

No. 612,404.

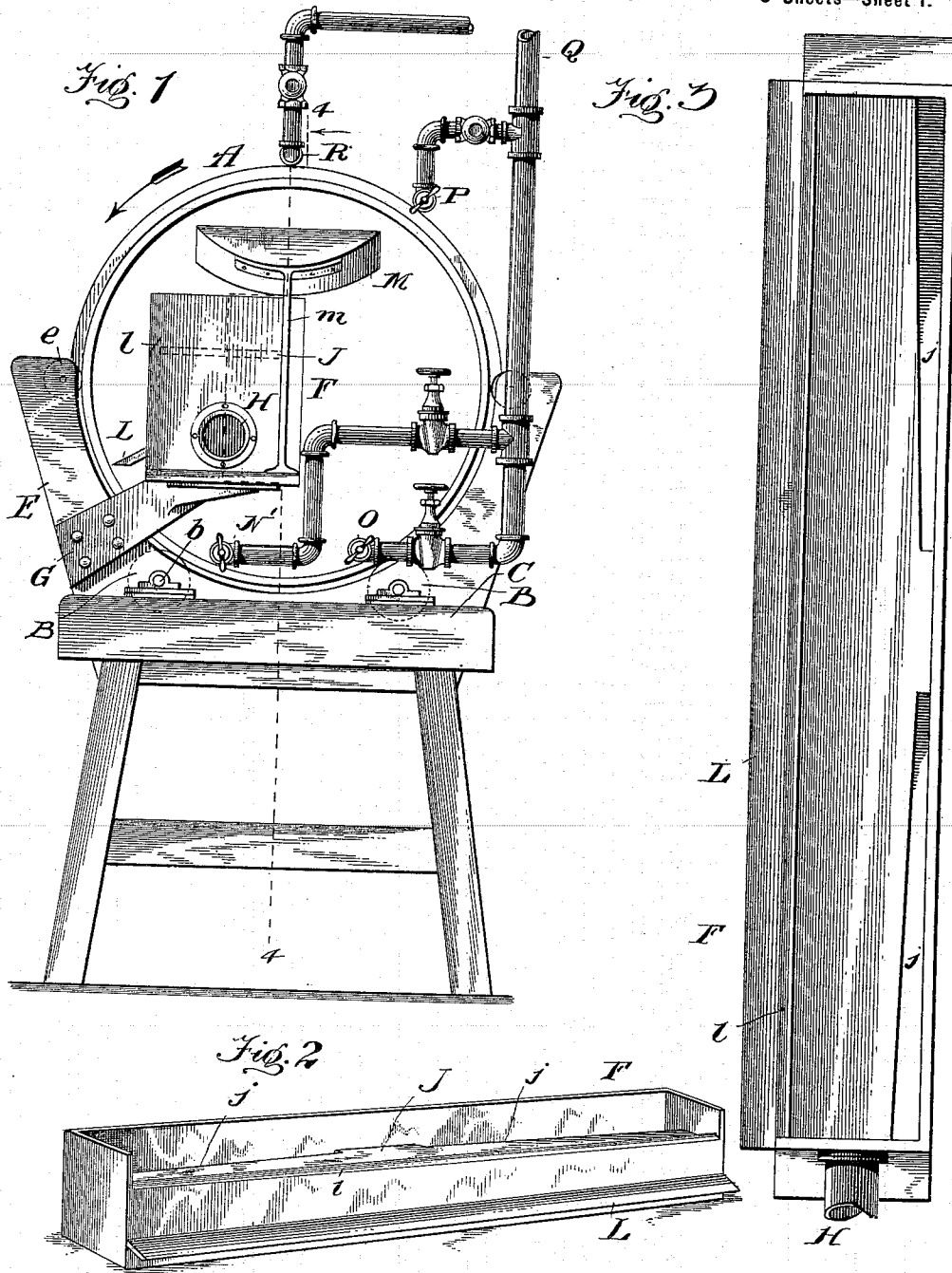
Patented Oct. 18, 1898.

D. R. DAVIS.
PULP SCREEN.

(Application filed Nov. 1, 1897.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses

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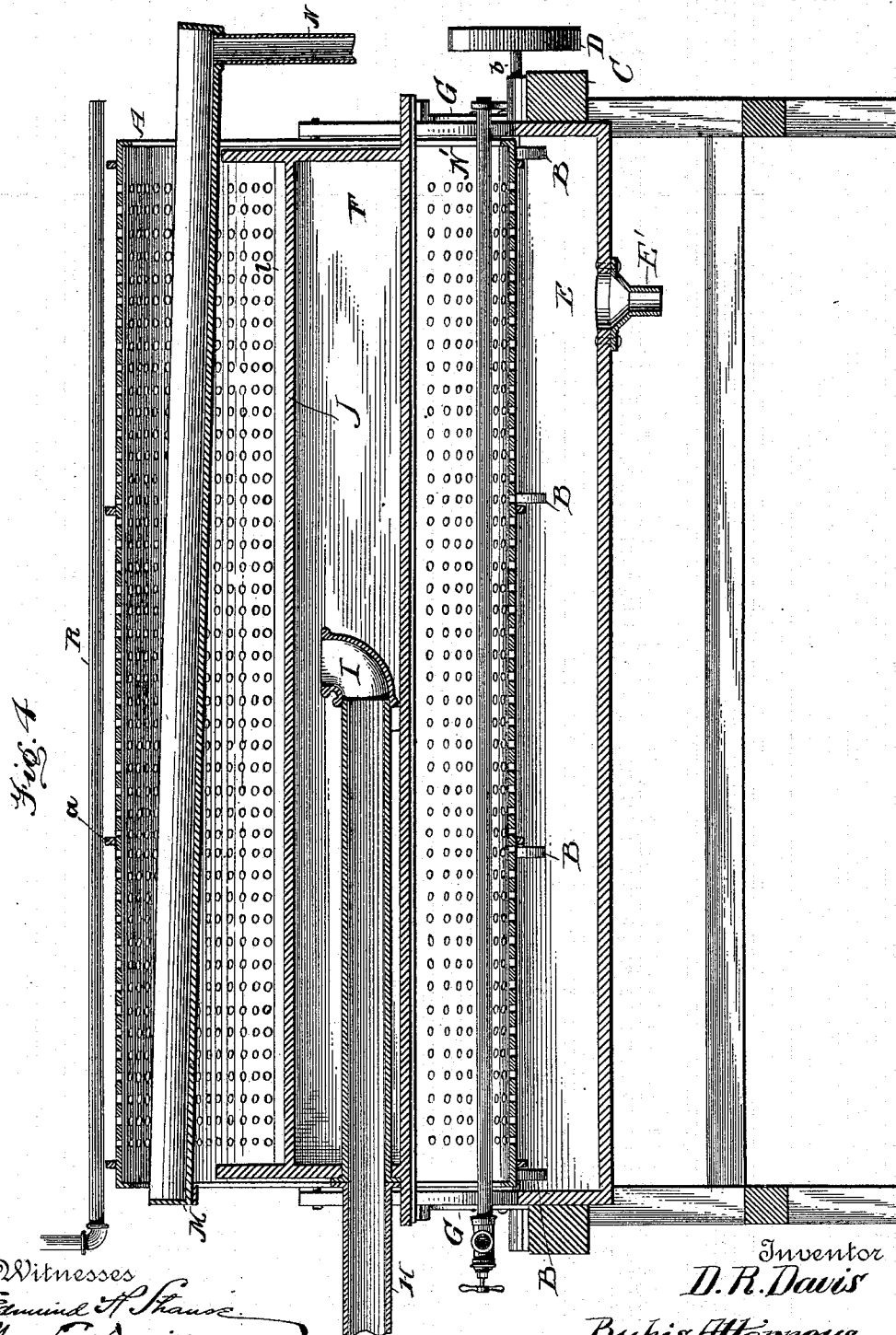
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3 Sheets—Sheet 2.



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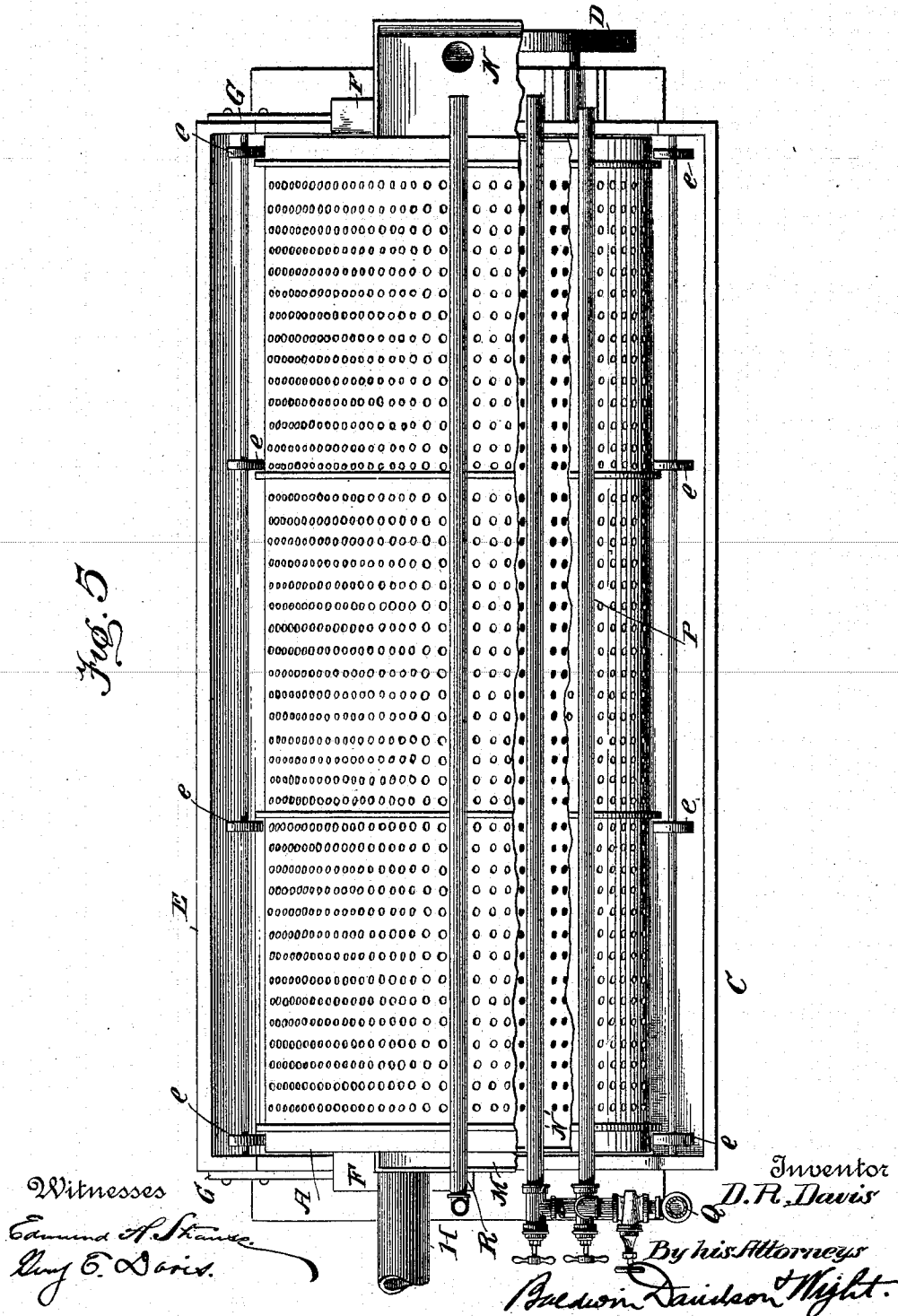
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3 Sheets—Sheet 3.

Fig. 5



UNITED STATES PATENT OFFICE.

DAVID R. DAVIS, OF EAU CLAIRE, WISCONSIN.

PULP-SCREEN.

SPECIFICATION forming part of Letters Patent No. 612,404, dated October 18, 1898.

Application filed November 1, 1897. Serial No. 657,063. (No model.)

To all whom it may concern:

Be it known that I, DAVID R. DAVIS, a citizen of the United States, residing at Eau Claire, in the county of Eau Claire and State of Wisconsin, have invented certain new and useful Improvements in Pulp-Screens, of which the following is a specification.

The object of my invention is to separate by improved devices the fine fibers of paper-pulp from the coarse fibers or slivers thereof.

I provide a rotary cylindrical screen and a flow-box from which the pulp to be screened is delivered and from which it passes to a distributor that feeds it to a revolving cylinder. The fine fibers or particles of the pulp pass through the meshes of the screen, while the coarser fibers and slivers are delivered to a carrying-off trough, or the fine particles may be made to pass through the screen into a carrying-off trough, while the coarser fibers are carried away in other ways. The flow-box is so arranged as to deliver the wet pulp to the screen in a comparatively thin sheet and the screen is arranged above the water-level in the receptacle below it. The flow-box and the carrying-off trough are arranged to extend throughout the entire length of the working surface of the cylinder, and the organization is such that the finer particles of pulp are made to pass through the cylinder without any longitudinal movement thereof, and the coarser particles are moved vertically and without longitudinal movement, separated from the finer particles, and delivered to devices which carry them away from the screen. In order to separate the coarser fibers or slivers from the cylinder, I employ a spray-pipe which causes jets of water to impinge against the cylinder, pass through the meshes thereof, separate the particles of pulp therefrom, and direct them into a receptacle provided for them and by which they are carried away. Ordinarily the fine particles or the greater portion of them will pass through the meshes of the screen as soon as they fall onto the surface of the cylinder, the water with which they are mixed being generally sufficient to wash them through the meshes; but in order to promote the screening and to wash through the screen any small particles that might adhere after the water that came from the flow-box has passed through the screen

I preferably employ one or more spray-pipes which cause jets of water to flow over the screen and wash through it the remaining small particles that may be adhering. Generally speaking, the screen is self-cleaning, and a new clean surface is constantly being presented in front of the spillway of the flow-box to receive the wet pulp therefrom. Sometimes, however, especially when working with green wood, there is a gummy deposit upon the screen after it has been used for some time and it is desirable to use some additional means for cleaning it. I therefore provide a perforated pipe running longitudinally of the cylinder and cause steam to pass through it and into the meshes of the screen, so as to cause the gummy matter and other clogging material to be separated. It is only necessary to clean the screen with steam occasionally—that is to say, after it has become clogged from continued use.

The details of construction will be hereinafter more fully described; but I wish it understood that my invention is not confined to the details of construction shown in the drawings and hereinafter specified, but irrespective of these details consists particularly in providing an unsubmerged screen to which the wet pulp to be screened is fed from the flow-box, which delivers the wet pulp in a thin sheet from end to end of the working surface of the cylinder, or practically so, and in providing means practically coextensive with the flow-box for carrying off the material that does not pass through the screen.

In the accompanying drawings, Figure 1 is an end elevation of an apparatus embodying my improvements. Fig. 2 is a perspective view of the flow-box. Fig. 3 is a plan view of the flow-box. Fig. 4 is a longitudinal section through the apparatus on the line 4 4 of Fig. 1. Fig. 5 is a plan view with some of the parts broken away.

The cylinder A is composed mostly of perforated sheet metal in cylindrical form, with suitable frames or flanges at the ends to stiffen it. It is, however, without spokes, and it is open at each end. The cylinder rests on small carrying-wheels B, mounted in suitable bearings on a supporting-frame C. The shafts *b* of the rollers may extend from end to end of the cylinder, and one of the shafts

carries a pulley D, to which power may be applied. By suitable gearings both shafts may be driven from this pulley. In this way the cylinder may be made to revolve in the direction indicated by the arrow in Fig. 1. In order to stiffen or strengthen the cylinder, annular ribs *a* may be formed on or secured to it at proper intervals, as indicated in Fig. 4. The cylinder is arranged over a receptacle E, adapted to receive the water which passes through the screen and also the fine particles of pulp that are carried through by the water. This receptacle has end pieces extending up along the side of the cylinder and carrying rollers *e*, which bear against the end flanges *a* and prevent endwise movement of the cylinder and also lateral movement thereof. As will be seen by a close inspection of Figs. 1 and 4, the bottom of the cylinder is arranged above the top of the trough or receptacle E, and is therefore unsubmerged, being above the water-level in the receptacle.

The flow-box F extends, preferably, from one end of the cylinder to the other. It is preferably arranged inside the cylinder, and, as shown in the drawings, it is supported on brackets G, secured to the receptacle or box E, outside of the edges of the cylinder. A delivery-pipe H passes through one end of the flow-box and extends to near the middle thereof, where it is provided with an elbow I, that delivers upwardly. A partition J, arranged below the upper edge of the flow-box and above the elbow I, holds down the pulp as it is delivered, but permits it to flow through openings *j*. (Shown clearly in Fig. 3.) The wet pulp passes over onto the top of the partition J and then out over the edge of the flow-box and falls onto a distributor or spreader L, that delivers to the cylinder A.

A carrying-off trough M is arranged in the upper part of the cylinder above the flow-box and is supported on brackets *m*, as indicated in Fig. 1. The trough is inclined, is imperforate, and is provided with a delivery-pipe N at its lower end. The apparatus, as shown in the drawings, is equipped with three water-spray pipes N', O, and P, the pipes N' and O being arranged inside the cylinder and the pipe P outside thereof. Water is supplied to all of these pipes through the service-pipe Q, and branch pipes lead from the pipe Q to the spray-pipes, which latter preferably extend from end to end of the cylinder. The pipes may be equipped with suitable valves to regulate the supply. I preferably also employ a steam-pipe R, extending from end to end of the cylinder, and it is perforated to permit steam to impinge upon the cylinder and to force through it any material that may be lodged in the meshes thereof. This pipe is only occasionally used to clean the screen when clogged with gummy matter, &c., after constant use.

I do not wish to be confined to the precise manner of mounting the cylinder or of ar-

ranging the flow-box and carrying-off trough. For convenience, as well as for obtaining the best results, the flow-box is arranged inside the cylinder and the carrying-off trough is arranged above the flow-box within the cylinder. The water that flows out from the flow-box is usually sufficient to wash the fine material through the screen, and therefore it is not always necessary to employ spray-pipes for supplying additional quantities of water for this purpose. The water supplied by the spray-pipes N' and O should be in small quantities and should not act to force the material through the meshes of the screen, but merely act to gently wash the fine material adhering between the meshes of the screen into and through the meshes thereof without tending to force the larger particles or slivers therethrough. It is not essential that a steam-pipe should be used to clean the cylinder, as the cylinder is largely self-cleaning; but it is sometimes desirable to employ such an additional cleaning device, and I find it advantageous to use it in order to obtain the best results.

The operation of the apparatus is very simple. Briefly stated, it is as follows: The pulp is brought in by the pipe H and delivered by the elbow I to the flow-box. It then rises through openings *j* and flows over the partition J, and then over the edge of the spillway *l* and falls onto the distributor or spreader L, which delivers it into the interior of the cylinder while it is revolving in the direction indicated by the arrow. The fine fibers of the pulp pass through the perforations in the cylinder with the water and the slivers and coarse pulp stay in the cylinder, adhere to the inner surface thereof, and are carried by it around past the pipes N' and O up to the trough M. As before stated, it is not essential that the pipes N' and O should be used, inasmuch as the water that passes out of the flow-box is usually sufficient to carry all the fine particles through the screen, and this occurs within a small area just at the side of or below the flow-box; but the pipes N' and O may be employed, if found necessary, to obtain the best results and insure perfect work. There is no liquid standing in the cylinder at any time, the liquid-level being below the bottom of the cylinder, and the coarse particles and slivers which adhere to the interior of the cylinder are comparatively dry or only moist. When they reach the trough M, jets of water from the spray-pipe P impinge against them and drive them into the trough, a sufficient quantity of water being derived from the jets to flow the material down the trough to its destination.

A machine constructed like that just described has been found to separate approximately ninety-five per cent. of all the fine particles of pulp from the wet pulp delivered from the flow-box. This fine pulp, which is received into the receptacle E, is carried off from it by any suitable passage E' and is pref-

erably treated in a "diaphragm-screen," by which small particles of sawdust and the like may be separated. The other five per cent. of material which passes into the trough M flows therefrom through the pipe N and may be utilized or treated in any suitable way.

My machine is so constructed that it may be operated at high speed. The material delivered from the flow-box is immediately screened, the water and fine particles passing through the meshes of the screen immediately, while the coarser particles are carried only part way around with the cylinder without longitudinal movement. They are separated before the cylinder has completed a revolution. Therefore clean portions of the screen are constantly being presented to the flow-box, and the operation of screening can be very rapidly performed. If the cylinder were arranged above the level of the liquid which passes through the cylinder and the liquid pulp were fed in at the end of the cylinder, the water would immediately pass through the meshes of the screen and leave the pulp in a thick mass on the surface thereof. On the other hand, if the cylinder were arranged below the liquid-level in the receptacle below it a large surface of the cylinder would be kept constantly clogged, the cylinder would have to work through the liquid, and a constant agitation would be necessary in order to keep the meshes of the screen open; but by having the cylinder arranged above the liquid-level, supplying the liquid thereto in thin sheets along its entire length, these objections are obviated, the cylinder is constantly kept clean, and the operation of screening is both rapid and efficient.

I claim as my invention—

1. The combination of an unsubmerged screen, a flow-box arranged within the screen and delivering liquid pulp from end to end of the working surface thereof, a carrying-off trough arranged above the flow-box, and a spray-pipe outside the screen for forcing particles of pulp from the screen into the carrying-off trough.

2. An apparatus for screening pulp, comprising a rotatable screen, a flow-box extending approximately along the entire working surface of the screen and delivering liquid pulp thereto, a receptacle below the screen provided with means for keeping the liquid-level thereof below the screen, and a trough extending approximately along the entire working surface of the screen for collecting the unscreened material and delivering it.

3. The combination of an unsubmerged

screen, a flow-box extending approximately along the entire working surface of the screen and delivering liquid pulp thereto, a carrying-off trough extending approximately along the entire working surface of the screen for collecting the unscreened material and delivering it, and means for separating pulp fibers from the screen and driving them into the trough.

4. The combination of an unsubmerged screen, a flow-box extending approximately from end to end of the working surface of the screen for delivering liquid pulp thereto, a carrying-off trough extending approximately along the entire working surface of the screen, a receptacle below the screen provided with means for keeping the liquid-level thereof below the screen, and a water-spray pipe for separating particles of pulp from the screen and driving them into the carrying-off trough.

5. The combination of an unsubmerged screen, a flow-box arranged within the screen and extending approximately from end to end of the working surface thereof and delivering liquid pulp to the screen, a carrying-off trough arranged above the flow-box within the screen and extending approximately from end to end of the working surface of the screen, and a spray-pipe outside the screen for forcing particles of pulp therefrom into the carrying-off trough.

6. The combination of the unsubmerged screen, a flow-box arranged within the screen and delivering liquid pulp from end to end of the working surface of the screen, a carrying-off trough arranged above the flow-box, a water-supply pipe within the screen below the flow-box, and a water-supply pipe outside the screen for forcing particles of pulp from the inner surface of the screen into the carrying-off trough.

7. The combination of a rotatable screen, a flow-box extending approximately along the entire working surface of the screen and delivering liquid pulp thereto, a trough extending approximately along the entire working surface of the screen for collecting the unscreened material and delivering it, and a water-spray pipe arranged at one side of the trough and above it for driving the unscreened material into the trough.

In testimony whereof I have hereunto subscribed my name.

DAVID R. DAVIS.

Witnesses:

WM. A. TEALL,
WM. RICHARDS.