(No Model.)

D. CALDER & J. D. MACLAY.

AMALGAMATING MACHINE.

No. 371,031. Patented Oct. 4, 1887.

Fig. 1.

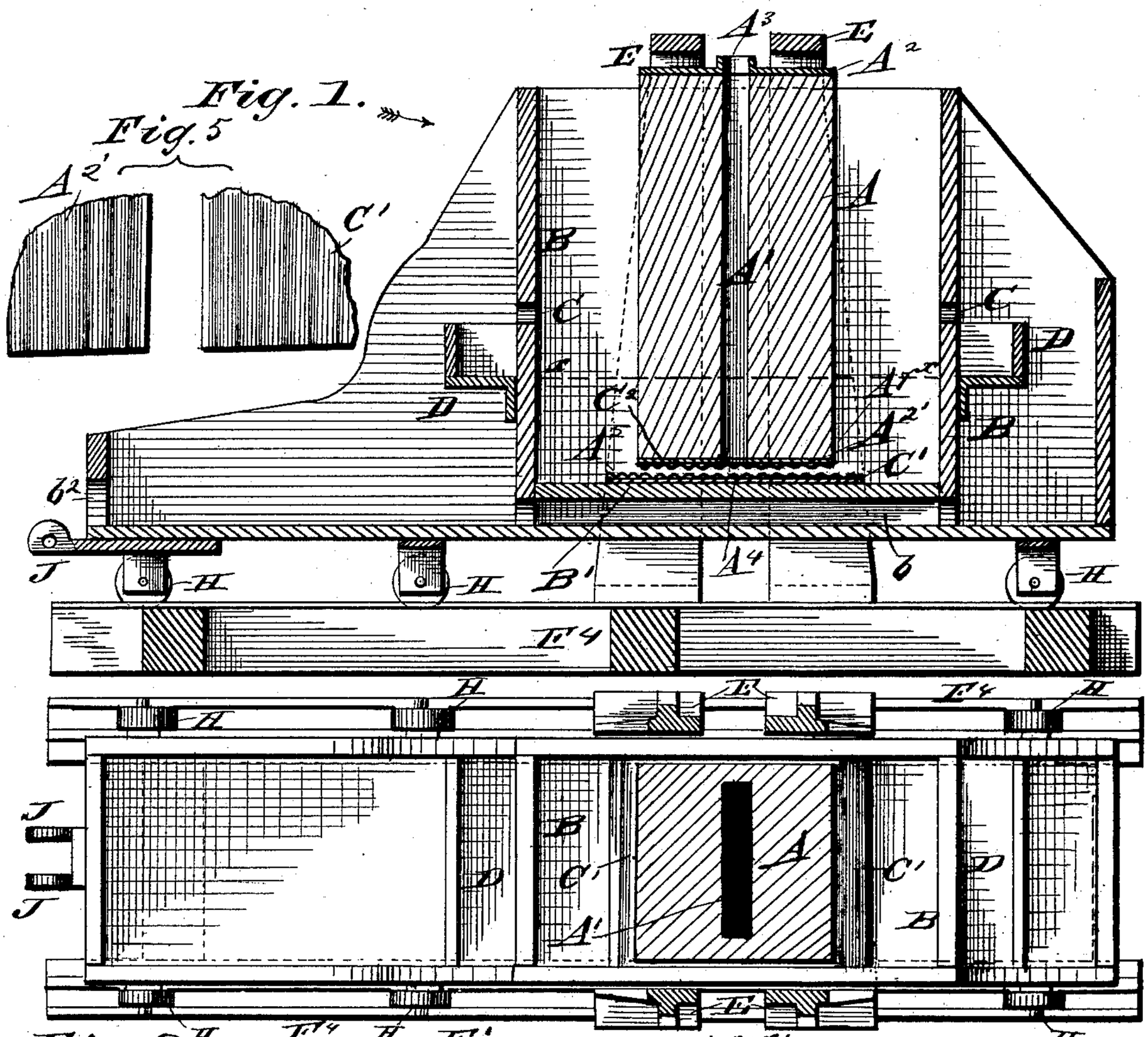

Fig. 5

Fig. 2.

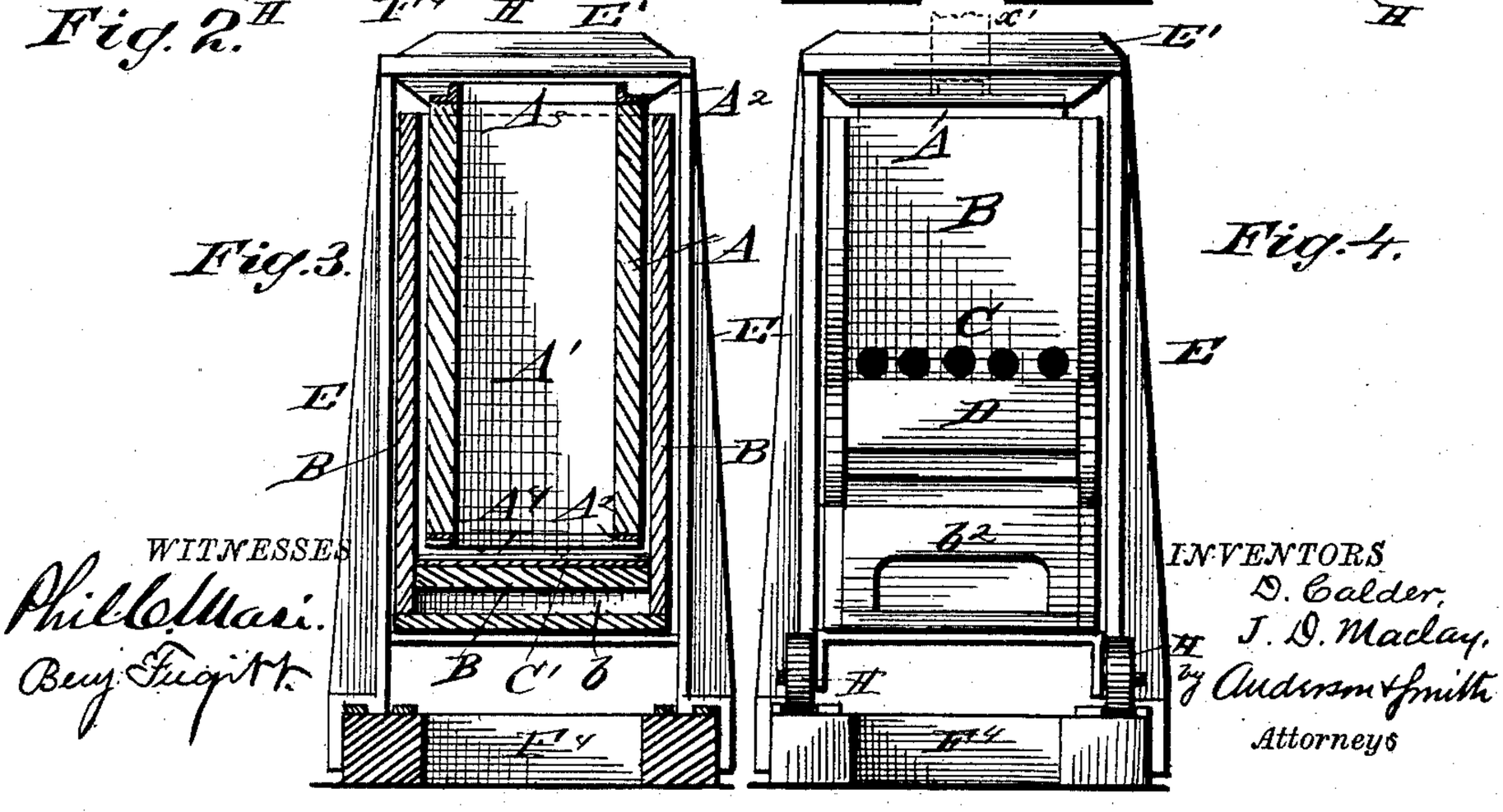

Fig. 3.

Fig. 4.

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DAVID CALDER AND JAMES DUNN MACLAY, OF LOUISVILLE, KENTUCKY.

AMALGAMATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 371,031, dated October 4, 1887.

Application filed April 21, 1886. Serial No. 199,643. (No model.)

To all whom it may concern:

Be it known that we, DAVID CALDER and JAMES DUNN MACLAY, citizens of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Amalgamating-Machines; and we do 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a representation of a vertical section. Fig. 2 is a plan view, partly in section. Fig. 3 is a transverse longitudinal section. Fig. 4 is an end elevation. Fig. 5 is a view of the corrugated or roughened plates $A^{2\prime}$ and C′.

Our invention has relation to a machine for separating gold, silver, &c., from their ores or earths comprised in part of such ores by the process known as "amalgamation with metallic mercury;" and the invention consists in the construction and novel combination of parts, as will be hereinafter fully described, and particularly pointed out in the claims.

The objects of the invention are to cheaply and effectively accomplish the amalgamation of gold of exceeding fineness as regards divisibility of particles, which, by existing forms of machines, has been heretofore lost; and to so construct the machine that the subdivided ores or earths, composed in part of such metal-bearing ores or gold-bearing sands, after being mixed with water in a suitable form of receptacle or hopper, are compelled to pass through a body of metallic mercury contained in a suitably-shaped receptacle, subjected while passing to a cutting, turning, rubbing, and grinding motion or movement produced by a slight reciprocating or semi-rotative motion imparted to the movable parts of the machine itself, which I will now proceed to describe.

Referring by letter to the accompanying drawings, A designates a rectangular or other suitably-shaped block or receptacle, which may be made of wood or of a metal not subject to the action of metallic mercury or its salts. It may be composed of one or more pieces, but must be so formed as to have an opening, A′, extending directly through its vertical length. The opening A′ should be either an elongated ellipse or a narrow rectangular parallelogram, and may be the same size through the block, or may have a slight bevel downward, making the lower side a very little larger than the top or upper side. In fact, the size of the opening passing through the block or receptacle should be governed to a certain extent by the material operated on. The upper or top end of the block or receptacle A is (if formed of wood) covered by a suitably-shaped plate, A^2, provided with an opening, A^3, of the same shape and size as the opening A′, passing through the block A. The lower end of the block or receptacle A is provided or fitted with a hardened plate, $A^{2\prime}$, the exterior surface of which is roughened or corrugated. This roughened or corrugated plate serves as a rubber or grinder, being opposite and near to a similar plate, A^5, secured to the bottom of the box or chamber B. The plate $A^{2\prime}$ is also provided with an opening, A^4, through it, to correspond exactly to the opening A′, terminating at the lower end of the block or receptacle A, in order that the passage-way through the block or receptacle may be continuous.

B designates any suitably-shaped box or chamber, the joints of which are made watertight, and said box or chamber is of a width sufficient to permit the free admission of the block or receptacle A, the sides of which are, however, in position close to the side walls of the box or chamber. This box B may be composed of either wood or metal; but if of metal it should be of that character not acted on by metallic mercury or its salts. At the ends of the chamber B is provided one or more rows of perforations, C, which serve as exit-ways. The perforated end pieces divide the box or chamber B into a receptacle in which is suspended the block or receptacle A. A false bottom, B′, serves to form beneath the bottom of the block-retaining chamber and the bottom of the box proper a passage-way for the material passing from the back end of the machine to the front exit by way of the space *b* between the two bottoms, and thence out by the forward part of the

machine at the exit b^2 to a proper waste-dump.

The openings or perforations C are placed sufficiently high in each end wall of the block-retaining chamber B from the bottom of the chamber to prevent waste of the mercury should the machine be too rapidly reciprocated. The perforations C empty into troughs or basins D, one at each end, outside of the chamber. In case the mercury should at any time be thrown out through the opening C the troughs D will catch and hold it until it can be placed back into the inner chamber, B. If deemed desirable, a small pipe-connection may convey the mercury back into its proper place in the inner chamber, B.

C′ designates a hardened, roughened, or corrugated plate of any suitable metal secured to the false bottom B′ of the chamber B, and this plate C′ is directly opposite and parallel to a like-shaped roughened plate, C^2, secured to the lower end of the block or receptacle A, as shown at A^7. Between these two separate plates the material to be amalgamated is subjected to a rolling, rubbing, scouring, and grinding motion of the plates, thereby removing the small particles of earths or ores, scouring and cleaning any foreign or other matter that would prevent the combination of the ore with the mercury. When clean, the amalgamation is most certain to be accomplished. The reciprocating or other not too rapid motion imparted to the whole chamber or box B effects a sort of pumping-action on the part of the mercury and causes the material to be gradually worked out from the interior of the block or receptacle A, beneath the same, between the hardened and roughened plates C′ and C^2 and up through the mercury and out through the perforations or openings C at each end of the chamber B.

The pockets D D are more especially designed to catch and hold any mercury that may under any circumstances be thrown out of the chamber, for the reason that any other material falling into said pockets will be of a gravity lighter than the mercury and will flow over the sides or ends of the pockets, while the other matter and exhausted ore, &c., will flow off by way of the passages b and b^2.

E E designate two or more strong studs or columns, which may be preferably made from cast-iron. These may be in any way strongly and rigidly attached to the frame-work of the machine at each side of the rolling or reciprocating chamber B. At the same time the block or receptacle A is rigidly secured to and suspended from the top ends of the columns by any suitable form of brace or clamp, E′. This brace or clamp is made up of any number of like or similar plates, or in any other manner to obtain a like adjustable result.

F^4 designates any suitable form of base or frame-work, composed in most cases of strong and well-seasoned hard-wood timber. It is essential that this part be well and strongly made. To this base or frame-work are secured the lower ends of the columns E E. Upon the base or frame-work F^4 is properly constructed a track or tramway, upon which or between which operate the wheels H of the machine, which prevent the machine from leaving the track while being reciprocated. This track is either a regular tramway of iron rails and the wheels flanged truck-wheels, or it is of light bar-iron, with which plain tread truck-wheels are used. In fact, any suitable form of truck may be used in this connection.

The line $x\ x$ is used in the illustration to designate the height within the chamber B and receptacle A of the metallic mercury. This height can, however, be varied to suit differing conditions and materials.

J J designate a simple form of fork, in which can articulate any sort of connecting rod or pitman, by means of which a not too speedy or sudden reciprocating motion may be imparted to the chamber B on the rollers or wheels or other mechanical equivalent.

The mode of operation is as follows: After having properly secured the strong framing and having built a suitable waste-trough for leading away from the machine the exhausted material, and after seeing that proper distance is had between the hardened plates $A^{2\prime}$ C′, the chamber is then charged with metallic mercury to a height near to the dotted line $x\ x$, a conduit or pipe, x', fitting tightly around the upward-projecting flange surrounding the opening A′, which pipe can extend some distance above the top of the machine and may terminate in a hopper into which the crushed ore or earth is fed to the chamber, a stream of water being also directed into the same hopper. The machine having been charged with metallic mercury, is then slowly and steadily moved to give it any of the movements hereinbefore described at the rate of from thirty to sixty double strokes per minute. The ore and water, running down the feed-pipe or chute, enters the block A, passes down into and through the body of mercury therein contained, and each separate particle of the material is turned, revolved, and rubbed one against another in a manner that cleans any dirt or oxides from the surface of the gold particles therein contained. At the commencement the alternate strokes imparted to the machine tend to produce a partial vacuum, the mercury acting as a piston, causing the ore or earth-bearing ore to be drawn under the block A, where it is subjected to a still further rolling, cutting, twisting, scraping, scouring, and grinding between the oppositely-adjusted roughened and hardened plates. After the ore becomes worked through beneath the block A the ore will, from its lightness and freedom from weight of the column of ore and water extending from the feed-hopper, float up through the mercury surrounding the exterior of the block A, and then out through openings C at each end of the chamber B into troughs D D, exterior box, B^2, and passages $b\ b^2$ to the waste-dump.

It will be readily seen that the gold-bearing ore or sandy earth containing such gold will

be saved by this machine. All greasy or oxidized gold not taken up by mercury in other machines, where the ore is only stirred around with the mercury, will be caught by this machine by reason of the fact that the ore earth being treated or passing through the mercury is continually, until it gets from under the block A, ground, turned, and mixed under a pressure equal to the height of the column of mercury, and is forced through the mercury and cannot at any time until it leaves from beneath the block float up and off by its greater buoyancy, and at the same time the gold is scoured or cleaned during its passage. In existing forms of machines, wherein the gold-bearing quartz or earth is simply triturated in the mercury, it tends to rise and does rise in the mercury and float off to the waste-heap, and is lost, or at least not saved.

One of the essential features in the operation of this machine is this, that the material to be treated is constantly under a pressure that can be varied by raising or lowering the hopper through which it is fed and increasing or decreasing the distance between the plates $A^{2'}$ and C'.

To obtain the gold it is only necessary to take out the charge of mercury within the chamber B between the two perforated partitions through any suitable door or opening, and subject such mercury to a distillation, the mercury distilling over while the gold, &c., remain in the retort.

One great advantage in this machine is that it is unnecessary to stop to (what is termed) "clean out." The old charge can be taken out in a very few minutes and a new charge supplied and proceeded with while the old charge is being retorted. In some of the existing forms of amalgamating-machines the work of cleaning out is a slow and not an inexpensive undertaking.

The state of the art shows that amalgamating-chambers have been constructed with ore-feeds discharging below the level of the mercury; that amalgamating-chambers have been made movable, and that the overflow or discharge has been arranged above the surface of the mercury. Consequently we can make no broad claim to said points. The movement of the corrugated surfaces over each other releases the particles of metal in the ore, and by the rubbing and scouring action of said surfaces the particles are polished, so that they readily unite with the mercury to form an amalgam.

Having described this invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination, with the ore-feed provided with the rubbing-plate secured to its lower end, of the amalgamating-chamber having the outlet b^2, the box B, provided with the roughened rubbing-plate, the perforations C, and troughs D, and forming the open passage *b* with the floor of the box, and means for reciprocating the amalgamating-chamber, substantially as specified.

2. The combination, with the amalgamating-chamber having the outlet b^2 and false bottom B', forming a passage, *b*, between itself and the true bottom of the said chamber, which is provided with the perforations C, of the troughs D, the ore-feed block A, having the feed-passage A', the rubbing-plate secured to the lower end of said block, and the rubbing-plate secured to the false bottom B', substantially as specified.

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

DAVID CALDER.
JAMES DUNN MACLAY.

Witnesses:
JOHN P. SACKSTEDER,
N. R. HARPER.