

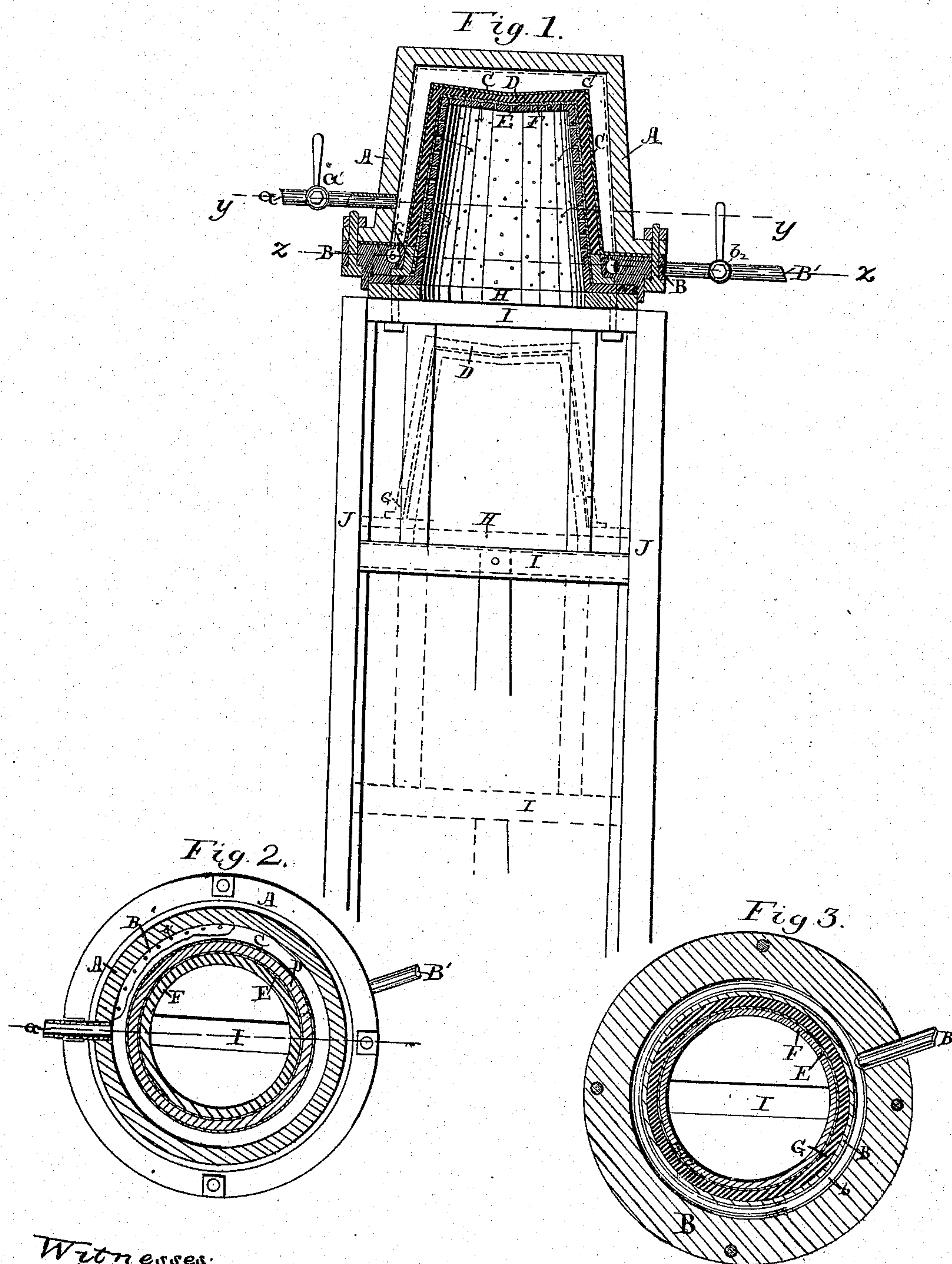
(No Model.)

J. G. BODGE.

MACHINE FOR FORMING HOLLOW WARE FROM WOOD PULP.  
No. 887,614

No. 287,614.

Patented Oct. 30, 1883.



Witnesses:  
L. L. Morrill  
L. A. Robinson.

Inventor:  
Joseph B. Dodge  
by S. W. Bates  
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# UNITED STATES PATENT OFFICE.

JOSEPH G. BODGE, OF WATERVILLE, MAINE.

## MACHINE FOR FORMING HOLLOW WARE FROM WOOD PULP.

SPECIFICATION forming part of Letters Patent No. 287,614, dated October 30, 1883.

Application filed April 2, 1883. (No model.)

*To all whom it may concern:*

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

My invention relates to machines for forming pails and other hollow ware from wood pulp or other paper-stock.

Heretofore devices and processes have been employed in making paper pails, buckets, and the like articles, wherein the means or parts have been so arranged that the pressure could be applied on the articles from the inside outwardly; but the result has not proved a success. This has arisen chiefly from the fact that the peculiar manner of applying the pressure served to separate the fiber or material of which the articles were made, and thus seriously damaged their unity, and they were often cracked. There has also been used for this general purpose a mold in two parts working toward each other and thus pressing the material between them; but such a device is somewhat complex in structure, and not well adapted to the uses had in view in the present invention.

The object of my invention is to form a pail or similar article of paper-pulp, so that the fiber shall be laid in a strong and uniform manner, and a heavy pressure may at once be applied in a direction at right angles to all parts of the surface without disturbing the arrangement of the fiber or the form of the pail. I accomplish this result by means of mechanism shown in the accompanying drawings, of which—

Figure 1 shows a vertical section through  $x$  of Fig. 2. Fig. 2 is a section through  $y y$  of Fig. 1. Fig. 3 is a section through  $z z$  of Fig. 1.

A is a hollow chamber or cylinder, the lower edge of which is flanged and bolted to the metal ring B. The pipe  $a$ , with its valves  $a'$  and  $a''$ , opens into the cylinder A. Within the ring B, and extending entirely around it, is the circular chamber  $b$ , from which lead small holes or perforations,  $b'$ , (see Fig. 2,) which open within the cylinder A. The pipe

$B'$ , with its valve  $B^2$ , connects with the chamber  $b$ . Clamped between the ring B and the cylinder A is the flexible rubber bag or diaphragm C, which I find to work, but when molded in the exact form of the outside of the pail after the latter has been compressed.

D shows a pail after being formed.

F is a perforated form covered with a felt or other porous drainer, E, the outside of which will be the exact shape and size of the inside of the pail to be formed. The bag C, before the pail is formed, fits more or less closely over the drainer E. The lower edge of the former F contains a flange, on which rests the rubber packing-ring G, and which confines the drainer E to the former F. This packing-ring G also forms a tight joint between the former F and the ring B. The former F is bolted, by means of the ring H, to the frame I, which is movable up and down in the frame J by means of the sweep K or other devices.

Having described the construction of my machine, I now proceed to show its manner of operation.

The valves  $a'$  and  $a''$  being closed, the pulp is admitted under considerable pressure, through the pipe  $B'$ , the chamber  $b$ , and the perforations  $b'$ , to the space between the bag C and the drainer E. The water of the pulp begins at once to pass through the drainer E and the perforated former F on all sides, leaving the pulp deposited on the surface of the felt. The pulp, being forced in much faster than it is able to escape through the drainer E, fills the space between the bag C and the drainer, and expands the bag C until it fills the inside of the cylinder A, as shown by dotted lines. When enough pulp has been passed into the cylinder to form the pail of sufficient thickness, the valve  $b^2$  is closed, shutting off the supply. The tension of the rubber bag C, which has been distended until now, causes it to contract to its molded form, which should always be somewhat smaller than the outside of the formed article. As the bag C contracts it forces the water of the pulp which it incloses through the drainer and closes itself tightly around the outside of the formed pail, as shown in Fig. 1. The valve  $a'$  is now



opened and water is admitted through the pipe *a*, and the space between the rubber bag C and the inside of the cylinder being filled, a heavy pressure is applied. This hydraulic pressure, acting at right angles to the surface of the bag C at all points, compresses and consolidates the pulp, and does not impair its strength by changing its fibrous structure. The pail being formed, the frame I, bearing the former and the formed pail, is lowered, as shown by dotted lines, Fig. 1, and the pail removed. The pail, having received a pressure of one hundred pounds to the inch, for instance, which I have found sufficient, has nearly all the water extracted, and may be calendered or otherwise finished with ease.

The water used for pressure is drawn off by means of the valve *a*<sup>3</sup>; or a special waste-pipe may be used.

It will be observed that by my process the pail is formed and compressed to any desired extent automatically and without handling the ware or taking the machine apart.

I am aware that hollow ware has been formed inside of a mold and hydraulic pressure applied by means of a removable rubber bag; but when a heavy pressure is thus applied it has been found that the sides tend to break away from the bottom, and thus materially weaken the corners. By my process the corners are sharp and compact and as strong as any portion of the pail.

The exact size and shape of the bag C is a matter to be determined by experiment in each case.

I do not wish to confine myself to the device here shown for raising and lowering former F, for this may be done in a variety of ways and is no part of my invention.

The pulp may be admitted between the bag C and the felt E by other means than here shown; but I consider this the preferable way.

The former F, with its felt jacket E, may be replaced by a strong woven-wire former cov-

ered with wire-gauze, thus making it all one article.

What I claim as my invention is—

1. The machine for forming pails and similar ware from paper-pulp, consisting of the cylinder A, with its connecting-pipe *a*, the ring B, with its chamber *b*, and the rubber bag C, all combined with the removable former F, with its drainer E, substantially as and for the purpose set forth.

2. In a machine for forming articles of paper-pulp, the cylinder containing rubber diaphragm C, combined with the porous former F, the pipe B', for admitting the stock between the diaphragm and the former, and pipe *a*, for applying hydraulic pressure, all substantially as described and shown.

3. A machine for forming hollow ware of pulp, consisting of a porous former, the outside of which is covered with a closely-fitting rubber bag, between which and the former the pulp is admitted, combined with a pump or other means of applying hydraulic pressure, substantially as shown and described.

4. The process of forming hollow ware of pulp on the outside of a porous former by forcing the pulp between said former and a rubber bag fitting over it, and afterward applying hydraulic pressure on the rubber, all in one operation and without removing the formed article from the machine, substantially as shown and described.

5. The process of forming hollow articles of pulp, consisting of forming the articles on the outside of a porous former, and then applying hydraulic pressure by means of a rubber bag fitting over the article, substantially as described and set forth.

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

JOSEPH G. BODGE.

Witnesses:

S. W. BATES,

L. L. MORRILL.