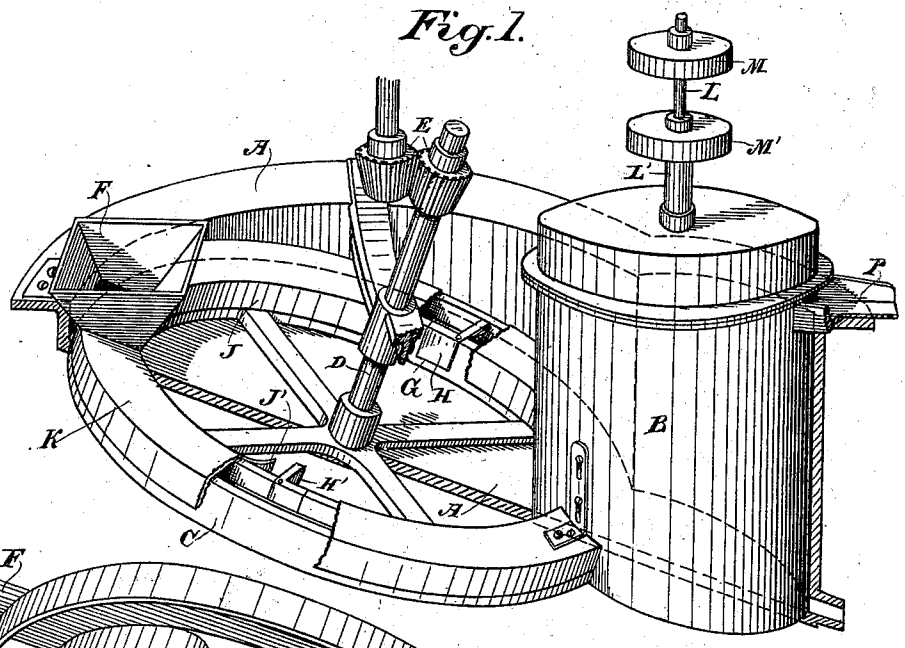
(No Model.)

A. M. SHIELDS.

LEAD BATH APPARATUS FOR WORKING ORES.

No. 552,624. Patented Jan. 7, 1896.

Fig. 1.



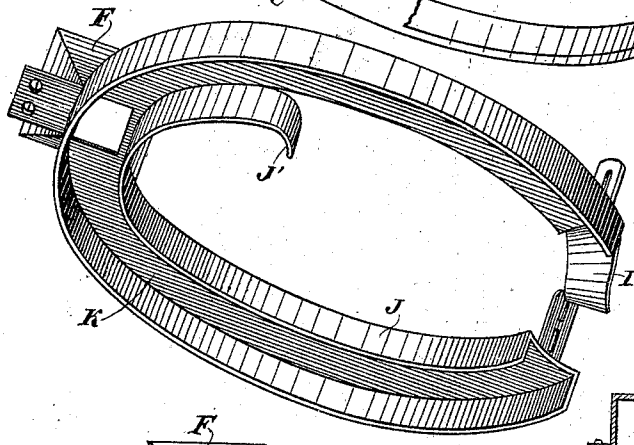


Fig. 2.

Fig. 3.

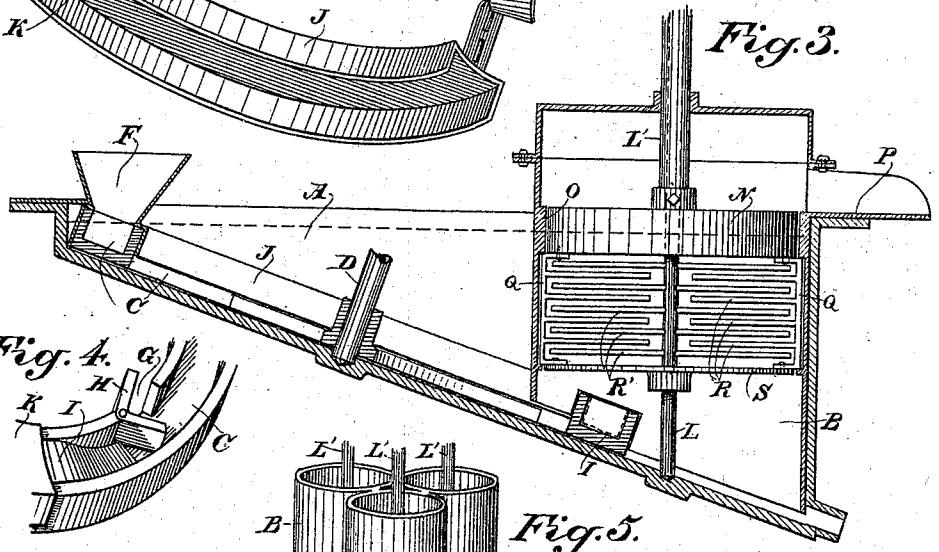


Fig. 4.

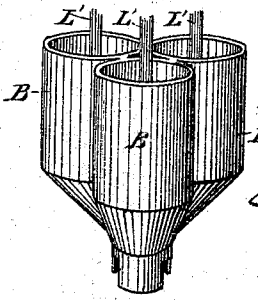


Fig. 5.

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UNITED STATES PATENT OFFICE.

ANDREW M. SHIELDS, OF OAKLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE MOROSCO, SHIELDS & BISHOP FUSION COMPANY, OF SAN FRANCISCO, CALIFORNIA.

LEAD-BATH APPARATUS FOR WORKING ORES.

SPECIFICATION forming part of Letters Patent No. 552,624, dated January 7, 1896.

Application filed May 13, 1895. Serial No. 549,159. (No model.)

To all whom it may concern:

Be it known that I, ANDREW M. SHIELDS, a citizen of the United States, residing in Oakland, Alameda county, State of California, have invented an Improvement in Lead-Bath Apparatus for Working Ores; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an apparatus in which molten lead is employed as a bath and finely-pulverized ore or sand bearing the precious metals is forced through the bath for the purpose of extracting the metal therefrom.

My invention relates to certain details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a perspective view of the apparatus with a part of one side broken away. Fig. 2 is a bottom view of the stationary cap or cover, showing the interior flange which operates the gates or valves. Fig. 3 is a vertical section through the apparatus. Fig. 4 is an enlarged perspective view of a part of the ore-channel, showing the scraper and one of the gates. Fig. 5 shows a cluster of wells through which the ore is distributed.

A is a circular pan, the bottom of which stands at an inclination, while the top is approximately horizontal. At the lower and deeper side of this pan is a well or chamber B, which stands vertically with relation to the pan, and is adapted to contain a quantity of molten lead, which is kept in this state by the application of heat, either by means of a furnace (not here shown) or other suitable means. This chamber is kept so full of the molten material that its surface is nearly on a level with the top of the pan A.

Within the pan A is a circular channeled ring or carrier C of such diameter that one edge of it reaches to the shallowest edge of the pan A, while the other extends to a point beneath and within the lower part of the chamber B. This carrier is fixed to a central shaft D turning in a step in the bottom of the pan extending upwardly and having the upper end supported by a suitable journal-box and arms from the side of the pan, as shown in Fig. 1. Power is supplied to rotate this shaft and with it the disk or ring which is fixed to it by means of gears E, belt-pulleys, or other suitable devices.

F is a feed opening or hopper fixed above the upper edge of the ring C and in line with the circular channel which is formed around its periphery, so that any ore or material delivered into the hopper F will pass into the channel C at the upper side. The inner periphery of this channel has slots or openings made in it, as shown plainly at G, Fig. 4, and in these slots or openings are pivoted the L-shaped gates H. The pivot-pins of these gates pass through the angles of the L-shaped gates or valves, leaving the outer ends free to turn about their pivot-pins. When these gates are turned into the position shown at the upper side in Fig. 1 one of the sides closes the slot or opening G and the other side extends transversely across the channel C so as to close it. These gates are turned into the position to close the channel before they reach the hopper F, so that any material falling into the channel in front of one of the gates will be forced to travel with the disk as it rotates until the material is brought to a point within and beneath the chamber B. At this point the gate is opened or turned by coming in contact with a scraper I, Fig. 4, and the side which has up to this point extended across the channel is then turned so as to close the opening G from the inside, leaving the channel without obstruction, while the other arm of the gate projects toward the center of the disk or carrier. The movement of the gates is effected by a flange J, which forms a part of the cover K. This cover fits over the channeled portion of the rotating carrier C so as to close it and prevent the contents from rising up out of the channel when by reason of the rotation of the carrier the material is carried beneath the surface of the molten metal in the pan. The cover is secured to the sides of the chamber B and to the pan, and the inner flange J is in such position that it lies closely against the inner rim of the channel C, and as one leaf of the gate H closes the opening or channel G it is kept in this posi-

tion by this rim J while the carrier is traveling from the hopper F to the point of discharge within the chamber B. This circular cover K terminates against the sides of the chamber B, and as the gate H passes beneath and within the chamber B it leaves the guide-flange J and is then free to be turned about its hinge-pin when it strikes the scraper I, and will then be turned into its new position which is shown on the lower side of the drawings, Fig. 1, at H'. It retains this position until it reaches the inwardly-curved point J' of the rim or flange J, and when it strikes this inwardly-turned flange the gate is again turned about its hinge-pin until it stands in the position to advance the ore which is received into the hopper F. The object of this is to insure the movement of the ore by a positive pressure, as I have found by experience that if no such gate is employed the ore will sometimes be clogged in the groove or channel C and the carrier would rotate without moving the ore. I have, therefore, employed these gates as a positive device for forcing the ore down to the chamber B.

The chamber B, in the present case, is shown as standing vertically, and within it is a shaft L stepped in the bottom of the chamber and extending up through the closed top and through a sleeve L' of larger diameter, within which it is free to turn. Upon the upper end of the shaft L is a pulley or equivalent driving device M, and upon the sleeve L' is a similar driving device M'. Power is applied to drive the shaft L in one direction and the sleeve L' in the opposite direction.

Within the chamber B a disk N is keyed to the sleeve L, and the periphery of this disk forms a shoe which travels in close proximity with a die O formed around the interior periphery of the chamber B, and just below the level of the outlet P through which the waste material is discharged. To the disk N is secured a downwardly-projecting flange or arms Q, which lie closely within the periphery of the chamber B. From this flange arms R extend radially toward the center of the chamber. The shaft L has similar arms R' projecting from it between the arms R, so that as one set of arms rotates in one direction and the other in the opposite direction the material delivered from the carrier C, rising up through the molten metal is thoroughly disintegrated and distributed through the metal, being also hindered in its upward movement, so that it will be exposed to the action of the metal for a considerable time.

S is a disk fixed below the stirring-arms R and R', and against the bottom of this disk the sand and material rising through the molten metal from the carrier C is first arrested. It is allowed to pass upwardly around the periphery or through openings in this disk, so as not to rise too rapidly. By this arrangement it is exposed to the molten metal for a long time, and any valuable precious metal contained in the sand will be taken up by the melted lead. When the sand has reached the bottom of the disk N, it gradually moves outwardly by centrifugal action and passes between the periphery of the disk and the dies O which surround the interior of the chamber, and the ore is thus subjected to a grinding and disintegrating process which will separate any of the molten lead which may still remain in it, and retain it in the chamber instead of allowing it to pass off through the discharge with the waste material. The fine dust and waste material gradually pass out through the discharge-passage P.

In some cases I have found it advisable to make more than one of the chambers B. In this case the lower part into which the carrier C enters forms one chamber, and above this point it branches out into as many chambers B as may be desired, as plainly shown in Fig. 5. This causes a more complete distribution of the sand, and by subdividing it into the several chambers there is less to be acted on in any one. The stirring-arms and disks in this case are arranged in each of the chambers as previously described.

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

1. In an apparatus for working ores, a pan having an inclined bottom, a chamber connected with the lower and deeper part of the pan and adapted to contain molten lead, a channeled carrier having a central shaft by which it is turnable, an annular groove or channel around its upper periphery, said carrier being adapted to receive the ore at the upper and shallower side of the pan and deliver it within the bottom portion of the chamber at the opposite side, hinged gates adapted to swing across the channel to carry the ore from its point of reception to its point of delivery, and then to be turned out of the channel to allow the ore to be discharged, and means at the point of delivery and in the path of the gate, for moving said gate out of the channel and at the same time lifting the ore therefrom and delivering it into the molten metal above.

2. In an apparatus for working ores, a pan having an inclined bottom, a chamber connected with the lower side adapted to contain molten lead, a circular carrier fitting the bottom of the pan with its lower edge passing beneath and within the chamber at the lower side, an inclined plane at the lower end of the carrier, a channel formed around the upper periphery of the carrier, a hopper fixed to deliver ore into said channel at the upper and shallower side of the pan, hinged L-shaped gates fitted into openings in the inner side of the channel adapted to engage the inclined plane whereby they are swung about their pivots so as to alternately extend across the channel and form gates and then swing so as to form a part of the inner periphery of the

channel, an annular cover fitting closely over the channeled carrier and having a flange on the inner periphery adapted to form contact with the gates so as to retain them across the channel while the ore is being transferred to the point beneath the receiving chamber.

3. In an apparatus for working ores, a pan having an inclined bottom, a chamber connected with the lower side adapted to contain molten metal, a circular channeled carrier having a driving shaft stepped in the bottom of the pan whereby the carrier is rotated upon the bottom, a hopper situated above the channeled carrier at the shallower side of the pan through which ore is delivered into the channel, gates movable so as to extend across the channel and force the ore to move with the carrier until it reaches a point beneath the receiving chamber, a guiding flange by which the gate is retained in this position until it reaches the point of discharge, said flange terminating at the side of the chamber, and a fixed inclined scraper projecting downwardly into the channel adapted to move the gate out of the channel and at the same time lift the ore therefrom and deliver it into the molten metal above.

4. In an apparatus for working ores, a pan having an inclined bottom, the chamber connecting with the deeper side, adapted to contain molten metal, a circular channeled carrier rotatable upon the bottom of the pan, a hopper delivering ore into the channel at the upper and shallower part of the pan, gates adapted to extend across the channel and form dams by which the ore is carried to a point beneath the receiving chamber, guides by which the gates are retained in a closed position until this point is reached, said guides terminating to allow the gates to be moved, after arriving beneath the chamber, an inclined stationary scraper projecting into the channel carrier so as to form contact with the gates and force them, in turn, out of the channel, and at the same time to lift the ore therefrom and deliver it into the molten lead above, and other guides formed upon the opposite side so as to again close the gates and extend them across the channel before they reach the feed hopper.

5. In an apparatus for working ores, a pan having an inclined bottom adapted to contain molten metal, and a chamber connected with the deeper side of the pan, a rotary channeled carrier having a shaft stepped in the bottom of the pan, so that the carrier moves over the bottom, a hopper into which the ore is fed at the upper and shallower side, and through which it is delivered into the channel of the carrier, L-shaped gates hinged at their angles and adapted to be extended across the channel so as to carry the ore down into the molten metal and deliver it into the chamber at the lower side, an inclined scraper at the lower side of the carrier and in the path of the gates whereby the latter are turned out of the channel to allow the ore to be removed therefrom, and a stationary cap or cover fitting over the channeled carrier having the flange upon the inner side adapted to form contact with the gates to keep them closed during the first part of the revolution of the carrier, said flange terminating so as to allow the gate to be opened beneath the receiver, and bent to form contact with and again close the gate before it reaches the receiving point.

6. An apparatus for working ores, consisting of a pan having an inclined bottom adapted to contain molten metal, a circular channeled carrier movable over said bottom adapted to receive ore at the upper and shallower side thereof, and to deliver it at the lower and deeper side, a vertical cylindrical chamber connected with the lower and deeper side of the channel and through the lower part of which the channeled carrier moves, a vertical rotatable shaft stepped in the bottom of said chamber having arms projecting radially therefrom, a sleeve extending into the upper part of the chamber surrounding the shaft having a disk fixed thereto, and forming a shoe, a die fixed within the chamber opposite the periphery of the disk, and a peripheral downwardly projecting flange secured to the bottom of the disk, having radial arms projecting between those of the interior shaft and movable in the opposite direction therefrom to serve as distributers, and a disk secured to the lower portion of the flange below the arms.

7. In an apparatus for working ores, the combination, of a carrier having swinging gates and a vessel containing molten metal, beneath which the carrier passes, of an inclined scraper at the end of the carrier beneath the vessel, adapted to engage and open the gates, and lift the ore out of the carrier and deliver it into the molton metal above, means for operating the carrier and means for closing the gates after they emerge from the vessel.

8. In an apparatus for working ores, a pan adapted to contain molten metal having an inclined bottom, a hopper at the upper and shallower side through which ore is fed, and one or more vertical cylindrical chambers connected with the lower and deeper side of the pan, a circular carrier having a groove or channel around its upper periphery, and a central shaft by which it is rotated upon the bottom of the pan so that the channel passes beneath the feed hopper upon one side, and beneath the receiving chamber or chambers upon the other side, a stationary cap or cover fitting over the channeled carrier having an interior guide flange and L-shaped gates hinged in openings in the inner periphery of the carrier channel and adapted to contact with the guide flange so as to be closed before arriving at the feed hopper and remain closed until they reach a point beneath the receiving chambers where the guide flange termi-

nates, an inclined scraper adapted to contact with and open the gates as they reach it and to raise the material contained in the channel and deliver it into the molten metal above, said guide flange being so arranged as to again close the gates after they leave the chamber and before they reach the feed hopper.

In witness whereof I have hereunto set my hand.

ANDREW M. SHIELDS.

Witnesses:
S. H. NOURSE,
J. C. BRODIE.