2 Sheets—Sheet 1.

A. G. BATCHELDER.

Paper-Tube Machine.

No. 209,746. Patented Nov. 12, 1878.

Fig 1

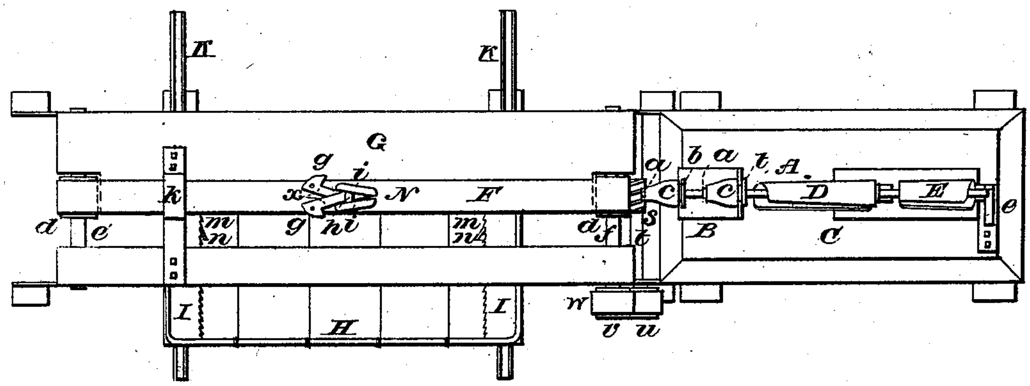

Fig 2

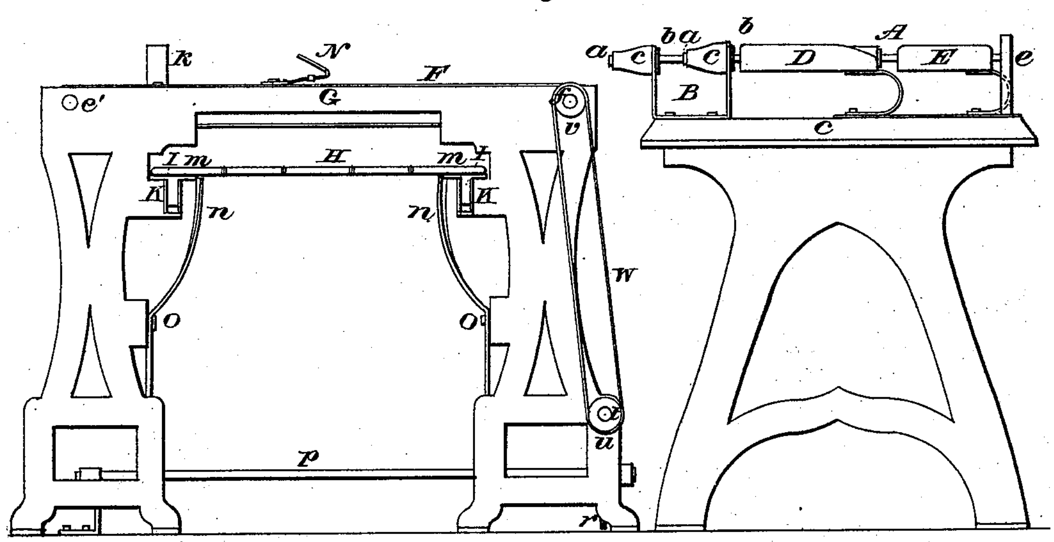

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Fig 3

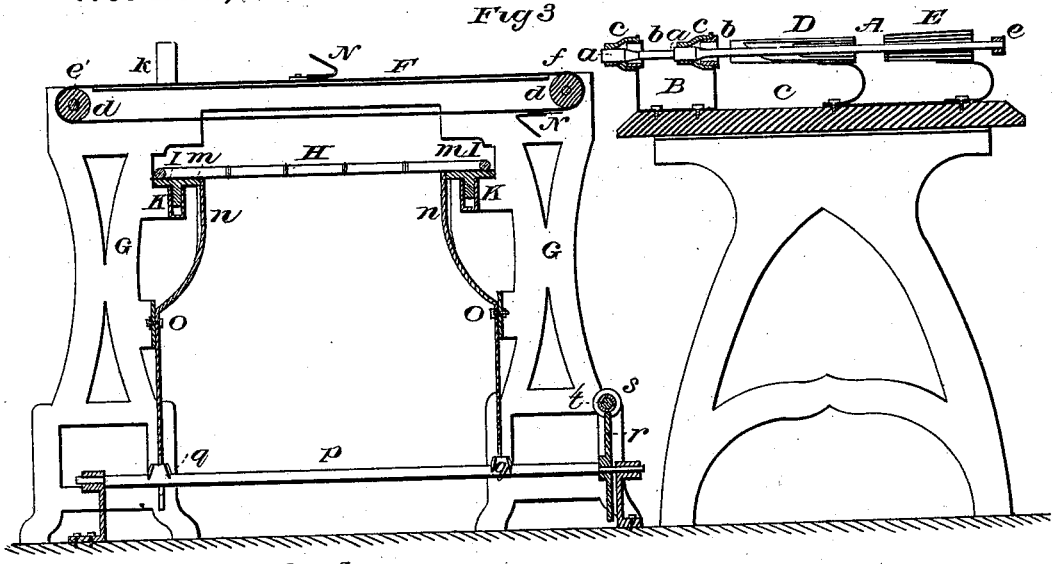


Fig 4

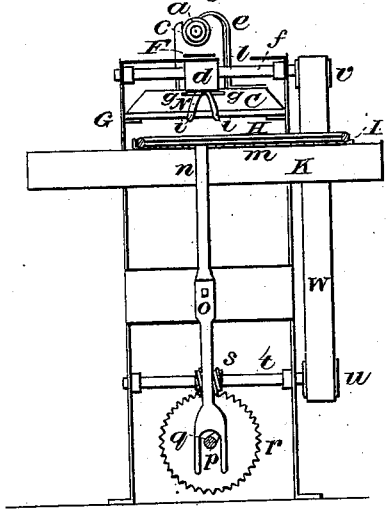


Fig 5

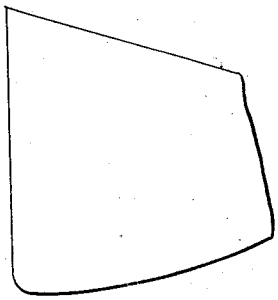


Fig 6

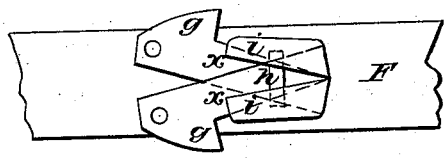
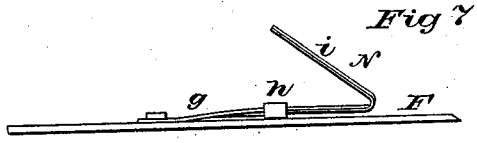


Fig 7



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UNITED STATES PATENT OFFICE.

ASAHEL G. BATCHELDER, OF LOWELL, MASSACHUSETTS.

IMPROVEMENT IN PAPER-TUBE MACHINES.

Specification forming part of Letters Patent No. **209,746**, dated November 12, 1878; application filed August 17, 1878.

To all whom it may concern:

Be it known that I, ASAHEL G. BATCHELDER, of Lowell, of the county of Middlesex and State of Massachusetts, have invented a new and useful or Improved Machine for Making Tubes of Paper; and do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a top view, Fig. 2 a front elevation, Fig. 3 a longitudinal section, and Fig. 4 a transverse section, of the said machine. Fig. 5 is a representation of the form of the sheet of metal used in making the front bender, or that having the helical front edge.

The machine is intended more especially for the making of "cop-tubes," though tubes for various other purposes may be manufactured by it, such being made of paper or a suitable sheet material.

It consists of a mandrel, one or more benders, one or more bore and outer-surface finishers, an endless carrier, and two or more sets of nippers, and two rack-carriages, provided with mechanism for operating them, all being essentially as hereinafter explained.

In the drawings, A denotes a stationary rod or mandrel, supported at its rear end by a standard, B, extended up from a table, C. This mandrel supports two inside or bore finishers or non-elastic cylinders, *a a*, equal in diameter, and having a diameter corresponding to that of the bore of the paper tube to be made.

Encompassing these bore finishers are two tubular or non-elastic outside-finishers, *b b*, which are short tubes, each being concentric with one of the finishers *a a*. Besides one or more of the aforesaid outside-finishers, I employ one or more elastic finishers, *c c*, each, as shown, consisting of a sleeve of vulcanized india-rubber. It encircles and is supported by one of the outside-finishers, and projects beyond it in manner as represented; and as the paper tube passes through and beyond the metallic outside-finisher, such tube is grasped firmly by the elastic finisher, which, contracted upon it, serves, while the tube is passing through it, to wipe or press it down and finish its outer surface to much better advantage than can be effected by a metallic non-elastic finisher, which, owing to the paper varying more or less in thickness, will not accomplish what is done by the elastic finisher. I sometimes dispense with the inelastic outside-finisher, and use in place thereof the elastic finisher.

In connection with the mandrel and inside and outside finishers, I employ in the machine one or more benders, such being shown at D E, each consisting of a plate of metal bent laterally in a spiral form. The mandrel extends lengthwise through each of the benders, which is supported by a standard, *e*, fixed to the rear end of it, and extended up from the table C. Each bender is tapering or conical in shape. Instead of making the front bender with its front edge arranged in a plane at right angles to the mandrel, I make it so that such edge shall form a helix about the mandrel and continue to gradually approach the mandrel. This crowds together the folds of the paper while leaving the bender.

I would remark that by using two or more short benders instead of one long one, and having them arranged apart from each other, I am enabled to make the tube with much less friction than I could with a single long bender, especially when the paper used is very thick.

In advance of the mandrel, and in range with it, is an endless belt, F, supported by rollers *d d*, fixed on shafts *e' f*, arranged in and sustained by a frame, G. This belt carries two or more sets of hooked nippers, N N. Their shanks *x x* cross each other, and they are pivoted to the belt. Each shank is provided with an inclined plane or cam, *g*.

Fig. 6 denotes, on an enlarged scale, a top view, and Fig. 7 a side view, of a pair of such nippers and part of the endless belt or carrier. An elastic band or spring, *h*, extended across the shanks at their crossing and fixed to the belt, serves to close the nippers, whose jaws *i i* not only make an acute angle with each other, but both incline to the horizon or the belt, in manner as shown.

An arch, *k*, spans the endless belt, and is extended up from the frame G. Each pair of nippers, in passing through the arch, has its jaws opened by reason of its cams being carried against the flanks of the arch.

The sheet of paper to be formed into a tube,

after having been suitably pasted, is run into and through the bender or benders, by which it is bent around in a spiral, after which it goes through the finishers, and is laid between the jaws of a pair of the nippers. These jaws, being advanced or moved forward by the endless belt, will draw the paper tube forward through the benders and finishers. On passing through the arch, the jaws will open and discharge, or allow the tube to drop from between them. Just before, however, such may take place, another set of the jaws should have caught the tube, and an attendant should, with scissors, cut the tube across it just in advance of the last-named jaws. The piece so severed will drop off the belt, or will fall down through a slot or opening, *l*, in the frame G, and upon a rack, H, laid upon two carriages, I I. These carriages are supported in guides K K, so as to be capable of being moved simultaneously and transversely of the frame G, they having an intermittent movement, in order that the tubes may be laid side by side and close together upon the rack. The machinery for effecting such movement may be thus described:

Each of the carriages has at its inner edge a serrated rack, *m*. These racks engage with two lever-pawls, *n n*, whose fulcra are shown at *o o*. The lower arms of such pawls are furcated, and span a horizontal shaft, *p*, arranged as shown, and provided with a cam, *q*, to each fork. On the shaft is fixed a worm-gear, *r*, which engages with a worm or screw, *s*, fixed on a transverse shaft, *t*. On this shaft *t* is a pulley, *u*, about which and another pulley, *v*, fixed on one of the shafts of the endless belt F, another endless belt, *w*, extends.

On revolving the shaft *t* not only will the belt F be put in motion, but the mechanism for operating the rack-carriages will also be put in action.

I claim as my invention as follows:

1. The combination of the elastic finisher *c*, the mandrel A, one or more bore-finishers, *a*, and one or more benders, D E, all being arranged and applied substantially as set forth.

2. The combination of one or more elastic finishers, *c*, the mandrel A, one or more bore-finishers, *a*, one or more tubular non-elastic or outside-surface finishers, *b*, and one or more benders, D E, all being applied and arranged substantially as specified.

3. The front bender provided with the helical front edge, arranged as and for the purpose set forth, in combination with the mandrel, extending entirely through the said edge, as specified.

4. The hooked nippers N, substantially as described, composed of the hooked and crossed shanks *x x*, provided with the cams *g g* and closing-spring *h*, as set forth.

5. The combination of two or more sets of hooked nippers, N, the endless belt or carrier F, and the arch *k*, all arranged, constructed, and to operate substantially as set forth.

6. The rack-carriages I I, provided with mechanism for operating them, as described, in combination with the endless belt F and two or more sets of nippers, N, applied thereto, all being essentially as set forth.

7. The combination of the mandrel, one or more benders, and one or more bore and outer-surface finishers, as described, with the endless carrier F, and two or more sets of nippers, N, and the rack-carriages I I, provided with mechanism for operating them, substantially as specified.

8. The combination of the mandrel A, one or more bore-finishers, *a*, and one or more elastic outside-surface finishers, *c c*.

9. The bender D, made substantially as explained—viz., of a plate (see Fig. 5) bent in a conical, spiral, or volute, and having its front edge helical with and gradually approaching the axis of it, (the said bender,) all being essentially as represented.

10. The rack-carriages I I, provided with mechanism for operating them, as described, in combination with the endless belt F.

11. The combination of the mandrel A, one or more bore-finishers, *a*, one or more elastic outside-surface finishers, *c*, and one or more non-elastic outer-side finishers, *b*.

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