

(No Model.)

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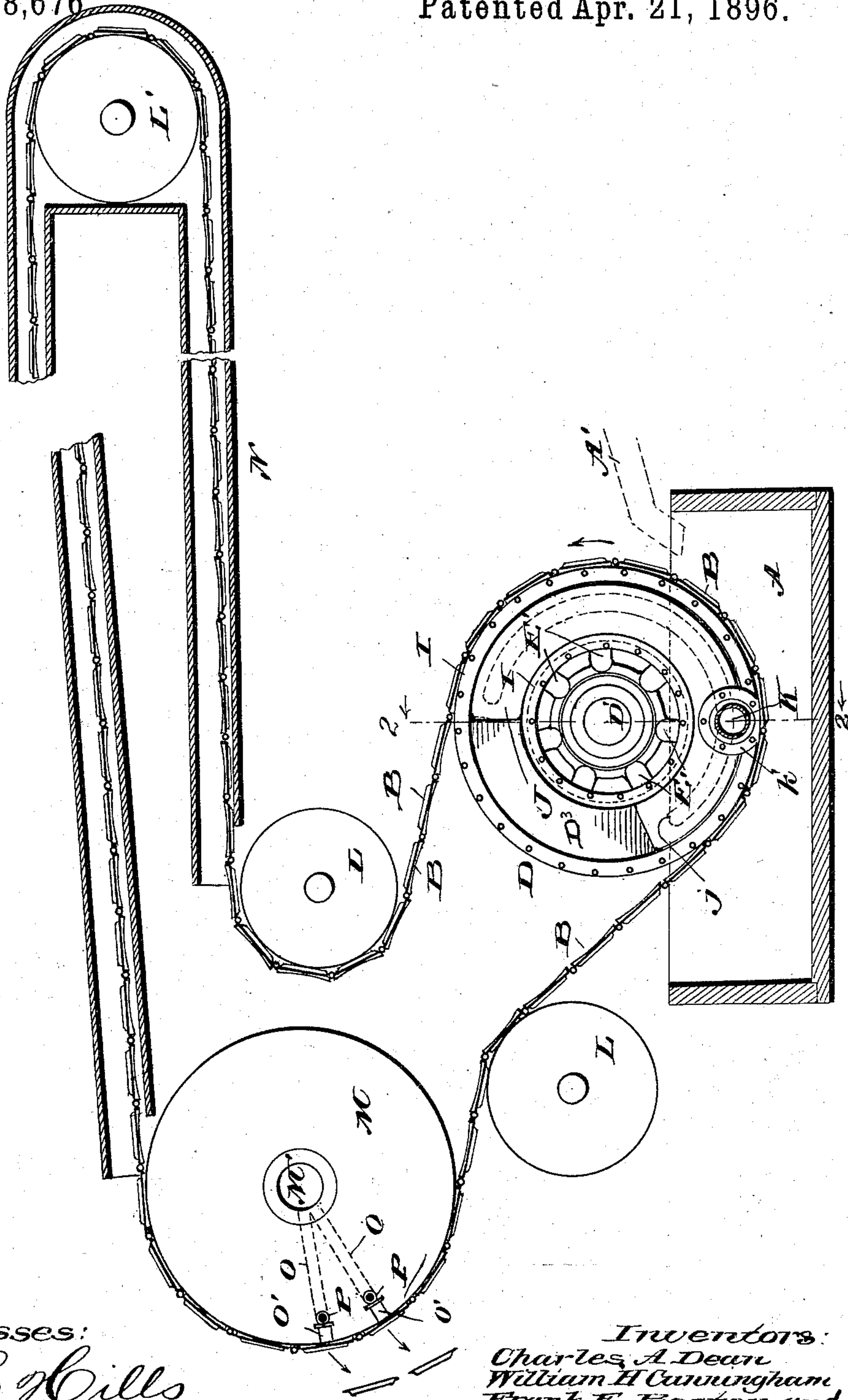
C. A. DEAN, W. H. CUNNINGHAM, F. E. BOSTON  
& J. L. DEAN.

APPARATUS FOR MAKING PULP ARTICLES.

No. 558,676

Patented Apr. 21, 1896.

*Fig. 1.*



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(No Model.)

3 Sheets—Sheet 2.

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Fig. 3.

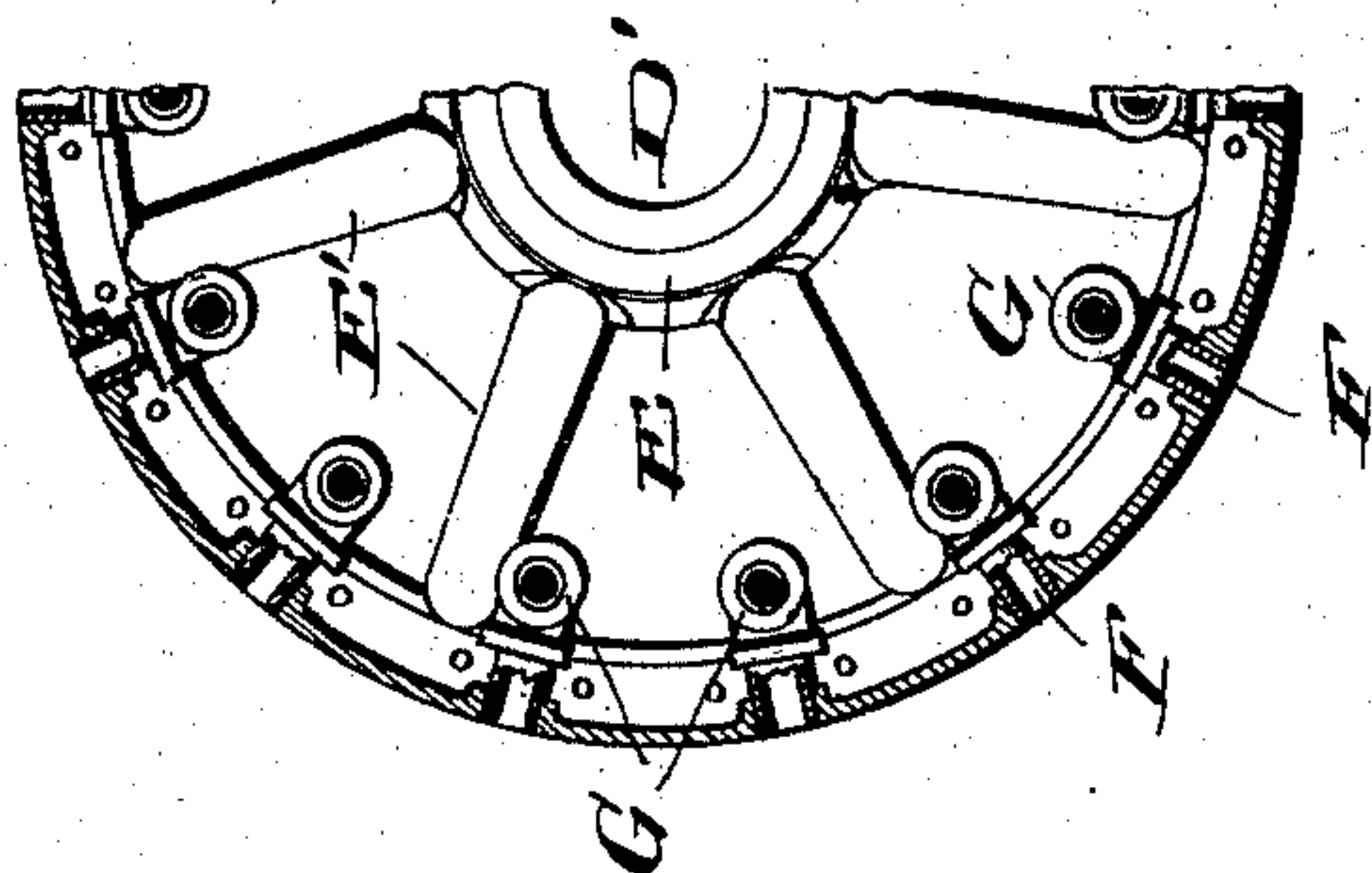
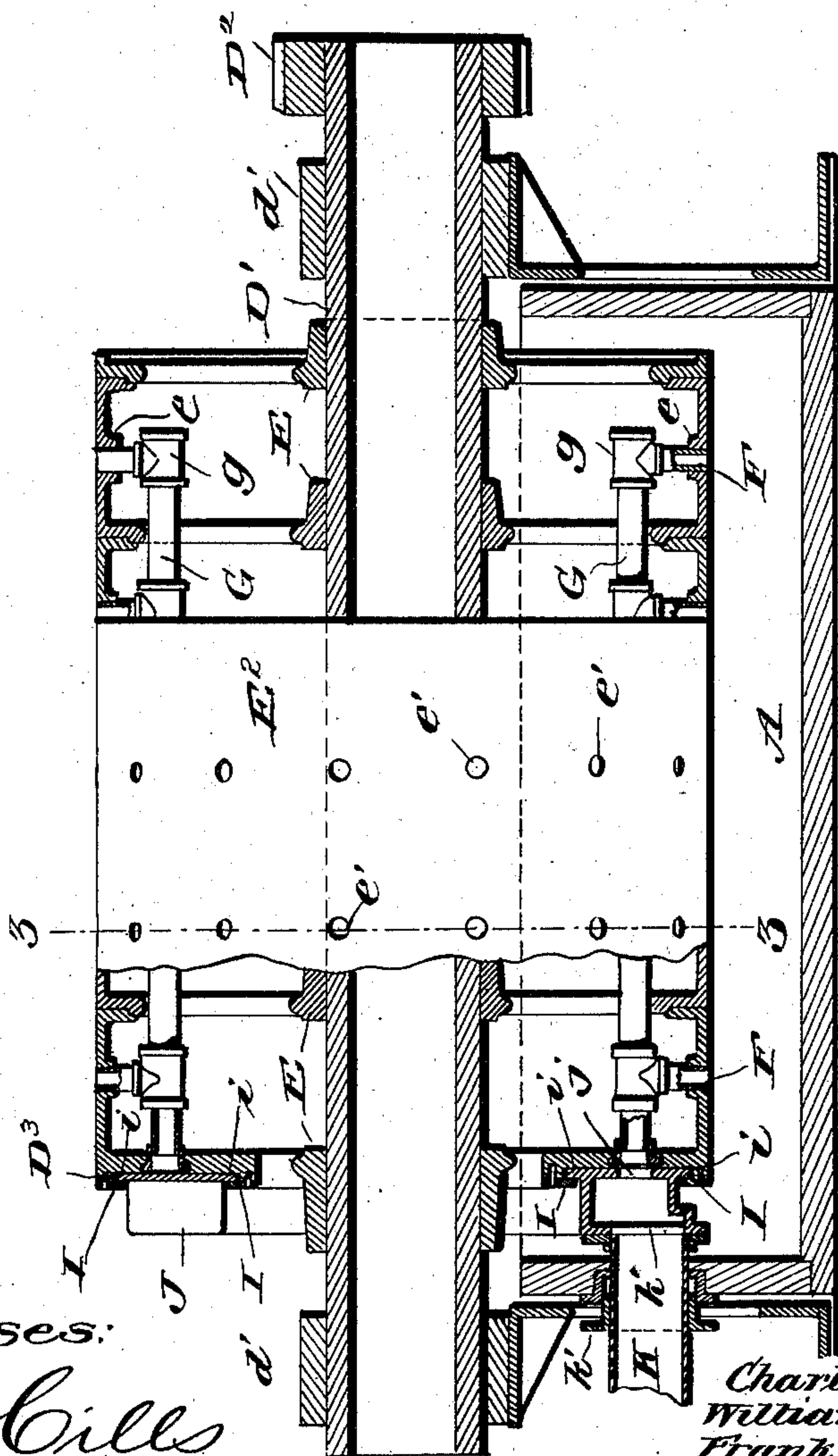


Fig. 2.



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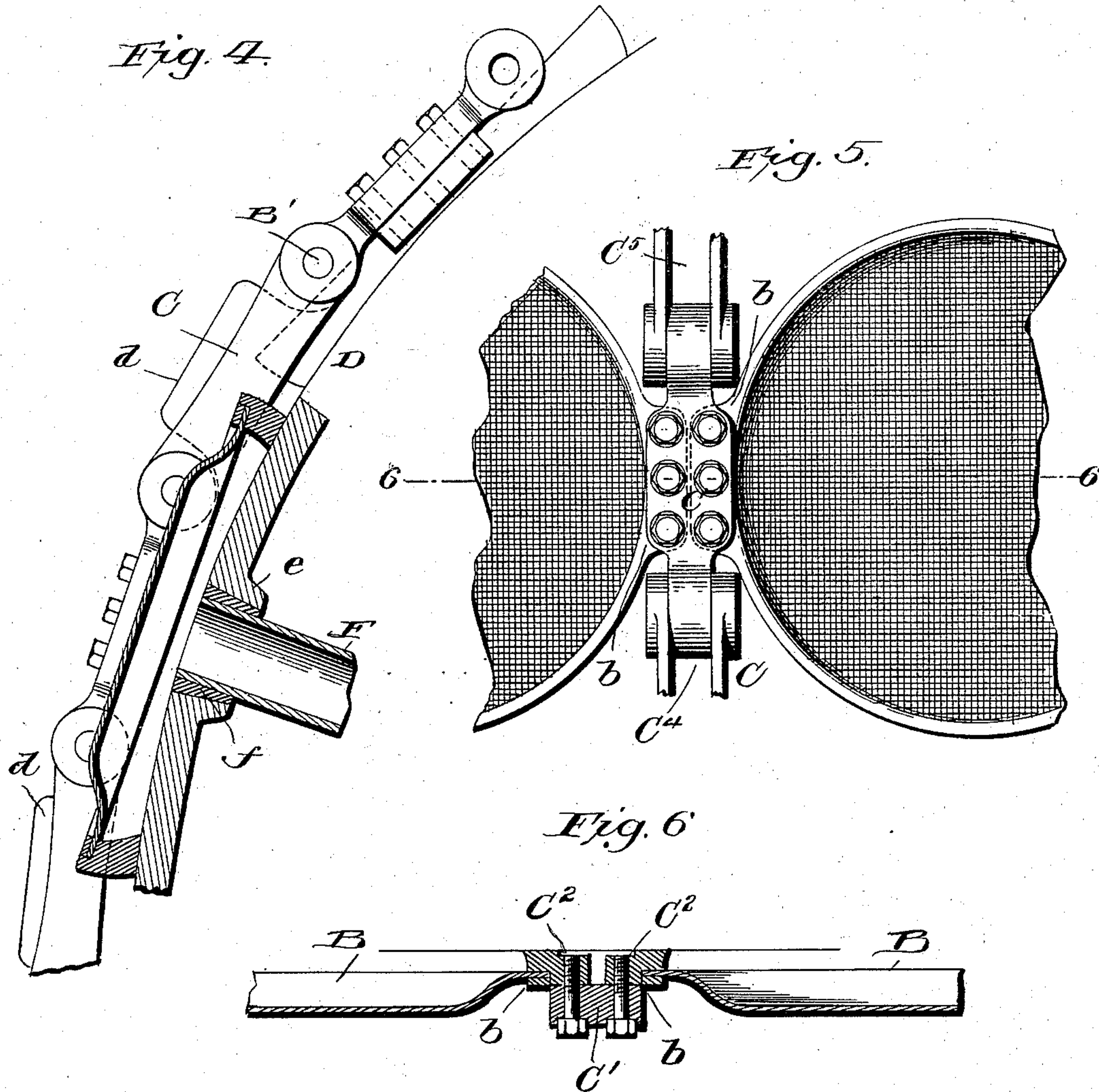
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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR MAKING PULP ARTICLES.

SPECIFICATION forming part of Letters Patent No. 558,676, dated April 21, 1896.

Application filed April 23, 1895. Serial No. 546,928. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES A. DEAN, residing at Boston, county of Suffolk, State of Massachusetts, and WILLIAM H. CUNNINGHAM, residing at Waterville, FRANK E. BOSTON, residing at Gardiner, and JAMES L. DEAN, residing at Winslow, county of Kennebec, State of Maine, citizens of the United States, have invented certain new and useful Improvements in Apparatus for Making Pulp Articles, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to certain new and useful improvements in apparatus or machines for forming articles from paper-pulp or analogous material; and it has for its objects, among others, to provide simplified means for forming or molding the article by means of suction on continuously-moving molds or forms and automatically forcing the completed articles from such molds or forms.

It has for a further object to provide means whereby the articles may be dried or partially dried while upon the molds or forms. We connect the molds or forms to constitute an endless chain which passes around the cylinder, which is equipped with mechanism for exhausting the air to suck the material onto the molds and around a separate cylinder provided with mechanism for automatically forcing off the completed articles by the introduction of compressed air. The mold-chain may be of a greater or less number of molds in width and the cylinders of a corresponding width and having openings and piping according to the number of molds. The parts are so mounted and arranged that the operation is continuous, the molds taking up the material passing over a predetermined route, being dried or not, as may be desired, and thence passing around the forcing-off cylinder the completed articles are automatically forced off and the molds continuing are again immersed in the vat to take up more material, and so on.

Other objects and advantages of the invention will appear in the following description,

and the novel features will be particularly pointed out in the claims.

The invention is clearly illustrated in the accompanying drawings, which, with the letters of reference marked thereon, form a part of this application, and in which—

Figure 1 is a side elevation, with parts in section and a portion broken away, of our improved apparatus for forming articles from pulp. Fig. 2 is a vertical section through the cylinder and vat, the section being taken on the line 2 2 of Fig. 1, looking in the direction of the arrows and with a portion of the periphery of the cylinder shown in elevation, the said section being upon an enlarged scale. Fig. 3 is a vertical cross-section through the cylinder, the section being taken on the line 3 3 of Fig. 2, with one-half of the cylinder broken away. Fig. 4 is an enlarged perspective detail, partially in section, showing a portion of the mold-chain and one of the openings in the cylinder and its pipe. Fig. 5 is an enlarged detail in plan with a portion broken away, showing the manner of connecting the molds or forms to constitute a chain. Fig. 6 is a section through Fig. 5 on the line 6 6 thereof.

Like letters of reference refer to like parts in all the figures of the drawings.

The molds or forms herein disclosed are of a shape designed to form depressed plates; but it will be readily understood that the invention is in no way restricted to the shape of the mold, and consequently not to the shape of the completed article. Neither is it restricted to the character of the pulp employed for forming such articles.

Referring then to the details of the drawings by letter, A designates a suitable vat or receptacle for containing the pulp, which may be supplied thereto in any convenient manner—as, for instance, through a feed-spout A'. (Indicated by dotted lines in Fig. 1.)

B are the forms or molds constructed to give the desired shape to the article. They may be constructed in any suitable manner, the body portion being foraminous, as indicated in Fig. 5, one side of said molds being



concave and the other convex, and said molds are further formed with ears or lugs *b* to adapt them for attachment to the sprocket-chain, as indicated in Figs. 5 and 6. This chain comprises links *C*, between each two of which is pivotally held, upon a suitable pivot *B'*, a plate *C'*, through which pass bolts *C''*, which are screwed into the ears of the molds or forms, as indicated in Figs. 5 and 6. The ears on the molds or forms are integral with the metal ring or frame to which the foraminous body portion is secured, as indicated in Fig. 6. The foraminous portion and ring or frame may be secured together in any well-known manner. There may be more or less of these molds or forms arranged side by side to constitute a mold chain or belt of the desired width. In Fig. 2 the cylinder is shown as of a length adapted to accommodate a chain of five molds in width; but this number may be varied as circumstances may require, and other means may be employed for connecting the molds to constitute the chain.

*D* is the cylinder. It is mounted so that its lower portion will be immersed in the pulp in the vat, as seen in Figs. 1 and 2. It is designed to be continuously rotated in any suitable manner. In Fig. 4 we have shown the cylinder as provided upon its periphery with sprocket-teeth *d*, designed to fit in the openings *C''* of the links of the mold-chain, while in Fig. 2 the shaft *D'* of the cylinder is shown as provided with a gear *D''*, designed to mesh with cooperating gearing (not shown) and by which the cylinder is revolved. This shaft is shown as hollow and is mounted in bearings *d'*, as seen in Fig. 2. This cylinder in this instance is shown as composed of the hubs *E*, through which the hollow shaft passes, and from these hubs radiate the arms or spokes *E' E'*. The periphery *E''* of this drum or cylinder is formed in sections, as illustrated in Fig. 2, so that the drum or cylinder may be readily made up of any desired length. Each section of the periphery is provided with an equally-spaced series of openings *e'*, as shown, formed in the interior enlargements *e*, and through each of which passes a short pipe *F*, as seen in Figs. 2, 3, and 4, a tapered bushing *f*, as seen in Fig. 4, being sometimes employed. These openings are so distributed peripherally that one will come opposite each mold as the latter comes in contact with or fits the periphery.

*G* are pipes disposed longitudinally within the cylinder, being suitably supported, and with each pipe there is connected, by suitable coupling, the pipes *F*, which are in line with the said pipe *G*, so that each pipe *G* will be connected with all of the pipes *F* that are in the same longitudinal plane or line, as will be understood from Fig. 2, it being understood, of course, that the coupling *g* at the end farthest from the end which communicates with the air-chamber is closed.

One end of the cylinder may or may not be closed, the other end being provided with a

head *D''*, as seen best in Fig. 2, which has a peripheral groove formed by the plates *I I*, suitably held thereto, as seen in Figs. 1 and 2, the pipes *G* opening through this head or end of the cylinder, as seen best in said Fig. 2, and fixed outside of the end of this cylinder is a box *J*, extending, as seen in Fig. 1, for about two-thirds of the circle and having in its inner wall an opening *j* in line with the outer open ends of the pipes *G*, as seen in Fig. 2, the ends of this box being closed and at its lowest point having an opening *k*, communicating with the pipe *K*, which is adapted to be connected with any suitable means of exhausting the air from the box, and consequently from the pipes *G* and *F*, as the latter communicate therewith. This means may be a continuously-operating suction-fan, (not shown,) operatively arranged with relation to the said pipe *K*. The inner wall of the box has flanges, as shown at *i*, which flanges work in the groove in the end of the cylinder, as clearly illustrated in Fig. 2. The pipe *K* is mounted in a suitable bearing and should be provided with a stuffing-box *k'* or other suitable provision for providing a perfectly airtight joint, and the pipes *G* are also mounted in the head of the cylinder, so as to form tight joints, as leakage at any of these points would be detrimental to the successful operation of the apparatus.

The box *J* may extend for a greater or less distance around the head of the cylinder, it being understood that the air is being exhausted from the pipes *F* and *G* during the entire period that their portion of the periphery of the drum or cylinder is immersed.

The formed articles may or may not be dried before removing them from their molds.

In Fig. 1 we have shown an apparatus in which the articles are designed to be dried in their passage from the forming-cylinder to the place where they are removed from the mold-chain. In this view the mold-chain is shown as passing around the cylinder and over the supporting and guiding pulleys *L* and around the forcing-off cylinder *M*. Between the upper guide-pulley *L* and forcing-off cylinder is arranged a hot-air conduit *N*, through which the mold-chain passes, said chain passing also over a guide-pulley *L'*, located at one end of the conduit, any suitable means being provided for heating this conduit, and the forcing-off cylinder *M* is provided with a hollow axis *M'*, from which lead the radially-disposed pipes *O*, each of which communicates with a pipe *O'* opposite an opening in the periphery of the cylinder, and each set of pipes *O'* is connected with a pipe *P*, arranged parallel with the axis of the cylinder, similar to those of the forming-cylinder, and, as shown in Fig. 2, this forcing-off cylinder *M* being provided at one end with suitable means for forcing air through the hollow axis and through the pipes *O*, *O'*, and *P* to force off the articles from the mold as they come opposite the openings in the cylinder with



which the pipes O' communicate, as will be readily understood from Fig. 1.

In operation the molds are immersed in the pulp in the vat, and as they enter the pulp, the air being exhausted from the hollow part of the molds and from the pipe communicating therewith, the suction thus produced draws onto the mold a thin coating of the pulp and the moisture therefrom is also extracted. The molds continuing in their passage emerge from the vat with the articles shaped thereon, and thence pass through the hot-air furnace where they are dried, and as they emerge from this conduit they pass around the upper portion of the forcing-off cylinder M, from which they are ejected by the admission of the compressed air. The openings in the cylinder are so located that a mold will come opposite each opening and the exhaust for the cylinder, and the blast of air for the forcing-off cylinder is automatically controlled to operate at the proper time, so that no attention on the part of the attendant is necessary, the apparatus being automatic in its operation and continuous, the articles being continuously shaped, dried, and forced off from their molds.

Modifications in detail may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

What we claim is—

1. A mold-chain composed of molds arranged in series side by side, links interposed between said molds and means connecting the links with the molds between each two of the latter, substantially as specified.

2. An endless chain composed of molds having a rim with ears, plates secured to said ears and links pivotally connected with said plates, substantially as specified.

3. The combination with a vat, of a cylinder mounted to revolve with its lower portion in said vat and having openings in its periphery and means for exhausting the air therefrom, and an endless mold-chain having its molds arranged in series side by side and pivotally connected between molds of each series, as set forth.

4. A cylinder for machines designed to form articles from pulp, the same having openings in its periphery, pipes communicating with said openings and means for exhausting the air from said pipes, combined with an endless mold-chain having its molds arranged in series side by side and pivotally connected between molds of each series, substantially as specified.

5. A cylinder for the purpose described having openings in its periphery, pipes communicating with said openings and means for automatically controlling the passage of air in said pipes, combined with an endless mold-chain having its molds arranged in series side by side and pivotally connected between molds of each series, substantially as and for the purpose specified.

6. A cylinder for the purpose described

having openings in its periphery, pipes communicating with said openings and connected in series, and means for automatically exhausting the air from said pipes, substantially as specified.

7. The combination with a vat, a cylinder having openings in its periphery, means for automatically exhausting the air there through and an endless chain of molds arranged in series side by side and having pivotal connections between the molds of each series, said chain being arranged to pass beneath said cylinder under the openings and into the vat, substantially as specified.

8. The combination of a vat, a cylinder mounted to revolve with its lower portion in said vat and having openings and means for automatically exhausting air, a mold-chain passing around said cylinder and a cylinder over which said chain passes having means for forcing the articles from the molds, substantially as specified.

9. The combination of a vat, a cylinder mounted to revolve with its lower portion in said vat and having openings and means for automatically exhausting air, a mold-chain passing around said cylinder, a cylinder over which said chain passes having means for forcing the articles from the molds and interposed drying means, substantially as specified.

10. The combination with a revoluble cylinder having openings in its periphery and pipes connected in series and within said cylinder and communicating with said openings, of an air-chamber fixedly mounted at the end of and outside said cylinder and extending for a portion only of the distance around the end thereof and having an opening communicating with said pipes, and means for exhausting the air from said chamber and pipes, substantially as specified.

11. A revoluble cylinder having peripheral openings and inclosed pipes connected in series and communicating with said openings combined with a stationary air-chamber at the end of the cylinder extending for a portion only of the distance around the end thereof and having communication with said pipes, a groove on the end of said cylinder to receive flanges on said chamber, and means for exhausting the air from said chamber and pipes, substantially as described.

12. A cylinder for pulp-machines having peripheral openings radially-disposed pipes arranged within the cylinder and communicating with said openings, longitudinally-disposed pipes also arranged within said cylinder and with which the radial pipes communicate, a fixed air-chamber at the end of the cylinder extending for a portion only of the distance around the end thereof, and means for exhausting the air from said pipes and chamber, substantially as specified.

13. The combination of a revoluble cylinder having peripheral openings and radially-disposed pipes communicating therewith, lon-



gitudinally-disposed pipes within the cylinder communicating with the radial pipes, plates on the end of said cylinder forming a peripheral groove, and a fixed box or chamber in communication with said pipes and having flanges extending into the said groove said box extending for a portion only of the distance around the head of the cylinder, substantially as described.

10 14. The combination of a revoluble cylinder having peripheral openings and radially-disposed pipes communicating therewith, longitudinally-disposed pipes within the cylinder communicating with the radial pipes, plates on the end of said cylinder forming a peripheral groove, a fixed box or chamber having flanges extending into the said groove said box extending for a portion only of the

distance around the head of the cylinder and communicating with said pipes, and a hollow shaft for said cylinder provided with a gear, substantially as specified.

In testimony whereof we affix our signatures in presence of witnesses.

CHARLES A. DEAN.

WILLIAM H. CUNNINGHAM.

FRANK E. BOSTON.

JAMES L. DEAN.

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