(No Model.)

H. FAIRBANKS & H. PARKER.

APPARATUS FOR MAKING PAILS FROM PULP.

No. 549,998. Patented Nov. 19, 1895.

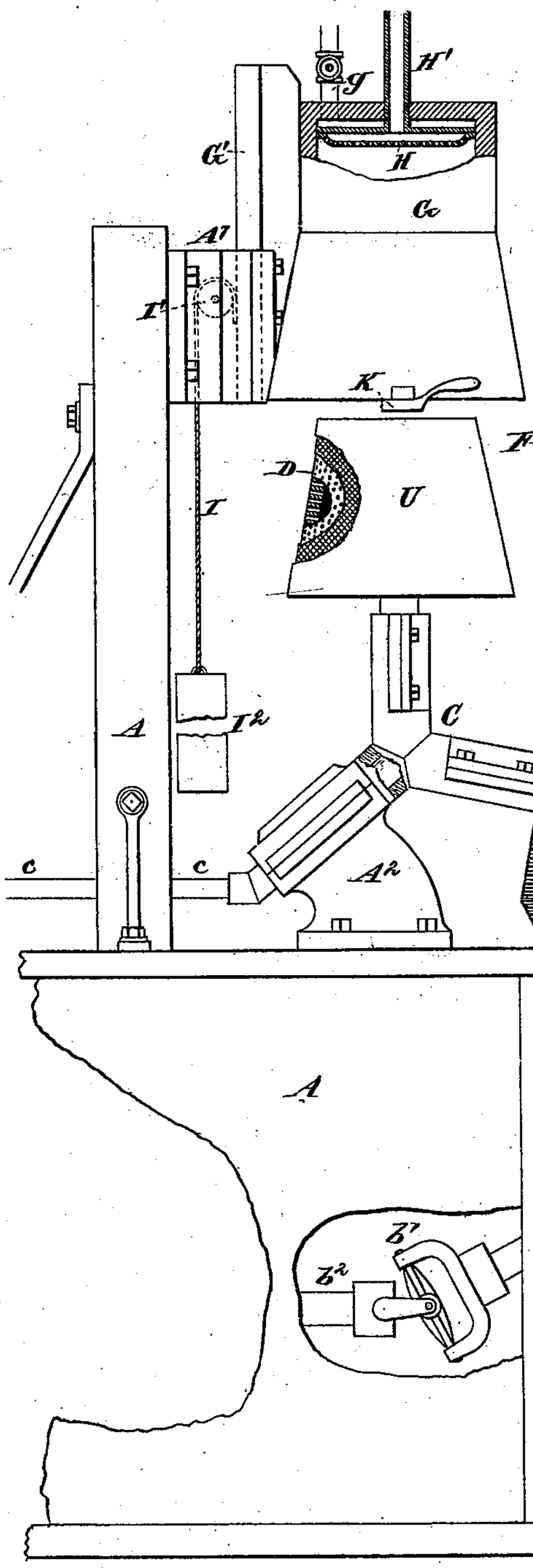

Fig: 1.

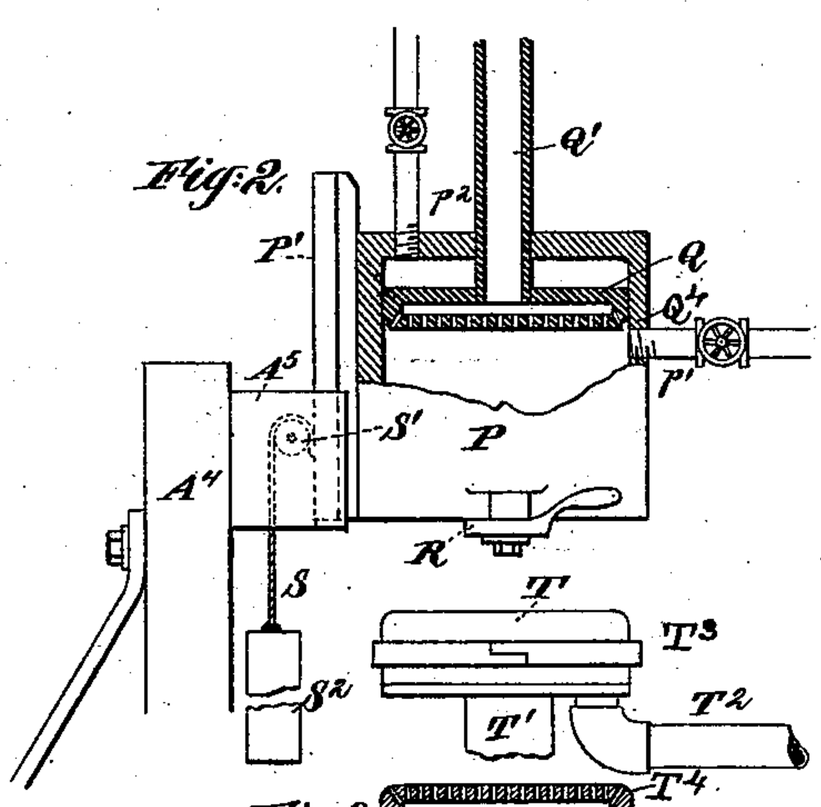

Fig: 2.

Fig: 3.

Fig: 4.

Witnesses:

Charles R. Seale,

M. F. Boyle.

Inventors:

Henry Fairbanks

Howard Parker

By their attorney

Thomas Dressler

UNITED STATES PATENT OFFICE.

HENRY FAIRBANKS AND HOWARD PARKER, OF ST. JOHNSBURY, VERMONT.

APPARATUS FOR MAKING PAILS FROM PULP.

SPECIFICATION forming part of Letters Patent No. 549,998, dated November 19, 1895.

Application filed December 24, 1887. Renewed September 5, 1890. Serial No. 363,995. (No model.)

To all whom it may concern:

Be it known that we, HENRY FAIRBANKS and HOWARD PARKER, of St. Johnsbury, Caledonia county, in the State of Vermont, have invented a certain new and useful Improvement in Apparatus for Making Pails from Pulp, of which the following is a specification.

The invention relates to features of the apparatus fully set forth hereinafter and recited in the claims.

The accompanying drawings form a part of this specification, in which—

Figure 1 is a side elevation in vertical section of the mechanism for taking up the pulp, molding the pails, applying the bottom thereto, and pressing the whole. Fig. 2 is an elevation, partly in section, of the mechanism for forming the bottom of the pails. Fig. 3 is a vertical section of the stationary piston detached. Fig. 4 is a section through one of the pail-bottoms.

Similar letters indicate corresponding parts in all the figures where they occur.

A is a fixed framework.

B is a large hollow conical receiving-roller having a peripheral surface of wire-gauze or analogous foraminous material mounted on a hollow shaft *b*, having perforations within the roll, and slowly rotated by a universal joint *b'*, connecting it with a driving-shaft b^2, turned by any suitable power. (Not shown.) This roller B is partially immersed in thin paper pulp contained in the tank A', and which, as the roller slowly revolves, is drawn inward through the meshes in the wire-gauze on the exterior of the roller, the watery particles flowing quite through into the interior of the roller B and escaping through the hollow shaft *b*, into which it finds its way through perforations in the shaft in the interior of roller B, and the denser particles, consisting of the fibers which are to constitute the pail, being retained in a thin coating on the exterior of this roller. This coating of dense pulp is removed by being accumulated in layers one upon another on a conical forming-roll in a manner now to be described.

A^2 is a bracket which supports a hollow Y-shaped arbor C, the interior of which arbor communicates by a pipe *c* with an air-pump. (Not represented.) The support is adapted to maintain an air-tight connection and allow the arbor to be revolved in bracket A^2. The arrangement maintains a partial vacuum in the arbor and in any devices properly connected therewith.

D D are conical perforated rolls, each of the size and taper necessary to shape the interior of a pail. Each is free to revolve on one of the branches of the arbor C, and its interior is in free communication therewith, so that there is a constant induction through the fine perforated surface of each of these rolls, or there is a tendency thereto, so as to abstract the water from the pail being formed thereon. Each is covered with a fine cloth or fabric when in use, the fabric being drawn off with the completed pail when it is removed.

We will describe as part of the operation our preferable means of producing the bottoms W, although it is not claimed as a part of this invention.

Reference is had to Fig. 2, which shows a slightly-modified form of the mechanism seen at the top of Fig. 1, and adapted for use in forming the bottoms. The section through corresponding parts in Fig. 1 shows similar mechanism for the final pressing of the bottom of the pail. The post A^4, which is distinct from the framework A, is equipped with a guide A^5, which embraces the flange P' of a vertically-moving cylinder P, which is suspended by a cord or chain S, running over a pulley S', and carrying a balancing or partially balancing weight S^2, so that it can be readily moved up and down. The cylinder P has two nozzles *p' p²*, each of which is adapted to receive fluid through hose-pipes, of rubber or other suitable material, leading to suitable reservoirs (not represented) and each controlled by a as cock, shown. The nozzle *p'* connects with a tank of thin pulp mounted at a higher level. The nozzle p^2 connects to a steam-boiler or other supply of steam at a high pressure. By these means we flow thin pulp into the cylinder P upon a stationary perforated piston T to a depth of three inches, or thereabout, the creamy pulp being admitted through the nozzle *p'*.

Q is a hollow piston, the lower side of which is perforated. It is provided with a hollow

piston-rod Q′, which is connected by a hose to a supply of steam. The lower side of the cylinder P is equipped with lever-dogs R.

The hollow stationary piston T is strongly supported on a firm upright T′, and has its upper face perforated and covered with wire-gauze. It has a packing-ring T^3, adapting it to fit tightly and easily in the interior of the cylinder P. A nozzle T^2 on the lower side of stationary piston T connects by a flexible hose to a suitable drain to carry away water. In the use of this portion of the apparatus we lower the cylinder P upon and embracing the stationary piston T, and thus introduce the latter into the former and secure it by the lever-dogs R. We then introduce a proper quantity of thin pulp through the nozzle p', and afterward admit steam at moderate pressure through the hollow piston-rod Q′ and piston Q. This steam issuing from the perforated under face of piston Q presses downward upon the pulp. On first entering and striking the cold surface of the liquid pulp some is condensed. That adds water to the already thin pulp; but soon the cylinder and piston, and especially the fluid pulp, become heated up to the temperature of the steam. Then the condensation will stop and we have a mass of fluid pulp resting on a porous stationary piston amply provided with a drain through a pipe, offering no resistance to the escape of any fluid filtered through and with a constant pressure of steam on its upper surface. The result is to press downward on the whole mass of fluid pulp with such force that the watery particles enter the stationary piston and flow out through the drain-pipe. There is thus formed a partially-compressed disk of suitable thickness lying upon and molded by the upper face of stationary piston T, the water in the pulp meanwhile being pressed downward and passing out through the drain T^2. This upper face is so formed with rounded corners T^4, registering with rabbeted corners Q^4 of the movable piston, that a thin edge of the pulp will extend down around its rim to round the interior angle and give more surface for attaching the sides of the pail to be subsequently formed. The form is shown in strong lines in Fig. 4 and in dotted lines in Fig. 1. At a proper stage steam is admitted through the nozzle p^2. This should be at a higher pressure than the steam through hollow piston-rod Q′, so that it will overcome the pressure of the latter below the piston Q and force such piston downward, pressing strongly upon the soft molded pulp below. This pressure hardens the pulp. The steam which continues to be admitted through the piston-rod Q′ and piston Q drives downward all, or nearly all, the remaining moisture in the pulp. After a brief period the pressure is shut off, the cylinder P is liberated from the bottom mold T by turning the lever-dogs R back to their original positions, and on raising the cylinder P and its attachments a completely-molded bottom W remains upon stationary piston T, which can be lifted off and removed at leisure, and the operation repeated.

A^3 is a bracket supporting an arbor E′, carrying a wheel E, which latter is adapted to receive the previously-formed bottom W, which has been produced by the devices shown in Figs. 2 and 3. A bottom W being placed on the wheel E by the attendant, the latter is next moved facewise by giving a longitudinal movement to the arbor E′, so as to present the freshly-formed compacted but moderately porous bottom W against the perforated small end of the roll D, which roll is then receiving pulp from roller B. Thus conditioned, the bottom W and its attached wheel E commences to revolve with the roll D. A small flow of thin pulp is allowed to flow from an elevated reservoir (not shown) through the pipe F, and to drop upon the junction of the bottom W with the body of pulp, which is being accumulated by winding upon the roll D, from which the water is drawn inward by the vacuum obtaining in roll D, accumulates in roll D, and is discharged through the hollow arbor C and pipe *c*, while the denser particles—the fibers—remain and close the joint between the edge of the bottom W and the body of the pail being formed. It will now be seen that as the roller B slowly revolves it serves, by the gear-wheels shown on the large ends of rolls B and D, to correspondingly revolve the roll D, and also to bring up from the tank A′ a continuous thin layer of dense pulp and to add it to the layers of the same previously wound upon roll D. This coating extends along the whole length of the roll or mold D and also along the full breadth of the edge of the bottom W. The pulp thus laid on in thin layers may project over a little at one end or the other of the roll D with its added bottom W. Such projecting portions can be easily trimmed off afterward. It is important that the layers be applied with proper rapidity and compressed with proper force by the contact of the roll D with the roller B and that thin pulp be received additional to such layer, so as to completely saturate the material and fill all the recesses in and near the juncture V of the main body U with the bottom W. When the separately-formed bottom W has been properly brought into position and the continued flow of thin pulp through the pipe F into the joint or junction between the upper edge of the bottom W and the gradually thickening and forming body U and the continued draining due to the vacuum maintained in the interior of the perforated roll D has, by exhaustion through the pipe *c*, produced the main body U of the pail of proper thickness, and has made a strong junction V, permanently connecting the body with the bottom W, the pail is made. The subsequent operations press and shape it into more perfect form. Next the Y-shaped arbor C is turned a half-revo-

lution. This causes the two rolls or molds D D, mounted on the divergent arms thereof, to change places one for the other.

G is a hollow casing with a smooth interior, the lower portion of which is tapered to mold the exterior of a pail, and the upper portion is cylindrical and matches tightly to an inclosed piston H, equipped with a hollow piston-rod H′. The latter is connected by a flexible pipe of rubber or other suitable material to a steam-boiler or other source of steam. A nozzle *g*, controlled by a stop-cock, as shown, is connected by a flexible pipe to a source of stronger steam.

G′ is a slide or guiding-rib fixed on the side of casing G, and adapted to traverse through the vertical way formed by the guide A^7. The weight of this hollow casing G and its attachments are balanced or partly balanced by the chain I, running over the pulley I′ and carrying a suitable weight I^2. The lower edge of casing G is provided with lever-dogs K.

So soon as the exchange of positions of the two rolls D D has been effected and the material has commenced to be accumulated on the lowermost, the uppermost, with its covering-cloth and its nearly-completed pail carried thereon, is subjected to the finishing treatment by lowering the casing G and its attachments upon it and holding the parts strongly together by engaging the lever-dogs K under the roll D. Then the cock is operated to admit steam through the nozzle *g*, which presses downward the piston H strongly upon the inverted bottom of the pail below. Weaker steam is also admitted through the hollow piston-rod H′ and flows downward through the perforated piston H, through the interstices of the pulp of the now quite hard and firm bottom W of the pail, and finally downward through the perforated small end of the roll or mold D into the hollow interior of the latter, from whence it readily escapes through the arbor C and pipe *c*, being drawn off through the latter pipe by the suction therein. This pressure upon the bottom and flow of steam through the same may continue during the whole of the time while the material is accumulating on the opposite roll. Then the steam is shut off, the lever-dogs are unlocked, the casing G is raised, and on partially revolving the arbor C the nearly-completed pail may be removed. It may be subsequently further dried and shaped, if desired. It may be saturated with any desired material or surfaced in any desired way. On being furnished with proper eyes and a handle it is a pail ready for use.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. We can change the inclination of the shaft *b* and the taper of the rollers B and molds D, taking care to correspondingly taper the interior of the casing G.

Some parts of the invention may be used in other machines. For instance, in the ordinary web-machine the mold-wheel revolving in the pulp-tank may transfer the moist layer which it takes up directly to the surface of a perforated and partially-exhausted cylinder revolving in contact with it, thereby simplifying said machine and dispensing with its traveling felt, the cylindrical rollers of that machine operating together and upon the pulp-layer, as do the tapering rollers of the machine herein represented.

We claim as our invention—

1. A revolving roll or pail mold D, in combination with the tank A′ containing thin paper pulp, and the roll B adapted for applying a thin layer thereof upon its exterior, and with the wheel E, and sliding arbor E′ for holding a pail bottom against the end of roll D, and allowing it to revolve therewith, as herein specified.

2. A revolving roll D, and means for depositing a layer of moist pulp upon its exterior, in combination with the disk E and arbor E′ for holding a previously formed bottom in position and revolving therewith, and with the pipe F for applying thin pulp along the joint where these layers join the bottom, all substantially as herein specified.

3. The hollow arbor C, forked as shown, in combination with the support A^2 and with two foraminous rolls D, D, and with the receiving roller B and tank A′, and the casing G and perforated hollow piston H, as herein specified.

4. In an apparatus for manufacturing pails and analogous articles from paper pulp, a hollow piston, with its lower face of foraminous material and a vertical cylinder in combination with a hollow piston-rod with connections for receiving steam therethrough, and with a controlling valve and connections adapted for supplying in the cylinder above the piston steam at a higher pressure, and means for retaining the pulp within the cylinder as herein specified.

5. In an apparatus for manufacturing pails and analogous articles from paper pulp, a vertical cylinder a hollow piston with its lower face of foraminous material, a hollow piston-rod with connections for receiving steam therethrough, in combination with a controlling valve and connections adapted for supplying steam at a higher pressure to act on the upper surface of the piston, and with a supported removable bottom below having a foraminous upper surface, and connections for allowing the free discharge of the water received therethrough, as herein specified.

6. A hollow casing G, having the upper portion cylindrical and the lower portion tapered to match a roll D in combination with the piston H, having a perforated under face, and a hollow piston-rod H′, a nozzle and controlling valve, one or more conical rolls D and lever dogs K, substantially as specified.

7. The Y-shaped hollow arbor C, tapering hollow foraminous rolls D, D, wheel E and

arbor E′, in combination with each other and with the pulp supplying roll B for supplying the pulp in one or more layers, the pipe F for supplying pulp along the line of junction, the casing G, piston H, lever dogs K and hollow piston rod H′ and steam induction nozzle *g* for supplying higher steam all arranged for joint operation, as herein specified.

In testimony whereof we have hereunto set our hands, at St. Johnsbury, Vermont, this 19th day of October, 1887, in the presence of two subscribing witnesses.

HENRY FAIRBANKS.
HOWARD PARKER.

Witnesses:
R. P. FAIRBANKS,
KATIE MICKABY.