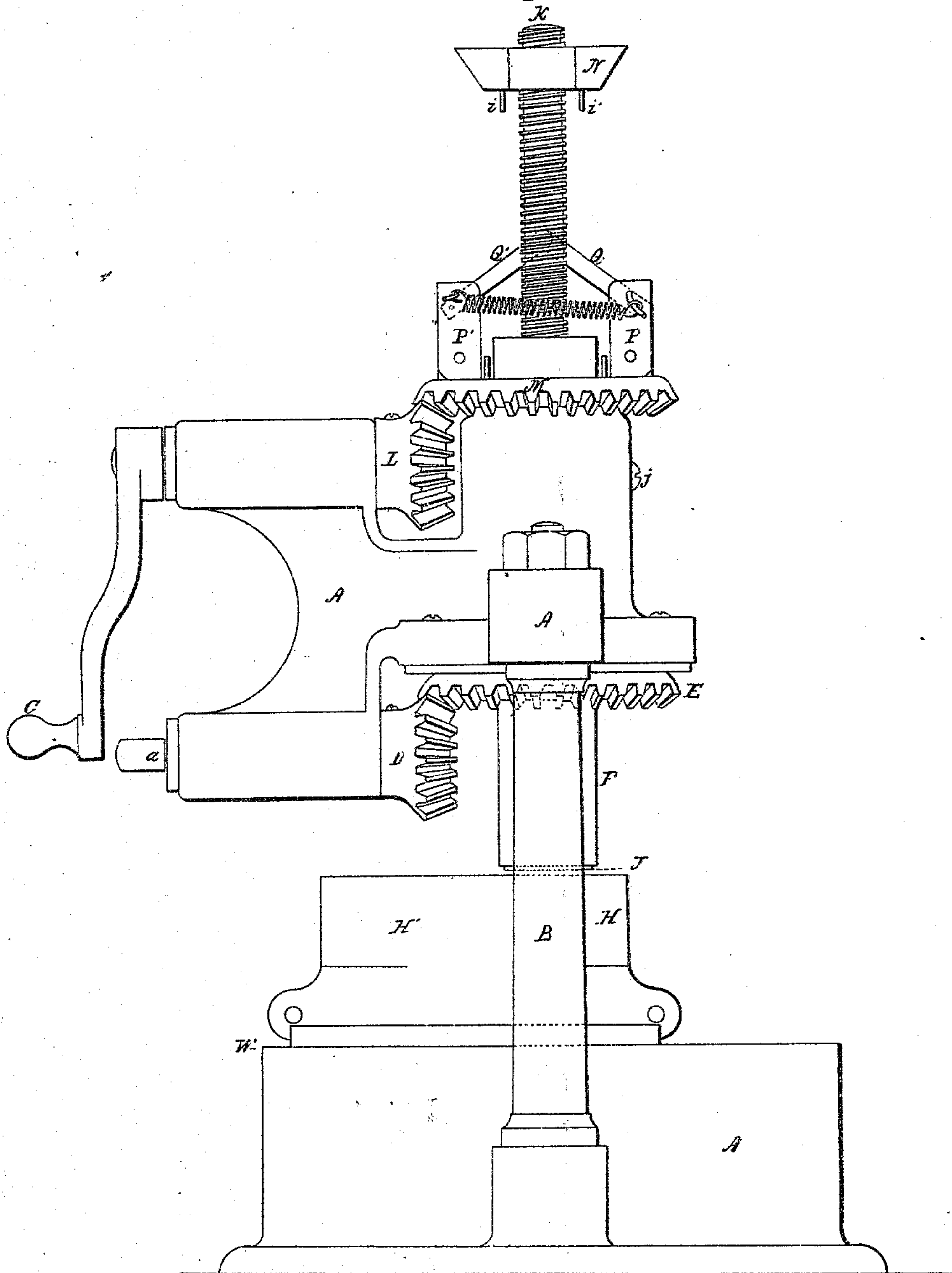


*R. Smith*      *Sheet 1 of 2 Sheets.*  
*Paper Molding*

*No. 84,246.*

*Patented Nov. 17, 1868.*

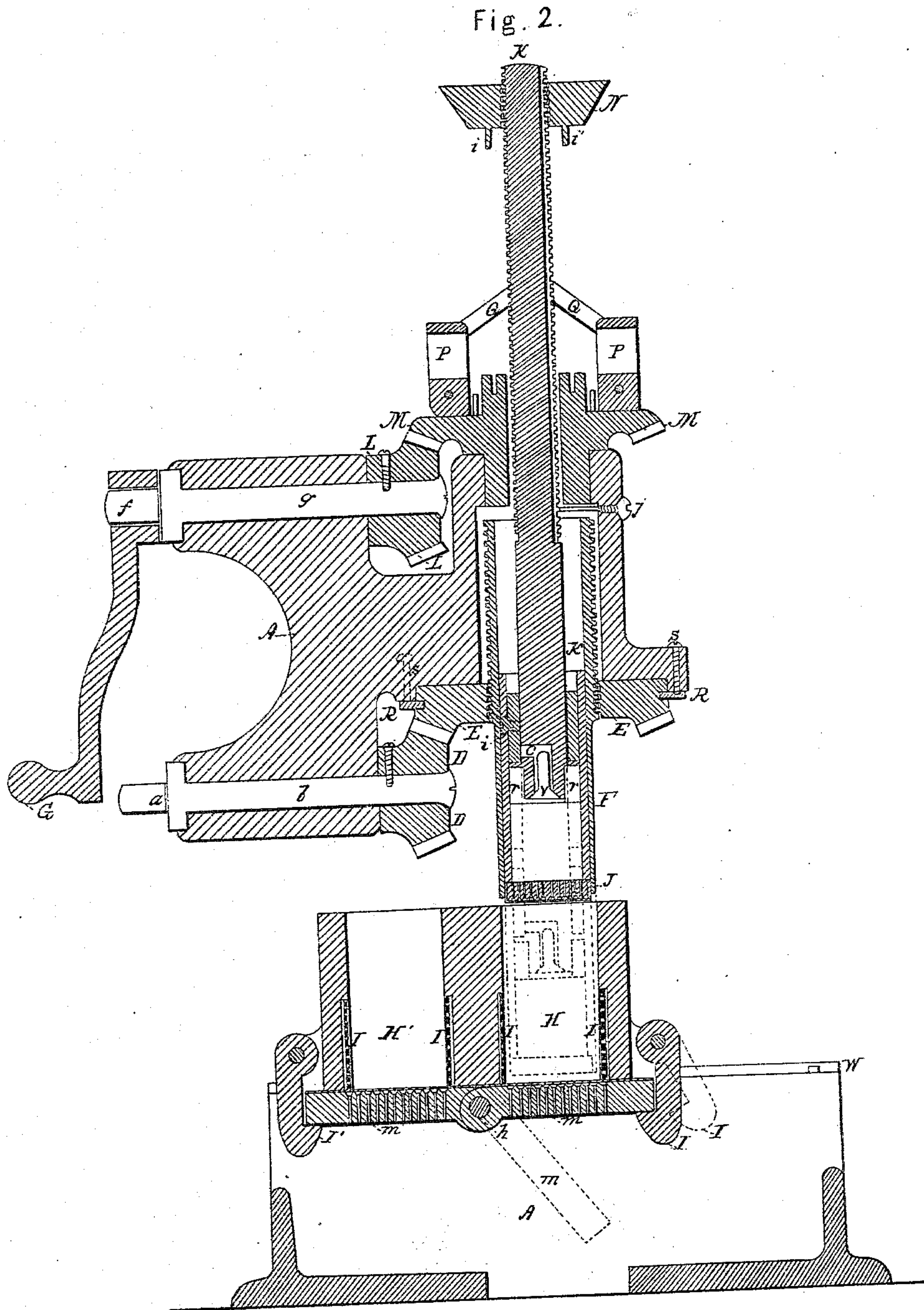
Fig. 1.



Witnesses:  
*E. H. Howard*  
*Chas F. Mansbury*

Inventor:  
*Richard Smith*

*R. Smith. Sheet 2.2, Sheets.*  
*Paper Molding.*  
*N<sup>o</sup> 84,246. Patented Nov. 17, 1868.*



Witnesses.  
*E. H. Howard*  
*Chas F. Gansbury*

Inventor:  
*Richard Smith*



# UNITED STATES PATENT OFFICE.

RICHARD SMITH, OF SHERBROOKE, QUEBEC, CANADA.

## IMPROVED MACHINE FOR THE MANUFACTURE OF PAPER BOXES.

Specification forming part of Letters Patent No. 84,246, dated November 17, 1868.

*To all whom it may concern:*

Be it known that I, RICHARD SMITH, of Sherbrooke, in the Province of Quebec, in the Dominion of Canada, have invented certain new and useful Improvements in Machinery for Making Paper Boxes and other hollow articles direct from the pulp; and I do hereby declare the following to be a full and correct description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the machine complete. Fig. 2 is a vertical central section of the same.

The same part is indicated by the same letter of reference wherever it occurs.

The nature of this invention consists, first, in a peculiar mode of forming the sides of a box by the sudden displacement of the pulp previously introduced into a mold of proper form and size by the quick descent of a plunger; second, in the introduction of air below the bottom of the plunger after the box is formed, for the purpose of permitting the withdrawal of the plunger without carrying with it the bottom of the box; third, discharging the finished box directly downward through the bottom of the mold; and, finally, the use of a double reciprocating mold, moving back and forth on ways below the plunger, so that while one mold is being filled with pulp the operation of forming a box is completed in the other, all as hereinafter more particularly described and shown.

To enable others skilled in the art to make and use my improvements, I will proceed to describe the construction and operation of my improved machine, referring to the accompanying drawings by the letters of reference marked thereon.

In these drawings, A marks the bed-plate and frame of the machine; B B, uprights which support the upper portion of the frame to which the gears are attached; C, a winch, representing the driving-power, of whatever nature it may be, applied to the shafts of the driving-gear. D is a bevel-gear, having a shaft, *b*, with a square head, *a*, for the reception of the winch C. The gear D meshes into the bevel-gear E, which is threaded on its interior surface, and acts as a nut to raise and lower the cylinder F, which passes into it, and is threaded on the upper portion of its outer

surface to correspond with and receive the thread on the inner surface of the gear E. The downward movement of cylinder F operates to give end pressure to the upper edge of the box, as will hereinafter be shown. The gear E has a groove or dowel in its periphery, which receives the inner edge of an annular plate, R, attached to the frame by screws *s s*. This plate supports the gear E in its place, while allowing of its free rotation.

H' H' are the molds, united together and attached to a common bed-plate, which slides in ways W, having a reciprocating movement below the cylinder F. The inner sides of the molds have vertical grooves in them, covered with a fixed lining of wire-gauze. The bottoms of the molds are formed in the same way, their grooves connecting with the lower ends of the side grooves, which thus drain into them. These bottoms are hinged, at *h*, to lugs on the bed-plate of the molds, and open downward, being held up by catches I I', hinged to the ends of the same plate while the box is being made.

J marks the plunger, which operates inside the cylinder F. It is a hollow cylinder, open at top, and closed at bottom by a perforated plate, having concentric grooves below, and covered on the outside by wire-gauze. It fits the inside of the cylinder F, and is the "former" for the inside of the box to be made. In the plunger is inserted a piston packed with an annular piece of rubber, *r*, which fits it loosely, so as to allow air to pass around it. The piston is attached to the lower end of piston-rod K. Through it is an air-passage, *c*, in which is a valve, *v*, operating, both by its weight and by atmospheric pressure, to open the passage *c* and admit air under the piston. This valve is closed when the bottom of the piston is in contact with the bottom of the plunger, the valve being then forced against its seat. A collar, *d*, is attached by screw *e* on the inside of the upper end of the plunger J. Its office is to prevent the piston from being drawn out of the plunger when the piston-rod K is drawn up, and to insure the rise of the plunger with the rod K after the latter has risen far enough to bring the top of the piston into contact with the lower edge of the collar.

The rod K is plain on its lower portion, as shown, but threaded above. It has a verti-



cal groove on its side, into which the end of a screw-pin, *j*, enters to keep the rod from turning when acted upon by the nut. The thread on rod K engages a similar thread in the nut N, but passes freely through the bore of gear M. Gear M engages with gear L, whose shaft *g* has a square head, *f*, which receives the winch C, by which it is driven. Hinged to the upper surface of gear M are two spring-catches, P P', which are drawn together by the spiral spring S, but can be pressed apart, and, when separated, held open by the toggle-arms Q Q'. They are pressed open by the inclined faces of the nut N, which nut they receive and hold firmly to the gear M, the pins *i i'* on the bottom of the nut entering holes in the upper end of said gear, thus compelling the nut and gear to turn together.

The operation of the machine is as follows: The mold H is filled with pulp, formed of any suitable material or materials, the filling being done by hand or otherwise. The lower end of the cylinder F is then caused to enter the top of the mold just far enough to keep the pulp from overflowing. The plunger J is next brought down by a sudden movement, till the nut N, which had previously occupied the position shown in the drawings, is brought down between the catches P P', and firmly attached to the gear M, so as to turn with it. The effect of this sudden descent of the plunger is to force the pulp to rise around it on every side sufficiently high to form, when compressed, the sides of the box to be made. A slow movement would not effect this object, but would compress all the pulp in the mold into a solid mass at the bottom. After the first sudden descent of the plunger, it is gradually forced down far enough to compress and solidify the bottom of the box. This is done by turning the gears L and M, to the latter of which the nut N became fixed by the first descent of the plunger. The rotation of the fixed nut forces the plunger down the required distance to effect the condensation referred to. The cylinder F is then driven down, by turning the gears D and E, to give end compression to the sides of the box. During these operations the water of the pulp escapes through the gauze lining of the sides and bottom of the mold into the grooves, by which it is conducted out below into any proper conduit or receptacle. The piston-rod K is next raised until the piston comes into contact with the collar *d*, which causes the valve *v* to open, by reason of its own weight and the pressure of the atmosphere, and allow air to pass freely into the lower portion of the plunger J. The plunger is then raised, and in rising leaves no vacuum below it, and has no tendency to tear out the bottom of the box. The catch I is next thrown

back, the bottom *m* is brought down at right angles with the bottom plate of the mold, and the box is thrown out at the bottom of the mold, by the operation of cylinder F, which is driven down into the mold, and acts against the upper edge of the box.

While the box is being made in mold H, the mold H' is being filled with pulp ready to be slid under the plunger for a repetition of the operation.

In the complete practical machine the parts are driven by power, and the operations are automatic. The boxes delivered from the molds are received upon endless aprons of cloth or wire.

The molds can be made in halves, if preferred, and the plunger may be operated either by a cam, crank, lever, or any equivalent mechanical arrangement.

Having thus fully described my invention and improvements, what I claim, and desire to secure by Letters Patent, is, in machinery for making hollow articles from pulp—

1. A plunger so constructed as automatically to admit air beneath its lower end just previous to its withdrawal from the cavity of the completed box or other hollow article, substantially in the manner and for the purpose set forth.

2. The formation of the sides of the box by the sudden displacement of the pulp in the mold by the introduction of the plunger into it by a quick motion, substantially in the manner described.

3. The combination and arrangement of the piston, packing *r*, air-passage *c*, and valve *v*, in the manner and for the purpose specified.

4. Discharging the completed box or other hollow article from the bottom of the mold, substantially as set forth.

5. The molds H, made with removable bottoms and permanent perforated linings, as distinguished from removable linings, substantially in the manner specified.

6. The ways W, in combination with the common bed-plate of the molds H H', for the purpose of allowing the latter to have a reciprocating movement to bring the molds alternately beneath the plunger, in the manner and for the purpose described.

7. Forming a box or other hollow article from pulp, by forcing a plunger down into the mold containing the pulp of which the box or other article is to be made, as set forth.

The above specification of my said invention signed and witnessed, at Washington, this 5th day of November, A. D. 1868.

RICHARD SMITH.

Witnesses:

EDM. F. BROWN,  
CHAS. F. STANSBURY.