S. BURGESS.

Machines for Making Paper Tubes, &c.

No. 155,703. Patented Oct. 6, 1874.

Fig. 1.

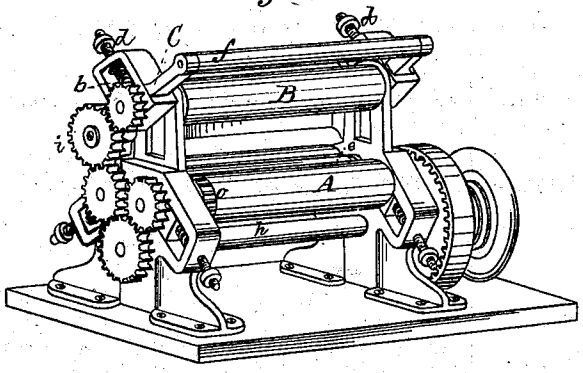


Fig. 2.

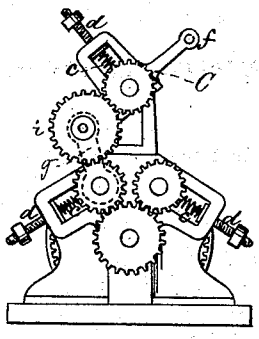


Fig. 3.

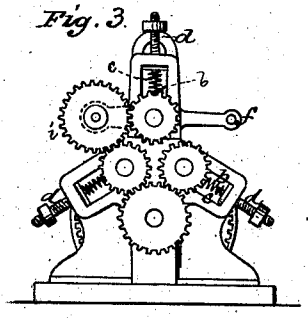


Fig. 4.

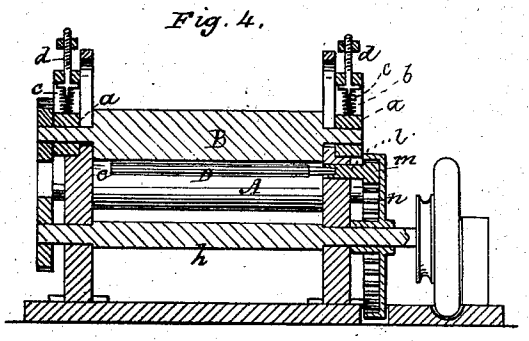


Fig. 5

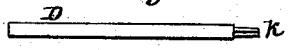


Fig. 6

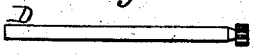


Fig. 7

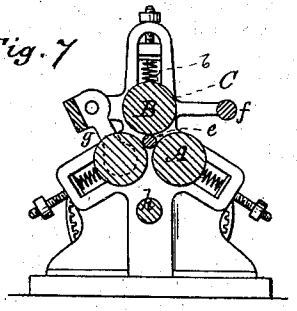
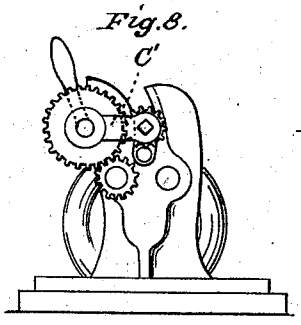


Fig. 8.



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UNITED STATES PATENT OFFICE.

SILVANUS BURGESS, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN MACHINES FOR MAKING PAPER TUBES, &c.

Specification forming part of Letters Patent No. **155,703**, dated October 6, 1874; application filed April 11, 1874.

To all whom it may concern:

Be it known that I, SILVANUS BURGESS, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Machines for Making Paper Tubes, Round Boxes, Cloth-Sticks, &c.

My invention consists mainly in combining a sufficient number of rollers properly geared, arranged to partially inclose, without the presence of guides or stationary surfaces, a central molding-space, with a mandrel located in said molding-space, and arranged to revolve in such a manner that the movement of its periphery will practically correspond in speed and direction with the movement of the peripheries of the several rollers, whereby the paper for forming the tube may be taken in by the mandrel without longitudinal strain on the paper, except that which is controlled by the attendant, and also so that each thickness of paper may be laid concentrically on the mandrel under any desired degree of compression.

My invention further consists in mounting the axes of said rolls in yielding bearings, whereby, as the thickness of the tube increases, the rolls may recede and enlarge the molding-space to meet the requirements of the occasion; and still further in a method of mounting the opening or liberating roll, whereby its gearing-connections may be maintained in whatever position they may be placed; and still further in mounting said liberating-roll in bearings, which are fitted to guides in such a manner that said roll may be raised and lowered in a vertical line above the axial line of the mandrel, and made to compress the periphery of said mandrel or the tube thereon, and to effect a corresponding degree of pressure of said mandrel or the tube thereon against the coincident peripheries of the bed-rolls; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming part of the same, is a clear and accurate description of machines embodying my said invention.

In the drawings, Figure 1 represents, in perspective, one of my machines with the liberating-roll elevated. Figs. 2 and 3 represent the same, in end view, with said roll elevated and lowered, respectively. Fig. 4 represents the same, in longitudinal central vertical section, with the liberating-roller in working position. Figs. 5 and 6 represent two mandrels for use in the machine. Fig. 7 represents, in transverse vertical section, the machine shown in previous figures. Fig. 8 represents, in end view, a modification of the gearing.

In all the figures, A denotes one of two bed-rolls. In machines adapted to make tubes of a certain fixed size or thickness of paper, the journals of these rolls may be mounted in fixed or unadjustable bearings. It is, however, desirable that any one machine should have a varied capacity; and for that reason I mount said rolls in slide bearing-blocks *a*, fitted to the radial slots *b* in the frame of the machine. In order that when thick-paper tubes are desired the rolls may recede radially as the thickness of paper increases, I control these bearing-blocks *a* by means of expansion-springs *c*, which can be made to exert a varied pressure by means of the adjusting-screws *d* at the head of the radial slots *b*.

Although I prefer to use but two bed-rolls, I am aware that a greater number may be employed with approximate results; and I do not therefore confine myself to the number shown.

In each instance, B denotes the liberating top roll. In all cases it should be so mounted that it can be raised wholly free from the bed-rolls, and thus afford ready access to the molding-space *e*. When two bed-rolls are employed it is preferable that a single top roll be combined therewith, and that one should be arranged when in operation to occupy with its axis a point triangularly equidistant from the axes of the bed-rolls.

I am aware that two top rolls may be employed with two bed-rolls, but I prefer the triangular arrangement without confining myself thereto. In all cases, whether three or more rolls in all be employed, they should be of equal diameters, and geared to revolve at equal speed. The rolls may be of wood, metal, or either, and may be covered with leather or other smooth-surfaced material. The gearing may be applied to the rolls in great variety of arrangement.

Inasmuch as the top roll should be capable

of being rotated at various heights in an adjustable machine, it is essential that it be mounted in a swinging frame, having on its axis a pinion for communicating power from a driving-shaft to said top roller, and so arranged that at whatever position said top roll may be the chain of gearing will remain intact.

I represent in the drawings two methods of gearing. In Figs. 1 to 4 the top roll is mounted in a frame, C, having the hand-rod *f* in front, and pivoted on a link, *g*, which embraces the end of the journal of the rear bed-roll. The main driving-shaft *h* has on its outer end a gear which engages with the gears on both bed-rolls. The gear on the rear bed-roll engages with a pinion, *i*, which is mounted on the end at the rear of the frame C, and communicates power from the rear bed-roll gear to the top roll. In whatever position the top roll is placed, the gearing remains in train. In Fig. 8 the power is applied to both bed-rolls at one end of the machine, and at the opposite end a pinion is mounted on the axis of the swinging top-roll frame C′, and, by communication with a gear on the rear bed-roll, it rotates the top-roll gear. In some cases the rolls, or some of them, may be fluted.

D denotes, in each instance, a rigid mandrel for supporting the paper tube while being rolled and compressed. It will, preferably, be positively driven at a rate of speed at its periphery equal to that of the rolls.

In Fig. 5 the mandrel is provided with a square shank, at *k*, which is fitted to the shaft *l*, revolving in a sleeved bearing in the right-hand end of the frame of the machine, Fig. 4, which is driven at proper speed by means of the pinion *m* thereon and the internal gear *n* on the main shaft.

In Fig. 6 the mandrel is provided with a gear, which, when in position, engages with the gear-teeth, at *o*, on the left-hand end of the front bed-roll.

The mandrel may be provided, if desired, with both the end gear and the square shank *k* located at opposite ends.

It is to be understood that this machine is adapted to work paper charged with paste, and the moisture thereof so softens the paper that should any one surface in contact therewith move very much faster than any other surface, also in contact with it, a rupture of the paper would possibly be the result. Should a stationary surface be presented for contact with the incoming paper, an injurious abrasion thereof would be liable to occur.

The operative, in presenting the paper with the paste side toward the mandrel, and so as to enter between its surface and that of the front bed-roll, has only to keep the sheet straight, and, when the mandrel has been covered, the top roll, by its weight and the pressure applied by the hand-rod, forces the mandrel toward the bed-rolls, compresses the paper as it enters, and drives superfluous (if there be any) paste before it.

In working straw-paper for heavy round boxes or tubular cloth-sticks, for instance, with paste, the paper is rendered exceedingly tender, and, should any stationary surfaces be presented in the machine for frictional contact with the paper after the manner of a guide, for instance, the paper would be unavoidably torn or abraded by frictional contact therewith.

In some cases the mandrels will be removed and the tubes started thereon, sometimes with, and sometimes without, paste, and the rolling completed in the machine, after which, on removing the mandrel, the tube can be taken therefrom.

The mandrels may be made capable of contraction, somewhat, or provided with open-joint sheet-metal jackets, easily removed if desired, although little difficulty is experienced in removing the tubes from a solid mandrel if its surface be smooth, kept clean, or slightly oiled. In some cases—as, for instance, in making foundations for round boxes, to be subsequently covered with surface-paper—the tubes may be cut longitudinally and stripped from the mandrel, the machine, in that case, serving to build up the tube from a continuous length of paper with stiffening-paste, and to give the box-foundations their general tubular form, which they will readily retain. By having the top roll and bed-rolls capable of being constantly revolved, it does not necessitate stopping at every time a mandrel is removed, and when a new tube is started the top roll may be brought into contact therewith while revolving at the same rate of speed as the bed-rolls, and hence no abrasion of the tender paper can possibly occur. When working light porous paper, it is advisable that the paste should be driven into and incorporated with it, as far as practicable, and at the same time the dampened paper should be condensed, and and this is effected by pressure, which will be applied to the desired degree by means of the hand-rod on the top-roll frame. Instead of paste, glue and other adhesive matters are sometimes used.

I am aware that machines have heretofore been constructed for wrapping and making cigars, cigarettes, and metallic tubular structures, in which bed and top rollers have been employed in a manner similar to that herein shown and described, and that, in some instances, in machines for forming tubes of sheet-metal, there have been employed, in connection with such rolls, positively-driven mandrels, but in all such cases the tubular structures to be made thereon are composed of but one thickness of metal, and one sheet thereof, of requisite size, would be required for making a single tube which would have a periphery equal to the length of the metal sheet. All such machines necessarily require a concave stationary guide for directing and shaping the metal after it is fed into the machine at the bite of the proper roll with the mandrel. The presence of such a guide in a paper-rolling machine would render it inoperative and worthless, for the friction of the tender moist

paper therewith would, during the rolling operation, abrade and injure the tube, and successive concentric thicknesses of paper could not be laid by reason of the presence of the unyielding surface of said guide. I therefore make no claim to any such pre-existing combination of devices, for they could not be practically employed for the purpose of making paper tubes.

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

1. In a paper-tube-rolling machine, the combination of bed and top rolls, geared together and revolved at the same rate of speed with a detachable mandrel, substantially as described, whereby tubes may be formed from a continuous length of paper charged with adhesive matter and laid under pressure in successive thicknesses on said mandrel, in the manner specified.

2. The combination, in a paper-tube-rolling machine, of the bed-rolls and positively-driven detachable mandrel, and a top roll mounted in a swinging frame and arranged to bear upon the surface of the mandrel, with varied pressure, by means of a hand-lever, substantially as described.

3. In a paper-tube-rolling machine, the bed and top rolls, mounted in sliding boxes in radial slots, and controlled by pressure-springs in combination with a rigid mandrel, substantially as described, whereby, as the size of the tube increases, the rolls will radially recede and compress the paper with greater force between them and the mandrel, as set forth.

4. The top roll, revolving in sliding journals in the vertical slots of the frame of the machine, and mounted on the frame C, pivoted by the link *g* to the main frame, and geared substantially as described.

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