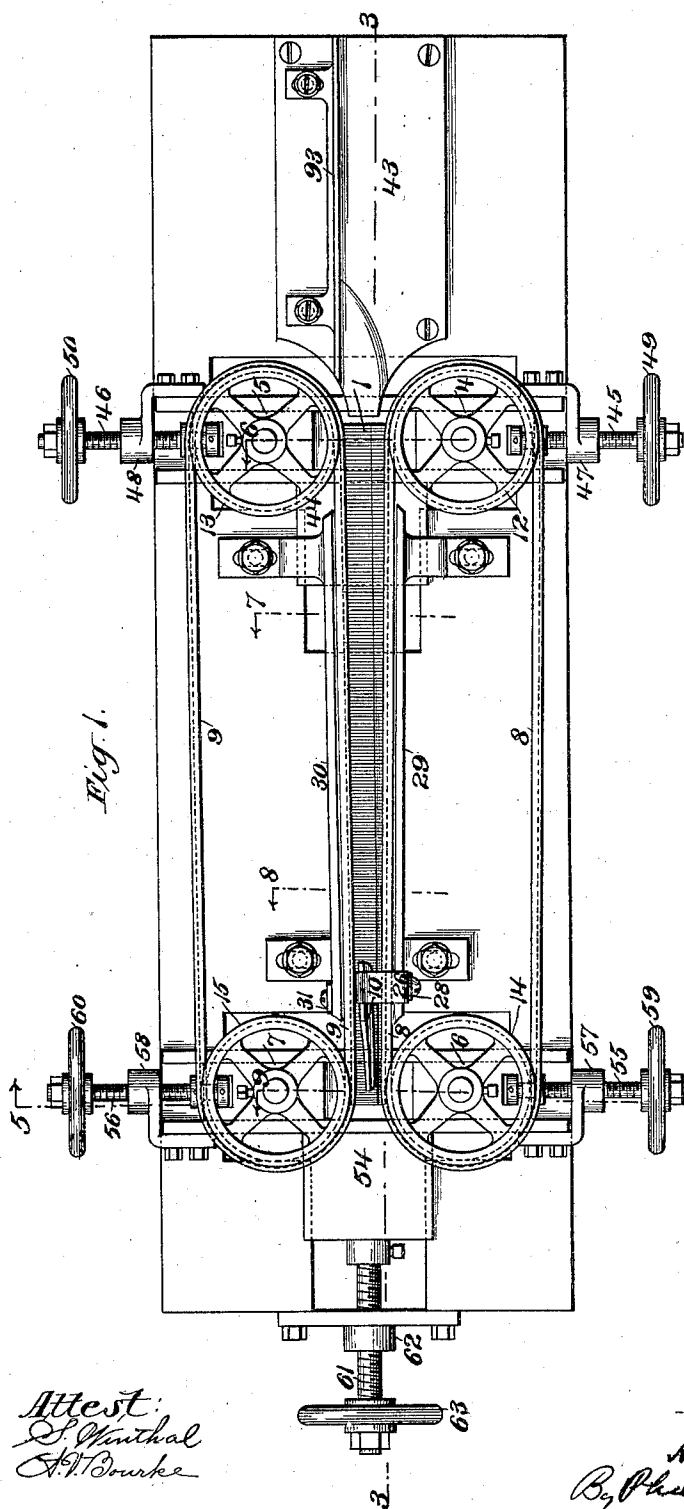
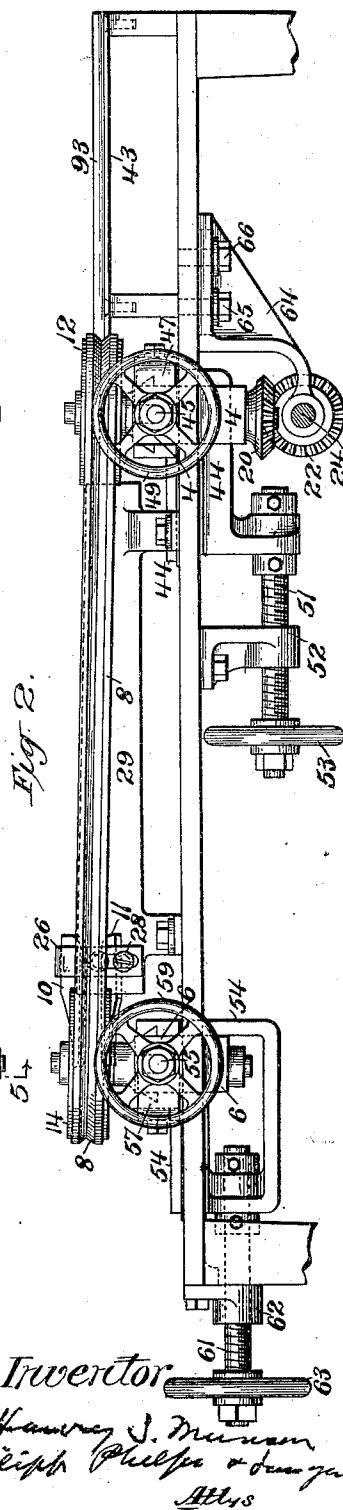


H. S. MUNSON.
MACHINE FOR REFOLDING PAPER TUBES.

(Application filed Aug. 4, 1898.)

(No Model.)

3 Sheets—Sheet 1.



Attest:
S. M. Mithal
S. P. Bourke

Inventor
Harvey J. Munson
By Philip Phelps & Son
Atty's

No. 709,502.

Patented Sept. 23, 1902.

H. S. MUNSON.

MACHINE FOR REFOLDING PAPER TUBES.

(Application filed Aug. 4, 1898.)

(No Model.)

3 Sheets—Sheet 2

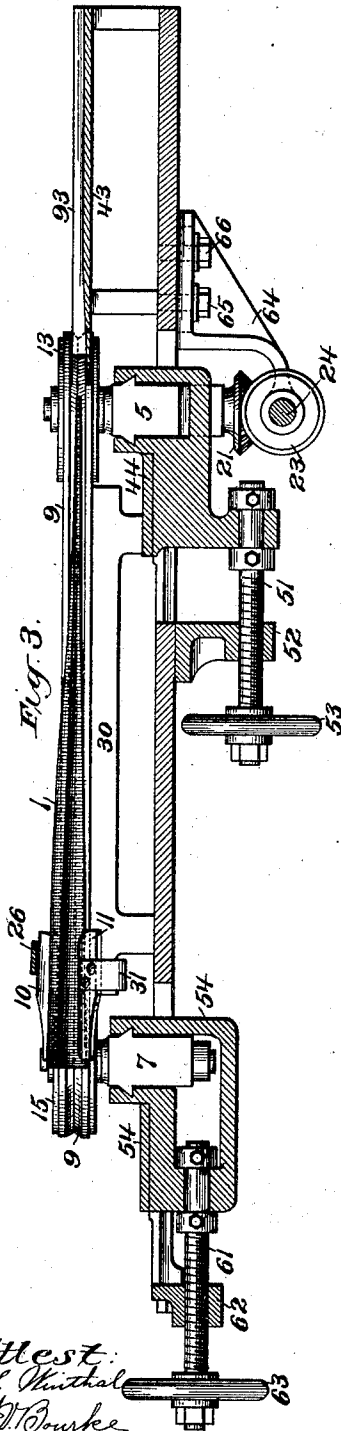


Fig. 3.

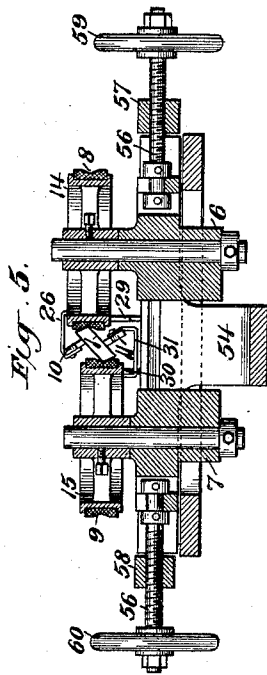


Fig. 5.

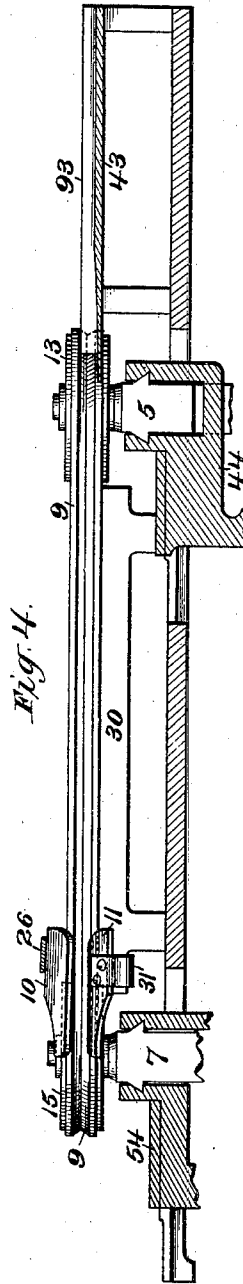


Fig. 4.

Attest:
S. H. Hirthal
J. W. Bourke

Inventor
Harvey S. Munson
By Philip Phelps & Son
Attys

No. 709,502.

Patented Sept. 23, 1902.

H. S. MUNSON.

MACHINE FOR REFOLDING PAPER TUBES.

(Application filed Aug. 4, 1898.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 6.

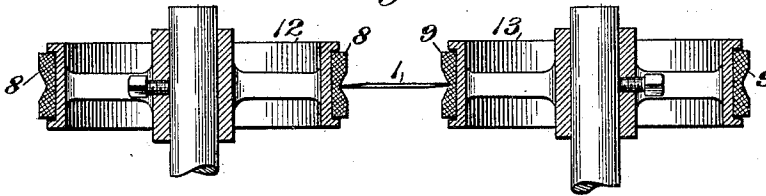


Fig. 7.

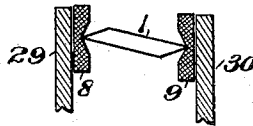


Fig. 8.

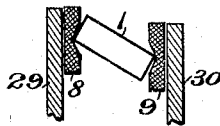
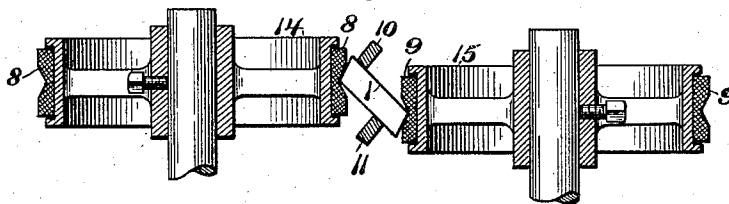


Fig. 9.



Attest:
S. Winthal
A. W. Burke

Inventor
Harry S. Munson
By Philip P. Phelps - Attorney
Atty

UNITED STATES PATENT OFFICE.

HARVEY S. MUNSON, OF NEW HAVEN, CONNECTICUT.

MACHINE FOR REFOLDING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 709,502, dated September 23, 1902.

Application filed August 4, 1898. Serial No. 687,700. (No model.)

To all whom it may concern:

Be it known that I, HARVEY S. MUNSON, a citizen of the United States, residing at New Haven, county of New Haven, and State of Connecticut, have invented certain new and useful Improvements in Machines for Refolding Paper Tubes, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to render supple or limp the defined lines upon which a flat blank must be bent to form it into a hollow tube that is to receive and act as the container for contents, as a slide, entered into it. Two of these lines of folding are necessarily doubled in the act of forming the flat tube by folding inwardly its sides and uniting them, while the remaining two defined lines for folding remain in their primary or unfolded condition. Primarily, said unfolded or defined lines are rendered limp or supple by bending or folding them sufficiently to bring the flat tube up into hollow form, and incidentally this necessarily opens up or refolds the once-folded lines. This operation of opening up or bending the tube upon its folding-lines is called "refolding" and it is accomplished by the present improvements in a machine embodying this invention in a most simple and effective structure, the several novel features whereof are too fully hereinafter described and claimed to need preliminary explanation, except to say that the essential characteristic of the mechanisms is a pair of grooved side carrying-belts whose planes of travel gradually contract from their receiving to their delivering ends, one of which belts also runs in a plane in the other direction, constantly varying vertically from that in which its companion runs, whereby the outer edges of the tube are compelled to so travel in moving inward as to gradually contract the tube widthwise and expand it in the other direction, its planes of travel being so changed by the combined strains thus imparted to it as to force or convert its flat tubular condition in which it is formed into or cause it to assume a hollow or outspread tubular one, from which it may reassume or be collapsed into its flat tubular condition, it having thus been so folded and refolded upon its folding-lines that the same will readily bend when the tube or short sec-

tions of a long tube are to assume a hollow tubular form in practical use, when they must be readily moved on their fold-lines while being worked, either by hand manipulation or a packing-machine, during the operation of filling them as containers with their contents.

In the accompanying drawings, which represent a machine capable of practically carrying this invention into use, Figure 1 is a plan or top view of such machine. Fig. 2 is a side elevation thereof. Fig. 3 is a longitudinal sectional elevation thereof on the line 3 of Fig. 1, a paper-box tube being shown undergoing the operation of being refolded. Fig. 4 is a like longitudinal sectional elevation, no tube being shown as undergoing the refolding operation. Fig. 5 is a cross-sectional elevation taken on the line 5 of Fig. 1, as seen looking in the direction of the attached arrow, which is contrary to that of the travel of the tube through the machine. Figs. 6, 7, 8, and 9 are enlarged cross-sectional elevations taken, respectively, on the section-lines 6, 7, 8, and 9 of Fig. 1, as seen looking in the direction of the arrows connected with said lines, which is that of the travel of the tube through the machine, whereby the various forms assumed by the tube as it is operated upon and refolded are rendered perspicuous.

The principal mechanisms are a pair of grooved side carrying-belts 8 9, which, though preferably of leather, may be of any material so long as they are strong and durable enough to form when stretched stable bounds, between which the paper tube will be carried onward, without forcing them apart sufficiently to modify their refolding action upon the tube; but lighter belts may be used when held in place by suitable bearers, as will hereinafter appear. These belts 8 9 are led about and driven by pairs of pulleys 12 13 and 14 15, which pulleys are preferably flanged to better hold the belts in place. (See Figs. 6 and 9.) These pulleys 12 13 are mounted fast upon spindles that are respectively provided with miter-gears 20 21, that mesh with companion miter-gears 22 23, carried by the driving-shaft 24, and this gearing drives the belt-pulleys 14 15, which are idlers, through the belts 8 9.

From Fig. 6 it will be observed that the pulleys 12 13 have a common horizontal plane

of motion, and from Figs. 5 and 9 (view seen in the opposite direction) it will be observed that the pulleys 14 and 15 revolve in separate horizontal planes, the plane in which pulley 15 revolves being in common with that in which the pulleys 12 and 13 revolve.

By comparing Fig. 6 with Fig. 9 it will further be observed that the belt-pulleys 14 15 are set nearer together than are the pulleys 12 13, or, in other words, the bearing-points of the carrying-belts between the pulleys 12 and 13 (the tube entrance) are at a distance apart equal to the width of the outspread or flat tube, while the distance between the bearing-points of the carrying-belts between the pulleys 14 15 (the exit of the tube) are at a distance apart equal to that of the outside bearing edges of the tube when in the opened-up or hollow tubular form, which is its refolding degree of outward spread.

When the flattened tube is entered between the belts 8 9, its border edges or outer folds engage the grooves of these belts at about equal points widthwise thereof, and since the belt 9 moves horizontally the edge of the tube bearing in it is carried horizontally by it through the machine; but as the groove of the belt 8 runs obliquely it results that the edge of the tube which is carried by the belt 8 is constantly and progressively lifted, or, in other words, that the opposite edges or outer folds of the tube are progressively moved toward each other by being caused to travel or advance in planes constantly converging, and because of the belts 8 9 progressively diverging edgewise as the exit end is approached it follows that the top and bottom plies of the flat tube are constantly and progressively moved away from each other concertedly with the like movement of the sides of the tube toward each other, by which combined movements of its component walls the flattened condition of said tube, as seen in Fig. 6, is gradually changed to that of an open tube, as seen in Fig. 9, which transformation in being accomplished forces the component sides, top, and bottom of the tube to move with respect to each other upon the defined folding-lines whereon a flat blank is doubled to form the tube and whereby said lines are folded and unfolded or refolded, and thus are so worked as to soften their resistance or cause them to become supple or limp. In order to govern the opening up of this flat tube and cause its top and bottom plies to aid the operation, or, in other words, always secure precision in this operation, I arrange longitudinally between the belts 8 9 stationary guides 10 11 (they may be twisted) or sectional equivalents thereof—that is to say, guides that may bear throughout the length of the travel of the box-tube, or substantially so, in such manner as to provide suitable bearing-points in differing planes to properly support the tube to the action of the belts while preventing buckling, and these guides have their bearings preferably diminished to narrow di-

mensions or edges. The upper guide 10 is preferably narrow-faced throughout, though its last bearing may be of considerable substance and flatly bear upon a considerable portion of the top of the tube, or it may be bent inward from its plane near that point to aid a substantial refolding of the upper corner at that time. The lower guide 11 preferably has generally throughout its principal extent a narrow bearing-face next to the box-tube, though it may at its terminal end be of considerable substance, so as to flatly bear upon a considerable portion of the under side of the tube, or it may be bent inward from its plane near that point, and thus insure that the adjacent doubled edge or lower corner of the same shall be sufficiently bent for a distance inward from this corner and compel its double edge to receive a substantial fold. Any suitable means for sustaining these guides in place may be used, that shown as convenient and suitable being the carrying-elbow 26 for the guide 10, secured by set-screw 28 to the bearer 29, and the carrying-elbow 31 for the guide 11, secured by set-screw 34 to the bearer 30. These guides are preferably made adjustable by means of slots in their elbows, that embrace their fastening set-screws. These bearers 29 30 are usefully and preferably provided to prevent any undue sagging or buckling of the belts, and they are set edgewise or in substantial parallelism with and along the outer sides of the belts 8 9 and are held in place by elbow-brackets 35 36 and 37 38, having elongated sockets whereby they may be adjustably held by retaining-screws 39 40 41 42.

As thus far described, assuming the machine to have been built for the treatment of a given size of box-tube, as a standard cigarette-box tube, its operation will be readily understood.

For convenience, although it is non-essential, a feeding-table 43, with an adjustable guiding-ledge 93, is provided, and one after another of long and flat box-tubes, suitable to be cut up into short containers, has its folded edges entered into the grooves of the belts 8 9, as in Fig. 6. The leading end of this tube, very slightly pressed open by the act of introducing it, is frictionally seized by contact of the grooves of the belts with its opposite folded edges, and thus caused to take up the movement of the belts. It is carried continuously and progressively onward and is regularly compressed or narrowed up widthwise, so that the opposite sides and top and bottom plies move in opposite directions, each connected side and ply bending on the outermost folded corner as contracting-fulcrums and each such side and ply bending on one of the remaining folded corners as an enlarging-fulcrum. As this movement proceeds the tube is caused to assume a rhomboidal form, as in Fig. 7, then becomes rectangular, as in Fig. 8, then moving still farther assumes a rhomboidal form beyond the rectangular, this

conversion of the transverse form of it taking up the shapes intermediate those illustrated, and thus the flat tube of Fig. 6 is opened out by its walls moving upon its lines of fold until its connecting folds are moved from an inward folded condition into an obtuse-angled fold and its unfolded lines are moved from the flat or unfolded condition and folded or bent into the acute-angled fold shown in Fig. 9. The tube thus treated has all of its folding-lines brought into that supple, limp, or "refolded" condition suiting them for convenient manipulation in forming them into containers for contents and loading them therewith. Paper tubes of this character are now extensively made in varying sizes, the refolding of which various-sized tubes is provided for in this machine, as follows: The spindles of the belt-pulleys 12 13 have their bearings in boxes 4 5, that are capable of moving laterally by means of sliders that bear in facing-ways cut in a sliding carrier-block 44. These boxes 4 5 are respectively provided with adjusting-screws 45 46, having their inner ends connected rotatively to said boxes and having their threaded shanks turning, respectively, in threaded nuts 47 48, fixed to the bed-plate, and bearing at their outer ends, respectively, hand operating-wheels 49 50. The carrier-block 44 slides longitudinally on ways provided for it at each side of a recess in the bed-plate, being provided with an adjusting-screw 51, rotatively connected with the block 44, the threaded shank of said screw turning in a threaded nut 52, that is fast to the bed-plate and provided at its outer end with a hand operating-wheel 53. The spindles of the belt-pulleys 14 15 have their bearings in boxes 6 7, that are capable of moving laterally by means of sliders that bear in facing-ways cut in a sliding carrier-block 54. These boxes 6 7 are respectively provided with adjusting-screws 55 56, having their inner ends connected rotatively to said boxes and having their threaded shanks turning, respectively, in threaded nuts 57 58, fixed to the bed-plate and bearing at their outer ends, respectively, hand operating-wheels 59 60. The carrier-block 54 slides longitudinally on ways provided for it at each side of a recess in the bed-plate, being provided with an actuating-screw 61, rotatively connected with the block 54, the threaded shank of said screw turning in a threaded nut 62, that is fast to the bed-plate, and being provided at its outer end with a hand operating-wheel 63. When, therefore, it is desirable or necessary to adjust the hand-pulleys 12 13 or 14 15 to or from each other, this may be accomplished by suitably turning the hand-wheels 49 50 or 59 60, and when this companion set of belt-pulleys 12 13 is to be adjusted bodily to or from the companion set of belt-pulleys 14 15 this is readily effected by suitably turning the hand-wheels 53 62, one or both. One such adjustment only is necessary, except where a very long tube is to be treated, when it may be desir-

able to make both adjustments. If, however, the carrying-block 54 is to be adjustable, the bracket 64 will also be appropriately adjusted by its slotted bearings and holding-screws 65 66, provided for that purpose.

From the foregoing description and a consideration of the mechanisms, together with their mode of operation, it will be understood that the guides 10 11 are not essential to the refolding operation, though desirable, or, stated otherwise, the grooved belts are capable within themselves of performing the refolding operation. It is, however, to be understood that short top and bottom guides at least are desirable and that they are to be placed at or near the forward ends of the grooved belts and that their use is preferred. These guides are preferably employed because their presence at or near the finishing-point of the refolding operation provides for a positive refolding of the innermost folding lines or seams, and that this may be made most positive, as by an overfolding, the forward ends of these guides 10 and 11 may be bent far enough inward as to cause such overbending of the said fold lines or seams.

What is claimed is—

1. A paper-tube-refolding mechanism comprising side carrying-belts whose planes of travel gradually approach from their receiving to their delivering points and which diverge edgewise, whereby one edge of the longitudinally-creased tube is moved out of the plane in which the other edge travels, and strains are exerted on the tube that cause it to travel onward and to be gradually contracted widthwise and enlarged in the other direction and thus become folded on its creased lines, and transform it from a flat or collapsed condition to a hollow or distended one, substantially as described.

2. A paper-tube-refolding mechanism comprising grooved side carrying-belts whose planes of travel gradually approach from their receiving to their delivering points with which are combined short opposed guides that gradually separate from their receiving to their delivering points, whereby the space in which the tube is compelled to travel is gradually contracted widthwise and expanded in the other direction and strains are exerted on the tube that cause its plies to move laterally upon its folding-lines and transform it from a flat or collapsed condition into a hollow or distended one, substantially as described.

3. In a paper-tube-refolding mechanism, the combination with grooved side carrying-belts, of pulleys 12, 14 and 13, 15 supporting said belts and provided with means for adjustment, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HARVEY S. MUNSON.

Witnesses:

E. G. THOMPSON,
G. M. BORST.