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PATENTED DEC. 10, 1907.

W. A. STEVENSON & A. H. WHITE.
APPARATUS FOR SCREENING PULP.

APPLICATION FILED MAY 17, 1907.

4 SHEETS—SHEET 1

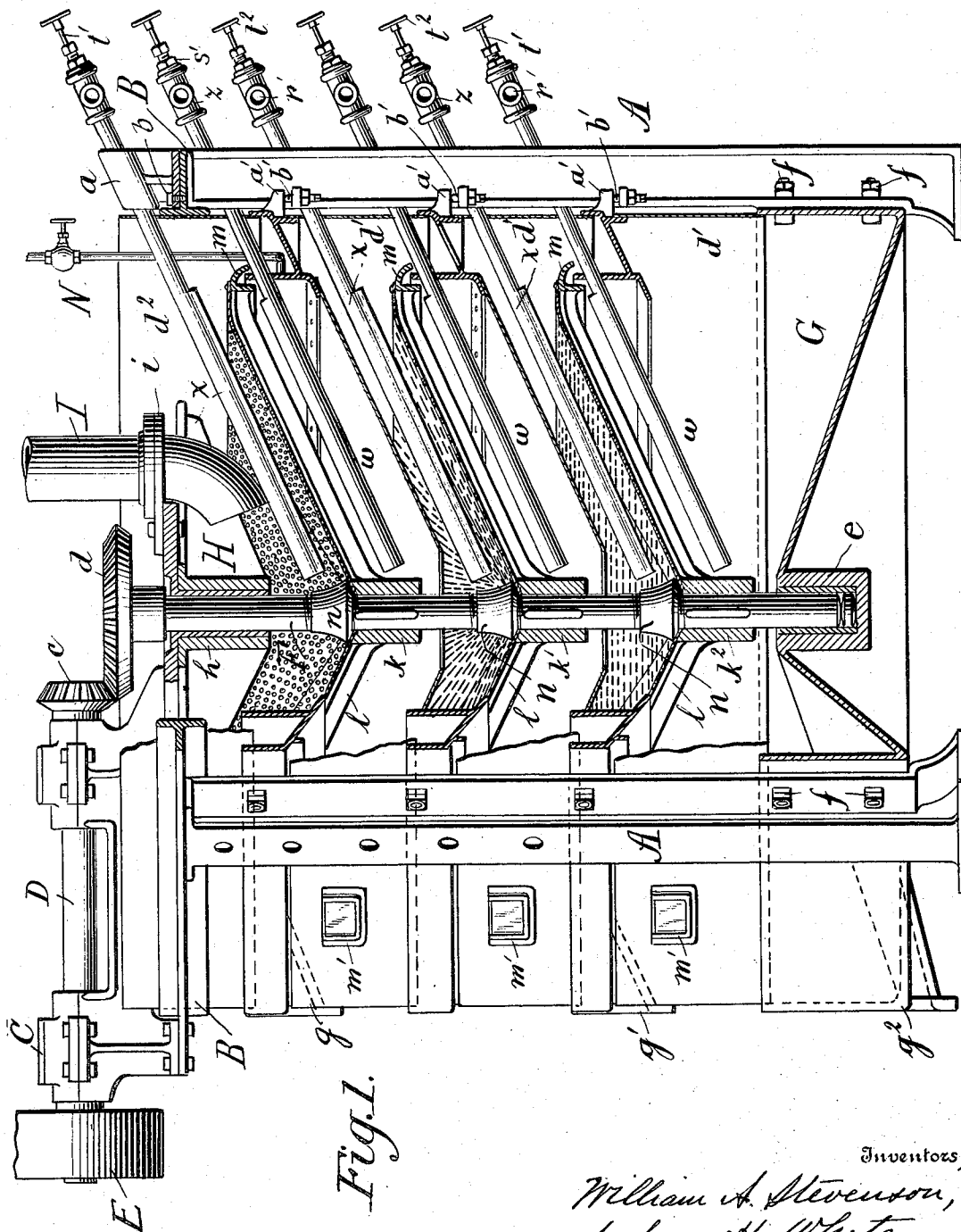


Fig. 1.

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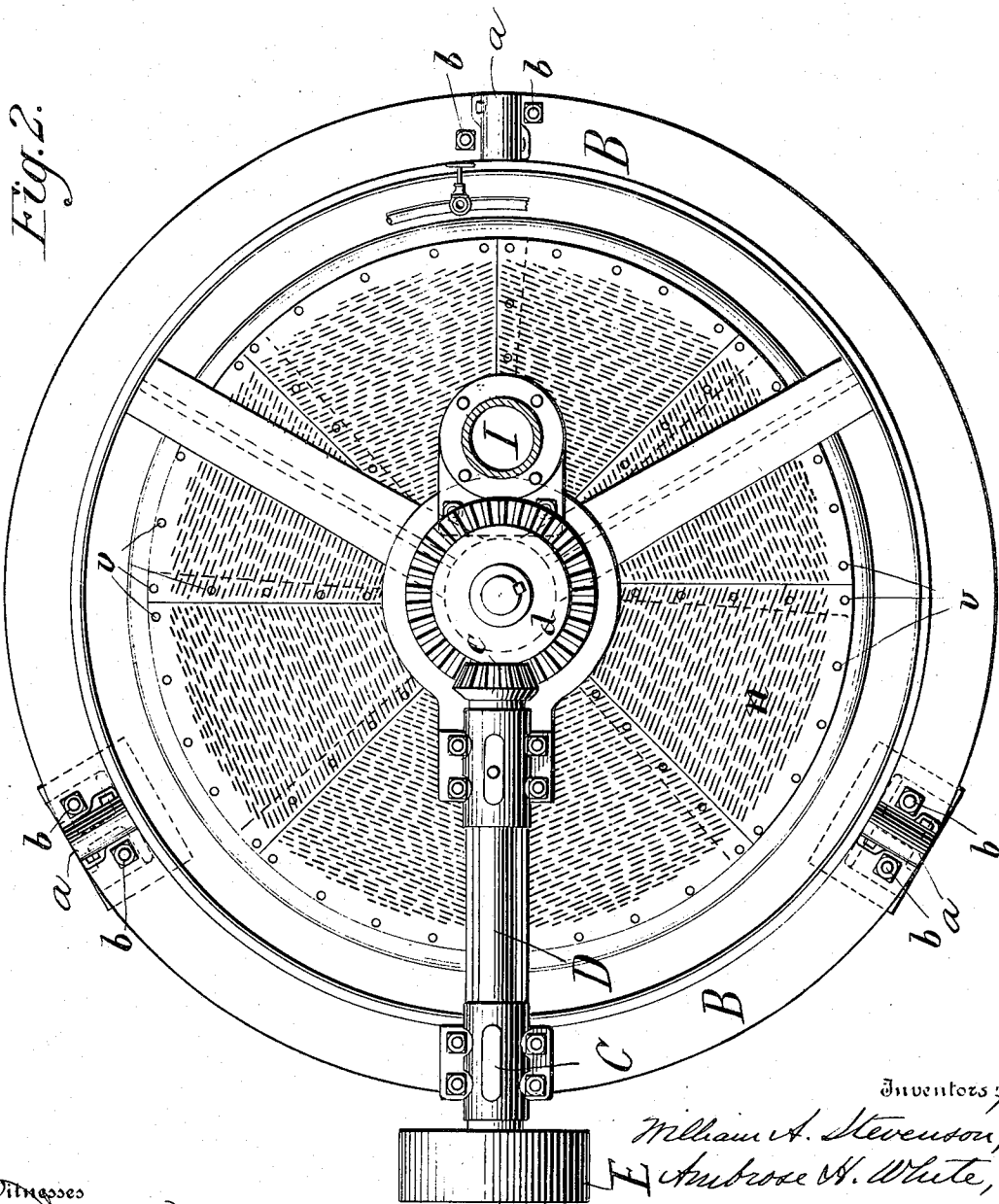
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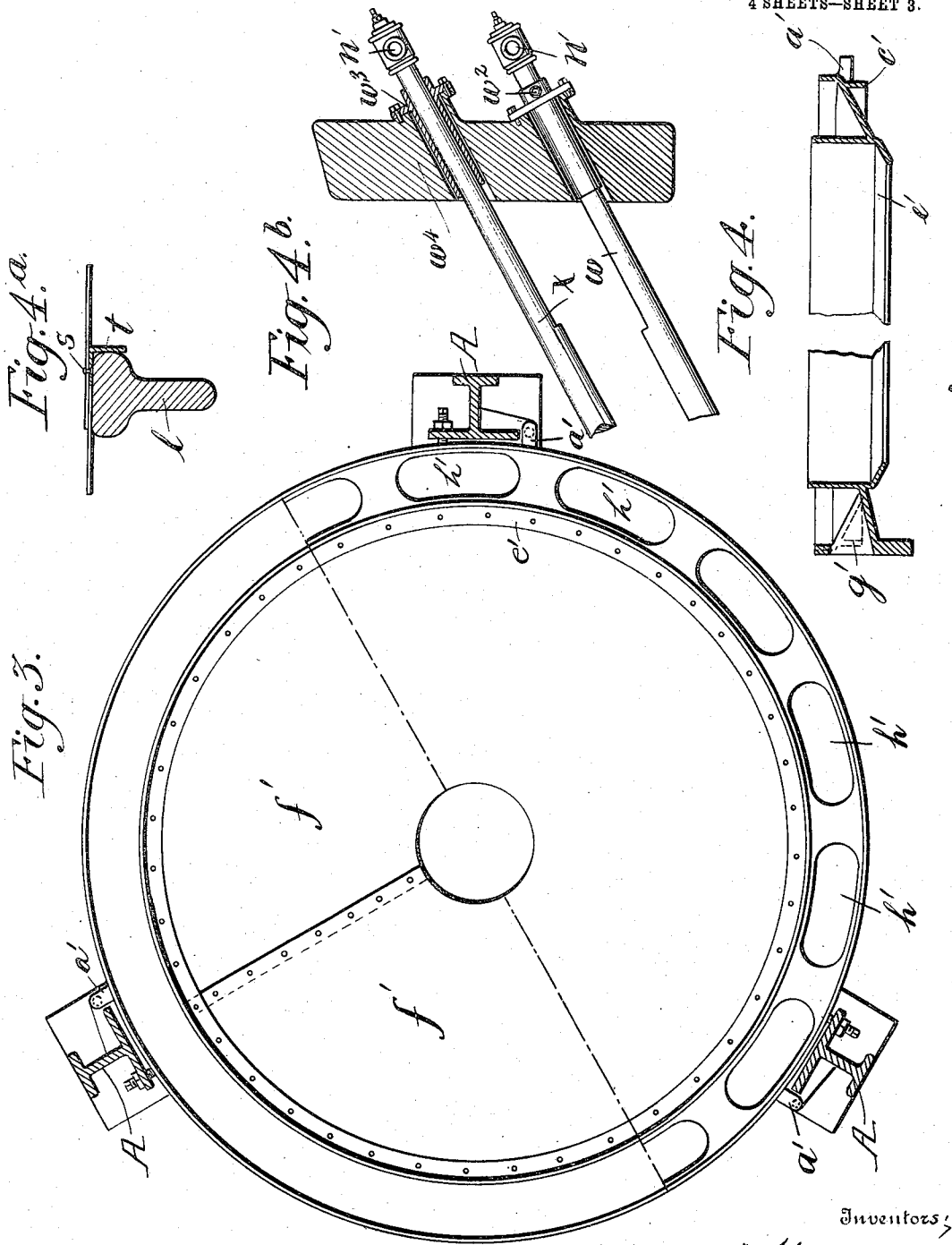
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4 SHEETS—SHEET 3.



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Fig. 5.

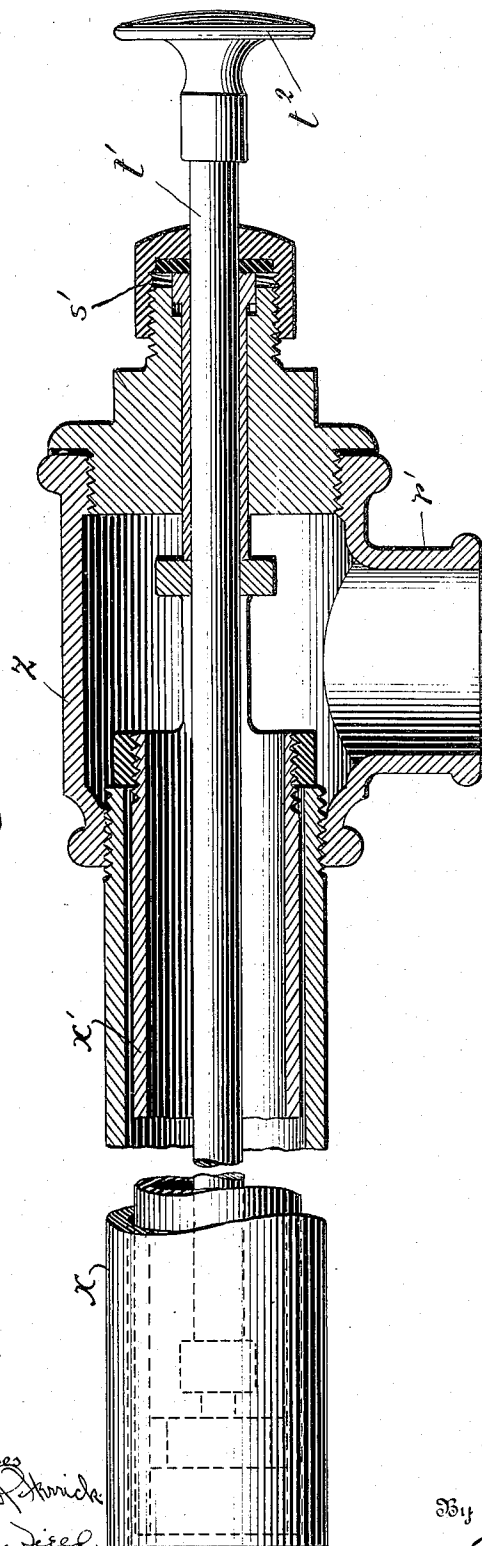


Fig. 7.

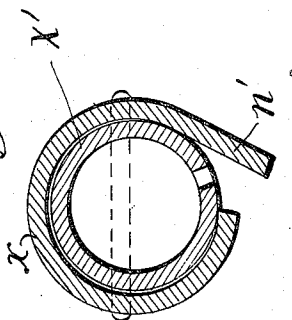
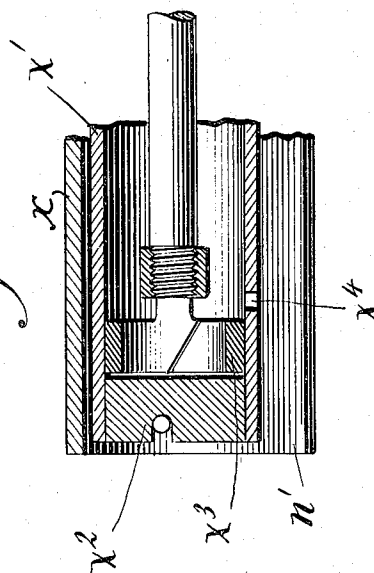


Fig. 6.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR SCREENING PULP.

No. 873,390.

Specification of Letters Patent.

Patented Dec. 10, 1907.

Application filed May 17, 1907. Serial No. 374,217.

To all whom it may concern:

Be it known that we, WILLIAM A. STEVENSON and AMBROSE H. WHITE, citizens of the United States, residing at Northampton, county of Hampshire, State of Massachusetts, and at the city of Brooklyn, county of Kings, State of New York, respectively, have invented certain new and useful Improvements in Apparatus for Screening Pulp; and we 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.

Our invention relates to certain new and useful improvements in apparatus for screening pulp, such as wood-pulp, sulfite-pulp, soda-pulp and the like, and it is particularly designed for the purpose of giving a large output of an efficiently screened product, and also when desired, for the purpose of sorting the product into two or more grades or degrees of fineness.

The main characteristic feature of the invention consists in supplying the pulp to be treated, to a relatively shallow conical screening surface, or a succession of such screening surfaces, mounted upon a supporting shaft or axis which rotates with just sufficient speed to spread the pulp up the incline to a greater or less degree permitting its finer particles to drain through the screen slots or apertures and at the same time subjecting the pulp to the action of a series of jets of water or thin pulp forming a continuous spray directed downwardly upon the revolving screen surface. The main portion of the pulp, under these conditions, will pass through the screen apertures, assisted by the coöperation of a like spray or succession of sprays directed upwardly upon the bottom surface of the screen and whose chief function is to prevent the screen apertures from clogging. The speed of rotation of the supporting shaft is so moderate that there is practically no tendency for the coarser fibers to be forcibly driven into the screen apertures, as is frequently the case in screens of the centrifugal type. On the contrary, as the thinner pulp passes through the screen apertures, the coarser fibers, knots and the like tend merely to settle upon the screen surface, and as the screen revolves they are met by the ascending radial spray or sprays which momentarily lift or float them, and

at the same time, the descending spray washes off from them the adhering pulp of finer grade and carries said finer pulp through the screen plates. In fact, the descending spray is the active agent upon which the passage of the pulp through the screen plates depends. The ascending spray or sprays, on the other hand, in lifting the coarser particles, bring them into a condition to move outwardly toward the verge or edge of the screen, where they either gather and accumulate temporarily, or over which they pass at once into the outlying collecting trough or gutter. In other words, the passage of the thinner pulp through the screen apertures is not due to momentum induced by centrifugal force, but is due to the direct downward washing action of the descending spray and the discharge of the coarser fibers over the verge or edge of the screen is due to the action of the lower or ascending spray or sprays which float or lift them sufficiently to permit them to move outwardly to their point of discharge. So far as we are aware, these features, as thus combined, are broadly new in the art.

Minor features of the invention will be hereinafter described and their construction and functions will be particularly set forth.

In the accompanying drawings, Figure 1 represents a partial section and partial elevation of the preferred form or embodiment of our invention; Fig. 2 represents a top plan view thereof, certain of the parts being omitted in order to more clearly illustrate the general arrangement; Fig. 3 represents a partial section and partial plan view showing one of the directing cones employed for conveying the pulp which has passed through an upper screen of the series to a lower screen thereof; Fig. 4 represents a detached view of one of the collecting gutters, shown as broken away midway of its length; Figs. 4^a and 4^b show certain details of construction of the individual parts; Figs. 5, 6 and 7 show, on a larger scale, our preferred means for directing a stream of water or thin pulp upon the upper and lower surfaces of the screen.

Similar letters of reference indicate similar parts throughout the several views.

Referring to the drawings, A indicate suitable columns, posts or standards, serving to support the screen and its operating mechanism. These columns are preferably of general I-beam shape in cross section and at

their upper ends are connected by a rim B of T-iron, which may be secured thereto by means of bolts and nuts. This rim serves to support the outer bracket C of the countershaft D of the driving mechanism, and also serves to support the brackets *a* of the upper range of water pipes. The preferred location of these brackets *a* is shown in Fig. 2, wherein it will be noted that they are placed immediately above the columns A.

E indicates the band wheel for the countershaft D, which shaft is geared by the pinion *c* to the pinion *d*, which latter is mounted upon the rotatory shaft F. The shaft F is stepped in a bearing *e*, as shown, which bearing is formed as a downwardly extending projection from the center of the collecting pan G, of general conical shape and bolted to the columns A by means of the bolts *f*. The upper bearing of the shaft F is contained within the hub *h* of a spider H, connected to the rim B in any suitable manner, and a bracket *i* supports the pipe I, through which the wood pulp or other pulp is admitted from the stock vat, said pipe I being inclined inwardly at its lower end so as to deliver the stock at the center of the upper screen, as shown.

Keyed upon the shaft F, one above the other, are a series of hubs *k*, *k'*, *k²*, having radiating arms *l* upwardly inclined and connected at their outer ends by a rim or verge *m*. The arms *l* and the verge *m* may conveniently constitute a single casting with the corresponding hub, and the hub is coned out at its upper edge, so as to afford a space upon which rest the inner edges of the screen plates. Coöperating with this coned out portion of the hubs *k*, *k'* and *k²* are the tubular nuts *n*, which are screw-threaded upon the shaft F and which are provided on their lower ends with conical bearing surfaces so that, by applying a wrench to the nuts *n* they may be caused to firmly clamp the inner ends of the screen plates, thereby holding them firmly but releasably in position.

The screen plates *r* may be provided either with slits or with circular, oblong, or other shaped holes, as preferred. In general, we prefer to have the screen plates of the upper screening surface which first receives the stock from the pipe I of the type that are usually provided with round or circular holes, but they may be provided with slits, if so desired, as shown in Fig. 2, and the lower screen plates may be provided either with holes or slits, as preferred. It is contemplated, however, to vary the size of the holes, slits or other apertures in the several screens, so that the upper screen may be the coarsest and the lower ones may increase successively in fineness. It is an advantage of the construction that it permits the operator to employ screens of the kind and grade desired for any particular purpose, and to employ one

kind for the roughing action effected by the rough screening and another kind for the finer screening action effected by the lower members of the series.

As indicated by dotted lines in Fig. 2, and as shown in detail in Fig. 4^a, the adjacent screen plates of each screen are caused to over-lap and they are secured by a series of screws *s* to an angle-iron *t*, which is secured to one of the arms *l* of the screen-supporting hub. At their outer edges the screens are secured by removable screws *v* to the verge *m*. It will, therefore, be evident that by applying a wrench to the nuts *n* so as to unclamp the screen blades, and by removing the screws *s* and *v*, the screen plates, or any number of them, may be removed and others substituted, expeditiously and effectively.

Below each screen is located a pipe *w* which discharges a stream of water or thin pulp upwardly upon the lower surface of the screening surface as it revolves. This pipe *w* is arranged slightly in advance of, or in rear of the neighboring pipe *x* of the upper series of pipes which discharge water or thin pulp on the upper surface of the screens, and the function of the pipe *w* is to keep the screen from clogging, by forcing upwardly and out of the screen holes or slits any particles which may tend to collect therein. Ordinarily, a single pipe will suffice for this purpose. The rim or verge of each screen discharges into a receiving gutter, whose configuration is indicated more fully in Fig. 4. These gutters are provided with lugs *a'* which rest upon the supporting set screws *b'*. They are provided with downwardly projecting flanges *c'*, to which are attached the over-lapping segment plates *d'*, constituting the side walls of the apparatus, in conjunction with the collecting pan G and the upper segment plates *d²*. By this expedient any segment plate *d'* may be removed so as to gain access to any desired part of the interior of the apparatus, and may be thereafter replaced, these operations being performed without being obliged to dismantle the entire structure.

An inwardly extending flange *e'* serves, as indicated in Figs. 1 and 3, to attach, by means of screws or rivets, the over-lapping plates *f'* of the directing cone upon which the screened stock falls as it passes through the screening surface above and by which it is directed to the inner and lower end of the next lower screen of the series.

The collecting gutter for the uppermost screen is provided with a discharge spout *g*, as shown, and a similar discharge spout *g'* is provided for the lowermost collecting gutter. In general, we prefer, as shown in the drawings, to omit providing a separate discharge pipe for the intermediate collecting gutter of the series, and, to provide said intermediate gutter with a number of free openings *h'*, as shown in Fig. 3, so that the coarse fibers and

the like rejected from the intermediate screen of the series into its collecting gutter shall join the coarse fibers and the like rejected from the lowermost screen. In this manner, the apparatus will give a three-fold product, to wit, the knots, dirt and unutilizable coarse fibers rejected from the top screen; a second product consisting of screened pulp of good quality rejected by the intermediate and lowermost screens; and, finally, a third product consisting of still finer pulp issuing from the discharge spout g^2 of the collecting pan G.

It is, of course, evident that the number of screens may be increased beyond those shown in the drawings, without departing from the spirit of our invention.

For convenience of inspection of the interior of the apparatus, glass plates m' may be inserted at convenient places in the outer shell.

Figs. 5, 6 and 7 show the preferred form of admission pipe for the supply of water, thin pulp, or other like diluent, to the apparatus. It consists primarily of an outer shell provided with a lip n' integral therewith, which outer shell has a screw-threaded engagement with a tee z supplied through an inlet nipple r' and closed by a stuffing box s' , through which passes the rod t' having an operating handle t^2 . Upon this rod t' is mounted the slide x^3 (see Figs. 5 and 6) whose function is to keep clear of obstructions the outlet apertures x^4 of an inner pipe x' , which is closed at its end by a plug x^2 . The arrangement is such that the diluting water or thin pulp, entering the inner pipe x' , finds its way in a series of jets through the apertures x^4 , and striking the lip n' of the outer tube is caused to spread out in a continuous spray. It will, of course, be understood that the pipes x which deliver the water to the top of the screens and the pipes w which deliver the water to the bottom of the screens are of the same construction, to wit, that shown in Figs. 5, 6 and 7. The pipes x are so located that the lip n' is directed downwardly and the pipes w are so located that the lip n' is directed upwardly, as shown in Fig. 1 of the drawings.

In Fig. 4^b, we have illustrated our preferred means for readily installing and removing these pipes x and w , for substitution or repair. On reference to this figure, it will be noted that the outer tube x or w is clamped by means of a set screw w^3 to a flanged sleeve w^3 , and that this sleeve, in its turn is removably secured by means of screws as shown, to an inclined bearing w^4 attached to the posts or columns A. The arrangement is such that by releasing the screws which connect the sleeve w^3 to the bearing w^4 , the sleeve and pipe may be at once withdrawn through the opening in the bearing.

It will be understood that, where desired, a pipe as, for instance, N, may be introduced

into the top collecting gutter, for diluting the material collected therein to an extent sufficient to insure its outflow.

Having thus described our invention, what we claim is:—

1. Apparatus for screening pulp, consisting of an inverted, shallow, conical screen, means for supplying pulp to the upper surface of the screen, means for imparting a moderate rotation to the screen so as to spread the pulp up the incline and over the screen plates, means for discharging a spray downwardly upon the upper surface of the screen so as to wash the fine pulp of the desired grade through the screen plates as they pass said spray, and means for spraying upwardly the lower surface of the screen, so as to raise or float the coarser particles and permit them to move outwardly toward the outer verge or discharge edge of the screen; substantially as described.

2. Apparatus for screening pulp, consisting of an inverted, shallow, conical screen, means for supplying pulp to the upper surface of the screen, means for imparting a moderate rotation to the screen so as to spread the pulp up the incline and over the screen plates, a spray pipe arranged radially to the revolving screen and discharging downwardly upon the upper surface of the screen so as to wash the fine pulp of the desired grade through the screen plates as they pass it, and a series of upwardly discharging radially arranged sprays arranged below the screen plates; substantially as described.

3. Apparatus for screening pulp, comprising an inverted, shallow, conical screen, means for rotating it at a moderate speed, means for supplying pulp to the screen at the lower part of its incline, a collecting or receiving gutter at the upper rim or verge of the screen, and means for supplying a spray of water or like diluent transversely to the upper surface of the screen as it revolves; substantially as described.

4. Apparatus for screening pulp, comprising an inverted, shallow, conical screen, means for rotating it at a moderate speed, means for supplying pulp to the screen at the lower part of its incline, a collecting or receiving gutter at the upper rim or verge of the screen, and means for supplying a spray of water or like diluent transversely to the upper surface of the screen as it revolves, and for supplying a like spray to its bottom surface; substantially as described.

5. Apparatus for screening pulp, comprising an inverted conical screen, made up of a series of screen plates, a supporting hub upon which the inner edges of said screen plates rest, and a releasable clamping nut upon the screen shaft for clamping the inner ends of the screen plates to the hub; substantially as described.

6. Apparatus for screening pulp, comprising an inverted conical screen, made up of a series of screen plates, a supporting hub upon which the inner edges of said screens rest, and a releasable clamping nut upon the screen shaft for clamping the inner ends of the screen to the hub, the supporting surfaces of the hub upon which the inner ends of the screen plates rest, and the corresponding clamping surfaces of the nut being conical; substantially as described.

7. Apparatus for screening pulp, comprising an inverted conical rotating screen comprising a series of screen plates, the upper edges of which are removably secured to the discharging verge or rim of the screen; substantially as described.

8. Apparatus for screening pulp, comprising an inverted conical screen, whose screening surface is made up of a series of screen plates, overlapping at their edges, and underlying angle irons, to which the overlapping edges are removably secured, and supporting arms carrying the said angle irons and mounted upon the screen shaft; substantially as described.

9. Apparatus for screening pulp, comprising a plurality of inverted screening cones, ranged one above the other, means for imparting rotation to said cones, a receiving gutter into which the upper screen discharges, and a directing cone arranged between adjacent members of the series of screens, so as to conduct the pulp passing through the upper screens of the series to the lower ends of the lower screens of the series; substantially as described.

10. Apparatus for screening pulp, comprising a plurality of inverted screening cones, ranged one above the other, means for imparting rotation to said cones, a receiving gutter into which the upper screen discharges, a directing cone arranged between adjacent members of the series of screens, so as to conduct the pulp passing through the upper screens of the series to the lower ends

of the lower screens of the series, and separate discharging spouts for individual receiving gutters; substantially as described.

11. Apparatus for screening pulp, comprising a series of inverted conical screens located one above the other and means for imparting rotation thereto, the uppermost screen constituting a roughing screen provided with a collecting gutter and discharge outlet therefrom, the lower screens discharging over their top surfaces into a collecting gutter having a common outlet, and a lowermost collector, receiving and discharging the pulp which passes through the lowermost screen of the series; substantially as described.

12. Apparatus for screening pulp, comprising an inverted conical screen, means for rotating the screen, an outlying receiving gutter, supporting lugs upon the gutter, and side posts upon which the supporting lugs are carried; substantially as described.

13. Apparatus for screening pulp, comprising an inverted conical screen, means for rotating the screen, an outlying receiving gutter, supporting lugs upon the gutter, and side posts upon which the supporting lugs are carried, through the intermediacy of adjustable bolts and nuts; substantially as described.

14. Apparatus for screening pulp, provided with pipes for the admission of water or the like, and means for removably attaching the pipes in place, consisting of bearings, carried by the supporting columns of the apparatus, sleeves upon the pipes, and flanges upon the sleeves for securing them to the bearings; substantially as described.

In testimony whereof we affix our signatures, in presence of two witnesses.

WILLIAM A. STEVENSON.
AMBROSE H. WHITE.

Witnesses:

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WARREN CURTIS, Jr.