

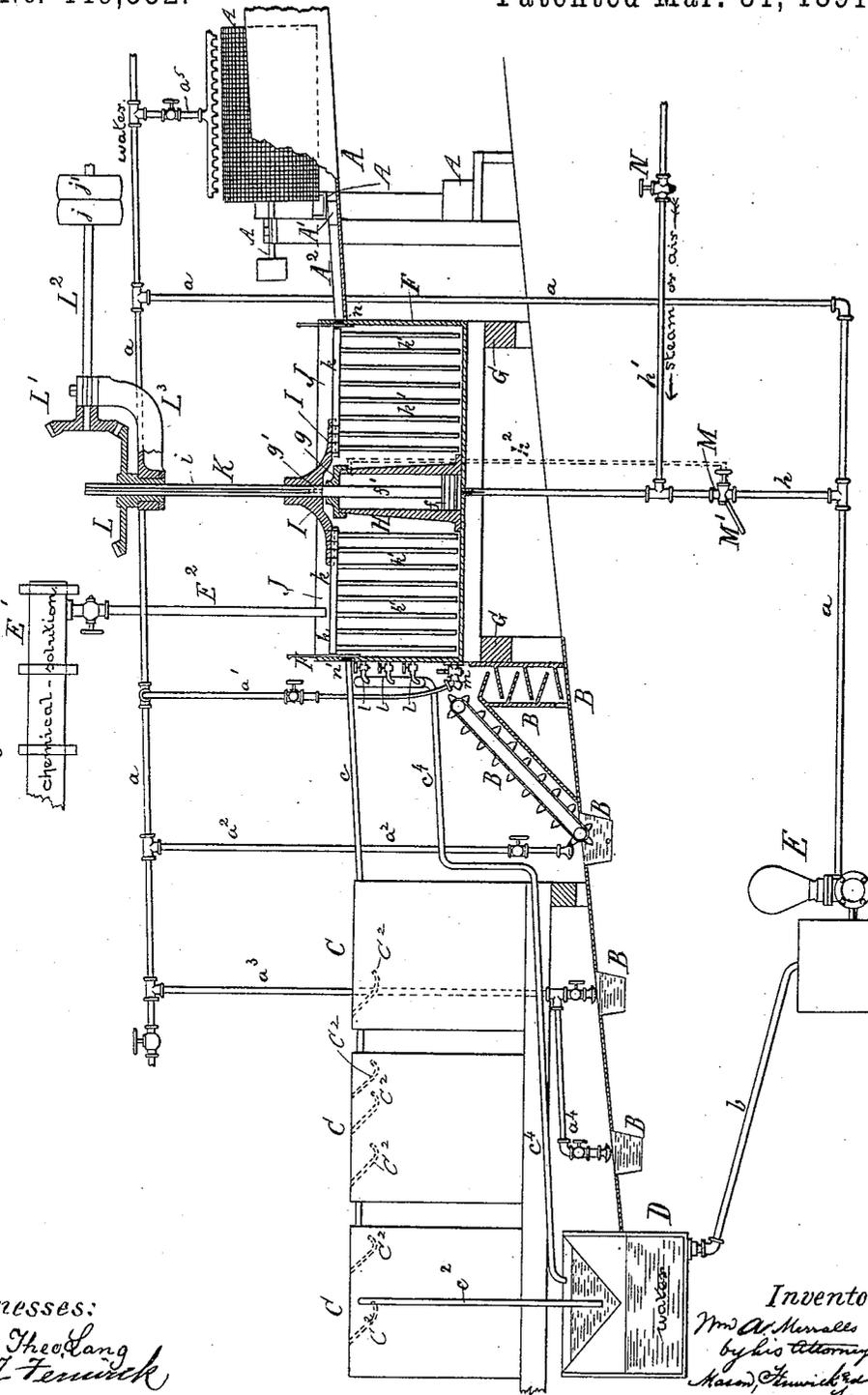
W. A. MERRALLS.

SETTLING AND AMALGAMATING PAN FOR MACHINERY FOR
EXTRACTING GOLD OR OTHER PRECIOUS METALS.

No. 449,552.

Patented Mar. 31, 1891.

Fig 1.



Witnesses:
J. P. Theobald
E. J. Fenwick

Inventor:
Wm. A. Merralls
 by his attorney
Mason, Fenwick & Lawrence

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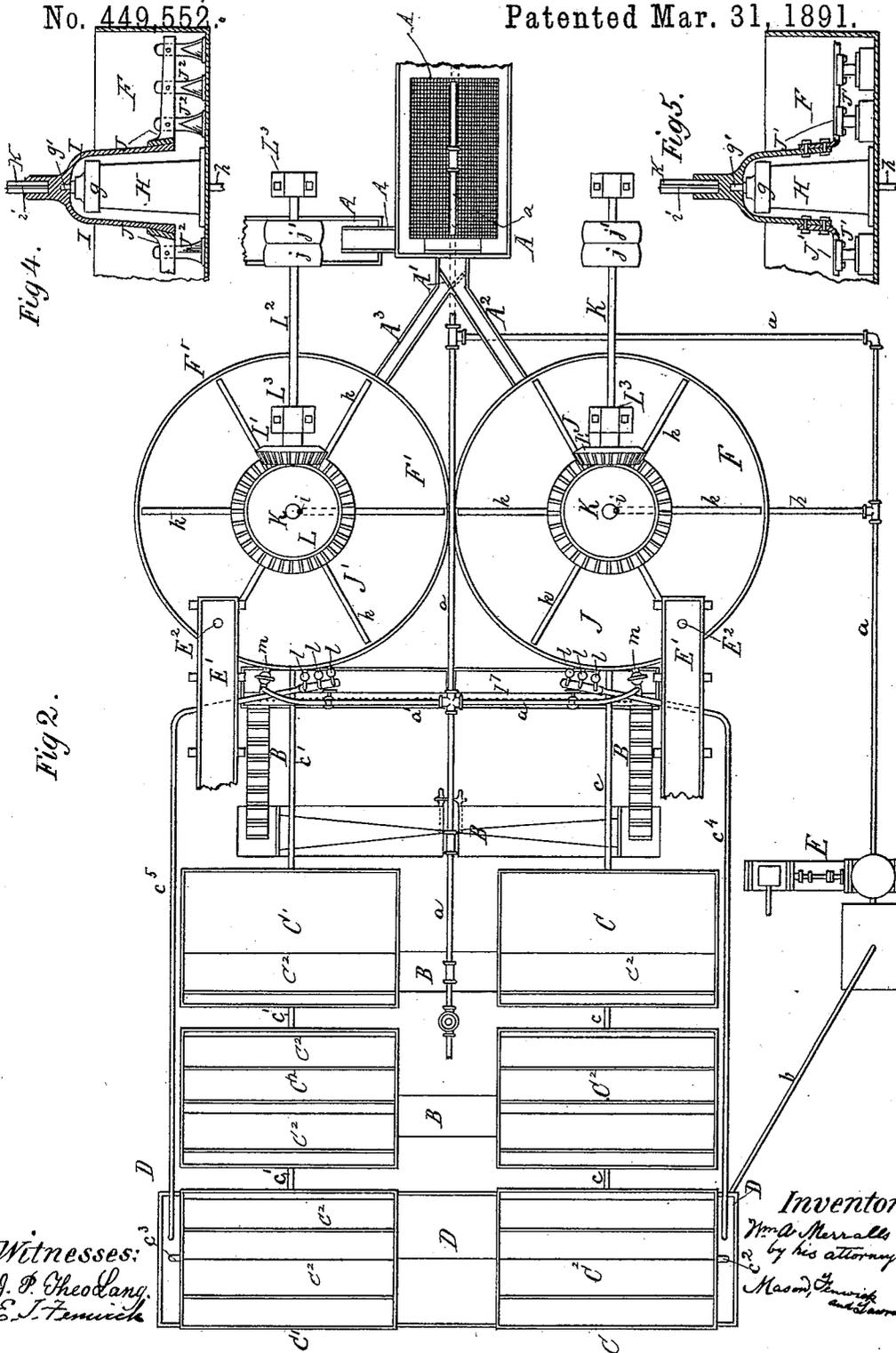


Fig. 4.

Fig. 2.

Fig. 5.

Witnesses:
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E. J. Fenwick

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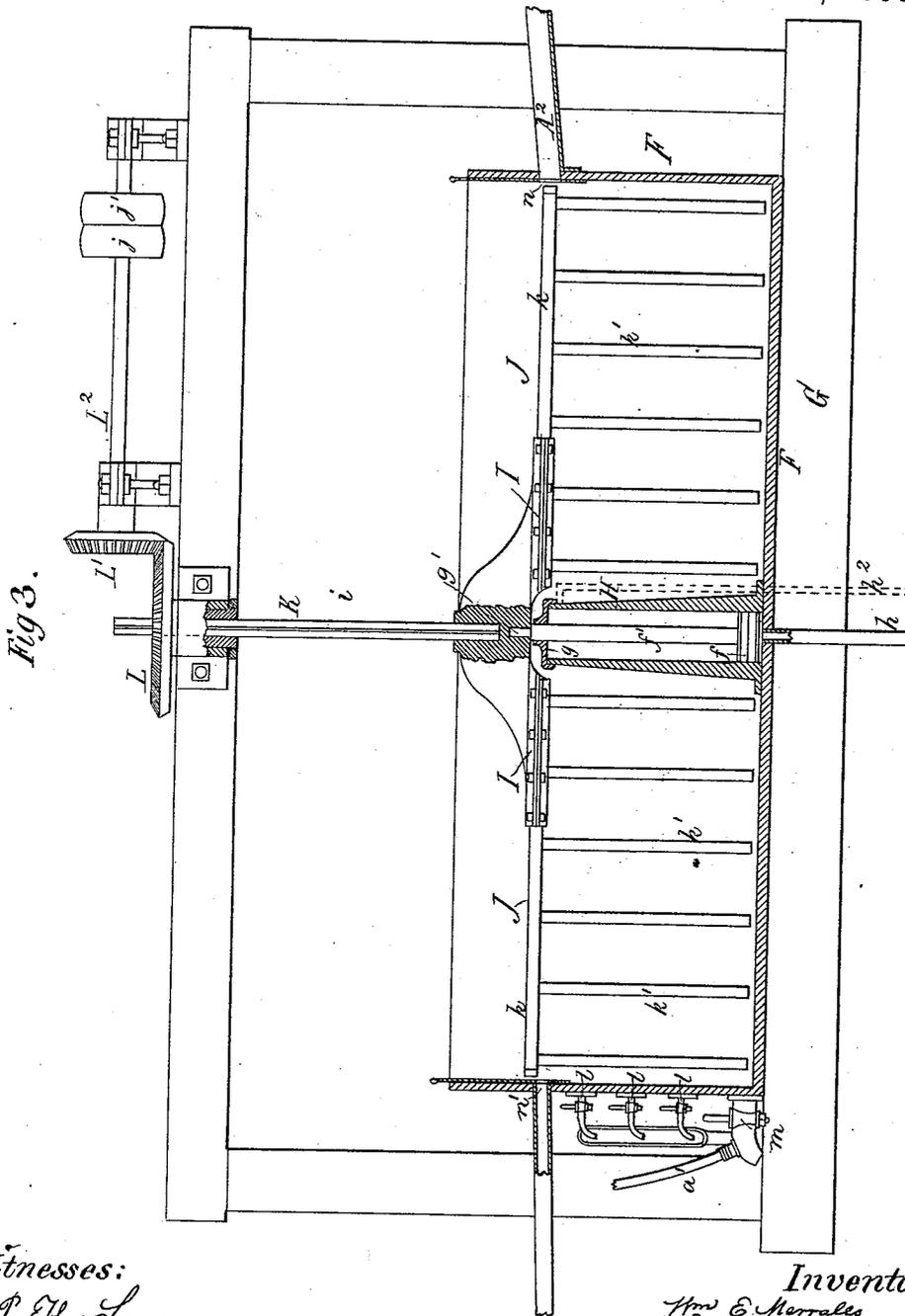


Fig. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. MERRALLS, OF KANSAS CITY, MISSOURI.

SETTLING AND AMALGAMATING PAN FOR MACHINERY FOR EXTRACTING GOLD OR OTHER PRECIOUS METALS.

SPECIFICATION forming part of Letters Patent No. 449,552, dated March 31, 1891.

Application filed February 27, 1890. Serial No. 342,182. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. MERRALLS, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Settling and Amalgamating Pans for Machinery for Extracting Gold or other Precious Metals, and for other Purposes; and I do hereby 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.

My invention relates specially to machinery for extracting gold in, say, placer-mines, or gold from stamp-mills which is rusty and cannot be caught on plates by ordinary methods in use; but it is not necessarily confined to such machinery; and it is especially designed as a substitute for the settling-cylinders shown in Letters Patent No. 412,643, patented to me October 8, 1889, but it will be useful in other relations.

The invention consists in the combination, with a pan, of a moving stirrer or agitator, or muller, or settler plow-shoes, which during the operation of filling the pan to the working level can be adjusted by pressure of water, air, or steam to a position above said level out of the way, and after the pan is filled to said level can be automatically lowered amid or upon the mass of pulp and caused to revolve and agitate or treat the mass.

It also consists in the combination, with a stationary pan wherein the gold and silver are deprived of rust or cleaned and coated with mercury preparatory to final amalgamation, and which is provided with passages for the entrance of the gold, sand, and water, and the exit of water and gold slimes, and with drain-cocks for draining off the water and a cock for discharging the prepared pulp, of a movable stirrer or agitator which is raised above the pulp in the pan by water, air, or steam pressure and automatically lowered and caused to revolve and agitate or treat the mass, and during this operation the drain-cocks can be opened successively and the water allowed to flow off to a filter or other receptacle.

The invention also consists in certain other novel combinations, as will be hereinafter described and claimed.

In the drawings, Figure 1 is a view, partly in section and elevation, of my present invention and a portion of the apparatus shown in my aforesaid patent; Fig. 2, a top view, and Fig. 3 a detail view, partly in section and elevation, of the apparatus shown in Figs. 1 and 2. Fig. 4 shows settler plow-shoes, and Fig. 5 mullers to be substituted at will for the spider with stirrer-tines.

The concentrator mechanism which is shown in part and indicated by the letters A A' A² A³, the finishing amalgamator mechanism, (indicated by letter B,) the settling-boxes and mechanism for gathering gold slimes, (indicated by letters C C' C²), the filter mechanism, (indicated by D,) the pump, (indicated by letter E,) direct water-pipes, (indicated by letter *a*,) pipes entering pulp-discharge cocks, (indicated by letter *a'*,) pipes with spraying-nozzles, (indicated by letters *a*² *a*³ *a*⁴ *a*⁵), return water-pipes, (indicated by letter *b*), drain-water and overflow-conducting pipes, (indicated by letters *c* *c'* *c*² *c*³ *c*⁴ *c*⁵), and chemical-solution chamber having pipe (indicated by letters E' E²) may, if adopted, be substantially as shown in my aforesaid patent, and therefore will not require a special description here, and they will only hereinafter be mentioned when it is necessary to show their connection and relation to my improved pans F F' and the adjuncts thereof.

The pans F F' are preferably used in pairs, and the substances coming from the concentrator A A' A² A³ first enter pan F by the gutter A², the gate A' being in the position shown in Fig. 2 by full lines, and when pan F is filled to the proper level the substances enter the pan F' by the gutter A³, the gate being in the position shown by dotted lines in the same figure. As both pans are precisely alike only one (that F) will be described. The pan F is cylindrical, and it may be constructed as represented, or its lower portion may be made of wrought or cast iron or other suitable material and its upper or body portion of stout wood or other suitable material banded around on its outer surface, and it may rest upon an elevated foundation G, or it may be otherwise

suitably constructed and arranged. In the center of the pan rises a steam, air, or water cylinder H, and in said cylinder a piston *f* is fitted, the rod *f'* of which extends up through a stuffing-box *g* and receives on its reduced axial end *g'* a revolving head or spider I, said head or spider carrying either stirrers J or mullers *J'* or settler plow-shoes *J²* and revolving loosely on the end *g'* of the piston-rod *f'*. The cylinder H is open to a water-pressure pipe *h* or to a steam or air pressure pipe *h'*, as in Fig. 1. If to the former, the force or pressure for operating the piston will be derived from the pump E or a tank above it, and if to the latter the force or pressure will be supplied from an auxiliary air or steam engine. (Not shown.)

To the spider I a stem or shaft K is fastened, and this stem or shaft is provided with a long key *i* or its equivalent, a keyway, and upon its upper portion a bevel-wheel L is fitted in any appropriate manner by the key or square on the stem, so that the shaft may slide up and down through it. Into the bevel-wheel L another bevel-wheel L' gears, said wheel being on a shaft L², mounted, as is also the wheel L, on a bracket L³ of a suitable frame. (Not shown.) The shaft L² is provided with a fast pulley *j* and a loose pulley *j'*.

The stirrer or agitator J (shown in Figs. 1, 2, and 3) consists of horizontal arms *k* and vertical pendant tines or bars *k'*, which extend down from about the filling-level of the pan to near the bottom thereof, as shown. In the periphery of the pan are provided a series of drain-cocks *l* at different altitudes. Near the bottom of the pan is a general delivery or discharge cock *m*, and near the top at front an inlet-passage *n*, and at back an overflow-passage *n'*, said cocks and passages being for the same purpose and substantially the same in their operation as similar ones which are provided in my aforesaid patent.

M is a three or four way cock for controlling the amount of water introduced into the cylinder H, and M' an exhaust-pipe from said cock, pipe *h*, and cylinder H, and N is a similar cock for controlling air or steam supplied to said cylinder when water from pump E is not used, the pipe M' answering for escape of exhaust water, steam, or air, as occasion may require. It is contemplated to lead a branch pipe *h²*, as indicated by dotted lines, from pipe *h* into the cylinder H at a point above the piston for the purpose of using direct pressure of water, steam, or air for lowering the piston, and thus avoid depending entirely upon the gravity of the piston for effecting its descent. When the pipe *h²* is used, the cock M will have to be a four-way cock.

It is contemplated to utilize the means shown for raising and lowering other description of devices for operating upon the pulp or substances in mining-pans—for instance, "mullers," "settler plow-shoes," and the like—for doing any kind of pan work, or with pan

for general amalgamating purposes and with pans for starch, glucose, and the like materials.

It is very important to have the piston-rod *f'* adapted to receive the spider-carrying stirrer loosely on its upper end, and the end of the shaft K, carrying the said spider and stirrer, fitted removably on said rod, and to this end I have constructed the shaft K separately from the piston-rod *f'* and fitted the spider and stirrer detachably upon said shaft K. By these features of construction one form of stirrer can be readily changed for another, and the spider and stirrer can be raised independently of the piston to any extent desired for the purpose of manipulating in the pan or for repairs and inspection of the parts belonging to the same without the great inconvenience of removing the shaft K, piston, spider, and stirrer from the machine. It is also important that the settling and amalgamating pan be constructed strongly and its bottom adapted for bearing heavy weight and standing hard work, and that the substances being treated shall rest directly upon said bottom as a working-surface.

To operate a pan and take its charge I proceed as follows: Open the cock M and allow the water from pump E under sufficient pressure to pass through the pipe *h* into the cylinder H under the piston *f*, and thus cause the piston to rise in the cylinder. In rising the piston-rod *f'*, spider I, and the stirrer or agitator J move upward, and thereby cause the tines or bars *k'* to be moved out of the way above the filling-level of the pan. The pulp is now allowed to flow from the gutter A² through the inlet *n* into the pan F, and when the pan becomes filled with water and pulp as high as the water-line of outlet *n'* and inlet *n* the fine sand, gold, or silver with other metals sink to the lower part of the pan, while the circulating overflow water and whatever of the fine gold slimes it may contain, that are too light to sink, pass off with the water into the settling-boxes C C, and the overflow from the settling-boxes into the filter D, so that all fine slimes and valuable matters shall be saved. When enough pulp for a charge is collected in pan F, the gate A' is turned and the pulp and concentrated substances from concentrator A are allowed to run into pan F'. Now the cock M is closed against the pump E and its exhaust-passage thereby opened and the water under the piston of cylinder in pan F allowed to discharge through said cock into the pipe M', thus permitting the piston to descend. The descent of the piston can be regulated just as may be necessary by controlling the speed with which the water is allowed to pass off. At about the same time that the cock M is closed and the waste-passage M' opened the tight pulley *j* has the belt shifted upon it and the agitator or stirrer is caused to revolve, and by gradually letting out the water at the cock M and revolving the stirrer the pulp is stirred up.

When the pulp has been thus agitated sufficiently to level it, the cock M is again opened and the piston *f* with the agitator or stirrer thereby raised out of the pulp, the belt being shifted upon the loose pulley *j'*, which stops the agitator or stirrer and allows the pulp in the pan to settle and assume a level and the excess of water to be drained off by the cocks *l*. As soon as the water becomes clear of solid substances and the solid material is no longer in suspension the highest cock *l* of the series is opened and the water above it is allowed to run out into the trough of pipe *c*⁴, and fine slimes passing away with the water by passing into the filter are saved. After all the water has been drained off by successively opening the cocks *l* and discharged into the filter D the cocks are closed, and about forty or fifty gallons of a chemical solution consisting, say, of twenty parts of chloride of sodium, two parts cyanide of potassium, and one part of chloride of mercury, dissolved in five hundred parts of warm water, as pure as possible, without distillation, as described in my aforesaid patent, or any other suitable equivalent solution which will remove the gold rust and coat the gold with a film of mercury, is introduced into the pan F from the chamber E'. Now the agitator is again allowed to descend and caused to revolve, this being accomplished by properly adjusting the cock M and driving-belt and permitting the water to gradually run out of the cylinder through the cock M and pipe M'. As the agitator revolves while the piston *f* is slowly descending, the pulp becomes gradually mixed with the solution, and at the end of about one hour the gold which was rusty, as well as all other gold and silver in the pulp, will have become coated with mercury, and this accomplished the cock *m* is opened and the pulp allowed to run through the amalgamator B, or any other suitable amalgamator. The same operation is followed with the pan F', and as soon as pan F is discharged of its contents and the pan F' has become charged the gate A' is adjusted to its original position and pulp allowed to flow into pan F, as in the first instance. The agitator or stirrer might be driven by gears below the pan. The within-described pan is not necessarily used in connection with the special concentrator, amalgamator, settling-boxes, filter, and water-pipes represented, but may be used in any relation and position that is found practicable.

As a substitute for the special chemical solution herein described one consisting of salt, bichloride of mercury, or other suitable salts of mercury, in proper proportions and dissolved in water, may be adopted without departing from my invention.

Settling and amalgamating pans for amalgamating below stamps in stamp-mills or for general amalgamating purposes in extracting gold and silver and pans for glucose and starch factories and the like which require a revolving spider or head carrying stirrers,

mullers, or settler plow-shoes can be operated with much greater rapidity and more beneficially if they are provided with the cylinder, piston, water, air, or steam conducting and controlling pipes and cocks and ordinary fast and loose pulley in accordance with my herein-described invention, for by means of these contrivances the stirrers or mullers or settler plow-shoes can in an instant be raised and stopped by simply opening a cock and shifting a belt and letting on the fluid-pressure, and as quickly adjusted for automatically descending and revolving by simply closing the cock, and thereby opening the escape-fluid passage, and shifting the belt; and in case of accident—say at the moment of a belt breaking—by one turn of the cock the spider and its adjuncts can be raised out of the quickly-settling pulp, and thus the danger of the same becoming stuck in the mass avoided, and as compared with the old styles of pans operated, say, by right-and-left-hand screw, with which much time and labor are consumed in turning the screw for the purpose of raising and lowering the spider and its adjuncts, my invention is a great improvement.

What I claim as my invention is—

1. An amalgamating apparatus consisting of a pan, a centrally-located upright cylinder attached to the bottom of the pan, a piston having a rod formed with an axial end, a sliding and operating shaft constructed separately from the piston-rod, a spider carrying stirrers and connected removably to said shaft and by said shaft connected detachably to the axial end of the piston-rod, gearing for operating and stopping the shaft and stirrers, and water, steam, or air conducting pipes having suitable cocks and connected to the upright cylinder, all substantially as described.

2. An amalgamating apparatus consisting of a pan, a centrally-located upright cylinder provided with inlet and outlet passages for either water, air, or steam, and attached to the bottom of the pan, a piston having a rod with its upper end constructed as an axle for a stirrer to revolve upon a sliding and operating shaft constructed separately from the piston-rod and connected thereto so as to be removed from the pan independently of the piston, and a spider carrying stirrers and means for revolving the stirrers, said spider being connected removably to the said piston-rod, substantially as described.

3. An amalgamating apparatus consisting of a pan, a cylinder attached to the bottom of the pan, a piston and piston-rod, and means for admitting fluid-pressure, such as steam, water, or air, both below and above the piston, substantially as described.

4. The combination of an amalgamating and deoxidizing pan F, cylinder H, attached to said pan, piston *f*, having piston-rod with an axial end and working in said cylinder, stirrer J, having all of its arms attached to one spider and revolving horizontally on the axial end of

the piston-rod, gearing for operating the stirrer, fluid-pressure pipes having cocks and connected to the upright cylinder, and a chemical-solution chamber E', having conducting-pipe leading into the pan, substantially as described.

5 5. The settling and amalgamating pan F, provided with drain-cocks *l*, inlet and outlet passages *n n'*, discharge-cock *m*, cylinder H, 10 piston *f*, stirrer J, having sliding shaft K, gearing for operating the stirrer, and pipes having cocks for admitting fluid-pressure to the piston *f*, substantially as described.

15 6. The combination of the settling and amalgamating pan F, cylinder H, attached to its bottom, piston *f*, having piston-rod *f'*, stirrer J, having shaft K, gearing for operating the stirrer, pipes having cocks for admitting fluid- 20 pressure to the piston, and a concentrating mechanism, substantially as described.

7. The combination of the amalgamating and settling pan F, provided with cylinder H, piston *f*, having piston-rod *f'*, stirrer J, 25 having shaft K, gearing for operating the stirrer, pipes having cocks for admitting fluid-pressure to the piston, and an amalgamator, substantially as described.

8. The combination of the amalgamating

and settling pan F, its stirrer J, cylinder, piston, fluid-conducting pipe having suitable 30 cocks, and the settling-boxes C, substantially as described.

9. The combination of the settling and amalgamating pan F, having drain-cocks *l*, its 35 stirrer J, cylinder, piston, fluid-pressure pipes having suitable cocks, pipes *c'*, and filter D, substantially as described.

10. The combination of the settling and amalgamating pan F, its stirrer J, the cylinder, piston, fluid-pressure pipes having suitable 40 cocks, a concentrator, an amalgamator, pump E, and pipes *a a' a² a³ a⁴*, substantially as described.

11. The combination of the settling and amalgamating pans F F', their stirrers J J', 45 cylinders, pistons, fluid-pressure pipes having suitable cocks, gutters A² A³, gate A', and a concentrating apparatus, substantially as described.

In testimony whereof I hereunto affix my 50 signature in presence of two witnesses.

WILLIAM A. MERRALLS.

Witnesses:

W. B. TWITCHELL,
J. R. UNDERWOOD.