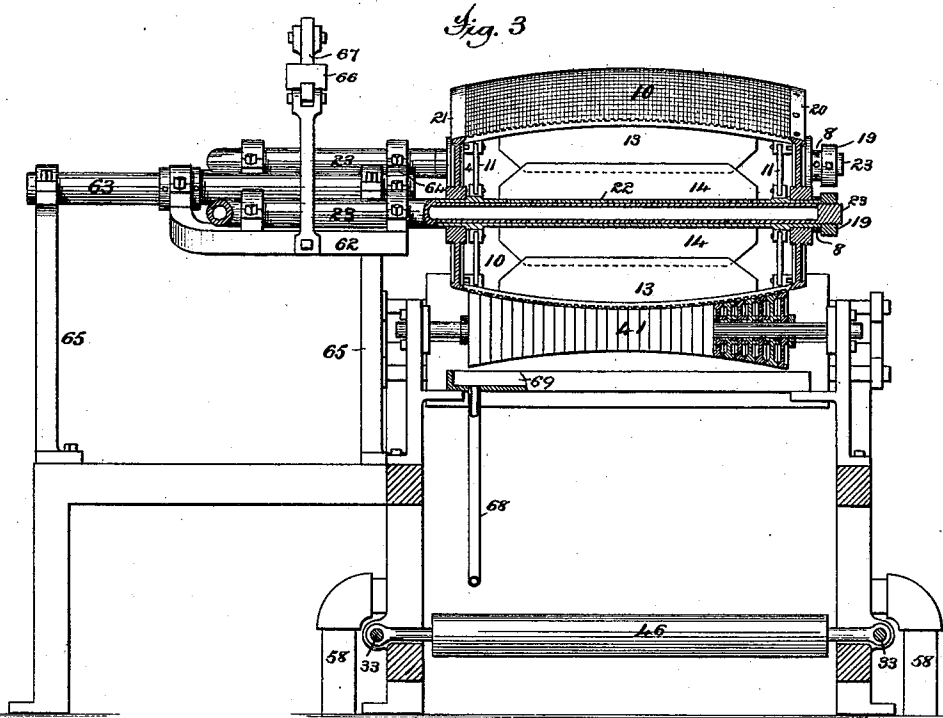
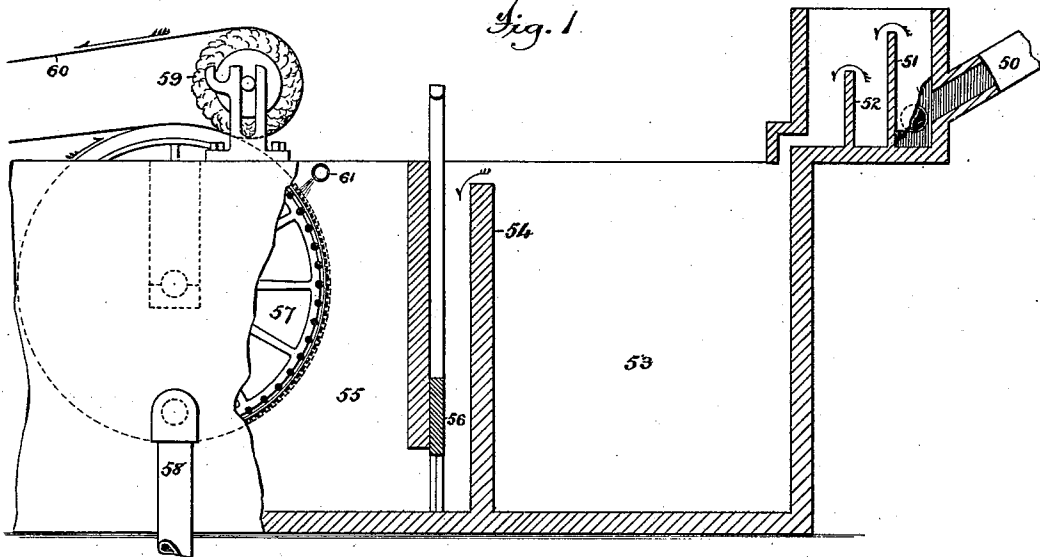


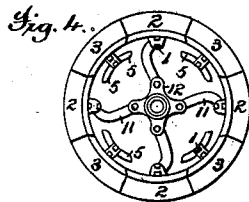
(No Model.) 3 Sheets—Sheet 1.
W. H. CLARK, R. E. SCHERMERHORN & C. E. SEDORE.
Machine for Making Paper Barrels.

No. 240,233.

Patented April 19, 1881.



Attest;
Geo. H. Graham
J. H. Palmer



Inventors
Wm. H. Clark,
R. E. Schermerhorn and
Chas. E. Sedore,
 by *Mason & Phillips*
Attys.

(No Model.)

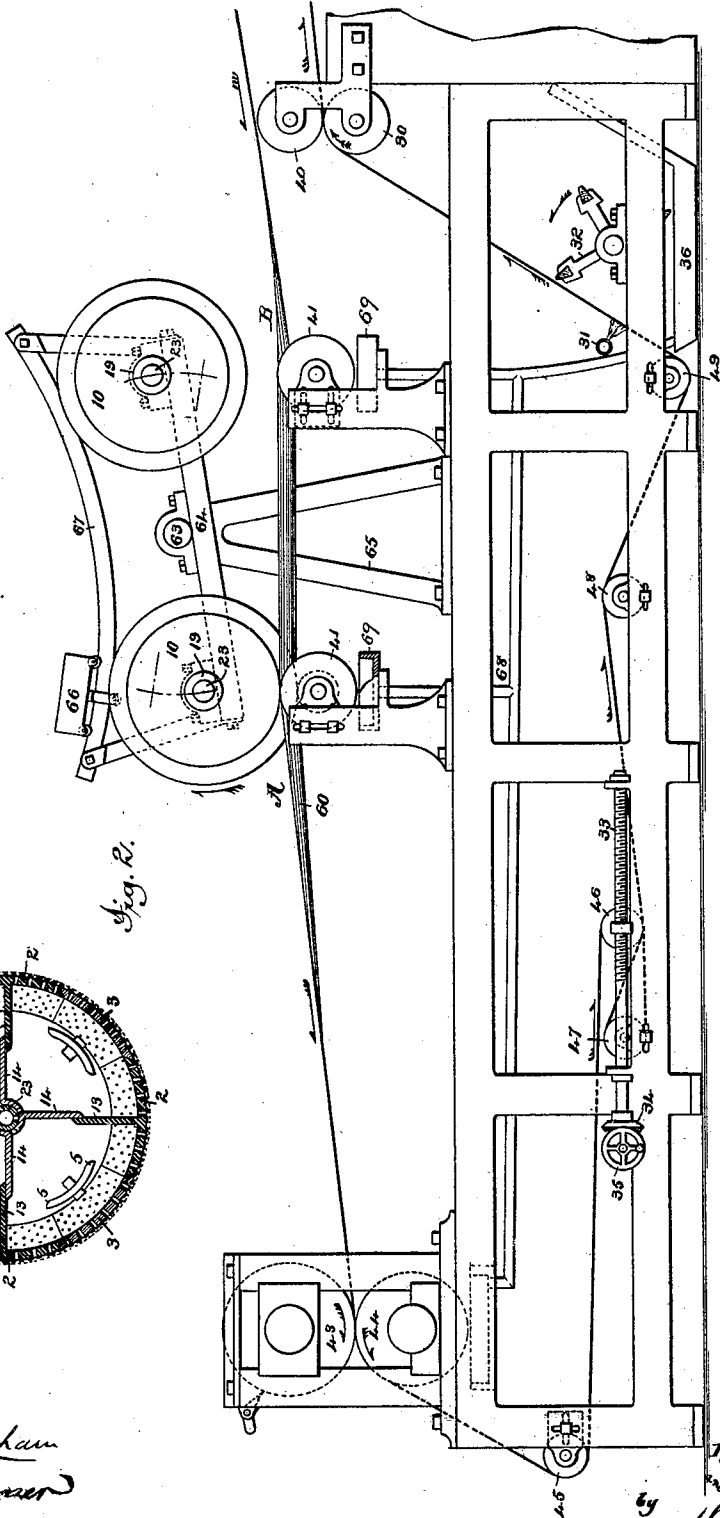
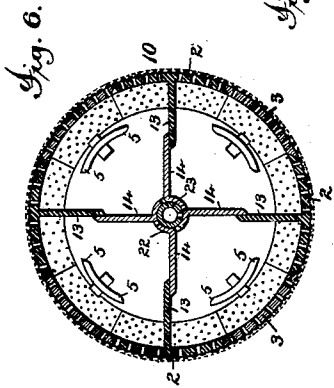
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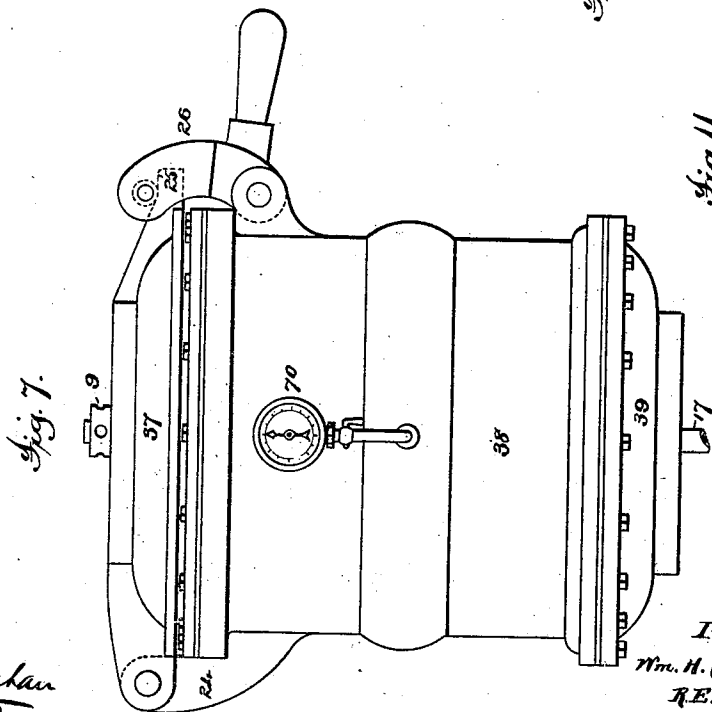
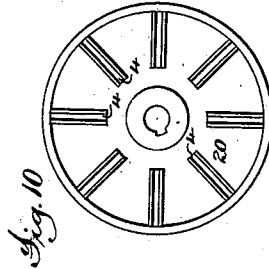
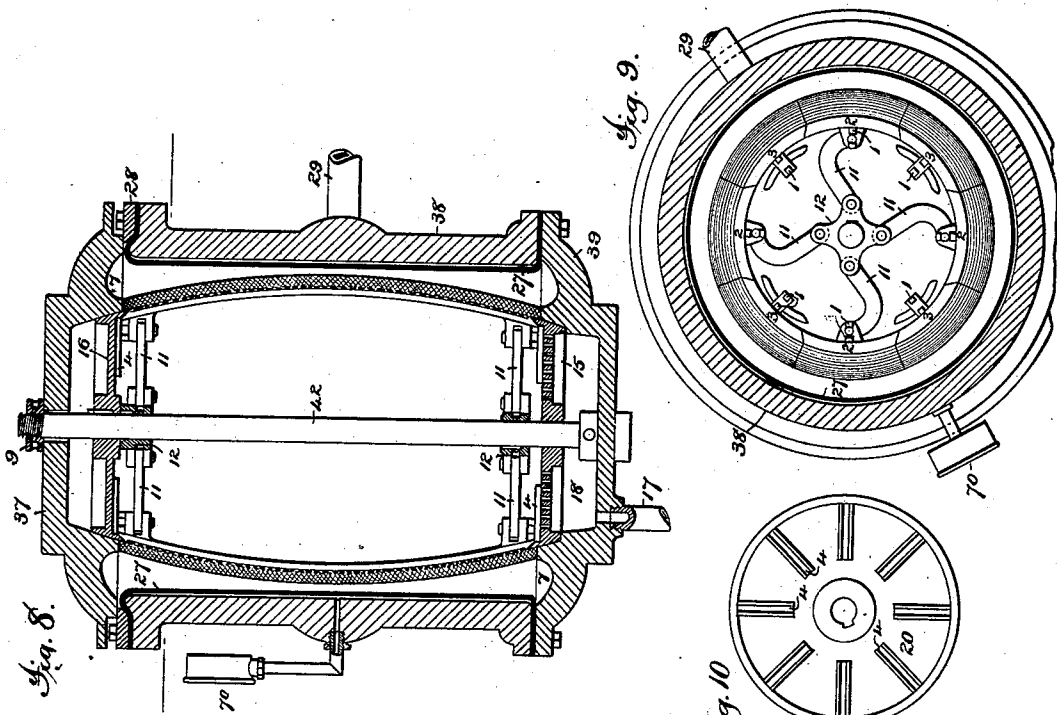
Patented April 19, 1881.



Attest:
L. M. Graham
J. W. Palmer

Inventors,
 Wm. H. Clark,
 R. E. Schermerhorn,
 & Chas. E. Sedore,
 by *Munson & Chittiford*
 Attys.

(No Model.)
 3 Sheets—Sheet 3.
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Attest;
Geo. H. Huban
T. H. Palmer

Inventors,
Wm. H. Clark,
R. E. Schermerhorn, & C.
Chas. E. Sedore,
 by *Mason & Phillip*
 Attys.

UNITED STATES PATENT OFFICE.

WILLIAM H. CLARK, OF CHATHAM VILLAGE, RICHARD E. SCHERMERHORN, OF MEDINA, AND CHARLES E. SEDORE, OF BROOKLYN, ASSIGNORS TO LOWELL M. PALMER, JULIUS A. STURSBURG, AND VICTOR W. McFARLANE, OF NEW YORK, N. Y.

MACHINE FOR MAKING PAPER BARRELS.

SPECIFICATION forming part of Letters Patent No. 240,233, dated April 19, 1881.

Application filed December 15, 1880. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. CLARK, residing at Chatham Village, county of Columbia, and State of New York, RICHARD E. SCHERMERHORN, residing at Medina, county of Orleans, and State of New York, and CHARLES E. SEDORE, residing at the city of Brooklyn, county of Kings, State of New York, all citizens of the United States, have invented certain new and useful Improvements in Process of and Apparatus for Making Bilged Paper Barrels, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In said drawings, Figure 1 represents a side elevation, partly in section, of the feeding-end portion, and Fig. 2 represents a side elevation of the rear-end portion, of a machine embodying our improvements, the two figures taken together illustrating a full side elevation of such machine. Fig. 3 represents a cross-sectional elevation looking toward the feeding end of the machine and more particularly illustrating the structure of the barrel-body-forming cylinder. Fig. 4 illustrates an end view of the forming-cylinder. Fig. 5 is a similar view of said cylinder as collapsed. Fig. 6 is a cross-sectional elevation of said forming-cylinder as extended. Fig. 7 shows an exterior view, Fig. 8, a vertical sectional elevation, and Fig. 9 a cross-sectional plan view, of the pressing apparatus. Fig. 10 represents an inside plan view of one of the cylinder-heads. Fig. 11 shows a sectional elevation of one of the segments of the forming-cylinder.

The object of the present invention is the production of bilged paper barrels, and the same embodies an improved process of manufacture that consists in forming a flat web of pulp, curving the same transversely, and winding the curved web in several layers lapped one upon another upon a bilged-formed exhausted cylinder.

It further embraces an apparatus for forming the bilged barrel-body and an apparatus for compressing the walls of the same, all of which is too particularly hereinafter set forth to need further preliminary description.

The pulp is admitted, through a pipe, 50, into a mixing-box consisting of a series of chambers formed by partitions 51 52, from which the properly-prepared pulp flows over the partitions, and finally into the main settling-vat 53. From this settling-vat a suitable quantity of material flows over the partition 54 into the cylinder-vat 55, its passage being controlled by a gate, 56. In this vat 55 a making-cylinder, 57, is arranged to revolve in suitable bearings, and is provided with an eduction pipe or pipes, 58, to convey off the water that passes through the reticulated shell of said making-cylinder in the process of depositing the floating fibres contained in the stuff or pulp. As this making-cylinder revolves it takes up a film or thin web of pulp upon its surface and conveys the same to the point occupied by a couching or sponge roller, 59, around which runs an endless felt, 60, the said web of pulp being thereby removed from the cylinder, transferred by the action of the coucher to the felt, and carried onward upon the upper surface of the latter to the bilged forming-cylinder. The reticulated surface of the making-cylinder is properly cleansed by means of a spray-pipe, 61, the water flowing from which washes the reticulated shell of the making-cylinder, so as to render its condition proper to repeat the making operation.

The making-cylinder is formed of spoked heads connected by a frame-work of longitudinal rods upon which a shell of wire-cloth or similar reticulated material is supported, and the couching-roller 59 is covered with sponge or similar soft substance, as is common in paper-making machines. The felt 60 passes from the couching-roll 59 through the forming mechanism; thence between driving-rollers 43 44, that are driven by any suitable means, and returns over a leading-roller, 45, stretching-rollers 46 47, guiding-rollers 48 49; thence through squeezing-rolls 30 40 to the surface of the making-cylinder 57, and in its passage between the rollers 49 30 it is thoroughly cleansed by means of a stream of water from a supply-pipe, 31, and a felt washer, 32, that revolves over a water-box, 36. Its tension is regulated by means

of the stretching-roller 46, whose shaft is provided at opposite ends with nuts that are engaged by screw-threaded shafts 33, journaled in ears attached to the side frames and simultaneously turned by means of bevel-pinions 34, that are engaged by similar pinions 35 carried by a cross-shaft that is supplied with a crank-wheel.

The apparatus for forming the bilged barrel-body is shown as duplex, each single apparatus A or B consisting of a reticulated forming-cylinder, 10, of bilge shape, and provided with an exhaust mechanism, which cylinder, during the forming operation, rests upon a sectional supporting-roller, 41, the surface of which is concave. Each forming-cylinder 10 is composed of a sectional body, consisting of bilge-shaped segment-plates, as 2 3, that are capable of being expanded into cylindrical form, as in Fig. 4, or drawn within each other, or collapsed, as in Fig. 5. These segments (see Fig. 11) are metal plates made strong enough to resist pressure, and perforated to admit the passage of air and fluid. These segments are each covered externally with several layers of wire-cloth, the first layer of which is coarse, the second somewhat finer, and so on, the last being fine enough to prevent the pulp or stuff sinking within the surface far enough to rupture the material or prevent the perfect operation of the apparatus. To prevent the deposit of dust upon the wire-cloth, or its apertures otherwise becoming clogged, this forming-cylinder is covered by an endless piece of coarse muslin or other material, which, while admitting the passage of air, will collect dust and fine particles of dirt upon its surface and admit of ready cleansing. This is represented by the continuous surface shown in Fig. 3.

The wire-cloth covering is segmental—that is to say, each segment carries its own reticulated covering, which forms an integral portion of the segment-plate, so that the parts may all move together. Each segment-plate has its ends shaped to fit the inner flange of cylinder-heads 20 21, and near said ends the segments are provided with projecting guide-studs, as 1, that travel in radial slots, as 4, formed in ribs projecting from the inner face of the cylinder-heads 20 21. These segment-plates are all supported by the shaft 22, each alternate segment-plate being connected at opposite ends to said shaft by arms 11, pivoted at one end to ears projecting from the segment, and at the other end pivoted to a hub, 12, splined or otherwise securely fastened to the shaft; and the intervening segments, as 3, are provided with undercut edges, against which the flanged edges of the segments 2 bear in supporting said segments 3 in their outward position. Said latter segments are also provided near their ends with laterally-projecting arms 5, that are arranged so as to be engaged at times by the edges of the segments 2, in the operation of collapsing and readjusting the forming-cylinder. The heads 20 21 are centered and turn upon the shaft 22.

In order to move the segments either in expanding or withdrawing them, the shaft 22 is provided at one end, outside of the head 20, with a fixed collar, 8, that is constructed to be engaged by a suitable instrument. It may be polygonal to receive a wrench, or provided with numerous holes to receive a rod, and in order to secure its adjusted position it may have a set-screw. The head 20 is also provided with a means for holding it stationary during this adjusting operation, the holes and rod being preferred, though any other common means may be used. To perform the adjustment in either direction, a rod may be inserted into a hole in the rim of the head 20, and held stationary, while a rod entered into one of the holes in the collar 8 is moved in an opposite direction, thereby causing the hubs 12 to turn with respect to the shaft 22 and withdraw or extend the segments. When said shaft is turned so as to throw the segments 2 3 into the position shown in Fig. 4, and maintain them there, the flanged edges of the segment 2 hold the segments 3 in place, and the arms 11 secure the extended position of the segments 2. With the segments in this position the forming-cylinder is in that adjustment which adapts it for the reception, upon its reticulated body, of the material that is to be shaped thereon into a bilged barrel-body. When said shaft is moved in the opposite direction the arms 11 operate to draw the segments 2 inward, while the edges of their sides, by engaging the arms 5 of the segments 3, cause the latter segments to make a similar inward movement, by which operation the forming-cylinder is collapsed, as in Fig. 5, thus enabling a barrel-body that has been formed upon its surface to be removed.

Each cylinder 10 rests, during the forming operation, upon a concave-surfaced sectional roller, as 41, which roller is constructed of a number of narrow pulleys or disks, each of a shape to adapt the entire roller to conform to the contour of the forming-cylinder. These disks or pulleys are secured between collars on the shaft, and are each free to rotate independently.

In practice the pulleys composing the independently-moving sections of the roller 41 have rims of small width—say an inch—this limited size being requisite to perfectly operate with the bilged forming-cylinder. If the said pulleys were of common construction this limited size would provide a bearing of like size upon the supporting-shaft, which, being of slight extent, would soon wear away and cause one or more of the pulleys to run low upon the shaft, and thus break up the continuity of the general bearing-surface, and consequently break up the even surface of the barrel-body, as well as make its thickness irregular and weak at different points. We therefore provide the pulleys with long bearings capable of sustaining great wear by constructing them with hubs the flange of which extends on one side from a point high enough to

receive the flange extending from the opposite side of the next adjacent pulley, between it and the shaft. We are thus enabled to provide a bearing nearly twice as wide as the rim of the pulley, which will sustain great wear and obviate the defect named.

As before stated, each cylinder 10 is provided with an exhaust mechanism. This consists of a hollow shaft, 23, which connects with any suitable exhaust apparatus, said shaft having a reduced surface to afford a bearing-seat for the hollow shaft 22 of the cylinder. The hollow shaft 23 is perforated with a number of holes, and the shaft 22 is likewise perforated, said perforations being arranged so that those in the hollow shaft 22 will, as that shaft is rotated with the cylinder 10, coincide with the perforations in the shaft 23, and thus permit the air and water to be exhausted from within the cylinder, and, together with whatever fluid is exhausted from the barrel-body, to be conducted off. To aid this passage of fluids each segment 2 3 is provided with inwardly-extending wings 13, that coact with similar wings 14 protruding from the hollow shaft 22, one each of said wings co-operating to form a conductor extending from the segment to the shaft, and, being separate members, permitting the inward and outward movements of the segments in the operations of adjusting the forming-cylinder.

Where the duplex arrangement shown is desired the cylinders 10 will be arranged so that one at a time will be in operation. To accomplish this the hollow shafts 23 that support the cylinders are journaled in a swinging carriage, that consists of arms 62 and cross-bar 64, that are journaled on a shaft, 63, which is supported by standards 65, said shafts 23 being secured to the arms 62 and cross-bar 64, so as to be stationary thereon, but capable of being swung up and down as the carriage is moved. When the carriage is so moved as to cause one of the cylinders 10 to rest upon the roller 41 it is necessary to hold it there by overbalancing the weight of its companion raised cylinder. This is done by a weight, 66, that is arranged to travel upon a guide-rail, 67, that is maintained by rods rising from the carriage and arranged to extend from points over each cylinder.

The operation of forming a bilged barrel-body is as follows: Suitably-mixed pulp, led into the vat 53 and allowed to flow therefrom into the vat 55, is taken up in a semi-fluid condition and formed into a web of wet pulp upon the surface of the making-cylinder 57, as is common in paper-making. This pulp-web is taken from the surface of the cylinder 57 by the couching-roller 59 and felt 60, and carried by the latter to the forming-cylinder 10, upon the surface of which it is caused to adhere by the combined action of the reticulated surface of the cylinder 10 and the action of the apparatus that exhausts the air from said cylinder. This green and exceedingly tender pulp-web is thus manipulated without danger of disruption by

the action of the endless felt, which, driven by the rollers 43 44, imparts a uniform surface movement to the making-cylinder 57, couching-roller 59, forming-cylinder 10, and supporting-roller 41. The felt 60 occupies a horizontal transverse plane as it receives the web from the cylinder 57, and this condition continues as it passes over the couching-roller 59; but as the forming-cylinder is approached said felt assumes a curved transverse plane that causes the web of pulp to be gradually bent into the concave form in which it is to be delivered onto the forming-cylinder. This is effected by the curvature imparted to the felt by its being clamped between the convex surface of the cylinder 10 and the concave surface of the roller 41, and, since the curvature thus imparted to the wet web of pulp tends to throw its sides toward the center, it will be apparent that a consolidating action takes place rather than a reverse one, and hence that no injury to the continuity of the web results. As the wet web passes between the cylinder 10 and roller 41 it is more or less pressed, a considerable quantity of the fluid it holds in suspension being thus expelled from its body. This fluid descends into a pan, 69, arranged beneath the roller 41, from which it is conveyed away by a pipe, 68.

The somewhat consolidated and still wet web of pulp taken up on the surface of the cylinder 10 is wound thereon until the surface thereof is covered, whereupon the air-exhaust tends to create a vacuum within said cylinder, thus drawing the wet web closely upon the reticulated surface of said cylinder and sucking much of the fluid remaining in the web into the cylinder, from whence it escapes over the conducting-wings 13 14 and through the hollow shaft 23. The winding continues until enough laps of the web have been collected upon the cylinder to constitute a barrel-body of the desired thickness and strength. The forming-cylinder 10, having the pulp barrel-body upon its surface, is then elevated by moving its carriage upon the shaft 63, which action breaks the wet-pulp web and brings the companion-cylinder 10 down into co-operation with the felt 60, whereupon the winding or forming operation is repeated upon that cylinder.

The barrel body upon the raised cylinder 10 is now removed as follows: A wrench or other suitable tool is applied to the collar 8 of the shaft 22, and the same is turned sufficiently to collapse the cylinder by withdrawing its segment-plates into the positions shown in Fig. 5. This reduces the said cylinder to a diameter smaller than the least diameter of the formed barrel-body, and enables the same to be removed lengthwise from off the cylinder, said consolidated barrel-body being strong enough to bear transferring to the press.

To finish the same to a condition suitable for use as a barrel-body requires its subjection to high pressure. This is attained by a finishing-press or apparatus constructed as follows: It consist, mainly, of a press, the body of which

consists of a strong cylinder, 38, to flanges of which a base or bottom plate, 39, is securely bolted, while its upper end is provided with a cap or head-plate, 37, hinged to a bracket, 24, and provided at an opposite point with a lip, 25, that is adapted to be embraced by a forked locking-arm, 26, whereby said head 37 may be secured in its closed position or be released and swung open to admit access to the interior. The body 38 is provided with an elastic lining consisting of a tubular sack, 27, preferably of rubber, one end of which is confined between the end of the body 38, and the flanges of the bottom plate, 39, while the opposite end is, in a similar manner, secured between the end of said body 38 and a ring, 28, bolted thereto. The body 38 is provided with a pipe, 29, that connects the chamber, between the sack 27 and the body 38, with a hydraulic or pneumatic apparatus capable of exerting great pressure, the degree of which may be registered by means of a gage, as 70. The bottom plate, 39, is constructed with a chamber, 18, having an exit-pipe, 17, at the upper edge of which chamber an annular seat with inclined sides is provided for the reception of a perforated head, 15, and the cap or head 37 has a similar seat for a solid head, 16. These heads are fixedly seated and centered upon a central shaft, as 42, which is fixed at its lower end to the bottom plate, 39, and at its upper end (which passes through the cap 37) is provided with a fastening-nut, 9. This shaft 42 supports a bilge-formed collapsible cylinder, which may be constructed in precisely the same manner as the cylinder 10—that is, have perforated segments 2 3, Fig. 11, opening arms 11, hubs 12, and studs or guides 1, that run in slots 4 in the heads 15 16; and the shaft 42 may be provided with means for turning it to operate the segment-plates 2 3. No further description is therefore necessary concerning its structure and operation, as corresponding parts are marked with the same reference characters.

The finishing operation is conducted as follows: The nut 9 is removed from the end of the shaft 42, the locking-arm 26 is released from the cap 37, and the latter is thrown open. This exposes the end of the shaft 42, and the latter is rotated either by the use of a pipe-wrench or other suitable tool until the hubs 12 are moved far enough to carry the segment-plates 2 3 inward, or collapse the cylinder, as in Fig. 5. This enables the barrel-body which was removed from the cylinder 10 when the latter is collapsed to be entered over this cylinder when adjusted in like condition. The edge of this barrel-body rests upon a seat provided for it upon the surface of the bottom plate, 39. The cylinder is then expanded by a reverse movement of the shaft 42, and thus brought into the condition shown in Fig. 4, thus supporting the barrel-body in the same manner as when it was formed. The cap 37 is then closed and locked and secured against the great internal pressure by means of the nut 9, this cover bringing the edges of the head 16

against the ends of the segments 2 3, and an annular seat upon the cap 37 against the upper edge of the barrel-body, as in Fig. 8. The pressure is then applied through the pipe 29, and the rubber sack 27 is forcibly expanded against the exterior surface of the barrel-body, said pressure acting not only to perfectly consolidate the barrel-body, but to express from it any remaining moisture it may contain, which moisture passes through the plate 15 and escapes by the pipe 17. When the barrel-body is sufficiently pressed the cap 37 is raised, the cylinder is collapsed, and the barrel-body is removed and finished into a barrel by supplying it with hoops and heads.

Practical experience has demonstrated that the heads 37 39 must be recessed, as at 7, so that the sack 27 may, when expanded, so lap upon the ends of the barrel-body as to smoothly press thereon, and these recesses are therefore provided to receive whatever buckling of the sack may result from stretching its material near the points where its ends are secured. It is preferable that they be made rounding in order to remove undue strain.

In the operation of winding the wet-pulp web upon the bilged forming-cylinder, it is obvious, from the fact that the web is required to be lapped upon a cylinder that is of the greatest extent in its center and decreases toward the ends, that the web must either be stretched longitudinally on its central part or be consolidated longitudinally near its sides. This difficulty has heretofore proved a barrier to the formation of a bilged barrel-body by winding a flat web upon a bilged forming-cylinder, for the reason that no mode of preventing a central stretch and consequent destruction has been found, and is successfully overcome by the process carried out in this machine, for the reason that the felt first covers the pulp-web into a form approximating that of the cylinder, and then by its elasticity gives enough to compensate for the slight varying differential movement which is produced by the action of the sectional roller 41 constantly occurring between it and the pulp-web it transfers to the cylinder, aided by the simultaneous drawing action maintained by the exhaust apparatus within the cylinder, these combined effects resulting in the smooth laying of the pulp onto the cylinder and the even consolidation of its body toward each end of the cylinder.

What is claimed is—

1. The process of making bilged paper barrel-bodies, the same consisting in forming a flat web of pulp, as upon an ordinary paper machine, curving the same transversely, and winding the curved web in several lapped layers upon a bilged-shaped forming-cylinder with the aid of vacuum, all substantially as described.

2. The combination, with a bilged-shaped forming-cylinder provided with an apparatus for exhausting the same, of a web-carrying felt and means for curving the same transversely, all substantially as described.

3. The combination, with the bilged-shaped forming-cylinder, of a sectional concave supporting-roller, composed of a series of separate pulleys, all substantially as described.

5 4. The combination, with the bilged-shaped perforated forming-cylinder and its hollow perforated shaft, of an exhaust apparatus, substantially as described.

10 5. The combination, with the felt 60, of duplex barrel-forming mechanisms A and B, connected by means substantially as described, so that the bringing of one into operation simultaneously suspends the operation of the other.

15 6. The combination, with perforated cylinder 10 and its perforated shaft, of the wings 13 14, substantially as described.

20 7. The combination, with a perforated cylinder and an apparatus adapted to exhaust the air from its interior, of wings for conducting the moisture from the shell of the cylinder to its hollow supporting-shaft, substantially as described.

25 8. The combination, with the roller 41 and cylinders 10, of the way 67, and shifting-weight 66, substantially as described.

9. A collapsible forming-cylinder, consisting of segments 2, hung to revolving hubs 12,

and segments 3, having arms 5, said segments being guided in heads, as 20 21, and adapted to move radially, to collapse and expand the cylinder they form, substantially as described. 30

10. A pressing apparatus consisting of a perforated cylinder having a perforated lower head, as 15, and a head, as 16, and adapted to be seated between the top and bottom plates, 37 39, of a vessel, 38, that is provided with a pressing-sack, as 27, and means for expanding the same with great pressure, substantially as described. 35 40

11. The combination, with the perforated cylinder, the vessel 38, and its sack 27, of plates, as 37 39, having recesses, as 7, substantially as described.

12. A sectional roller composed of independent revolving pulleys having overlapping bearings, substantially as described. 45

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

W. H. CLARK.
R. E. SCHERMERHORN.
C. E. SEDORE.

Witnesses:

T. H. PALMER,
GEO. H. GRAHAM.