H. P. HARBRECHT.

PULP MOLDING APPARATUS.

APPLICATION FILED JULY 1, 1919.

1,377,342.

Patented May 10, 1921.

5 SHEETS—SHEET 1.

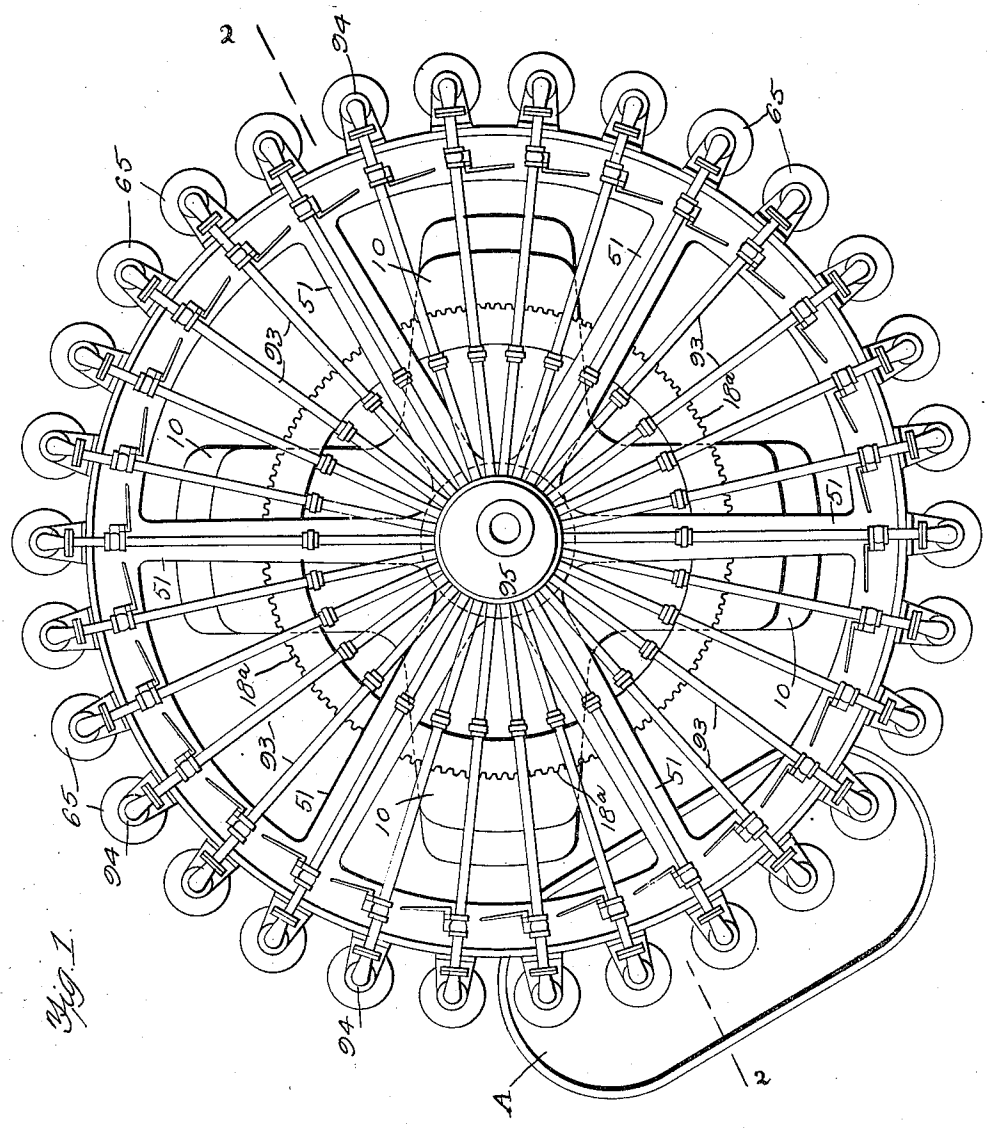


Fig. 1.

Inventor
Henry P. Harbrecht,

By C. L. Parker. Attorney

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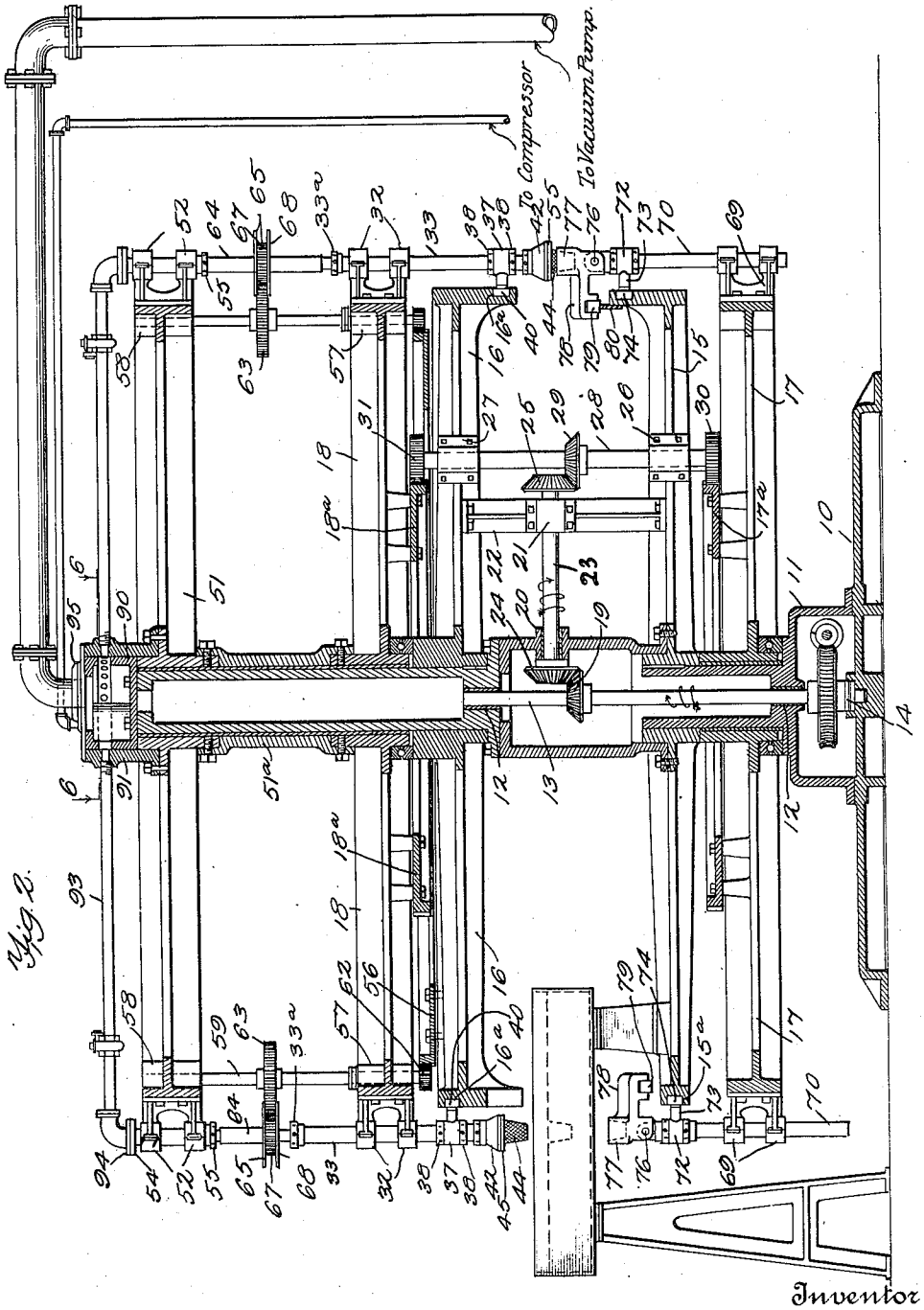


Fig. 2.

Inventor
Henry P. Harbrecht,

By C. L. Parker. Attorney

H. P. HARBRECHT.

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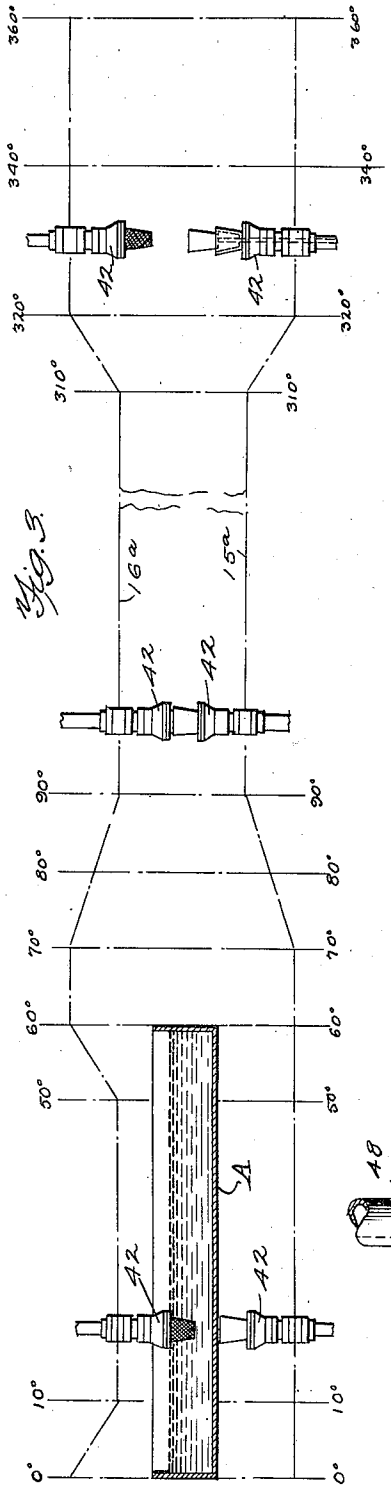


Fig. 3.

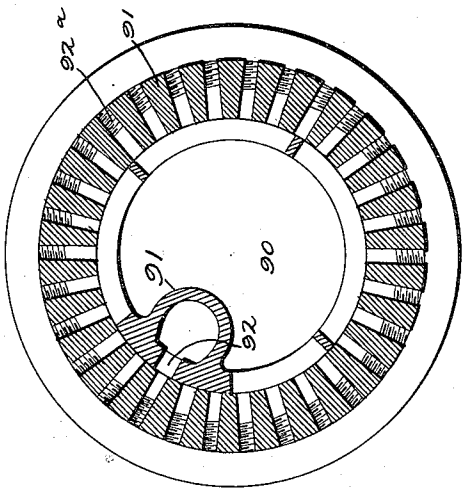


Fig. 6.

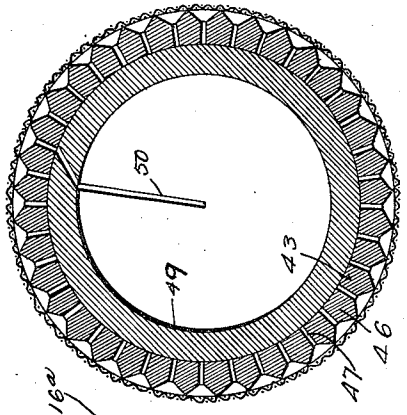


Fig. 5.

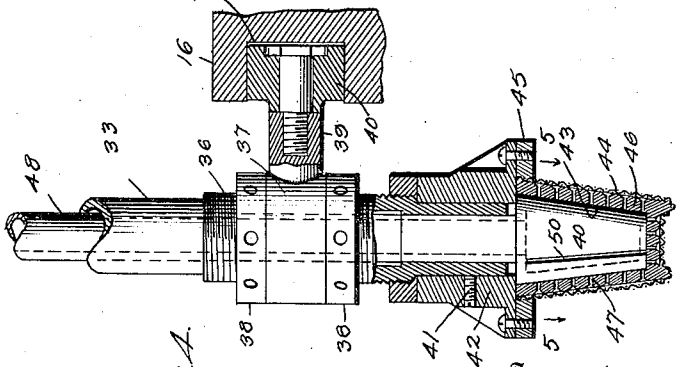


Fig. 4.

Inventor

Henry P. Harbrecht

By C. L. Parker, Attorney

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5 SHEETS—SHEET 4.

Fig. 9.

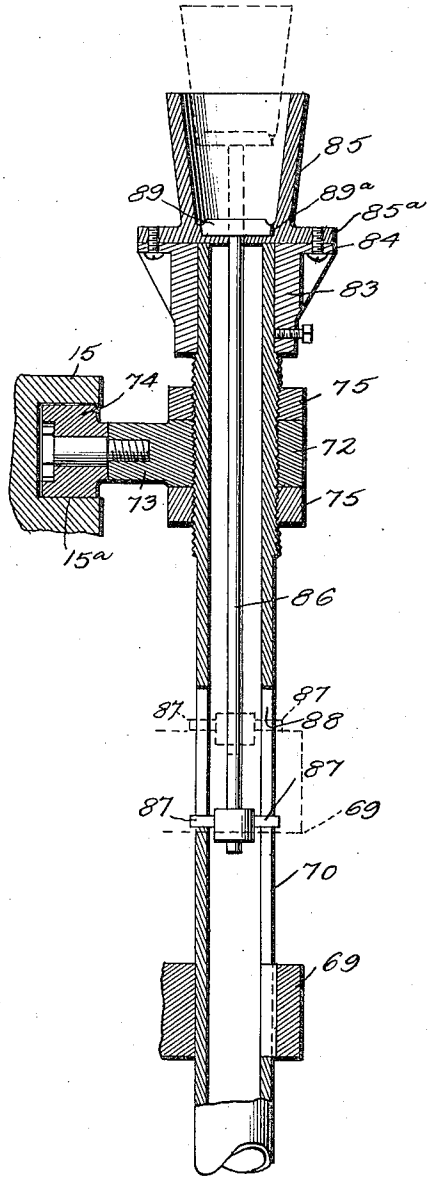


Fig. 7.

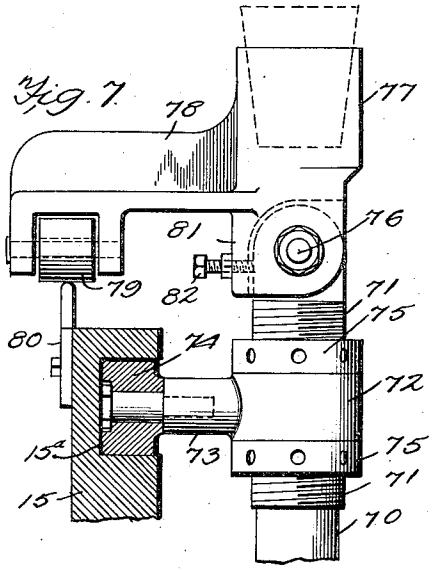
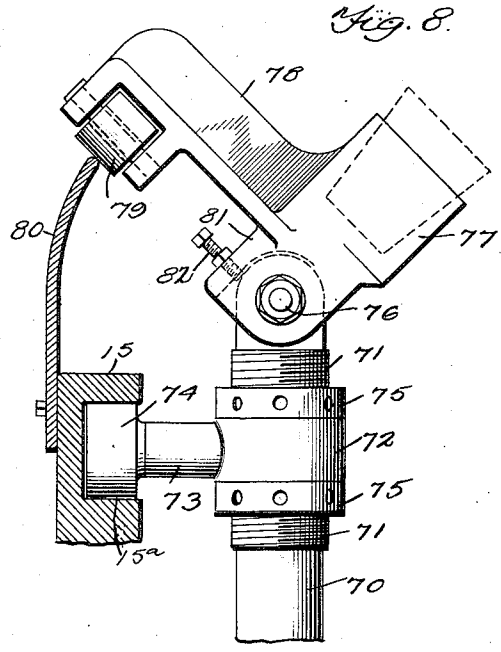


Fig. 8.



Inventor

Henry P. Harbrecht,

By C. L. Parker. Attorney

H. P. HARBRECHT.

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Fig. 10.

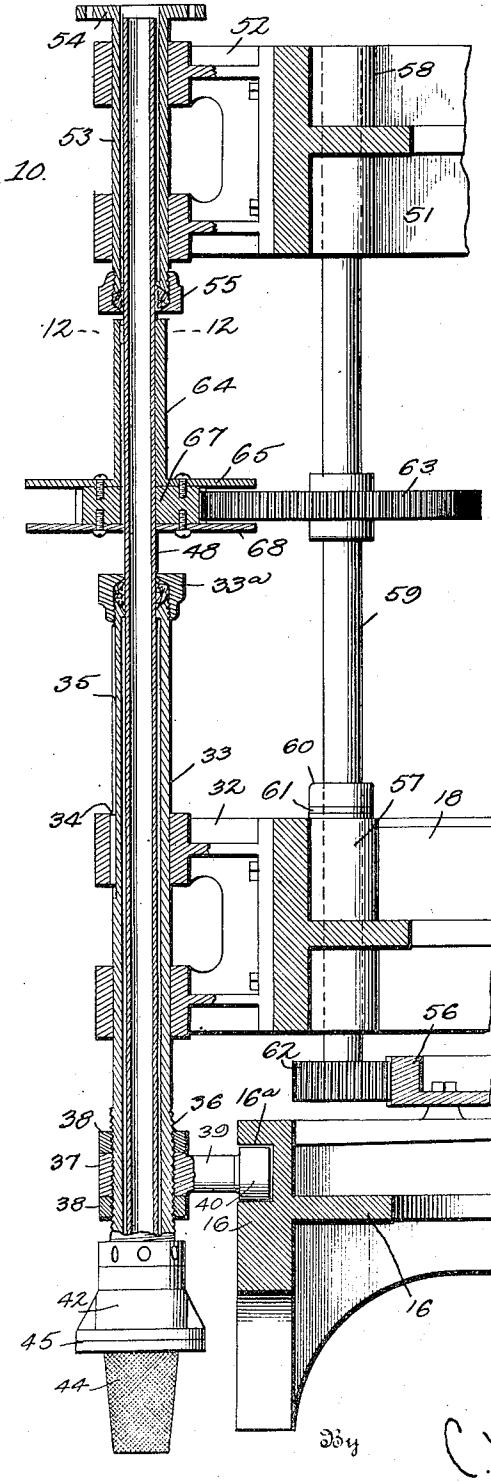


Fig. 11.

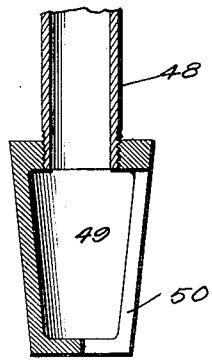
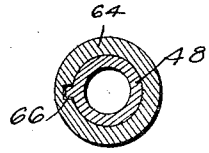


Fig. 12.



Inventor
Henry P. Harbrecht,

By C. L. Parker. Attorney

UNITED STATES PATENT OFFICE.

HENRY P. HARBRECHT, OF SANDUSKY, OHIO.

PULP-MOLDING APPARATUS.

1,377,342. Specification of Letters Patent. Patented May 10, 1921.

Application filed July 1, 1919. Serial No. 307,891.

To all whom it may concern:

Be it known that I, HENRY P. HARBRECHT, a citizen of the United States, residing at Sandusky, in the county of Erie and State of Ohio, have invented certain new and useful Improvements in Pulp-Molding Apparatus, of which the following is a specification.

This invention relates to new and useful improvements in pulp molding apparatus, and has for its object the provision of an apparatus with which the manufacture of paper or other articles formed directly from a pulp solution may be accomplished.

In my apparatus a mold having the shape of the article to be formed is passed through a vat or tank containing a pulp solution which by means of suction within the mold is attracted or drawn thereto, the water or fluid forming the vehicle for the pulp passing through a system of orifices and leaving the fibers to adhere to the exterior of the mold, the mold then being lifted out of the solution and again subjected to suction to remove all surplus liquid. Thence the product is removed from the mold and subjected to a drying process, after which it is calendered, trimmed and finished in any way desired.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same:

Figure 1 is a plan view of my device;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic view, showing the operation of the mold sections by the cam tracks;

Fig. 4 is an enlarged detail view, partially in section of one of the mold sections;

Fig. 5 is an enlarged section on line 5—5 of Fig. 4;

Fig. 6 is an enlarged section of the valve mechanism;

Fig. 7 is an enlarged detail view, showing the lower mold section;

Fig. 8 is a similar view, showing the mold in tilted position for the removal of its contents;

Fig. 9 is a sectional view, showing an alternate form of mold device;

Fig. 10 is a sectional view, showing the upper mold section and its operating mechanism;

Fig. 11 is an enlarged section, showing the inner member of the mold; and

Fig. 12 is a enlarged section, on the line 12—12 of Fig. 10.

Referring now more particularly to the drawings, the numeral 10 indicates a base upon which is mounted a vertical tubular standard 11. Mounted in suitable journals 12 formed in the tubular standard 11 is a vertical shaft 13, the lower end of the shaft being supported by a thrust bearing 14 mounted upon the base 10.

Secured to the tubular standard 11 are cams 15 and 16, the cam 15 hereafter being referred to as the lower cam and the cam 16 as the upper cam. Arranged below the lower cam and rotatably mounted upon the tubular standard 11 is a lower rotatable support 17 having secured to its upper surface a rim gear 17^a. Mounted above the upper cam is a similar rotatable support 18 having on its under surface a rim gear 18^a.

Mounted upon the shaft 13 is a miter gear 19. A shaft 23 is rotatably mounted in a journal 20 formed in the tubular standard 11 and a journal 21 formed in or secured to a bracket 22 secured to the cams 15 and 16. The inner end of the shaft 23 is provided with a miter gear 24, meshing with the miter gear 19 upon the shaft 13. The outer end of the shaft 23 is provided with a miter gear 25.

Mounted in journals 26, 27 formed in or secured to the upper and lower cam members is a shaft 28 having thereon a miter gear 29 meshing with the miter gear 25 upon the shaft 23. The lower end of the shaft 28 is provided with a pinion 30 meshing with the rim gear 17^a secured to the lower rotatable support and the upper end of the shaft is provided with a pinion 31 meshing with the rim gear 18^a on the upper rotatable support. It will be seen that if the shaft 13 is rotated the supports 17 and 18 are rotated synchronously.

Secured to the upper rotatable support 18 are a plurality of brackets 32, in which are slidably mounted sleeves 33, rotation of the sleeves 33 being prevented by means of a key 34 carried by the supports 32 engaging in the slot 35 formed in the sleeve. It will

be seen that the sleeves 33 are capable of vertical reciprocation but may not be rotated.

Adjacent their lower ends the sleeves 33 are provided with screw threaded portions 36 upon which are mounted the members 37. Each of the members 37 is held in position by collars 38 provided with screw threads engaging the threaded portion of the sleeve. The member 37 is provided with an extension 39 having rotatably mounted thereon a roller 40 which engages in a groove 16ª formed in the peripheral base of the cam 16.

Mounted upon the lower end of each of the sleeves 33 and secured thereto by means of set screws 41 are form holders 42. These form holders support a foraminous mold 43 which comprises a shroud 44 formed of fine mesh wire and an inner shell 46. The shroud is provided at its upper end with a ring 45 soldered or otherwise secured thereto, and this ring is secured to the form holder 42 by means of screws, bolts or the like. The shell 46 is provided with openings 47 through which water from the pulp may be drawn.

Mounted within the sleeve 33 is a tubular member 48. Secured to the lower end of the member 48 is a hollow member 49 having sliding fit with the interior of the shell 46. The tubular member 48 and the member 49 are adapted for rotation. The member 49 is provided with a slot 50 extending, as shown (see Fig. 11), from the top to the bottom, and being continued through the bottom radially to a point near the center of the member. These slots are cut obliquely in the face of the member, the direction of obliquity being opposed to the direction of rotation. Mounted upon the upper end of the sleeve 33 and surrounding the tubular member 48 is a packing gland 33ª, the purpose of which will hereinafter appear.

Mounted above the upper rotatable support 18 and connected thereto by means of a sleeve 51ª surrounding the tubular standard is an upper auxiliary rotatable support 51 provided upon its periphery with brackets 52 similar in construction to the brackets 32 mounted upon the rotatable support 51. Secured within these brackets is a sleeve 53 provided on its upper end with a flange 54 for a purpose hereinafter to appear, the lower end of the sleeve receiving the upper end of the tubular member 48 and being provided with a packing gland 55. Secured to the upper cam plate 16 is a rim gear 56. Rotatably mounted in journals 57 and 58 formed in the rotatable supports 18 and 51 respectively is a shaft 59 which is supported by means of a collar 60 secured to the shaft and resting upon a thrust bearing 61 mounted in the upper end of the bearing 57. The shaft 59 is rotated by means of a pinion 62 arranged on the end thereof, and meshing with rim gear 56. Secured to the shaft 59 is a gear 63. Mounted upon the tubular member 48 is a sleeve 64 provided with a flange 65, the sleeve 64 being feathered to the tubular member by means of a key 66. Secured to the flange 65 by means of screws or the like, is a pinion 67 meshing with a gear 63. This gear has secured to its lower face in any suitable manner a plate 68. It will be noted that the flange 65 and plate 68 extend over the gear 63 in such a manner as to prevent longitudinal displacement of the pinion with regard to the gear.

It will be seen that when the supports are rotated, the rotation is imparted to the tubular member 48 and the member 49 through the medium of shaft 59, gear 63, pinion 67 and sleeve 64.

Mounted upon the lower rotatable support 17 are brackets 69 similar in number, arrangement and construction to the brackets 32 upon the upper rotatable support 18. Mounted for vertical reciprocation within these brackets is a tubular member 70, rotation of the member 70 being prevented by means of a key operating in a slot formed therein. The member 70 is provided adjacent its upper end with a screw threaded portion 71 upon which is mounted an element 72 having an extension 73 provided with a roller 74 engaging in a groove 15ª formed in the cam 15, longitudinal displacement of the element 72 being prevented by adjusting collars 75. Pivotally secured to the upper end of the member 70, as at 76, are lower mold sections 77. These mold sections have a rearward extension 78 provided with a roller 79 adapted to engage a rim 80 bolted or otherwise secured to the cam 15. As clearly shown in Fig. 8, this rim 80 has a raised portion which tilts the mold so that its contents may be easily reached for removal. The mold member 77 is provided with a downwardly extending portion 81 having therein an adjusting screw 82 adapted to engage the upper end of the member 70, whereby the position of the mold may be adjusted.

In the alternate form shown in Fig. 9, the member 70 is provided upon its upper end with a sleeve 83 secured thereto by a set screw or the like. This sleeve 83 is provided with a flange 84 which receives the flange 85ª of the mold member 85. Slidably mounted in the bottom of the mold 85 and extending downwardly from the tubular member is a shaft 86 provided on its lower end with cross arms 87, the ends of which project through slots 88 formed in the member 70. The upper end of the shaft is provided with a head 89, forming a false bottom for the mold, which is normally seated in the recess 89ª formed in the bottom of the mold. It will readily be seen that when the mold member is lowered, the ends of the cross arms 87 will contact with the

bracket 69 raising the shaft 86 and its head 89 and forcing the article from the mold.

Secured to the upper end of the tubular standard 11 is a chamber 90. Secured to the upper auxiliary support 51 is a valve structure 91 provided with ports 92, the outer ends of these ports communicating with pipes 93 having a flange adapted to be secured to the flange 54 of the sleeve. The upper end of the chamber 90 is closed by a plate 95 having a port which communicates with the chamber and with the pipe connected to a vacuum pump and a second port which communicates with the auxiliary chamber 91 and with a pipe connected to a vacuum pump and a second part which communicates with the auxiliary chamber 91 and with a pipe connected to an air compressor.

The operation of my device is as follows:

Assuming the machine as starting at a point 0° in the diagram shown in Fig. 3 and moving in clockwise direction, as the forms advance through the first ten degrees the upper section of the mold drops to the lower position, thus dropping the mold into the pulp solution in the tank. During this period the tubular member 48 is in connection with the suction chamber 90 through its pipe 93 and the member 49 secured to the tubular member is rotated as previously described. The pulp is picked up by the suction thus induced. The mold is carried in this position over approximately 40° of its travel or to a point 50° in the diagram, then being lifted to its original position through the next 10°. At a point of 70° the receiving pocket or lower mold section is raised by its cam and the upper mold section moves downwardly to meet it. The two sections joining at a point 90 in the diagram. These mold members may be adjusted so that they engage loosely or sufficiently tight to squeeze the walls of fiber that adhere to the upper mold section. This squeezing operation possibly is desirable as it assists in extracting the surplus water while suction is in progress. It is understood that during this period, the tubular member 48 is still in connection with the suction chamber 90. At a desired point, say 310° from the starting point, the molds are separated. As this separation takes place, a light blast of air from the auxiliary chamber 91, which is now in communication with the tubular member 48, loosens the formed article from the wall of the upper mold section and causes it to drop into the receiving pot. Between points 320 and 340 of the diagram, the pocket is tilted outwardly if the type of lower mold section is that shown in Figs. 7 and 8, or the article is ejected from the mold if the type shown in Fig. 9 is used.

It is to be understood that the form of my invention herewith shown and described is to be taken as the preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In a device of the type described, a support, a mold section embodying a revolving suction element carried by said support, means for rotating said support, means actuated by the rotation of said support for revolving said suction element, and means actuated by the rotation of said support for reciprocating said mold section.

2. In a device of the type described, a rotatable support, a plurality of vertically reciprocable foraminous molds mounted thereon, hollow rotatable members mounted within said molds and provided with a slot, means for rotating said members, means for inducing suction therein, a vat, and means for reciprocating said molds to insert the molds into and withdraw the molds from said vat.

3. In a device of the type described, a rotatable support, a cam having a groove therein, a plurality of vertically reciprocable molds embodying an internal rotatable suction element mounted on said rotatable support and having an extension provided with a roller engaging in the groove in said cam, means for rotating said support, a vat arranged in the path of said molds, said cam vertically reciprocating said molds to insert them into and withdraw them from said vat, and means actuated by the rotation of said support for rotating said suction elements.

4. In a device of the type described, a rotatable support, a plurality of vertically reciprocable molds mounted thereon, each of said molds embodying an internal rotatable element, a sleeve having an extension thereon provided with a roller, a stationary cam having a groove adapted to receive said rollers, means for rotating said support, means operated by the rotation of said support for rotating said rotatable elements and means for inducing suction in said rotatable elements.

5. In a device of the type described, a rotatable support, a cam having a groove therein, a plurality of vertically reciprocable molds mounted on said rotatable supports and having an extension provided with a roller engaging in the groove in said cam, hollow rotatable members mounted within said molds, means for rotating said members, and means for inducing suction therein.

6. In a device of the type described, a rotatable support, a cam having a groove therein, a plurality of vertically reciprocable molds mounted on said rotatable sup-

port, and having an extension provided with a roller engaging in the groove in said cam, hollow rotatable members mounted within said molds, means for rotating said support, means operated by the rotation of said support for rotating said members, and means for inducing suction in said members.

7. In a device of the type described, a rotatable support, a cam having a groove therein, a plurality of vertically reciprocable sleeves having molds secured thereto mounted on said rotatable support and having an extension provided with a roller engaging in the groove in said cam, means for rotating said support, hollow rotatable members mounted within said molds and having a sliding fit with the interior thereof, said members being provided in their side and bottom wall with an angular slot, means operated by the rotation of said support for rotating said member, and means for inducing suction in said members.

8. In a device of the type described, a mold comprising inner and outer mold sections, a hollow rotatable member mounted within the inner mold section and provided in the side wall with an angularly disposed slot, means for rotating said member, means for inducing suction therein, means for inserting said inner mold section into and withdrawing the inner mold section from a vat containing a pulp solution, means for bringing the mold sections into engaged position, and means for separating said molds.

9. In a device of the type described, a mold comprising inner and outer mold sections, a hollow rotatable member mounted within the inner mold and fitting the interior wall thereof, said member being provided in its side and bottom wall with an angularly disposed slot, means for rotating said member, means for inducing suction therein, means for inserting said upper mold section into and withdrawing the upper section from a vat containing a pulp solution, means for bringing the mold sections into engaged position, means for separating said mold sections, and means for introducing a blast of air through said member as the molds are separated.

10. In a device of the type described, upper and lower rotatable supports, a mold comprising upper and lower mold sections, said upper mold section being carried by said upper rotatable support and said lower mold member being carried by said lower rotatable support, means for vertically reciprocating said mold sections with respect to said supports, a hollow rotatable member mounted within the upper mold section and provided in its side wall with an angularly disposed slot, means for inducing suction in said rotatable member, means for rotating said supports, and means operated by the rotation of said upper rotatable support for rotating said member.

11. In a device of the type described, a rotatable support, a plurality of reciprocable molds mounted thereon, each of said molds embodying an internal rotatable element and a sleeve having an extension thereon provided with a roller, a stationary cam having a groove therein adapted to receive said rollers, means for rotating said vertical support, a source of suction, a source of pressure, means operated by the rotation of said support for rotating said rotatable elements and means operated by the rotation of said support for alternately connecting said rotatable elements with said sources of suction and pressure.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY P. HARBRECHT.

Witnesses:
MARGARET NOLAN,
IONA SCHLESSMAN.