(No Model.)

W. W. McEWAN.

MACHINE FOR FORMING HOLLOW ARTICLES FROM PULP.

No. 490,037. Patented Jan. 17, 1893.

Fig. 1.

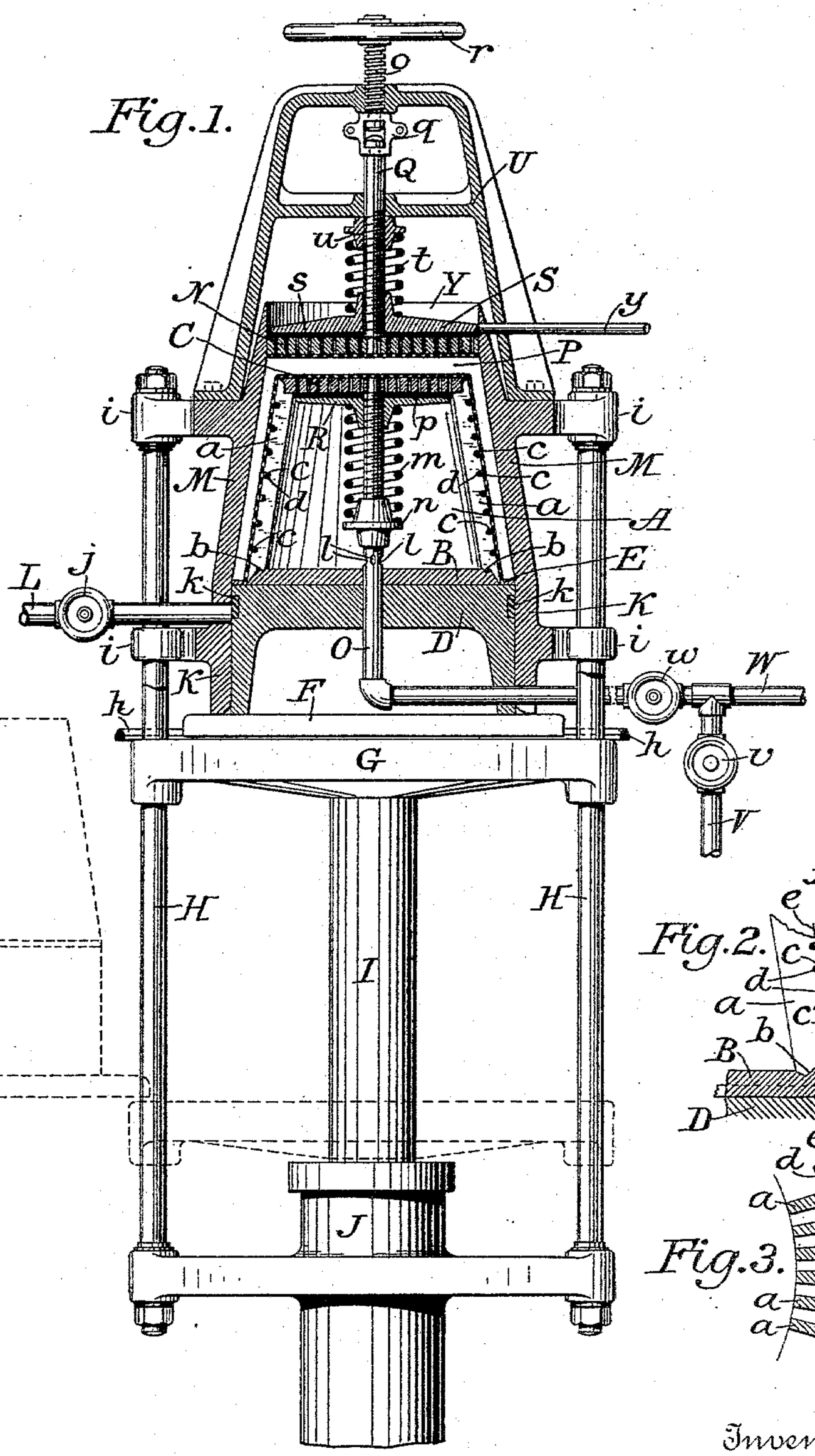

Fig. 2.

Fig. 3.

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MACHINE FOR FORMING HOLLOW ARTICLES FROM PULP.

SPECIFICATION forming part of Letters Patent No. 490,037, dated January 17, 1893.

Application filed December 19, 1891. Serial No. 415,604. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. McEWAN, of Belvidere, in the county of Warren and State of New Jersey, have invented certain new and useful Improvements in Machines for Forming Hollow Articles from Pulp; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My invention relates to the manufacture of pails, basins and other articles of hollow ware, from wood or paper pulp, and is designed to provide an improved machine for forming such articles of pulp in a semi-liquid condition, expelling so much of the moisture contained therein as can be expressed by drainage and pressure without drying, and producing an article that shall be strong, cohesive and substantially homogeneous in structure, completely shaped and ready without further manipulation for the subsequent processes of drying and induration.

The use, in a machine for forming such pulp articles, of a female mold constructed wholly or partially of rubber, is frequently practiced for the purpose of securing a gradual and even drainage of water from the fibers of the pulp. This results in an unequal expansion of the elastic envelope or female mold in response to unequal pressure of the pulp against it, and in a product of unequal thickness in its various portions. A pail or basin formed in such a manner must be turned or sawed to an even thickness after drying, breaking up the surface laminations of its fibrous structure, which are most nearly complete and contribute greatly to the strength of the article, and leaving a rough outer surface which requires finishing, thereby increasing both the cost and the structural weakness of the product. On the other hand, if in such a machine the male and female molds are rigid and unyielding, and even if both or either of said molds are perforated for the escape of water from the pulp, the distribution and consequent density of the pulp are unequal, the drainage of water from different portions thereof cannot be regulated, and the resulting product is uneven in texture and lacking in strength.

My invention is intended to provide an improved machine whereby a gradual and even drainage from the body of the pulp article is produced, and whereby such drainage may be regulated both manually and automatically, without the disadvantages resulting from the use of an elastic female mold.

In the drawings, Figure 1 represents partly in elevation and partly in section, a pail forming machine embodying my improvements; Fig. 2, is a vertical section of a portion of the pail form and female mold, and Fig. 3 is a horizontal section of a portion of the pail form.

The pail form, or male mold A, is formed of the inwardly inclined bars or rods *a*, *a*, engaging at their lower ends with a groove *b* in the circular large end B, of the form A; and the perforated smaller end C, with the edge of which the upper ends of the bars *a*, *a*, engage. The bars *a*, *a*, have intervals between them to permit free passage of water, and are recessed as at *c*, *c*, on their outer edges to permit the form A to be wound spirally with the heavy wire *d*, the entire form A being by such construction materially strengthened against pressure from without. The form A is further covered on its outer surface by several thicknesses of wire gauze *e*, *f*, *g* of different meshes, the finer outside to give the pail a smooth finish and prevent it from sticking on the mold, and the coarser within to add strength to the gauze envelope and prevent it from sagging into the intervals between the bars *a*, *a*, under mechanical or atmospheric pressure.

The contour of the form A as completed by the wire gauze covering, is substantially that of the inner surface of the pail to be formed. The form A, rests on the cylindrical block D, shown in the drawings as cut away in its inner portion to decrease its weight, and having a diameter somewhat greater than that of the base of the form A, the difference in diameter being equal to the thickness of the edge of the pail to be formed. A removable ring E, adapted to fit closely around the base of the form A, and having an outer circumference equal to that of the upper face of the block D, may be placed thereon to facilitate the removal of the pail when formed, without exposing it to injury by direct handling while

still moist. The cylindrical block D, rests on the base plate F, which slides on guide rails *h*, *h*, on the vertically movable platen G. The platen G, moves on guides H, H, to which the female mold is immovably secured as at *i*, *i*, and is supported and moved by the piston rod I, of the piston J, of a hydraulic press, or by other equivalent mechanism. On lowering the platen G the base plate, block and form, with the completed pail thereon, are run out on the guide rails *h*, *h*, to the position indicated by dotted lines in Fig. 1, and the completed pail is removed from the form. The block D fits closely within the hollow cylinder K, forming the lower portion of the female mold, and has free vertical movement therein. The feed pipe L, furnished with a valve *j*, through which the pulp is introduced, is inserted in the side of the hollow cylinder K, near its upper end. Packing may be inserted in the block D, as at *k*, *k*, to insure a perfectly tight joint and prevent the escape of pulp or water from above. The cone-shaped upper portion M, of the female mold, including the adjustable perforated end plate N, also covered on its lower surface with wire gauze, is made to conform to the outer surface of the form A, in such a manner as to leave a space P, which, when the platen G carrying the structure of the male mold, is forced upward until the upper surface of the base plate F, is in contact with the lower edge of the hollow cylinder K, will have substantially the shape and dimensions of the pail to be formed, the upper portion thereof, designed to form the bottom of the pail, being, as hereinafter shown, of variable thickness. The pipe O, leads vertically downward from the perforated end-plate C, of the form A, through the center of the larger end B, the block D, and outward through the block D, and the lower edge of the hollow cylinder K, which is recessed to permit its passage. It is furnished with apertures *l*, *l*, at the inner surface of the larger end B, of the form A, and by use of the valve *v*, the vent V, and the valve *w*, and flexible connection W, with air pumping apparatus, may be made at will a suction or discharge pipe, exhausting the air in the interior of the form A or simply draining off water therefrom. The portion of the pipe O above the perforations *l*, *l*, serves simply as a guide-rod, as hereinafter described, and might therefore be a solid rod secured to the pipe, but for convenience I prefer to make it an extension of said pipe.

Within the form A, and immediately below the perforated end-plate C, is the imperforate plate R vertically movable on the guide or upper portion of the pipe O, furnished with packing *p* on its upper surface, and supported by a spring *m* which is held in tension by a jam nut *n*, threaded on the pipe O. The end plate N, of the female mold is carried on the vertical shaft Q, supported in the framework U, and having a swivel joint *q*, therein, and is made vertically adjustable by means of the screw-thread *o*, and the hand wheel *r*. Immediately above the end plate N is the imperforate plate S, vertically movable on the shaft Q, having packing *s* on its lower surface, and pressed downward by the spring *t*, which is held in tension by the jam nut *u*, threaded on the shaft Q. The upper edge of the cone-shaped upper portion M of the female mold is preferably extended above the usual position of the edge of the plate, forming a shoulder or dam Y to prevent overflow, through which leads a discharge pipe *y* to carry off water forced through the perforated end plate N, and past the packing *s*.

While the mechanism for applying pressure, shown and described herein, is that of a hydraulic press, other means for producing and applying pressure may be used. It is like wise obvious that in forming pails of different shapes, and having sides and bottoms of different conformations, as well as in forming basins, tubs and other articles of hollow ware, the form of the molds may be suitably varied without material departure from the spirit of my invention.

In operation the platen G, is lowered until the base of the form A, is below the mouth of the feed pipe L, the cylindrical block D, being however retained in contact with the inner surface of the hollow cylinder K, and forming a watertight joint therewith. The space P is thereby enlarged sufficiently to receive enough liquid pulp to form after pressure a pail of the desired thickness and density of fiber. The extent to which the platen G is lowered, and the consequent enlargement of the space P, will be dependent on the amount of fiber in the pulp. The pulp is turned on and flows into the space P, completely filling it and covering the form A. It is then turned off, and pressure is applied gradually until the lower edge of the hollow cylinder K and the upper surface of the base plate F, are in contact. If the water, forced out of the pulp by this pressure, is allowed to make its way with the same freedom through the end plate C, of the form A, the end plate N and the sides of the form A, it causes an unequal distribution of fiber and an unequal drainage therefrom, an undue proportion of the fiber being carried to the top of the space P by the direction of the pressure and the double set of water outlets furnished by the end plate C, and the end plate N. At the same time, it is desirable that drainage should take place from both surfaces of the pail bottom in order to produce complete and thorough interlocking of fiber in the portion of the pail most exposed to strain in use. It is not practicable to produce a more even drainage by making the interstices in the top of the mold smaller than those on the side of the form A; by reason of variations in the texture, consistency and fiber of the pulp used under different circumstances.

In the machine shown and described herein the plates R and S, are normally held against

the end plate C and the end plate N, by the springs *m* and *t* respectively, and the perforations in said plates C and N are kept tightly closed by the packing *p* and *s*.

The springs *m* and *t* are adjusted by means of the jam nuts *n* and *u* at such tension that as the male mold gradually rises they will resist the pressure of the water contained in the upper portion of the space P, prevent drainage through the end plate C, and end plate N, keeping the pulp between them in a semi-liquid condition, until by drainage through the sides of the form A, deposit of fiber thereon, and the filling of the sides of the space P, with partially drained pulp, the formation of the sides of the pail is insured. Under continued pressure, drainage through the sides of the form A, being checked as above shown, the water pressure against the plates R and S increases beyond the resistance of the springs *m* and *t*, and drainage through the end plate C and the end plate N is set up and continues until the pail is completely formed. The rapidity of the drainage into the interior of the form A, is readily increased by suction through the pipe O, which can be applied or shut off by the use of the valves *v* and *w*.

The end plate N, is made vertically movable by means of the screw thread *o* on the swivel jointed shaft Q, for the purpose of pushing downward the completed pail and thus breaking any possible adhesions between the pail and the sides of the female mold.

I do not perforate the sides of the cone-shaped upper portion of the female mold in order to produce a drainage from both the inner and outer surface of the female mold, but I make the inner surfaces of the female mold of smooth metal because I find that such single drainage from the sides of the pail, combined with drainage from both surfaces of the bottom, results in sufficient density and interlocking of fiber to produce a strong and durable article, and because the completed pail is caused by such perforation to stick in the mold, and frequently to be damaged in removal therefrom. After the pail is completely formed, pressure, and suction through the pipe O, are left on until in the judgment of the operator the pulp in the pail has been consolidated and relieved of water to such an extent as to permit handling. The pressure and suction are then released, and the platen G is lowered until the pail clears the lower edge of the cylinder K, when the male mold is run off in the manner indicated by the dotted lines in Fig. 1, and the pail removed from the form A by means of the ring E. The best results are not attained by the operation of the machine automatically and without regulation.

The main object of my invention is to provide a machine capable of adjustment and regulation, containing means whereby a skilled workman, familiar with the properties of the pulp used, and having in mind the even distribution and interlocking of fiber to be attained, can so vary pressure and drainage in the mold or in different portions thereof as to produce such results uniformly under various conditions.

I claim as my invention:—

1. In a machine for making hollow ware from pulp, the combination with a female mold of a hollow male mold to co-operate therewith and having a perforated end plate and an imperforate plate yieldingly supported below and in contact with said end plate, substantially as shown and described.

2. In a machine for making hollow ware from pulp, the combination with a male mold of a female mold to co-operate therewith and having a perforated end-plate and an imperforate plate yieldingly supported above and in contact with said end plate, substantially as shown and described.

3. In a machine for making hollow ware from pulp, the combination with a male mold, of a female mold to co-operate therewith and having a movable end plate, a supporting frame work, and a shaft supporting said end-plate, said shaft being screw-threaded to engage said frame-work and having a swivel joint, substantially as shown and described.

4. In a machine for making hollow ware from pulp, a mold comprising end plates having grooves formed in their lateral and proximate surfaces, bars connecting said end plates and interlocking at their ends with said grooves, backing or wrapping wire wound about said mold on the outer edges of said bars and an envelope of wire gauze about said mold, substantially as shown and described.

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

WILLIAM W. McEWAN.

Witnesses:
A. N. JESBERA,
E. A. GREELEY.