E. F. RUSSELL.

Amalgamator.

No. 205,215. Patented June 25, 1878.

Fig. 1.

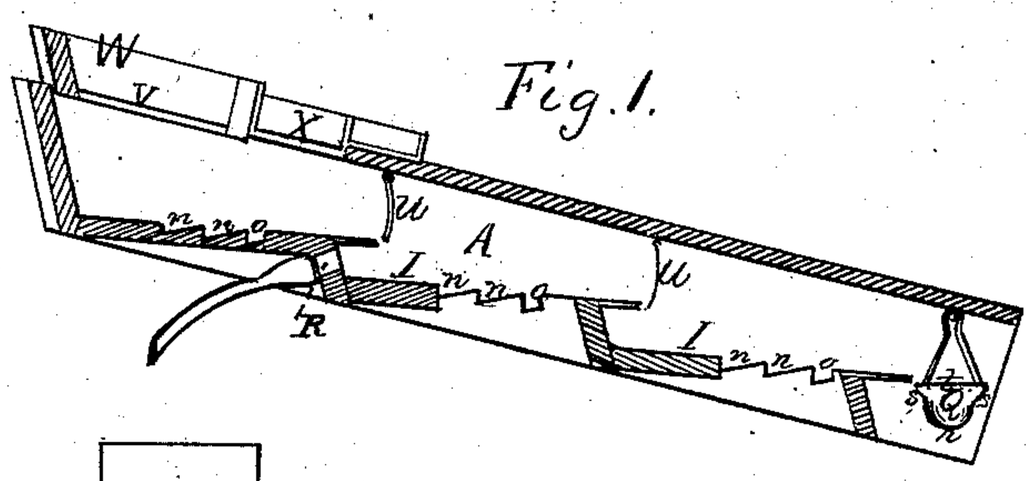



Fig. 2.

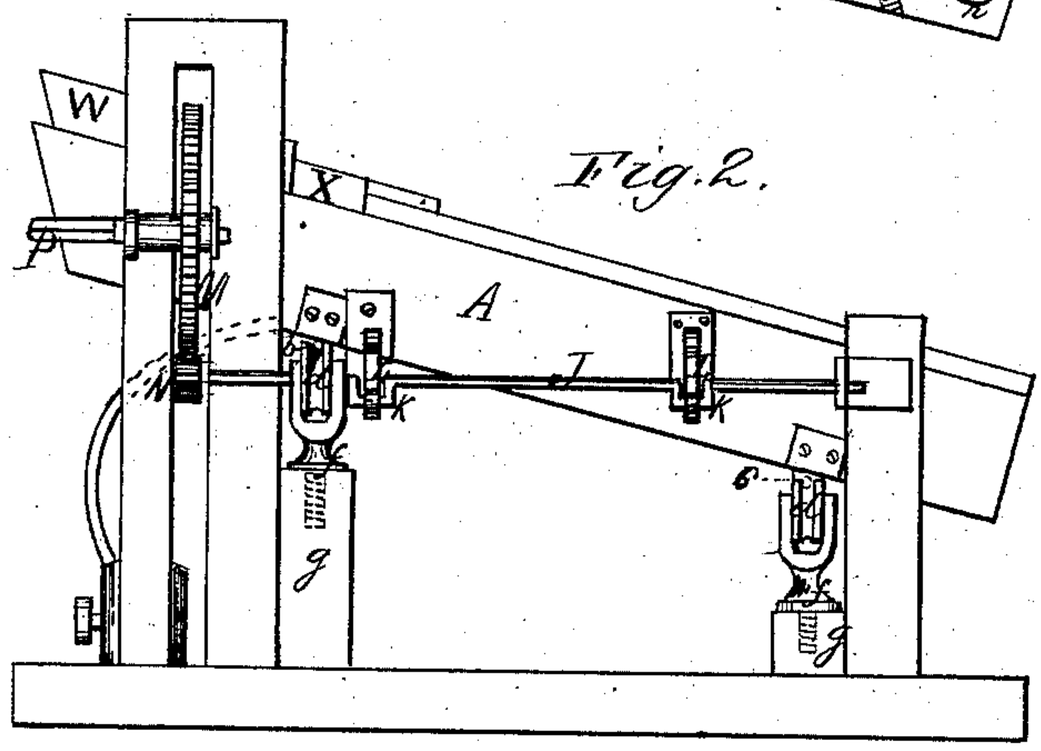
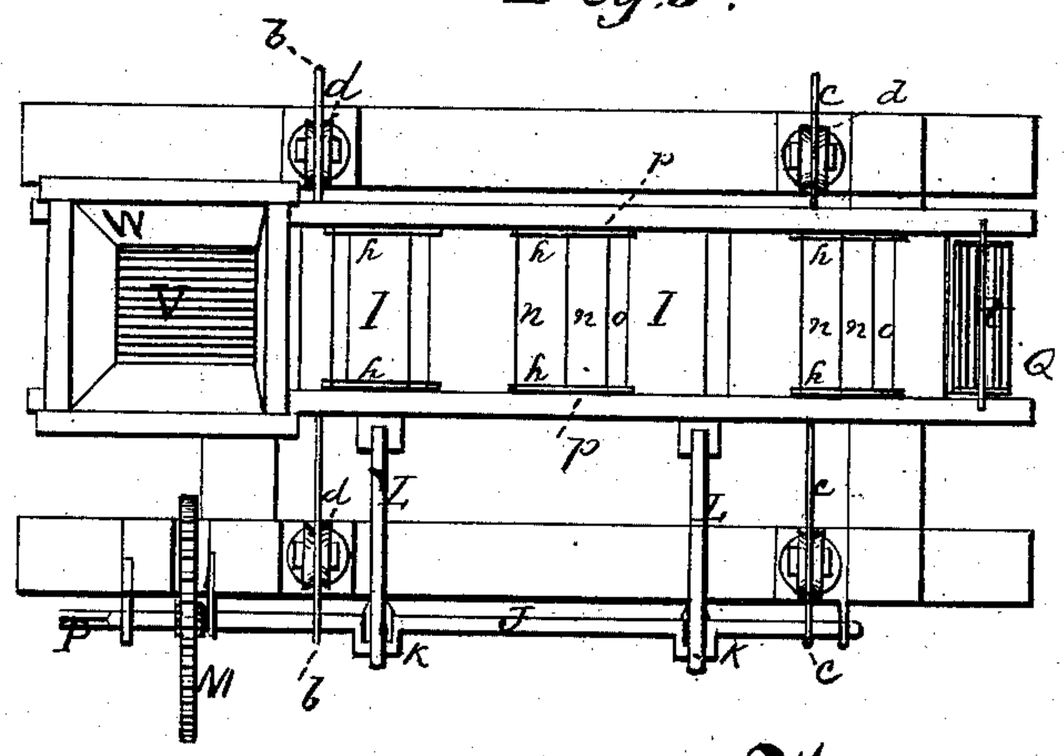



Fig. 3.




Witnesses.

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN AMALGAMATORS.

Specification forming part of Letters Patent No. **205,215,** dated June 25, 1878; application filed May 3, 1878.

*To all whom it may concern:*

Be it known that I, ELI F. RUSSELL, of the city and county of San Francisco, State of California, have invented an Improved Amalgamator; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to certain drawings accompanying this specification and forming a part of the same.

My invention has reference to an improved apparatus for separating the particles of gold which are contained in auriferous earth, sand, gravel, or pulp from the worthless portion, and bringing the gold particles in contact either with mercury or amalgamated surfaces, so that they will become amalgamated and retained, while the worthless portion or tailings are carried away.

My apparatus can be adapted, by a few simple changes, to serve either as a wet or dry amalgamator, and is intended more especially as a portable mining-machine, which can be used in any locality where auriferous material is found, whether water can be conveniently obtained or not.

Referring to the accompanying drawings, Figure 1 is a longitudinal section. Fig. 2 is a side elevation. Fig. 3 is a plan.

Let A represent a box or sluice of any desired length, width, and depth. Usually I shall make it from ten to fifteen feet long, about three feet wide, and from twelve to eighteen inches deep, although much will depend on the character of the material to be worked and the desired capacity of the machine. To increase its capacity, I prefer to increase its width rather than its length, in order to prevent it from becoming cumbersome. This box or sluice has on each side an arm, *b*, projecting at right angles from it near its upper end, and another, *c*, on each side, near its lower end. These arms rest upon pulleys or rollers *d d*, which are so arranged that the box or sluice will stand at an angle or inclination, as represented. These pulleys or rollers can be raised or lowered, so as to change the angle or inclination of the box or sluice to any desired grade. In the present instance I have represented each of the pulleys or rollers mounted in the upper end of a screw-post, *f*, which screws into the upper end of a standard, *g*, so that by turning the screw-post the pulley is raised or lowered. This, however, is incidental to the machine, as any convenient arrangement for mounting and adjusting the rollers can be used.

The entire interior of the box, bottom, sides, and top, (if a cover is used,) I line with copper. The bottom I form into two or more inclined steps or shelves, I I. The lower end of each shelf overhangs the upper end of the shelf below, so that the material will fall from one to the other in its descent.

Near the middle of each inclined shelf I make one or more (usually two) angular or V-shaped depressions, *n n*, which extend entirely across the bottom of the box or sluice. The upper side of each of these depressions is nearly vertical, while the lower side extends forward at an angle, so that any heavy particles that may be caught in it will settle back into the angle or deepest part, instead of moving forward over its front edge. Directly in front of these angular depressions on each shelf I make a transverse depression, *o*, for containing quicksilver. To pack the ends of these corrugations or depressions where they fit against the sides of the sluice or box, I use a sheet or strip of india-rubber, *p*, against which the edges of the corrugated metal strip presses, thus making a tight joint and preventing leakage or waste.

When water is used as a vehicle for moving the earth, sand, gravel, or pulp, I suspend a quicksilver-trough, Q, under the overhanging lower edge of each shelf. The shape of this trough, it will be noticed, is peculiar. It has a central depression, *r*, and a shelf or ledge, *s*, on each side, all formed out of one sheet of metal, and it has a copper-wire grating, *t*, placed in it, so as to rest upon the shelves or ledges. This construction is important, because it gives an amalgam-space in the depression and prevents the quicksilver from being overflowed, the ledges serving to catch and retain any particles that may attempt to escape.

When the dry method is used, I substitute hanging amalgamated plates U for these quicksilver-troughs, as hereinafter specified.

The upper end of the box or sluice has a grate, V, and hopper W secured above it, and

a turn-out spout or chute, X, for carrying away the large particles that cannot pass through the grate.

J is a shaft, which is supported in bearings in uprights parallel with the sluice or box. This shaft has one or more cranks, K, formed on it, which are connected, by pitmen L, with the box or sluice. The shaft is driven by a toothed wheel, M, pinion N, and crank P, so that the box or sluice is given a brisk back-and-forth side motion.

The entire copper-lined interior of the box or sluice having been amalgamated and mercury placed in the troughs Q and depressions O, the auriferous material is dumped upon the grate in the hopper, and the trough set in motion. The quick, short lateral vibrations cause the finer particles to sift through the grate and travel down the inclined shelves, while the larger pieces pass through the chute X, and fall outside of the machine. The finer particles are carried by the water down the inclined shelves, over the angular depressions *n n* and quicksilver-channels O, where the particles of gold that get to the bottom are caught. The balance passes down and is precipitated over the overhanging edge into the suspended quicksilver-trough Q, where other particles are caught, and so on down the incline until the gold particles are all arrested and saved. The quick side motion causes the particles to travel in a zigzag course down the incline and over the amalgamated surface, so that they are rolled over and rubbed against the surface, thus insuring their contact and amalgamation.

In the riser of the upper inclined shelf I make an opening, R, which I keep closed when the machine is being operated by the wet method; but when it is to be operated by the dry method, I open it and insert the nozzle from a blower, which is driven by the same power that drives the machine. The blower and nozzle are connected by a flexible pipe, which yields to the motion of the trough. I also remove the quicksilver-trough Q and suspend the curved amalgamated plates U across above the overhanging lower ends of the shelves. The dry particles will then be caught by the blast from the nozzle as they drop from the upper overhanging shelf and be dissipated or blown forward in a thin shower against the amalgamated surfaces, and be deflected downward by the suspended plates U, so that every particle is brought in contact with the amalgamated surfaces, and amalgamation insured.

When water is used, the cover of the box can be dispensed with; but in operating on the material by the dry method, it is absolutely necessary that the top should be kept closed.

This machine is light, portable, and easily operated. It enables the miner to work auriferous deposits whether water is convenient or not, and is arranged to secure the best results for saving the particles of gold.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The copper-lined box or trough A, having the arms *b c*, supported on rollers *d d*, and having the grate V, hopper W, and chute X at its upper end, in combination with the crank-shaft J, pitman L, toothed wheel M, pinion N, and crank P, substantially as and for the purpose above described.

2. The copper-lined box A, mounted upo rollers *d d*, and having its bottom formed into inclined steps or shelves I I, the lower end of each shelf overhanging the upper end of the shelf below, each shelf being provided with the transverse depressions *n o*, in combination with the crank-shaft J, pitman L, toothed wheel M, pinion N, and crank P, substantially as and for the purpose above described.

3. The suspended quicksilver-troughs Q, having the central depression *r* and side shelves or ledges *s*, and covered by the screen *t*, substantially as and for the purpose described.

4. The inclined copper-lined laterally-shaking box A, provided with the steps or shelves I I, and having the opening R in the upper riser, in combination with the amalgamated plates U, which are suspended across the box at the lower end of each shelf, substantially as and for the purpose specified.

5. The inclined copper-lined laterally-shaking box A, provided with the steps or shelves I I, and having the opening R in the upper riser, in combination with the blower and elastic or flexible tube, substantially as and for the purpose specified.

In witness whereof I have hereunto set my hand and seal.

ELI F. RUSSELL. [L. S.]

Witnesses:
I. F. LITTLEFIELD,
J. V. DEVRY.