(No Model.) 2 Sheets—Sheet 1.

J. G. BODGE.

MACHINE FOR FORMING HOLLOW WARE FROM PAPER PULP.

No. 319,182. Patented June 2, 1885.

Fig. 1.

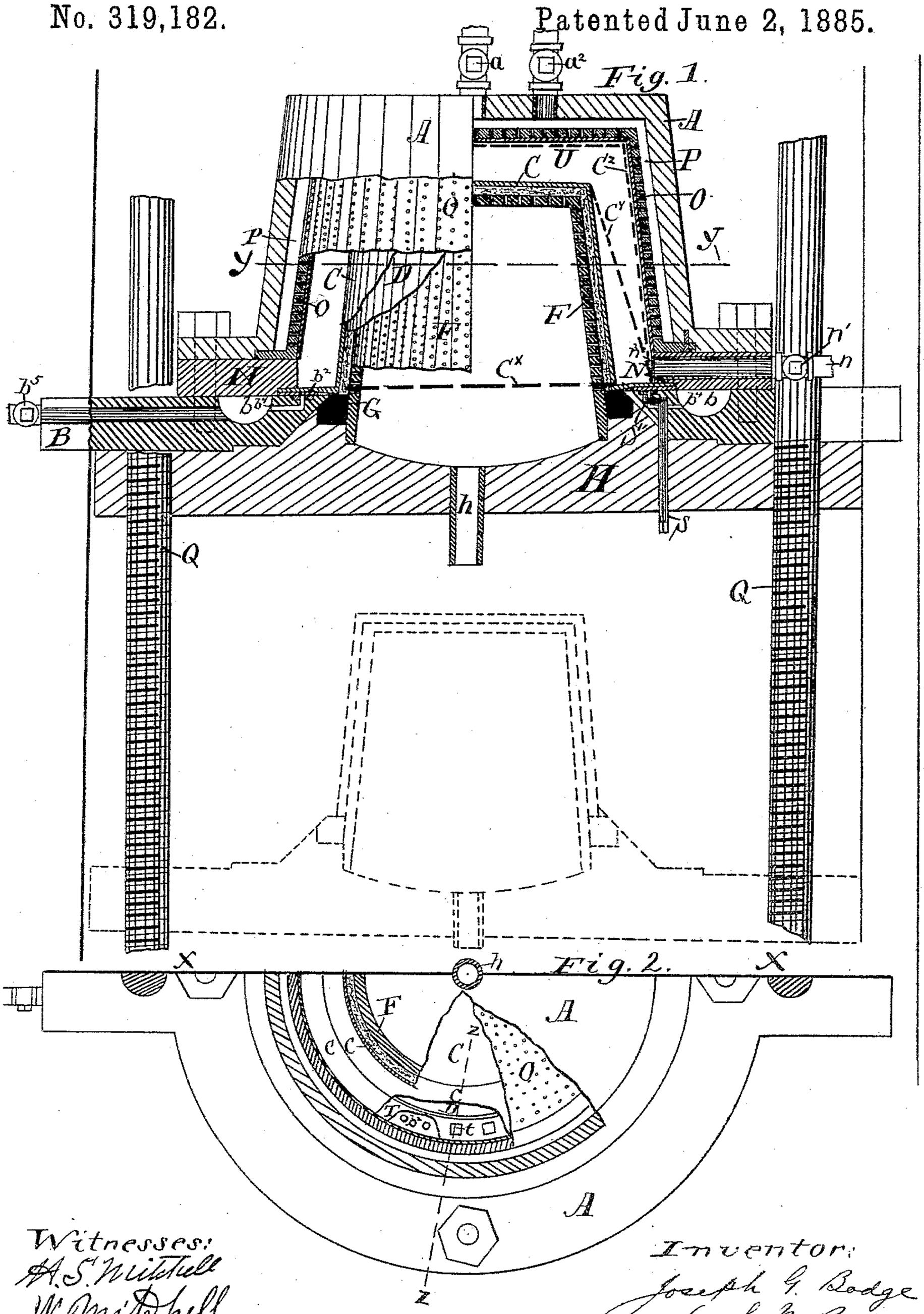
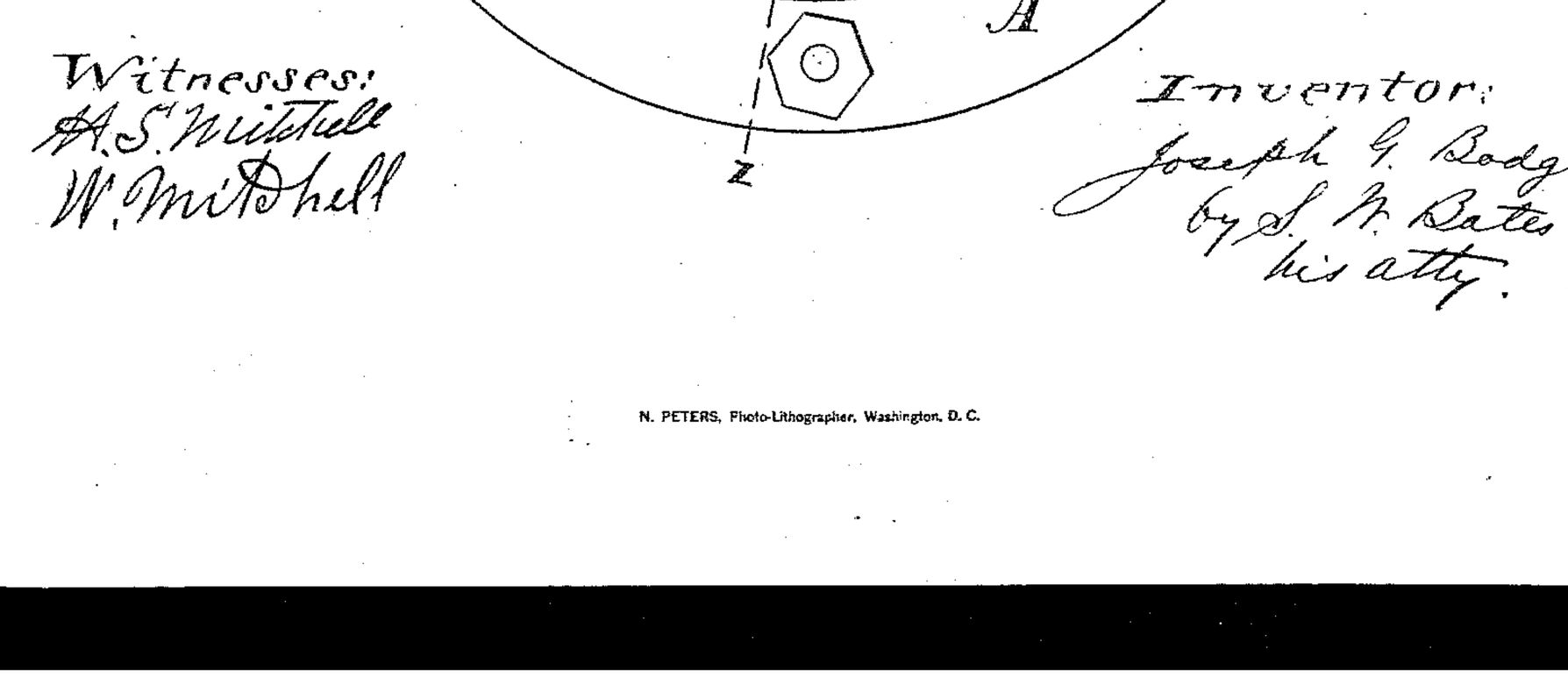


Fig. 2.



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W. Mitchell

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by S. H. Bates
his atty.

(No Model.) 2 Sheets—Sheet 2.

J. G. BODGE.

MACHINE FOR FORMING HOLLOW WARE FROM PAPER PULP.

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Fig. 3.

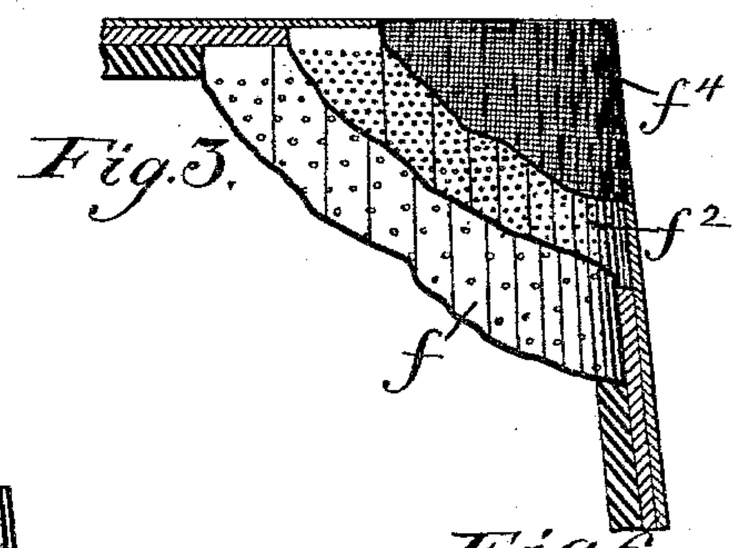


Fig. 4.

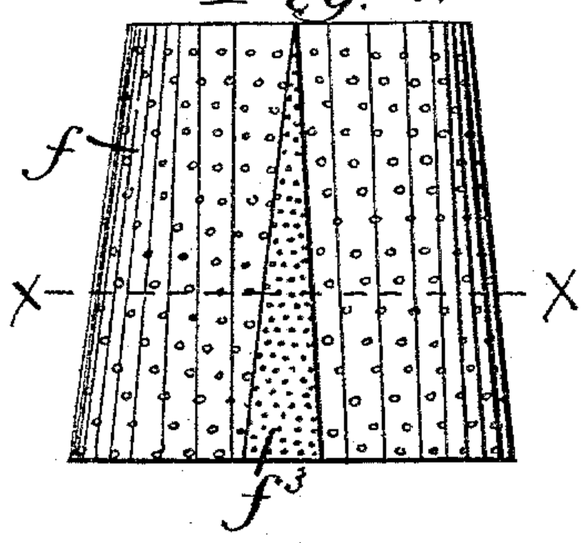


Fig. 5.

Fig. 10.

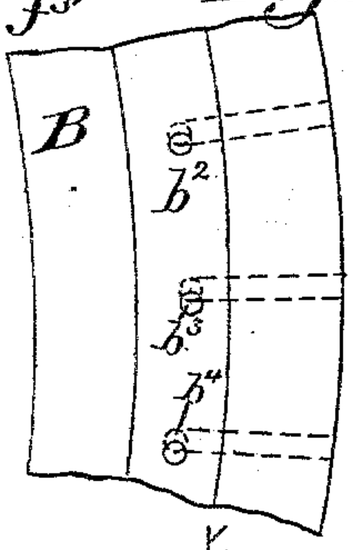


Fig. 6.

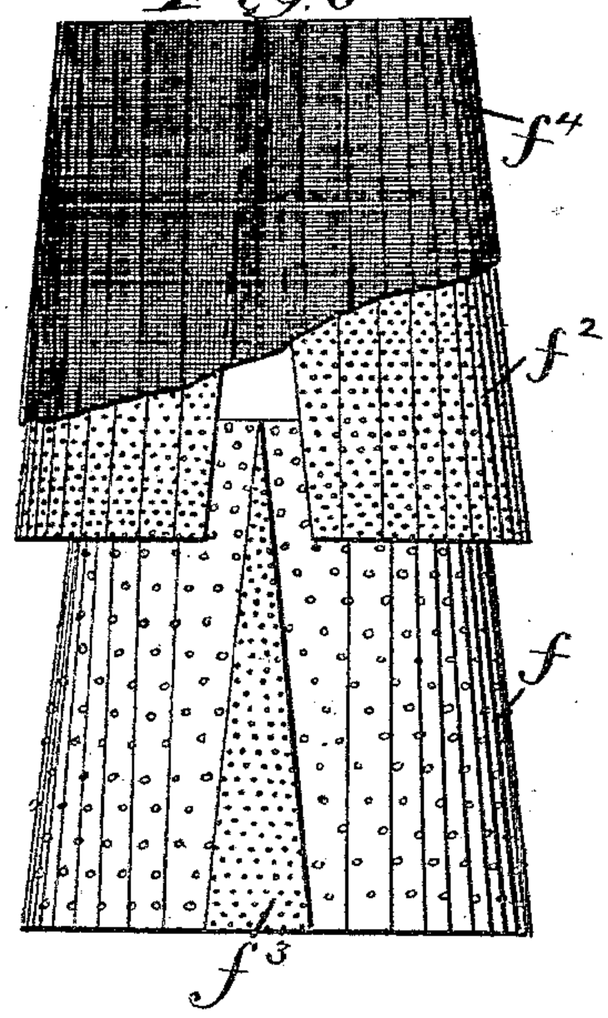


Fig. 7.

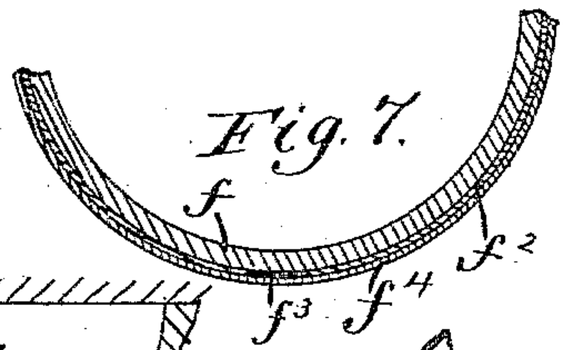


Fig. 8.

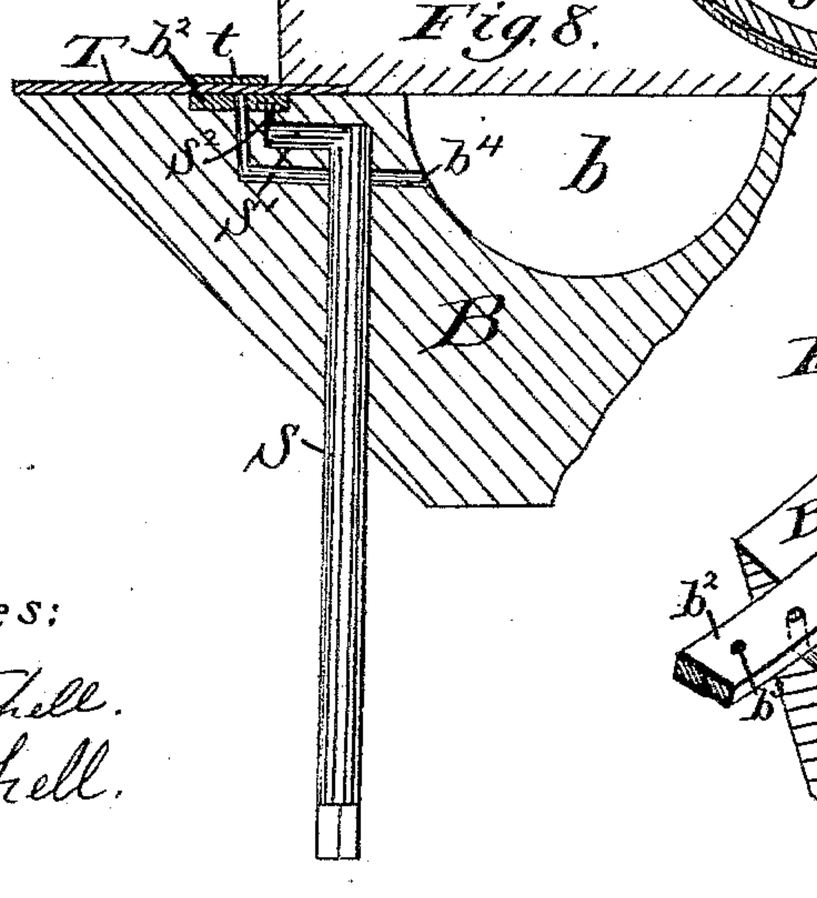
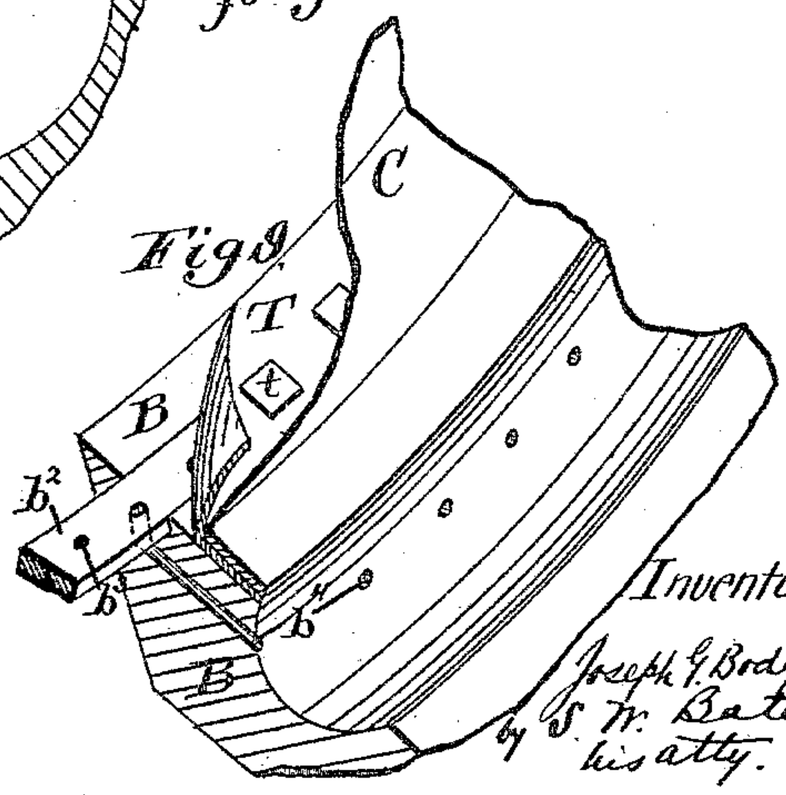


Fig. 9.



Witnesses:
A. S. Mitchell.
W. Mitchell.

Inventor:
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his atty.

UNITED STATES PATENT OFFICE.

JOSEPH G. BODGE, OF GORHAM, ASSIGNOR TO THE INDURATED FIBRE COMPANY, OF PORTLAND, MAINE.

MACHINE FOR FORMING HOLLOW WARE FROM PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 319,182, dated June 2, 1885.

Application filed February 14, 1885. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH G. BODGE, a citizen of the United States, residing at Gorham, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Machines for Forming Hollow Ware from Paper-Pulp, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to machines for forming hollow ware from paper-pulp; and it consists of an improved construction of my machine for the same purpose, patented to me October 30, 1883, whereby said machine is rendered more efficient in its operation.

My invention consists, first, of a double dome or outside cylinder, the two parts having a space between them, and the inner being perforated; second, of a rubber diaphragm of thin dental rubber, made in one straight piece and not molded to the form of the pail or other article, as in my former machine; third, of a check-valve or rubber flap supplemented by a metal valve placed at the apertures where the pulp enters the machine to prevent the pulp from crowding back into these apertures and packing them full when the pressure is applied.

In the drawings, Figure 1 is a vertical section through the line *x x* of Fig. 2, showing a portion of the figure in elevation and other portions cut away. Fig. 2 is a section through *y y* of Fig. 1, with portion of the figure in plan. Fig. 3 is a detail showing construction of die or former. Fig. 4 is an elevation of inner shell of former with gore of outer shell attached to it. Fig. 5 is a section through *x x* of Fig. 4. Fig. 6 is an elevation showing manner of putting inner and outer shells together. Fig. 7 is a cross-section through center of former when complete. Fig. 8 is an enlarged section through *z z* of Fig. 2. Fig. 9 is a perspective view showing manner of introducing stock. Fig. 10 is a plan view of a portion of valve b^2.

A is the hollow cylinder or dome shown in my former patent. Within the dome A, and separated from it by the space or chamber P, is the inner dome, O. The dome O is perforated and lined on its inside with felt. The two pipes *a* and a^2 enter the chamber P through the top of dome A. The pipe *n*, with its valve *n'*, leads out from the inner face of the bottom of inner dome, O, and the inside opening of this pipe is covered with wire-gauze. The rubber diaphragm C is composed of a straight unmolded piece of thin rubber, its edges being confined between the edges of the ring N and the ring B. When the former F is dropped down, the diaphragm C is stretched straight across on line $C^{\times}$, Fig. 1.

b^4 b^4 are the openings from the stock-chamber *b* into the space U, and beneath the rubber diaphragm C. A valve-ring, b^2, is sunk in the upper surface of ring B, running entirely around the ring B, and having holes or perforations b^3 coincident with the openings b^4 when valve b^2 is in proper position. The valve-ring is slid in its seat by the stem S, having a crank, S', and pin S^2 on its end, the latter of which fits in a slot in the under side of valve b^2. The thin rubber ring or flap-valve T is secured, as to its outer edge, beneath the edge of diaphragm C, while its inner edge is left free. The stiffening-piece *t* is attached to the flap-valve T over each of the holes b^3. The perforated former F is of three thicknesses, an inner shell, *f*, an outer shell, f^2, of thinner material, and a covering or envelope, f^4, of wire-gauze. Two or more gores, f^3, are removed from the outer shell, f^2, and these gores are secured to the inner shell, *f*. Their edges are beveled in such a manner that when the parts are together the gores f^3 dovetail into the outer shell, thus holding it firmly in place. The wire-gauze f^4 envelops the whole former, and it is soldered or otherwise secured to the outer shell, f^2, at frequent intervals.

Having thus described the construction of my improved machine, I now proceed to explain its mode of operation. When the former F is raised to its place, the diaphragm C assumes the position shown by dotted line C^{Y}. The valve b^2 is now placed so that the holes b^3 coincide with the holes b^4. The pulp is then let in through chamber *b*, and as it comes in it lifts the flap-valve T. When the space U is full, it expands the diaphragm C back against the surface of the felt lining of the inner dome, O. The wire screen n^2, over the end of the pipe *n*, prevents the diaphragm C from being forced into the pipe. The valve a^2 is opened during this operation to allow the air to es-

cape. When the pulp is shut off and the water-pressure put on through the pipe *a*, the valve b^2 is closed, and the flap-valve T closes of itself, keeping the pulp from becoming compressed in the holes b^3. The water fills the space P, passes through the perforations in the inner shell, O, and presses at once on all parts of the diaphragm C. The diaphragm C is thus forced inward toward the former F uniformly on all sides.

When the pail has been formed and is ready to be removed, the outer shell, bearing with it the wire-gauze and the formed article, is slipped from the inner shell. The sides of the outer shell are then sprung toward each other and the pail loosened and slipped off.

As thus constructed my former is capable of resisting the heavy hydraulic pressure without wearing out, as in the case of felt, and it can be handled with great ease and the pail removed without breaking.

It was found upon trial that when the diaphragm C was expanded out against the inner surface of the dome A the water entering through the pipe *a* took some time to find its way down the sides between the rubber and the wall of the dome, and hence the top was pushed in more rapidly than the sides, causing unevenness in the formation of the pail. The use of the inner dome does away with this difficulty. By the use of the thin rubber diaphragm a more even formation can be secured, because the diaphragm being straight and always in a state of tension adapts itself readily to the form of the article and does not form any folds.

The use of the valves T and b^2, I found to be quite necessary to the perfect working of the machine, because the apertures through which the pulp entered were liable to get clogged when the back-pressure was put on. Valve b^2 may be turned with a worm-gear or other devices. In some cases where light hydraulic pressure is used valve b^2 may be omitted.

I claim—

1. In a machine for forming hollow ware from paper-pulp, a perforated inner dome, O, arranged concentric with the outer dome, having space P between the two domes, the surface of inner dome being cushioned or protected by felt or other suitable material, substantially as described.

2. Combination of straight rubber diaphragm C with valve T, with its stiffening-pieces *t*, substantially as shown and described.

3. The combination of straight rubber diaphragm C, flap-valve T, and valve b^2, operated by a stem, S, or other suitable means, substantially as shown and described.

4. The combination of the straight rubber diaphragm C with former made up of inner shell, *f*, outer shell, f^2, gores f^3, and gauze f^4, substantially as shown and described.

5. The former composed of inner shell, *f*, with its gores f^3, the outer shell, f^2, and wire-gauze f^4, substantially as described.

6. The flap-valve T, with its stiffening-pieces *t*, to stop back-flow of pulp into pipes, substantially as shown.

7. The valve b^2 with openings b^3, connecting with ports b^4, and operated by stem S, with its crank S′ and pin S^2, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

JOSEPH G. BODGE.

Witnesses:
FRANKLIN J. ROLLINS,
EDWARD L. O. ADAMS.