No. 768,310. PATENTED AUG. 23, 1904.

J. H. RIVERS.

METHOD OF FORMING HOLLOW PULP ARTICLES.

APPLICATION FILED FEB. 6, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

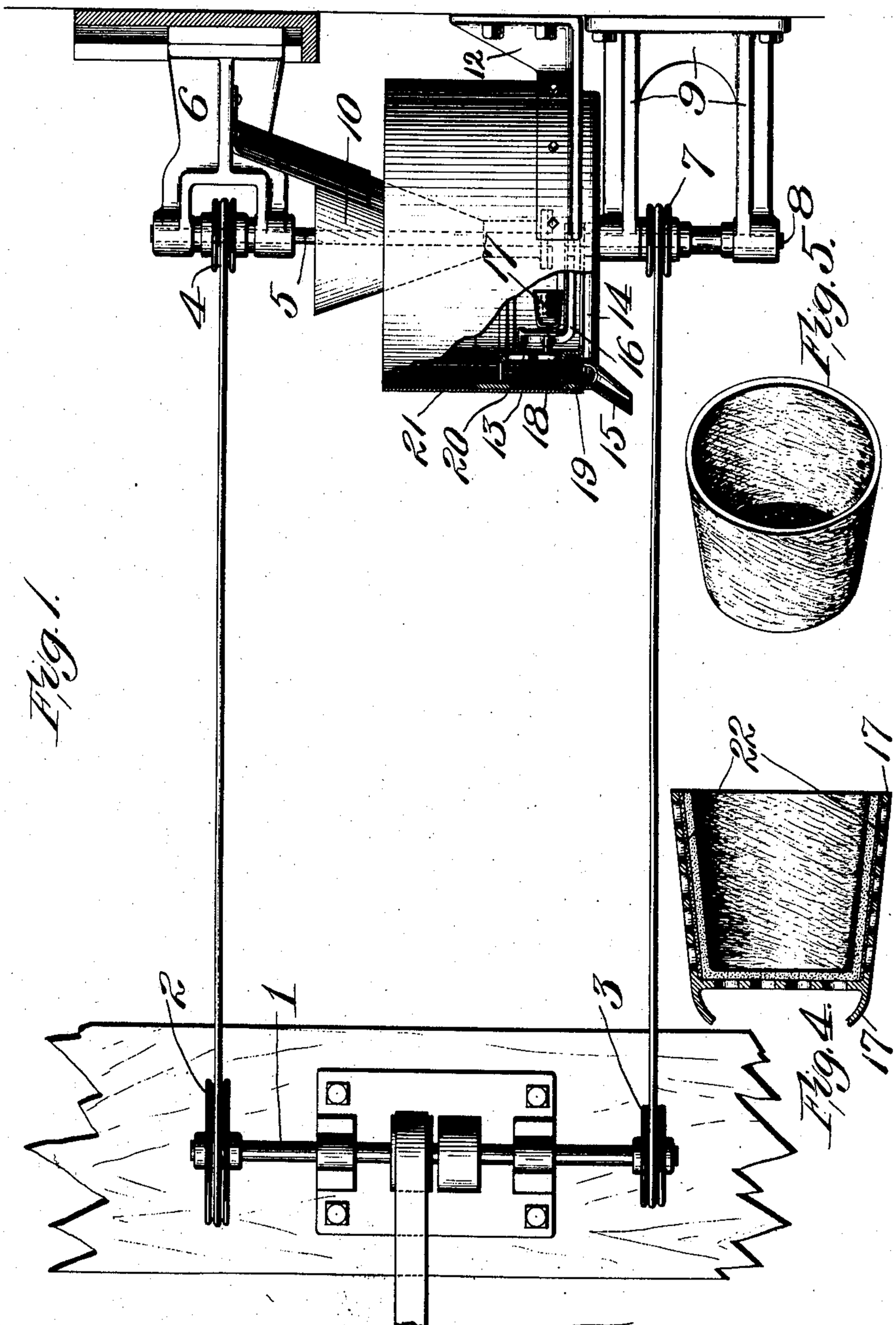

Fig. 1.

Fig. 5.

Fig. 4.

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NO MODEL. 2 SHEETS—SHEET 2.

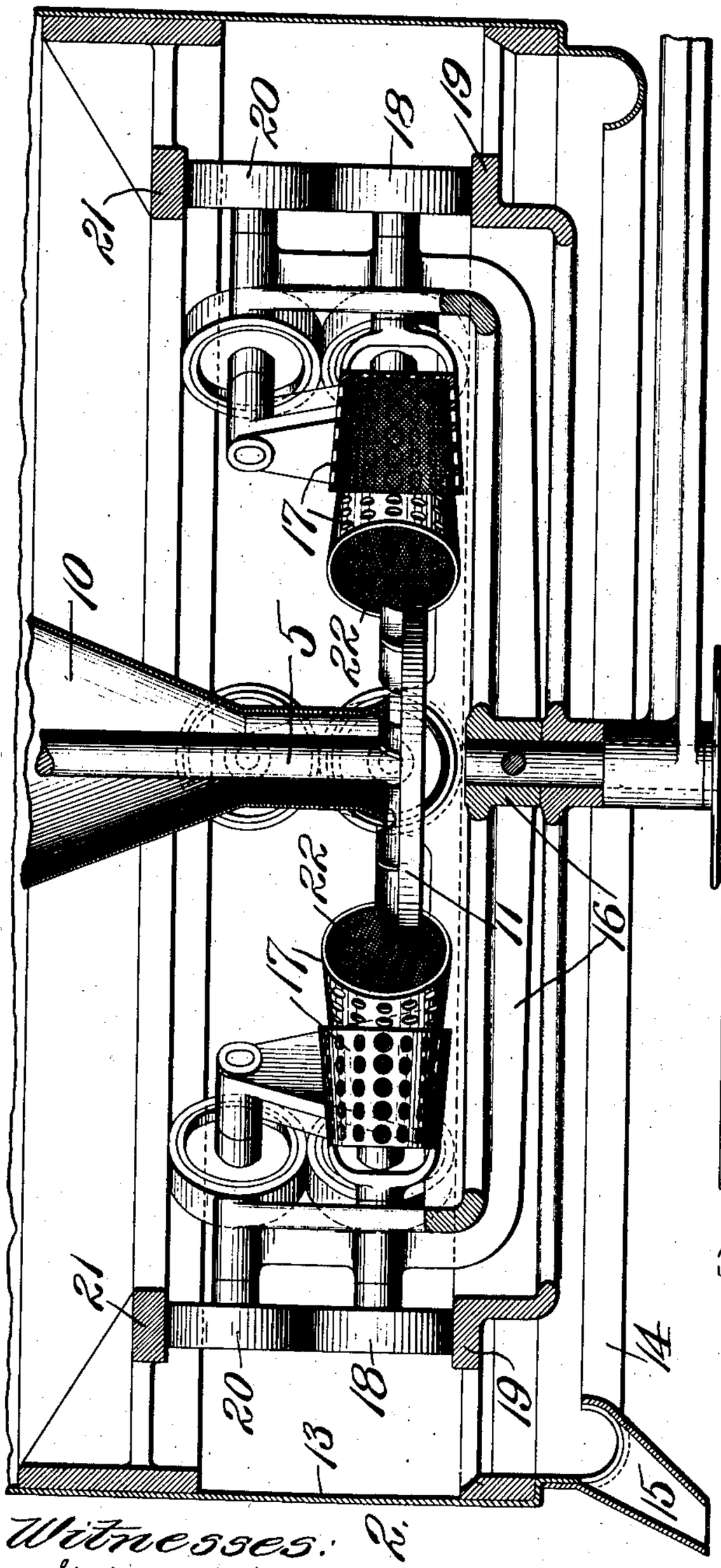

Fig. 2.

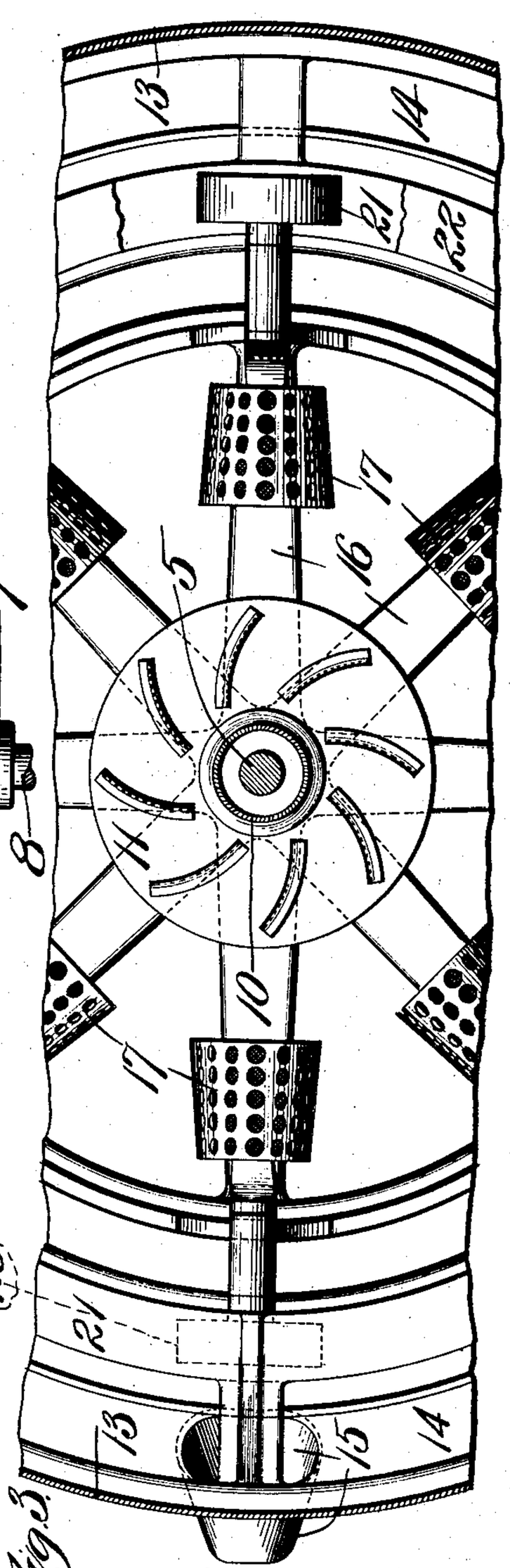

Fig. 3.

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No. 768,310. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

JULIAN H. RIVERS, OF ST. LOUIS, MISSOURI, ASSIGNOR TO UNITED STATES FIBER STOPPER COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF SOUTH DAKOTA.

METHOD OF FORMING HOLLOW PULP ARTICLES.

SPECIFICATION forming part of Letters Patent No. 768,310, dated August 23, 1904.

Application filed February 6, 1904. Serial No. 192,376. (No model.)

To all whom it may concern:

Be it known that I, JULIAN H. RIVERS, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Methods of Forming Hollow Pulp Articles, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevational view, partly in section, of my apparatus by means of which my improved method may be practiced. Fig. 2 is a vertical sectional view. Fig. 3 is a top plan view, partly broken away. Fig. 4 is a detail view of a formed hollow article in its mold, and Fig. 5 is a detail view of an article formed by my said apparatus.

This invention relates to methods of forming hollow pulp articles, such as buckets or other articles, where it is desired to have a bottom wall or flange integral with the side walls.

The objects of this invention are to utilize the action of centrifugal force as a factor in determining the position of the fibers entering into the construction of the article, said force so disposing and compacting the fibers that a solid compact article composed of layers or strata of interwoven fibers is produced.

I do not in this application claim the apparatus or the article, the same forming the subjects-matter of companion applications filed by me of even date herewith and serially numbered 192,375 and 192,377.

In the accompanying drawings I have shown a form of apparatus by which my method may be practiced; but I do not wish to be understood as limiting myself to this particular apparatus, as the same could be changed without in the least departing from the nature and principle of my present invention.

In the drawings, 1 is a driven shaft having pulleys 2 and 3 of different diameters mounted thereon, the larger of which, 2, is belted to a pulley 4 on a shaft 5, mounted in a bracket 6, while the smaller, 3, is belted to a pulley 7 on a shaft 8, mounted in a stationary bracket 9. Bracket 6 carries a funnel 10, into which the pulp-water is poured, said pulp-water being delivered from said funnel onto a winged disk 11, carried by the lower end of the rotating shaft 5. The pulp-water is thrown off by centrifugal force from this disk in the form of a spray.

12 is a bracket carrying a shell 13, around the lower inner edge of which shell is arranged a conduit 14 for delivering the waste to a conducting-off spout 15.

16 is a spider-frame on the upper end of shaft 8, which frame carries bearings in horizontal alinement with the disk 11. In these bearings are mounted molds 17, the bottoms and side walls of which are perforated, the open side of the mold (in the form of an open-ended cylinder) being presented toward the feeding device. The mold is carried by a shaft mounted in a bearing in the spider-frame, and on the opposite (outer) end of this shaft is arranged a roller 18, which rides upon a track-ring 19, carried by the casing 13. To insure roller 18 engaging the track-ring and causing its carried mold to rotate during the operation of the device, I arrange a companion roller 20 in the spider-frame for each roller 18 and provide an upper track-ring 21 for engaging the rollers 20, said upper track-ring being also supported by the casing 13.

In operation removable pieces of gauze 22 are preferably introduced in the molds to preserve a smooth outer surface on the finished article and to enable it to be easily removed from the mold. Pulp-water being delivered upon the rotating disk 11 will be thrown outwardly by centrifugal force in the form of a spray. The frame 16 causes the molds to travel around the feeding device, during which the rollers 18 impart rotation to said molds, so as to bring the entire inner surface of the mold in the path of the spray. Upon striking the face of the mold the fibers of the pulp are caught, and the water by centrifugal action is forced out. The fibers are separately deposited and impacted and are capable of being influenced so far as their position in the mold

is concerned by the forces acting upon them. First, they are forcibly projected by the feeding device and lie in various directions in transit; second, upon striking the side wall of the mold centrifugal action due to the rotatation of the frame 16 tends to straighten the fibers and cause them to lie in a direction from the open to the closed end of the mold, and, third, the rotation of the mold occasioned by roller 18 sets up a force acting at an angle to the second force above mentioned, and the influence of this third force is to cause the fibers to lie in a circumferential direction. The resultant position of the fibers is determined by the resultant value of these forces so combined, which value can be changed or modified to suit conditions or effects desired by changing the relative speeds, first, of the disk 11; second, of the frame 16; third, of the mold 17. With relation to the action of the above-mentioned forces on the fibers deposited upon the bottom of the mold the first (projectile) force tends to lay the fibers flat irrespective of direction. The second force is compactive, and the third causes the fibers to lie in spiral lines. All of these forces act simultaneously, and in some positions assumed by the fibers the third force is neutralized; but many fibers are so received as to be influenced thereby, as the finished article shows fibers chiefly spirally disposed in the bottom wall and chiefly helically disposed in the side walls.

If desired, after the required thickness of pulp has been deposited in the mold hydraulic or other suitable cement or hardening substance may be introduced for the purpose of providing a lining which is practically impervious to moisture. This cement may be introduced with the fibers in small quantities at first, and by gradually increasing the quantity of cement and decreasing the quantity of fibers a blend will be effected which is very desirable, the final facing being pure cement, which enables the surface to be finished by a die. Of course the finishing operation would occur before the cement is set.

An important advantage obtained by the use of my improved method lies in the fact that heretofore in the manufacture of this kind of articles they have been usually shaped in forming dies which have comparatively a limited scope of compressing action, so that a blank bucket as ordinarily made has a density of between forty and fifty grains per cubic inch, which is compacted in the die to from eighty to one hundred grains per cubic inch by reducing the bulk approximately one-half. By the use of my improvement the blank as originally made will have a density of from eighty to one hundred grains per cubic inch, and then by the use of the same dies, as above described, the blank may be given a density of from one hundred and sixty to two hundred grains per cubic inch, a result impossible of attainment by former methods without resorting to the use of a multiplicity of dies and operations.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. The herein-described method of forming hollow pulp articles, the same consisting in spraying pulp-water into a mold rotating about an axis approximately coincident with the direction of movement of the spray; substantially as described.

2. The herein-described method of forming hollow pulp articles, the same consisting in spraying pulp-water into a mold traveling at an angle to the direction of movement of the spray; substantially as described.

3. The herein-described method of forming hollow pulp articles, the same consisting in spraying pulp-water into a mold traveling at an angle to the direction of movement of the spray and rotating about an axis approximately coincident with the direction of movement of the spray; substantially as described.

4. The herein-described method of forming hollow pulp articles having a bottom wall or flange integral with the side wall, the same consisting in spraying the pulp-water into the mold so as to cause the fibers composing the bottom to lie in spiral lines; substantially as described.

5. The herein-described method of forming hollow pulp articles having a bottom wall or flange integral with the side walls, the same consisting in spraying the pulp-water, and in so moving the mold as to cause the fibers composing the side walls to lie helically disposed, and the fibers composing the bottom to be spirally disposed; substantially as described.

6. The herein-described method of forming hollow pulp articles, the same consisting in subjecting the pulp-water to centrifugal force and projecting the same in the form of a spray, moving the mold in a concentric path around the point from which the spray emanates, and in rotating the mold in its travel; substantially as described.

7. The herein-described method of forming hollow pulp articles which consists in first spraying pulp-water into a mold and adding a liquid self-hardening cement; substantially as described.

8. The herein-described method of making pulp articles, the same consisting in spraying the pulp-water into a mold to form a facing, and then adding liquid self-hardening cement in gradually increasing quantities; substantially as described.

9. The herein-described method of making pulp articles, the same consisting in spraying the pulp-water into a mold to form a facing, then adding liquid self-hardening cement in gradually-increasing quantities, and in reduc-

ing the quantity of pulp-water as the quantity of liquid cement is increasing; substantially as described.

10. The herein-described method of making pulp articles which consists in first spraying pulp fibers into a mold, and then depositing a facing of self-hardening liquid cement thereon; substantially as described.

11. The herein-described method of making pulp articles which consists in first spraying pulp-water into a mold to form a facing composed of fibers, then spraying liquid self-hardening cement with the pulp-water and gradually increasing the quantity of cement and simultaneously decreasing the quantity of pulp-water so as to blend the pulp fibers with the cement, and finally finishing the article by shutting off the pulp-water and spraying only the liquid cement; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 6th day of January, 1904.

JULIAN H. RIVERS.

Witnesses:
F. R. CORNWALL,
GEORGE BAKEWELL.