May 22, 1951 B. F. PATRICK 2,553,936

RECLAIMING MACHINE

Filed July 2, 1948 2 Sheets-Sheet 1

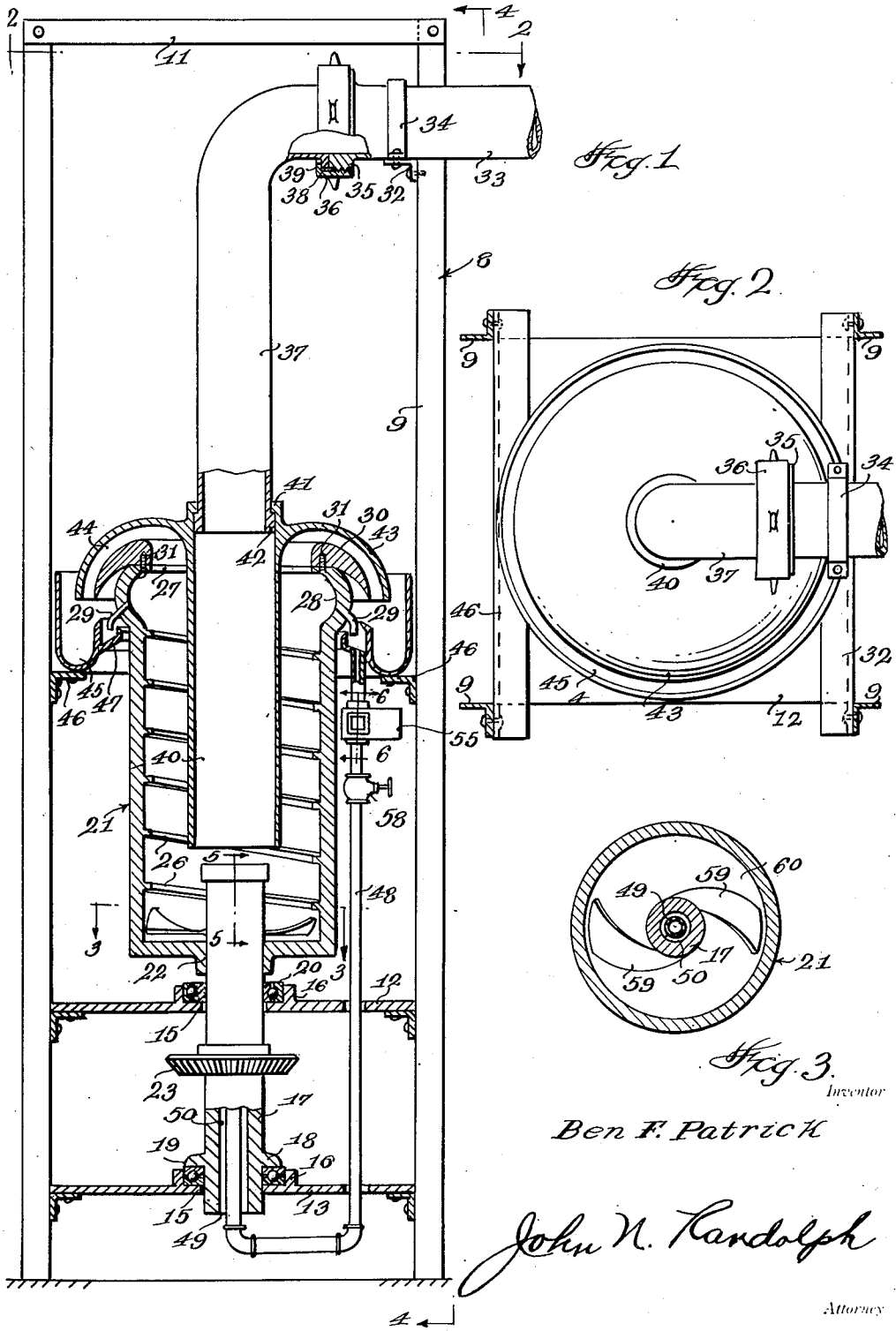

Fig. 1



Fig. 2



Fig. 3

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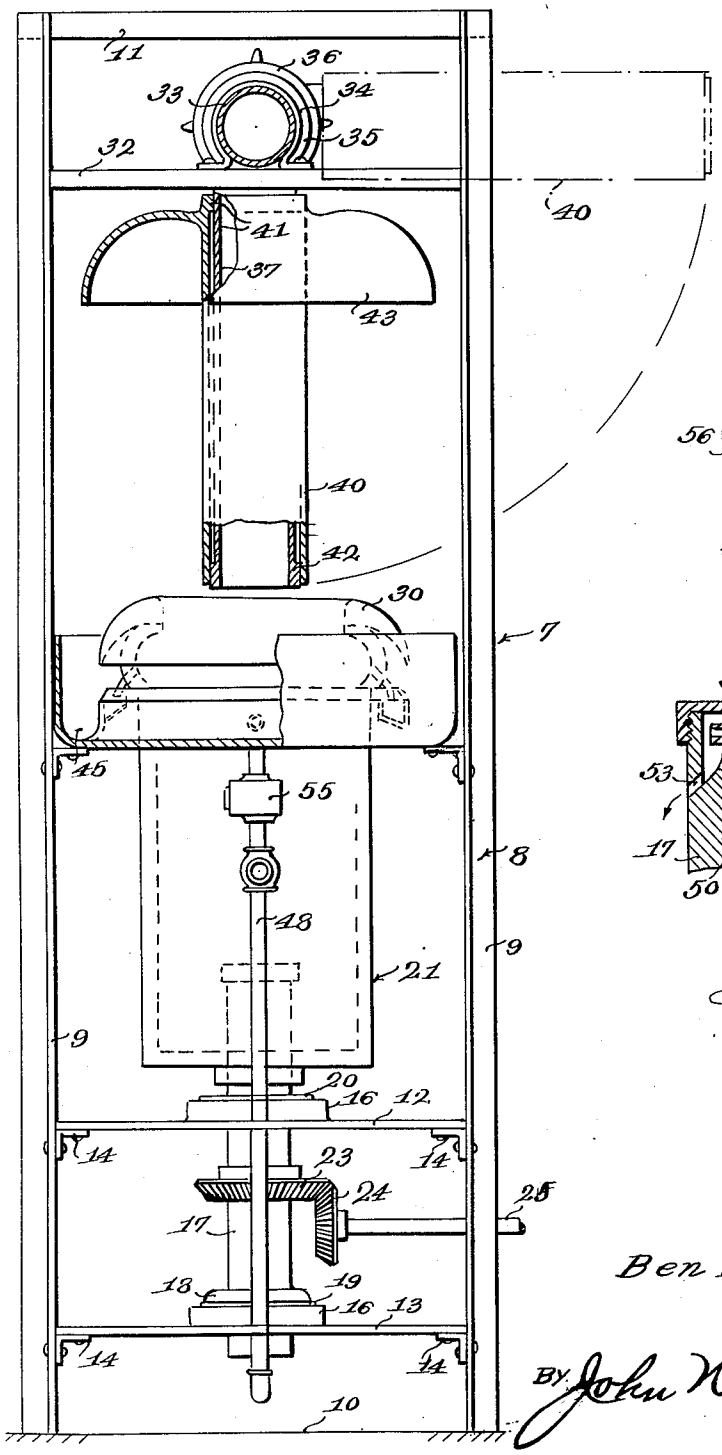


Fig. 4

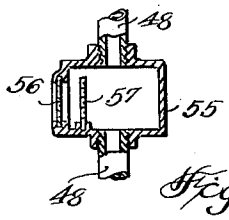


Fig. 6.

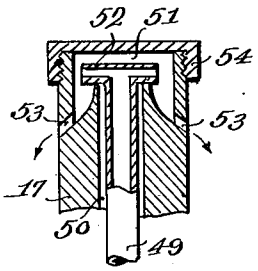


Fig. 5.

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# UNITED STATES PATENT OFFICE

2,553,936

## RECLAIMING MACHINE

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Application July 2, 1948, Serial No. 36,730

5 Claims. (Cl. 209—199)

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This invention relates to an improved reclaiming machine for extracting precious metals such as placer gold and other metals, found in a free state, from pulp and more particularly constitutes an improved centrifugal amalgamator which utilizes mercury for separating the precious metals from the pulp.

A primary object of the present invention is to provide a reclaiming machine of extremely simple construction having means for circulating the mercury to and from the machine in order to maintain the surface of the mercury in a fresh condition and relatively free from the precious metals which have been amalgamated thereby so that the amalgamation of the precious metals can be readily accomplished and to eliminate the necessity of reducing the velocity of rotation of the machine to break up the mercury wall for accomplishing this purpose.

Another object of the invention is to provide a machine of extremely simple construction which is adapted to be revolved at a high rate of speed whereby through the centrifugal force are parted thereby to the pulp and precious metals, the precious metals will be readily separated out of the pulp and amalgamated with the mercury and the pulp carried off and separated from the machine through a surrounding launder.

Still a further object of the invention is to provide a machine including a bowl for containing the mercury and into which the pulp is discharged and having means for readily exposing the open top of the bowl for the purpose of inspection or repair.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a vertical sectional view, partly in side elevation of the reclaiming machine;

Figure 2 is a horizontal sectional view thereof taken substantially along a plane as indicated by the line 2—2 of Figure 1;

Figure 3 is a horizontal section view taken substantially along a plane as indicated by the line 3—3 of Figure 1;

Figure 4 is a side elevational view, partly in vertical section taken substantially at a right angle to Figure 1 and looking from right to left thereof;

Figure 5 is a vertical sectional view on an enlarged scale, taken substantially along a plane as indicated by the line 5—5 of Figure 1, and

Figure 6 is a similar view taken substantially

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along a plane as indicated by the line 6—6 of Figure 1.

Referring more particularly to the drawings, the novel reclaiming machine or centrifugal amalgamator constituting the invention is designated generally 7 and includes a frame 8 composed of upright corner posts 9, preferably of angle iron, the lower ends of which rest on or may be suitably anchored in a supporting surface 10. The posts 9 are braced at their upper ends by the braces 11 and adjacent their lower ends by superimposed plates 12 and 13 which are attached to the legs 9 by angle brackets 14 and each of which is provided with a central opening 15 and an upstanding flange 16 disposed concentrically around the opening 15 and spaced outwardly therefrom.

A hollow shaft 17 extends loosely through the opening 15 and is provided adjacent its lower end with a collar 18 which bears on a thrust bearing 19 retained in the flange 16 of the bottom plate 13 for rotatably supporting the shaft 17 in the frame 18. The flange 16 of the upper plate 12 contains an antifriction bearing 20 in which said shaft 17 is journaled and which combines with the bearing 19 for axially journaling the shaft in the frame 8.

A bowl 21 is provided with a central externally flanged opening 22 in the bottom thereof through which the upper portion of the shaft 17 extends and to which said shaft is secured for rotation of the bowl 21 with the shaft 17 and as best illustrated in Figure 1, said shaft extends to a slight distance above the bottom of the bowl 21. A beveled ring gear 23 is fixed to the shaft 17 between the bearings 19 and 20 and meshes with a beveled gear 24 of a driven shaft 25 which may be driven from any suitable power source, not shown. Likewise, it will be readily apparent that a belt pulley, not shown, could be substituted for the gear 23 for revolving the shaft 17 by a belt drive.

The bowl 21 is provided with a substantially cylindrical side wall having an internal spiral rib 26 extending from near the bottom thereof to a point near the open top 27 of said bowl which is slightly restricted relatively to the internal diameter of the bowl. Adjacent its open top 27, the bowl 21 is provided with an annular outwardly bowed portion 28 disposed above the upper end of the spiral rib 26 and which is provided with a plurality of outwardly and downwardly extending discharge conduits 29, for a purpose which will hereinafter become apparent. An annular rim 30 having a central opening of

approximately the same size as the bowl opening 27 is secured by fastenings 31 to the upper end of the bowl 21 and externally thereof and from its bore to its periphery is tapered and curved outwardly and downwardly, as best illustrated in Figure 1.

A brace 32 is secured to and extends between two of the legs 9 adjacent their upper ends for supporting a portion of a supply pipe 33 which is mounted thereon and secured thereto by a strap 34. The end of the pipe 33 which extends into the frame 8 is externally enlarged and threaded as seen at 35 to receive a threaded retaining collar 36 which is mounted on the elbow of a pipe 37. The elbow end of the pipe 37 has an out-turned flange 38 which is adapted to bear against the outer end of the enlargement 35 and the collar 36 is provided with an inturned annular flange 39 at one end thereof which engages the opposite, inner side of the flange 38 for securing it against the enlargement 35 for coupling the pipes 33 and 37. The opposite, normally depending end of the pipe 37 is provided with an extension 40 which telescopes thereon and which has an internal flange 41 at its inner end for engagement with an external flange 42 on the lower or outer end of the pipe 37 to prevent the section 40 from being disconnected from the pipe 37 and for normally supporting said section 40 in its extended position of Figure 1 and so that it will extend into the bowl 21 and open above and adjacent the upper end of the shaft 17. The pipe section 40 adjacent its upper end is provided with an annular flange 43 of arcuate cross section which is disposed substantially concentrically over the rim 30 and which combines with the exterior surface thereof to form an annular outwardly and downwardly extending discharge passage 44 which opens outwardly of the conduits 29 and into an annular trough or launder 45 which is supported in the frame 8 on brackets 46 secured to the posts 9. The trough 45 is provided with an outer annular wall which extends to above the bottom edge of the flange 43 and which is spaced outwardly therefrom and has an inner annular wall which terminates in an inwardly flared edge disposed below and inwardly of the outer edge of the rim 30 and accordingly inwardly of the discharge passage 44. Said inner wall of the trough 45 is spaced from the cylindrical side wall of the bowl 21 and disposed beneath and adjacent the bowl portion 28 and is provided with a flange which extends upwardly therefrom and toward the bowl 21 to combine therewith for forming a smaller inner gutter or flume 47 into which the conduits 29 discharge.

A pipe 48 has an upper end opening into the bottom of the flume or gutter 47 and extends downwardly therefrom through openings in the plates 12 and 13 and is provided with an upwardly extending opposite end 49 which extends upwardly through the bore 50 of the shaft 17 and which is loosely disposed in said bore 50 so that the shaft 17 can freely revolve around the pipe portion 49. As best seen in Figure 5, the shaft 17 is provided with a recessed upper end 51 into which the upper end of the bore 50 opens and into which extends the upper end of the pipe section 49. Said upper end of the pipe section 49 terminates in a crosshead 52 having oppositely opening discharge ends which open into the recess 51. Said recess 51 is tapered downwardly and outwardly and is provided with downwardly and outwardly opening discharge ports 53. The recess 51 is normally closed by a threaded cap 54 which engages the externally threaded upper end of the shaft 17.

The pipe 48 beneath and adjacent the gutter 47 is provided with an inspection box 55 to the top and bottom of which adjacent sections of the pipe 48 are threadedly connected so that box 55 constitutes a part of the conduit of the pipe 48 and forms an enlargement thereof. The inspection box 55 is provided with a window 56 behind which and within the box 55 is disposed an upstanding graduated rod 57. The pipe 48, beneath and adjacent the inspection box 55, is provided with a manually controlled valve 58.

The shaft 17 is provided with a pair of diametrically opposed impeller vanes or blades 59 which extend outwardly therefrom and which are curved in a direction away from the direction of rotation of the shaft 17 as indicated by the arrow 60 of Figure 3 and which vanes 59 increase in width toward their outer ends and are provided with upwardly curved trailing edges.

The shaft 17 is adapted to be revolved in the frame 8 by its driving connection with the driven shaft 25, as previously described, for rotating the bowl 21 on its longitudinal axis at a relatively high velocity for producing a substantial centrifugal force within said bowl. The conduit 33 is adapted to be connected to a source of pulp supply containing precious metal which may be conveyed therethrough in any suitable manner and discharged from the pipe section 40 into the bowl 21 adjacent its bottom. The bowl 21 is initially charged with mercury, not shown, which due to the centrifugal force within said bowl 21 when revolved will form a lining on the cylindrical wall of the bowl and fill the spaces between the spaced convolutions of the spiral rib 26. The pulp which is discharged outwardly and downwardly into the bowl 21 will be deflected outwardly and upwardly by centrifugal force and by the action of the vanes or blades 59. This centrifugal force will cause the precious metals to be separated from the pulp and to be amalgamated with the mercury lining the cylindrical wall of the bowl. The lighter pulp will be conveyed upwardly and will be discharged through the open top 27 of the bowl 21 and over the rim 30 and will be deflected outwardly and downwardly by the annular deflector flange 43 so as to be discharged from the annular discharge passage 44 into the trough or launder 45 which may be provided with a suitable outlet, not shown, for carrying off the pulp after the precious metals have been thus separated therefrom. Ordinarily, the surface of the mercury lining the inner wall of the bowl 21 would rapidly become impregnated with the precious metal particles which would resist further amalgamation. In order to overcome this and without the necessity of slowing down the rotation of the bowl to break up the mercury wall, the mercury is supplied in sufficient quantities so that the upward impetus produced thereon by the vanes 59 together with the centrifugal force will cause the amalgam of precious metals and mercury to be carried upwardly of the bowl 21 into the enlarged portion 28 from which such amalgam will be discharged through the conduit 29 into the flume or gutter 47 from whence the amalgam will flow through the conduits 48, 49 into the recess 51 of the shaft 17 to be discharged therefrom through the ports 53 centrifugally back into the lower portion of the bowl 21 thereby constantly re-distributing the mercury so that the surface of precious metals cannot be formed thereon. The window 56 of

the inspection box 55 affords a means whereby the operator can visually determine and check the flow of the mercury for varying and regulating this flow by the control valve 58. By momentarily shutting off the valve 58 the rate of mercury flow can be determined by reference to the graduated rod 57 for determining the rate at which the mercury will fill the inspection box.

Ready access is provided to the open top of the bowl 21 for the purpose of inspection or repair by the simple expedient of retracting the pipe section 40 upwardly on the pipe section 37, as illustrated in Figure 4 after which said telescoped pipe can be swung upwardly and to one side, as illustrated in dotted lines in Figure 4, so that the top of the bowl 21 will be exposed.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. A centrifugal reclaiming machine for precious metals comprising a frame, a hollow shaft journaled therein, a bowl fixed to said shaft and supported thereby in the frame in an upright position and for rotation with the shaft on its vertical axis, said shaft extending through the bowl bottom, drive means connected to said shaft beneath the bowl, said bowl having a cylindrical side wall adapted to be lined with mercury by the centrifugal force of the rotation of the bowl, a feed conduit for pulp supported by said frame and having a discharge end opening into the bowl adjacent the bottom thereof, said pipe extending through the open top of said bowl, a rim secured to the open top of the bowl and having an outwardly and downwardly extending annular flange over which the pulp is adapted to be discharged after separation of the precious metals therefrom by amalgamation in the mercury, a trough or launder supported by the frame around the bowl and beneath and adjacent the annular flange for receiving the pulp, and means for circulating the mercury by extraction of the mercury from adjacent the top of the bowl and by recharging the bowl by a gravity feed with the mercury adjacent the bottom thereof and through the hollow shaft.

2. A reclaiming machine as in claim 1, said last mentioned means comprising an annular gutter or flume supported by said trough and inwardly thereof, said bowl having an upper annular internally enlarged portion forming an integral part thereof into which the mercury is conveyed and provided with discharge ports opening into said gutter, a conduit extending downwardly from said gutter having an upturned portion extending upwardly through said hollow shaft through which the mercury is returned to the bottom of the bowl by gravity from the gutter, said hollow shaft having a recessed upper end provided with outwardly and downwardly opening discharge ports opening into the lower portion of the bowl and into which the upturned end of said pipe discharges for recharging the bowl with the mercury.



3. A reclaiming machine as in claim 1, said feed pipe having an annular deflector flange normally disposed over and adjacent the bowl rim for deflecting the pulp into the trough, said feed pipe having a telescopic section supporting said deflector flange above and out of engagement with the bowl, said telescopic section being retractable out of said bowl, and said feed pipe including a joint on which the telescopic portion thereof is swingable for displacing the feed pipe away from the bowl for exposing the open top of the bowl.

4. A reclaiming machine as in claim 1, said means comprising an annular gutter or flume supported by said trough and inwardly thereof, said bowl having an upper annular internally enlarged portion into which the mercury is conveyed and provided with discharge ports opening into said gutter, a conduit extending downwardly from said gutter having an upturned portion extending upwardly through said hollow shaft, said hollow shaft having a recessed upper end provided with outwardly and downwardly opening discharge ports opening into the lower portion of the bowl and into which the upturned end of said pipe discharges for recharging the bowl with the mercury, the flange of said rim extending outwardly beyond said gutter for deflecting the pulp into the trough and away from the gutter.

5. A reclaiming machine as in claim 1, said hollow shaft having an upper portion disposed within the lower part of said bowl, and impeller blades secured to said upper portion and adjacent the bowl bottom and provided with upwardly curved trailing ends for deflecting the pulp upwardly relatively to the bowl bottom.

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