W. H. DECKER.

APPARATUS FOR MAKING BARREL BODIES FROM PULP.

APPLICATION FILED FEB. 5, 1907. RENEWED APR. 1, 1909.

**928,247.** **Patented July 20, 1909.**

4 SHEETS—SHEET 1.

Fig. 9

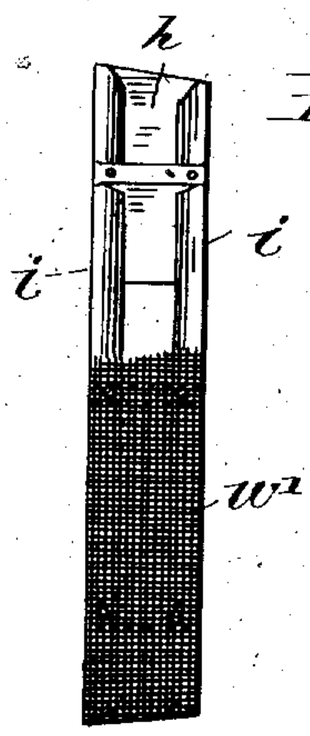



Fig. 1.




Fig. 7.

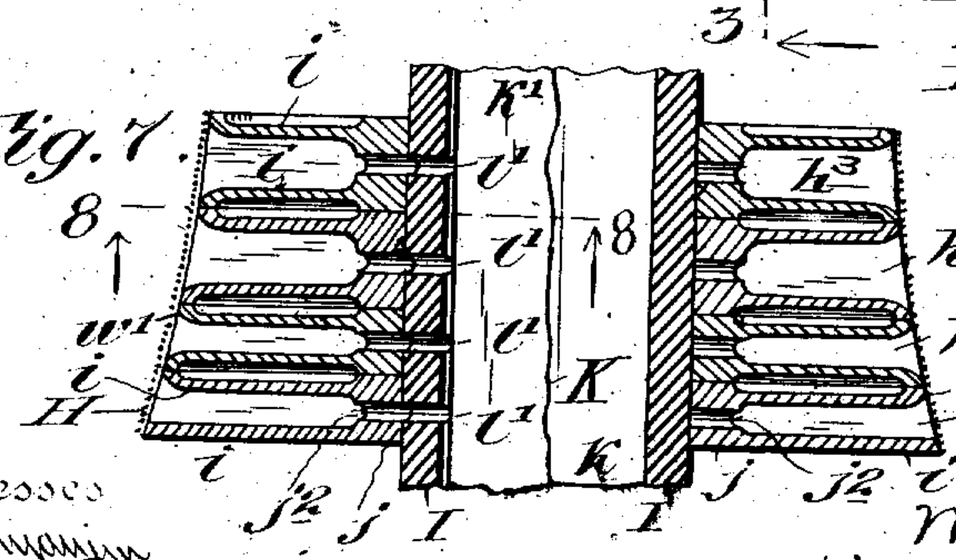
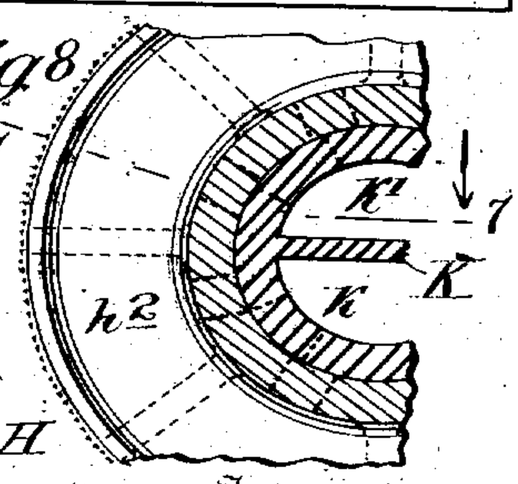



Fig 8




Witnesses
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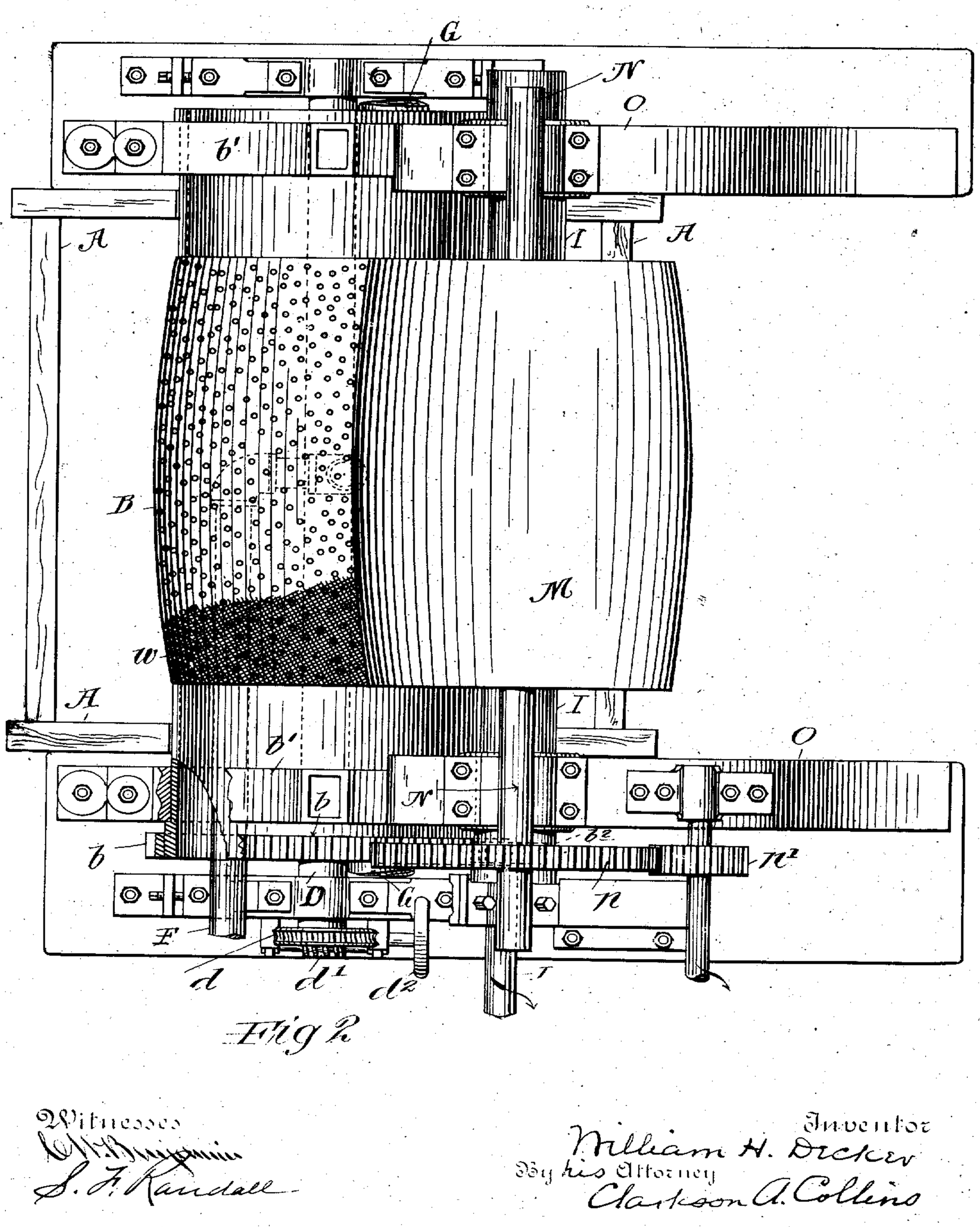


Fig 2.

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4 SHEETS—SHEET 3.

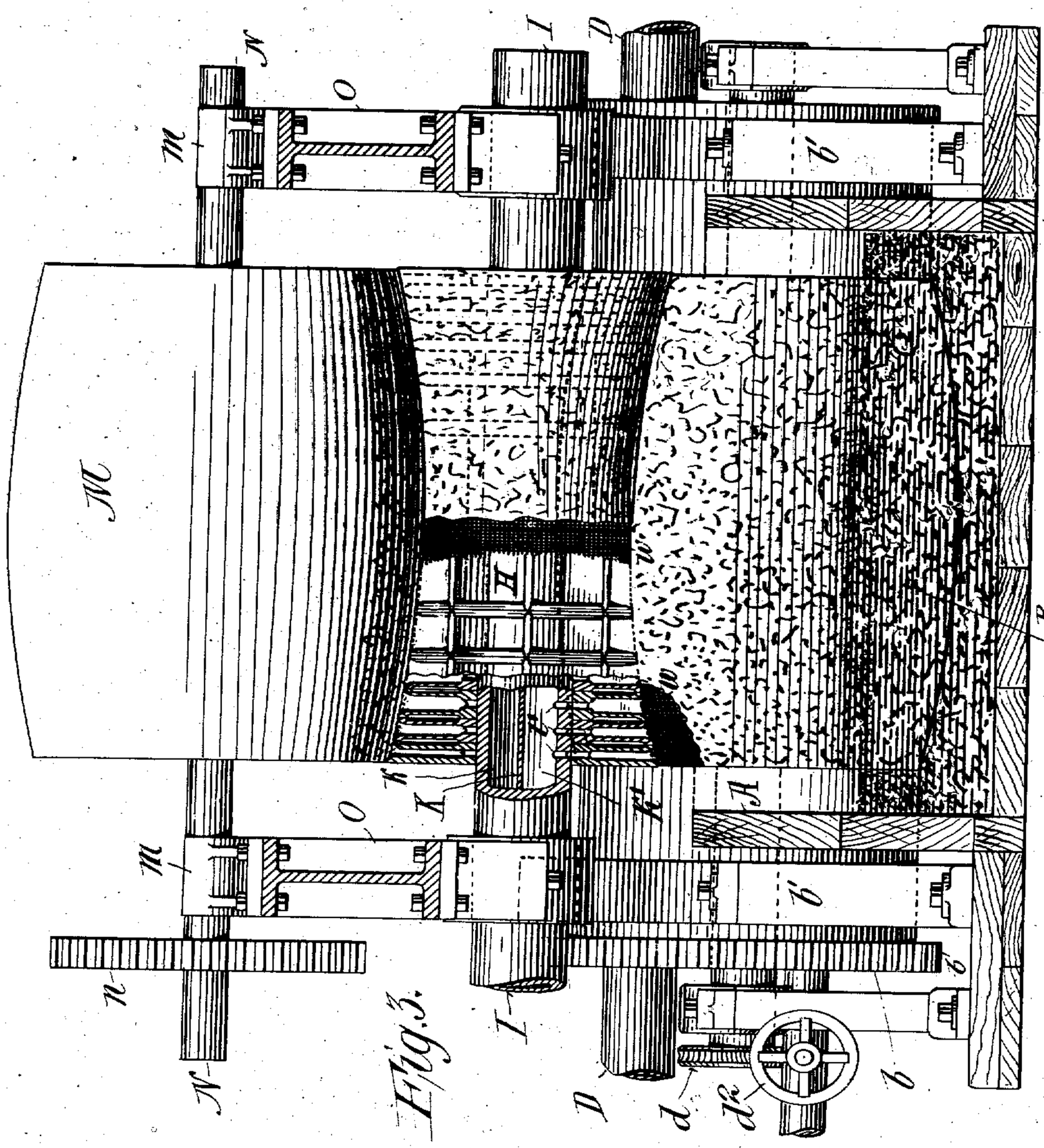


Fig. 3.

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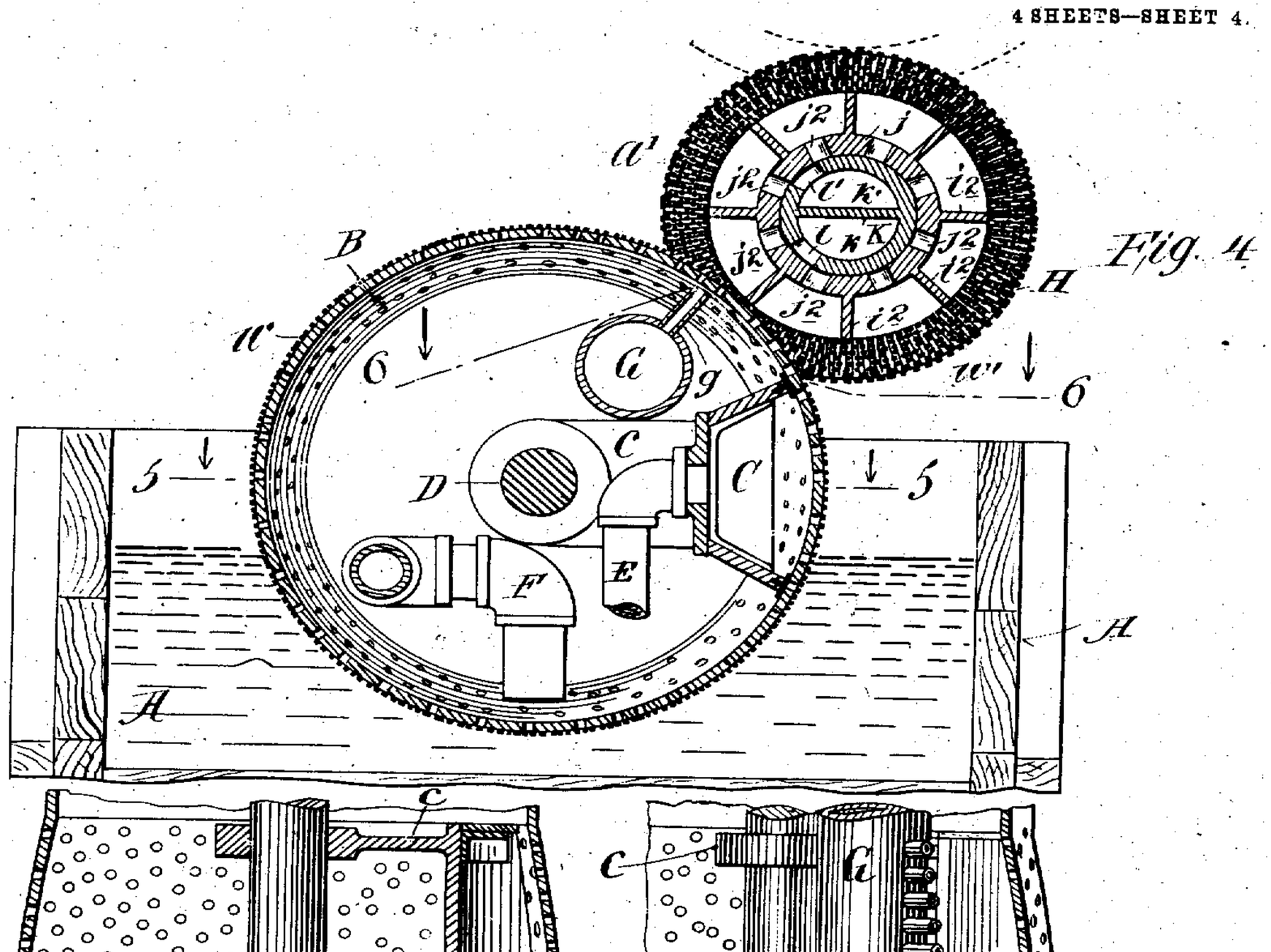


Fig. 4

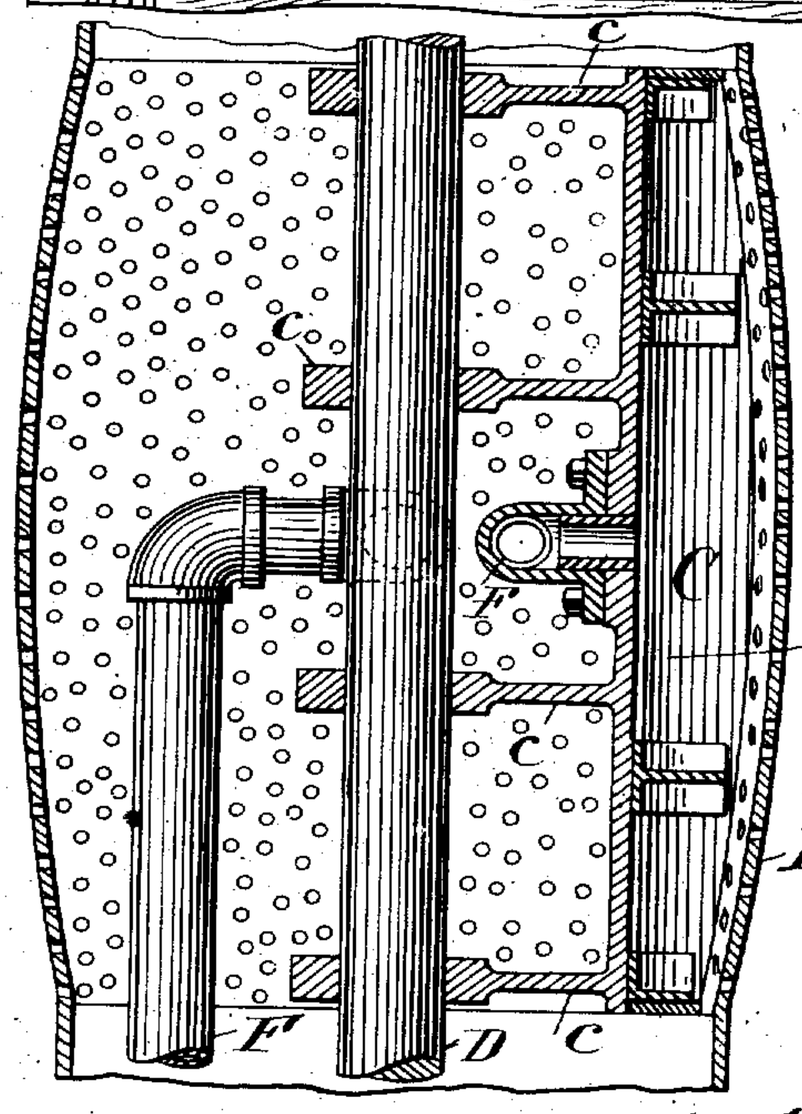


Fig. 5.

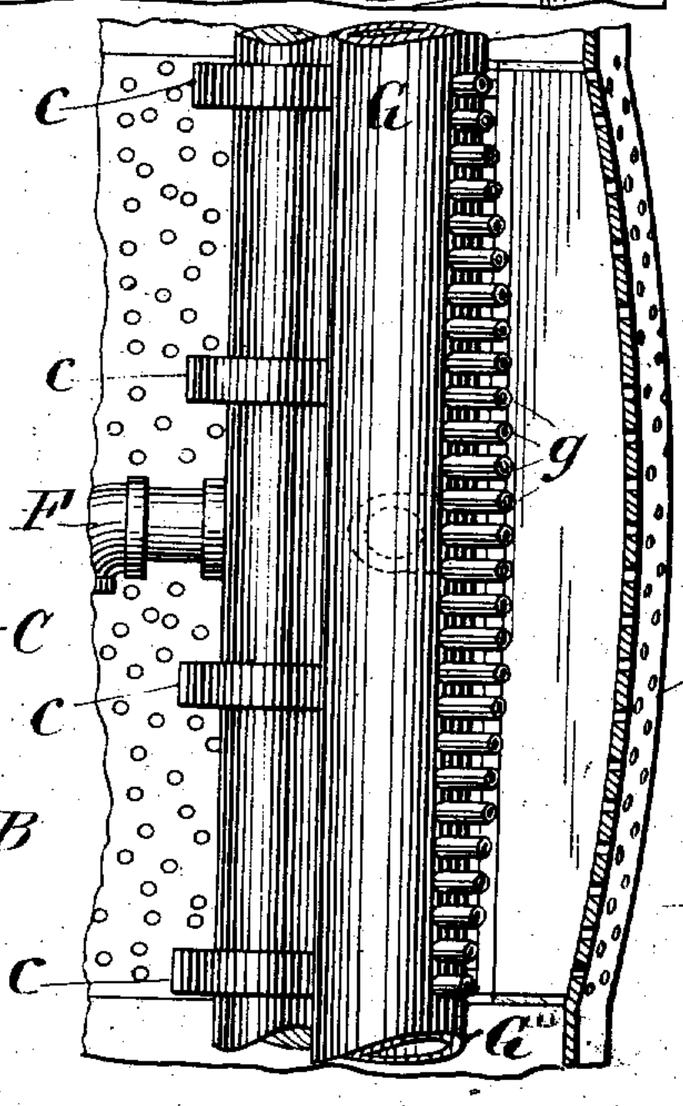


Fig. 6.

Witnesses
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# UNITED STATES PATENT OFFICE.

WILLIAM H. DECKER, OF SYRACUSE, NEW YORK, ASSIGNOR TO THE SOLVAY PROCESS COMPANY, OF SYRACUSE, NEW YORK, A CORPORATION OF NEW YORK.

## APPARATUS FOR MAKING BARREL-BODIES FROM PULP.

No. 928,247. Specification of Letters Patent. Patented July 20, 1909.

Application filed February 5, 1907, Serial No. 355,844. Renewed April 1, 1909. Serial No. 487,339.

*To all whom it may concern:*

Be it known that I, WILLIAM H. DECKER, a citizen of the United States, residing in the city of Syracuse, county of Onondaga, and State of New York, have invented a new and Improved Apparatus for Making Barrel-Bodies from Pulp, of which the following is a specification.

My invention relates particularly to the making of bilged barrel bodies from paper pulp. Heretofore cylindrical barrel bodies have been made from such pulp by winding the same upon a cylindrical mandrel. Such barrels, however, are inconvenient to handle, on account of their shape, and for this reason are not used except in very small sizes. Bilged barrel bodies have also been made from pulp by compressing the pulp in a mold of the desired shape. Barrel bodies made in this way are, however, weak on account of the method of manufacture, and for this reason are undesirable as containers of heavy contents.

The desirability of a barrel body formed by winding a sheet of pulp directly upon a bilged mandrel has long been recognized, since such a body, while having the advantages due to the bilged shape, would be strong by reason of the substantially uniform disposition of the pulp fibers throughout the mass, and would have the lightness and cheapness incident to the material composing it. Since a bilged mandrel has its greatest circumference at its center, it is evident that, as such a mandrel revolves, points on such central circumference will move more rapidly than points at the ends or between the ends and the center, and that a sheet of material continuously wound thereon will be longest at the center. Hence, in winding pulp upon a bilged mandrel, it would be necessary to supply material thereto in such shape as to provide for the formation of a continuous sheet longer in the middle than on the sides, and to supply it more rapidly at the center than at the ends of the mandrel. Prior to my invention no means had been discovered of successfully accomplishing this, but in all attempts to produce a barrel body by winding the same upon a bilged mandrel, the sheet of pulp has been so strained and disrupted by improper delivery to the mandrel, as to result in a weak and imperfect construction.

The object of my improvements is to overcome these difficulties, and provide a practicable method of delivering to and winding upon a bilged mandrel a continuous, unbroken sheet of pulp of uniform strength throughout, so as to build up a barrel body thereof. To this end I give to the sheet of pulp at the outset the same form and proportions it will have when deposited upon the mandrel, by drawing it up from the vat upon a forming cylinder or roll of substantially the same shape and size as the mandrel. The wet, weak sheet of pulp cannot, however, be directly transferred from the convex surface of such roll to another convex surface, such as that of a bilged mandrel, owing to the considerable space that must intervene between parts of any two such convex surfaces. I therefore transfer the moving sheet of pulp from the convex surface of the forming roll to a concave surface, which at all points of its cross section closely approaches the surface of the forming roll, and upon which the sheet of pulp is carried to the mandrel at such a rate of travel in every part thereof as such part will have after being deposited upon the mandrel. The preferred form for such device which I have illustrated and described herein is a transfer roll having, as a whole, a concave surface, and made up of a series of independently rotatable disks or sections which primarily lie against and are revolved by friction with the surface of the mandrel. Hence each of such disks has the same mean surface rate of speed as that part of the surface of the mandrel with which it is in contact, and the sheet of pulp, while thereon, moves at substantially the same speed in every part that it does after being delivered to the mandrel. The sheet of pulp continues to be wound upon the mandrel until a deposit of the required thickness is formed, when the barrel body is removed from the mandrel, or an empty mandrel is substituted, and the operation is repeated. In this manner I am able to form barrel bodies of successive layers of pulp which are undistorted, or, in other words, have the same shape and position when laid upon the mandrel as when lifted from the mass of pulp from which they are formed and which have a uniformly parallel disposition to one another, a formation which adds largely to the strength of the structure. Each layer of pulp has also the same thickness and the

same degree of solidity throughout, thus giving the barrel body a uniform load carrying and strain resisting capacity in all parts.

The invention will be best understood by reference to the accompanying drawings, in which the same characters of reference indicate corresponding parts throughout.

Figure 1 of the drawings shows an end view of the apparatus, and Fig. 2 a plan view. Fig. 3 is a rear elevation, showing the concave transfer roll partially broken away, stepping down from the sheet of pulp on the exterior to section of shafting on line 3—3, Fig. 1. Fig. 4 shows a vertical section of the forming and transfer cylinders. Fig. 5 shows a section on line 5—5 of Fig. 4; and Fig. 6 a section on line 6—6, Fig. 4. Fig. 7 shows a longitudinal section of a portion of the concave transfer roll on the line 7—7, Fig. 8; and Fig. 8 a transverse section of the same on the line 8—8, Fig. 7. Fig. 9 is a side view of one of the disks forming the transfer roll, shown partially covered with wire netting.

Referring to the drawings, A, indicates the pulp tank, in which revolves the forming roll, B, the extended ends of which rest in bearings $b'$ $b'$, and which is rotated by means of the gears, $b$ $b^2$. The forming roll, B, is a metal shell thickly pierced with small perforations, and is covered on the outside with wire netting of small mesh, a portion of which is shown in Fig. 2. The operative portion of the roll, B, within the tank, A, is of the same size and shape as the bilged mandrel, M.

Within the forming roll, B, is a suction box, C, which, by means of straps, $c$, $c$, $c$, is suspended from and secured to a shaft, D. The shaft, D, is provided with a worm and gear, $d$, $d'$, by means of which it may be rotated to the end of adjusting the position of the suction box, C, within the roll, B. From the suction box, C, a pipe, E, leads to an air exhaust apparatus of any usual or suitable form (not shown in the drawings).

F, indicates a pipe through which water may be withdrawn from the interior of the forming roll, B.

G, is a pipe leading from a source of air pressure (not shown), and provided with a row of tubes, $g$, $g$, $g$, whereby an air blast may be directed against the inner surface of the roll, B.

H, is the concave surfaced transfer roll located closely adjacent to, but out of contact with, the forming roll, B. The transfer roll, H, is made up of a series of independent hollow disks or sections, $h$, $h^1$, $h^2$, &c. which are rotatably mounted on a fixed shaft, I. Each of the disks, $h$, is made up of two side walls, $i$, $i$, connected, adjacent to the shaft, I, by a hub, $j$. The space between the side walls, $i$, $i$, and the hub, $j$, is divided into a series of cells by partitions, $i^2$, $i^2$, &c., which extend from the hub, $j$, outwardly to the periphery of the disk. Perforations, $j^2$, through the hub $j$, connect with each of the cells formed by the partitions, $i^2$, $i^2$. The open peripheral faces of the disks, $h$, $h^1$, $h^2$, &c., are covered with fine wire netting, shown partly broken away in Fig. 9. The hollow fixed shaft, I, on which the sections of the transfer roll, H, rotate, is divided by a partition, K, into two parts, $k$, $k'$. A series of ports or openings, $l$, $l'$, through the wall of the shaft, I, into each of the parts, $k$, $k'$, are arranged to register with the openings, $j^2$, of the disks, $h$, $h'$, &c., as these rotate. One part, $k$, of the shaft, I, is connected with an air exhaust (not shown), and the other part, $k'$, is connected with a source of air pressure (not shown). Each of the sections forming the transfer roll, H, is so shaped that the transfer roll presents a concave exterior surface, which is the converse of the bilged or convex exterior surfaces of the forming roll, B, and the mandrel, M.

M, indicates a bilge shaped collapsible mandrel of any usual or suitable construction, supported by the shaft, N, which rests in open bearings or crotches, $m$, $m$, and is adapted to be rotated by the gear wheels, $n$, $n$. The mandrel, M, lies in contact with the transfer roll, H, the sections of which are rotated by friction therewith.

The operation of the device is as follows: The tank, A, being filled with pulp to the required depth, and the suction box, C, being set by means of the worm and gear, $d$, $d'$, so that its lower edge is slightly below the level of the pulp in the tank, the forming roll, B, is revolved, and a film or web of pulp is brought up on the surface thereof from the mass in the tank, A. Air is withdrawn from the suction box, C, and by means of the vacuum or partial vacuum thus formed, the film of pulp, as it passes in front of the suction box, C, is firmly held on the surface of the forming roll, B, and a portion of its watery content is extracted so that it is partially dried. As the film of pulp reaches the line of the tubes, $g$, $g$, a blast of air through the pipe, G, and the tubes, $g$, $g$, detaches it from the forming roll, B, and carries it over to the transfer roll, H. The detachment of the film of pulp from the forming roll, B, and its transfer to and retention upon the transfer roll, H, is facilitated by the exhaustion of air from the part $k$, of the hollow shaft, I, acting upon the film of pulp through the ports, $l$, in the shaft, I, and the ports, $j^2$, in the disks, $h$, $h'$, $h^2$, &c., which form the transfer roll, H, as these latter register with the ports, $l$. As the film of pulp approaches the point at which the transfer roll, H, is in contact with the mandrel, M, it is loosened from the surface of the transfer roll, and its transfer to the mandrel is facilitated by a moderate air

pressure applied to the film through the part, $k'$, of the hollow shaft, I, the ports, $l'$, and the ports, $j^2$, as these register with the ports, $l'$. When the film reaches the line of contact between the transfer roll, H, and the mandrel, M, it leaves the transfer roll, and follows the mandrel, and is wound thereon until a barrel body of the required thickness is formed.

It will be evident that since each of the independently rotatable disks or sections forming the transfer roll, H, is revolved by friction with that portion of the mandrel, M, in contact therewith, it will travel at the same means surface rate of speed as such portion of the mandrel, the smallest or central disk, which is in contact with the largest part of the mandrel, moving more rapidly than the larger end disks, which are in contact with the smallest parts of the mandrel, and so in like manner with the intermediate disks. In this way I am able to cause every part of the sheet of pulp to travel at a uniform rate of speed in its progress over the forming cylinder, and transfer roll, and while being wound upon the mandrel, and the straining and tearing of the sheet of pulp which would result from variations in the rate of travel as the sheet is transferred from one surface to another is avoided. Any slip that may be due to the difference in size of the two sides of the individual sections of the transfer roll, H, will be so slight that it may be disregarded.

The shaft, N, of the mandrel, M, is free to rise in the open bearings, $m$, $m$, and thus space is afforded between the mandrel and the transfer roll, H, for the sheet of pulp upon the mandrel as it increases in thickness by the deposition of successive layers. The sheet of pulp is subjected to the entire weight of the mandrel, and is thus compressed as it is rolled upon the mandrel, forming a rigid, solid barrel body. After the barrel body has attained the required thickness, the mandrel, M, is removed by lifting the shaft N, from the bearings, $m$, $m$, and the barrel body is removed from the mandrel in the usual manner and set aside to dry.

What I claim as new and desire to secure by Letters Patent is:

1. In an apparatus for forming bilged barrel bodies of paper pulp, the combination of a bilged forming roll for withdrawing a web of pulp from the vat, a bilged mandrel and a concave surfaced transfer roll lying between said forming roll and said mandrel, and in contact with the latter, and composed of hollow, independently rotatable sections mounted upon a hollow fixed shaft, and means of communication between the interior of said shaft and the interior of each of said sections, substantially as and for the purposes set forth.

2. In an apparatus for forming bilged barrel bodies of paper pulp, the combination of a bilged forming roll for withdrawing a web of pulp from a vat, a bilged mandrel and a concave surfaced transfer roll lying between said forming roll and said mandrel, and in contact with the latter, and composed of independently rotatable sections, substantially as and for the purposes set forth.

3. In an apparatus for forming bilged barrel bodies of paper pulp, the combination of a bilged forming roll for withdrawing a web of pulp from the vat, a bilged mandrel and a concave surfaced transfer roll lying between said forming roll and said mandrel and in contact with the latter, substantially as and for the purposes set forth.

4. In an apparatus for forming bilged barrel bodies of paper pulp, the combination of a bilged forming roll for withdrawing a web of pulp from the vat, a bilged mandrel and means for transferring the web of pulp from the forming roll to the mandrel, substantially as and for the purposes set forth.

5. In an apparatus for forming bilged barrel bodies of paper pulp the combination of a perforated barrel shaped forming roll for withdrawing a web of pulp from a vat, a shaft through said forming roll, a suction box secured to said shaft, means for withdrawing air from said suction box, and means for rotating said shaft to the end of adjusting the position of the suction box within the forming roll, substantially as and for the purposes set forth.

6. In an apparatus for forming bilged barrel bodies of paper pulp, the combination with a perforated barrel shaped forming roll for withdrawing a web of pulp from a vat, of a pipe connected with a source of air pressure and extending longitudinally through said forming roll, and a series of tubes extending from said pipe to points near the interior surface of said forming roll, substantially as and for the purposes set forth.

7. In an apparatus for forming bilged barrel bodies of paper pulp the combination of a perforated barrel shaped forming roll for withdrawing a web of pulp from a vat, a concaved surfaced transfer roll adapted to receive such web, and means for directing an air blast against the interior of said forming roll to the end of transferring the web of pulp from the forming roll to the transfer roll, substantially as set forth.

8. In an apparatus for forming bilged barrel bodies of paper pulp a transferring device comprising a fixed shaft divided by a longitudinal partition, and having a series of openings through the wall thereof on each side of said partition, and a series of hollow, independently rotatable disks mounted upon said shaft, and having openings in the hubs thereof arranged to register with the openings in the shaft as the disks re-

volve, substantially as and for the purposes set forth.

9. In an apparatus for forming bilged barrel bodies of paper pulp, the combination of a fixed shaft, a series of hollow disks independently rotatable on said shaft, and forming together a concave surfaced transfer roll, and means for intermittently withdrawing air from and admitting an air blast to the hollow interiors of said disks as they revolve upon said shaft, substantially as and for the purposes set forth.

10. In an apparatus for forming bilged barrel bodies of paper pulp the combination of a bilged forming roll, a bilged mandrel, means for transferring a bilge-shaped web of pulp formed upon the forming roll to the mandrel, and means for causing such web of pulp to retain its bilged shape during its transfer from the forming roll to the mandrel, substantially as set forth.

11. In an apparatus for forming bilged barrel bodies of paper pulp, the combination with a bilged mandrel and a bilged forming roll, of means for causing the bilge-shaped web of pulp formed upon the forming roll to retain its bilged shape during its transfer from the forming roll to the mandrel, substantially as set forth.

In testimony whereof, I have hereunto subscribed my name, this 1st day of February A. D., 1907.

WILLIAM H. DECKER.

Witnesses:
ED. F. HUGHES,
JAMES PLANT.

Corrections in Letters Patent No. 928,247.

It is hereby certified that in Letters Patent No. 928,247, granted July 20, 1909, upon the application of William N. Decker, of Syracuse, New York, for an improvement in "Apparatus for Making Barrel-Bodies from Pulp," errors appear in the printed specification requiring correction, as follows: In line 57, page 1, the word "method" should read *means*, and page 3, lines 63–64, 73, 81, 88, 98–99, and 109, and page 4, lines 1 and 11–12, the words "and for the purposes" should be stricken out; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of August, A. D., 1909.

[SEAL.]

F. A. TENNANT,
*Acting Commissioner of Patents.*

volve, substantially as and for the purposes set forth.

9. In an apparatus for forming bilged barrel bodies of paper pulp, the combination of a fixed shaft, a series of hollow disks independently rotatable on said shaft, and forming together a concave surfaced transfer roll, and means for intermittently withdrawing air from and admitting an air blast to the hollow interiors of said disks as they revolve upon said shaft, substantially as and for the purposes set forth.

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