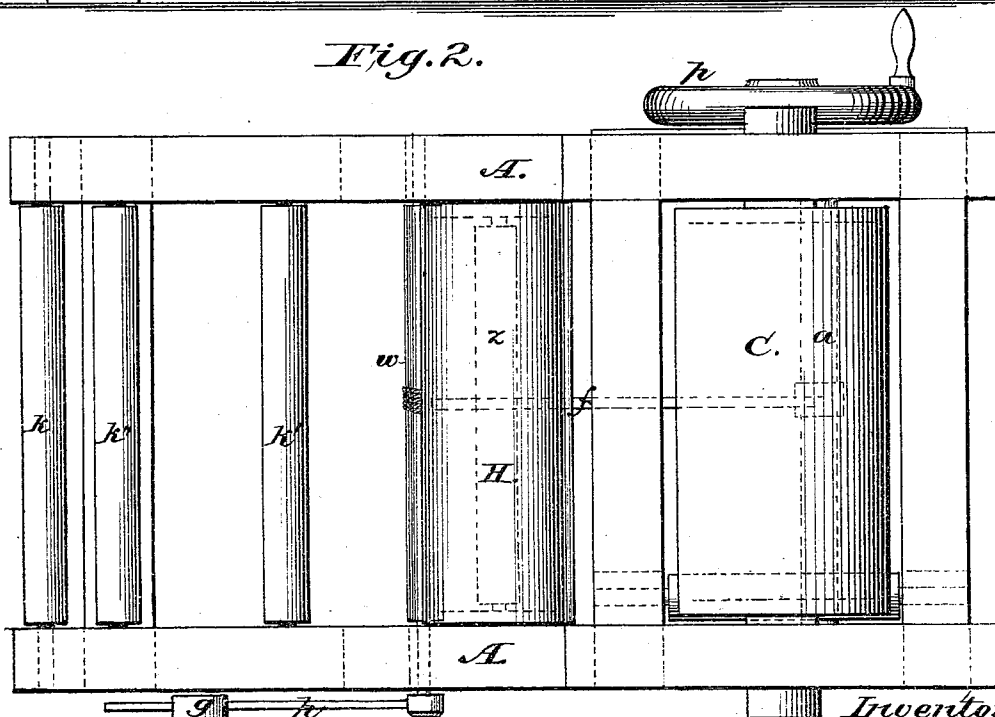
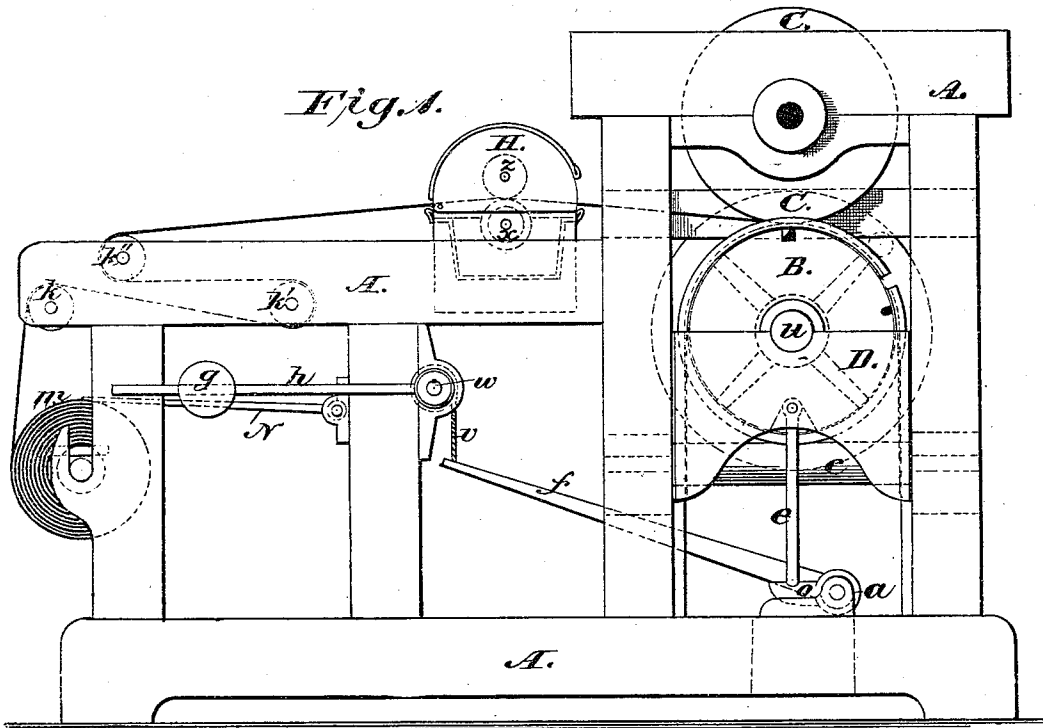


A. BALL.

Machines for Making Hollow Cylinders of Paper.

No. 148,544.

Patented March 17, 1874.



Witnesses
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Fig.3.

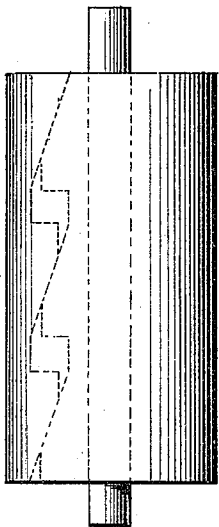
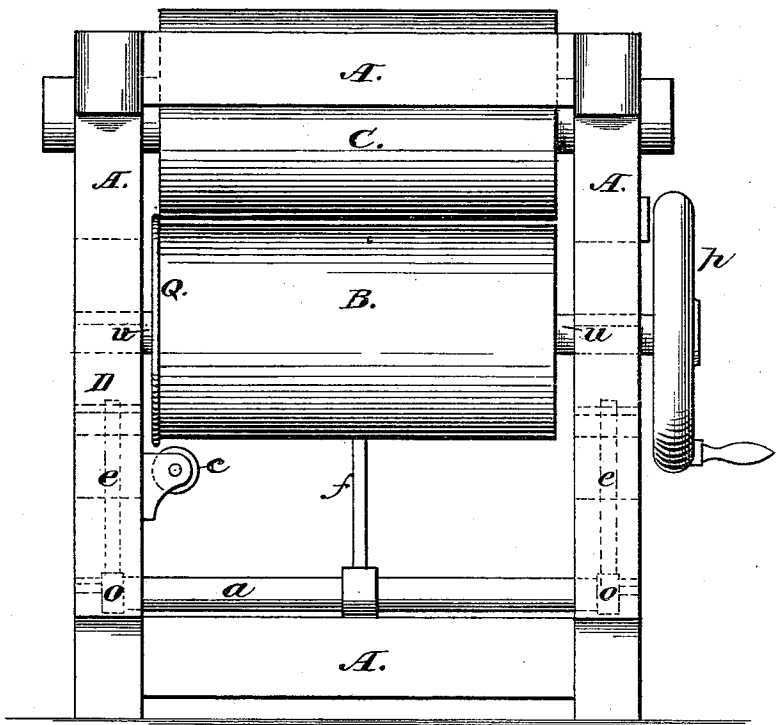


Fig.8.

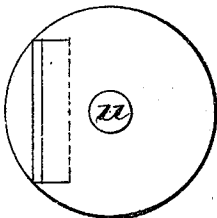


Fig.4.

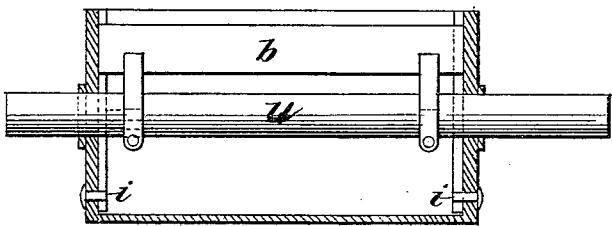


Fig.5.

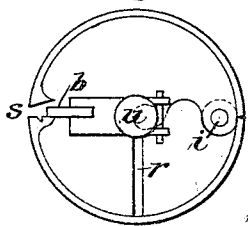


Fig.6.

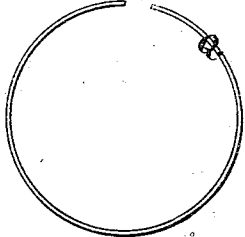
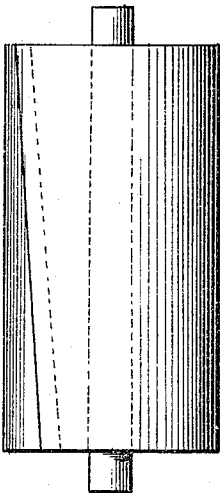
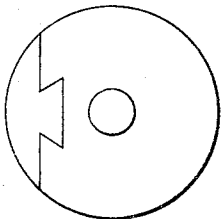


Fig.7.



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UNITED STATES PATENT OFFICE.

ALBERT BALL, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO SULLIVAN MACHINE COMPANY, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR MAKING HOLLOW CYLINDERS OF PAPER.

Specification forming part of Letters Patent No. **148,544**, dated March 17, 1874; application filed March 29, 1873.

To all whom it may concern:

Be it known that I, ALBERT BALL, of the town of Claremont, county of Sullivan and State of New Hampshire, have invented certain Improvements in Machines for Making Hollow Cylinders of Paper or other Fibrous Materials, of which the following is a specification:

My invention consists, first, in an adjustable roller, in one or more parts, used as a forming-cylinder; second, in combining with the forming-cylinder a movable case or jacket; third, in combining a calender roller or rollers with the forming-cylinder; fourth, in devices for applying glue, paste, or cement to the material, as required.

In the drawings filed herewith, Figure 1, Plate 1, represents an upright side view of a machine embodying my inventions; Fig. 2, Plate 1, a top view of such machine; Fig. 3, Plate 2, an upright rear end view of said machine; Fig. 4, Plate 2, a longitudinal sectional view of the forming-cylinder; Fig. 5, Plate 2, a transverse sectional view of forming-cylinder; Fig. 6, Plate 2, an end view of an elastic metallic case, made to fit the forming-cylinder; Figs. 7 and 8, Plate 2, longitudinal and end views of forming-cylinder with wedge devices for holding the forming-cylinder to its full size.

In the drawings, the same letters represent corresponding parts of the machine.

A A represent the frame of the machine; B, the forming-cylinder; C, a calender roller; D, a movable box for shaft of forming-cylinder; e, a guard-roller for supporting the cylinder B, when required; e, a brace, which supports the box D; a, a shaft, from which extends an arm, o, upon which the brace e rests when the machine is adjusted for work; f, a lever, by which to turn the shaft a, so as to let down the arm or arms which support the brace e, by which also to press the forming-cylinder to the calender-roller; h, an arm or lever attached to the lever f by the cord v, which winds upon the shaft w; g, a movable weight upon the arm h, by which to regulate the pressure of the forming-cylinder to the calender-roller; H, a receptacle for paste or liquid glue; x, a felted or other revolving roller, partly immersed in paste or liquid glue; z, a revolving roller, which bears upon the roller x; K K' K'', tension-rollers; m, a roll of pa-

per or other suitable fibrous material upon a shaft held in its bearings, from which the paper or material is drawn through the machine; N, a tension-plate, which rests upon the roll m; p, a hand gear or pulley for turning the forming-cylinder; u, the shaft of forming-cylinder, an eccentric shaft; s, a slot in the forming-cylinder; b, a block or paper-holder projecting from the eccentric shaft u. This block may, by the hand-pulley, be projected so as to fill the slot s, and thus distend the forming-cylinder, which may be somewhat elastic, or hinged, as shown in the drawings, to its full size; or it may be drawn entirely within the cylinder, and thereby the size of the cylinder may be diminished to the extent of the width of the slot. i, a hinge within the forming-cylinder, upon which one part or section of the forming-cylinder is hung; Q, the outer case or jacket of forming-cylinder; r, a stop or brace within forming-cylinder to limit the independent movement of eccentric shaft.

I have devised this forming-cylinder to obviate serious obstacles that have been encountered in making paper cylinders. Hitherto it has been impracticable to make such cylinders with rapidity, economy, and uniformity, because the material, when it has been wound firmly upon a forming-cylinder, and pasted and pressed together, has shrunk, and by reason of this shrinkage the material has been held so firmly to the forming-cylinder that it could not without damage be removed. My improved forming-cylinder obviates this difficulty. The inner cylinder is fitted with the devices described, by which its size may be increased or diminished. Upon this inner cylinder is fitted the cylindrical case or jacket. This case is of thin elastic metal, with an opening on one side to correspond with the slot of the inner cylinder. It has at one end a rim to facilitate drawing it, by hook or otherwise, from the inner cylinder. The paper or other material is wound upon this outer case or jacket when this outer case is upon the inner cylinder, and the inner cylinder is distended to the fullest extent. After one layer of the paper or other material is upon the forming-cylinder, the paste or glue is applied to the under side of the paper or other material in its progress to the forming-cylinder, and thus successive layers are pasted or glued and compressed together until the desired thick-

ness is attained. After the paper cylinder has thus been formed upon the outer case or jacket, then the inner cylinder is diminished in size by the hand-pulley, and the movable box is lowered. The end of the cylinder is thus exposed, suspended, and the case or jacket is readily, by its rim, drawn from the inner cylinder, bearing upon it the paper cylinder. Now, the paper cylinder may be allowed to dry and harden by artificial heat, or otherwise, and whatever may be the shrinkage of the paper or other material used, the case or jacket will yield to the pressure, and will still preserve the cylindrical shape or form, and when sufficiently dry and hard, the metallic jacket or case may be still further reduced in diameter by winding it within itself, and thus it may be easily withdrawn, leaving the paper cylinder finished.

I will now describe the preparation and full operation of my machine: A roll of paper or of suitable material, *m*, upon a roll is placed in the machine, as shown in Fig. 1. The roll *m* revolves readily, but it may be held with the desired firmness by the pressure of the tension-plate *N*, which may be weighted, so as to bear upon *m* with the desired pressure. The outer end of the paper forming the roll *m* is now carried up over the outer tension-roller *K*, thence under the inner tension-roller *K'*, thence back under and over the upper tension-roller *K''*, thence through the glue-case *H*, and between the rollers *x* and *z* in the glue-case *H*. In first carrying the paper or other material through the glue-case it is desirable to avoid contact with glue or paste, and the lower roller *x* may at such time be lowered, or a thin sheet of metal may be passed between the rollers *x* and *z*, over which metallic sheet the paper or other material may pass clean to the forming-cylinder *B*. The end of the paper is then carried to the forming-cylinder *B*, which now has the outer case upon it, and is passed within the slot *s*, from which the block or slide *b* is withdrawn. This is accomplished by holding the forming cylinder firmly while the hand-pulley is turned back. Now, by holding the cylinder firmly and turning the hand-pulley forward, the block or slide *b* may be thrown into the slot *s*, so as to hold the end of the paper or other material firmly to the cylinder. The independent movement of the eccentric shaft within the forming-cylinder is limited by the stop *r* and the eccentricity of the shaft. This eccentricity at the same time throws the block or slide *b* into or withdraws it from the slot *s* as the shaft is turned forward or turned backward, the cylinder being held still. When the end of the paper or material is secured in the forming-cylinder, as described, the forming-cylinder is turned so as to wind upon it one layer of paper without the application of paste or glue. The metallic sheet is removed from between the rollers *x* and *z* when enough paper or material has passed these rollers to form one layer upon the forming-cylinder, and

the paste or glue is then, by the felted roller *x*, applied to the under surface of the paper or other material as it passes to the forming-cylinder. The lever or arm *h* and weight *g* are now adjusted so as to give the desired pressure of the forming-cylinder to the calender-roller, and the machine is ready for operation. Power is applied directly by the hand-pulley to the forming-cylinder, and thus the material is wound from the roller *m* upon the forming-cylinder to the extent desired, when the cylinder formed may be cut from the material not wound and removed from the machine, and further dried and hardened, as before described. When the desired thickness of cylinder is attained, the metallic sheet should be passed between the paper and the felted roller *x*, so that the paper may now again pass to the forming-cylinder free from paste or glue. The calender and other rollers of the machine are revolved by the friction of the paper or other material.

The drawings show but one calender-roller. The number may be increased, if desired, and, if desired, they, as well as the forming-cylinder, may be heated by steam or otherwise, and the glue or paste in the receptacle *H* may, in like manner, be kept at the desired temperature.

I find that tension devices substantially as described are important for the purpose of making uniform, compact, and strong cylinders.

By care in respect to the use of paste or glue, the forming-cylinder constructed substantially as described may be used without the outer case or jacket.

It is obvious that other devices than those described may be used for adjusting the size of forming-cylinder, among which are the different forms of wedges which are shown in the drawings, (Figs. 7 and 8,) or the outer case or jacket may be conical in its interior, so as to fit a conical shaft or drum.

What I claim, and desire to secure by Letters Patent, is—

1. The forming-cylinder *B*, constructed with the hinge *i*, eccentric shaft *u*, block *b*, and slot *s*, substantially as and for the purpose described.

2. The forming-cylinder *B*, constructed with the hinge *i*, eccentric shaft *u*, block *b*, and slot *s*, in combination with the elastic case or jacket *Q*, substantially as and for the purpose described.

3. The forming-cylinder *B* and the case or jacket *Q*, in combination with the calender-roller *C*, the movable box *D*, the brace *e*, the shaft *a*, and the lever *f*, substantially as and for the purposes described.

4. The combination of the forming-cylinder *B* and the calender-roller *C* with the box *H* and the rollers *x* and *z*, substantially as and for the purposes described.

Witnesses: ALBERT BALL,
COTTRELL J. CAHALEY,
JULIUS M. FERGUSON,