(No Model.) 3 Sheets—Sheet 1.

# D. N. BERTRAM.

## PULP STRAINER.

No. 589,329. Patented Aug. 31, 1897.

*Fig. 1.*

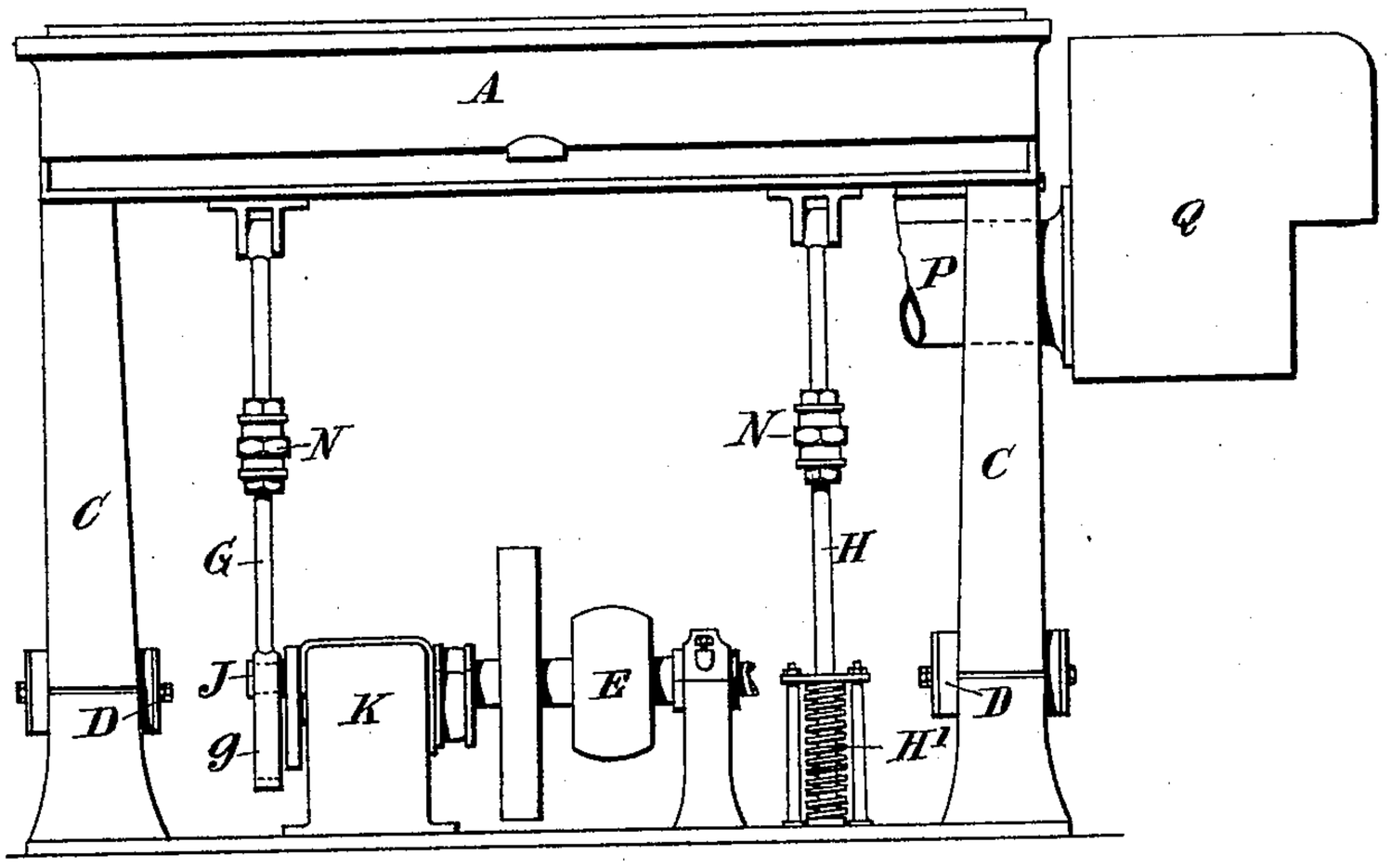
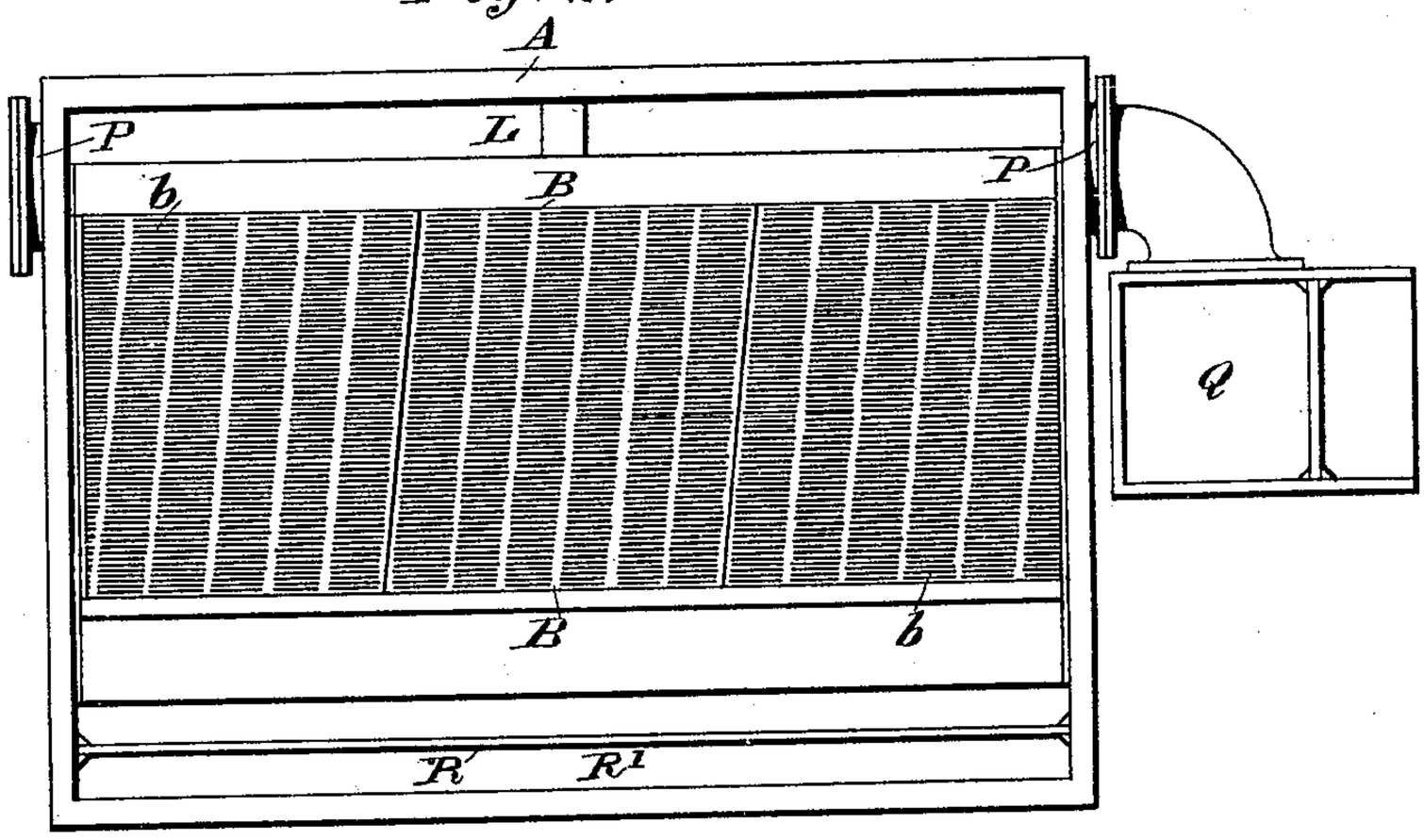



*Fig. 2.*

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(No Model.)

3 Sheets—Sheet 2.

# D. N. BERTRAM.

## PULP STRAINER.

No. 589,329. Patented Aug. 31, 1897.

Fig. 4.

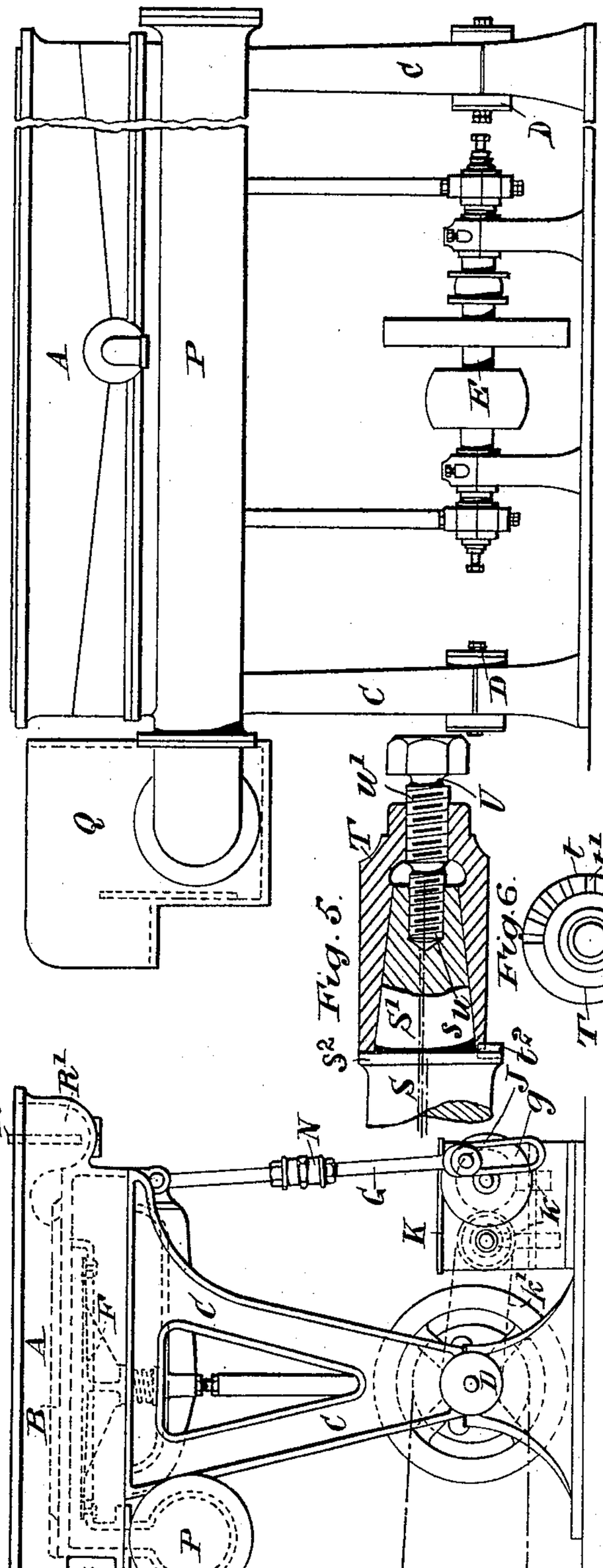


Fig. 3.




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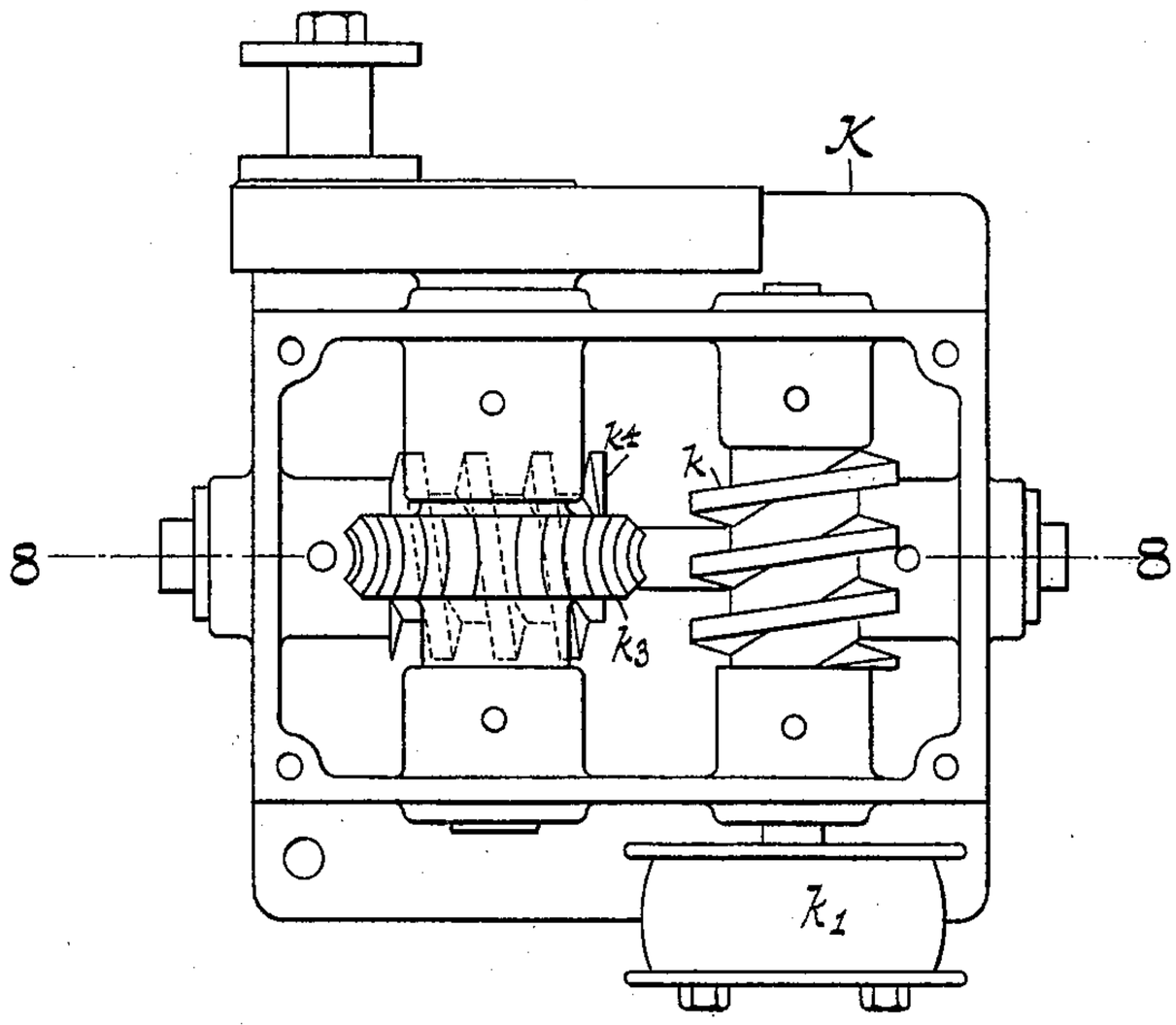
## PULP STRAINER.

No. 589,329. Patented Aug. 31, 1897.

Fig. 7.



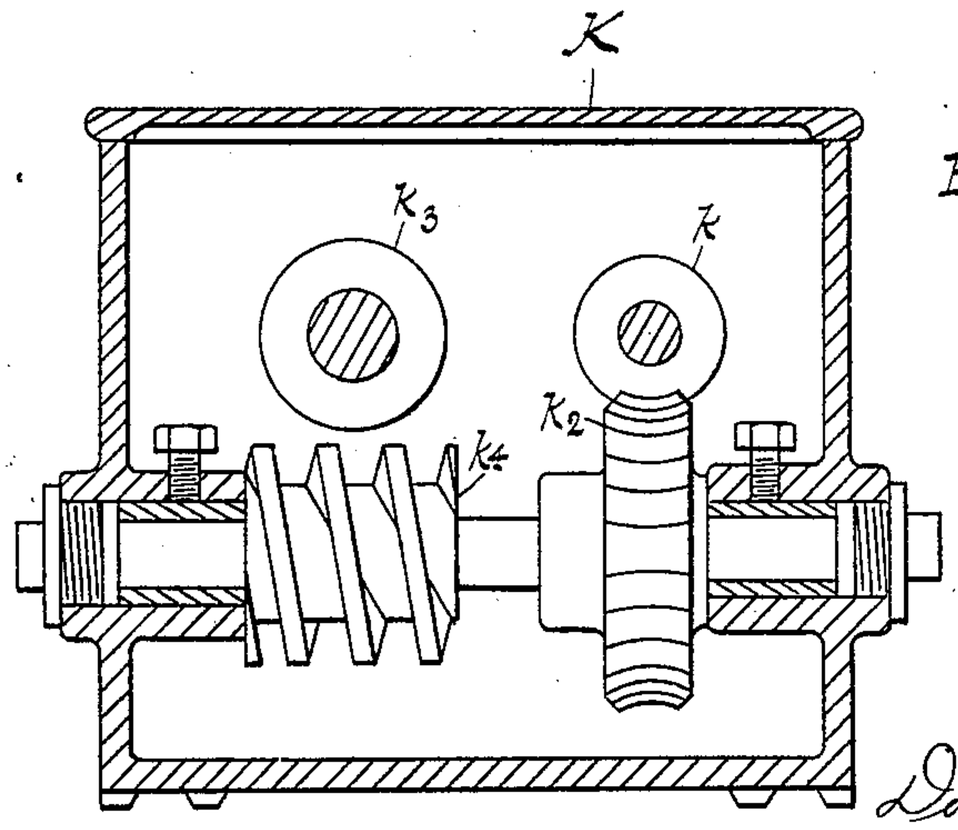




Fig. 8.

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# UNITED STATES PATENT OFFICE.

DAVID NOBLE BERTRAM, OF EDINBURGH, SCOTLAND.

## PULP-STRAINER.

SPECIFICATION forming part of Letters Patent No. 589,329, dated August 31, 1897.

Application filed July 17, 1894. Serial No. 517,805. (No model.) Patented in England June 17, 1893, No. 11,943, November 23, 1893, No. 22,463, and March 7, 1894, No. 4,771; in France January 7, 1894, No. 235,291, and July 7, 1894, No. 227,730, and in Canada July 20, 1894, No. 46,527, and October 8, 1894, No. 47,195.

*To all whom it may concern:*

Be it known that I, DAVID NOBLE BERTRAM, of St. Katherine's Works, Sciennes, Edinburgh, in the county of Mid-Lothian, Scotland, have invented Improvements in Pulp-Strainers, (for which Letters Patent have been granted in Great Britain, No. 11,943, dated June 17, 1893, No. 22,463, dated November 23, 1893, and No. 4,771, dated March 7, 1894; in France, No. 235,291, dated January 7, 1894, and No. 227,730, dated July 7, 1894, and in Canada, No. 46,527, dated July 20, 1894, and No. 47,195, dated October 8, 1894,) of which the following is a specification.

This invention relates to improvements in pulp-strainers of paper-making machines, and has for its object the construction of a strainer which will overcome the objections hitherto attached more or less to the various classes of strainers at present in use—that is to say, that in accordance with my said invention no hanks, knots, or unboiled fibers will remain on the surface of the plates nor come in contact with the strainer-plates after they have been separated from the clean pulp. The revolving strainer and other strainers having an oscillating motion, hitherto used, cause the pulp around them and on their surface to be kept in a state of agitation and in contact with the plate-surfaces and thus permit of the liability of the deleterious matter being sucked through the strainer-plates and passed on to the wire of paper-making machines.

This invention also has for its object to provide means whereby the refuse matter is washed off the face of the strainer-plates and is prevented from again coming in contact with the face of the said plates, as is the case with strainers having an oscillating motion imparted to them.

In accordance with my said invention the pulp flows into a cast-iron vat in which is fitted, as usual, the strainer-plates, the said plates being preferably formed with their slits running parallel to the apex or top edge of the plates, said slits being also formed in rows which run downward at an angle to the flow of the pulp from the apex. The vat with the said strainer is arranged either level or inclined toward the discharge or refuse end of the screen, which inclination can be arranged more or less, as desired, so as to correspond to the quantity of water used in the pulp and to other circumstances which affect the flow of the pulp over the face of the said strainer-plates.

To effectually wash any refuse matter off the face of the strainer-plates which may catch on the slits thereof, I impart an intermittent motion to the vat, which motion raises one side of the vat so as to cause a wash into the refuse-channel, the said motion returning the vat to the position from which it started, which is either at a horizontal or at an incline toward the discharge end, but never below the horizontal.

In the drawings, Figure 1 is a back elevation; Fig. 2, a plan. Fig. 3 is an end elevation, and Fig. 4 a front elevation, of a pulp-strainer constructed in accordance with my said invention. Figs. 5, 6, 7, and 8 are detail views.

Referring to the said drawings, I employ a cast-iron or other vat A, in which the plates B are fixed and which is carried by a standard C at each end, the lower ends of which are mounted on circular bushes and pins D, so that it will move freely, the center of the bushes and pins D being exactly on a line with the center of the shaft E, which actuates the diaphragm F, so that whatever position the vat A may take the diaphragm F remains in the same relative position to the plates B and shaft E. The strainer-plates B are formed with their slits *b* running lengthwise of the plates and arranged in angular rows which run down the plates at an angle to the flow of the pulp from the apex of the plates, as shown in Fig. 2, so as to give a more effective strainer. To the said vat A are connected two sectional rods G H, the rod G being actuated by the crank-pin J. In the box K, Figs. 7 and 8, there is an arrangement of two sets of worm and worm-wheels $k\,k^2$ and $k^3\,k^4$, driven by belt and pulleys $k'$ from the shaft E, so as to reduce the speed of the crank-disk J to the necessary number of revolutions required for causing an intermittent raising and lowering of the vat A, plates B, and diaphragm F.

The crank-pin J in the disk *j* as it approaches the perpendicular line comes in contact with the connecting-rod G and tilts the vat A up at the feed side, thus lowering the discharge side and causing a wash of pulp over the plates B the one way only, thereby dislodging any refuse matter which may have settled on the plates B into the channel L, from which the refuse matter is allowed to flow to auxiliary strainer through a regulating flat valve and pipe fixed to front of vat A, the pipe discharging it into a square box or other vessel.

When the vat A is lowered at the feed side, it is brought back to its normal position, which, as above stated, is never below the horizontal, by the connecting-rod H and spiral spring H′, which is compressed as the discharge side of the vat A is raised by the connecting-rod G. Thus when the crank-pin J passes over the top center and begins to descend the connecting-rod G is still in contact with the crank-pin J as the compression of the spiral spring H′ thus begins to take effect, and the vat A comes gradually back to its original position without any shock, and from the point of release the connecting-rod G describes the revolution of the crank-pin J until it comes again in contact with the top of the slot *g*, formed in the lower end of the connecting-rod G, thus causing the raising motion again, and so on, repeating the former movements.

The strainer can be set to work with the plates B at any desired angle or level, such being arranged by the right and left hand nuts N, mounted on the threaded ends of the sectional connecting-rods G and H, and by the use of these nuts more or less incline can be given to the plates B while the strainer is at work.

The discharge of pulp is effected through the channel P, which is formed or provided at the front of the plates B, as shown, said channel P extending across the length of the vat, so as to insure of an equal suction over all the area of the plates B, as well as to form a free exit for the strained or clean pulp. To insure against agitation, I bring the regulating-box Q for the discharge into a position central to the strainer above the crank-shaft, in which part the movement is so slight as in no way to cause agitation.

While I have thus described in this particular instance the movement adopted in causing the raising and lowering of the vat, it can be performed in various ways—for instance, by hanging the front side of the sole-plate, which carries the entire strainer, and at the front side raising and lowering the whole strainer from the sole-plate by cam, crank, or other means.

The diaphragm F is practically made the full length of the strainer-plates B.

The spreading of the pulp is effected by a sluice R, fixed in the channel R′, and the pulp is run in over the edge of the vat A and through below the sluice R, which regulates the flow equally all over the length of the apex of the plates. The arrangement is such that the clean pulp is passed through the plates B before the objectionable or deleterious matter rests thereon, such matter being carried away by impetus of the stuff into the channel L, which is effected by the quantity of pulp passing into the channel which is usually employed when the strainers are working in connection with an auxiliary strainer, and in which I mount zinc plates having longitudinal or cross slits, through which the heavy dirt passes into the under channel and remains there until it is cleaned out when washing up, or it may be run off by a cock. The flow from the upper channel is conducted to the auxiliary strainer, which cleans the pulp in the usual manner, as hitherto. It will thus be seen that the dirt or deleterious matter when once clear of the plates B does not again come in contact with the straining-surfaces, as is the case with oscillating and revolving strainers.

As shown in part sectional elevation, Fig. 5, and cross-section, Fig. 6, I form each of the ends of the crank-shaft S with a tapered portion S′, having its center line *s* running eccentrically to the center line *s′* of the shaft S. On the outside of the tapered portion, S′ I mount an elliptical sleeve T, the outside of which is eccentric and the inside concentric to the tapered portion S′ of the shaft S. The said sleeve T after being set so as to give the necessary stroke is then bound up against the end plate or collar $S^2$, which is formed on or attached to the shaft S by means of a double screw U, the front end *u* of which works in the end of the tapered portion S′, and it is of less diameter and screwed to a finer pitch than the back portion *u′*, which works in the end of the sleeve T, as shown, so as to form a powerful and gradual means of engaging or disengaging the shaft and sleeve for setting purposes. In order to enable the sleeve T being set to any desired position, I form the face of its inner end *t* with a number of grooves or recesses *t′* around the one-half of its circumference, as shown more particularly in Fig. 6, said grooves or recesses *t′* engaging with a key or projection $t^2$, screwed, pinned, or otherwise attached to the end plate or collar $S^2$ in such a manner that the throw of the crank can be varied, as desired.

The whole arrangement thus provides a strainer in which there is not the objection in causing the pulp to wash backward and forward over the surface of the plates, bringing with it the refuse matter, and thereby subjecting such refuse matter necessarily to the straining action of the strainer and allowing it to pass onto the paper-machine with the clean pulp, as when the front of the vat is lowered and does not rise above the level from which it began to descend, the refuse

matter is not carried over the surface of the plates, as is the case with an oscillating motion lowering both sides of the vat alternately.

I claim—

1. In a pulp-strainer, the combination of the strainer-vat, arranged at a horizontal or at an incline toward the discharge end with means for intermittently raising the feed side of the vat, as distinguished from the continuous oscillatory or rocking motion so as to prevent the refuse matter from being carried back over the strainer-plates, and the diaphragm with means for moving the same, as described and shown.

2. In a pulp-strainer, the combination of the strainer-vat arranged normally at a horizontal or at an incline toward the discharge and adapted to be tilted toward the discharge end of the strainer-plate, with means for intermittently raising the feed side of the vat as distinguished from a continuous oscillatory or rocking motion, so as to wash the refuse matter from, and prevent its being carried back over the strainer-plates, and the diaphragm with means for moving the same as described and shown.

3. In pulp-strainers, the vat A working on pins D and connected at the back to the top ends of the adjustable connecting-rods G, H, the rod G being driven by the gearing $k$, $k^2$, $k^3$, $k^4$, and $k'$ through the medium of the crank-pin J and slot $g$, and the other rod H having a spiral spring H', whereby the back of the vat A is intermittently raised and lowered, as described and shown.

4. In pulp-strainers, the strainer-plates B having the slits $b$ running parallel to apex of the plates and also in rows running down at an angle to the flow of the pulp, as described and shown.

5. In pulp-strainers, the combination of the elliptical sleeve T, eccentrically-tapered ends S' of the shaft S, collars $S^2$, screws U and recess $t'$ with key $t^2$, whereby the stroke of the diaphragm may be altered, as described and shown.

6. In pulp-strainers, the vat A working on pins D and connected at the back to the top ends of the adjustable connecting-rods G, H, the rod G being driven by the crank-pin J which fits a slot $g$ of the rod G, and the other rod H having a spiral spring H'; whereby the back of the vat A is intermittently raised and lowered, as described and shown.

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

DAVID NOBLE BERTRAM.

Witnesses:

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ROBERT BELL MILLER.