W. W. HUBBELL.

Amalgamators and Ore-Washers.

No. 153,079. Patented July 14, 1874.

Fig-1.

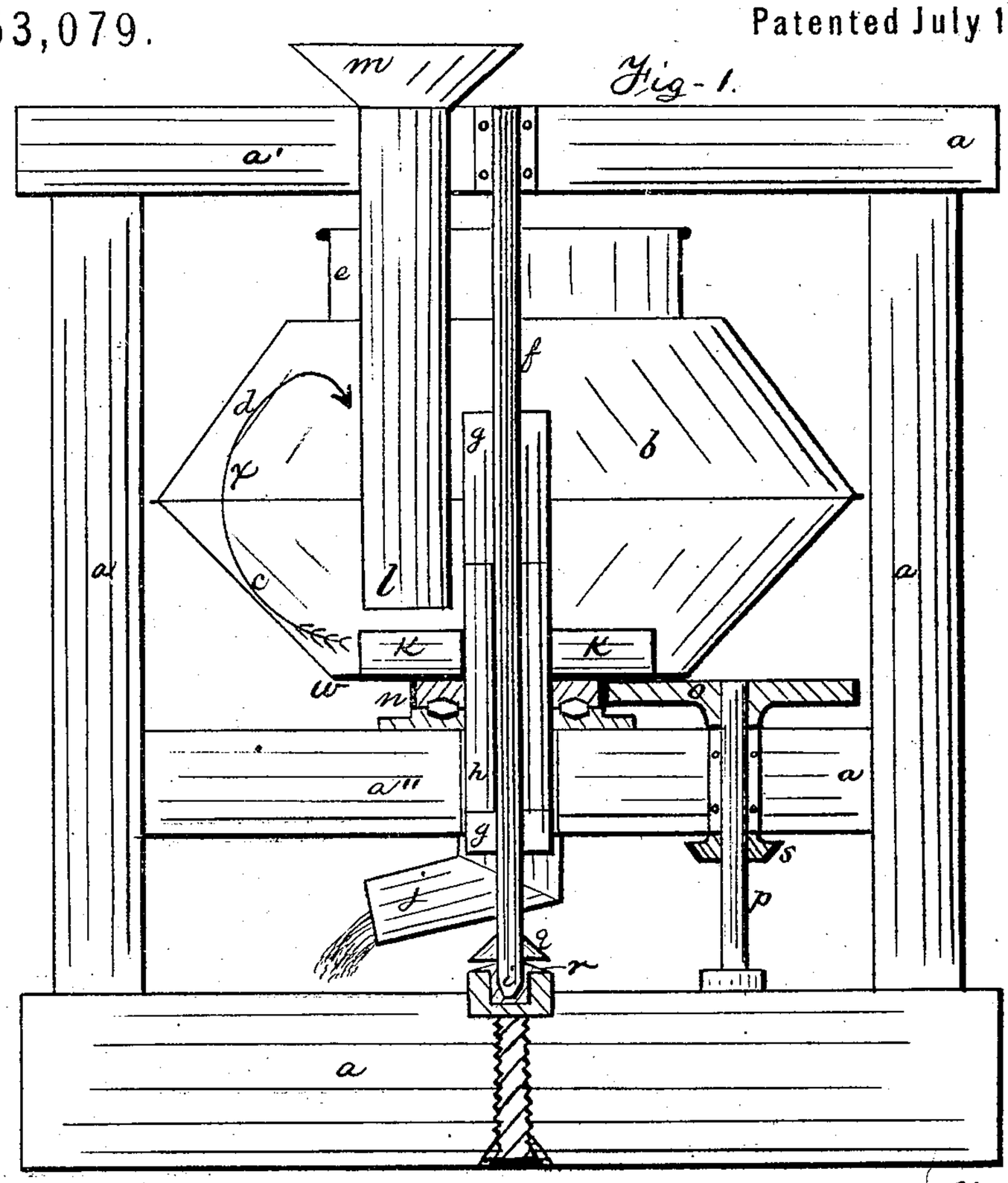


Fig-3.

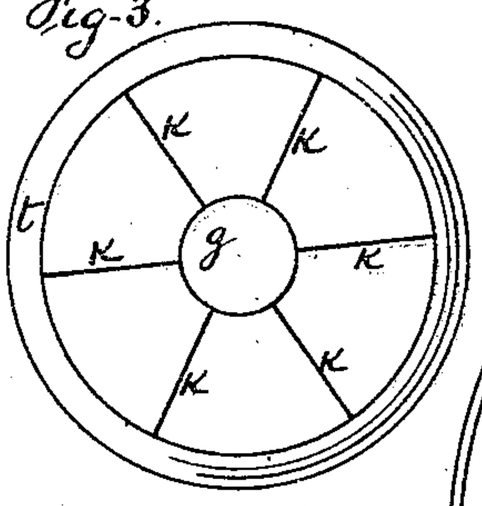


Fig-2.

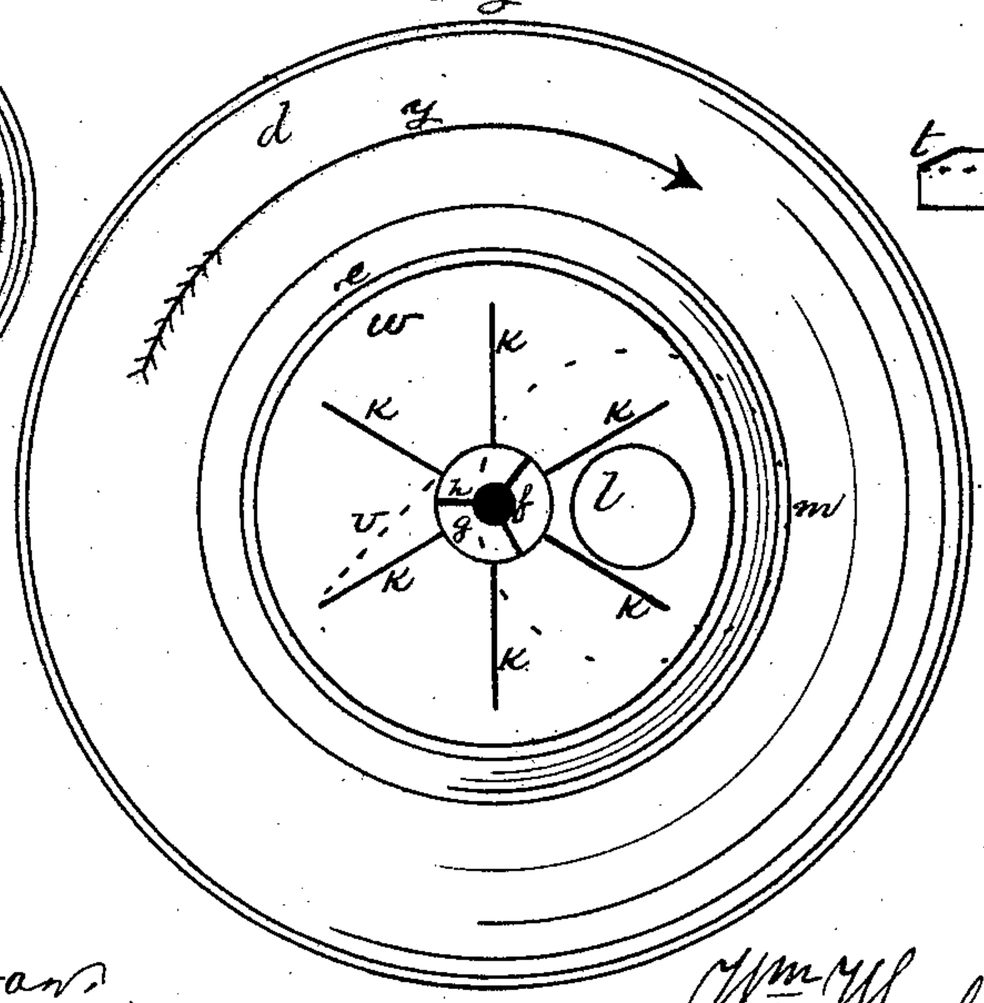
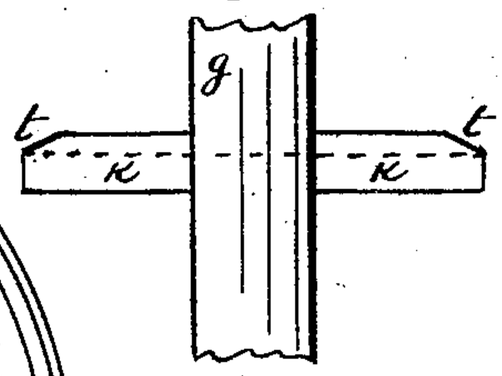


Fig-4.



Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM W. HUBBELL, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN AMALGAMATORS AND ORE-WASHERS.

Specification forming part of Letters Patent No. **153,079**, dated July 14, 1874; application filed June 27, 1874.

To all whom it may concern:

Be it known that I, WILLIAM WHEELER HUBBELL, of Philadelphia, State of Pennsylvania, have invented a Centrifugal Amalgamator and Washer to Extract Precious Metals from their Ores, of which the following is a specification:

The object of my invention is to create a circulation of the pulp, together with centrifugal force, to bring the gold and silver in the pulverized ore and the quicksilver together, forming an amalgam, and more completely than heretofore extract these metals from the pulp formed by mixing the pulverized ore with water.

The nature of my invention consists in constructing a suitable circular rotating drum to contain the pulp, with devices for producing a vertical circulation of the pulp, together with the horizontal rotation of the pulp with the drum; also, in constructing a device for feeding the fresh pulp to the centrifugal action of the other devices below the surface of the rotating pulp; also, in constructing a device for discharging the waste pulp by a centripetal action; also, in the construction and arrangement of a device to receive the waste pulp from the rotating devices; also, in the construction and arrangement of devices to prevent this waste pulp from cutting the journal and step on which the rotating devices run.

In the accompanying drawings, which illustrate the invention, Figure 1 represents the entire amalgamator and washer divided through the center and suspended on its round vertical shaft in its wood frame, with the gearing to run it. Fig. 2 represents a top view of the rotating drum, showing the interior devices. Figs. 3 and 4 show a method of constructing the interior devices, with the addition of an accelerating device to increase the force of the outward flow of the pulp from between the wings at the bottom of the rotating drum.

The framing *a* of the amalgamator is made of wood, and consists of a heavy base with two uprights and two cross-pieces, as shown. The rotating drum *b* is made of heavy wrought or cast iron, or other suitable material, and may be lined with copper where the pulp contains chlorine or any ingredients requiring copper. The bottom *w* of the drum is at about right angles to the vertical axis, and the side *c* flares outward to about the middle of the height of the drum; and above this the side *d* of the drum contracts, and is surmounted by an open circular collar, *e*, as shown. The object in flaring the side *c* outward is to form a circular inclined face to allow the quicksilver used by centrifugal force to mount up and spread itself over this surface *c* to catch the gold and silver as the centrifugal force of rotation drives them out to this surface; and the object of the inward direction of the face *d* is to cause the quicksilver, when it rises to that face, to fall over inwardly and envelope any gold or silver driven to that extreme outer circuit, and also to direct any waste pulp inwardly, to be drawn down and again subjected to the same action by means of the vertical circulation induced by the wings K and feed-pipe *l*. By "waste pulp" is meant pulp which has once passed through the feed-pipe *l* and wings *k*, the action of which I will now describe. Secured to the bottom of the drum are six (more or less) radially-extending wings, *k*, which, at the bottom, force the pulp between them with a positive rotating velocity greater than the body of pulp above them, and, therefore, they drive this bottom pulp outward by centrifugal force. The particles of gold and silver, being the heaviest, have the highest velocity or force outward, and this outward flow induces the pulp above the wings to descend to supply them, and thus these wings *k* establish a vertical circulation of the pulp, and by their action and the centrifugal force carry a fresh surface and supply of pulp against the quicksilver spread over the bottom at *w* and inclined side *c* beyond them. These wings *k* are arranged around the central waste-tube *g*, as shown, and above these wings *k* is suspended the stationary supply-pipe *l* having a receiver, *m*, at its upper end, and its lower end coming down to about two inches above the wings *k*. This supply-pipe *l* is made fast to the upper cross-beam *a'* of the frame, and through this pipe *l* all the pulverized ore and water or pulp are supplied, and directly to the rotating wings *k* at the bottom of the drum, and below the

mouth of the waste-pipe *g*, and below the surface of the pulp in the drum, so that not the fresh pulp, but only the light or waste pulp, passes out through the pipes *g*. In the rotation of the drum with the pulp the centrifugal force causes the pulp to rise much higher around the outer surface *d* of the drum than the height of the pulp at the middle; hence the waste-pipe *g* is made with its upper open end, as shown, much lower than the upper surface of the face *d* and of the collar *e* of the drum, in order that the lighter particles of the pulp, with the waste water, may, by gravity or centripetal action, pass to this lower mouth of the waste-pipe *g*, and flow down it as new pulp is supplied at the bottom through the supply-pipe *l*. The fact that the supply-pipe *l* is stationary in the pulp above the wings *k* obstructs this upper body of pulp, and prevents it from rotating as rapidly as the pulp which is between and carried around by the wings *k*, and therefore, also, the lower pulp is forced outward most rapidly, aiding to increase the vertical circulation of the pulp, which is essential to bring a fresh supply or face of pulp continually next to the quicksilver, that the superior centrifugal force due to the superior weight of the gold and silver in the pulp over the specific gravity of the other elements of the pulp, shall cause these precious metals to leave the pulp and unite with the quicksilver, which is kept out on the surface *c* by its great specific gravity and the centrifugal force, which, with its affinity for the precious metals, retains them, forming the amalgam on this outer surface *c* and the outer facing of the bottom *w* of the drum. The waste-pipe *g* is central, with its upper end all open, and located about half-way up between the base and top of the upper portion *d*, of the drum, as shown. This pipe extends down through the bottom of the drum, through the cog-wheel and friction-plate *n*, and through the middle cross-beam *a''*, below the drum, into a stationary receiver or spout, *j*, secured to the beam, which spout receives and conducts the waste-pulp off from it, to be saved or used, as desired. This central-pipe, *g*, has firmly secured inside of it, on its axial line, a wrought-iron shaft, *f*, made fast and held by a sleeve fitting close around the shaft, with three stays *h*, extending across the space between the shaft and pipe, and made fast to the latter. The spaces between these stays allow the waste pulp, which enters the open mouth or upper end of the pipe, *g*, to pass down into the receiver *j*. The shaft *f* runs in a box set in a block on the upper cross-beam *a'*, and the lower end *i* of the shaft runs in a movable box, *r*, in a block, forming a step set in the middle cross-beam *a''*, as shown, which step may be set up or down by a screw or lever, to allow some weight on the friction-plates and rollers at *n*. Between the receiver *j* and the box *r* a cone-shield, *q*, is secured to the shaft *f* to prevent the waste pulp which leaks through the bottom of the receiver, around the shaft extending through it, from soaking down into the box *r*, and thereby preventing the grit in the pulp from cutting the journal *i* and bearing *r*. Under the bottom of the drum and firmly thereto, around the pipe *g*, is secured a cog-wheel, *n*, which works into a larger cog-wheel, *o*, with a smaller cog-wheel, *s*, on the shaft *p*, to which latter cog-wheel *s* the power is applied, and thus communicates the revolutions to the drum, the power being applied at its bottom, which is both the point of greatest resistance and greatest strength. The drum should be run about two hundred revolutions a minute, or more or less, according to the quality of ore or pulp, and the amount of work to be done.

In Figs. 3 and 4, an accelerating-ring, *t*, is secured to the upper edges of the wings *k*. It slopes downward with a bevel-face, contracting the orifice of discharge from the wings, which bevel accelerates the flow of pulp with increased force outward from the orifices between the wings, and is useful for washing out the gold, and also to increase the vertical circulation. The vertical and horizontal circulation together, in fact, produce a spiral circulation within the drum.

The arrow *x*, Fig. 1, denotes the general direction of the vertical circulation. The arrow *y*, Fig. 2, denotes the direction of horizontal rotation of the drum with its contents.

The cog-wheel *n* is provided with a circular groove, to rest on cone friction-rollers between it and a bed-plate, as shown, on the middle cross-beam *a''*. About five hundred pounds of quicksilver may be put into the drum at a time, as it is capable of rapid extraction and amalgamation.

The construction of some parts may be varied. The supply-pipe may be made oval or with a wing, extending more in a radial direction, and thus diminish the degree of rotation of the pulp above the wings, and increase the vertical circulation. The wings *r*, when radial, admit of horizontal rotation in either direction. The wings may be set oblique, as shown by the dotted line *v*, Fig. 2, and when thus set oblique the drum must be run in the direction indicated by the arrow *y*. An indented channel, groove, or depression, may be formed around in the bottom of the drum at *w*, for the washed gold to settle in.

The sides of the drum may flare inward from the bottom, and thus drive all the particles of quicksilver, gold, and silver, together at its outer edge; or the sides of the drum may be cylindrical.

The ore and water may be measured into the receiver *m* by a wheel and water-chute, as described in my patent for an amalgamator, dated October 8, 1867. I have contemplated all these modes of applying my invention, and deem that shown by the drawings the best.

What I claim as my invention is—

1. The centrifugal amalgamator and washer consisting of the drum *b*, wings *k*, supply-pipe *l*, and waste-pipe *g*, constructed and operating together, substantially as described.

2. The supply-pipe *l*, extending down in the rotating drum below the mouth of the waste-pipe *g*, to operate as described.

3. The waste-pipe *g*, extending centrally up, and open below the top of the revolving drum, sufficiently far to receive the lower centripetal flow of waste pulp, as described.

4. The wings *k*, attached to the bottom of the drum to rotate with it, and operate as described.

5. The stationary receiver *j*, constructed and applied to the revolving pipe *g* and its shaft *f*, to operate as described.

6. The cone-shield *q*, secured between the receiver *j* and box *r*, to protect the latter from the waste of the former, as described.

7. The accelerating-ring *t*, constructed and applied to the wings *r* within the revolving drum, to operate as described.

8. The combined construction and arrangement of the cog and anti-friction wheel plates *n* with their intervening rollers applying the power, rotatory motion, and relieving the friction, all at the point of greatest resistance of the weight of the drum hung on its vertical shaft, substantially as described.

9. The combined cog and anti-friction wheel plates *n*, concentric with and around the shaft *f*, with adjustable step *r*, to divide the weight and friction between the plates and step, and impart power and rotation to the drum, substantially as described.

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Witnesses:
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