

(No Model.)

H. CARMICHAEL.
APPARATUS FOR MANUFACTURING PULP BOXES.

No. 503,738.

Patented Aug. 22, 1893.

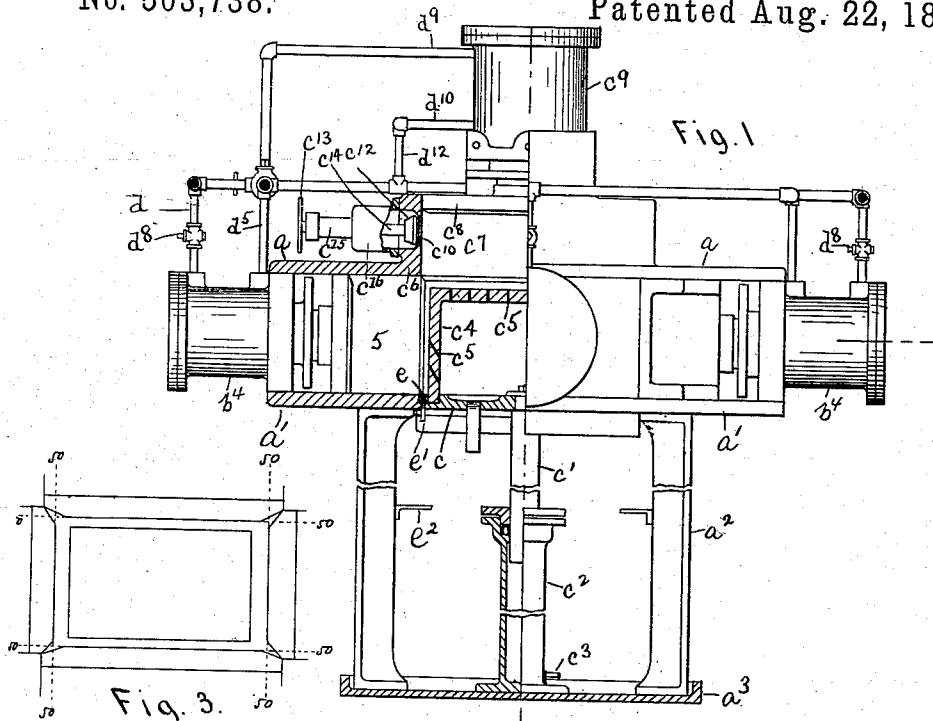


Fig. 3.

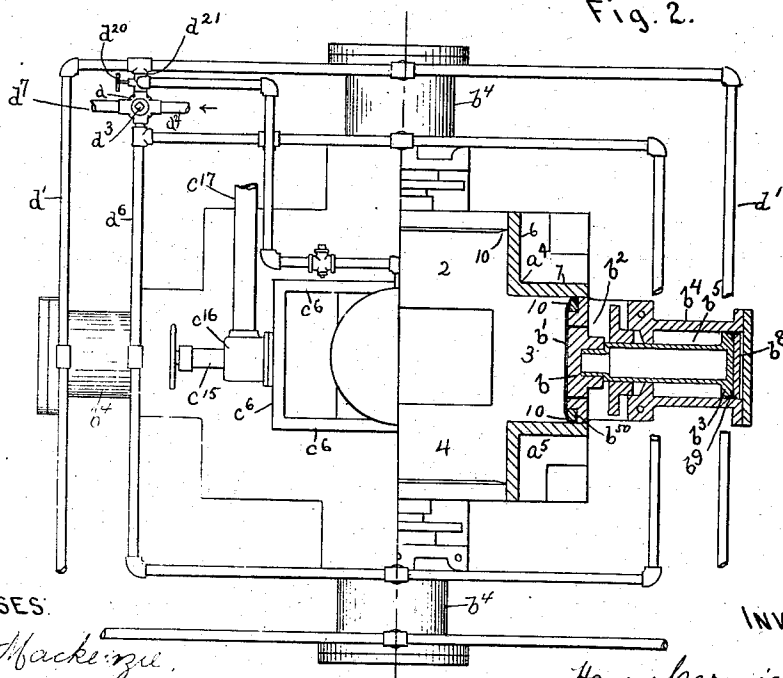


Fig. 2.

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APPARATUS FOR MANUFACTURING PULP BOXES.

SPECIFICATION forming part of Letters Patent No. 503,738, dated August 22, 1893.

Application filed June 23, 1892. Serial No. 437,703. (No model.)

To all whom it may concern:

Be it known that I, HENRY CARMICHAEL, residing in Malden, county of Middlesex, and State of Massachusetts, have invented an Improvement in Apparatus for Manufacturing Pulp Boxes, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to apparatus for producing polygonal-shaped articles from wood or other pulp, and is especially adapted to be used in the manufacture of pulp boxes.

My present invention has for its object to provide an apparatus, in which fluid pulp may be compressed into the shape of a box or like polygonal-shaped article, having substantially sharp edges, and in which the pulp at the edges of the box is interlocked or felted and is not crushed, but possesses substantially the same degree of strength as the sides of the box. This result I am enabled to accomplish by means of an apparatus consisting essentially of a plurality of lateral compressor chambers having sides or walls axially parallel, and in which one wall of one chamber forms with a wall of an adjacent chamber, a substantially sharp edge, and compressors in said chambers having their sectional areas equal to, and preferably in excess of, the corresponding exterior surfaces of the molded box or article. The side walls of the compressor chambers are, for the sake of structural simplicity, preferably formed by angle irons or pieces interposed between an upper and lower plate or table, forming the top and bottom of the said chambers. The lower plate or table referred to, is provided with an opening or discharge orifice, and when it is desired to provide the polygonal article with a bottom, as in a box, the upper plate is also provided with a polygonal opening, having its side walls parallel and extended above the upper plate to form a vertical casing or chamber in which is located a compressor, also having a sectional area equal to or in excess of the bottom of the molded box. The discharge orifice referred to is normally closed by a platen, having secured to it a "former" of the same shape as the interior of the box or article to be made. The vertical compressor casing is provided with a pulp inlet controlled

by a valve, and through which the fluid pulp is supplied to the apparatus. The compressors have secured to them preferably differential plungers, which reciprocate in cylinders attached to the frame-work of the apparatus. The plungers are actuated by preferably hydraulic pressure, and the area of the larger portion of each plunger is proportional to the area of its compressor, so that the columns of pulp being compressed, are subjected to pressure proportionate to the cross-sections of the said columns, and the sides and bottom of the box are subjected to uniformly proportionate pressure, whereby an excess of pressure upon one or more of the sides or bottom is obviated, and a uniformly pressed pulp article or box is obtained.

The particular features in which my invention consists will be pointed out in the claims at the end of this specification.

Figure 1 is a partial section and elevation of an apparatus embodying my invention; Fig. 2, a plan or top view partially in section of the apparatus shown in Fig. 1, the fluid-conducting pipes being broken out, and Fig. 3, a detail to more clearly show the relative size of the compressors, and the corresponding size of the molded article formed by them.

The frame-work of my improved apparatus is preferably made as herein shown, it consisting essentially of an upper table or plate *a* and a bottom table or plate *a'*, supported on suitable columns or legs *a²*, herein represented as resting on a foundation or bed-plate *a³*. The plates or tables *a*, *a'*, have interposed between them a series of angle irons or pieces *a⁴*, *a⁵*, &c., secured to the lower table or plate *a'*, and to the upper table *a*, in any suitable or desired manner, to form parallel side-walls of lateral compressor casings or chambers, the tops and bottoms of which are formed by the upper and lower tables or plates, there being as many such angle irons or pieces as there are lateral casings or chambers.

The apparatus herein shown is provided with four angle irons or pieces, forming four lateral compressor chambers marked 2, 3, 4, 5, one part or member, as 6, of each angle iron or piece, as for instance *a⁴*, forming one side-wall of one compressor chamber, as for instance, the chamber 2, and also forming with the other part or member, as 7, of the same

angle iron or piece, a substantially sharp edge, the part or member 7 of the angle piece a^4 forming one side-wall of the chamber 3. The angle pieces a^4 a^5 , &c., are arranged, as herein shown, substantially near the corners of the tables a a' to form a quadrilateral box, and in the present instance, the said angle pieces are located at such distance apart as to form an oblong-shaped box, the compressor chambers 2, 4, corresponding to the sides of the oblong, and the chambers 3, 5, to the ends of the same.

Each lateral compressor chamber or casing contains within it a compressor or plunger b , preferably of metal, and in the present instance, rectangular in shape, and having its front face beveled at its sides as at 10, the front face of the compressor being covered with a sheet b' of wire netting or other foraminous material fastened, as herein shown, to a frame b^{10} fitted into a recess extended around the rim or edge of the compressor. The compressors b are provided with drainage or water outlet ducts b^2 extended through the said compressors, and herein represented by full black lines. Each compressor has preferably secured to it a differential plunger, consisting of a piston b^3 located in a cylinder b^4 and provided with an enlarged piston-rod b^5 , herein shown as tubular in shape, and extended through the cylinder head b^6 and stuffing-box b^7 , of any usual or well-known construction, the said tubular piston-rod being screwed or otherwise secured to its compressor b .

As represented in Fig. 2, the piston b^3 is provided with a detachable face-plate b^8 , between which and the piston b^3 is interposed a packing ring b^9 .

The lower plate or table a' is provided near its central portion with a discharge opening or orifice, normally closed by a platen c , secured to a plunger c' movable in a cylinder c^2 , supported on the bed-plate a^8 and provided with a fluid inlet pipe c^1 . The platen c supports upon it, a "former" c^4 , having the shape of the article to be molded, the said "former" being herein represented as a rectangular oblong box, provided with drainage openings c^5 , represented in Fig. 1 by black lines.

The upper table a is provided, as herein shown, with an opening having its walls c^6 extended above the upper table to form a rectangular chamber or casing c^7 , in which is located a compressor c^8 of substantially the same construction as the lateral compressors b , the compressor c^8 in practice forming the bottom of the box. The compressor c^8 has secured to it a differential plunger located in a cylinder c^9 . One of the walls c^6 of the compressor casing or chamber c^7 is provided with a port or opening c^{10} forming a pulp inlet, which is controlled by a valve c^{12} , herein shown as operated by a hand-wheel c^{13} connected to the stem c^{14} of the said valve, the latter being extended through a sleeve or casing c^{15} secured to or forming part of a connection or

fitting c^{16} , to which the pulp inlet pipe c^{17} is connected.

As herein represented, all of the cylinders b^4 have water inlet ports at their outer ends connected by branch pipes d (see Fig. 1) to a common supply pipe d' , connected to a main supply pipe d^2 , the pipe d^2 being provided with a fitting d^x having a four-way valve d^3 . Each cylinder b^4 at its inner end is connected by a branch pipe d^5 , to a pipe d^6 also connected to the fitting d^x , and thereby to the water supply d^2 . The fitting d^x has connected to it a water outlet or discharge pipe d^7 . The branch pipes d are preferably each provided with a cock or valve d^8 . The vertical cylinder c^9 has likewise connected to its opposite ends, branch pipes d^9 d^{10} , preferably connected, as herein shown, the branch pipe d^{10} being connected to the pipe d^6 , and the branch pipe d^9 to the arm of the fitting d^x , which is connected to the pipe d^7 by the pipe d^{21} .

In the operation of my improved apparatus, the platen c , with its "former" c^4 , is raised into the position shown in Fig. 1, after which the valve c^{12} is opened to admit fluid pulp into the vertical compressor casing c^7 , from which casing the fluid pulp flows into the lateral compressor casings 2, 3, 4, and 5. When the casings have been filled with columns of fluid pulp, water is admitted into the vertical cylinder c^9 at its outer end through the branch pipe d^9 , preferably slightly in advance of the admission of water into the lateral cylinders b^4 through the branch pipes d , the supply of water to the inlet pipe d^1 being controlled by a stop-cock or valve d^{20} in the pipe d^{21} . The fluid admitted into the cylinders c^9 b^4 forces the vertically moving compressors c^8 and the laterally moving compressors b , toward a central point, thereby compressing the pulp against the "former" c^4 , the fluid in the pulp escaping through the drainage openings c^5 in the "former," and through the drainage openings b^2 in the compressors. The pressure exerted upon the columns of the pulp in the different compressor chambers, is proportional to the cross-section of each column of pulp, and in this way, an abnormal or undue pressure upon any one side of the article being formed, is thereby avoided, and as a result, all the sides and also the bottom of the box or article, are subjected to a substantially uniform pressure. By beveling the sides of the compressors, as at 10, undue pressure upon the corners or edges of the box formed, is avoided, and as a result, a stronger box or article is obtained the surplus material shown in Fig. 3, being trimmed or buffed off when desired on the finished box.

By reference to Fig. 3, it will be seen that the sectional area of each compressor is greater than the sectional area of the side of the box formed by the compressor, and which, when finished, as by trimming or buffing its edges, may be represented in said figure by the portion within the dotted lines 50—50, and that the pulp at the corners of the box is not

crushed, but is interlocked or felted, and as a result, the edges of the box after being trimmed and buffed to finish the box are strong and durable.

5 I prefer to employ a differential plunger in connection with each compressor, that is, the area of the plunger on one side upon which the fluid acts to force the plunger forward to compress the pulp, is greater than the area
10 on the other side upon which the water acts to return the plunger to its normal position, thereby, effecting an economy in fluid employed to return the compressor to its normal position, the difference in area being effected as herein shown by the enlarged piston rod.

15 The platen *c* has secured to it, a frame or band *e* having secured to it pins or studs *e'*, which extend through the platen and are adapted to strike against projections or stops
20 *e''* secured to the columns or legs *a''*, when the platen is lowered, and by which the box or pulp article is forced off from the "former."

If desired, the faces of the compressors may be provided with an ornamental design or
25 outline. It will be noticed that the side-walls of the compressor chambers are axially parallel to the compressors.

I claim—

30 1. In an apparatus for producing polygonal-shaped articles from wood or other fluid pulp, the combination of the following instrumentalities, viz.—a plurality of lateral compressor chambers having parallel sides or walls, compressors in said chambers, and means to operate said compressors, substantially as described.

2. In an apparatus for producing polygonal-shaped articles from wood or other fluid pulp, the combination of the following instrumentalities, viz.—a plurality of lateral compressor
40 chambers having parallel sides or walls, compressors in said chambers having their sectional areas equal to or in excess of the corresponding exterior surfaces of the molded article, and means to operate said compressors, substantially as described.

3. In an apparatus for producing polygonal-shaped articles from wood or other pulp, the combination of the following instrumentalities, viz.—a lower table, and an upper table,
50 interposed angle irons or pieces arranged between said tables to form with the same, lateral compressor chambers, compressors in said chambers, and means to operate said compressors, substantially as described.

4. In an apparatus for producing polygonal-shaped articles from wood or other pulp, the combination of the following instrumentalities, viz.—a lower table having a central open-

ing or discharge orifice, an upper table provided with an opening having its side-walls extended above the said table to form a casing or chamber, angle irons or pieces interposed between the said tables and forming with the same, lateral compressor chambers,
65 a platen co-operating with the opening in the lower table, a "former" supported on said platen, laterally moving compressors *b*, in the casings or chambers between the tables, and a vertically moving compressor *c''*, substantially as described.

5. In an apparatus for producing polygonal-shaped articles from wood or other pulp, the combination of the following instrumentalities, viz.—a lower table provided with a discharge orifice or opening, an upper table, interposed angle irons or pieces arranged between the said tables to form with the same lateral compressor chambers, compressors in said chambers, and differential plungers connected to said compressors, substantially as described.

6. In an apparatus for producing polygonal-shaped articles from wood or other pulp, the combination of the following instrumentalities, viz.—a lower table, and an upper table,
85 interposed angle irons or pieces arranged between said tables to form with the same, lateral compressor chambers, compressors in said chambers having beveled edges 10, and plungers connected to said compressors, substantially as described.

7. In an apparatus for producing polygonal-shaped articles from wood or other pulp, the combination of the following instrumentalities, viz.—a lower table having a central opening or discharge orifice, an upper table provided with an opening having its side-walls
95 *e''* extended above the said table to form a casing or chamber, one of the said walls having a pulp inlet orifice, angle irons or pieces interposed between the said tables and forming with the same, lateral compressor chambers, a platen co-operating with the opening in the lower table, a "former" supported on
105 said platen, laterally moving compressors *b* in the casings or chambers between the tables, a vertically moving compressor, and a valve to control the admission of pulp through the pulp inlet in the wall *e''*, substantially as described.

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

HENRY CARMICHAEL.

Witnesses:

JAS. H. CHURCHILL,
SADIE C. FEARING.