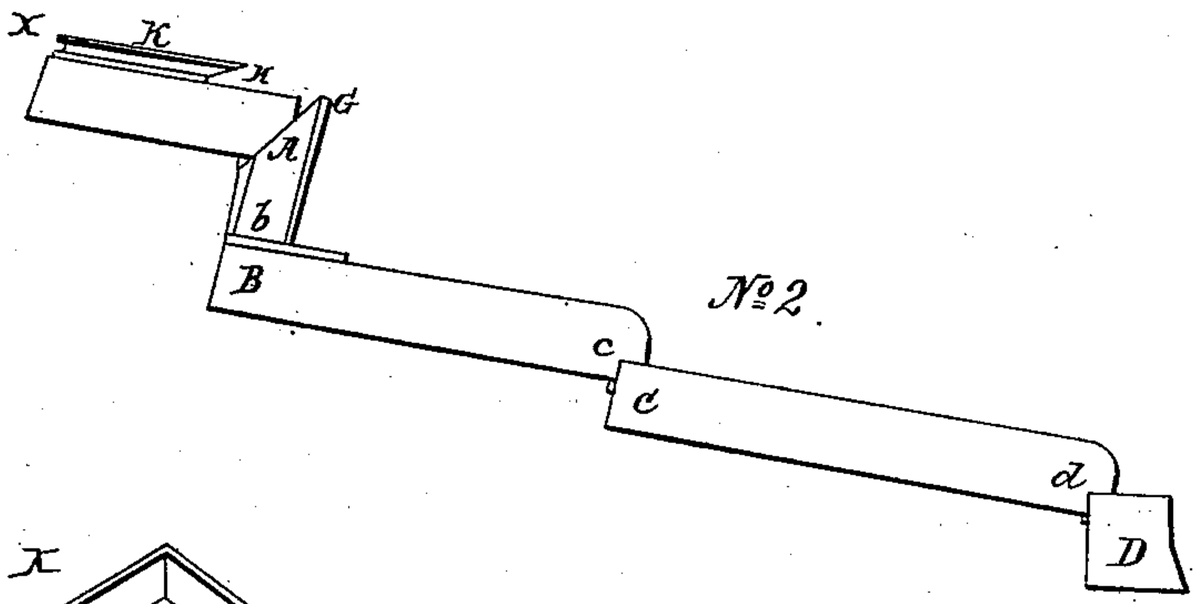
T. V. TAVNAY.

Gold Washer.

No. 17,758. Patented July 7, 1857.



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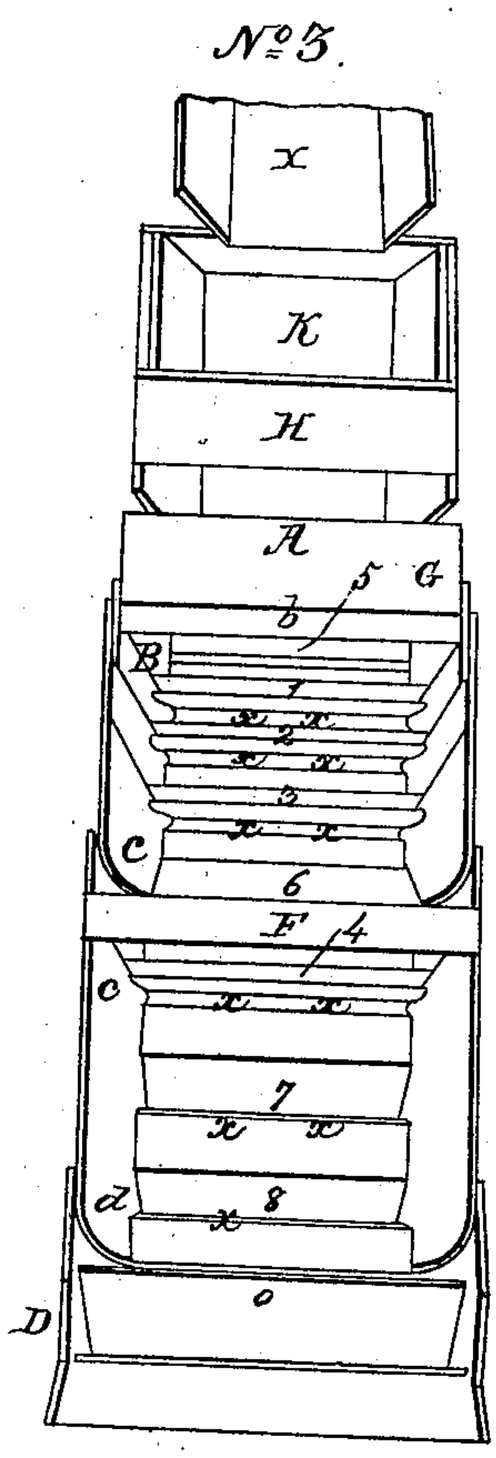

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Witnesses

Inventor

T. V. Tavnay

UNITED STATES PATENT OFFICE.

T. V. TAVNAY, OF SAN FRANCISCO, CALIFORNIA.

IMPROVED GOLD WASHER AND AMALGAMATOR.

Specification forming part of Letters Patent No. **17,758**, dated July 7, 1857.

To all whom it may concern:

Be it known that I, T. V. TAVNAY, of the city and county of San Francisco, in the State of California, have invented a new and useful improvement on the sluice, the riffle-box, and amalgamator for the purpose of washing and amalgamating gold and silver, by which joint process I save the finest particles of these metals found from experience and despite all improvements known to be carried away and lost; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a perspective view; Fig. 2, a longitudinal elevation, and Fig. 3 a transverse section.

X is the end of an ordinary sluice, which is furnished with screens to keep out the gravel, and may have metallic plates coated with mercury toward the end, or otherwise modified according to circumstances. Every riffle in the machine is filled with mercury and every plate is coated with the same.

K is a screen to receive the water, sand, and fine gold only, the coarse gold having been retained in the sluice; H, platform to throw off the coarse sand which cannot pass through K, whose wire was cut from a piece of the same used in the machine worked by me; A^b, cascade-box containing metallic plates to form a series of falls or cascades. The board G is raised on being unhooked for the purpose of cleaning.

B^c is the first riffle-box with riffles at *x x x x x x*, and metallic plates at No. 5, and plates also attached to each movable vane 1 2 3, made thus for cleaning; C^d, second riffle-box containing the movable vane No. 4, F, with metallic plate 6, and placed between the two boxes, before or behind the point fixed thereto, in such a way as to receive the fall of the cascade toward the center of the lower plate and react or change the current of water. Nos. 7 and 8 are also coated plates. The three knobs at *o o o*, Fig. 1, outside the box are for the purpose of communicating electricity, if found necessary. D is a box at the end of the machine to retain any overflowing mercury. Metallic plates can be placed in this box in the same way as in cascade-box A^b, if found necessary. O is a slide, which rises or falls so as to regulate the passage of the water, which must have force enough barely sufficient to carry off the sand and no more.

To render my description as succinct and clear as possible, I must enter into a few preliminary remarks, which I believe necessary, as no drawing can in this case convey a perfect idea of the improvements effected.

The fine gold contained in some alluvial soils and in the rivers, in the form of thin flakes or scales, is often found to be so light and minute that it escapes from the miner despite all the means employed up to this time. The same loss takes place in the quartz-mills, none of the processes in use being found adequate to the purpose of preserving the fine escaping particles above referred to. The difficulty existing is not always found to be the same in both cases of quartz and placer mining, although the great tenuity of the flakes or scales will be found to occur in both.

In the rivers or soils the particles of gold metal are generally pure—*i. e.*, incorporate with other bodies. In pulverized quartz a simple inspection will prove that whatever may be its fineness particles of gold may be found adhering to one of quartz or pyrites. In proportion as the quartz or pyrites is large the particle of gold adhering is less likely to be saved. Amalgamation takes place according to the specific gravity of the gold, as well as according to its affinity or attraction to mercury.

In supposing that according to its specific gravity each particle of pure gold must amalgamate, those particles adhering to quartz or to pyrites have the more or less chance of being saved according to the size of the foreign body, which is lighter than gold or even than mercury itself. One particle composed of one-half quartz, the other half of gold, will have fifty per cent. less chance of being saved by the mercury. Another particle composed of one part gold and three parts of foreign matter will have seventy-five per cent. less chance, the current of water on the surface of the mercury being equal in both cases.

It sometimes happens that a particle of gold, although in contact with mercury on one of

its sides, will escape the attraction, pass through, and become lost in the tailings. This takes place most often in those placers where, having deposited in a soil through which calcareous salts have more or less filtered, the particles of gold have been covered over by a coating impervious to mercury; and it is often the case that many particles of gold, spread in scales almost as light as gold-foil, float on top of the water. I have, I believe, got over all these difficulties by means of a process as simple as it is easy of application wherever mining can be carried on.

Having at different times mixed gold and mercury in vases of different metals—such as copper, iron, tin, silver—I remarked that when any part of the vase was attacked by the mercury and adhered to it, fine scales of gold were easily caught on those parts, sticking thereto forcibly. I was thereby encouraged to make a few experiments on the subject, and discovered the most important of the principles on which I have based my process of washing and amalgamating. I remarked, also, in examining some sluices and riffle-boxes, that the floating particles of gold jumped over the riffles, never came in contact with the mercury, and were carried away even quicker than the sand. To obviate this difficulty I combined currents together in such a way as to form little whirlpools, into which the floating particles would be attracted, and after turning therein for some time would be submerged.

The following is therefore an exposé of my process based on the forgoing remarks.

Give the particles of gold every possible chance of being retained in whirlpools, or by placing in their way a great surface of mercury, having previously disengaged them when necessary from any coating of foreign matter. By having sheets of iron in the bottom of the sluice, the mere friction therewith of the particles of gold will free the latter in part, if not wholly, from a portion of the foreign matter which may be adhering thereto. Then carried by the current against a metallic plate, covered over with mercury and so placed as to cause a fall or cascade, the gold being heavier than the water will go with a certain force against the plate, to which it will be found attached, or otherwise will have retained enough mercury to keep it in the riffle. The bottom of my riffle-box is furnished with movable vanes, which regulate the current of water, keeping it an equal height and making it as even and as steady as possible. The vanes, which are placed in front of the riffles, have attached to their lower edges plates coated with mercury, against which most of the floating particles of gold will be found adhering. Those that may escape here remain in the whirlpool formed close to the vane, or in that which will be found under the lower edge of the deep riffle placed behind the vane. The height of the fall in this riffle is calculated in such a way that the water will have exactly the power (and no more) to carry off the sand, only leaving in the riffle every particle of metal or any other body heavier than sand.

It may perhaps be necessary sometimes, on account of the great tenuity of the metallic scales, to have recourse to electricity. In that case galvanic batteries of any kind are to be placed so as to act on the mercury contained in the riffles, through the means of metallic knobs which go through the sides of the boxes. This constant current of electricity gives to the mercury the property of having a greater affinity for gold. I have, however, after long and repeated experiments, tried under many different states and conditions, never been able to find any particle of gold in the sixth riffle, and therefore never had occasion for recourse to electricity.

One of the most important conditions for the washing of gold is to receive in the riffle-boxes set apart for the amalgamation of fine gold none but the finest sand possible. For this purpose, all the larger particles of gold having been caught in a separate part of the sluice, I interpose screens, which receive the gravel, sand, and fine gold, allowing only the two latter to pass through into my riffle-box, where they meet the plates, whirlpools, and cascades referred to. Where I have to operate on ground quartz the plates coated with mercury are found to be of the greatest use. They will even retain a particle of pyrites to which is sometimes found attached a single molecule of gold. As the plates would be found in a very short time covered over with metallic particles, and would no longer offer the same facilities for the amalgamation of the golden particles, I from time to time throw into the sluice a few drops of mercury, which spread themselves through the body of sand carried along by the current, and arrive on the plates in the form of little globules, which, attaching themselves to the surface of the particles of gold already adhering thereto, form an amalgamated mass, which is soon driven by the constant action of the sand and current to the lower edge of the plates, and detaching itself therefrom by degrees in lumps or large drops remains in the riffle.

The box at the extremity of the machine is to retain the globules of mercury which may escape by accident or from the overflowing of the riffles.

The machine will require more or less inclination according to the quality of the soil, its density, or the quantity of titanate of iron or other heavy bodies which it may contain.

Consider the machine (or riffle-boxes) to be properly inclined and ready for work, at the moment when elevating it gradually I find the water to have a current just sufficient to carry off easily, smoothly, and regularly the whole mass of sand washed.

The breadth of the riffle-boxes must be calculated according to the quantity of water to be employed. I have never required much more than one-eighth of an inch of water, so

that one inch of water would require the riffle-box to be about seven inches broad. When the particles of gold become finer and are the more likely to float, then the water must be decreased in depth and spread more evenly, if possible.

My process of washing requires but little capital and no difficult or costly work to be done. Once the machine is in its place one man can watch it and attend to it while fifteen or even twenty men are employed throwing dirt into the sluices. In the quartz-mill the only labor required is to clean the screens once about every half-hour. It can, of course, be used to amalgamate silver as well.

Having thus fully explained the nature of my invention and shown how the same may be reduced to practice, what I claim therein as new, and desire to secure by Letters Patent, is—

In gold washers and amalgamators, the metal plates coated with mercury, the riffles, vanes, and reacting-surfaces, arranged and located substantially as herein described, and for the purpose set forth.

Mariposa, 12th October, 1855.

T. V. TAVNAY.

Witnesses:

O. GRANDVOINET,

G. E. GARDNER.