at the lower corners of the shoe simply by the strain on the paper at these points, as it is continuously drawn underneath and around the shoe. In this instance, the strip of paper is shown as deflected, after leaving the shoe, at an angle of forty-five degrees from its previous line of travel. By deflecting it at this angle, and bending it sharply, as I do, at the lower corners of the shoe, I am enabled not only to dispense with the former heretofore employed, but to complete the tube within a much shorter space than has heretofore been practicable, said distance, from the point where the paper begins to bend to the point where the tube is completed, being only one-third greater than the width of the strip from which the tube is formed.

The angle of deflection of the paper obviously, however, may be varied within certain limits without affecting this mode of operation; and the depressing-shoe might be a mere skeleton frame or a solid block, if desired, the edges alone being the operative part.

To effectually insure a sufficient strain upon the paper at the proper points, I cause it to bear against the corners of the shoe with a pressure greater than that with which it bears against the middle portion of the lower edge of the shoe. The pressure at the corners is produced, in this instance, by means of a friction-bar, K, secured upon the bed-plate, the middle portion of which bar is cut away to allow its end surfaces to bear against the strip, to produce the desired friction on the paper at the corners of the shoe. This friction-bar may be advantageously made adjustable, or in the form of separate independent fingers, acting on the paper at the corners of the shoe.

Instead of the web of paper being fed over tension-rollers, as hereinbefore described, friction might be applied to the paper roll, and the strip of paper allowed to pass directly to the depressing-shoe, and the location of the paste-box correspondingly changed.

A pasting device consisting of a box or reservoir, P, having an opening in its flat base, rests upon the strip of paper near one of its edges, the paper being supported underneath by the flat horizontal plate F′. The paste-reservoir is retained in proper position, in this instance, by an encompassing-frame, P″, near its base, in which it is prevented from lateral displacement.

The paste contained by the reservoir, because of the opening in the base, rests upon the paper, and is applied to it in a continuous line simply by the action of drawing the strip underneath it, the strip of paper virtually forming the bottom or a portion of the bottom of the paste-reservoir. The opening in the base of the reservoir regulates the width of the line of paste, and an adjustable scraper or gate sliding over a feed-orifice regulates the depth of the line of paste; for it will be seen that on all sides of the bottom of the reservoir, except that in which the feed-orifice is made, the escape of paste is prevented by the close adhesion of its flat bottom to the paper.

To guard against accidental derangement of the fold, and avoid the possible failure of the edges to turn inward, fingers L L′, which may be detachably and adjustably secured upon the bed-plate, are employed. These fingers project inwardly and upwardly over the depressing-shoe at an angle of about forty-five degrees, more or less, depending upon the angle of inclination of the folded strip in passing from the shoe to the actuating-rolls, and bear upon the turned edges of the strip between the depressing-shoe and feed-rolls I I′, and not only insure the proper folding of the edges, but the finger L′ also insures the pasted edge of the strip being folded inward upon the central part of the strip beneath the other edge, which folds down upon it just before the tube enters the feeding and compressing rolls.

When it is desired to divide the tube into sections or blanks, the roll I′ is provided with a knife, M, preferably serrated, to puncture or partially sever the tube when the knife, during each revolution of the roll, comes in contact with the tube. The tube passes from the actuating-rolls between drawing-rolls N N′, portions of the surfaces of which are made of a diameter greater than the other parts of the rolls, so as to produce an accelerated movement of the tube when these enlarged portions come in contact with it; and as this contact, under the organization herein shown, takes place just as the knife on one of the actuating-rolls punctures the tube, the portion in advance of the knife is torn away from the portion behind it without strain upon said rear portion, and fed forward with an accelerated velocity, to gain time for subsequent manipulations. In practice I have found this mode of operation to secure uniformity in the lengths of the blanks, as it prevents any tendency to draw the paper through the actuating-rolls, as sometimes occurs with a dull knife located on the drawing-rolls, as heretofore practiced.

I have found in practice simple elastic or yielding pads *n n′* to operate efficiently; and they are much simpler than the well-known accelerated gearing, which might, however, be employed to produce the same result.

The operation of my improved apparatus will be obvious without further description.

By the foregoing description, it will be seen that I am enabled by my improvements to dispense with the pasting rollers, brushes, and tapes heretofore employed, and to apply the paste directly, positively, and accurately to the

strip by the mere passage of the paper across and in direct contact with the mass of paste in the reservoir. I am also enabled to fold the strip accurately, without the use of a former, in less space than has heretofore been required, by the mere drawing action of the paper in passing across a sharp-edged surface; and, finally, to sever the blanks accurately with a dull knife, and without strain upon the tube in the process of formation.

I claim—

1. The combination, substantially as hereinbefore set forth, of the roll or shaft from which the paper is drawn, actuating-rolls or feeding mechanism, and an inclined sharp-edged shoe intermediate the paper roll and feeding mechanism, across the surface of which the strip is drawn and then deflected at an angle of about forty-five degrees from its previous line of travel, whereby the strip is instantly doubled upon itself at the corners of the shoe simply by the strain on the paper.

2. The combination, substantially as hereinbefore set forth, of the roll or shaft from which the paper is drawn, the pasting device, the feeding mechanism, and the inclined sharp-edged shoe intermediate the pasting device and feeding mechanism, across the surface of which shoe the strip is drawn and then deflected at an angle of about forty-five degrees from its previous line of travel, whereby the strip is drawn forward under tension, its edges pasted, and the strip then folded and its edges united, as set forth.

3. The combination, substantially as hereinbefore set forth, of the sharp-edged shoe, across the surface of which the strip is drawn, and a friction-bar on the side of the strip opposite to that next the shoe, whereby the strain on the paper is increased at the corners of the shoe, and the edge folds formed by the conjoint operation of the shoe and bar.

4. The combination, substantially as hereinbefore set forth, of a roll or shaft from which the paper is drawn, actuating-rolls or feeding mechanism for drawing the paper forward under tension, a paste-reservoir, a shoe having a straight edge of a length equal the width of the tube to be formed and terminating in square or sharp corners, across which edge the strip is drawn intermediate the paper roll and the feeding mechanism and deflected at an angle of about forty-five degrees from its previous line of travel, and a finger which guides one edge of the strip under the other, for the purposes specified.

5. The combination, substantially as hereinbefore set forth, of the shoe, the friction-bar, and the overhanging fingers, by the conjoint operation of which the fold is formed.

6. The combination of a roll or shaft from which the paper strip is drawn under tension, a paste-reservoir for supplying paste to one edge of the strip, an inclined sharp-edged or square-cornered shoe, across which the strip is drawn and deflected at an angle of about forty-five degrees to its previous line of travel, actuating or feeding rolls, a knife carried by one of said rolls, and drawing-rolls, these members being constructed and operating substantially as hereinbefore set forth, whereby the strip is pasted, folded, pressed, and severed into blanks.

In testimony whereof I have hereunto subscribed my name.

CHAS. B. STILWELL.

Witnesses:
B. H. MORSE,
F. STITH.