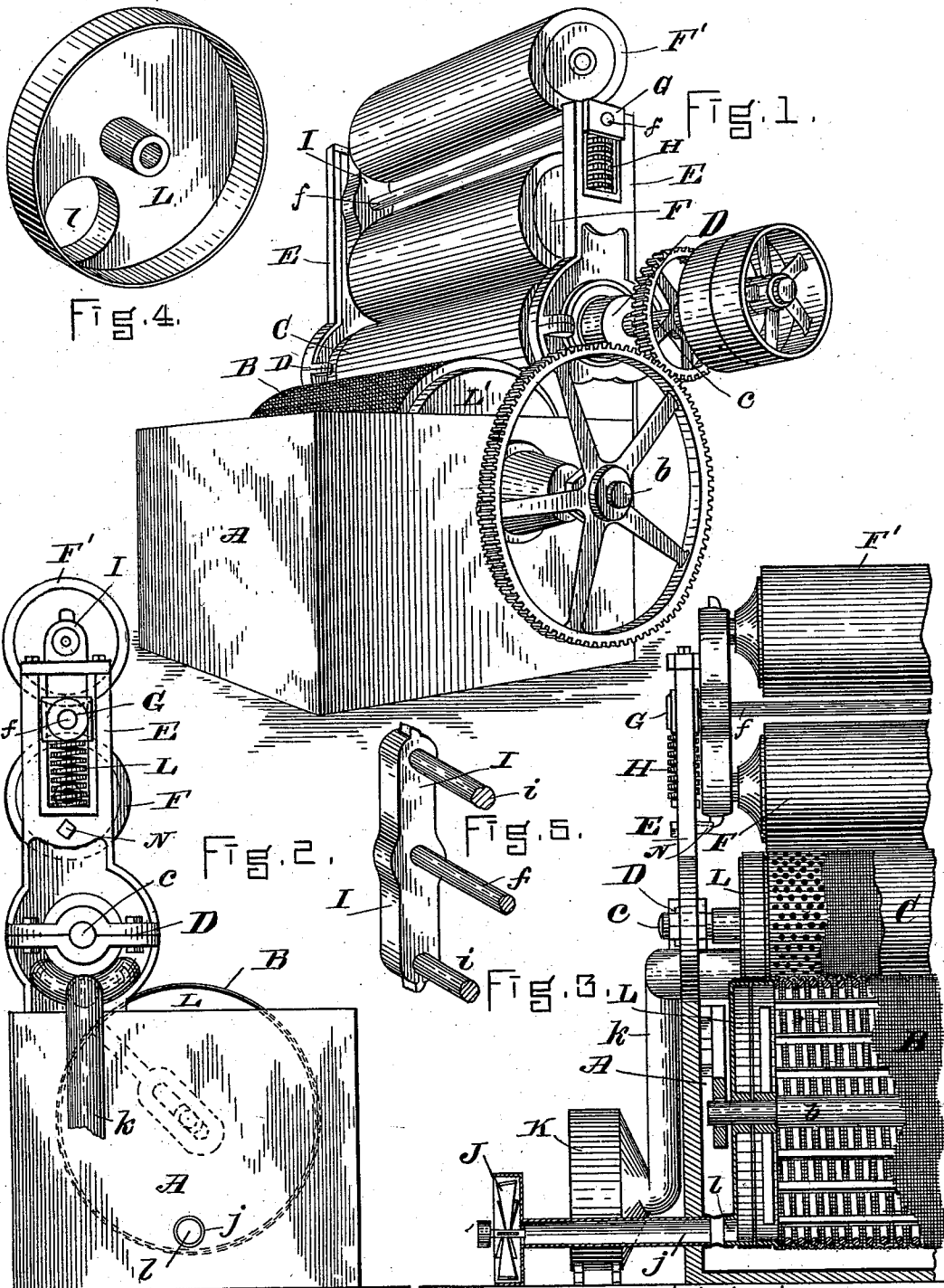


(No Model.)

H. FAIRBANKS & H. PARKER.  
APPARATUS FOR MAKING BODIES FROM PULP.

No. 549,999.

Patented Nov. 19, 1895.



WITNESSES.

*L. Henry Marsh.*  
*James S. Prince*

INVENTORS.

*Henry Fairbanks*  
*Howard Parker*  
*by R. H. J. [unclear] atty*

# UNITED STATES PATENT OFFICE.

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

## APPARATUS FOR MAKING BODIES FROM PULP.

SPECIFICATION forming part of Letters Patent No. 549,999, dated November 19, 1895.

Application filed February 24, 1891. Serial No. 382,383. (No model.)

*To all whom it may concern:*

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

This invention relates to apparatus for the treatment of wet pulp for the speedy conversion of the same into merchantable forms, and is of the nature of an improvement upon the invention set forth in the Letters Patent No. 408,092, granted to us July 30, 1889, for machines for forming bodies from successive layers of pulp.

In our former patent the mold-roll and press-roll were mounted in fixed bearings on the pulp-vat, and the coucher-roll, in peripheral contact with them both, was in yielding bearings and was furnished with tubular gudgeons through which a tube passed, depressed and perforated within the coucher and connected at one or both ends with a pump, so as to partially exhaust the air within the roll and withdraw through the gudgeons from the lowest part of the interior the air and water drawn by suction into it.

By our present improvements the coucher-roll and the mold-roll are each connected with an exhausting-fan through an open or skeleton end of each roll and through a stationary case or head adjoining and opening from such open end down to the lowest part of the interior, whereby a suitable air-exhaust is secured, and the water entering through the porous periphery of these rolls is withdrawn with the air from their lowest portion without any internal mechanism. By thus exhausting the mold-roll the capacity of the machine for taking up a heavy even layer of pulp is very greatly increased, since in addition to the usual slight water-pressure due simply to the difference of water-level within and without this roll a limited atmospheric pressure may be utilized to increase the deposit of suspended pulp upon the gauze, and a much smaller cylinder than has hitherto been required becomes equally effective; and as this thickened layer passes under the

coucher-roll the water squeezed from it is subjected to the exhaust action from both sides, so that its extraction is greatly facilitated. In addition to this, the layer is acted upon by this exhaust while it is carried upon the porous surface of the coucher and then subjected to heavy pressure between that and the forming or press roll, while at the same time the water squeezed from the pulp layer by this pressure is rapidly drawn into the coucher by the strong suction, instead of being allowed to soften the body already wound upon the forming-roll.

In our aforesaid patent the mold-roll was not exhausted, and hence there was no extra thickness of pulp taken up by it, nor was there simultaneous suction from opposite sides of the pulp layer, serving to largely extract the water from such extra-thick layer.

The coucher-roll is in fixed bearings and the mold-roll is drawn up into yielding contact on the one side, and on the other the forming-roll presses heavily upon the coucher. For making cylinders which must be removed over the end of the forming-rolls two such rolls are provided, which come into action alternately, and we have improved upon the previous means for mounting such interchangeable formers by lengthening the axis upon which they revolve in interchanging and allowing each end to move toward the coucher-roll independently of the other end, as they are impelled by separate springs, so that the forming-roll when receiving its body of pulp is free to adjust itself in yielding contact to the coucher.

In the drawings, Figure 1 is a perspective view of our improved machine; Fig. 2, an elevation of the end opposite to that shown in Fig. 1. Fig. 3 is a vertical section, broken away and showing certain details of construction and of the exhausting devices. Figs. 4 represents a non-rotary head or case for the exhausted couch or mold roll. Fig. 5 illustrates the reversible bar with terminal spindles for the alternately-acting forming-rolls.

A represents the vat containing the pulp in suspension, and B the mold-roll revolving therein.

C is the perforated coucher-roll, mounted

by its solid shaft *c* in fixed bearings D in the standards E, erected upon the ends of the pulp-vat A.

F F' are the forming-rolls, interchanging about the arbor *f*, which is mounted in independent yielding bearings G above those of the couch-roll in the standards E and provided with pressure-springs H and suitable adjusting-screws.

The couch-roll C is fixed in bearings, which allow it to conveniently bear the heavy pressure of the forming-rolls and to have the exhausting mechanism applied.

The mold-roll B is in yielding bearings, which allow it to approach or recede from the coucher as far as the varying thickness of the pulp layer may require. These bearings may be simply drawn by suitable springs toward the coucher, the axle *b* being controlled by short guides within the vat. Such guides, obliquely placed, are indicated by dotted lines in Fig. 2 and shown in full lines in Fig. 3. The displacement due to emptying the roll B will tend to carry it bodily against the couch.

The forming-rolls F F' revolve upon axles *i i*, which stand out from a reversible bar I, leaving one end of each roll free, this reversible bar being carried by an arbor or shaft *f*, which runs across the machine parallel to the mold and couch rolls from one standard to the other. In these standards the ends of this shaft are free to move up and down in guides, and the pressure may be regulated by springs H or weights. Each end is independent of the other, so that each forming-roll adjusts itself perfectly to the coucher, with a uniform pressure not affected by any accidental variation in the thickness of the body of pulp wound on. This construction and adjusting device is claimed as new.

The forming-rolls may of course be conical instead of cylindrical, if that form of product is desired, and in that case the other rolls must have a corresponding taper, so that in all the series peripheral contact may be maintained.

The construction of our two suction-rolls and their connection with the exhaust is also believed to be new, and we are able to exhaust them without employing hollow axles, internal tubes, or any interior partitions or mechanism whatever, as illustrated in Figs. 2, 3, and 4.

The roll to be exhausted has one end entirely open, or merely supported by a skeleton of radial spokes, through which end the water flows out horizontally from the lowest part of the interior. Adjoining this open end is a stationary head or case L, fitting closely to the end of the revolving roll, preferably by a circular flange coincident with the end of the roll, or with a projecting ring, substantially an extension of the shell of the roll. The lower part of the head opens di-

rectly into the lowest part of the roll through its open end, as distinctly shown in Fig. 3, and this part *l* of the head is connected with or is a part of the exhausting apparatus. The fan may be applied in its case directly at the end of the roll. The opposite end of the roll is closed, or, if desired, the closing may be another stationary head with exhaust-passage through it.

The extended end of the roll runs close against the circular flange or ring upon the stationary head, and, being of the same size, is easily packed by a strip of leather or folded cloth, which is true of both rolls, since the slight rising movement of the mold-roll, adapting itself to varying thicknesses of the pulp layer, is not sufficient to make this packing inoperative, the air-pressure being light, while the stationary bearings of the couch-roll allow a closer joint, so that the same kind of packing will bear the heavier air-pressure.

The fact that part of the permeable periphery of the mold-roll and couch-roll is not covered by the pulp layer or furnished with an air-shield does not prevent such partial exhausting of the air from their interiors as the treatment of the pulp requires, since an exhausting-fan reduces the tension of the air almost as much when half enough to supply it is admitted as it does when the inlet is entirely closed.

The interior of the mold-roll (shown in Fig. 3) is vacant or without mechanism other than its solid shaft *b*, and its end, as appears in Figs. 2 and 3, is connected with an exhausting-fan J by a pipe *j*, capable of removing the water of suspension entering through its straining-surface, and also of reducing the atmospheric pressure within the roll to the extent of perhaps one pound per square inch of surface. The usual construction of a gauze surface, supported by a stout wire wound spirally over longitudinal rods which are carried by light-spoked wheels, is strong enough to bear this pressure. This atmospheric pressure, added to that produced by the difference of water-level, causes an unusually thick layer of pulp to be taken up by a small roll in a small pulp-tank, so that economy of space and materials is secured. The vacant interior of this roll, exhausted otherwise than through its axis, is claimed as new.

The couch-roll C is a perforated and grooved metal cylinder carried, if short, by the closed end, or, if long, having the open end running upon external friction-rollers or supported by a skeleton of radiating spokes, this cylinder covered, as shown, with wire gauze, and over this a close-fitting jacket of coarse linen cloth. This construction makes the couch-roll C strong enough to bear the pressure of the atmosphere when it is half or two-thirds exhausted, and the large fan K, acting through the connecting case or pipe *k*, is very effect-

ive in drawing the water from the pulp layer inward through the perforated surface of the roll and removing it through the open end, supplemented as this exhaust-pressure is by the squeezing which that layer receives in its passage between the mold-roll and this coucher and then between the coucher and the forming or press roll.

The layer of pulp loses much of its water by the action of the light exhaust in the mold-roll. Then the water pressed out between the mold-roll and the couch-roll is drawn into both rolls, so that the pulp does not roll back or curdle. The layer is further dried by atmospheric pressure upon the coucher-surface, and is brought into condition to wind upon the forming or press roll; and when it receives its final pressure between these last two rolls the strong exhaust action removes the water so rapidly at the line of pressure that the machine will build up of successive layers a body of nearly dry pulp of any required thickness and not perceptibly laminated.

The interchangeable forming-rolls are used when cylinders are to be made, the reversing bar being kept from turning by catching on the adjustable latch N, from which it releases itself automatically when it is raised by a sufficiently-thickened body of pulp upon the forming-roll. These interchangeable rolls are replaced by a single press-roll when the machine is to be used for forming sheets which may be cut off, as in the common wet machine, for which use it is equally well adapted.

We believe that we are the first to successfully employ a suction couch-roll to perform the function of the long traveling felt apron in the wet machine or paper-making machine, or in machinery for forming bodies of successive layers of pulp, so simplifying this class of machines, making them less clumsy, and avoiding the great expense of frequent renewal of the felts. The attempts that have been made to use a soft coucher-roll to effect the transfer from the mold-roll to the press-roll have not been successful, because no provision is made for removing the water, which removal has required in the wet machine the long travel upon the felt apron to effect, and this use of such a roll we do not claim. Suction-rolls of various and complicated construction have been tried for other purposes, but none like this or of any construction have been used in yielding peripheral contact with both the mold-roll and the press-roll to transfer the pulp layer from one to the other, pressing out the water at both lines of contact and over a part of the surface of the roll, as well as at these lines, removing the water by suction. The nearest approach to the process exemplified in taking up the pulp upon our mold-roll, pressing it between this roll and the coucher, and removing the water pressed

from the layer, of pulp from the under side into the mold roll and from the upper side by atmospheric pressure into the hollow coucher, without carrying that from either side quite through this layer, is shown in an old machine, where the traveling felt, with the wire apron outside of it, is carried partly around a roll having an exhaust acting through a part of its surface; but in this case the water is removed from only one side of the pulp layer, and this removal is not aided, as it is between the rolls, by squeezing that layer, and we claim the squeezing in connection with the removal of water from both sides. The nearest approach to the process exemplified in building up of successive layers a thickened body of pulp upon a forming roll, and removing the water pressed out at the line where successive layers are joining onto those previously wound, is in an old machine in which it was attempted to wind the web of wet paper from the traveling felt apron onto a form by the aid of an exhaust; but in this machine the pulp had been already dried upon the felt and become a web of paper, no pressure seems to have been used, and, after the winding began, the first layers would seal the surface of the roll and prevent the water from entering. Our invention is quite different from this, treating the pulp while soft, pressing out the water under the forming roll, as well as by the weight of the atmosphere, removing it away from instead of through the layers already wound on, and so rapidly that it cannot soften these layers and thus forming a very dense body of pulp that is not perceptibly laminated, and is practically a new product.

We claim as our invention—

1. In a machine for treating pulp, the improved suction roll described and a stationary case packed against the shell of the roll, the interior of which roll is open from its lower part into this case, in combination with an exhaust pipe into said case, connecting the interior of the roll with exhausting apparatus, substantially as set forth.

2. In a machine for treating pulp, the vat A, the mold roll, coucher roll and press roll, mounted in successive peripheral contact, fixed bearings for the coucher roll, and yielding bearings for the mold roll and press roll, with suitable pressure devices in combination with exhausting apparatus, adapted to withdraw air and water from within the mold roll and coucher, and thereby to take up a thickened layer of pulp, and extract the water therefrom, substantially as set forth.

3. In a machine for treating pulp, the pulp-vat, mold roll and coucher roll, in combination with the interchangeable forming rolls and the reversible bar I with its projecting spindles *i* carrying the same, the axis upon which this bar turns, and the independently mounted bearings for this axis at the two

sides of the machine, and with means for independently pressing these bearings and carrying the two ends of the forming rolls toward the coucher roll, substantially as and  
5 for the purpose set forth.

In testimony whereof we have signed our names to this specification, in the presence of

two subscribing witnesses, on this 27th day of January, A. D. 1891.

HENRY FAIRBANKS.  
HOWARD PARKER.

Witnesses:  
WM. C. TYLER,  
C. M. SPENCER.