W. J. KEEFE.

Mechanism for Pressing and Finishing Hollow Articles of Paper-Pulp.

No. 202,353. Patented April 16, 1878.

Fig. 1.

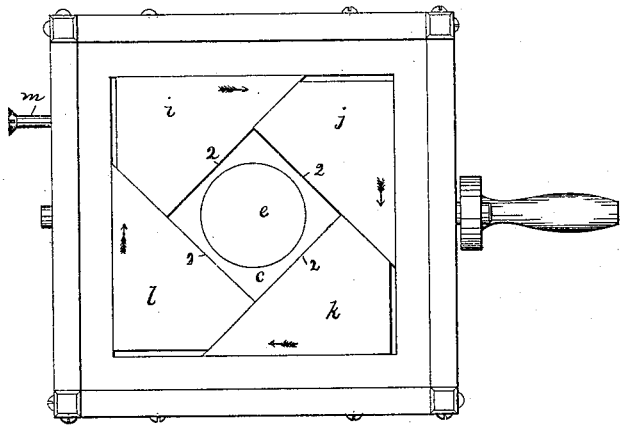


Fig. 2.

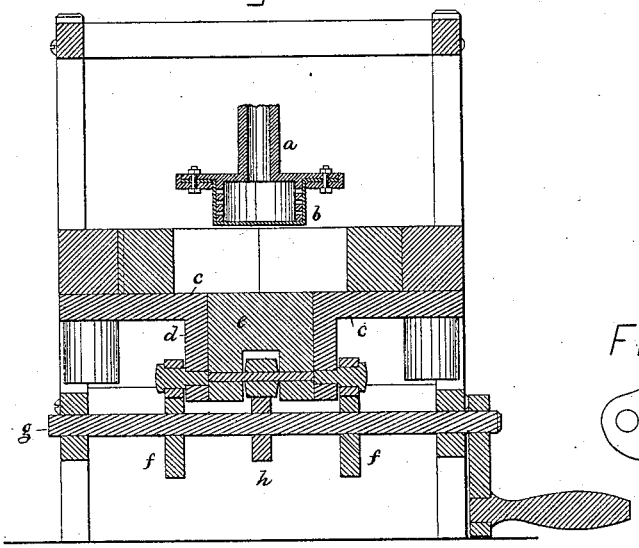


Fig. 3.

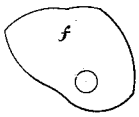
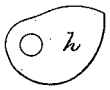


Fig. 4.



Witnesses

E. C. Perkins.

W. J. Pratt.

Inventor.

William J. Keefe

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UNITED STATES PATENT OFFICE.

WILLIAM J. KEEFE, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN MECHANISM FOR PRESSING AND FINISHING HOLLOW ARTICLES OF PAPER-PULP.

Specification forming part of Letters Patent No. **202,353**, dated April 16, 1878; application filed September 8, 1877.

To all whom it may concern:

Be it known that I, WILLIAM J. KEEFE, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Mechanism for Pressing and Finishing Hollow Articles of Paper-Pulp, of which the following is a specification:

This invention relates to a machine to press and finish hollow articles made from paper-pulp, such as boxes, &c., they being either cylindrical or angular.

The invention is an improvement on United States Patent No. 89,433, April 27, 1869, and has special reference to such a construction and operation of the pressing and finishing devices that the angular portions of the box, as between the cylindrical body and bottom of a cylindrical box, or the sides of a square box, may be carried toward the center of the box by pressure from the outside, to overcome the weakening of such angular portions as would take place by pressing the box from the inside alone, this operation of the outside pressing device obviating the separation of the box at its angles when being finally pressed.

In the case of a cylindrical box, the expansion of the elastic pressing-bag fitted within it causes the cylindrical portion of the box to be pressed from its inner surface outward, and the vertical inner wall of the box is carried outward, so as to occupy a circle of increased diameter. Such movement, if carried to a sufficient extent, would remove or detach such cylindrical portion from the box-bottom.

When the cylindrical upright portion of the box is pressed nearly to its maximum degree the angular junction between such portion and the box-bottom is consolidated by imparting to the piston an extra lift, which elevates the bottom from outside to outside of the box, after which the final pressure is exerted on the whole box.

This method of preventing the boxes from being broken when being pressed, and of pressing the corners independently to consolidate the angles of the box, is an important feature of my invention.

Figure 1 represents, in top view, the plunger and matrix of a machine adapted to operate in accordance with my invention; Fig. 2, a section thereof; and Figs. 3 and 4 details of the operating-cams.

In this specification it has been considered unnecessary to specifically describe the construction of the box-pressing bag and the mechanism for introducing into such bag a fluid to expand it, as that may be as in the Patent No. 89,433, or other well-known mechanism for expanding the bag under the action of hydraulic pressure may be employed.

In the drawing, *a* is supposed to represent the cylinder, and *b* the expansible india-rubber pressing-bag, substantially as in the patent referred to. The table part *c* of the machine, to finish and press cylindrical boxes, is provided with a cylindrical matrix, the inner wall *d* of which forms a support for the outside of the box, while the bottom thereof is sustained upon a movable bottom piece for the matrix. The table and the bottom piece *e* are each moved independently by the action of suitable cams. In this instance the table is moved by cams *f* on a shaft, *g*, and the bottom piece by means of a cam, *h*, such cams operating against suitable anti-friction rollers on the table and bottom piece.

The box to be pressed and finished is formed in any usual way from pulp, and, removed from the former, is placed with its bottom upon the bottom piece *e*, it and the table being as in Fig. 2. The diameter of the matrix is a little more than the diameter of the box, measured from outside to outside. Now the shaft *g* is rotated, causing the cam *f* to raise the table and wall of the matrix about the outside of the box, resting upon the bottom piece. The depth of the matrix is in excess of the depth of the box.

When the box is inclosed in the matrix, the cam *h* operates the bottom piece, so that it and the table rise together to place the box upon the india-rubber pressing-bag, and then the bag is expanded within and so as to press the box. When the pressing force has almost reached its maximum extent, the cam *h* lifts the bottom of the matrix a little, while the table remains substantially at rest, thereby contracting the size of the box by pressing its angular portions together, after which the full force of the apparatus is called into operation

to complete the final pressure upon the box, the matrix and bottom piece then rising together.

The operation so far described would press a cylindrical box or any hollow article the angles of which run in curved lines.

To press a square box, I compress the angles by working from the sides of the box rather than from the bottom.

The machine for use with a square box will be modified as follows, viz: the piston will be secured to, and so as to rise and fall simultaneously with, the table, and a set of dies, *i j k l*, will be placed upon the table to form a matrix for the box. These dies have straight faces 2, which rest against the outer sides of the box.

The bag, made rectangular and placed within a rectangular box, is expanded by hydraulic pressure, so as to press the box from its interior outward, and, to prevent this interior expansion from pulling the box apart at its angles, I contract the outsides of the matrix, and decrease its area by moving the angular portions of the box inward toward the center of the box.

To operate this matrix a screw, *m*, or other suitable device, is caused to move the die *i* in the direction of the arrow thereon, and it acting upon the die *j*, and die *j* on *k*, and so on, will move all the dies in the direction of the arrows marked on them, causing their acting faces to move toward the center of the box and press it upon the bag. This action will take place just before the box is finished or receives its final pressure, and enables the whole box, including its angular portions, to be thoroughly pressed without being broken or weakened at the angles.

The bag acting against the interior of the box, pressing it outward or expanding it, would, it will be readily seen, cause the separation of the box at its angles, as the strain at such portions is in opposite directions. By causing the matrix to contract at the angular portions after the box has been almost completely pressed, enables the angular portions of the box, which would be weakened by the pressure of the bag alone, to be carried toward the interior of the box, to thereby compact the paper at such angular portions.

The dies *i j k l* are moved and closed simultaneously by means of four cams on suitable rotating or rocking shafts placed about the frame, or by means of a cam-ring arranged to strike projections on the dies, or by four hydraulic pistons. In most instances I prefer to have the support for the rectangular box so made that it may be elevated, as in the case of the bottom piece *e*, for pressing the cylindrical box.

I claim—

In a paper-box finishing or pressing machine, an interior expansible die, in combination with a matrix having its parts movable with relation to each other to contract the area of the matrix, to thereby press from the outside inward the angular portions of the hollow article, after pressing it from the inside outward.

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

WILLIAM J. KEEFE.

Witnesses:
G. W. GREGORY,
W. J. PRATT.