

C. Sweetland.
Pulp Grinder.
N^o 5,756. Patented Sept. 5, 1848.

Fig. 1

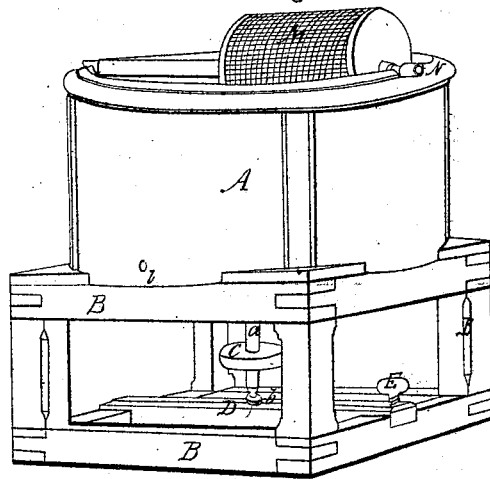


Fig. 2.

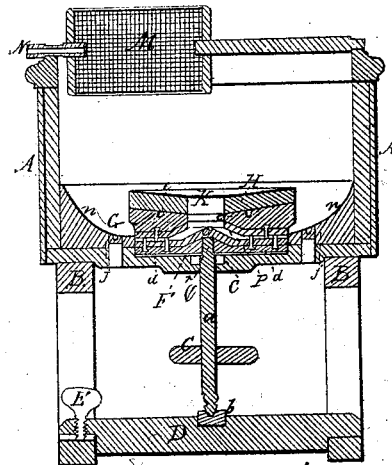


Fig. 7.

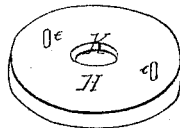


Fig. 6.

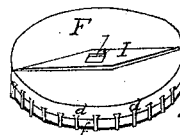


Fig. 4.

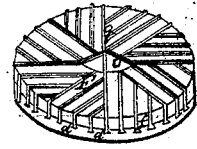


Fig. 5.

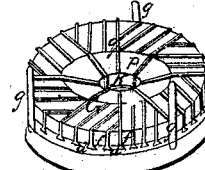
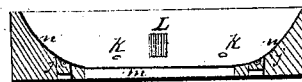


Fig. 3.



UNITED STATES PATENT OFFICE.

GEO. SWEETLAND, OF NEW HAVEN, CONNECTICUT.

PULP-MACHINE.

Specification forming part of Letters Patent No. 5,756, dated September 5, 1848; Reissued January 1, 1861, No. 3.

To all whom it may concern:

Be it known that I, GEORGE SWEETLAND, of the town of New Haven, in the county of New Haven and State of Connecticut, have
5 invented a new and useful Improvement in Machinery for Grinding or Preparing Pulp from Rags, Straw, and other Materials for Making Paper of Every Description; and I do hereby declare that the following is a
10 full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, which make part of this specification, in which—

15 Figure 1, is a perspective view of the external part of the cylindrical vat, frame, &c., with "Phelps's patent cylinder rag washer" attached. Fig. 2, is a direct sectional view of the same, cut vertically through the center, showing the working part, or internal
20 construction of the machine, &c. Fig. 3, is a direct sectional view of the opposite half of the circular curve in the lower part of the cylindrical vat, showing the internal surface and form. Fig. 4, is a perspective view of
25 the lower, or revolving wheel, or worker, with the cutters attached. Fig. 5, is a perspective view of the upper, or stationary wheel, or bed (against which the revolving wheel works), with the cutters attached.
30 Fig. 6, is a perspective view of the underside of the revolving wheel, or worker. Fig. 7, is a perspective view of the underside of an addition weight, or rim, to be attached to, or placed on, the upper side of the stationary
35 wheel, or bed, when more weight is required than is necessary for the lightest work.

My improvement consists in constructing a cylindrical vat, of suitable dimensions for
40 the extent of the work intended to be done, with a circular curve near the bottom extending about one-fourth of the diameter toward the center of the cylindrical vat, on all sides, or entirely round the lower part of the
45 vat. In the bottom of the cylindrical vat, and within the circle formed by the inner edge of the circular curve, I place, horizontally, a revolving wheel, or worker, of about one-half the diameter of the cylindrical vat,
50 with cutters set in the upper surface. This revolving wheel, or worker, rests on the upper end of a vertical spindle, or shaft, which is supported by the framework below, and by means of a pulley, or other gearing, on
55 the spindle or shaft, the revolving wheel, or

worker, receives a horizontal rotary motion with the required velocity. Above the revolving wheel, or worker, I place a similar wheel, or bed with cutters set in the under surface, and secure it in its stationary position by convenient supports attached to it,
60 and let into the circular curve at the bottom of the cylindrical vat, in such a manner as to allow of its being raised vertically, with ease when necessary. Vertically through the center of this stationary wheel, or bed, I make
65 a circular hole, or eye, of sufficient diameter to allow the water and the material to be ground to pass together freely down to the revolving wheel, or worker. I fill the cylindrical vat with water until the stationary
70 wheel, or bed, is completely submerged, and then throw the material to be ground (in suitable quantity), into the water, and then set the revolving wheel or worker in motion
75 by means of the pulley, &c.

The horizontal rotary motion of the worker communicates a centrifugal force to the water in the vat, which raises or elevates it about the sides and thereby causes it to
80 flow down to the center, and through the hole, or eye, in the stationary wheel or bed, to the revolving wheel or worker, and thus the material to be ground is being carried, continually, by the water down through the
85 hole or eye in the bed or stationary wheel, between the cutters, and up again to the surface; and this process is continued until the material is sufficiently ground and the pulp fit for use.

90 The cylindrical vat, A, Fig. 1, is made of wood, or any other suitable material, and of sufficient dimensions, suited to the extent of the work to be done, by any of the usual methods, or otherwise. In the lower part of
95 the cylindrical vat a circular curve is to be fitted, as seen at *n, n*, Figs. 2 and 3, extending about one-fourth part of the diameter toward the center of the vat on all sides, and the ascending sides, of this circular curve,
100 forming an easy curve to allow the water to be readily forced up by the rotary motion of the worker, F, Figs. 4 and 2. In this circular curve are two valves, *j, j*, Figs. 2 and 3, to let out the water, &c., when necessary,
105 and also a sand grate, L, Fig. 3, to let through any sand, or any other small and heavy substance that may happen to be mixed with the material to be ground. Under this sand grate L, Fig. 3, should be a hol-
110

low space, cut in the material of which the circular curve is made as a depository for the sand, &c., which will, of course, be filled with water, which can be let out at any proper time by means of a valve, or gate, as seen at *l*, Fig. 1.

The cylindrical vat should be placed on a suitable frame, as B, B, B, Figs. 1 and 2, in a firm and substantial manner, as seen in Fig. 1.

The revolving wheel or worker, F, Figs. 4 and 6, should be made of cast iron, or some other suitable material, with slots or grooves of dovetail shape running from the periphery, or verge, of the wheel toward the center in the proper directions and positions, and in the proper form to insert the cutters, as seen in Fig. 4.

The central part, *o*, Fig. 4, of the worker is raised in a conical form, or elevation, as seen at *o*, Figs. 4 and 2, to carry the material more readily from the center, so as to prevent choking or clogging the machine.

The cutters, *g*, Figs. 4 and 5, should be made of bars of steel, of the proper shape, and properly tempered, and inserted with dovetails, as seen at *d*, *d*, Figs. 4, 5, 6, and 2, so that they may be easily inserted or removed and changed should it be necessary in consequence of breaking or wearing down too low to work well. As the cutters are self sharpeners, the longer a set can be made to last the better, as they will work better after they have been properly fitted to each other by using them some time, than they will while new.

I would therefore recommend that the cutters, in both the worker, Fig. 4, and the bed, Fig. 5, be made of flat bars of steel, wider than would be necessary for cutters for ordinary use; and after they have been inserted into the dovetail slots, or grooves, to support them by suitable pieces of wood fitted into the spaces between them, as seen at *f*, Figs. 4, 5, and 6 (or other suitable material), which can be easily cut away as the cutter wears down, thus making a set of cutters last much longer, and at the same time never having too much space between the worker F and the bed G, Fig. 2, for the water and material to escape between the cutters. On the opposite side from the cutters, that is on the underside of the revolving wheel, or worker, Fig. 6, should be cast, or firmly attached, a bar, I, Fig. 6, extending nearly the whole diameter of the worker (called the "banger"), so that while the worker is revolving none of the material being ground will lodge at the bottom and obstruct or clog the machine. In the center of the underside of the worker, and through the cross-bar, or "banger" I, a square mortise, *h*, Fig. 6, is cut to admit the upper end, *r*, Fig. 2, of the spindle, or shaft, *a*, Figs. 1 and 2, on which the worker rests.

The upper or stationary wheel, or bed, G, Fig. 5, should be made of cast iron, or other suitable material, similar in form to the worker, with like dovetail shaped grooves, or slots, on the under side for inserting the cutters, *g*, Figs. 5 and 4, with a concave space, *p*, Figs. 5 and 2, in the central part of the underside, to admit the conical elevation *o*, Figs. 4 and 2, on the central part of the worker F, Figs. 4 and 2. Vertically through the center of this stationary wheel or bed, G, Fig. 5, should be made a round hole, or eye, K, Fig. 5, to permit the water to carry the material to be ground down through the bed to the worker, as seen at K, Fig. 2. This stationary wheel, or bed, G, Fig. 5, should have three (or any other convenient number of) supporters, *q*, *q*, *q*, Fig. 5, attached to its periphery, which supports are to rest in holes, or spaces, *k*, *k*, Fig. 3, in the circular curve, *n*, *n*, Figs. 2 and 3, to sustain the wheel, or bed, permanently in its proper position, as seen at G, &c., Fig. 2, at the same time allowing it to be readily raised vertically when necessary to take it up for repairs, &c., and also to leave it free to clear itself should too much material be carried in at any time; or should any improper substance get into the machine with the material to be ground. As the wheel, or bed, G, Fig. 5, is kept down by its own weight, should it be found to be too tight, at any time, additions may be made to it by cast-iron rims, like H, Fig. 7, with a hole, or eye, K, Fig. 7, through the center, of the same size and shape as that in the bed, as seen at K, Figs. 2 and 5.

These rims should be held in their proper position by steady pins, *e*, *e*, Figs. 7 and 2. Or for convenience, the bed, G, may be made light, and any number of these rims may be made of a convenient weight to handle, and be placed one upon another on the bed until there is sufficient weight; thereby rendering the machine more convenient to handle when necessary to be taken up for repairs, &c.

The cylindrical vat, A, Fig. 1, with the circular curve *n*, *n*, Figs. 2 and 3, fitted, is placed on the frame B, B, B, Figs. 1 and 2, in its proper position, as seen in Fig. 1.

The spindle or shaft, *a*, Figs. 1 and 2, passes up through the center of the bottom of the cylindrical vat, at O, Fig. 2, and through a suitable packing box, *c*, Fig. 2, which box should be packed essentially water-tight. This spindle, or shaft, *a*, Figs. 1 and 2, is supported at the lower end in a female center, *b*, Figs. 1 and 2, fitted on a bar, or lever, D, Figs. 1 and 2, extending across the lower part of the frame, B, B, B, Figs. 1 and 2, in a suitable position to be elevated, or lowered, at pleasure, by means of the thumb screw, E, Figs. 1 and 2, or by any other suitable and convenient method,

so as to regulate the space between the worker, F, Fig. 4, and the bed, G, Fig. 5, as seen in Fig. 2.

The revolving wheel, or worker, F, Figs. 4 and 6, is placed in the bottom of the cylindrical vat, within the circle formed by the circular curve at *m*, Fig. 3, where it rests on the upper end, *r*, Fig. 2, of the spindle or shaft, *a*, Figs. 1 and 2, with the cutters upward, as seen at F, &c., Fig. 2, and in such a position that the edges of the cutters may be about on a level with the inner edge of the circular curve, *n*, *n*, Figs. 2 and 3, as seen in Fig. 2.

The worker F, Fig. 2, receives a horizontal rotary motion by means of the upper end, *r*, of the spindle or shaft, *a*, Fig. 2, being square, and being inserted into the square mortise, *h*, Figs. 6 and 2, and by means of the pulley, C, Figs. 1 and 2, which is to be carried by a band; or by any other suitable or convenient means.

The stationary wheel, or bed, G, Fig. 5, is placed in the cylindrical vat, with the cutters downward, above the revolving wheel, or worker, F, as seen at G, &c., Fig. 2, resting on, and kept in its proper position by the three supporters, *g*, *g*, *g*, Fig. 5.

The additional weight, or rims, H, Fig. 7, are to be placed on the top of the stationary wheel, or bed, G, as seen at H, Fig. 2, as before described.

The upper side of the stationary wheel, or bed, and also of the additional weights, or rims, should be cast concave, or dishing, as seen in Fig. 2, and the hole, or eye, K, Fig. 2, should be of sufficient size to admit the water and material, together, to pass freely through down to the worker; say from one-sixth to one-fourth of the diameter of the bed.

"Phelps's patent cylinder rag washer" may be used in connection with my machine by attaching it as represented in the drawings M, Figs. 1 and 2, N representing the hollow gudgeon, or pivot, through which the water is let off, or any other washer may be used, as deemed most convenient in any case.

The advantages of my improvement over all others now in use consist, in part,

1st. In having the material to be ground, or reduced to pulp, carried over the top of the stationary wheel, or bed, down through the eye, between the cutters, out at the periphery of the wheels, and up again continually, by the combined centrifugal and gravitating motion of the water in the cylindrical vat, which motions are communicated to the water by the horizontal rotary motion of the worker, as before described.

2nd. The cutters being self sharpeners will always be in order for work, until they are worn out, and therefore need very little attention after they have been fitted, except to remove the wood which supports them.

3rd. The cutters being straight bars, and being inserted in dovetail grooves, or slots, may be fitted much more readily than those on the convex surface of a cylinder; and they are much less liable to get broken, not only from their position and support, but also as the bed being only held down by its own weight, would readily be raised vertically by the action of any improper substance getting between the bed and worker, by which means the improper substance would soon be thrown out; and if a heavy substance, it would not again be carried up, but would remain in the lower part of the vat.

4th. There being a much greater number of cutters in my machine than can be used in the common vertically revolving cylinder machines, of the same size, mine will, of course, do much more work at each revolution, and it is capable of having many times the number of revolutions which can be had with the vertically revolving cylinder machine, in the same time.

5th. The cutters being set at different angles with the diameter of the wheels, they will cut the material in different direction in the same revolution, and will also have a tendency to draw out the fibers, instead of chopping them short, or cutting them in strips, as is often done by the direct motion of the cutters of the vertical revolving cylinder.

6th. The material, being kept constantly in motion by the motion of the water through which it is diffused, will be carried to the cutters much more equally, and in a better condition to be ground even, than by any other method; and the machine will continue to work the material over and over until it is stopped; and will require but very little attention.

7th. My machine is more simple in its construction, economical in its use, and expeditious in its operation, than any machine now used, and will prepare pulp in a more perfect form, and in a better condition for use from any material whatever.

I do not claim the stationary wheel, or bed, nor the revolving wheel or worker, nor the cutters, nor the manner of inserting them in the wheels, as such; they all having been long known, and used for other purposes; but—

What I do claim as my invention and desire to secure by Letters Patent, is—

The combination of the bed and worker, with their cutters, arranged horizontally in the bottom of a cylindrical vat, so as to cut or grind rags, straw, and other material (for making paper of every description) into pulp of an even and suitable quality, by carrying the material in water through the machine, by means of the centrifugal force which is communicated to the water by the

horizontal rotary motion of the worker. By which centrifugal force the water will be raised against the sides of the cylindrical vat, whence, by its own gravity, it will flow
5 down to the center, and through the hole, or eye, in the stationary wheel or bed, down to the worker, thereby keeping the material always loosely diffused through the water,

and flowing with it through the machine continually, until the pulp is fit for use. The whole constructed, arranged, combined, and operating, substantially as herein described. 10

GEORGE SWEETLAND.

Witnesses:

R. FITZGERALD,
LENE KNEVA.

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