(No Model.) 3 Sheets—Sheet 1.

C. C. ORMSBY.

AMALGAMATOR.

No. 492,425. Patented Feb. 28, 1893.

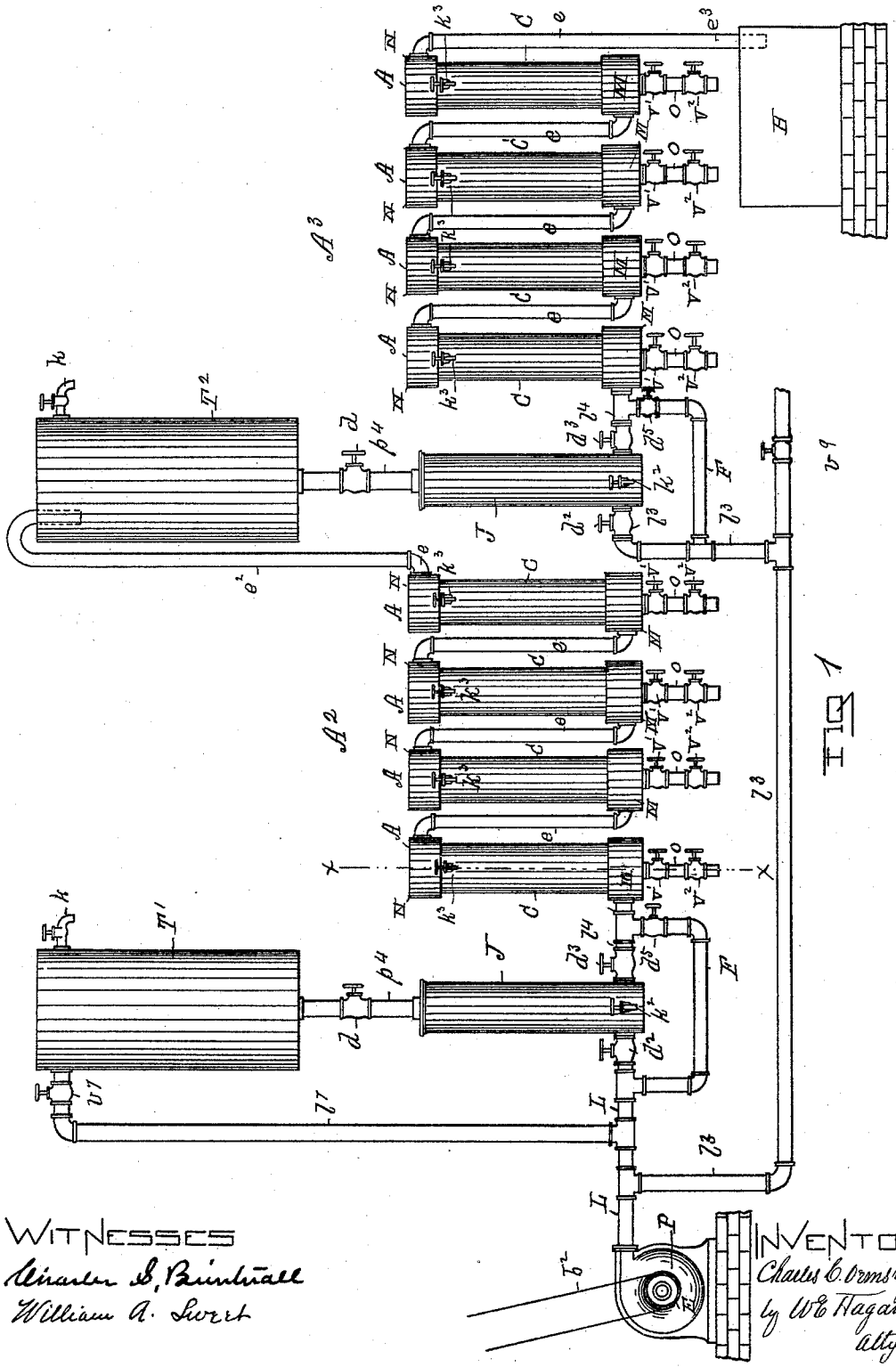

FIG 1

WITNESSES
Charles S. Brimhall
William A. Swett

INVENTOR
Charles C. Ormsby
by W. C. Hagan
Atty

(No Model.) 3 Sheets—Sheet 2.

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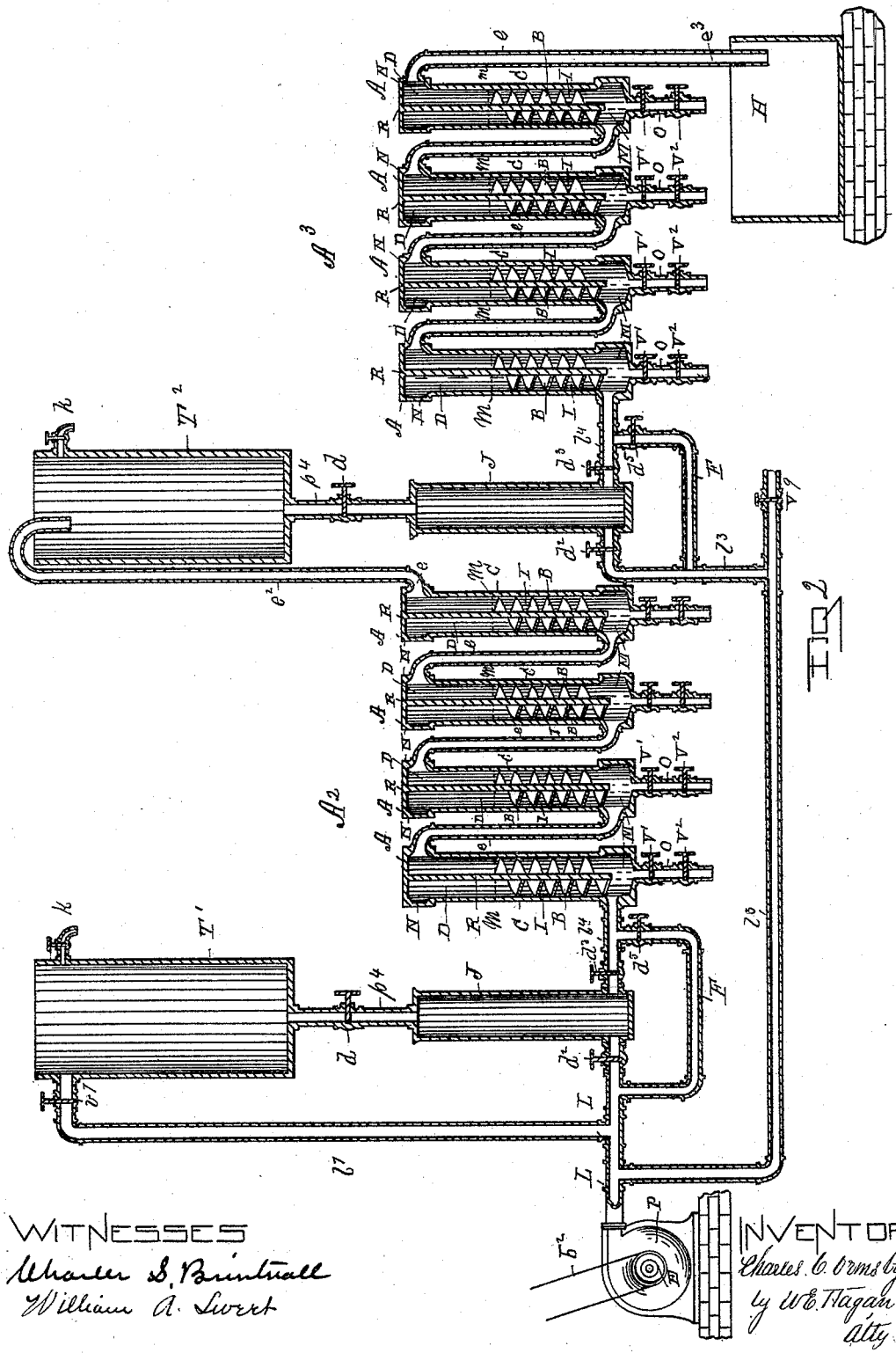

FIG 2

WITNESSES
Charles S. Brintnall
William A. Sweet

INVENTOR
Charles C. Ormsby
by W. E. Hagan
Atty

(No Model.) 3 Sheets—Sheet 3.

C. C. ORMSBY.

AMALGAMATOR.

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Fig 3

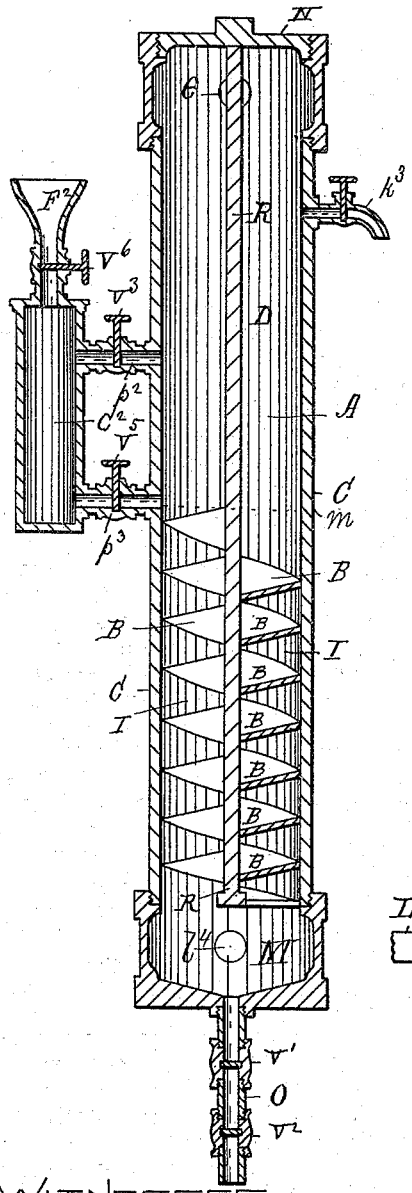
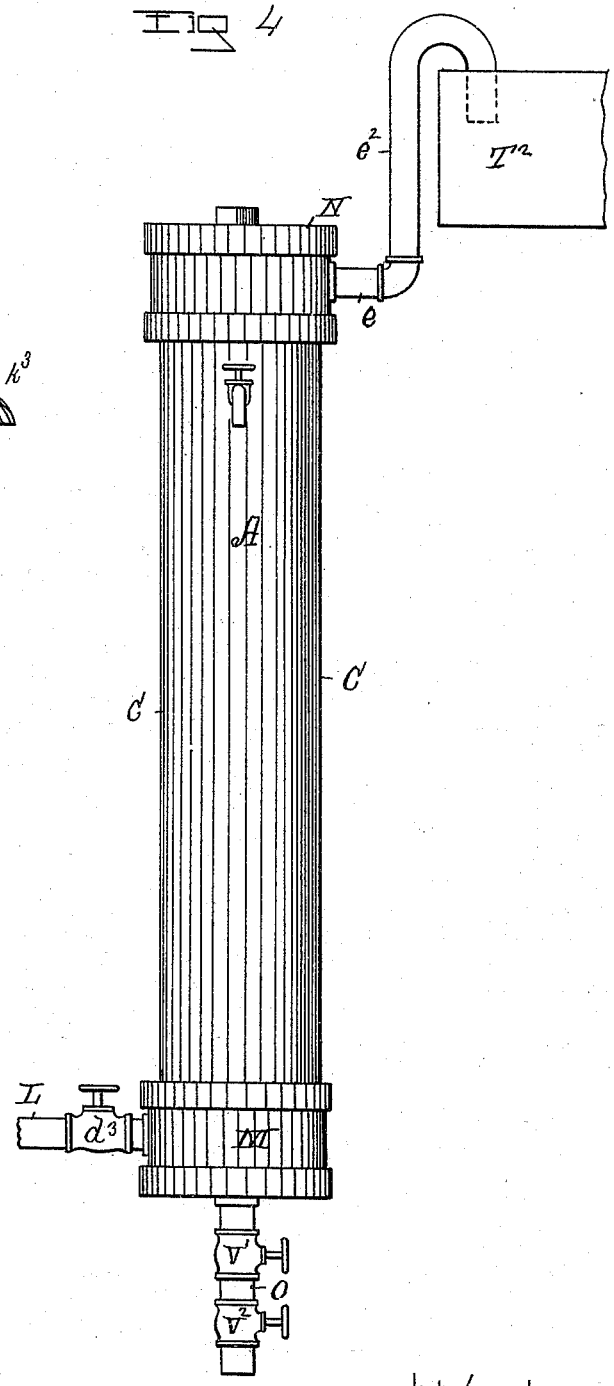


Fig 4



WITNESSES

Charles S. Bundall

William A. Swert

INVENTOR

Charles C. Ormsby

by W. E. Hagan, atty

UNITED STATES PATENT OFFICE.

CHARLES C. ORMSBY, OF WATERFORD, NEW YORK.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 492,425, dated February 28, 1893.

Application filed August 27, 1891. Serial No. 403,893. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. ORMSBY, of the village of Waterford, county of Saratoga, State of New York, have invented new and useful Improvements in Amalgamators, of which the following is a specification.

My invention relates to improvements in that class of apparatus that is used for the treatment of auriferous ores that have been powdered, or ore tailings, or gold-bearing sands for collecting the gold in the form of amalgam by the use of mercury.

The object and purpose of my improvements are to increase the efficiency, and make more reliable the apparatus employed for this kind of work, by using in a novel way water pressure to force through the mercury the material to be treated, in connection with an improvement in apparatus by which the use of water pressure can be so utilized.

As heretofore employed water pressure has been used in connection with a U-form conduit in the bend of which latter mercury was placed; and the water in connection with the ore under pressure was caused to pass down through, and up through the mercury in the conduit bend, to be discharged from that end of the conduit opposite to that at which it entered. As thus constructed the area of water pressure was diametrically equal to the diametrical area of the mercury column; and the whole of the latter was acted upon by the water pressure to drive the material and water with great rapidity through the mercury so that portions of the latter would be carried over to escape with the ore and water from the discharge end of the U-form conduit. To improve upon this older method of utilizing a water pressure to force the ore mixed with the water through mercury, I make the diameter of the water pressure area conduit to be less than that of the mercury column, and so that the water and ore under pressure pass up through the mercury without raising the whole of the latter. To make the movement of the water and material through the mercury more circuitous, and less direct, I produce a spiral or screw-form passage for the water and ore while being moved up through the mercury, and this gives more contact, and much better results than where the passage is direct.

Accompanying this specification to form a part of it there are three plates of drawings containing four figures illustrating my invention, with the same designation of parts by letter reference used in all of them.

Of these illustrations Figure 1, is a side elevation of a series of amalgamators containing my invention, and illustrating their connection with a water pressure supply pump, and with each other. Fig. 2, is a central vertical section taken from end to end of the apparatus shown at Fig. 1, with the exception that the pump is shown in side elevation. Fig. 3 is an enlarged central vertical section of one of the amalgamators shown in the series illustrated at Fig. 1, showing also in section one of the mercury charging chambers that are omitted at Fig. 1. Fig. 4, is a side elevation of one of my improved amalgamators in which the ore or material being treated is discharged directly into the amalgamator without any intermediate apparatus, between the pump or water pressure and the amalgamator.

The several parts of the apparatus thus illustrated are designated by letters of reference and the function of the parts is described as follows.

The letter A, designates the amalgamators which are adapted to be used single or in series connectedly. Each of these amalgamators consists of a cylinder C, made with a closed cap N, at its upper end, and a mercury chamber M, at its lower end. This mercury chamber at its lower end is provided with a discharge pipe O, which has arranged thereon two valves V', and V^2, one placed above the other on said pipe.

The letter R, designates a rod arranged centrally within the chamber D, inclosed by the cylinder C, the cap N, and the mercury chamber M, and the letter B, designates a screw-form plate made to encircle the rod R, and form within the amalgamator the helical conduit I.

The letter C^2, designates a mercury charging chamber which connects with the interior D, of the amalgamator by means of the pipes p^2, and p^3; the upper one designated at p^2, having thereon a valve V^3, and the lower pipe p^3, having thereon a valve V^5.

The letter F^2, designates a funnel connecting with the top of the mercury charging

chamber C^2, and the letter V^6, a valve on said funnel between its connection with the charging chamber C^2. As thus constructed and arranged when the valves on the pipes p^2, and p^3, are closed and the funnel valve open, mercury can be supplied to said chamber, and when the funnel valve is closed, and the valves on the pipes p^2, and p^3, open mercury will be discharged into the chamber D, of the amalgamator. This mercury charging chamber C^2, is shown in section and in connection with a sectional view of one of the amalgamators of a series illustrated as enlarged at Fig. 3, and which is omitted from the other figures.

The letter T′, designates an ore tank, which is open at the top, and into which the material to be treated is placed, and from which it is supplied to the amalgamating apparatus; there being one of these tanks for each connected series of amalgamators, when the latter are used in series.

The letter J, designates a charging cylinder that is arranged beneath the said tank, and p^4, designates a pipe that is vertically placed so as to intermediately connect the ore tank T′, with the charging cylinder J, said pipe being provided with a valve d. This charging cylinder J, when employed is used to supply ore to an amalgamator, or to a series of them when connected, in measured quantities; but if desired the ore or material to be treated may be supplied directly to the amalgamator, or to one of a series of the latter when used connectedly, and the charging cylinder J, omitted as will be described more fully hereinafter.

The letter P, designates a rotary pump adapted to connect with, and to receive a water supply, so as to discharge the same under pressure.

The letter L, designates a discharge pipe connected with said pump, and this pipe is shown as having a branch pipe l^3, leading to the charging cylinder J, of the A^3, series of amalgamators, whereat it is provided with a valve d^2. This main discharge pipe L, of the pump, connects with the bottom of the charging cylinder J, of the A^2, series of amalgamators, and where making this connection is provided with a valve d^2.

The letter V^9, designates a valve on the branch pipe l^3, beyond where the latter connects with charging cylinder J, of the A^3, series of amalgamators.

The letter l^4, designates a short pipe connecting the charging cylinders of each series of apparatus with the next adjacent amalgamator of each of said series and the letter d^3, a valve on each of the pipes l^4.

The letters F designate flushing pipes, and each of these pipes is at one of its ends connected with the water supply pipe of each series of apparatus, between the pump, and where the water supply pipe connects with the charging cylinder J, and at the other end each of these flushing pipes connects with one of the short pipes l^4, and the letter d^5, designates valves arranged on each of these flushing pipes. The function of each of these pipes is to clear out by increased and concentrated water pressure any clogging that may occur in the pipes l^4, and they are operated by closing their valves d^2, and opening the valve V^5, on each of them; and these flushing pipes may also be used to thin down the consistency or pulpy condition of the mixture of ore and water when desirable. Each of these amalgamators A, where arranged in the two connected series shown communicates by means of a pipe e, leading from the top of one of them to the bottom of the next adjacent one of each series, excepting the last one of each series; and when more than one series is employed the pipe e, of the last one of the amalgamators of the series is projected upwardly at e^2, to deliver the water and material into the tank T^2, of the second series, and in the terminal amalgamator of the second series, or when but one amalgamator is used the pipe e, may be extended downwardly to discharge the material into a tank H.

The letter l^7 designates a pipe connecting with the water supply pipe L, and therefrom extended upwardly to discharge into the tank T′, and the letter V^7 designates a valve on the pipe l^7.

The letters k designate cocks arranged on the tanks T′ and T^2, to draw off surplus water, and the letters k^2 designate cocks on the charging cylinders J, and k^3, cocks at the upper ends of each of the amalgamators A.

In the apparatus shown at Fig. 4, the cylinder J, is omitted and the water and the ore previously caused to commingle are forced into the mercury contained in the mercury chamber M, of the amalgamator so as to pass up through the mercury contained therein; and from out of the pipe continued upwardly at e^2, to discharge into the tank T^2, where the ore in a pulpy state is deposited.

The letter m, designates the level of the mercury in the amalgamators A.

The apparatus thus described and illustrated at Figs. 1, and 2, is operated connectedly as follows. The valves d^2, of each of the amalgamator series A^2, and A^3, being closed, and also the valves V^5, on the flushing pipes of both series of apparatus, as well as the valve V^9 on the pipe l^3; material is supplied to the tank T′, of the A^2, series of amalgamators, and water admitted thereto until made pulpy, when the valve V^7, is closed, and the valve d, on the pipe p^4, opened to fill the chamber J, of the A^2, series of amalgamators. When this has been done, the valve d, on the pipe p^4, is closed, and the valves d^2, and d^4, of the A^2, series opened. The current of water under pressure from the pump acting on the material in the bottom of the charging chamber J, of the A^2, series carries the material into the mercury chamber M, in the bottom of the first amalgamator of the A^2, series, and thence up through the mercury contained

therein, and in the circuitous passage I; with the water and commingled ore passing out of the first amalgamator of the A^2, series through the pipe *e*, to descend to enter the next adjacent amalgamator of the series at the bottom thereof, so that the water and material are discharged into the mercury chamber M, thereof, to repeat this same traverse through each of the latter of the A^2, series until the last amalgamator of the latter series is reached, when by the pipe *e*, and its upward extension e^2, the water and material pass into the tank T^2, of the A^3, series of apparatus, in which tank the material is allowed to rest or stand until that portion of the gangue containing small portions of adhering amalgamated gold, has an interval of time given it long enough for the mercury to take off the gold mechanically by absorption from the gangue to which it adheres; when the material is passed through the A^3, series of amalgamators in the same manner as has been described for the operation of the A^2, series of amalgamators, to be finally, by the downward extension of the pipe *e*, at e^3, delivered into the tank H.

In the construction of the amalgamating cylinders C, and the circuitous or retarding passage I, which they contain, it is essential that the size of the pipe furnishing the water pressure and material to be treated should be preferably from one half to one quarter smaller in diameter than the cross diameter of the amalgamator, containing the passage I, so that the current of water and material entering shall pass up through the mercury column without acting upon the whole of it. Where the whole column of mercury is acted upon by a column equal in pressure there is a tendency to flour the mercury as well as to carry off portions of it by rapid action of the entering current of ore and water. While I have stated a measure of difference between the areas of the mercury column and that of the pressure current yet even a smaller difference than that named can be used to good advantage.

When the apparatus is constantly running the upper valve V′, on the pipe O, at the bottom of the mercury chamber M, is kept open, and the lower valve V^2, closed; and the function of this pipe O, and the valves thereon is as follows: As amalgam becomes heavier than mercury it settles to the bottom of the latter in the pipe O, above the valve V^2, and when desirable the denser amalgam in the bottom of the pipe may be drawn off by closing the upper valve V′, and opening the lower valve V^2. The amalgam so drawn off may be strained and the mercury returned to the amalgamator through the charging cylinder C^2. This construction of the pipe O, having valves V′ and V^2, is of great advantage where long runs of the apparatus are made between clean-up periods.

As my improved amalgamator, constructed to be operated by means of a water pressure, and by which the water and material to be treated are forced up through mercury contained in the amalgamator, would operate in the same manner whether the water under pressure before entering the amalgamator was caused to commingle with the ore or material by the means which I illustrate and describe, or some other means that would perform substantially the same operation; hence I do not limit my improved construction of an amalgamator for using a water pressure to the particular means which I illustrate for commingling the water and material before entering the amalgamator. If desired the water and ore may be commingled by the pump.

The function of the pump is merely to supply water under pressure, and where a column pressure can be had the pump may be dispensed with and the column pressure substituted. When the pump P is used it is operated by the belt b^2 running on the pulley E.

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

1. The combination with an amalgamator, of a mercury charging chamber connecting with the amalgamator interior by means of a pipe leading from the top of said charging chamber to the amalgamator interior; and a pipe connecting the bottom of said charging chamber with the amalgamator interior, valves on each of said pipes and a funnel and valve arranged at the top of said charging chamber, constructed and arranged to be operated substantially in the manner as and for the purposes set forth.

2. The combination with a vertically placed, cylindrically formed amalgamator having a closed top, a mercury chamber at the bottom, a spiral passage-way connecting with the latter and the upper part of the amalgamator interior, and an outlet pipe at the top; of an ore tank having a charging cylinder arranged beneath said tank and connected to the latter by a vertically placed pipe having a valve thereon; a pipe having a valve thereon and connecting the bottom of said charging cylinder with the said mercury chamber; and a pipe connecting with the bottom of said charging cylinder, adapted to deliver water under pressure thereto, substantially in the manner as and for the purposes set forth.

3. The combination with a vertically placed cylindrical amalgamator, having a closed top, a mercury chamber at the bottom, a spiral passage-way connecting with the latter and the upper part of the amalgamator interior, and outlet pipe at the top, and an inlet pipe connecting with said mercury chamber; said inlet pipe adapted to deliver water under pressure to said amalgamator commingled with ore, substantially in the manner as and for the purposes set forth.

4. A series of cylindrical amalgamators, each made with a closed top; a mercury cham-

ber at the bottom; a spiral passage-way connecting with the latter, and the upper part of the amalgamator interior; an inlet pipe connecting with the mercury chamber of the first one of the series, said pipe being arranged to deliver powdered ore and water thereto under pressure; a pipe connecting with the top of each amalgamator of the series and the bottom of the next adjacent one of the latter, and a pipe connecting with the top of the last amalgamator of the series, and with a receiving tank, constructed and arranged to operate substantially in the manner as and for the purposes set forth.

5. A series of cylindrical amalgamators, each made with a closed top; a mercury chamber at the bottom; a spiral passage way connecting with the latter, and the upper part of the amalgamator interior; an inlet pipe connecting with the mercury chamber of the first amalgamator of the series; an ore tank connecting with said inlet pipe adapted to deliver ore thereto, with said inlet pipe adapted to deliver ore and water under pressure into the mercury chamber of the first amalgamator of the series; a pipe connecting the top of each amalgamator with the bottom of the next adjacent one of the series; and a pipe connecting the top of the last one of the series with a receiving tank, constructed and arranged to operate substantially in the manner as and for the purposes set forth.

6. A series of cylindrical amalgamators, each made with a closed top; a mercury chamber at the bottom; a spiral passage connecting with the latter and the upper part of the amalgamator interior; an ore tank having an ore charging cylinder beneath connecting by a vertical pipe with said tank; a valve on said pipe; an inlet pipe provided with a valve and connecting with the bottom of said ore charging cylinder, said pipe being adapted to deliver water thereto under pressure; a pipe provided with a valve connecting the ore charging cylinder with the mercury chamber of the first amalgamator of the series; and a pipe connecting the top of each amalgamator of the series with the bottom of the next adjacent one of the latter; and a pipe connecting the top of the last amalgamator of the series with a receiving tank, constructed and arranged to be operated substantially in the manner as and for the purposes set forth.

Signed at Troy, New York, this 16th day of June, 1891, in the presence of two witnesses.

CHARLES C. ORMSBY.

Witnesses:
W. E. HAGAN,
CHARLES S. BRINTNALL.