3 Sheets--Sheet 1.

H. M. BOIES.

Paper-Tube Machine.

No. 168,366. Patented Oct. 5, 1875.

Fig. 1.

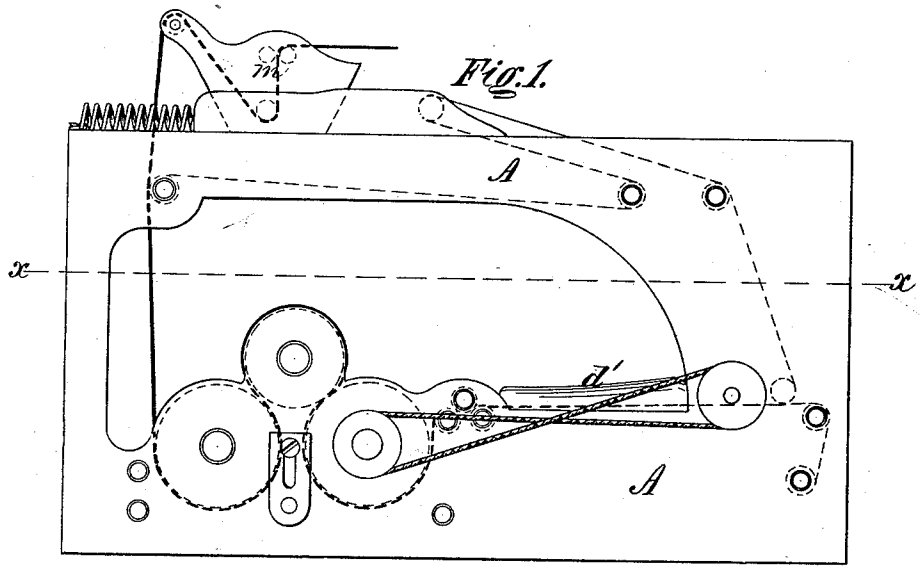

Fig. 2.

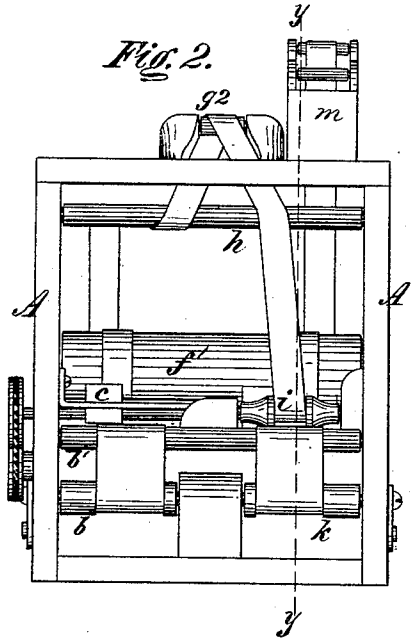

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Fig. 3.

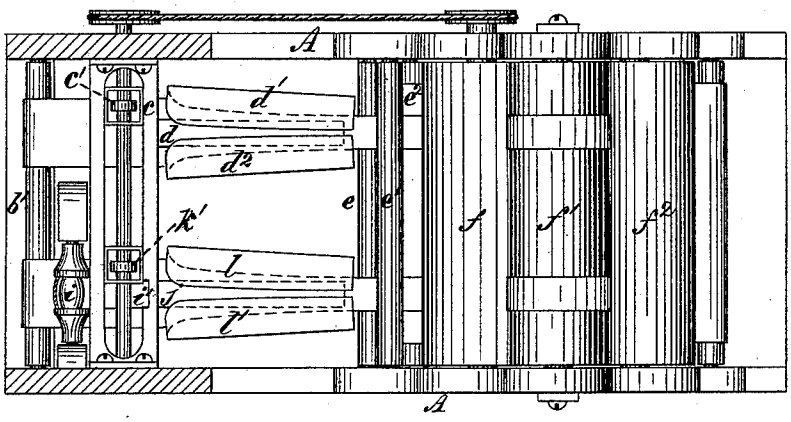
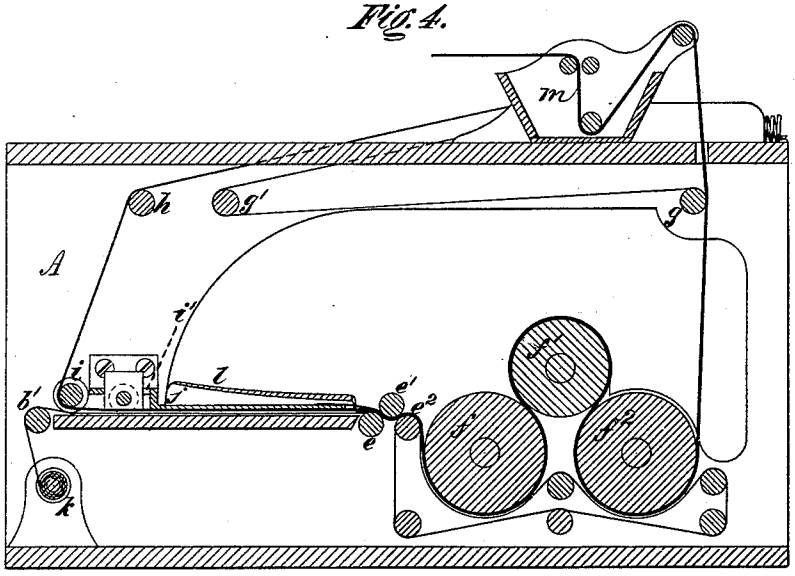


Fig. 4.



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3 Sheets--Sheet 3.

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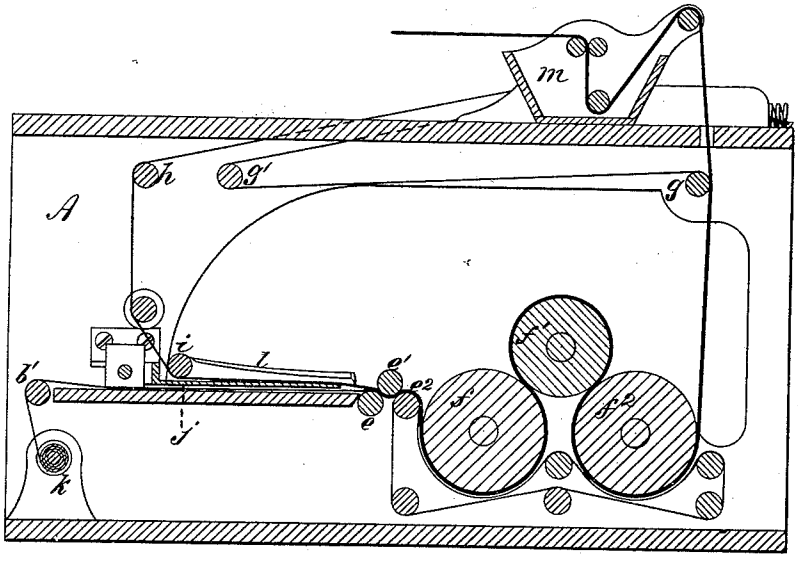
Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY M. BOIES, OF SCRANTON, PENNSYLVANIA.

IMPROVEMENT IN PAPER-TUBE MACHINES.

Specification forming part of Letters Patent No. **168,366**, dated October 5, 1875; application filed July 10, 1875.

To all whom it may concern:

Be it known that I, HENRY M. BOIES, of Scranton, Pennsylvania, have invented certain Improvements in Paper-Tube Machines, of which the following is a specification:

My improvements relate to machines for forming endless tubes of paper, or cloth, or both, or of a combination of them; and my invention consists in the arrangement of devices whereby such tubes are formed of several thicknesses of material, the one tube inside the other.

The accompanying drawings, are as follows:

Figure 1 is a side view of my improved apparatus. Fig. 2 is an end view of the same. Fig. 3 is a horizontal section through the line *x x* on Fig. 2; and Fig. 4 a vertical section through the line *y y* on Fig. 3. Fig. 5 is a longitudinal section, showing a modified arrangement of the roller for delivering the tube to the tube-forming mechanism.

My apparatus embraces the usual mechanism for forming a continuous tube by lapping the edges of a strip of material over a former or tongue, after one edge of the strip has been pasted, so that the laps will adhere when pressed together. The machine includes pressing and drying rollers, over which the tube is conducted, and guide-rollers by which the tube is carried to another tube-forming apparatus, and is guided and delivered thereto in suitable position to have a second tube formed over the outside of the first one. The double tube thus formed is also carried over pressing and drying rollers, and may then be guided into and through a tank containing a bath of varnish or other material designed to render the material water-proof, or its surface water-repellent; or the water-proofing may be deposited upon the tube by rollers or brushes, between which it can be made to pass.

Referring to the drawings, A represents a suitable frame, furnishing bearings for the various shafts used in the machine. The material to be formed into a tube consists of a strip of suitable width wound on a reel, *b*, from which it passes over the roller *b'*, under the paste-reservoir *c*, containing the paste-roller *c'*, which deposits the required quantity of paste near the edge of the strip. From the pasting apparatus the strip passes under the tongue or former *d*, over the top of which it is folded or lapped, as it passes along, by the folding-guides d^1 d^2. From the forming mechanism the tube passes between the pressure-rollers *e* e^1 e^2, by means of which the overlapping edges are firmly pressed together, and from there to the drying-rollers *f* f^1 f^2, which are hollow steam-drums, constructed and operating in the usual way. From the drying-cylinder the tube is conducted over rollers *g* g^1 to the roller g^2, which is mounted upon a sliding bed, for the purpose of imparting to the tube an elastic tension by means of a spring or weight. From the tension-roller the tube is conducted over the roller *h* to the delivery-roller *i*, which delivers the tube in suitable position to pass directly under the tongue *j* of another tube-forming apparatus, by means of which another strip of material, delivered from the reel *k* and pasted on the edge by the pasting-roller *k'*, is formed into an external enveloping-tube by means of the guides *l l'*.

The delivery-roller *i* may be arranged either in front or behind the paste-vat. As shown, it delivers the tube to the under side of the tongue, and the tube passes underneath the paste-vat. By notching the cross-bar which supports the paste-vat, as shown at *i'*, or by means of a suitable roller, the tube may be guided to the under side of the tongue without passing under the paste-vat, or by lengthening the tongue the delivery-roller may be placed in front of the folding-guides, so as to deliver the tube into the folding-guides upon the upper side of the tongue, as shown in Fig. 5. The tube, which is now composed of two thicknesses of material, or, in other words, of two tubes, one inside of the other, is carried over the pressing and drying rollers, as shown, and conducted into the vat *m*, where it receives a coating of water-proof or water-repelling-material.

After removal from the vat the tube is subjected to any suitable drying operation, and when dry it is ready for use for containing powder or any other substance which it may be desired to keep in a flexible water-proof tube.

My machine embraces several devices in common use in the manufacture of paper bags; but its distinguishing characteristic consists

in the devices whereby a paper tube of any form is conducted through tube-forming apparatus, by the operation of which a strip of paper is formed into another tube outside of the first one. It will be seen that any number of additional thicknesses of tubing may be applied by repeating the operation, as described.

I claim as my invention in tube-forming apparatus, substantially such as described—

1. The combination of two sets of tube-forming apparatus, substantially such as described, with an intermediate roller having its bearings in a yielding bed, for the purpose of administering elastic tension to the tube as it is drawn off from the first set of tube-forming apparatus, and delivered to the second set of tube-forming apparatus, substantially as shown.

2. The combination of tube-forming apparatus, substantially such as described, provided with a reel for containing and delivering a strip of paper in suitable position to be formed into a tube, with a guide for delivering a tube already formed in suitable position to have the said strip of paper pasted and folded into a second tube outside of the tube so delivered, substantially as described.

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