M. L. KEYES.

APPARATUS FOR MAKING PULP ARTICLES.

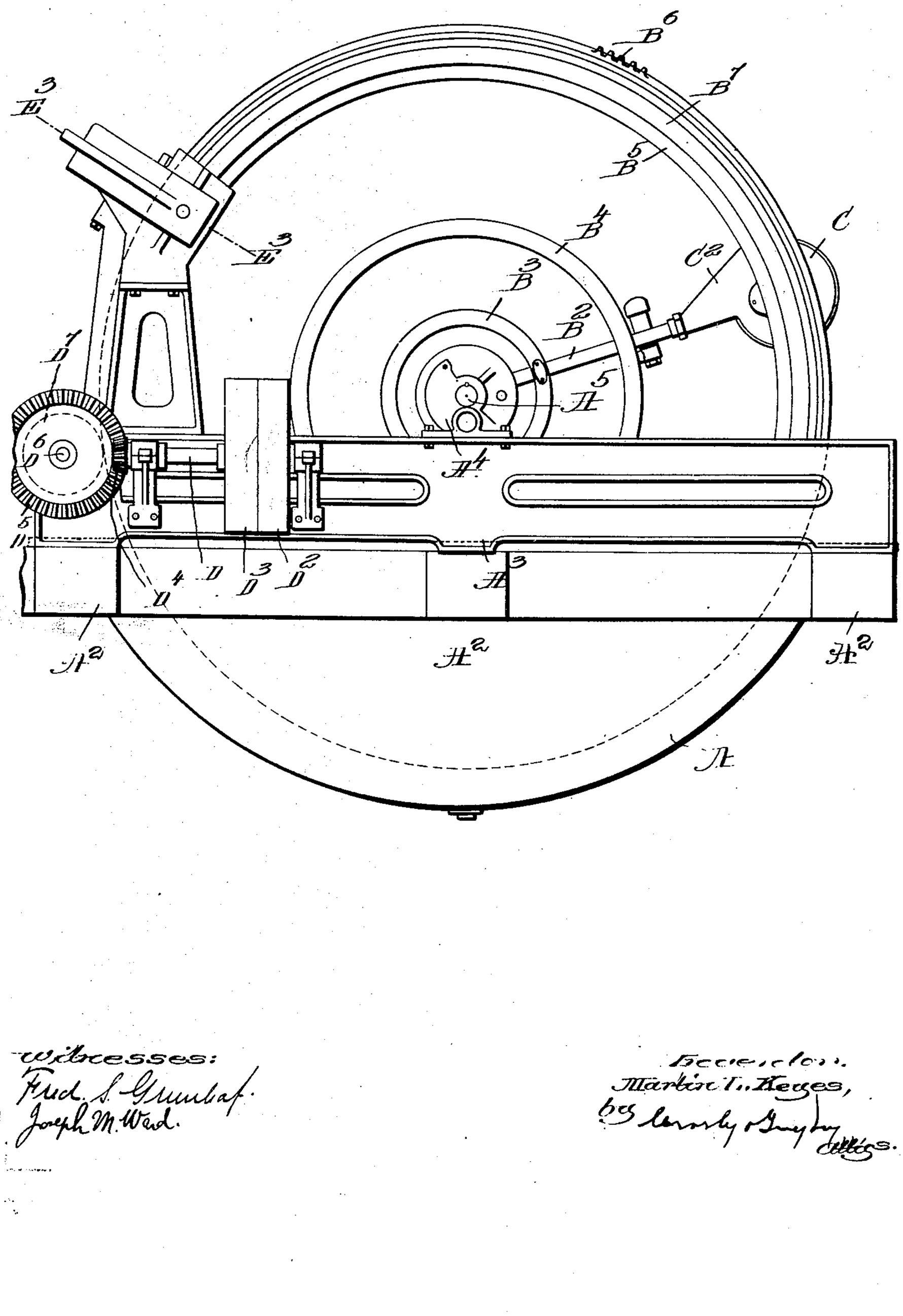
APPLICATION FILED MAY 8, 1908.

908,577.

Patented Jan. 5, 1909.

4 SHEETS—SHEET 1.

Fig. 1.



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4 SHEETS—SHEET 2.

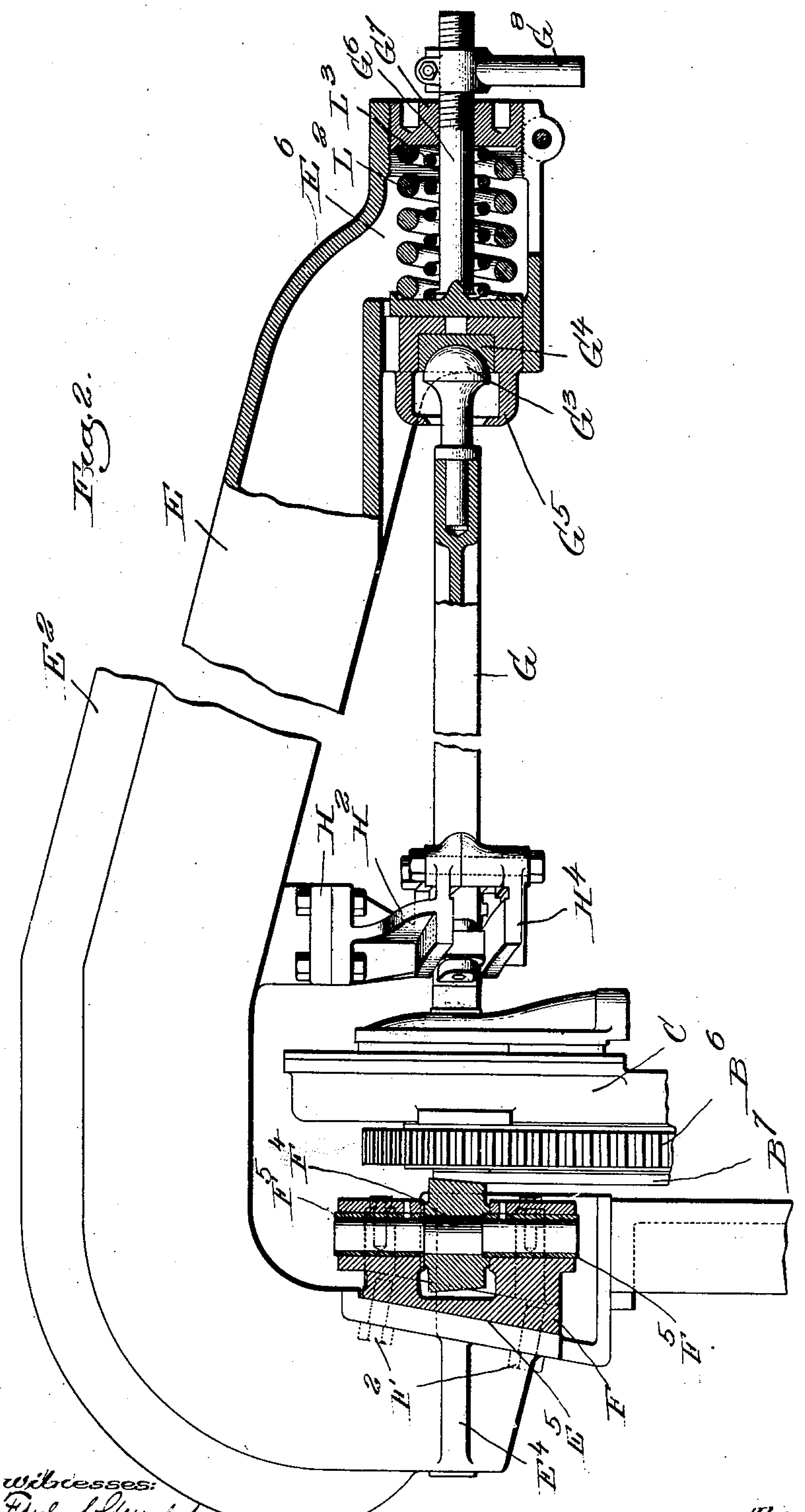

Fig. 2.

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4 SHEETS—SHEET 3.

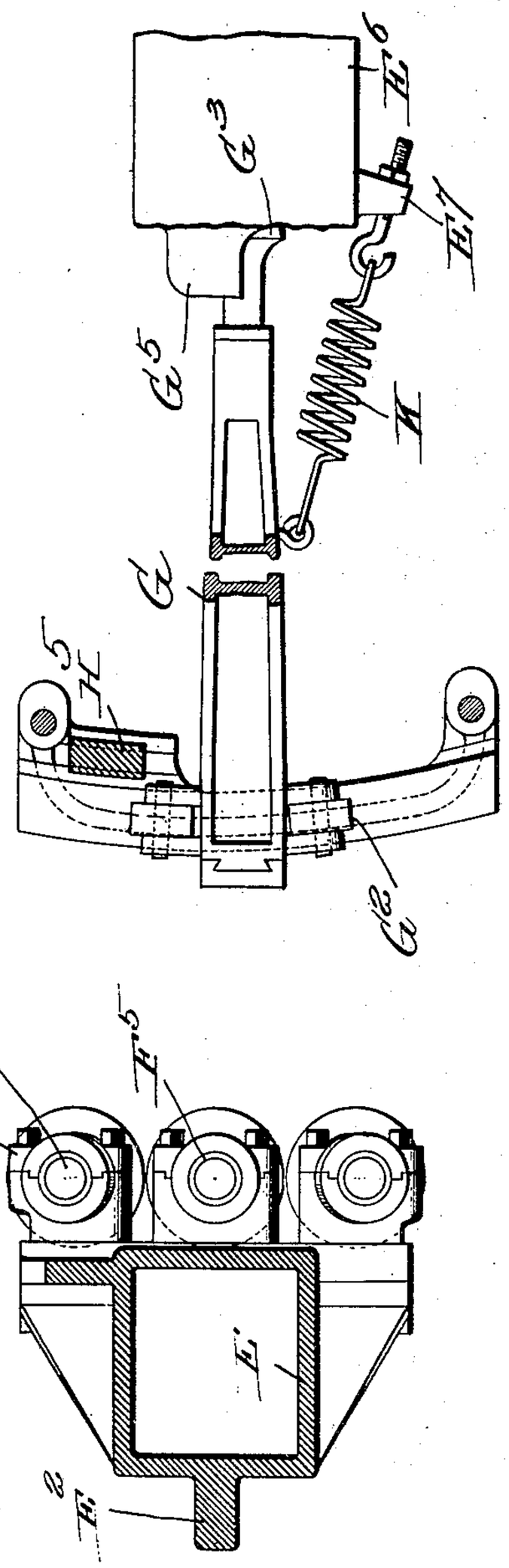

Fig. 3.

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4 SHEETS—SHEET 4.

Fig. 4.

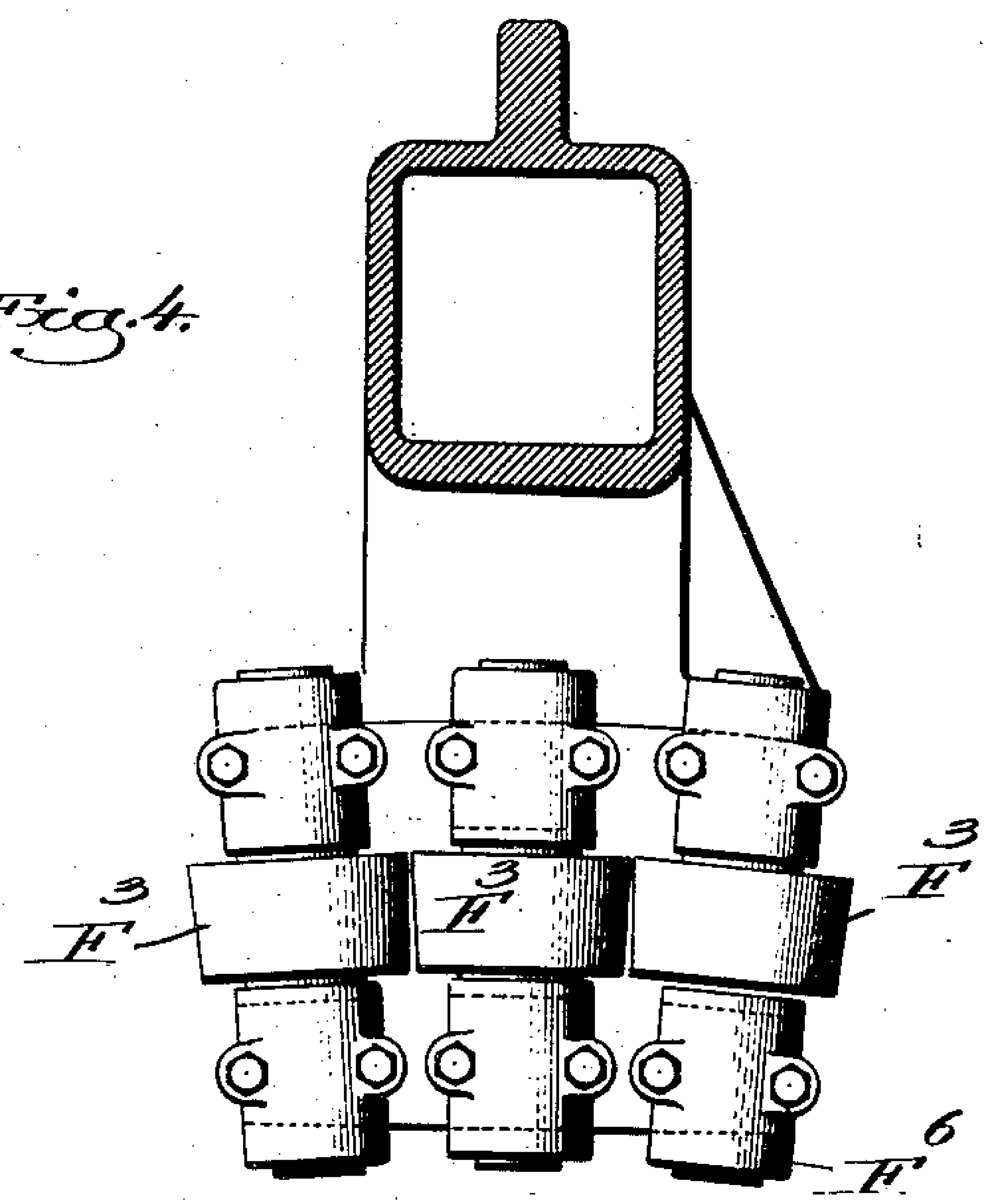
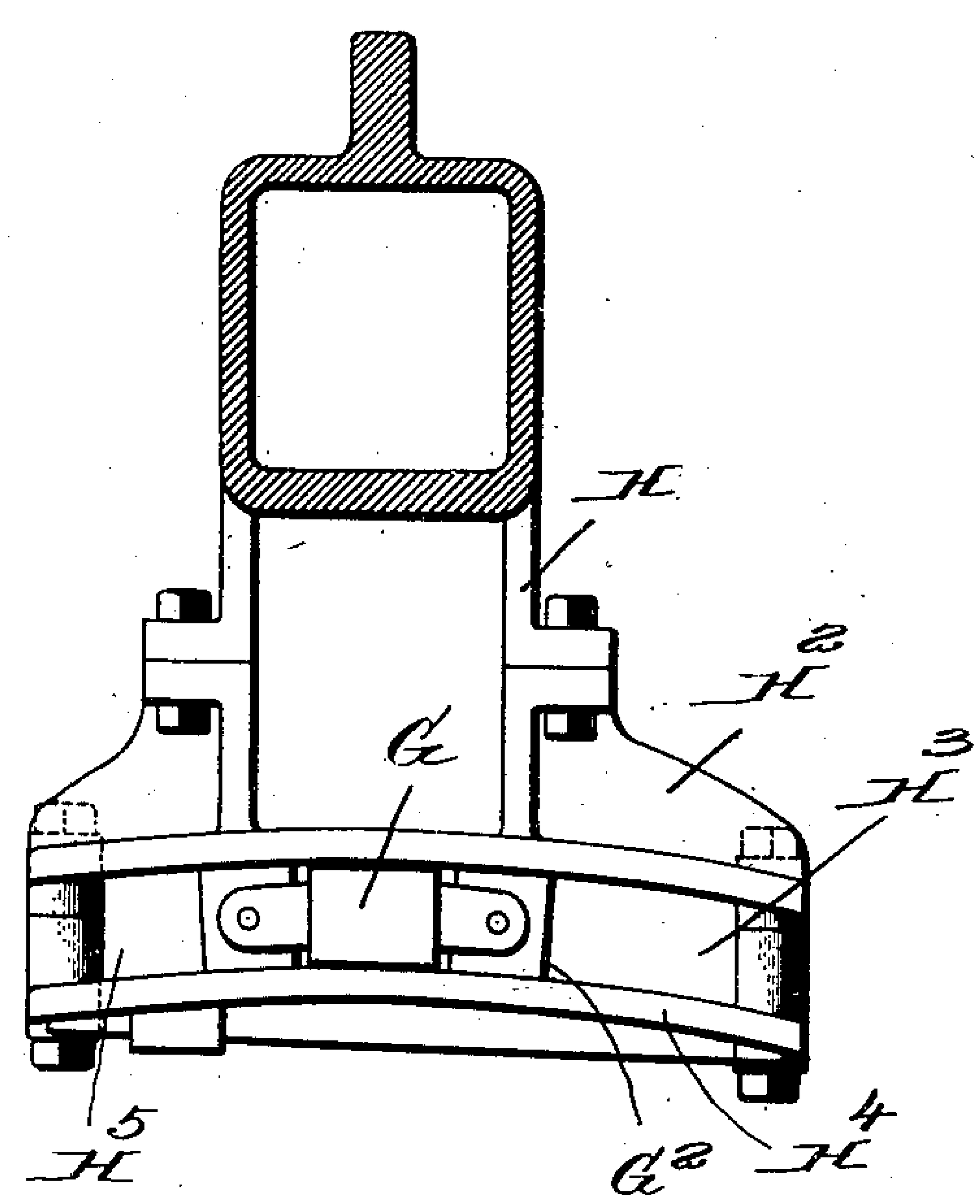


Fig. 5.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MAKING PULP ARTICLES.

No. 908,577. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed May 8, 1908. Serial No. 431,567.

To all whom it may concern:

Be it known that I, MARTIN L. KEYES, a citizen of the United States, and a resident of Fairfield, in the county of Somerset and State of Maine, have invented an Improvement in Apparatus for Making Pulp Articles, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to an apparatus for making pulp articles.

In my prior patents No. 740,023, granted September 29, 1903, No. 759,616, granted May 10, 1904, and No. 788,138, granted April 25, 1905, I have described and illustrated preferred forms of embodiment of such an apparatus. Such apparatus comprises a traveling mold having a plurality of faces adapted to form the article between them, means to supply suitable pulp to the mold, and means to press the mold-faces together at a point farther on in the travel of said mold, whereby the pulp which has been delivered to the mold is pressed into an article of the desired shape.

The present invention relates particularly to the means for pressing the mold-faces together whereby the pulp previously delivered to the mold is pressed into an article of the desired shape.

I have found it necessary to regulate or adjust the amount of pressure applied to the mold under various conditions, such as the quality of the pulp and the kind of article being formed. The present invention provides means whereby such adjustment or regulation of the pressure can be readily and accurately secured, and at the same time the pressure be exerted through a yielding means so that no damage or injury can be done to the machine in case of any hard foreign substance coming between the effective portions of the compressing means. I have also found, as indicated in the before-mentioned patents, that it is best to have the molds travel in a curve, and preferably in a circular path. This involves the movement of the end of the compressor along an arc of this path, and also about a center out of said path. The present invention includes the means for securing this peculiar movement.

This invention also includes other features and improvements in the compressing means, and the invention as a whole will be more fully described and set forth in the accompanying specification and drawings, and will be particularly pointed out in the claims.

The drawings indicate a form of apparatus of general type similar to that illustrated and described in the above-mentioned patents.

Figure 1 is a side elevation of the apparatus with some of the parts omitted and without going into detail, but illustrating the position of the compressing device. Fig. 2 is a side elevation of the compressing device, the view being taken normally to the plane of said device, and being partially in cross-section and with a portion of the device broken away, and showing the mold in position receiving the maximum pressure. Fig. 3 is a top plan view of the device shown in Fig. 2, taken at right-angles to the plane of illustration of Fig. 2, partially in cross-section, and with portions of the device broken away. Fig. 4 is a front elevation of the roller end of the compressor device. Fig. 5 is a front elevation of the guide-way of the compressor device showing the end of the compressor arm, the views in Figs. 4 and 5 being taken in opposite directions from the path of the mold.

I have shown for purposes of illustration an apparatus similar in general features to that illustrated in the above-mentioned patents, in which there are a series of traveling molds, each provided with two complemental separable mold faces, adapted to form therebetween a dished or hollow article, such as a pie-plate. These molds are shown as mounted on a rotary carrier, having a plurality of arms, one for each mold, and the circular path of travel of the molds lies through a vat to which liquid pulp is supplied. The faces of the mold separate before entering the pulp vat, and the pulp is supplied by the aid of suction to the mold. Upon leaving the vat the mold-faces are brought together and then enter the compressing device, which squeezes out mechanically a large amount of water from the pulp and leaves the articles in such shape that upon the subsequent opening of the mold they may be removed therefrom by the aid of compressed air, and a suitable pick-off device.

The pulp vat is illustrated at A extending below the level of the floor. Suitably arranged cross-bars A^3 are shown resting upon supporting beams A^2 in the floor. These

cross-bars A^3 have mounted thereon supporting brackets A^4, in which is mounted the non-rotary hollow shaft A^5, divided into two chambers, one for suction and one for compression, as set forth in said patents.

The mold carrier comprises a chambered hub mounted to rotate on said shaft, a series of radial supporting arms B^2 connected therewith, and concentric circular rings B^3, B^4, B^5, uniting the radial arms. The outer circular ring B^5 has fast thereto and serves to support the fixed member C of the molds, which are herein shown as comprising one fixed and one movable member. The circular ring B^5 also carries on its outer periphery a gear B^6, and on its exterior opposite the mold a raised frusto-conical surface B^7.

One of the cross-bars A^3 has mounted thereon a driving shaft D, carrying fast and loose pulleys D^2, D^3, and a beveled pinion D^4, intermeshing with a beveled gear D^5 on a shaft D^6, parallel to the shaft of the mold carrier. The shaft D^6 carries a pinion D^7, intermeshing with the gear B^6 on the mold carrier. This mechanism serves to drive the mold carrier to cause the molds to travel in a circular path down through the pulp vat and up between the jaws of the compressing device, as more fully described in the above-mentioned patents.

The compressing device comprises a yoke-shaped frame E, preferably of iron or steel, hollow in form, and provided with a web E^2, in the plane of its jaws, so that it is capable of resisting the large pressure of many tons which it is desired to secure for the operation of expelling the water from the articles being molded.

The molds mounted on the end of the radial arms B^2, are each provided with a draining chamber C^2, described in the above-mentioned Patent No. 759,616, and so shaped that when the mold in its travel arrives at the point when the mold members are to separate the tendency of all the water in the mold member attached to the ring B^5, will be to run out of the draining chamber C^2 by gravity. I have found that the water expelling compression should be applied to the mold when the mold has reached this position, and that otherwise unsatisfactory results are secured by reason of some of the water which is expelled from the pulp article by the pressure running back from the draining chamber onto the pulp article and being absorbed thereby after the compression has ceased, so that the result of the pressure is by so much neutralized. I therefore have devised a compressing device in which the yoke-frame, such as just described, is mounted at such a point in the path of travel of the mold that the water expelled cannot run back on to the article from which it has been expelled. In the construction illustrated this is secured by placing the plane of the compressing device yoke-frame, or the plane in which the pressure takes place, indicated at E^3, E^3, on a plane radial to the mold carrier and at an angle to the horizontal, equal to that which the mold must attain in its travel in order to have any water in the mold or draining chamber have a tendency to run out therefrom under the action of gravity. In the particular construction illustrated this angle should be slightly greater than the angle formed by the inclined wall of the draining chamber C^2 with the axis of its supporting arm B^2.

The compressing device, as in the patents above referred to, comprises a roller member and a swinging cam or compressor member between which members the mold passes and is compressed or squeezed.

The roller member of the present invention comprises a plurality of rolls to support the mold during the squeezing action, because I find that it is desirable to support the mold at a plurality of points, and thus secure substantially equal pressure on all points of the mold, and a steady and even pressure when the mold is between the members of the compressing device. The enormous pressure necessary to apply makes it essential that the mold in passing through the compressing device shall move steadily and firmly without being twisted or racked. It is also desirable to adjust the rolls bodily toward and from the mold so as to provide for any wear and tear occurring. It is necessary also, in order to prevent unnecessary friction, to have the rolls on axes normal to the path of the mold, and also to have all engaging points of the peripheries of the rolls and mold to move at the same rate of speed. As one means of securing these results I have devised the following construction. The outer jaw E^4, of the yoke-frame E, is formed with an inclined face E^5. A roll-supporting frame F is formed with a correspondingly inclined face, and is mounted by means of suitable screws F^2 on the inclined face E^5 of the jaw E^4. This construction enables the roll-carrying support and its rolls to be removed for repair by simply taking out the screws F^2 and sliding the roll-supporting frame downwardly.

The roll-supporting frame F carries a plurality of rolls F^3, herein shown as three in number. The shafts F^4 of these rolls are journaled at each end in bearings F^5, in the frame F, and removable journal caps F^6 are provided at each bearing so that access may readily be had thereto.

The axes of the rolls F^3 are arranged normally to the path of travel of the mold, and therefore in the case illustrated radial to the shaft A^5.

The peripheries of the rolls bear against the raised surface B^7 of the ring B^5 of the mold carrier, and are of frusto-conical shape

to correspond with the surface B^7. These surfaces are made conical in order that all engaging points may move at the same rate of speed, a result which it will be seen will be secured by forming these surfaces on cones having a common apex at the intersection of the axes of the rolls F^3 and the axis of rotation of the mold carrier.

The swinging cam or compressor member is shown at G. One end of this member is mounted in the jaw E^6, of the yoke-frame E, opposite the jaw E^4. In the compressing operation the free end of the arm G comes into contact with the mold as it starts to pass between the jaws of the yoke E, and as the movement of the mold continues the arm G swinging with the mold into the plane of the yoke produces a powerful pressure or compressing action on the mold.

It will be seen that the free end of the arm G in following the mold must travel in the path in which the mold is traveling, and must at the same time travel about in a path concentric with its own pivoted end. It must also, when the mold has passed from between the jaws, return to the position at which it first engaged the mold, so as to be ready to act upon the following mold in the same manner. I find it essential, therefore, in order to secure steady and effective action, to guide the free end of the compressing arm G. For this purpose I have arranged a guideway, herein shown as supported from the yoke-frame E.

The yoke E has depending therefrom a bracket H, to which is bolted the two-part guide H^2, H^4, between the parts of which is formed the guideway H^3. This guideway H^3, as shown in Fig. 5, is curved on a path concentric with the path of travel of the molds, and hence in the construction illustrated on an arc concentric with the shaft A^5. This guideway H^3 is also, as shown in Fig. 3, curved on a path concentric with the pivoted end of the swinging compression arm G.

The arm G near its forward end is provided with a slide G^2, preferably of some anti-friction material, and herein shown as made up of two anti-friction plates fitted to ride against the walls of said guideway.

After a mold has passed from between the jaws of the compression device the swinging arm G will fall back, guided by the guideway, to its starting position, and to diminish the shock and jar I provide at the lower end of the guideway a buffer, herein shown as a block of wood H^5. To insure the return of the free end of the arm G to its starting position, I also provide a spring K, connected at one end to the arm G and at the other end to a projection E^7, from the yoke-frame E.

The pivoted end of the compressor arm G is universally mounted in the yoke-frame E, and for that purpose is herein shown as a ball-head G^3, resting in a socket-piece G^4, mounted in a head G^5, fitted to slide longitudinally in the jaw E^6. The head G^5 is provided with an extended shaft G^6, which passes through a cap G^7, screw-threaded into the end of the jaw E^6. The shaft G^6 is screw-threaded at its outer end, and has mounted thereon a hand-nut G^8. Powerful coiled springs L^2, L^3, surround the shaft G^6, and the cap G^7. It will thus be seen that by means of the hand-nut G^8 any desired degree of compression may be given to the springs G^6, G^7, so that their compressing force may be adjusted as desired. This means for adjusting the power of the springs will alter the position of the free end of the arm G, which must always be the same, and hence it is necessary to provide for an adjustment of the arm G pivotally. This is secured by screwing the cap G^7 into and out of the head as required, and thereby positioning the free end of the arm G.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, means for causing said mold to travel in a curved path, a yoke-shaped frame mounted transversely of said curve to allow the mold to pass between its jaws, a plurality of rolls journaled in one jaw with their axes normal to said curve and with their peripheries on said curve, a compressor arm yieldingly and universally mounted in the opposite jaw.

2. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, means for causing said mold to travel in a curved path, a yoke-shaped frame mounted transversely of said curve to allow the mold to pass between its jaws, a plurality of rolls journaled in one jaw with their axes normal to said curve and with their peripheries on said curve, a compressor arm yieldingly and universally mounted in the opposite jaw, and means for guiding the free end of said compressor arm in the path of travel of said mold when in engagement with said rolls.

3. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, means for causing said mold to travel in a curved path, a yoke-shaped frame mounted transversely of said curve to allow the mold to pass between its jaws, a plurality of rolls journaled in one jaw with their axes normal to said curve and with their peripheries on said curve, a compressor arm yieldingly and universally mounted in the opposite jaw, a guideway to receive and guide the end of said compressor arm in the path of travel of said mold when in engagement with said rolls.

4. In a machine for molding pulp articles, a traveling mold formed of a plurality of sep-

arable mold faces, means for causing said mold to travel in a curved path, a yoke-shaped frame mounted transversely of said curve to allow the mold to pass between its jaws, a plurality of rolls journaled in one jaw with their axes normal to said curve and with their peripheries on said curve, a compressor arm yieldingly and universally mounted in the opposite jaw, a guideway curved concentrically to the pivot of the compressor arm and the axis of motion of said mold, said guideway receiving and guiding the end of said compressor arm when in engagement with said rolls.

5. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, means for causing said mold to travel in a curved path, a yoke-shaped frame mounted transversely of said curve to allow the mold to pass between its jaws, a plurality of rolls journaled in one jaw with their axes normal to said curve and with their peripheries on said curve, a compressor arm yieldingly and universally mounted in the opposite jaw, a guideway to receive and guide the end of said compressor arm in the path of travel of said mold when in engagement with said rolls, and a buffer block located at the lower end of said guideway.

6. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, means for causing said mold to travel in a curved path, a yoke-shaped frame mounted transversely of said curve to allow the mold to pass between its jaws, a plurality of rolls journaled in one jaw with their axes normal to said curve and with their peripheries on said curve, the contacting surfaces of said rolls and said mold being frustums of cones having a common apex, a compressor arm yieldingly and universally mounted in the opposite jaw.

7. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, means for causing said mold to travel in a curved path, a yoke-shaped frame mounted transversely of said curve to allow the mold to pass between its jaws, a plurality of rolls journaled in one jaw with their axes normal to said curve, means for adjusting said rolls bodily toward and from the path of said mold, a compressor arm yieldingly and universally mounted in the opposite jaw.

8. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, a compressing device to receive and compress the mold in its travel, one member of said device being a swinging compressor arm, a head, a universal connection between said head and the end of said compressor arm, a spring behind said head, means for adjusting the power of said spring.

9. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, a compressing device to receive and compress the mold in its travel, one member of said device being a swinging compressor arm, a head, a universal connection between said head and the end of said compressor arm, a spring behind said head, means for adjusting the power of said spring, and means for adjusting said head and swinging arm longitudinally.

10. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, a compressing device to receive and compress the mold in its travel, one member of said device being a swinging compressor arm, a head, a universal connection between said head and the end of said compressor arm, a cap, a spring mounted between said head and said cap, means for adjusting the head with respect to the cap to vary the power of the spring, means whereby the head, cap and intermediate spring may be adjusted bodily to position the end of the swinging arm.

11. In a machine for molding pulp articles, a traveling mold formed of a plurality of separable mold faces, means for causing said mold to travel in an upright curved path, a compressing device mounted in the path of travel of the mold to receive and compress the mold, the angle of location of the said compressing device being substantially equal to or greater than the angle of inclination of the mold at which all water in the mold has a tendency to flow away therefrom.

In testimony whereof, I have singed my name to this specification, in the presence of two subscribing witnesses.

MARTIN L. KEYES.

Witnesses:
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FREDERICK S. GREENLEAF.