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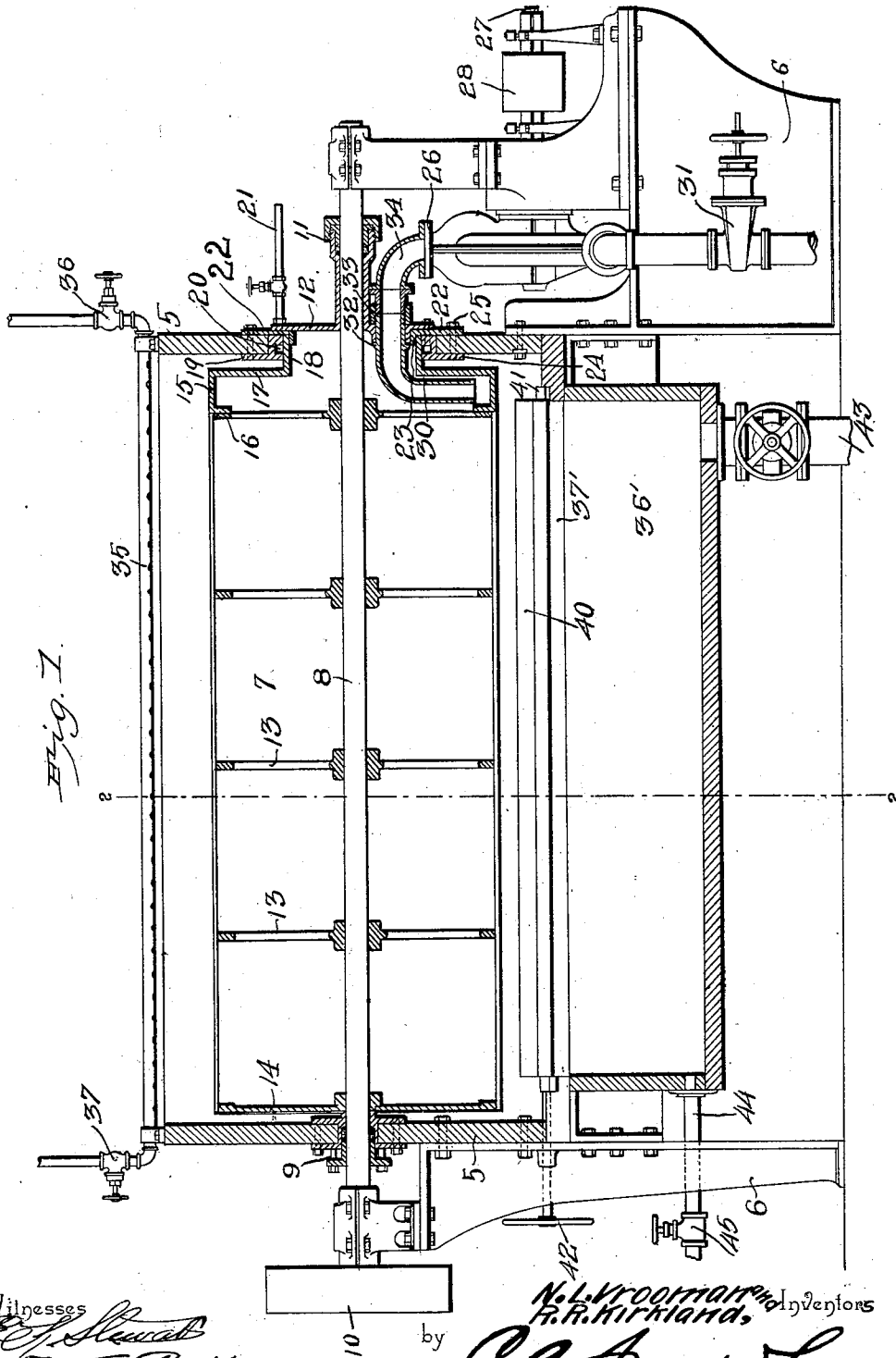
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PAPER PULP STRAINER.

(Application filed Feb. 18, 1902.)

(No Model.)

3 Sheets—Sheet 1.



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Fig. 3.

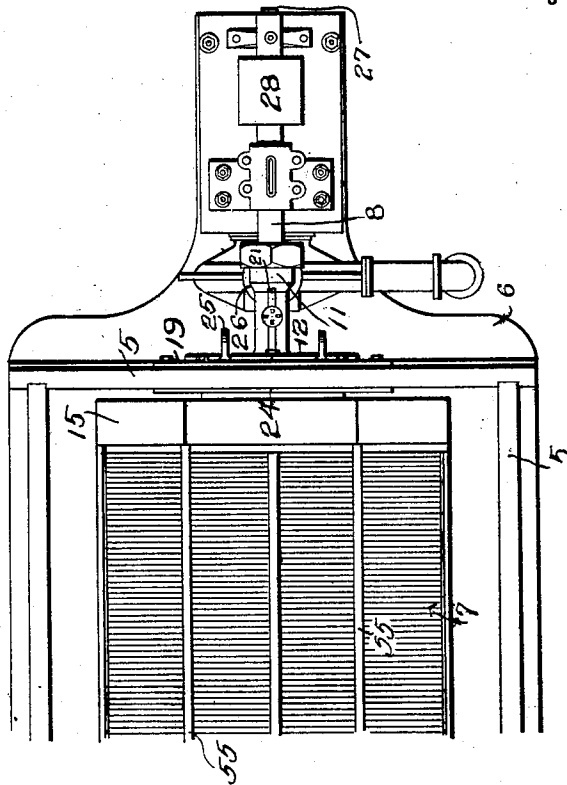
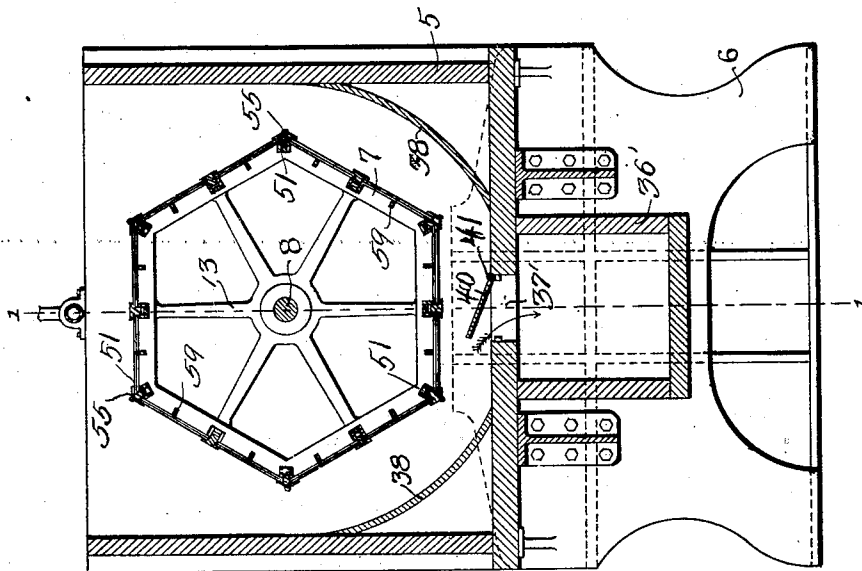


Fig. 2.



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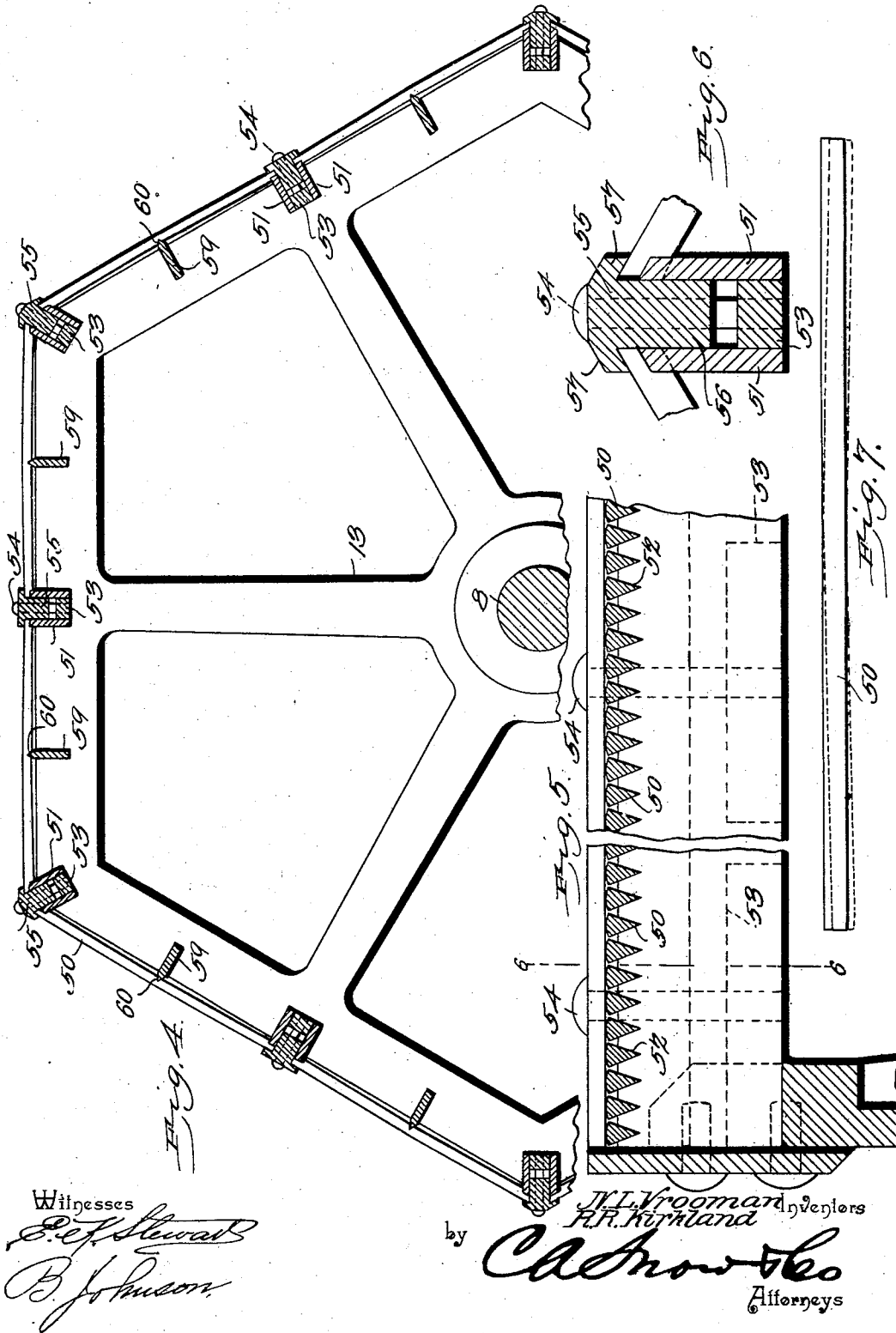
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

NATHANIEL L. VROOMAN AND ROBERT R. KIRKLAND, OF WATERTOWN,
NEW YORK.

PAPER-PULP STRAINER.

SPECIFICATION forming part of Letters Patent No. 703,682, dated July 1, 1902.

Application filed February 18, 1902. Serial No. 94,704. (No model.)

To all whom it may concern:

Be it known that we, NATHANIEL L. VROOMAN and ROBERT R. KIRKLAND, citizens of the United States, residing at Watertown, in the county of Jefferson and State of New York, have invented a new and useful Paper-Pulp Strainer, of which the following is a specification.

This invention relates to certain improvements in devices of that class employed for straining of sulfite and other wood-pulp and other fibrous material employed in the manufacture of paper, and has for its principal object to provide an improved form of revolvable strainer in which the screen-sections will act successively as strainers and in which the depth of the stock carried may be regulated in accordance with the character of the stock in order to vary the force and pressure employed to carry the stock through the screening-surfaces.

A further object of the invention is to so arrange the pump suction-pipe as to enable the withdrawal of the screened stock from the lower portion of the cylinder without undue increase in the screening action at a point or points adjacent to the suction end of the pipe, the latter being situated in a revolvable suction-box.

A still further object of the invention is to provide at the lower portion of the stock-tank a suitable flow-box for the reception of the coarse and unscreenable material and to provide for the discharge of such material without discharging the entire contents of the stock-tank, and, further, to provide for the filling of the flow-box with water before communication is again opened with the tank in order to prevent the immediate filling of the flow-box with unscreened stock.

A still further object of the invention is to provide a suitable sprinkler-pipe at a point above the water-line in order to clean the screening-surfaces of any fibrous material prior to the immersion of the screening-surface in the stock.

A still further object of the invention is to provide an improved form of screen-plate composed of a series of separate bars of any desired shape in cross-section, such bars being readily removed when it is desired to em-

ploy bars of larger or smaller size, to replace worn bars, or to substitute bars of a different shape in cross-section for any particular class of work.

With these and other objects in view the invention consists in the novel construction and combination of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the drawings, Figure 1 is a longitudinal vertical section on the line 1 1 of Fig. 2, illustrating a pulp-strainer constructed in accordance with our invention, the screen-bars being omitted for the sake of clearness. Fig. 2 is a transverse sectional elevation of the same on the line 2 2 of Fig. 1. Fig. 3 is a plan view of one end of the strainer. Fig. 4 is a detail sectional view, drawn to an enlarged scale, illustrating the construction of the screening devices and their supports. Fig. 5 is a longitudinal sectional elevation of a portion of the end of the cylinder on a still larger scale. Fig. 6 is a transverse sectional elevation of the same on the line 6 6, Fig. 5. Fig. 7 is a side elevation of one of the screening-bars, illustrating in dotted lines the position to which it is sprung when secured to the cylinder.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

5 designates a suitable tank supported on standards 6 and adapted for the reception of the polygonal screening-cylinders 7. Extending longitudinally of the tank and supported in suitable bearings on the end frames is a shaft 8, on which the screen is supported.

One end of the shaft 8 passes through a stuffing-box 9 of the usual type and is provided with a pulley 10, which may be connected to any suitable source of power for revolving the screening-cylinder. The opposite end of the shaft passes through a stuffing-box 11, carried by a plate 12, forming a closure for an enlarged opening at the end of the stock-tank.

The cylinder 7 is formed of a number of screen-plates of the character more fully set forth hereinafter, these plates being sup-

ported by a series of spiders 13, carried by the shaft 8, the opposite ends of the cylinder being formed by a plate or disk 14 and a suction-box 15, respectively. The suction-box 15 is of a contour corresponding to that of the cylinder and is provided with an inner flange 16, which may be secured to an adjacent spider 13. The outer portion of the box comprises a plate 17, having an annular flange 18 concentric with the center of rotation of the cylinder, said flange being supported in a bearing-ring 19, arranged in a suitable opening in the end of the stock-tank and having an annular groove 20 in communication with a water-supply pipe 21, through which water under pressure is forced to form a water stuffing-box, which will prevent the flow of stock from the tank at this point. The annular flange 18 is further supported by a plate 22, having an inwardly-extending annular flange 23, which fits within the end of the flange 18, forming a guide and support therefor and the parts being fitted together as closely as possible in order to form a substantially liquid-proof joint. For convenience in assembling the parts, as well as to afford a rigid support for the flange 18, the ring 19 is secured to or formed integral with an annular ring or flange 24, which fits closely against the inner surface of the tank in a manner similar to the arrangement of the plate 22 on the exterior surface of the tank. The plate 22 and ring 24 are secured together by bolts 25, which also pass through the end wall of the tank, the whole forming a rigidly-braced structure which will properly support the screening-cylinder and at the same time prevent any leakage from the tank.

Supported on the framework is a pump 26 of the double-suction type, the pump being connected to a shaft 27, adapted to suitable bearings on the frame, and provided with a driving-pulley 28. The plate 12 is provided with a flanged opening, through which the suction end 30 of the pump passes, the end of the pipe being bent downwardly within the suction-box 15, this arrangement within the box preventing any direct action on adjacent portions of the screen-bars while the pump is operated, the pump acting to reduce the level of water and screened stock within the cylinder, creating a partial vacuum and causing the passage of stock through all of the submerged surface of the screens by gravity.

The discharge end of the pump is provided with a governing-valve 31, which regulates the discharge through the pump, so that stock can be carried at any desired height within the screen-cylinder to vary the suction force and the effect of gravity, making it possible to properly operate the screen under varying conditions. The suction-pipe 30 is provided with a suitable collar 32, which fits closely against the inner flange of the opening in plate 12, a liquid-proof joint being effected by screwing on the end of the pipe a coupling-section 33, which bears against the face of the

plate, said coupling-section being connected by a curved pipe 34 to the inlet end of the pump.

In the operation of the screening-cylinder it is not necessary that the cylinder be wholly submerged, and in order to clear the screening-surfaces from any particles of fibrous material after they emerge from the water I employ a sprinkler-pipe 35, extending from end to end of the tank at a point above the cylinder and provided with inlet and discharge valves 36 and 37 to regulate the pressure of water in the sprinkler-pipe. The pipe is provided on its lower surface with a series of perforations, through which the water is forced into contact with the screens to be washed.

In the operation of devices of this class the coarse and unscreenable material collects at the bottom of the tank and usually cannot be withdrawn without the withdrawal of all of the stock, resulting in considerable waste or in the clogging of the screening-cylinders. To avoid this difficulty and to effect the discharge of the unscreenable material without any waste of stock, we arrange at the bottom of the tank a flow-box 36', which communicates with the tank through an opening 37', extending for nearly the full length of the tank, the coarser materials sinking by gravity into the flow-box while the cylinder is in operation. The discharge into the flow-box is further assisted by curved guards 38, extending along the opposite lower edges of the tank in order to prevent the accumulation of unscreenable material in the corners, or the bottom of the tank proper may be curved in form for the same purpose. The opening 37' may be closed by a valve or false bottom 40, pivoted at 41 at one side of the opening and provided with a hand-wheel 42, arranged on the end of the pivot-shaft at a suitable point outside the tank. From the bottom of the flow-box leads a valved discharge-pipe 43, through which the contents of the flow-box and of the tank may be withdrawn when necessary. The flow-box is also provided with a water-supply pipe 44, having a controlling-valve 45. During the screening operation the valve or false bottom 40 will be held open, as indicated in Fig. 2, to permit of the flow of the coarser materials to the lower box. When it becomes necessary to discharge the coarse matter, the valve or false bottom is closed by turning the hand-wheel 42, cutting off all communication between the flow-box and the tank, retaining unscreened stock in the latter. The valve of the discharge-pipe 43 is then opened to discharge the contents of the box 36, and said box may be washed clean before the discharge-pipe is closed by opening the valve of the water-supply pipe 44. After the box is empty the discharge-pipe is closed and water is allowed to flow into said box through the pipe 44 until the box is entirely filled. The valve or false bottom 40 may then be opened to again place the tank and flow-box in com-

munication without wasting the unscreened stock. By filling the flow-box with water we not only avoid the waste of a quantity of stock sufficient to fill the box, but also render the opening of the valve or false bottom 40 much easier than would be the case if the valve had to be raised against the weight of stock in the tank.

The screening-surfaces are each of the construction more clearly illustrated in Figs. 4, 5, 6, and 7, each screen being formed of a series of bars 50, which may be of any desired contour in cross-section, a preferable form being that illustrated in Fig. 5, wherein the bars are shown as of substantially V shape in cross-section, having slightly-rounded tops and corners to facilitate the entrance of the fiber. The bars are made, preferably, of very hard drawn bronze and may be made of varying width in order to provide any desired mesh or gage, the cross-sectional area and contour of the bars varying in accordance with the character of the work.

At each corner and at the center of each of the side portions of the end plates and spiders are formed recesses for the reception of supports for the screening-bars. These supports each comprise a pair of plates 51, having in their outer edges V-shaped notches 52 for the reception of said screening-bars, the notches being all of the same size and arranged at equidistant intervals, so that by the insertion of screening-bars of greater or less width the screen space or mesh may be altered. The inner or lower portions of the plates are rigidly connected at intervals by small blocks 53, riveted or otherwise rigidly secured in position and provided with threaded openings for the reception of securing-screws 54, by which the clamping-bars are secured in place. The clamping-bars 55 are of the same construction at the corners as at the central portions of the cylinder-surfaces, with such variations in the shape as may be necessary to accommodate them to the angular and flat faces, each bar comprising a tongue 56, adapted to fit between the plates 51, and laterally-extended flanges 57, adapted to fit over the ends of the screening-bars and clamp the latter securely in place in the notches or recesses 52. As the plates 51 are united only at intervals by the blocks 53, clogging of the space between them will be prevented, and any of the fibrous material which may enter can be readily removed.

In order to more securely hold the screening-bars in place, we arrange a central supporting-bar 59 centrally between the corner and middle plates 51, each bar having a rounded or V-shaped top, as indicated at 60, in order not to interfere with the free passage of the fibrous material to the interior of the cylinder. Each of the bars 59 is divided with notches in alinement with the several notches 52 of the plates 51, those of the central bar being somewhat less in depth than those of the outer

bars 51 or being of the same depth and arranged in a plane slightly above that of the notches 52. The screening-bars are perfectly straight and when placed in position will be slightly bowed, as indicated by the dotted lines of Fig. 7, the central portion of each bar being somewhat higher than the ends, so that they may be securely and rigidly confined in place and will be properly retained in position during the operation of the screening-cylinder.

The construction is such that by removing the clamping-bars 55 new screening-bars of any desired shape or size may be readily placed in position, or new bars may be substituted for bars slightly worn by the friction of the passing stock, while at the same time the area of the screening-surface is materially increased, owing to the fact that the toothed bars are arranged in a plane beyond the end plates of the side of the cylinder, as shown in Fig. 5.

While the construction herein described and illustrated in the accompanying drawings presents the preferred form of the device, it is obvious that various changes in the form, proportions, size, and minor details of construction may be made without departing from the spirit or sacrificing any of the advantages of our invention.

Having thus described our invention, what we claim is—

1. The combination in a pulp-strainer, of a tank, a screening-cylinder disposed within the tank and having at one end a flanged suction-box at a point beyond the screening-surface, and a pump having a suction inlet-pipe in communication with the lower portion of said suction-box.

2. The combination in a pulp-strainer, of the tank, having an opening at one end, a screening-cylinder arranged within the tank and having at one end an annular flange, a grooved bearing-ring arranged within the opening in the tank and supporting said flange, a water-pipe communicating with the groove in said ring, a plate having an annular flange extending within the flange of the cylinder, an auxiliary plate forming a closure for the tank-opening, and a pump having a suction-pipe passing through an opening in said plate into the interior of the cylinder.

3. The combination in a pulp-strainer, of the tank, a screening-cylinder disposed within the tank and having a suction-box at one end, an annular flange carried by the suction-box, a grooved bearing-ring supporting said annular flange and forming a water-packing box, and a pump having a suction inlet-pipe extending through the tank and in communication with the lower portion of the cylinder suction-box.

4. The combination in a pulp-strainer, of the tank, a screening device therein, a flow-box disposed below the tank and in communication therewith, a valve for controlling com-

munication between the flow-box and the tank, and a discharge-pipe leading from said flow-box.

5 The combination in a pulp-strainer, of the tank, a screening device therein, a flow-box disposed below the tank, a valve for controlling communication between the flow-box and the tank, a discharge leading from the flow-box, and a water-supply in communication with said flow-box.

10 6. The combination in a pulp-strainer, of the tank, a screening device therein, a flow-box arranged below the tank, a false bottom hinged at one of its edges to the bottom of the tank and controlling communication between the tank and flow-box, an operating device located outside the tank and connected to said false bottom, a valved discharge-pipe leading from the flow-box, and a valve water-supply pipe in communication with said flow-box.

15 7. The combination with a screening-cylinder, of a series of intermediate and end supporting-bars, the end supporting-bars being

arranged in spaced pairs, spacing-blocks secured at intervals to the pairs of end bars, the intermediate bars being arranged in a plane above the plane of the end bars, removable screening-bars adapted to notches or grooves in the supporting-bars, and clamping-bars adapted to fit within the spaces between the end supporting-bars and having flanges for holding the screening-bars in position.

8. The combination with the polygonal end pieces, of longitudinally-disposed supporting-bars carried by said pieces, intermediate supports between the end pieces, and a screening-surface formed of a plurality of screening-bars supported and clamped in slightly-arched position by said longitudinal bars.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

NATHANIEL L. VROOMAN.
ROBT. R. KIRKLAND.

Witnesses:

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C. L. HILDRETH.