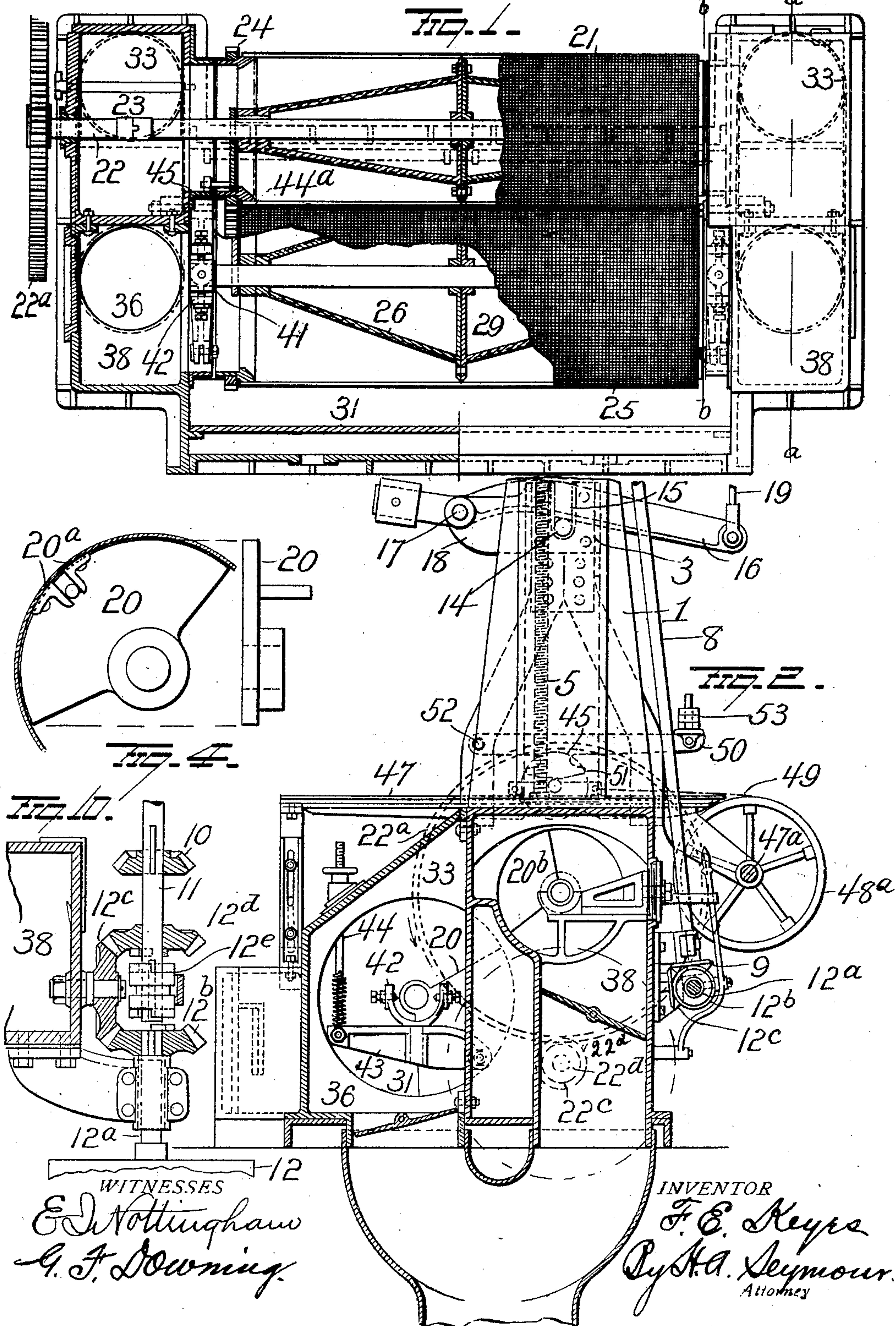


No. 796,583.

PATENTED AUG. 8, 1905.

F. E. KEYES.  
MACHINE FOR FELTING PULP.  
APPLICATION FILED FEB. 10, 1904.

3 SHEETS-SHEET 1.

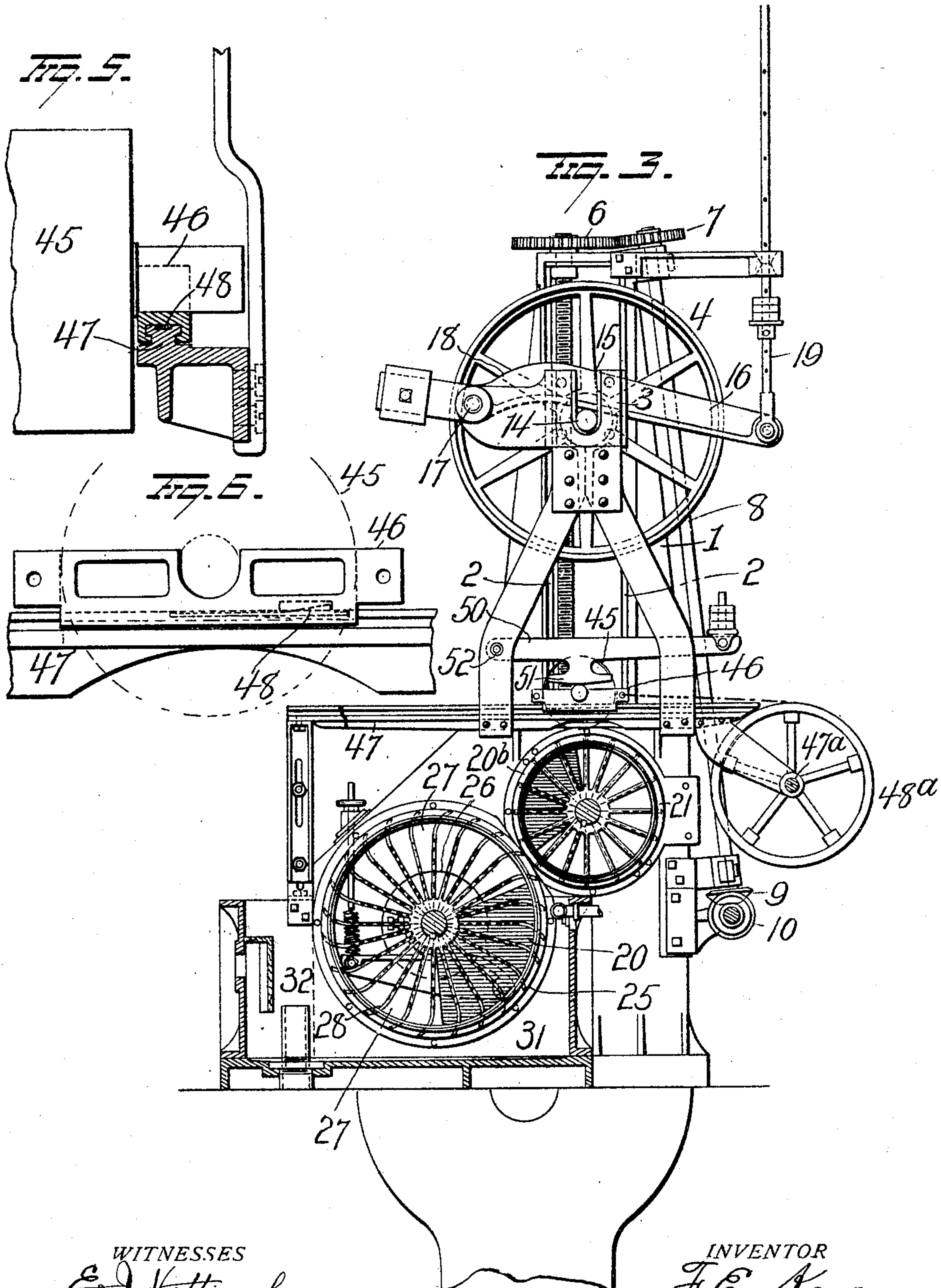


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3 SHEETS—SHEET 2.



WITNESSES  
E. D. Nottingham  
G. F. Downing.

INVENTOR  
F. E. Keyes  
By H. A. Seymour  
Attorney



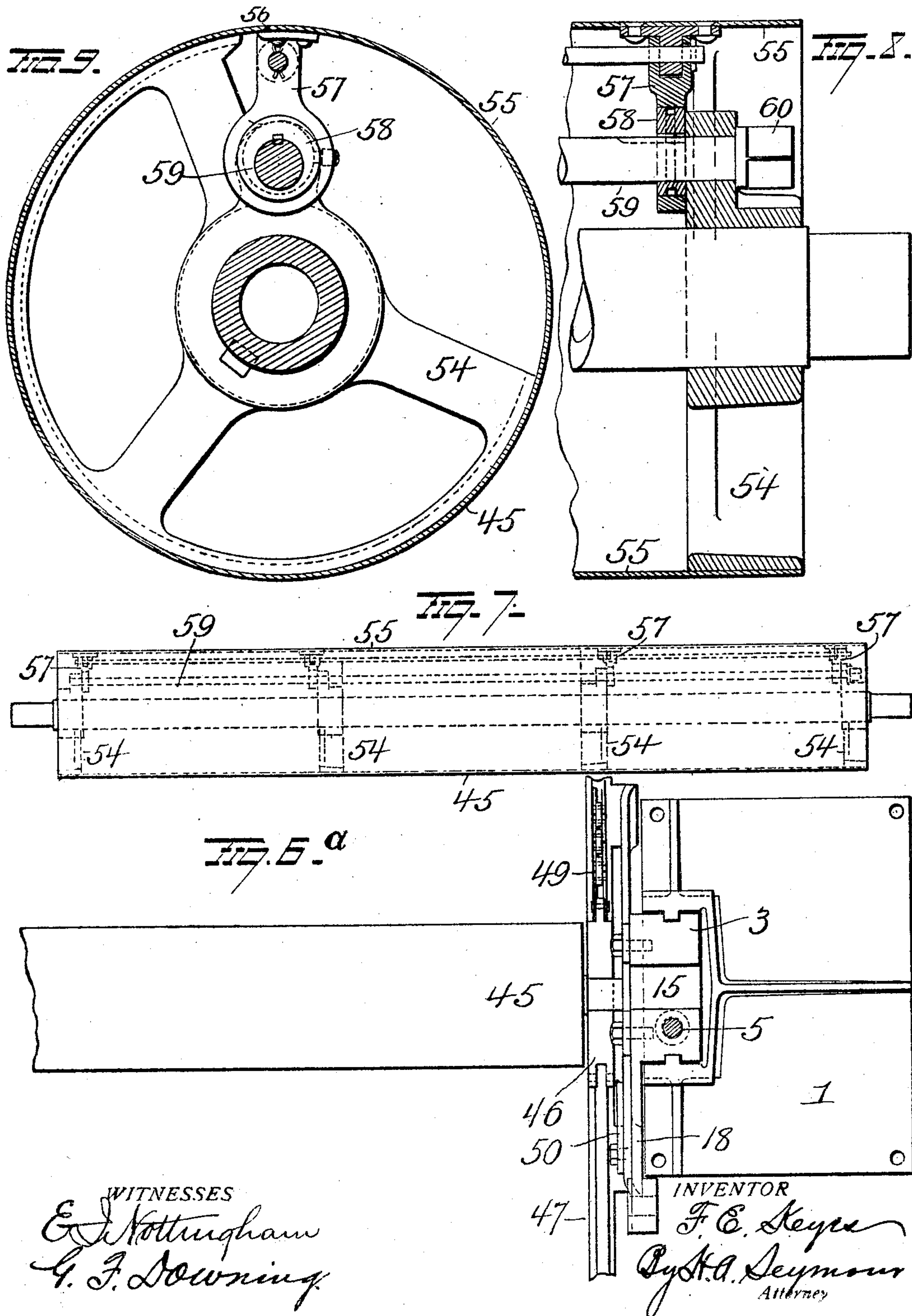
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3 SHEETS—SHEET 3.





# UNITED STATES PATENT OFFICE.

FRANK EUGENE KEYES, OF NEW YORK, N. Y.

## MACHINE FOR FELTING PULP.

No. 796,583.

Specification of Letters Patent.

Patented Aug. 8, 1905.

Application filed February 10, 1904. Serial No. 192,949.

*To all whom it may concern:*

Be it known that I, FRANK EUGENE KEYES, of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Machines for Felting Pulp; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in machines for felting pulp, and is especially adapted for use in connection with and is an improvement on the machine patented by me February 11, 1902, No. 692,862. In that patent I show and describe a perforated or reticulated mold or pulp-cylinder divided internally into radial compartments and revolving in a vat containing the pulp, the said cylinder being so constructed and arranged that a layer of the pulp is caused to adhere to the periphery of the mold or pulp-cylinder as the latter revolves, the superfluous moisture being removed from the said layer of pulp by maintaining the radial compartments of the mold or pulp cylinder as they leave the pulp-vat and approach the couch in a vacuous condition, thus extracting the moisture from the fiber before the latter leaves the mold or pulp-roll. The layer of pulp thus deposited on the mold or pulp-cylinder is removed from the latter by the couch-roll and deposited upon the winding-roll until the required thickness has been obtained, after which the material that has been wound on the winding-roll is removed by severing it, thus leaving it free to be stripped from the winding-roll. With such an apparatus the product is a sheet or board having a surface area approximately the surface area of the winding-roll.

My present invention consists, first, in the introduction between the couch and the main winding-roll of a removable collapsible winding-roll designed for forming tubes or tubes from which barrels, buckets, kegs, or similar articles may be formed, and, second, in providing the mold and couch-rolls with suction-openings at their ends, the said openings being of greater area than the closed sections of the ends.

With these ends in view my invention consists in the parts and combinations of parts and in the details of construction, as will be more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in plan, partly in section, of my improved apparatus, the mold being removed. Fig. 2 is a view in vertical section on the line *a a* of Fig. 1, the mold and couch-rolls being removed. Fig. 3 is a view in section on line *b b* of Fig. 1 through the vat and showing the mold, couch and winding rolls in end elevation, and also showing the near track and the frame supporting the same. Fig. 4 is a view in end and also in side elevation of one of the end plates for the mold and couch-rolls. Fig. 5 is a view showing the winding-roll and its bearing-block and track, the block and track being in section. Fig. 6 is a view in side elevation, and Fig. 6<sup>a</sup> is a view in plan, of same. Fig. 7 is a view of the winding-roller complete, showing the details in dotted lines. Fig. 8 is a view in vertical longitudinal section of one end of the winding-roll. Fig. 9 is a view in transverse section of said roll, and Fig. 10 is a sectional view of the gearing for elevating and lowering the winding-roll.

1 represents a pair of standards or uprights formed with suitable vertical guideways 2, in which the bearings 3 of the winding-roll 4 are adapted to be raised or lowered to accommodate rolls of various sizes. The bearings 3 are each provided with a screw-threaded opening or bore for the passage of a screw 5, which latter is mounted in suitable bearings in the uprights or standards 1. Each screw 5 is provided on its upper end above its upright or standard 1 with a pinion 6, which latter is engaged by the pinion 7 on the slightly-inclined shaft 8, journaled in bearings on the rear side of the apparatus. Each shaft 8 is provided on its lower end with a bevel-pinion 9, which meshes with a bevel-pinion 10 on the horizontal shaft 11. This shaft 11 extends lengthwise the apparatus and carries both bevel-pinions 10. Power is applied to shaft 11 by belt-pulley 12, secured on stub-shaft 12<sup>a</sup>. This stub-shaft is mounted in a suitable bearing carried by the frame of the apparatus and has keyed thereto the bevel-pinion 12<sup>b</sup>, which meshes with pinion 12<sup>c</sup>, mounted on a pin carried by the frame of the apparatus. This pinion 12<sup>c</sup> meshes with pinion 12<sup>d</sup> loose on shaft 11, and between pinions 12<sup>b</sup> and 12<sup>d</sup> is located the sliding clutch 12<sup>e</sup>, keyed to shaft 11, and is designed to engage clutch-teeth on said pinions 12<sup>b</sup> and 12<sup>d</sup>. When the clutch is out of engagement with pinion 12<sup>d</sup>, the latter simply rotates without



imparting any movement to its shaft 11. When the clutch is moved into engagement with pinion 12<sup>d</sup>, thus locking the latter to shaft 11, rotary movement in one direction will be imparted to said shaft through the pinions 12<sup>b</sup>, 12<sup>c</sup>, and 12<sup>d</sup>, and when the clutch is shifted to the other extreme the shaft 11 will be rotated in the opposite direction by the engagement of the clutch (which, as before stated, is keyed to shaft 11) with pinion 12<sup>b</sup>. By this arrangement shaft 11 can be rotated in either direction to raise or lower the winding-roll or can be disconnected, so as to remain stationary.

After the proper thickness of fiber has been deposited on the winding-roll the latter can be elevated above the couch-roll and the sheet or board severed and unwound. After the sheet or board has been removed from the winding-roll by reversing the direction of motion of the screws 5 the winding-roll can be lowered onto the couch-roll in a position to take the adhering film of fiber therefrom.

The bearings 3 are each provided with an open slot 15, in which the trunnions 14 of the winding-roll rest and in which they move. The winding-roll rests with a yielding pressure on the couch-roll. Hence as the fiber is deposited on the winding-roll the latter is gradually elevated until the desired thickness of board has been obtained. The pressure on the winding-roll is regulated by the levers 16, which latter are pivoted at 17 to the arms 18. The arms 18 are integral with their respective bearings 3, and each lever 16 bears on a trunnion 14 of the winding-roll 4. The longer members of the arms 16 carry at their ends the rods 19, on which removable weights may be placed for increasing the pressure. The fiber is delivered to the winding-roll from the couch-roll 21, the latter being mounted in the frame with its periphery in contact with the periphery of the pulp mold or cylinder. This couch-roll 21 is hollow, with a perforated or reticulated periphery, and is connected to the shaft 22 by a coupling interposed at the point 23, so as to permit the roll to be removed and recovered or repaired, as necessity demands. The shaft 22 is provided with a gear 22<sup>a</sup>, meshing with driving-gear 22<sup>c</sup>, which latter is fixed on the shaft 22<sup>d</sup>, carrying the belt-pulley 22<sup>e</sup>. The couch-roll is provided with the toothed gear 24, which meshes with a similar gear 44<sup>a</sup> on pulp-mold 25, thus causing the couch and mold to rotate in unison. This mold or cylinder 25 is provided centrally with a hollow core 26, which is of double-conical shape in longitudinal section—that is to say, is in the shape of two hollow cones placed base to base—the portion outside of said central conical section being divided into compartments 27 by a series of radial partitions 28, which terminate in contact with the inner face of the perforated or reticulated periphery of the mold. The central part of the inter-

nal double cone is provided with a peripheral rib 29 for supporting the reticulated circumferential covering of the mold or cylinder 25, the rib having openings therein for the free passage of air from one end of the cylinder to the other.

The vat 31 is provided with a supply-pipe for the pulp and with an overflow-pipe for the escape of the surplus pulp. The overflow-pipe 32 maintains the pulp in the vat at a uniform level, and, if desired, the said pipe may be screwed into its seat, so as to render it adjustable with respect to its height, so that the level at which the overflow occurs may be varied.

The pulp mold or cylinder 25 is open at its two ends, and the latter are overlapped by flexible bands or rings 45, which latter are carried by the ends of the vat and are designed to seal the joint between the ends of the vat and the revolving mold or cylinder and prevent the ingress through the ends of the mold of pulp or air into the compartments of the mold or cylinder.

Located at the two ends of the mold and within the vat are the plates 20. These plates each have a hub to receive the shaft of the mold, and each is held against rotation on the mold-shaft by a pin secured to its plate and resting between the brackets 20<sup>a</sup>, secured to a stationary part of the vat or frame. By changing the position of the brackets it will be readily seen that the position of the plates can be changed with relation to the ends of the compartments. These plates rest up close to the ends of the partitions in the mold and cover and close that portion of the mold from a point just in the rear of the point where the pulp is removed from the mold by the couch to a point below the pulp-level in the vat, or less than one-half of the open ends of the molds, thus leaving the greater area of the ends exposed to the suction. In other words, the compartments in the mold that are not covered with the pulp, but which, on the contrary, have deposited their pulp on the couch and are returning to the vat, are covered by the end plates, so as to prevent any suction through them, as no suction is needed there, while those compartments which are on the upward move toward the couch are exposed at their ends to the suction. The open compartments in the mold or those not covered by plates 20 are in direct communication with the suction-chamber 33, which latter is connected at 36 with the pipe of an exhaust-fan, which operates to maintain a partial vacuum or constant suction within those compartments of the mold not covered by plates 20, and thus cause not only the fibers to be drawn onto the mold and adhere thereto and the felting together of the fibers of the several sheets, but extracts the water from the adhering plates.

The couch 21 is identical in structure with the mold, except that it is of less diameter



and its longitudinal partitions, which divide the roll into longitudinal compartments, are straight at their outer ends instead of curved, as in the mold. The couch is also provided at each end with a plate 20<sup>b</sup>, similar in all respects to the plates 20 at the ends of the mold, which cover the compartments that have deposited their pulp on the winding-roll down to the points where they take pulp from the mold, thus cutting out from the suction those compartments of the couch not covered with pulp. The compartments of the couch not covered by plates 20<sup>b</sup> are in communication with suction-flues 38, also leading to the pipe of the suction-fan, the flues into which the mold and couch discharge their air being each provided with a damper by which the suction or exhaust can be regulated and controlled.

The suction at the ends of the molds necessarily draws in air through the pulp, and the water from the pulp and the air and water thus drawn into the compartments in the mold are discharged at the ends of the latter into the suction-chamber 33, the water being separated from the air, if deemed essential, before reaching the pump or exhaust-fan.

The shaft of the pulp mold or cylinder is carried in bearing-boxes 41, and the boxes 41 are pivotally supported in the yokes 42, carried by the levers 43. These levers are pivoted to the vat or tub and each is provided with adjusting mechanism 44, by which the mold or cylinder can be moved toward or away from the couch-roll. As the air or exhaust chambers or boxes are carried on the shaft of the mold or cylinder, it follows that when the latter is moved or adjusted the air boxes or chambers move therewith. The pulp mold or cylinder receives its motion from the couch-roll through the pinions 24 and 44<sup>a</sup>, the depth of the teeth of said pinions being such that these parts will not become disengaged by any variations in the position of the mold or cylinder relatively to the couch-roller.

The parts thus far described are designed for making sheets or boards. For making tubes I elevate the winding-roll previously described and interpose a collapsible roller 45. This roll 45 is mounted at its ends in the sliding blocks 46, which latter are mounted on the parallel horizontal rails 47, the boxes being grooved to receive the heads of the rails. These rails project from both sides of the machine and each is provided with a spring-tooth 48, designed to enter a recess in sliding block 46 and yieldingly hold the latter against a sliding movement.

Mounted in brackets projecting from the frame of the apparatus is the shaft 47<sup>a</sup>, provided near its ends with the wheels 48<sup>a</sup>. Secured to each wheel is a chain or wire rope 49, the rear ends of which are designed to be detachably secured to the front ends of the blocks 46, so that when the wheels are turned

in the proper direction, by hand-power or otherwise, the blocks carrying the collapsible roll will be pulled forward toward the front ends of the tracks. In the operation of the device while one collapsible roller is receiving its coating of pulp I detachably connect another pair of blocks 46 to the rear of the blocks carrying the roll being covered, so that when the roll in operation has been covered the act of withdrawing it brings another roll into place, thus making the operation of the machine practically continuous. When one roll has been covered to the desired thickness, it is withdrawn from the rails and is then detached from the blocks in the rear and also from the chains. The free ends of the chains are then connected up to the front end of the blocks carrying the roll being covered and another set of blocks carrying an empty roll is mounted on the rails from the rear ends of the latter and connected up to the rear of the blocks carrying the roll being operated upon. By this construction and operation of the rolls as one is withdrawn from an operative position another is drawn into position, so that the operation is continuous, no stoppage being necessary for the removal of the covered roll or the introduction of a new roll.

The collapsible rolls rest in slots in the blocks and as they are covered with the necessary layers of pulp they gradually rise until the required thickness has been deposited and they are held down in their seats by the levers 50, each of which is provided with a depending bearing 51, having curved or beveled ends with which the trunnions of the rolls engage as they are drawn into and moved from their operative positions. These levers 50 are pivoted to the frame at 52 and each is provided at its outer end with a weight 53, which latter holds its lever against the trunnions and the periphery of the roll in a position to take the film of pulp from the couch.

The roll 45 is, as before explained, designed for making pipes or tubes or barrels, buckets, or keg-bodies. Hence it must be so constructed as to be collapsed within the tube, so as to permit the tube, pipe, or other article to be stripped intact therefrom, and while this may be accomplished in various ways I have shown a roll comprising a series of spiders 54, one located at each end and preferably two intermediate its ends. These spiders each comprise a hub, a series of arms, and a rim, the latter being broken away a distance sufficient to permit of the contraction of the sheet-metal covering 55. This covering 55 is in the form of a slitted cylinder and is secured to the rims of the spiders with its free edge 56 terminating near one set of arms. This free edge 56 is supported on a series of links 57, each of which is mounted on a cam 58. The several cams are preferably located adjacent to the spiders and are secured on a shaft 59, running lengthwise the roll. This shaft is provided at one end with



a square or angular head 60 for the attachment of a wrench, key, or other device by which the shaft and cams are turned, thus drawing inwardly or collapsing that part of the sheet-metal covering not supported by the spiders. This collapsing of the roll detaches the latter from the pulp-tube and permits the latter to be withdrawn. With the machine as above described I am enabled to not only make tubes, but by using the large upper winding-roll 4 can make sheets or boards, and by the use of the plates or heads covering those compartments of the mold and couch not covered by pulp I am enabled to secure much greater suction than has ever before been attained, and hence produce a pulp containing much less moisture.

It is evident that changes in the construction and relative arrangement of the various parts might be made without avoiding my invention, and hence I would have it understood that I do not restrict myself to the particular construction and arrangement of parts shown and described; but,

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

1. In a machine for felting pulp, the combination with a vat, a mold rotating therein, a couch-roll, adjacent to the mold so as to take the fiber therefrom, a winding-roll and suction-chamber, the mold being divided into a series of longitudinal compartments by partitions, of a plate so located as to cover one end of the compartments of the mold not coated with the pulp or fiber, the other compartments communicating with the suction-chamber.
2. In a machine for felting pulp, the combination of a vat, a rotating mold therein, the latter being divided into a series of longitudinal compartments by partitions, plates covering the ends of a series of said compartments not coated with pulp, and a suction-chamber in communication with the other compartments.
3. In a machine for felting pulp, the combination of a vat, a rotating mold adapted to take pulp from the vat, the said mold being divided into a series of independent compartments by longitudinal partitions, plates covering the two ends of a series of said compartments not covered with pulp, and suction-chambers in communication with the two ends of the remaining compartments.
4. In a machine for felting pulp, the combination of a vat, a rotating mold adapted to take pulp from the vat, the said mold being divided into a series of compartments by longitudinal partitions, adjustable plates covering the two ends of a series of said compartments not covered with pulp, and suction-chambers in communication with the two ends of the remaining compartments.

5. In a machine for felting pulp, the combination with a vat, a mold and a couch-roll, of a horizontal trackway above the couch-roll and a winding-roll mounted on blocks or trucks carried by said track.

6. In a machine for felting pulp, the combination with a vat, a mold and a couch-roll, of horizontally-sliding bearings located above the couch-roll and a winding-drum carried by said bearings.

7. In a machine for felting pulp, the combination with a vat, a mold and a couch-roll, of horizontal tracks above the couch-roll, sliding bearings removably mounted on said tracks, means for sliding the bearings and a winding-roll carried by said bearings.

8. In a machine for felting pulp, the combination with a vat, a mold for taking the pulp or fiber therefrom, and a couch-roll, of a horizontal track above the couch-roll, sliding blocks on said track, a winding-roll carried by said blocks and weighted levers for holding the winding-roll in position.

9. In a machine for felting pulp, the combination with a vat, a mold for taking the pulp or fiber therefrom and a couch-roll, of horizontal tracks located above the couch-roll, sliding blocks mounted on said tracks, a collapsible roll carried by said blocks and means for sliding the blocks.

10. In a machine for felting pulp, the combination with a vat, a mold rotating therein, a couch-roll and a winding-roll, the couch-roll being divided into a series of longitudinal compartments by partitions, of a plate so located as to cover the end of the compartments of the couch not coated with the pulp, the other compartments communicating with a suction-chamber.

11. In a machine for felting pulp, the combination with a vat, a mold rotating therein, a couch-roll and a winding-roll, the couch-roll being divided into a series of longitudinal compartments by partitions, of plates covering both ends of the compartments of the mold not coated with pulp or fiber the other compartments communicating with suction-chamber.

12. In a machine for felting pulp, the combination with a vat, a mold, a couch-roll and a winding-roll, the couch and mold being divided into a series of compartments by longitudinal partitions, of plates so located as to cover the ends of the compartments of the mold and couch not coated with pulp, the other compartments communicating with suction-chamber.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANK EUGENE KEYES.

Witnesses:

GEO. F. DOWNING,  
S. G. NOTTINGHAM.