

(No Model.)

W. H. KNIGHT & F. O. BLACKWELL.  
PAPER TUBE MACHINE.

No. 573,004.

Patented Dec. 15, 1896.

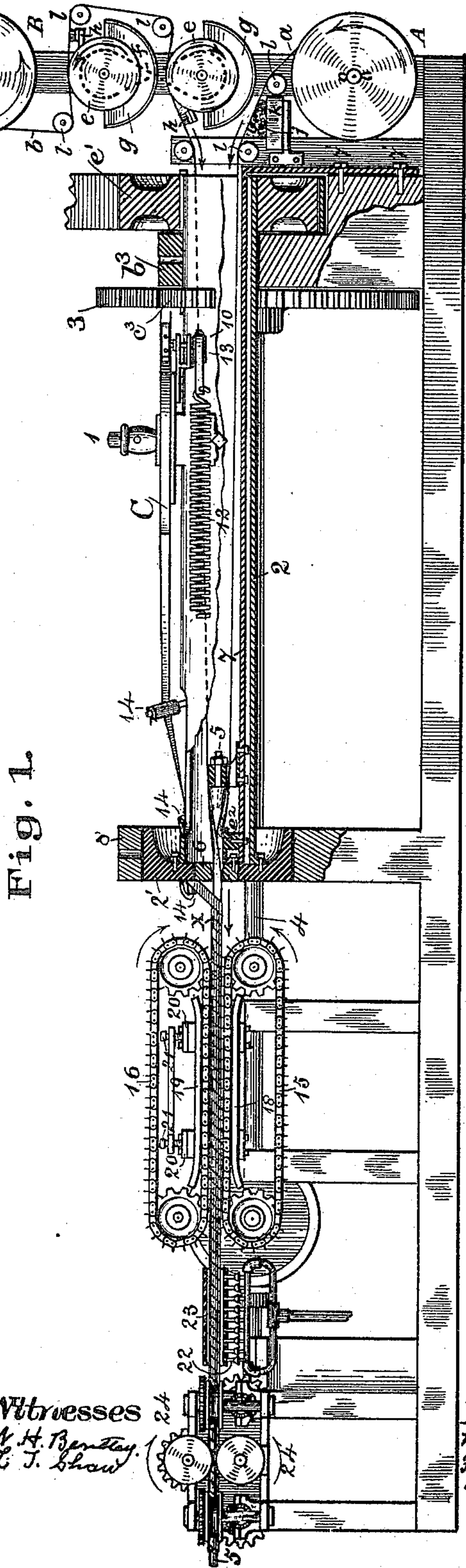


Fig. 1.

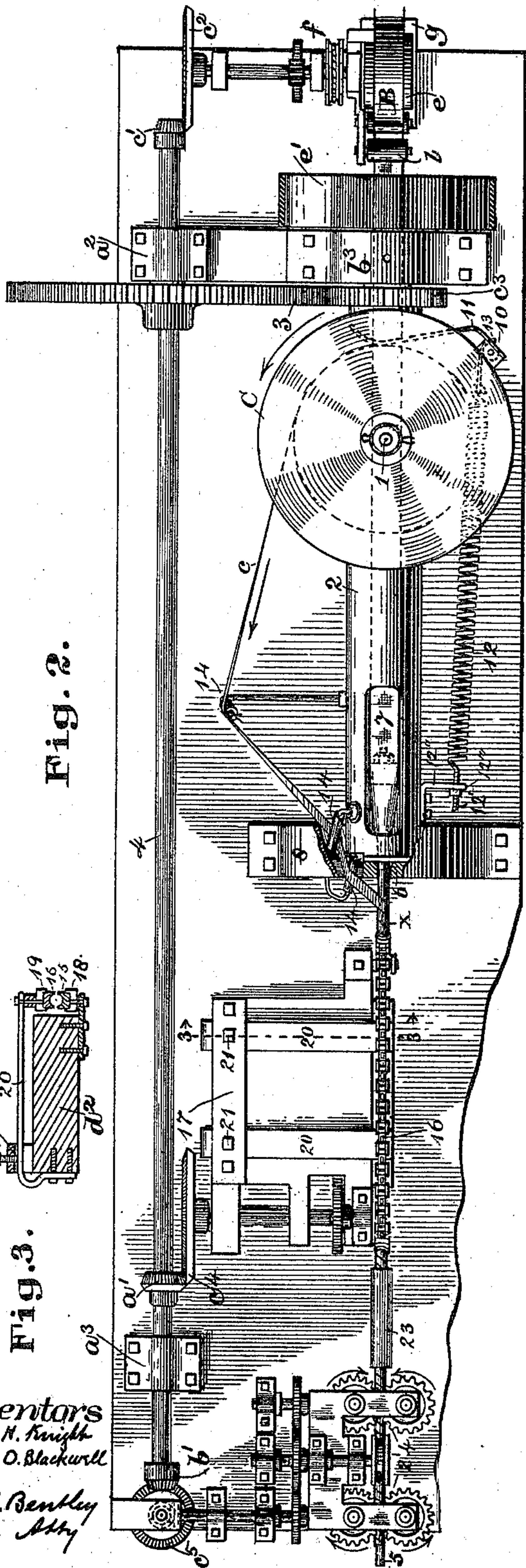


Fig. 2.

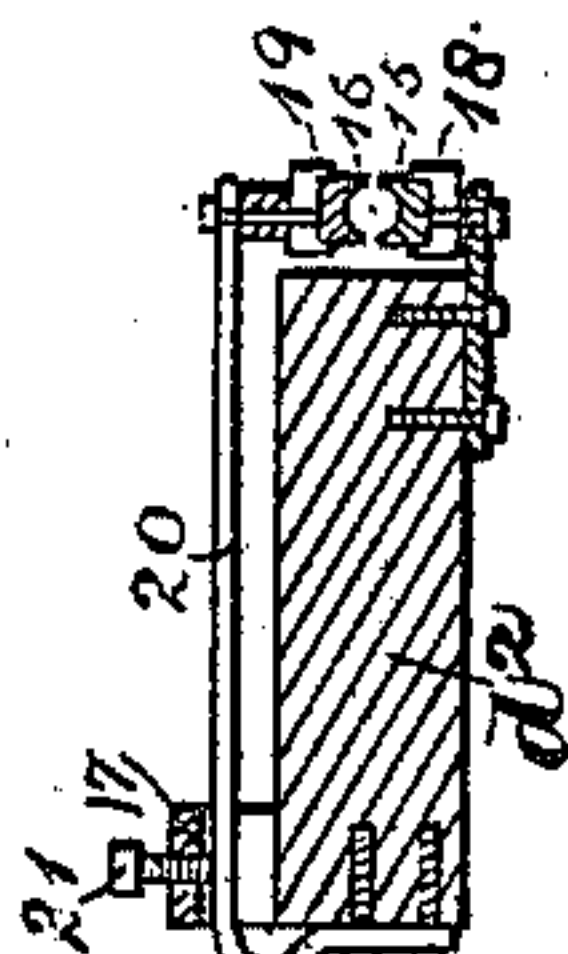


Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## PAPER-TUBE MACHINE.

SPECIFICATION forming part of Letters Patent No. 573,004, dated December 15, 1896.

Application filed February 13, 1895. Serial No. 538,297. (No model.)

*To all whom it may concern:*

Be it known that we, WALTER H. KNIGHT and FRANCIS O. BLACKWELL, citizens of the United States, residing at Schenectady, county of Schenectady, and State of New York, have invented a certain new and useful Improvement in Paper-Tube Machinery, of which the following is a specification.

Our invention relates to paper-tube machinery; and it consists in a machine for forming paper tubes by combination with two longitudinal interior strips of one exterior wrapping-strip.

Certain details not claimed herein are features of construction which are not of our invention.

Figure 1 is an elevation partly in section. Fig. 2 is a top plan view; and Fig. 3 is a section on line 3 3, Fig. 2.

In the drawings, 4 is a shaft carrying the gear-wheels  $c'$ , 3,  $a'$ , and  $b'$ , meshing, respectively, with wheels  $c^2$ ,  $c^3$ ,  $c^4$ , and  $c^5$ . The shaft 4 rotates in bearings  $a^2$  and  $a^3$ . The wheel  $c^3$  is mounted on a sleeve 2, preferably cylindrical, which rotates in bearings 8 and  $b^3$ . The inner end of the sleeve is provided with a bushing 2', centrally perforated, and the outer end carries the driving-pulley  $e'$ .

Securely fastened to the standard which supports bearing  $b^3$  by bolts 7' is a stiff metal tongue 7, which extends from the outer to the inner end of the sleeve 2 within the sleeve, but free from contact therewith. By means of a lug  $e^2$ , secured to the inner end of the tongue 7, a perforated disk 6 is supported concentrically within the opening in the bushing 2'. The disk 6 is therefore stationary, while the bushing 2' is free to rotate about it. The opening in the disk is somewhat beveled on its inner edge. The tongue 7 also supports one end of the mandrel 5, which is tapered for a short distance from the point of attachment to the tongue 7, and then has a uniform diameter to its other extremity beyond the rolls 24.

Paste-rollers  $ee$ , partially immersed in paste contained in the bowls  $g$   $g$ , are rotated by means of suitable gearing  $f$ , turned by the pulley  $c^2$ , meshing with  $c'$ . Paper-reels A and B are arranged to carry the rolled paper

tape from which the interior part of the tube is formed, and they may also be rotated, if desired, by suitable gearing, or they may be rotated by the tension produced in the tape when the machine is in operation. The paper from reel B passes over guide-rolls  $l$  and is pasted on both sides by the paste-rolls  $e$ . Brushes  $h$  are provided to remove the excess of paste. The paper from reel A is also guided by rolls  $l$  and is not pasted, but only moistened with water from the sponge  $j$  in its cup  $k$ .

The third or outside tape composing the wrapping for the tube is fed from a roll on the reel C, journaled on a stud 1, projecting from the cylindrical sleeve 2. Suitable guide-rolls 14 are provided to conduct the tape, so that it will be wound about the inner two tapes and the mandrel 5 at a point beyond the inner extremity of the sleeve 2. The reel C rotates with the sleeve 2, and therefore has a twofold rotation—viz., on its own spindle and about the axis of rotation of the sleeve 2.

Journaled in a lug 9, that projects from the rotating sleeve 2, is a fusee 10. A rigid tongue 11 on the fusee is caused to press forcibly against the periphery of the paper roll on reel C by a spring 12, which has a flexible connection 13 with the periphery of the fusee. The eccentricity of the fusee is such as to maintain a uniform spring-pressure upon the paper roll whether the roll is full or partially full. The other end of the spring 12' is threaded and is attached to a lug 12'', through which the end passes. A nut 12''' allows adjustment of the spring-tension.

Suitably-mounted sprocket-wheels driven by shafting operated by wheel  $C^4$  carry chains 15 and 16, one above and one below the mandrel 5. The chains are provided with projections which grip the tube formed on the mandrel, and as the chains adjacent to the tube both move in the same direction their combined action serves to carry along the tube X away from the sleeve 2.

In Fig. 3 is shown the device used to vary the pressure with which the chains bear against the tube X. Blocks  $d^2$ , suitably mounted in proximity to the chains 15 and 16, carry



an extension-guide 18. Guide 19 is supported at the extremity of springs 20, which pass through the strip 17, and between these two guides the chains 15 and 16 pass. Screws 21 in the strip 17 may be used to vary the tension of springs 20. As the tension of the springs is varied the pressure of the guide 19 on chain 16 is also varied, and the chain therefore bears with greater or less pressure on the tube formed about the mandrel 5.

23 is a metal tube through which the mandrel passes. The tube is supported by a frame which also supports a number of Bunsen burners. When lighted, the flame from the burners heats the tube.

The gear-wheel C<sup>5</sup> operates shafting carrying a series of grooved shaping-rollers 24 in sets of two. Each one of a set coacts with its fellow to compress the tube on the mandrel. Two of the sets bear laterally on the tube and the third one vertically.

The operation is as follows: The inner two tapes from stationary reels A and B are led in through the outer open end of the cylindrical sleeve 2 and laid about the tapered mandrel 5. The outside tape from reel C is then given a few turns about the mandrel over the inner tapes near the inner end of the casing and the machine started. The rotation of the sleeve to which the reel C is attached causes the tape from that reel to be wound spirally about the inner two tapes without overlapping. As fast as the tube is thus formed it is carried along on the mandrel by the chains 15 and 16 and passes through the tube 23, heated by the Bunsen burners, where the paste is properly dried. The shaping-rollers 24 then smooth out the tube, after which it runs off the end of the mandrel. It may then be cut into proper lengths.

It is of course understood that all the parts of the machine are relatively proportioned, and the speed of the chains 15 and 16 is so adjusted that the tube is drawn away from the sleeve no faster than it is formed. All mechanism being geared directly or indirectly to the rotating sleeve 2, the movements of the tube-forming and tube-carrying mechanism are synchronous.

What we claim as new, and desire to secure by Letters Patent, is—

1. In a machine for making paper tubes, the combination of a rotatable sleeve, a sta-

tionary mandrel projecting into said sleeve at one end, two stationary reels adapted to supply paper tape through the opposite end of said sleeve to said mandrel, a third reel mounted upon the rotatable sleeve, and suitable guide-rolls also mounted upon the sleeve and adapted to wrap the tape from the third roll spirally about the two longitudinally-formed tapes at their point of exit from the rotatable sleeve, substantially as set forth.

2. In a machine for making paper tubes, the combination of the rotatable sleeve supported in suitable bearings, a stationary rigid strip projecting into said sleeve from one end, a perforated stationary disk supported upon said strip within the opposite end of the rotatable sleeve, a stationary mandrel projecting from said disk and supported independently of the rotatable sleeve, two stationary reels for supplying paper tape longitudinally to the mandrel within the sleeve and the third reel rotating with said sleeve and adapted to wind its paper tape spirally about the two longitudinally-formed tapes at the point of exit from the sleeve, and means for feeding the formed paper tube along the mandrel, substantially as set forth.

3. In a machine for making paper tubes, the combination of the rotatable sleeve journaled in suitable bearings, a stationary rigid strip 7 projecting longitudinally into the sleeve from one end, a perforated disk 6 mounted upon the strip 7 and supported in the opposite end of the rotatable sleeve, a stationary mandrel projecting through the perforated disk 6 and having its inner end rigidly supported upon the strip 7 independently of the sleeve, two stationary reels for supplying paper tape longitudinally to the mandrel within the sleeve, guide-rolls and pasting-rolls for the tapes, a third roll rotating with said sleeve and adapted to wind the paper strip spirally around the two longitudinally-formed strips at the point of exit from the rotatable sleeve, and means for feeding the formed tube along the mandrels, substantially as set forth.

In testimony whereof we have hereto set our hands this 2d day of January, 1895.

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Witnesses:

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