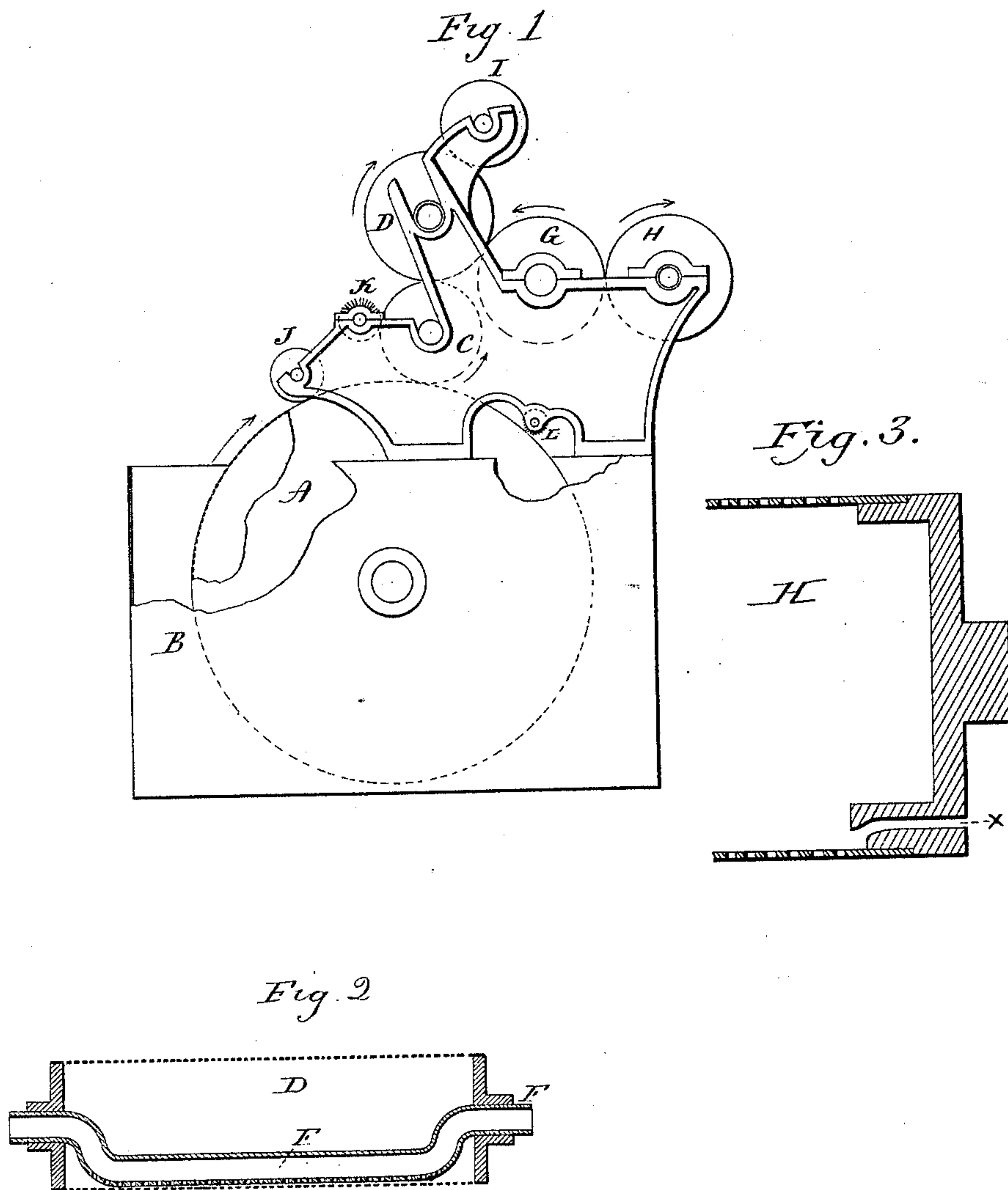


(No Model.)

H. PARKER & G. F. CUSHMAN.  
MACHINE FOR FORMING SHEETS FROM PULP.

No. 462,505.

Patented Nov. 3, 1891.



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# UNITED STATES PATENT OFFICE.

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## MACHINE FOR FORMING SHEETS FROM PULP.

SPECIFICATION forming part of Letters Patent No. 462,505, dated November 3, 1891.

Application filed October 14, 1889. Serial No. 326,962. (No model.)

*To all whom it may concern:*

Be it known that we, HOWARD PARKER and GEORGE F. CUSHMAN, of St. Johnsbury, in the county of Caledonia and State of Vermont, have invented a new Improvement in Machines for Forming Sheets from Pulp; and we do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, an end view of the machine, the mold-roll and vat being in partial vertical section; Fig. 2, a longitudinal central section through the couch-roll, and Fig. 3 a modification.

This invention relates to an improvement in apparatus for forming pulp into sheets or into bodies by successive layers.

In the patent to Fairbanks and Parker, No. 408,092, dated July 30, 1889, is described an apparatus consisting of a revolving mold-roll, the surface of which dips into a vat of pulp, and so as to take upon its surface pulp from the vat, a perforated couch-roll running upon the surface of the said mold-roll, the air being exhausted from the said couch-roll, so that it will take up the layer of pulp from the surface of the mold-roll, and a press-roll working in contact with the said couch-roll, so that the pulp will be pressed on the couch-roll by the said press-roll to express the water from the pulp, the exhausting of air from the couch-roll serving to suck the water from the pulp to the inside of the couch-roll, from whence it is drawn off. The pulp thus taken upon the couch-roll is wound thereon in successive layers or otherwise delivered.

It is to an improvement in this machine that this invention particularly relates, it having for its object to adapt the apparatus to the more perfect drying of the pulp, as well as to better adapt it to the production of pulp in thin sheets; and the invention consists in the construction as hereinafter described, and particularly recited in the claims.

A represents the mold-roll, which works in a vat B, supplied with pulp, the roll being adapted to dip into the vat to a greater or less extent. The surface of this roll is made porous or

perforated, so that the water in the vat may work through the surface to the interior of the roll, from whence it is drawn off in the usual manner, or it may be drawn off in the same manner as hereinafter provided for exhausting from the roll D. The flow of water from the pulp-vat through the surface of the mold-roll causes the pulp to adhere to the surface of that roll, the roll being caused to revolve in the direction indicated by the arrow.

Above the mold-roll and in suitable bearings a roll C is arranged to bear upon the surface of the mold-roll. The surface of this roll C is of a fibrous or flexible nature, such, for illustration, as felt. Above the roll C the roll D is arranged in suitable bearings, the bearings of both rolls C and D being such as to permit a limited amount of movement of the rolls C D toward and from each other and to and from the mold-roll. The surface of the roll D runs in contact with the surface of the roll C. The surface of the roll D is perforated, as shown, and preferably covered with one or more thicknesses of cloth or other suitable fibrous material, through which air or water may freely pass. The gudgeons of the roll D are made tubular, and through these gudgeons an axle E (see Fig. 2) passes, which axle is also tubular and is bent downward within the roll, so that the portion F stands in a position close upon the lower surface of the interior of the roll. The axle is stationary—that is, is supported so that it may not partake of the revolution of the roll D and always maintain its down position in relation to the roll, as seen in Fig. 2, the roll revolving so that its inner surface passes close to the under surface of the bent-down portion of the axle. That under surface of the bent-down portion of the axle is perforated, as seen in Fig. 2.

A pump or other suitable device (not shown) is applied to one or both ends of the axle by means of a flexible tube or otherwise, so as to exhaust the air or water, if any there be, from the roll D. If the exhaust be made from one end only of the axle, then the other end is to be closed.

G represents a press-roll supported in suitable bearings and so as to run in contact with



the roll D. It is arranged substantially below the roll D and so that the weight of the roll D is substantially supported on the rolls C and G. The surface of the press-roll G is preferably metal or so as to present a hard bearing-surface upon the roll D.

H represents a perforated hollow roll, like the roll D, provided with a tubular axle bent down within the roll, so as to exhaust the air or water, as the case may be, therefrom. The roll H runs substantially in contact with the press-roll G and so that revolution may be imparted to the perforated roll H, giving to it substantially the surface velocity of the roll G.

I represents a pressure-roll arranged in suitable bearings and so as to run upon the surface of the roll D and bear thereon. The bearings for the roll I are open above, so as to allow the necessarily slight rise of the roll I as the roll D rises in its bearing, but so as to insure a constant pressure of the roll I upon the roll D.

J is an auxiliary press-roller arranged in suitable bearings and so as to run upon the mold-roll.

K is a revolving brush arranged to run in contact with the roll C for the purpose of cleaning the surface of that roll, and a like cleaning-brush L is arranged to work upon the surface of the mold-roll after the pulp shall have been taken therefrom and so as to clean that surface. This completes the machine.

Its operation is as follows: The pulp is taken from the vat upon the surface of the mold-roll (that roll revolving in the direction indicated by the arrow) and carried thereon until the roll C is reached, which takes the pulp from the mold-roll and carries it upward beneath the roll D, the roll D taking upon its surface the layer of pulp so delivered to it. Thence the layer of pulp passes on the roll D beneath the press-roll I, where it is subjected to the pressure of the roll I, so as to press a portion at least of the remaining water from the layer of pulp on the roll D, the exhaust through the roll tending to draw the water so expressed into the roll and take it therefrom. The layer thus partially pressed then comes into contact with the press-roll G, which again subjects the layer of pulp to pressure to further dry it. The press-roll G may take the layer from the roll D and carry it around and deliver it between the press-roll G and the exhausted perforated roll H, where the layer of pulp (the pulp readily adhering to the surface of the perforated roll H) will be pressed down between the press-roll G and the perforated roll H to further dry it, the exhaustion from the roll H causing the remaining water to pass into that roll, or, in the absence of water, to draw air through the pulp, so as to substantially dry the pulp.

The perforated roll H may be omitted, but

is desirable when the pulp is to be run off in thin sheets; but if the pulp is to be wound upon the press-roll G, as in the patent before referred to, the roll H will not be required.

The press-roll G, with the roll D in this application, corresponds, substantially, to the press and couch roll in the previous patent; but in that case the roll D took the pulp directly from the surface of the mold-roll. By the interposition of the roll C between the mold-roll and the roll D a double compression is made upon the pulp before it passes on to the couch-roll. The additional press-roll I also to a very considerable extent facilitates the drying of the pulp, as does the press-roller J; but the press-rollers I and J may be omitted. The auxiliary press-rolls I and J may be employed without the roll C—that is, may be employed in the apparatus described in the patent before referred to, the press-roll G corresponding to the press-roll in that application.

Instead of constructing the roll D with gudgeons and exhausting the water through the center of the gudgeons, the roll may be constructed open at its end and so as to work upon a stationary head or gudgeon, as represented in Fig. 3, the roll revolving on the head as upon a gudgeon and the water being exhausted through an opening X at the bottom. By the term "exhausting through the gudgeons," therefore, we do not wish to be understood as limiting the invention to exhausting directly through the center or axis of the gudgeon or support for the roll.

The series of rolls over which the paper is carried may be increased in number, and the effectiveness of such series of rolls may be increased by perforating their surface and applying an exhaust from the interior of the roll, as we have described.

It will be understood that we do not broadly claim in this application the introduction into a paper-making machine of a hollow roll the surface of which presents a porous or perforated surface, and having combined therewith an exhaust adapted to exhaust the said roll, as such, we are aware, is not new.

We claim—

1. The combination of the mold-roll A, adapted to receive and carry a layer of wet pulp, a roll C, arranged in bearings to run substantially upon the surface of the said mold-roll, the roll D, substantially above the roll C, said roll D presenting a porous surface substantially in contact with the surface of the roll C, an exhaust applied to the interior of the roll D through one or both the gudgeons, and a press-roll G, supported in bearings and so that the roll D may run substantially in contact with the surface of the roll G, the said roll D being free in its bearings to move toward or from the rolls C G, substantially as described.

2. The combination of the perforated mold-roll A, adapted to receive and carry a layer



of wet pulp, the rolls C and G, arranged above said mold-roll, the roll D, having its surface perforated and so as to present said perforated surface to the said rolls C and G, an exhaust applied to the interior of the roll D through one or both of its gudgeons, and an auxiliary press-roll I above the roll D, substantially as described.

3. The combination of the perforated mold-roll A, adapted to receive and carry a layer of wet pulp, the rolls C and G, arranged above said mold-roll, the roll D, having its surface perforated and so as to present said perforated surface to the said rolls C and G, an exhaust applied to the interior of the roll D through one or both of its gudgeons, and the auxiliary press-roll J, arranged to bear upon the mold-roll in rear of the roll C, substantially as described.

4. The combination of the perforated mold-roll A, adapted to receive and carry a layer of wet pulp, the rolls C and G, arranged above said mold-roll, the roll D, having its surface perforated and so as to present said perforated surface to the said rolls C and G, an exhaust applied to the interior of the roll D through one or both of its gudgeons, the perforated surface-roll H, arranged to bear upon the surface of the press-roll G, and an exhaust applied to the interior of the said

roll H through one or both of its gudgeons, substantially as described.

5. In a machine for forming sheets from pulp, having the roll C and making devices adapted to deliver the pulp thereto, the combination therewith of a series of two or more rolls, with mechanism adapted to deliver the web from the said roll C to the first of said series of rolls, the said series of rolls being adapted to receive and carry the web after it has been so delivered to said first roll of the series, and one or more of the said series of rolls having its surface perforated and provided with an exhaust applied to the interior of said perforated roll, substantially as described.

6. The combination of the mold-roll A, adapted to receive and carry a layer of wet pulp, a roll adapted to receive the pulp from said mold-roll, a press-roll working in connection with the said roll so arranged to receive the pulp, with press-rolls J I, the one J arranged to operate upon said mold-roll, and the roll I arranged to operate upon said pulp-receiving roll, substantially as and for the purpose described.

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