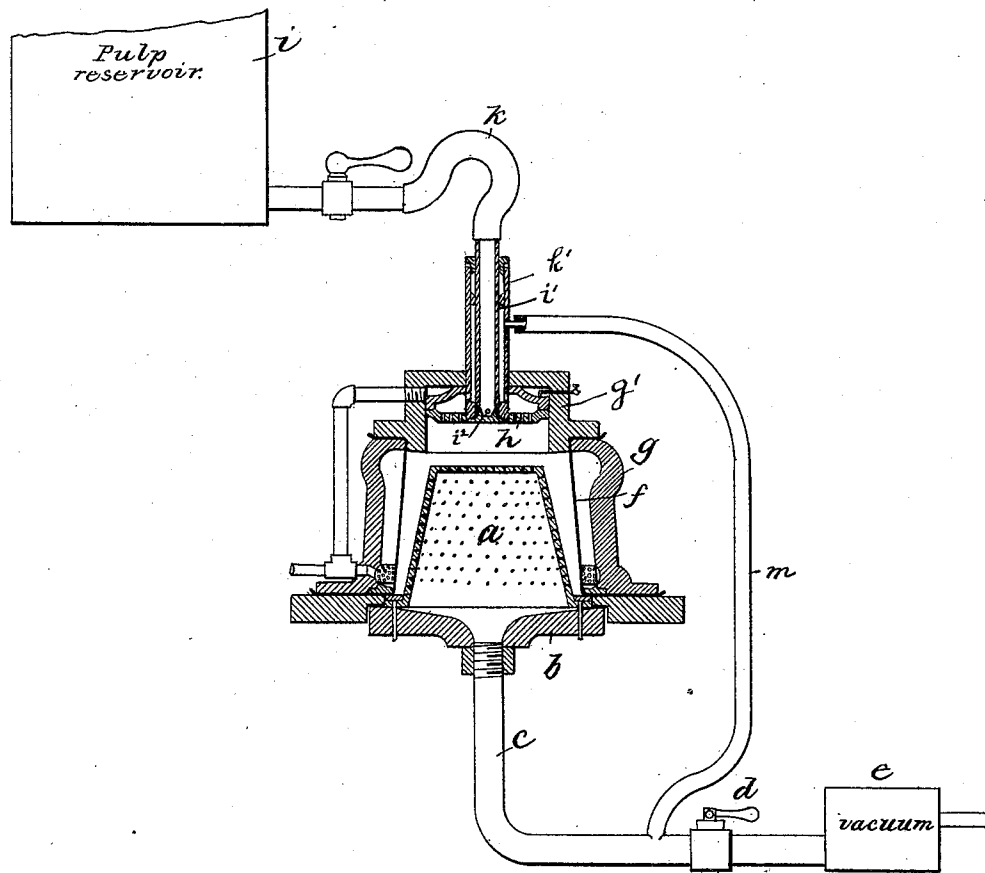


(No Model.)

F. E. KEYES.
METHOD OF MOLDING PULP ARTICLES.

No. 424,003.

Patented Mar. 25, 1890.



Witnesses.

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UNITED STATES PATENT OFFICE.

FRANK EUGENE KEYES, OF PETERBOROUGH, NEW HAMPSHIRE, ASSIGNOR,
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FIBRE COMPANY, OF PORTLAND, MAINE.

METHOD OF MOLDING PULP ARTICLES.

SPECIFICATION forming part of Letters Patent No. 424,003, dated March 25, 1890.

Application filed November 21, 1887. Serial No. 255,792. (No model.)

To all whom it may concern:

Be it known that I, FRANK EUGENE KEYES, of Peterborough, county of Hillsborough, State of New Hampshire, have invented an Improvement in Methods of Molding Pulp Articles, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

My invention relates to the art of making molded articles from pulp material, being applicable in the manufacture of pails, tubs, and other articles from wood pulp. In the manufacture of said articles from wood pulp as now commonly practiced, the pulp material is introduced in a semi-fluid state into the space between a perforated former and a contractible mold, the said space being several times as great as that required for the finished article, and after the fluid material has been thus introduced into the space the outer mold is contracted upon it under heavy pressure, forcing out the water in which the pulp has been suspended through the perforations of the former and compacting the pulp material into a solid wall.

The object of the present invention is to produce a more perfect cohesion of the pulp material, rendering the articles made from it tougher and stronger than those produced by the methods commonly practiced prior to my invention, which consists, mainly, in removing the air-pressure from, or, in other words, applying suction to the interior of the former while the pulp is flowing in around the said former as well as while the compression of the pulp upon the former is taking place.

The application of suction to the interior of the former while the pulp is flowing into the mold and before pressure is applied to the mold tends to cause the water in which the pulp is suspended to flow freely out through the perforations in the former, and by its flow to lay the fibers of the pulp more nearly parallel with one another, so that when the pressure is subsequently applied the fibers will receive a certain definite arrangement with relation to one another, instead of being matted together promiscuously, as takes place when

the pulp is acted upon only by pressure at the outside of the mold, and by this laying or definite arrangement of the fiber the resulting material is found to have greater toughness or strength, so that a vessel or hollow article can be made with thinner and lighter walls and yet have greater strength than a thicker wall made in accordance with the old methods.

The drawing shows a sufficient portion of an apparatus for molding pulp articles to illustrate the method of forming the subject of this invention, which may, however, be carried out by apparatus of other construction.

The apparatus comprises a perforated former *a*, the outer surface of which corresponds in shape to the interior of the article to be made, the said former being closed by a head *b*, having an air-tight connection with said former, and communicating with an exhaust-pipe *c*, controlled by a stop-cock *d*, and communicating with an air-pump or exhaust apparatus *e*. The mold that co-operates with the former *a* to compress the pulp into a solid wall on the former is shown as consisting in part of a flexible partition or diaphragm *f*, contained in a strong chamber *g*, and being movable toward and from the sides of the former *a* to shape the sides of the article, which is shaped at its end by a movable piston or plunger *h*, working in a cylindrical extension *g'* in the chamber *g*. The pulp is admitted from a reservoir *i* through a pipe *k*, which may be controlled by any suitable valve or faucet to permit the pulp to flow in when desired and to cut off the pulp-inlet *i* from the interior of the mold at the time when the pulp is to be compressed.

The construction of the inlet-pipe is shown as substantially the same as in Patent No. 354,708, dated December 21, 1886, the lower portion of said pipe *i'* passing through a larger pipe *k'*, connected with the piston *h*. The portion *i'* of the pipe has a delivery-orifice *i''* near the lower end, and by moving the said pipe downward a short distance with relation to the outer pipe *k'* the said orifice is brought below the piston, so that the pulp may be discharged through it into the mold. The construction of this device forms no part

of the present invention, and is not herein claimed.

In using an apparatus of this kind in accordance with the method forming the subject of this invention, the exhaust-pipe *c* is placed in communication with the exhausting apparatus *e*, thus tending to remove the atmospheric pressure from the interior of the former *a*, or applying suction therein during the time that the pulp is being admitted through the pipe *i* into the space around the former within the mold. This suction causes the water to flow out through the fibers of the pulp before the pulp begins to be compressed, and thus lays or arranges the fibers of the pulp in the mass, and in order to give the best results the suction is continued after the mold has been filled with the pulp and while the mold is being forcibly contracted to compress and compact the pulp upon the former, which may be done in the usual manner by hydraulic pressure admitted into the chamber *g* and *g'* at the outside of the contracting portions *f* and *h*.

The peculiar action of the suction in laying the fibers results from the fact that it acts to quickly extract the water from that portion of pulp which comes in contact with the pervious former, thus depositing the pulp with a papery structure. This effect extends gradually from the inner surface outward, so that layer after layer is added, a perfect drainage being formed at all times through the interstices of the laid pulp. It is for the above reason that the process is more effective and produces a different result from the use of an

external pressure, which drives the pulp and water together against the former, to a great extent bunching rather than laying the fiber.

When a part of the mold consists of a plunger or rigid portion, as *h*, that moves toward the former in compressing the material, the said plunger may be perforated, as shown, and suction applied to the outer side of the perforated plunger, as provided for by the pipe *m* communicating with the exhausting apparatus *e* and with the space within the hollow piston through the space between the pipes *k'* and *i'*.

I claim—

1. The art or method of molding pulp which consists in introducing pulp under pressure between the mold and the former, applying suction through the former to the pulp, and thereafter compressing the pulp that has been introduced into the mold, substantially as described.

2. The art or method of molding pulp which consists in forcing the pulp between the mold and the former, then compressing the pulp and applying suction through the former to the pulp during the time that it is being forced into the mold and compressed therein, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK EUGENE KEYES.

Witnesses:

JOS. P. LIVERMORE,
M. E. HILL.