

Feb. 16, 1932.

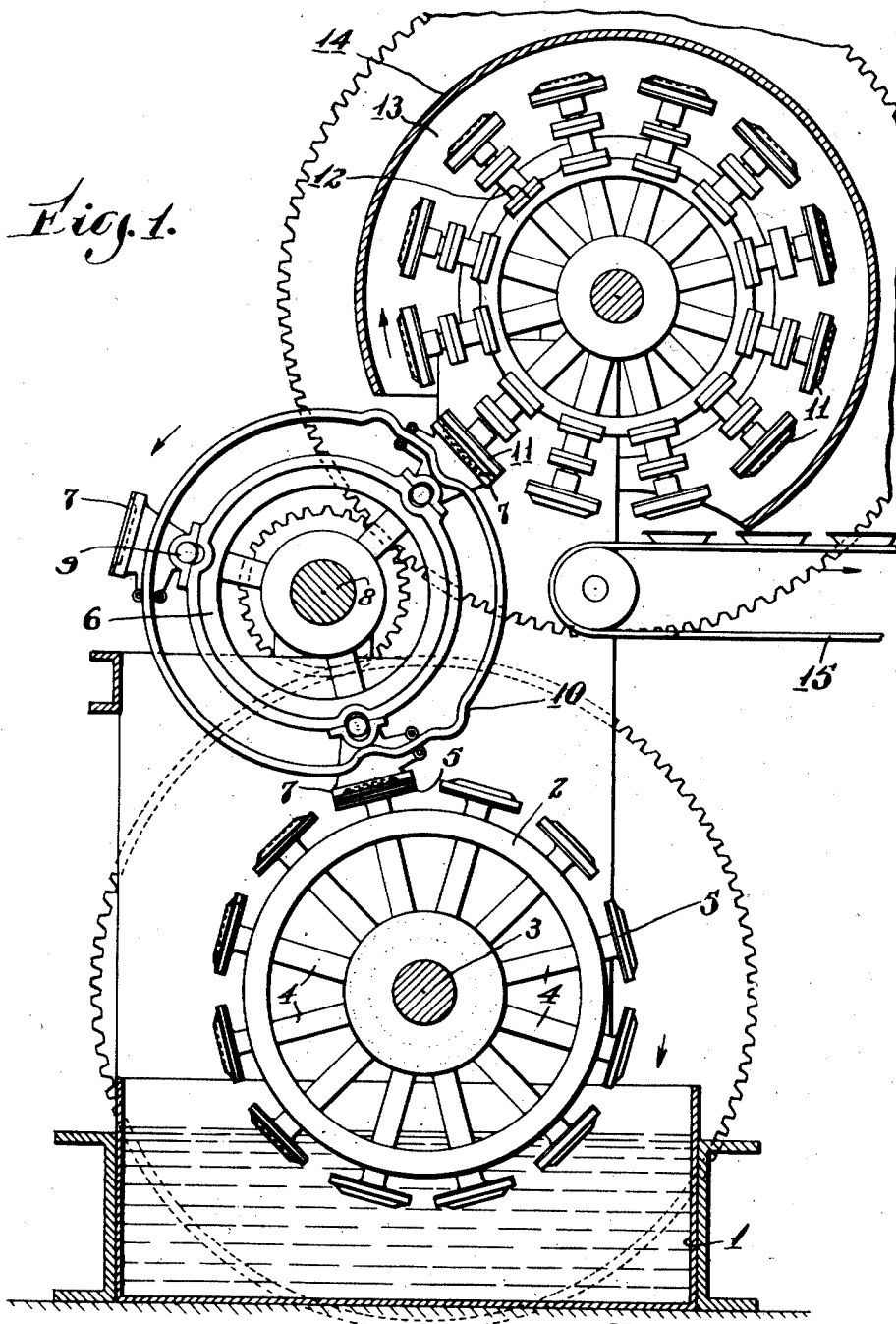
M. P. CHAPLIN

1,845,830

ART OF PRODUCING MOLDED ARTICLES

Filed Nov. 2, 1928

4 Sheets-Sheet 1



Inventor
Merle P. Chaplin
by *W. S. Sear*
Attorney

Feb. 16, 1932.

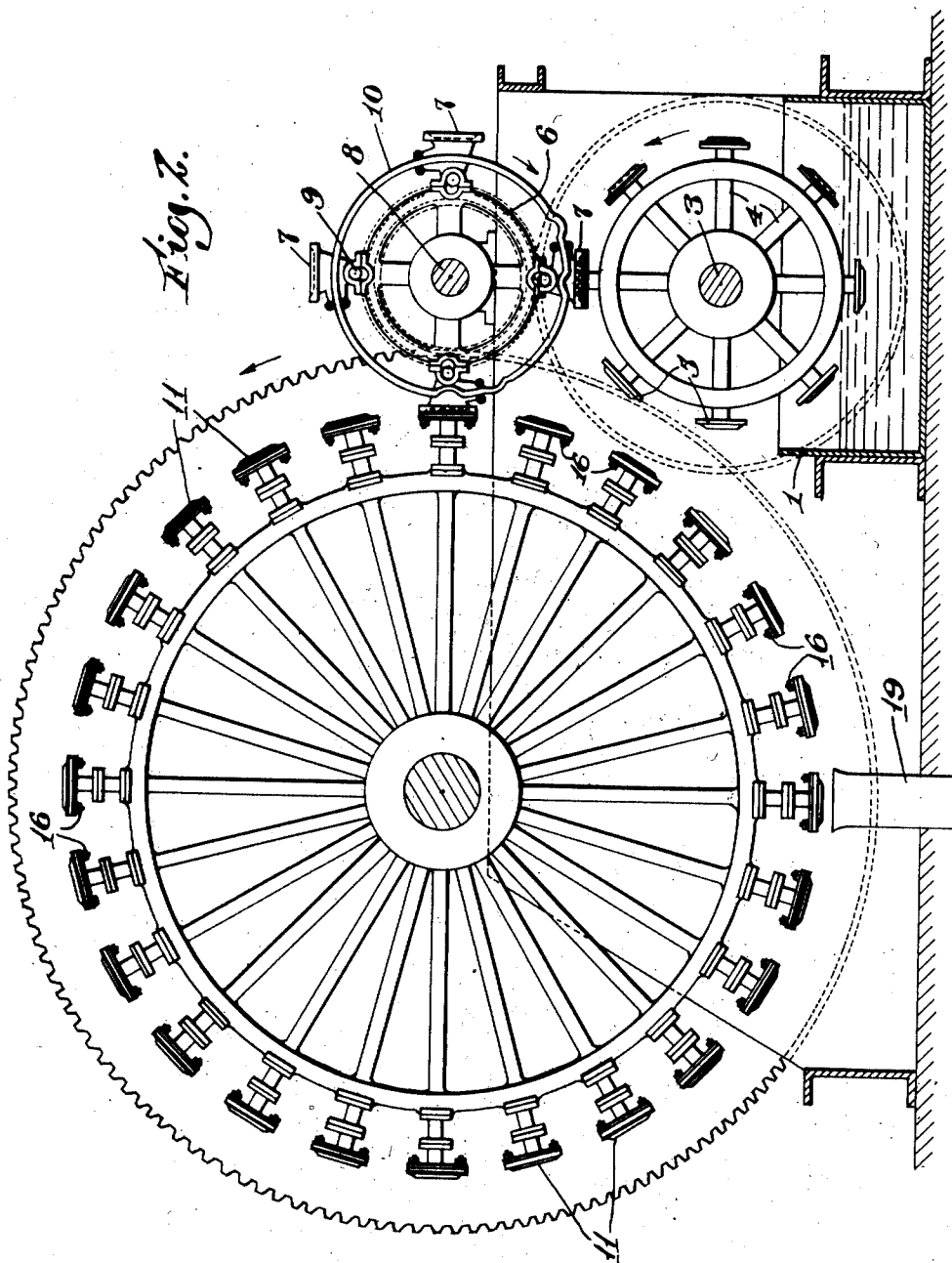
M. P. CHAPLIN

1,845,830

ART OF PRODUCING MOLDED ARTICLES

Filed Nov. 2, 1928

4 Sheets-Sheet 2



Inventor
Merle P. Chaplin
by *Deis Spaulf.*
Attorney

Feb. 16, 1932.

M. P. CHAPLIN

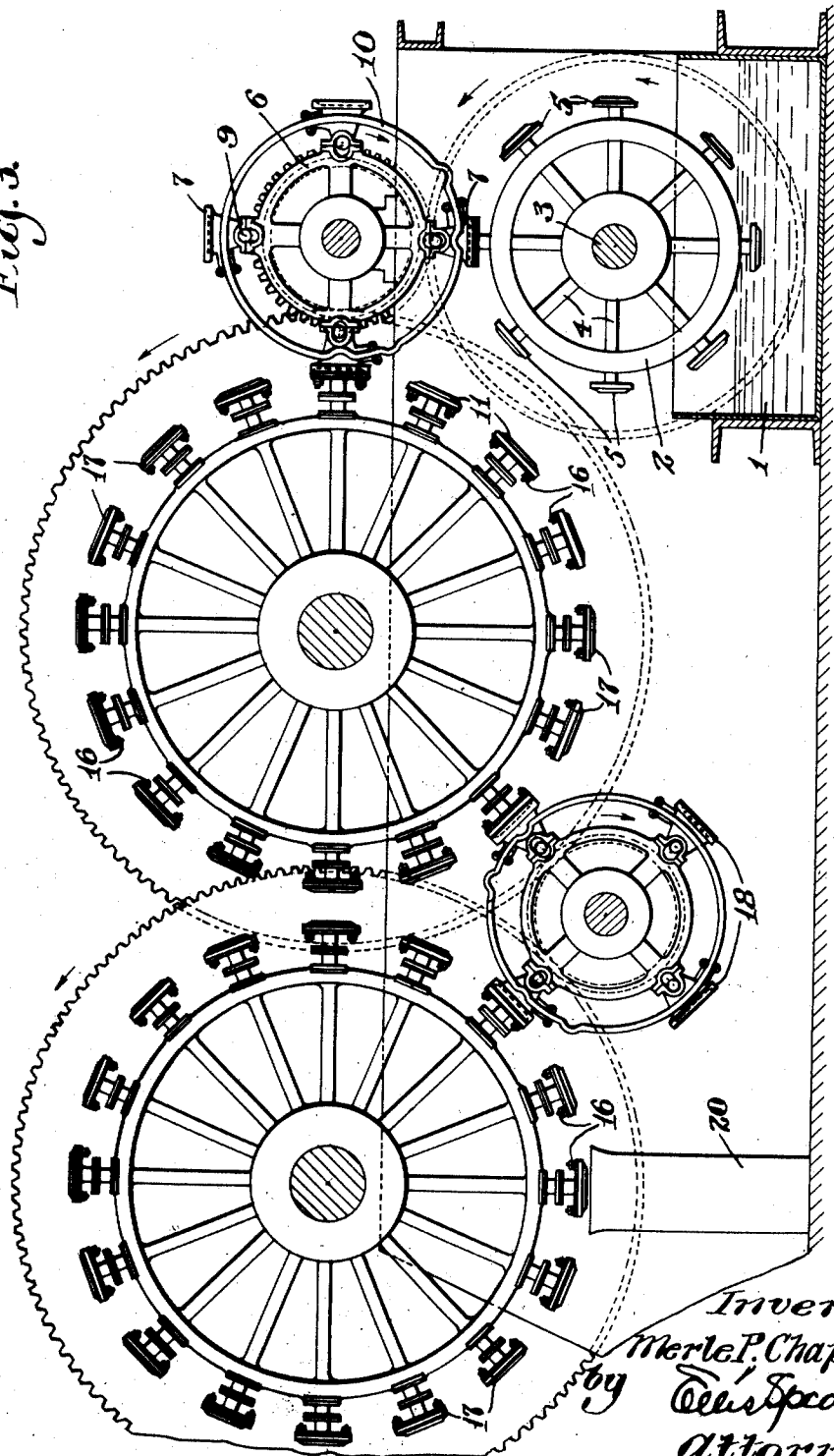
1,845,830

ART OF PRODUCING MOLDED ARTICLES

Filed Nov. 2, 1928

4 Sheets-Sheet 3

Fig. 3.



Inventor
Merle P. Chaplin
by *Deus Spaul*
Attorney

Feb. 16, 1932.

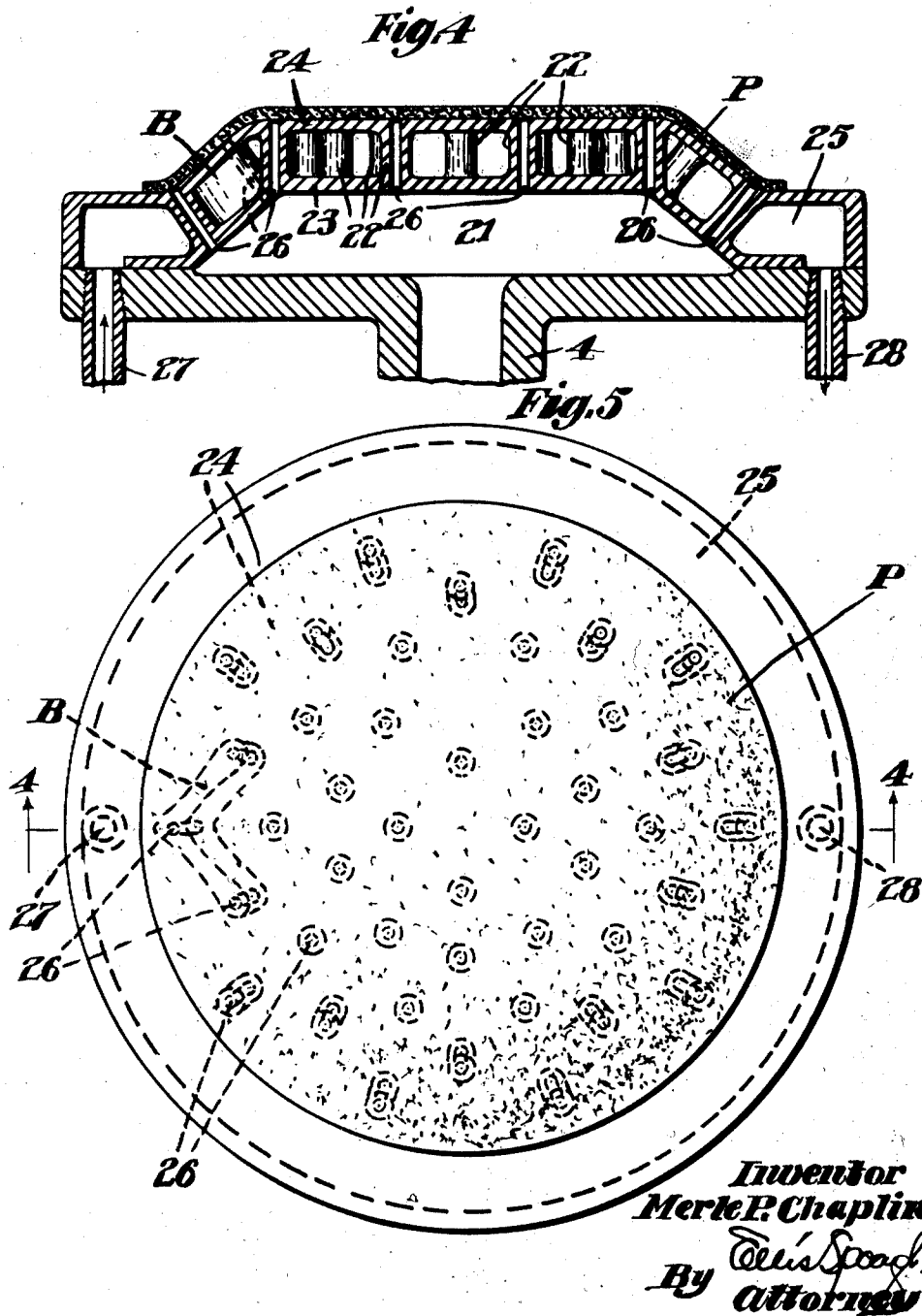
M. P. CHAPLIN

1,845,830

ART OF PRODUCING MOLDED ARTICLES

Filed Nov. 2, 1928

4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

MERLE P. CHAPLIN, OF WATERTVILLE, MAINE, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO FIDELITY TRUST COMPANY, TRUSTEE, OF PORTLAND, MAINE, A CORPORATION
OF MAINE

ART OF PRODUCING MOLDED ARTICLES

Application filed November 2, 1928. Serial No. 316,643.

The subject matter herein involves certain methods and apparatus for producing molded and dried pulp articles by which the drying is effected as part of a continuous operation.

In general it may be said to involve the introduction of a drying phase into what has been heretofore considered as a transfer phase so that in that phase both transfer and drying are accomplished.

To such ends I have devised certain apparatus capable of methodical operation in accordance with my invention. Such apparatus follows as closely as practicable standard die molding methods in so far as the actual molding of the articles is concerned, but departs sharply therefrom in so far as drying of the articles on the machine and as a part of a continuous operation is concerned.

For the purposes of this application I shall illustrate my invention in its adaptation to a pulp molding machine of the type wherein the articles are die-molded on a series of rotating forming dies, from which they are successively transferred to apparatus in accordance with my invention for drying as a continuous part of the forming operation. It will be understood, however, that such showing is for illustrative purposes only and is in no way limiting and that the principles of my invention may be applied to any type of molding machine wherein the articles are die-molded from liquid pulp and subsequently dried.

In the drawings:—

Fig. 1 is an end elevation, partly in section, of a machine of the type indicated equipped in accordance with one form of my invention.

Figs. 2 and 3 show modifications, and

Figs. 4 and 5 show an alternative construction of heated die unit useful with any of the forms of apparatus shown in Figs. 1, 2 and 3.

In all of the several forms of my invention disclosed herein the molded articles are die molded from liquid pulp. Such pulp may be deposited on the forming dies in any desired manner, as by rotating the forming dies through a vat containing the pulp solution or by spraying the pulp under pressure onto the dies. As shown herein, however, the suction method of pulp deposition is employed, the

numeral 1 indicating a tank or vat containing pulp solution of the desired consistency and the numeral 2 rotating forming and collecting die carrier operating through a portion of its rotation within said tank, being revolved from any suitable power source about the horizontal axis 3 and being provided with a radial series of hollow die carrying arms 4 terminating at the periphery of the carrier in perforated forming and collecting dies 5 of the desired shape and size.

As is usual in this type of machine, mechanism is provided whereby vacuum is created through the forming and collecting dies throughout an initial phase of their revolution together with automatic means for shutting off the vacuum and sending compressed air through the dies during a subsequent phase of their revolution, such mechanism, however, forming no part of my present invention.

Also in accordance with standard practice, I arrange adjacent the forming and collecting die carrier a pressing die carrier 6 having a radial series of pressing dies 7 disposed in orbitally intersecting relation to the forming and collecting dies. The pressing die carrier revolves about the axis 8 in properly timed relation to the revolution of the forming and collecting dies and in order to secure a proper pressing action between the individual dies of these two carriers the pressing dies are pivoted at 9 to the forming die carrier for rocking movement during their phase of contact with the forming and collecting dies. The cam for imparting such rocking motion to the presser dies is indicated at 10 in all three forms.

As with the forming and collecting dies, the pressing dies are also equipped with mechanism for alternately applying vacuum and compressed air thereto in timed relation to the operation of the forming and collecting dies.

In all three forms, the action of the pressing dies is to transfer to themselves the articles formed on the forming dies and subsequently to discharge such articles from themselves to a series of heated drying dies 11. These dies are arranged radially about a ro-

tary die carrier 12, and as with the forming and collecting dies and the pressing dies, the drying dies may also be equipped with means for alternately applying vacuum and compressed air whereby to accomplish transfer of the articles from the pressing dies to themselves and subsequently to discharge the dried articles therefrom.

Referring now to Fig. 1, I provide for drying the articles on the drying dies by the use of a drying chamber which substantially encloses said dies. Such chamber is indicated at 13 in Fig. 1 and is defined by a shroud or hood 14 disposed about the dies themselves. Any usual drying medium may be admitted into the drying chamber, as hot air or steam, and the drying dies themselves, if desired, may be heated in any desired manner as by electricity additionally to assist the drying action.

In order to prolong the time of drying travel of the articles on said drying dies the drying die carrier is not only rotated in the direction of the arrow in Fig. 1, but the die carrier itself is made considerably larger in diameter than heretofore and provided with as many closely spaced dies as can be practicably arranged thereon. This is true of the several installations, as also shown in Figs. 2 and 3.

During substantially the entire travel of the drying dies through the drying chamber, the vacuum is on so as to draw the hot dry air through the articles themselves, thus increasing the drying effect as well as shortening the drying time. When the dies approach the farther end of the drying chamber, the vacuum is automatically shut off and compressed air sent through the dies to effect the discharge of the now substantially dried articles therefrom. Such articles may discharge onto a conveyor 15 disposed therebeneath and be carried by such belt either to the point where they are to be stacked, counted, and packaged, or where further drying is desired, such conveyor may be carried through any usual drying tunnel.

In the form of my invention shown in Fig. 2, the drying heat is applied directly to the drying dies. This may be accomplished in any of a variety of ways, but for convenience of illustration, I have shown the individual dies 11 as provided with electrical connections 16, by means of which they may be electrically heated.

In the form of my invention shown in Fig. 3, I provide an additional series of heated drying dies 17 corresponding in number and arrangement to the first series of drying dies 11. The partially dried articles are transferred from the heated dies 11 to the heated dies 17 for additional drying by means of an intermediate series of presser dies 18 similar to the presser die series 7 and operating between the dies 11 and 17 to effect the trans-

fer of the partially dried articles from the first set of drying dies 11 to the second set of drying dies 17. As in the form shown in Fig. 2 both sets of drying dies may be heated in any suitable manner, but for convenience of illustration, I have shown them as electrically heated.

In both Figs. 2 and 3, as in the form shown in Fig. 1, the vacuum is maintained through the drying dies until they substantially complete their revolution at which time the vacuum is shut off and compressed air applied to eject the dried articles. In the embodiment of Fig. 2 the ejected articles may discharge from the dies 11 directly into the packaging chute 19. In the embodiment of Fig. 3, the partially dried articles on the heated drying dies 11 are transferred by the dies 18 to the second series of heated drying dies 17 and from said dies discharge into the packaging chute 20.

Although I have indicated that the drying dies may be heated by electrically, either in conjunction with the drying chamber 13 as in Fig. 1, or independently of such drying chamber, as in Figs. 2 and 3, it will be understood that this disclosure is for purposes of illustration only and that these dies may be heated by any of a variety of methods and that any of a variety of drying media may be used, as for example, steam or hot air, either under pressure or not, or any other usual heating medium, or one heating medium, as hot air or steam for example, may be used to supplement another heating medium, as electricity for example.

The dies themselves may be of any special construction, as for example that shown in Figs. 4 and 5. Referring to these figures I have indicated at 21 a chamber formed on the head of the hollow arm 4 and between that head and the die wall. The die wall itself is double, consisting of an inner wall 23 and an outer wall 24 separated by spacers 22. These spacers are apertured at 26 to provide communication from the face of the die to the chamber 21. Adjacent the intake side and opposite the intake port 27 I provide a baffle B for spreading the flow of the steam, hot air, or heated oil through the wall of the die to secure a uniform drying of the article formed on the die wall, such as the plate P. The moisture is drained through the die walls into the chamber 21 and carried off through hollow die carrying arm 4. The hot fluid medium passes from the chamber 25 through the return outlet 28. Such a die structure provides a convenient basis of utilizing any heated fluid medium for drying in place of the electrically heated dies above suggested.

Various other modifications in method and apparatus may all be restored to if within the spirit and scope of my invention as defined by the appended claims.

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

1. The method of forming and drying molded pulp articles which consists in die molding the article from liquid pulp on a forming die, in transferring the formed article to a pressing die and thence to a drying die, and in drying the article while on the drying die.

2. The method of forming and drying molded pulp articles which consists in die molding the article from liquid pulp on a forming die, in transferring the formed article to a pressing die and thence to a drying die, and in heating the drying die to dry the article while thereon.

3. The method of forming and drying molded pulp articles which consists in die molding the article from liquid pulp on a forming die, in transferring the formed article to a pressing die and thence to a drying die, and in passing the drying die through a drying chamber for a substantial portion of the travel of such die whereby to dry the same while on the drying die.

4. The method of forming and drying molded pulp articles which consists in die molding the article from liquid pulp on a forming die, in transferring such article from the forming die to a pressing die and thence to a drying die, in arranging about the drying die a drying chamber through which said die passes, in maintaining a vacuum through the drying die during its travel through said chamber whereby to draw heat through the article thereon, and in finally shutting off the vacuum and sending compressed air through the drying die to dislodge the dry and formed article thereon.

5. The method of molding pulp articles which consists in rotating a die carrier having a plurality of forming and collecting dies past a pulp deposition supply, in rotating in intercylic relation thereto a timed pressing die series, in rotating in intercylic relation to said pressing die series a timed receiving die series, and in heating the received articles while in position on said receiving die series and while in orbit.

6. The method of molding pulp articles which consists in rotating a die carrier having a plurality of forming and collecting dies past a pulp deposition supply, in rotating in intercylic relation thereto a timed pressing die series, in rotating in intercylic relation to said pressing die series a timed receiving die series, in maintaining the receiving dies at drying temperature during said orbit, and in expelling the dried articles successively therefrom at the end of the orbit phase.

7. In pulp molding apparatus, a forming die adapted to receive a pulp deposit, a pressing die cooperating therewith to press the article on the forming die and to transfer it to itself, a drying die cooperating with the

pressing die to transfer to itself the formed article, and means for heating said drying die to dry the article thereon.

8. In pulp molding apparatus, a forming die adapted to receive a pulp deposit, a pressing die cooperating therewith to press the article on the forming die and to transfer it to itself, a drying die cooperating with the pressing die to transfer to itself the formed article, means for heating said drying die partially to dry the article thereon, a second drying die, a second presser die operating between said drying dies to transfer the article from said first to said second-named drying die, and means for heating said second-named drying die further to dry the article thereon.

9. In pulp molding apparatus, a forming die adapted to receive a pulp deposit, a pressing die cooperating therewith to press the article on the forming die and to transfer it to itself, a drying die cooperating with the pressing die to transfer to itself the formed article, and a drying chamber disposed about said drying die through which the formed article is carried and within which the article is dried on said die.

10. In pulp molding apparatus having successive orbits including a forming orbit wherein the articles are formed on forming dies, a pressing orbit wherein they are pressed on the pressing dies rotating in orbitally intersecting paths to said forming dies, and a transfer orbit wherein they are transferred to transfer dies rotating in orbitally intersecting paths to said pressing dies, and means for heating the formed articles while in orbit on the transfer dies to accomplish drying thereof during such transfer.

11. In pulp molding apparatus, rotating forming dies adapted to receive successive pulp deposits, pressing dies rotating in orbitally intersecting paths thereto, and combination drying and transfer dies rotating in orbitally intersecting paths relative to the pressing dies for continuously accomplishing both transfer and drying of the formed articles in the transfer phase of the apparatus and means for heating said transfer dies while in orbit to dry the formed articles thereon.

12. Apparatus for forming and drying molded pulp articles, comprising a forming die and a pressing die rotating in orbitally intersecting paths, a drying die rotating in a path intersecting that of the pressing die, and means for heating said drying die to dry the article thereon.

13. Apparatus for forming, pressing and drying molded pulp articles, comprising a movable series of forming dies, a movable series of pressing dies cooperative therewith to press the articles formed on said forming dies and to transfer such articles onto themselves, a movable series of drying dies cooperative

with said pressing dies to transfer the formed and pressed articles onto themselves, and means for heating said drying dies to dry the formed and pressed articles thereon.

- 5 14. A suction die comprising a head, a double walled pulp receiving face carried by said head and defining therewith a drying chamber, apertured spacers between the double walls of said receiving face, the apertures
10 of said spacers providing communication with said chamber, said head having an intake port for a fluid drying medium and an outlet port for such medium, and a baffle adjacent to said port for distributing the fluid
15 drying medium uniformly throughout the drying chamber.

In testimony whereof I affix my signature.
MERLE P. CHAPLIN.

20

25

30

35

40

45

50

55

60

65