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Patented Nov. 19, 1901.

J. H. BAKER, G. F. SHEVLIN & F. H. BAKER.

CENTRIFUGAL PULP SCREEN.

(Application filed May 15, 1901.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

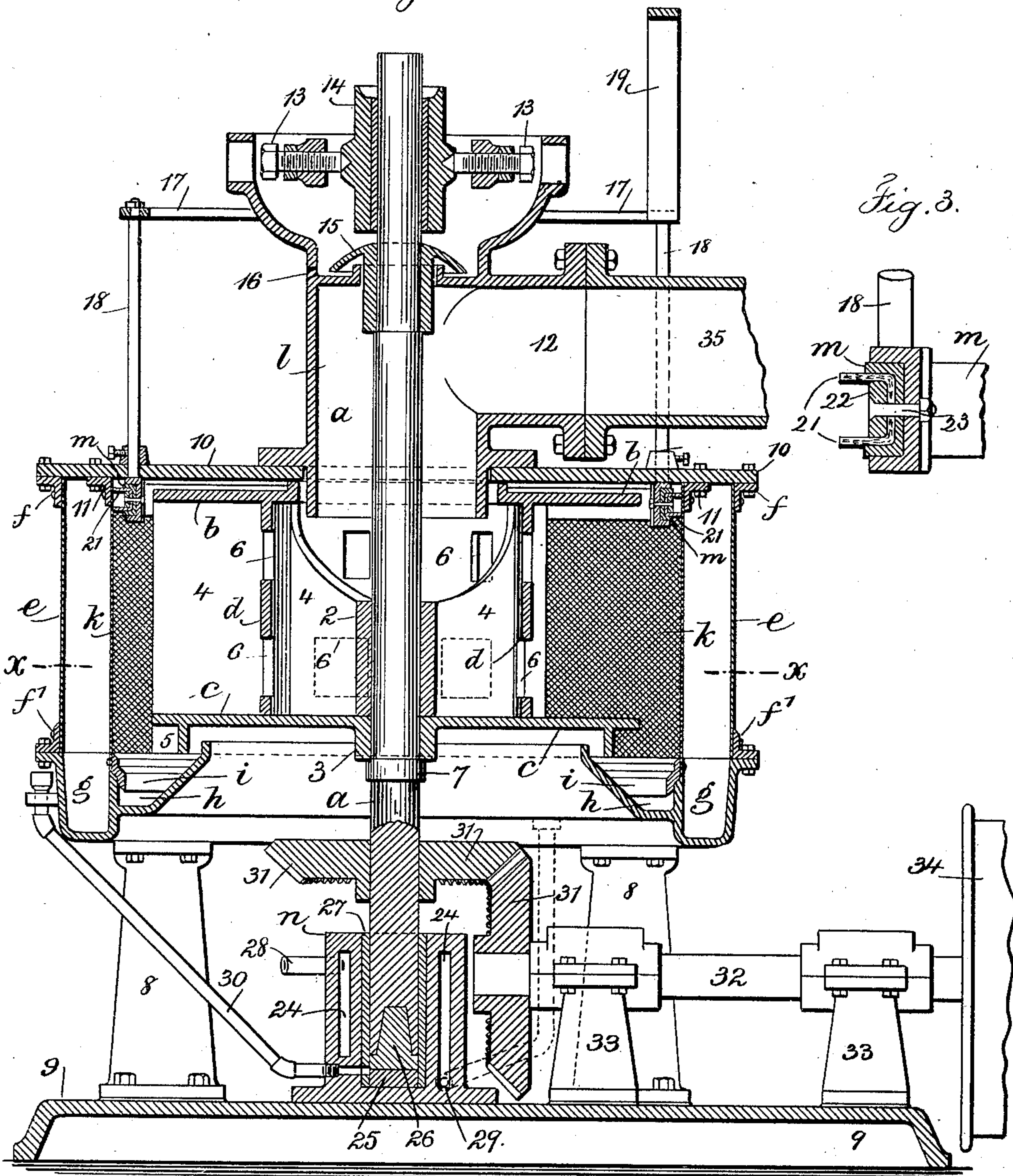
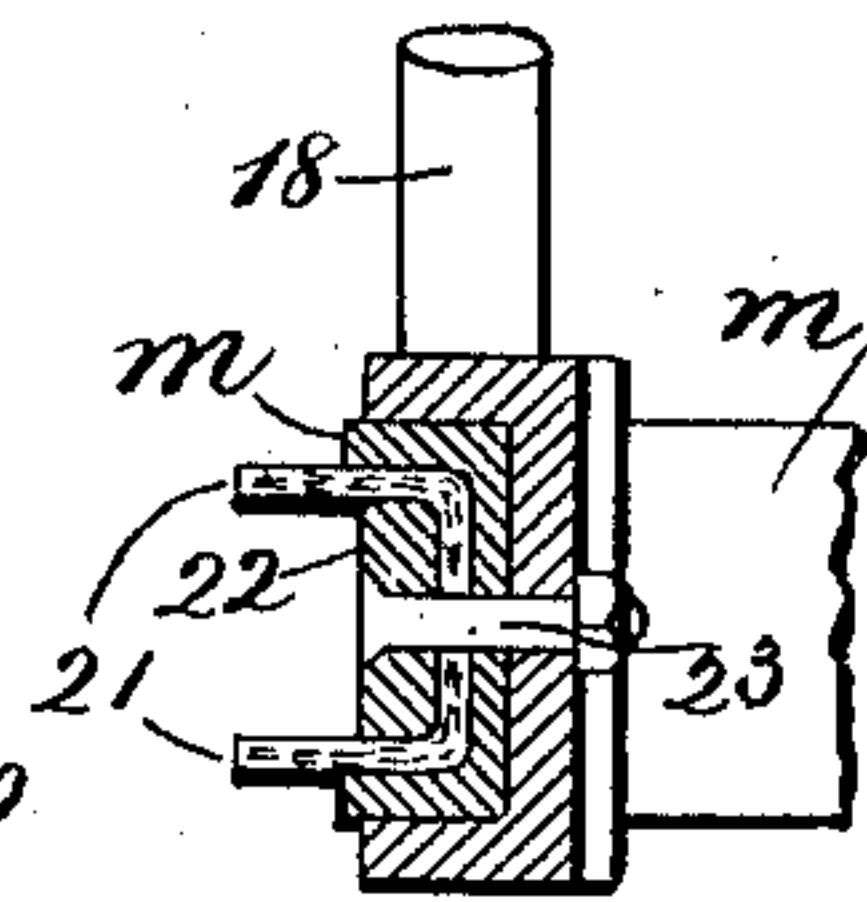


Fig. 3.



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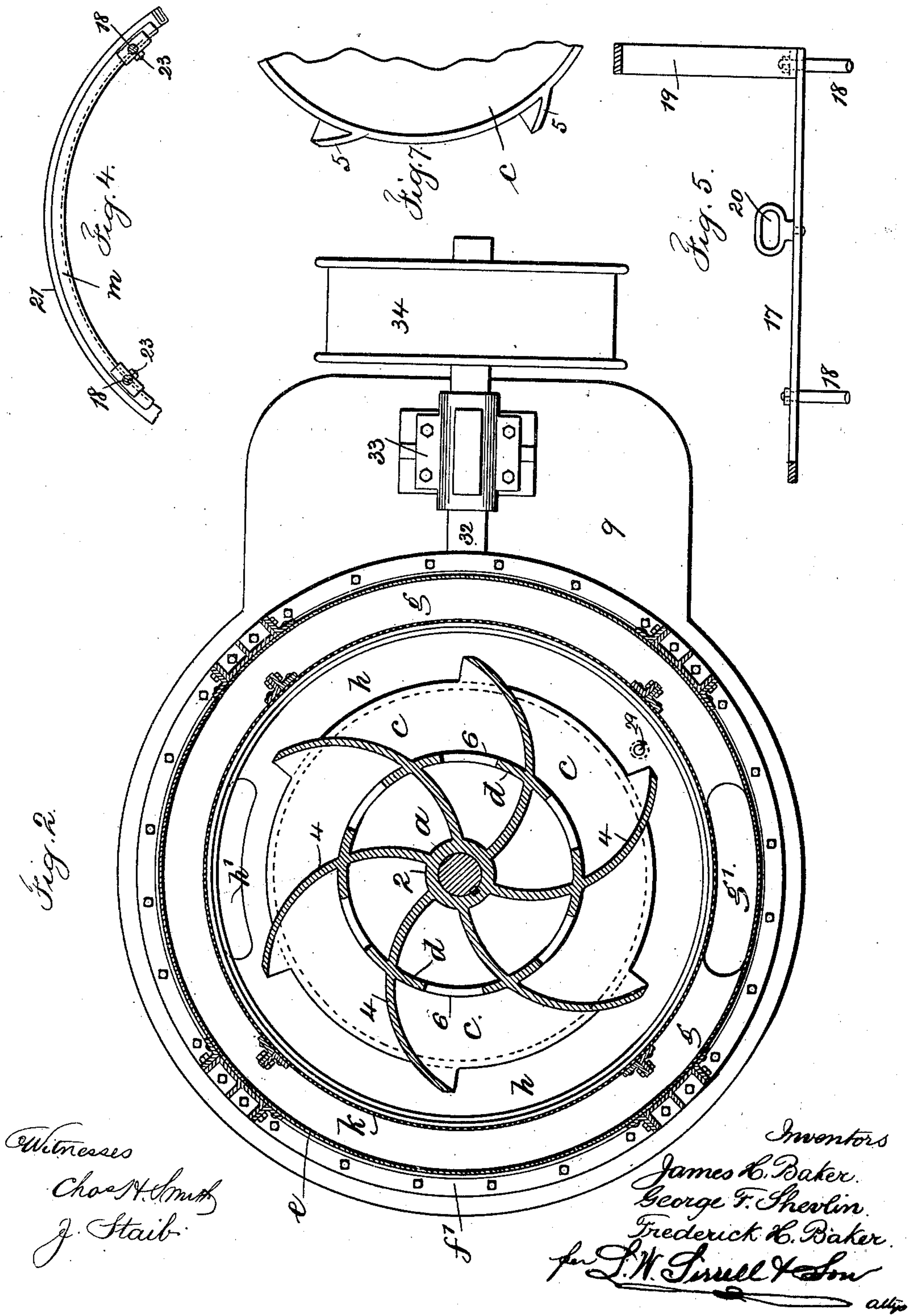
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3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

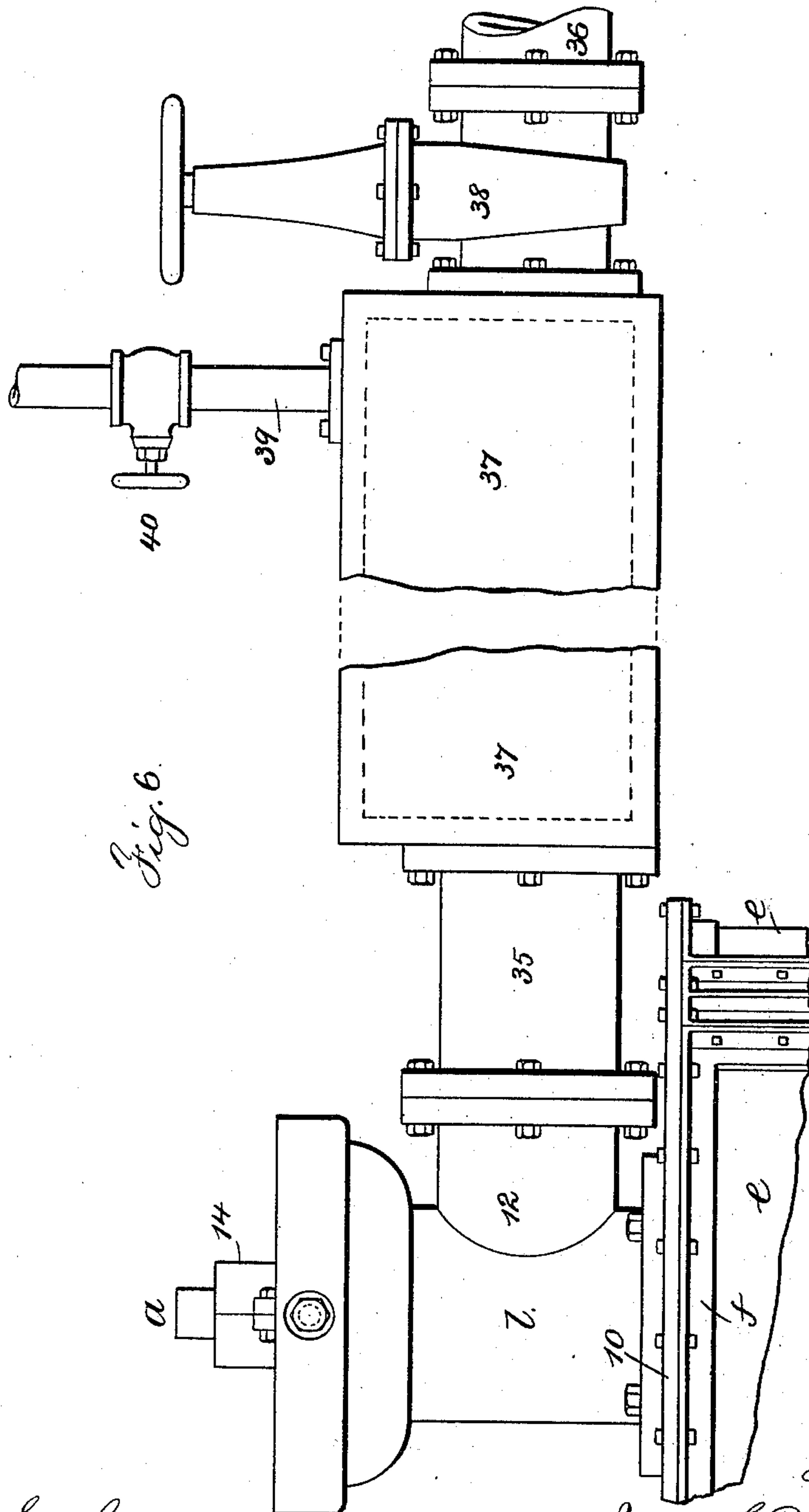


Fig. 6.

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CENTRIFUGAL PULP-SCREEN.

SPECIFICATION forming part of Letters Patent No. 686,962, dated November 19, 1901.

Application filed May 15, 1901. Serial No. 60,292. (No model.)

To all whom it may concern:

Be it known that we, JAMES H. BAKER, GEORGE F. SHEVLIN, and FREDERICK H. BAKER, citizens of the United States, residing at Saratoga Springs, in the county of Saratoga and State of New York, have invented an Improvement in Centrifugal Pulp-Screens, of which the following is a specification.

Our invention relates to improvements in centrifugal mechanism and devices for treating pulp and paper stock, and the same comprises improvements upon Letters Patent granted to us October 12, 1897, No. 591,645; Letters Patent granted May 16, 1899, No. 625,275, and Letters Patent granted to B. Ziegler February 23, 1897, No. 459,495. In the devices of these patents, as in our present invention, the pulp and paper stock are screened by centrifugal action to separate the fine stock, which is delivered in one direction, from the slivers, which are conveyed away in another direction for their separate use and after-treatment.

In the machine of our present invention the supply of pulp carrying the fiber and the supply of water to reduce the consistency thereof are each regulated as desired in a mixing-chamber or flow-box, from which they pass to the pulp-screen. In the present device the pulp-stock is received at the center of the machine and we employ centrifugal devices comprising superposed beater wheels or wings for throwing the fiber and water outward against circular segmental screen-plates. Centrally-placed troughs receive the good stock and the slivers and exit-passages therefrom convey the same away. We make use of a cleaner of annular form against the inner surface of the screen-plates, which cleaner is movable vertically and periodically as desired by devices connected therewith and outside the centrifugal pulp-screen, said cleaner being adapted for removing substances that may adhere to the said screen-plates. The casting for the step of the shaft is hollow, and it is cooled by water flowing therethrough, and devices are provided for supplying an abundance of oil to the lower end of the shaft and the step supporting the same. We prefer to utilize the water employed in the hollow-step casting for cooling the same for the purpose

of washing out the slivers from the trough receiving the same, and with this end in view connect the said hollow step with the said trough by a pipe, so that the flow of water is continuous through the step and the sliver-trough.

In the drawings, Figure 1 represents a vertical section and partial elevation of our improved centrifugal screen. Fig. 2 is a sectional plan of the same at the line $x x$ of Fig. 1. Fig. 3 is a vertical section in larger size, showing the details of the screen-cleaner. Fig. 4 is a plan showing a segment of the said screen-cleaner. Fig. 5 is an elevation and section showing part of the devices connected to the said screen-cleaner outside of the machine and by which the same may be raised or lowered; and Fig. 6 is an elevation at the upper end of the machine, showing the devices for supplying pulp or paper stock and water to the machine. Fig. 7 is an inverted plan of a portion of the lower beater-wheel.

The vertical revoluble shaft a passes through the machine, and this shaft is provided with hubs 2 3, and beater-wheels are formed integral with said hubs and the beater-wheels are superposed. The uppermost of the beater-wheels comprises a cover-plate b , blades 4, of curved form, that extend outward from the hub 2 to the periphery of the cover-plate b , and the intermediate ring d , provided with perforations 6, two of which are arranged between the blades 4, the one above the other. The hub 2, the cover-plate b , the blades 4, and the intermediate perforated ring d are all advantageously made integral, and it will be noticed from Fig. 1 that the portions of the blades 4 between the perforated ring d and the hub are downwardly curved to the hub, because the hub is of shorter vertical dimensions than the ring d , and the inner periphery of the cover-plate b is preferably made with a raised edge, the upper surface of which lies closely adjacent to the under surface of the cover of the machine for the purpose of making a close joint.

The lowermost of the beater-wheels comprises the hub 3, the cover-plate c , and the short curved blades 5, that extend from the downward projection of the cover-plate

(shown by section in Fig. 1) to the periphery of the same, so that in these beater-wheels the hub 3, the cover-plate *c*, and the blades 5 are advantageously made integral. The hubs 5 are keyed to the shaft, so that the shaft and the beater-wheels revolve together, and the shaft is advantageously made with a collar 7, coming below the hubs 2 3 and serving largely as a support therefor.

10 The periphery of the cover-plate *c* is cut away to the surface of its depending flange between the overlapping parts of the blades 4 of the upper beater-wheel. The blades 4 5 are vertically in line and angular. Peripheral 15 portions of the cover-plate *c* are left adjacent to the lower edges of the beaters 4 to form supports for and to stiffen the blades 5 with reference to the cover-plate *c*. Standards 8 are connected to and supported by the base 9 20 and annular cast-metal troughs *g h*, concentric with one another, are provided and supported upon the standards 8. The trough *g* is to receive the good stock and the trough *h* the slivers, and we provide openings *g'* and *h'* 25 from the troughs *g* and *h* for delivering the good stock and the slivers to devices adapted for conveying the same away to any desired place or for any desired further use.

We provide segmental metal casings *e*, connected together and at their top and bottom 30 edges to ring-like frames *f f'*. These parts are similar to what we have shown in our former patent, No. 625,237. The lower ring-like frame is bolted to a flange of the cast-metal trough *g* and the upper ring-like frame 35 *f* is bolted to the cover 10. The cover is made with an open center substantially of the same dimensions as the opening in the cover-plate *b* of the upper beater-wheel, and we provide 40 a cylinder *l*, extending into the upper beater-wheel through the opening in the cover and rising above the cover and provided with a flange bolted to the cover, with an inlet-pipe 12, with adjusting-screws 13 for the bearing- 45 sleeve 14, and with a deflector 15 over the shaft-opening in the cylinder to prevent oil passing to the centrifugal portion of the apparatus. This cylinder *l* and the parts connected therewith and enumerated 12, 13, 14, 50 and 15 are also similar to those heretofore employed by us and described in our Patent No. 625,237. In the cylinder *l* and above the plate of the cylinder coming beneath the deflector 15 we provide an oil-hole 16, through which 55 any surplus oil may escape, thus preventing an overflow beneath the deflector.

In our present machine we employ an annular frame *i*, adapted to set upon and above 60 the division-wall between the troughs *g* and *h*. The circular segmental screen-plates *k* are preferably connected together by angle-iron plates, as shown in Fig. 1, and they are secured to the frame *i* and extend around the outer surface of said frame. The contacting 65 surfaces of the frame *i* and division-wall are preferably tapering toward the trough *h*, and the frame *i* projects upon the inside into the

trough *h*. The lower edges of the screen-plates *k* are connected to the annular frame *i* and the upper edges of the screen-plates to 70 a ring-frame 11, adapted to be bolted to the under surface of the cover 10. The ring-frame thus secures the upper end of the screen-plates *k* in a fixed relation to the cover, and the annular frame *i* preferably overlaps 75 the division between the troughs *g* and *h*, and it is apparent that when the upper parts of the machine are removed and the bolts of the ring-frame 11 and the frames *f* and *f'* loosened or removed the segmental metal cas- 80 ing *e*, as well as the screen-plates *k*, may be lifted out of the machine without disturbing the center shaft or either of the beater-wheels, the troughs, or the parts below the same.

We provide above the cover 10 a curved 85 plate 17, almost a ring, and rods 18, connected thereto and spaced apart, extend vertically through the cover 10 and may be provided at the cover with openings or with simple bosses as guides, and the ends of the metal plate 17 90 are provided with a loop 19, extending up and adapted to pass over the inlet-pipe 12, and handles 20 are placed upon the metal plate 17 at opposite sides of the cylinder *l* for the purpose of raising and lowering the plate 17, 95 loop 19, rods 18, and the screen-cleaner connected to the lower ends of the rods 18. This screen-cleaner is within the machine, bearing against the inner surface of the screen-plates *k*, and the same comprises a channel- 100 iron ring *m*, between the edges of which and the screen-plates *k* there is about one-half an inch clearance. This channel-iron is grasped by U-shaped feet at the lower ends of the rods 18, and within the channel-iron we pro- 105 vide a ring of rubber 21, that conforms to the channel-iron ring and the edges of which bear directly upon the inner surface of the screen-plates *k*, and a clamp-ring 22 fits within the rubber ring, and bolts 23 pass through the 110 clamp-ring and through the rubber ring, through the channel-iron ring *m*, and through the feet at the lower ends of the rods 18, securing all the parts firmly together. Fig. 3 shows in large size the detail of these parts, 115 Fig. 4 a plan of a segment, and Fig. 5 the devices at the upper ends of the rods 18. The normal position of this screen-cleaner is elevated, as shown in Fig. 1, and periodically the same is depressed by attendants grasping 120 the handles 20 and pushing the parts down for the purpose of cleaning from the inner surfaces of the screen-plates any thick slivers or foreign matter that may adhere thereto and which would interfere with the proper func- 125 tions of the machine. The openings 6 in the intermediate ring *d* are proportioned so as to equally distribute the stock over each of the plates 4, and the space within the perforated ring *d*, around the hub 2 and below the open 130 end of the cylinder *l*, forms a basin for the stock delivered from the inlet-pipe 12.

We provide a hollow-step casting *n* at the lower end of the shaft *a*, the recess 24 therein

being adapted to hold water supplied by an inlet-pipe 28 and carried away by an exit-pipe 29 for the purpose of cooling the steel block 25 in the base of the casting, the steel step 26 ; above the same and upon which the lower end of the shaft rests, and the bronze bushing 27, surrounding the lower end of the shaft, the step, and the block 25 and fitting within the casting *n*. The flow of water is preferably
 10 continuous and the water is advantageously utilized as conveyed away by the pipe 29 by continuing the said pipe upwardly and entering the same into the bottom portion of the sliver-trough *h* for the purpose of softening
 15 up the comparatively dry slivers and washing them out of the trough.

We provide a pipe 30, connected to an opening passing through the lower portion of the hollow step *n* and through the bushing 27,
 20 which pipe rises to a fastening at the side of the trough *g*. This pipe 30 carries a supply of oil by which the lower end of the shaft and the step are liberally lubricated. The shaft *a* is preferably provided to be driven with a
 25 pair of bevel-wheels 31, one of said wheels being upon said shaft and the other upon a shaft 32, mounted in bearings 33 on the base 9, and upon which shaft is a power-wheel 34. In the line of the inlet-pipe 12 we place aux-
 30 iliary inlet-pipes 35 36, with a flow-box 37 intermediate to the pipes 35 and 36, and in the pipe 36 is a valve 38. A pipe 39 for water enters the flow-box 37, and in this pipe is a valve
 40 40. The pulp or paper-stock enters the flow-box 37 by the pipe 36, and the valve 38 regulates the quantity. This pulp is usually too thick to pass through the machine, and water is ad-
 35 mitted by the pipe 39, the extent of which is regulated by the valve 40, and the thinned paper-pulp or paper-stock passes by the flow-box and by the pipe 35 and inlet-pipe 12 into the cylinder and down into the open center of the upper beater-wheel, where by the cen-
 40 trifugal motion quantities of material in proportion to the sizes of the openings 6 are forced through the openings against the blades 4, and by the rapidly-revolving blades 4 the ma-
 45 terial is forced against the screen-plates *k*, the watery materials and good stock passing through the screen-plates into the trough *g*, and the heavier coarse particles, known as "slivers" and "foreign material," fall into the trough *h*. The good stock is removed through the opening *g'* and conveyed away,
 50 and by the surplus water from the step, as heretofore described, the slivers are preferably removed and washed away through the opening *h'*.

The features of improvement embraced in
 60 the present machine contribute toward making an exceedingly perfect and fully operative mechanism superior to the machines heretofore employed by us.

We claim as our invention—

65 1. The combination in a centrifugal pulp-screen with devices for acting upon the pulp

or paper-stock, of a device for receiving the pulp or paper-stock and a supply of water for reducing the consistency thereof and in which a mixture is effected, independent de-
 70 vices for delivering the pulp and water thereto and regulating the same and other devices for delivering the mixture to the machine at the center thereof, substantially as set forth.

2. The combination in a centrifugal pulp-
 75 screen with devices for acting upon the pulp or paper-stock, and a cylinder and inlet-pipe to the machine, of a pipe connected to the inlet-pipe, a flow-box and a pipe connected therewith, a valve in the latter pipe for reg-
 80 ulating the flow of the paper-stock or pulp to the flow-box, a pipe entering the flow-box for water and the valve for regulating the same whereby the pulp or paper-stock is not only admitted in regulated quantities but is
 85 thinned to the extent desired before being passed into the machine.

3. In a centrifugal pulp-screen, the combination with the screen-plates and the power-
 90 shaft, of superposed beater-wheels each having blades in the same vertical line, the top of the lower beater-wheel, forming the bottom for the upper beater-wheel and the center of the upper beater-wheel, forming a receptacle for the pulp, said upper beater-wheel having
 95 means for permitting regulated quantities of pulp to escape to be acted upon by the blades thereof, substantially as set forth.

4. In a centrifugal pulp-screen, the combination with the screen-plates and the power-
 100 shaft, of superposed beater-wheels secured to said shaft and adapted to revolve together, the upper beater-wheel comprising a hub around the shaft, a cover-plate with an open center, curved blades extending out from the
 105 hub and an intermediate perforated ring and the lower beater-wheel comprising a hub around the shaft, a cover-plate forming a bottom to the upper beater-wheel and blades around the periphery thereof which occupy
 110 the same vertical plane as the blades of the upper beater-wheel, substantially as set forth.

5. In a centrifugal pulp-screen, the combination with the screen-plates and the power-
 115 shaft, of superposed beater-wheels secured to said shaft and adapted to revolve together, the upper beater-wheel comprising a hub around the shaft, a cover-plate with an open center, curved blades extending out from the
 120 hub and an intermediate perforated ring and the lower beater-wheel comprising a hub around the shaft, a cover-plate forming a bottom to the upper beater-wheel and blades around the periphery thereof which occupy
 125 the same vertical plane as the blades of the upper beater-wheel, the cover-plate of the lower beater-wheel having a depending flange from which the blades thereof radiate, the periphery of the said lower beater-wheel being cut away beyond the flange and between
 130 the blades, and the blades of the upper beater-wheel between the open center of the cover-

plate and the hub thereof being curved downwardly, substantially as and for the purposes set forth.

6. In a centrifugal pulp-screen, the combination with a power-shaft and beater-wheels, a surrounding casing, and troughs for good stock and slivers, of circular segmental screen-plates and means for connecting the same together vertically, an annular frame to which the lower edges of the said plates are secured and which frame is adapted to set over the division-wall between the said troughs but disconnected therefrom, and a ring-frame connected to the upper edges of the said screen-plates and adapted to be secured to the cover of the machine, whereby upon the removal of the cover the entire screen-plates and annular frames can be removed from the machine, substantially as set forth.

7. In a centrifugal pulp-screen, the combination with a power-shaft and beater-wheels, a surrounding casing and troughs for good stock and slivers, of circular segmental screen-plates and means for connecting the same together vertically, an annular frame to which the lower edges of the said plates are secured and which frame is adapted to set over the division-wall between the said troughs, said annular frame and the said division of the troughs having a tapering seat and the said frame projecting toward the center of the machine into the sliver-trough, and a ring-frame connected to the upper edges of the said screen-plates and adapted to be secured to the cover of the machine whereby upon the removal of the cover the entire screen-plates and annular frames can be removed from the machine, substantially as set forth.

8. In a centrifugal pulp-screen, the combination with the beater-wheels and the segmental screen-plates, of a vertically-movable screen-cleaner of annular form setting against the inner surfaces of the screen-plates and normally occupying an elevated position and adapted to be moved from the outside of the machine vertically for the purpose of removing foreign material from the inner surfaces of the screen-plates, substantially as set forth.

9. In a centrifugal pulp-screen, the combination with the beater-wheels and the segmental screen-plates, of a screen-cleaner comprising a channel-iron ring with a clearance between the same and the screen-plates, a ring of rubber passing around and into the channel-iron ring and conforming thereto with the edges thereof against the screen-plates, a metal clamp-ring and bolts for connecting the parts, rods passing through the top plate of the machine and having lower ends adapted to engage the said channel-iron ring, and means outside of the machine and adapted to raise and lower the rods and the screen-cleaner, substantially as set forth.

10. In a centrifugal pulp-screen, the combination with the beater-wheels and the segmental screen-plates, of a screen-cleaner comprising a channel-iron ring with a clearance

between the same and the screen-plates, a ring of rubber passing around and into the channel-iron ring and conforming thereto with the edges thereof against the screen-plates, a metal clamp-ring and bolts for connecting the parts, rods passing through the top plate of the machine and having lower ends adapted to engage the said channel-iron ring, and a circular metal plate above the cover of the machine and to which the vertical rods are secured, a loop connecting the ends of the circular plate and extending over the inlet-pipe of the machine and handles connected to the said circular plate by which the parts are raised and lowered that the screen-cleaner may act upon the inner surface of the screen-plates in performing its function, substantially as set forth.

11. In a centrifugal pulp-screen, the combination with the vertical shaft and the beater-wheels carried thereby, of a hollow step-casting, a central bronze bushing receiving the lower end of the shaft and a step within the bushing, a water-supply pipe by which the recess in the step-casting is filled with water and an exit-pipe therefrom, substantially as set forth.

12. In a centrifugal pulp-screen, the combination with the vertical shaft and the beater-wheels carried thereby, of a step-casting, a central bronze bushing receiving the lower end of the shaft, a steel step upon which the shaft is supported and rotates, there being an opening through the step-casting to the lower end of the shaft, and an oil-pipe connected to the step-casting at said opening and rising to the side of the machine to hold a supply of lubricating-oil, substantially as set forth.

13. In a centrifugal pulp-screen, the combination with the vertical shaft, the beater-wheels mounted thereon and the sliver-trough, of a hollow step-casting receiving the lower end of the said shaft, an inlet-pipe for water connected to the said casting and communicating with the recess therein, a pipe connecting with the lower end of the said recess and extending to the said sliver-trough whereby a continuous flow of water is maintained through the hollow step-casting and into the sliver-trough for the purpose of not only cooling the bearing of the shaft, but utilizing the same water for washing away the slivers, substantially as set forth.

14. In a centrifugal pulp-screen, the combination with the power-shaft, of a centrifugal beater-wheel comprising an open center and a hub around the shaft, blades extending out from the hub and an intermediate ring having perforations between the blades, a cover-plate connected to the shaft and forming an imperforate bottom for the beater-wheel and said parts forming a central receptacle for the pulp and the openings in the perforated ring permitting regulated quantities of pulp to escape therefrom to be acted upon by the blades, substantially as set forth.

15. In a centrifugal pulp-screen, the combi-

nation with the screen-plates and the power-
shaft, of a centrifugal beater-wheel compris-
ing a hub around the shaft, a cover-plate with
an open center, curved blades extending out
5 from the hub, and an intermediate ring hav-
ing upper and lower perforations between the
curved blades, a cover-plate connected to the
shaft and forming a bottom for the beater-
wheel, the blades of the beater-wheel between
10 the perforated ring and the central hub be-
ing curved downwardly and said part form-
ing a receptacle for the pulp, the openings in
the perforated ring permitting regulated
quantities of pulp to escape to be acted upon
15 by the blades, and a vertically-movable de-

vice of annular form setting against the inner
surfaces of the screen-plates and adapted to be
moved from outside of the machine at any
time during the operation of the machine for
the purpose of cleaning the screen-plates by 20
removing foreign material and large particles
from the inner surfaces thereof, substantially
as set forth.

Signed by us this 4th day of May, 1901.

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