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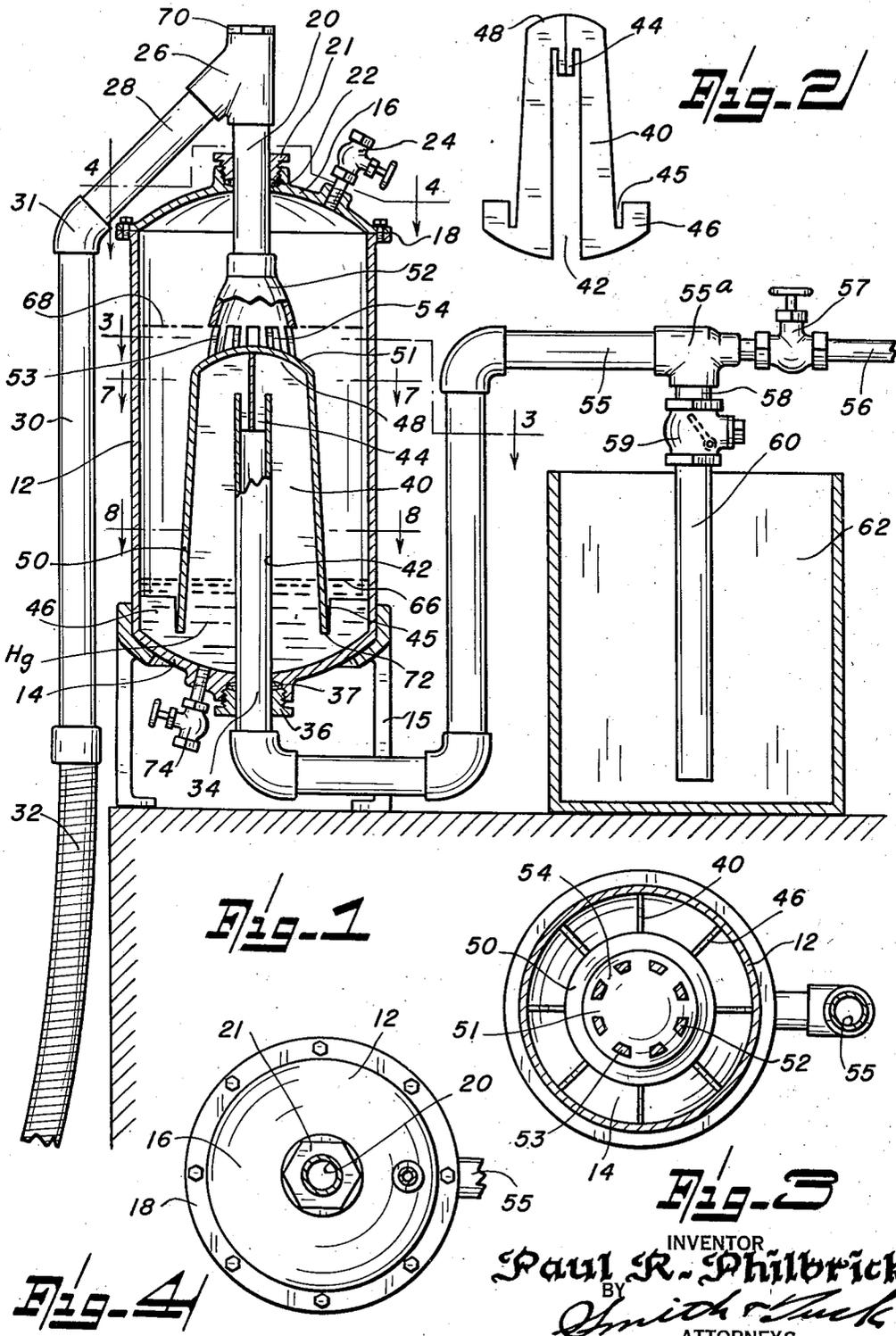
P. R. PHILBRICK

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AMALGAMATOR

Filed April 8, 1940

2 Sheets-Sheet 1



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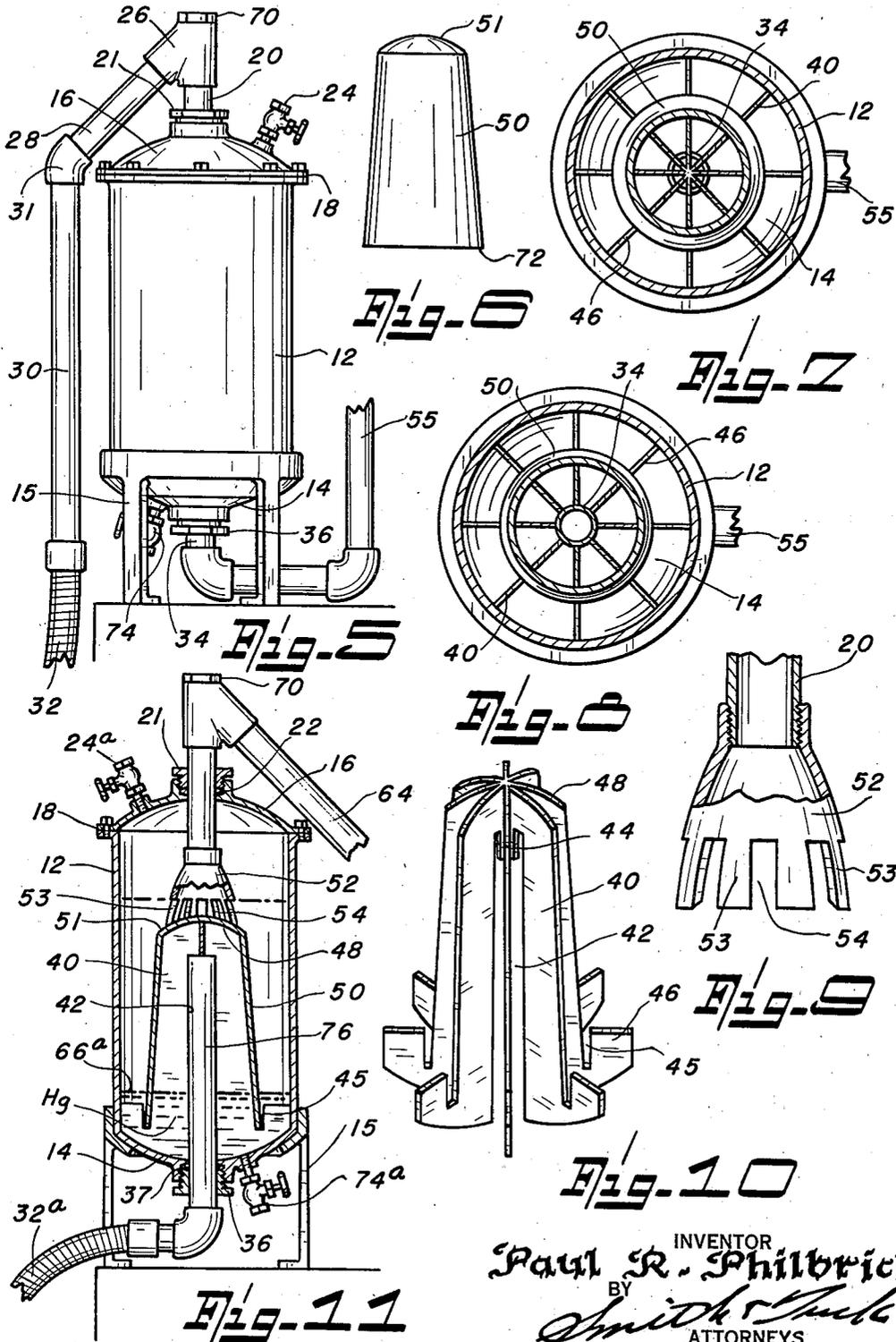
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AMALGAMATOR

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11 Claims. (Cl. 209—185)

My present invention relates to the general class of equipment used in the recovery of precious metals, and more particularly to an amalgamator.

My device consists essentially of a closed chamber of relatively small size into which the concentrated pulp, bearing precious metals, is introduced, caused to be broken up, and passed through a mercury bath in the lower portion of my chamber. Then, after the metal has been removed, the pulp and water are carried away for disposition so that the operation can be continuous for long periods. In the recovery of precious heavy metals, the principal one of which is gold, many devices have been created for the purpose of bringing the gold-bearing pulp, or gold-bearing sand, into intimate contact with mercury which, through its affinity for gold and certain other precious metals, is considered the most practical means for recovery.

In the majority of devices observed, however, large, bulky pieces of equipment are designed to break up the pulp into relatively small bodies so that the free gold can be brought into contact with mercury, to the end that the natural affinity of mercury for gold can be used to retain the gold while the waste materials are passed out of the machines. In my present equipment I have overcome the many deficiencies of the large bulky equipment formerly used and have provided equipment relatively small in size, yet capable of handling large quantities of material in a continuous operation. To make my equipment readily available where transportation is a problem, or where first cost is a matter of real consideration, I have arranged my equipment to operate as a syphon. Once the cycle of operation is started, by any of the known means of starting syphon flow, the operation will be continuous, not requiring power to move the materials. It has further been found that a unit, even if it is only twelve inches in diameter, can be expected to handle approximately one and one-half yards of material each hour. Thus I provide a very compact, yet efficient, piece of equipment which can be made at a relatively low cost, and which requires no attention in its operation. This surmounts one of the important objections to so much of the more complicated equipment which requires men in constant attendance.

Another object of this invention has been the provision of an amalgamator unit having self-contained means for breaking up the pulp in its passage to the mercury body for treatment.

A further object of my invention has been to

provide an amalgamator easily disassembled for cleaning or for the replenishment of the mercury body, and equally easily reassembled.

Still another object performed by the provision of an amalgamator, according to my disclosure, has been that of a device capable of operating upon certain ore-bearing pulps which do not need to be broken up by merely reversing the usual flow of the material through the unit.

Other and more specific objects will be apparent from the following description taken in connection with the accompanying drawings wherein:

Figure 1 is a side elevation, in section, showing a preferred form of my recovery device.

Figure 2 is a side elevation illustrating two of the baffle fins employed inside my recovery chamber to provide means for comminuting and dividing the incoming materials so that no large mass of the same will pass through the mercury at any given point.

Figure 3 is a cross-sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a cross-sectional view taken along the line 4—4 of Figure 1.

Figure 5 is a side elevation of a preferred form of my equipment.

Figure 6 is a side elevation of the inner distributing head of my device.

Figure 7 is a cross-sectional view taken along the line 7—7 of Figure 1.

Figure 8 is a cross-sectional view taken along the line 8—8 of Figure 1.

Figure 9 is a fragmentary, side-elevation, partly in section, showing the collector head for my device, illustrating how it is formed with a plurality of openings which cause suction at a plurality of points, so as to assist in promoting an evenly distributed flow of material through my equipment.

Figure 10 is a perspective view showing the deflecting baffles as they are assembled in my machine, but with all other parts removed therefrom.

Figure 11 is a modified form of my device illustrating a secondary use of my equipment.

Referring to the drawings throughout which like reference characters indicate like parts 12 designates the main body, or drum, of my recovery chamber. This I prefer to form with cylindrical walls and a bottom portion 14 that is dish-shaped, or saucer-like, in form. Any suitable form of supporting means may be used such as the legged standard 15. At its upper end I provide a cover member 16 which is secured to body

12 with an air tight joint such as the bolt-held packing joint at 18. Passing through the center of cover 12 is the suction discharge pipe 20. Normally, it is desirable to have this member downwardly adjustable so that a snug engagement is made with the interior portions of the device. In order to obtain an air-tight joint at this point I provide the packing gland 21. Suitable packing may be used at 22. A vent is provided, preferably equipped with a valve 24 so that in use the amount of air permitted within my chamber may be adjusted as desired. Secured to pipe 20, I provide, preferably, an angled L 26 to which are in turn secured pipes 28 and 30; the latter two being connected by a 45° L 31. To the lower end of pipe 30, which should extend below the bottom of my recovery chamber, I provide means for attaching a flexible pipe or hose 32 so that the rate of flow through my recovery device can be controlled easily by regulating the height of the ultimate discharge.

Passing through the center of the bottom portion 14 of my recovery chamber, I provide the underfeed supply pipe 34. This pipe, like pipe 20, is provided with a packing gland 36 so that suitable packing 37 may be employed to form an air and water tight joint at this point. Pipe 34 may be enlarged in size over supply pipe 55 to compensate for the obstruction caused by the downwardly extending fin portions 44 if a jetting effect is not desired.

The pipe 34 is led upwardly to a point slightly above the middle of my chamber, and around it are disposed a baffle composed of a plurality of radial fins 40. These fins are cut away at 42 so as to form a snug fit over the pipe and the depending tongue portion 44 is adapted to fit inside the pipe to position baffles. The plurality tongue portions 44 placed within the discharge end of pipe 34 constitute a comminutor element having radial cutting edges operable on the inflowing pulp masses. The outer edges of fins 40 are slightly tapering after the showing particularly of Figures 1 and 2. The lower ends of the fins are each cut with a slot 45 which leaves the fin extension portions 46. The upper ends of fins 20 are rounded, as illustrated at 48, so that a cup-like frusto-conical distributor dome 50 may be placed over fins 40 and held in position by fitting into slots 45.

As shown in the drawings the dome 50 may be of a round and frusto-conical shape to present a smoother impact surface, but it may be any suitable shape. Adapted to rest on the curved outer portion 51 of the distributor dome 50 is a suction bell 52 which is secured to pipe 20 and is provided with a plurality of legs 53 and intermediate openings 54 so that the suction on the slime water and other disposable materials inside the amalgamating chamber will be equally distributed around its periphery.

Suitably connected to pipe 34 is the feed pipe 55. This pipe, is provided preferably with a reducer T at 55a so that a water supply pipe 56 may be connected thereto and controlled as by valve 57. The downwardly directed portion of the T 55a is provided with a nipple at 58 which in turn connects a check valve 59 and the suction pipe 60. Suction pipe 60 extends substantially to the bottom of the pulp collecting chamber 62. No means is shown for feeding the pulp into chamber 62 as it will be apparent any suitable supply means may be employed to effect this deposit of material for treatment in the circuit.

In Figure 11 I have shown a modification of the

use of my device which has been found to be practical under certain conditions. This calls for a reversal of the operation of this device shown in Figure 1 with the material being delivered into the equipment through the pipe 64 and out through the hose 32a. The remainder of the parts are substantially identical to my preferred form shown in Figure 1.

Method of operation

In operating my device a quantity of mercury, Hg, or quicksilver is placed in the bottom of the collecting chamber rising substantially to the dashed line 66 as indicated in Figure 1 or 66a as indicated in Figure 11. It is to be assumed that the collecting tank 12 is being fed with an adequate supply of finely divided mineral-bearing pulp or, in some instances, fine mineral-bearing sand. It is first necessary to start the syphon flow. This may be done in many different ways. A convenient method, where water pressure is available, is to introduce water from pipe 56 through valve 57 so that as the water passes through T 55a it will be carried through pipe 55 and will fill the recovery chamber up to the dashed line indicated at 68 in Figure 1. This will compress the air in the upper portion of the recovery chamber and this air must be vented out through valve 24 so as to maintain the water level at the point desired. A continuation of the water flow will cause the water to rise in pipe 20 and ultimately to be discharged out through hose 32. When this occurs, a syphon cycle has been started and on the closing of valve 57 material will then be drawn through pipe 60 out of tank 62. For this cycle of operation it is necessary to have the check valve indicated at 59 so that the pressure of the water from pipe 56 will not go down into pipe 60 during the period of initiating the syphonic flow. Another convenient method, if water pressure is not available, is to remove the cap 70 of the angle T 26 and by closing the end of hose 32 the system is filled with water and with the replacement of cap 70 the syphon cycle will then be started.

As the material flows through pipe 55, and through pipe 34, it is discharged up and out of the end thereof and by means of the plurality of baffle fin tongues 44, will be comminuted and divided into a number of streams. It will then drop downwardly and as new material is being constantly fed through the system, the material will ultimately be forced out around the lower end 72 of bell head or dome 50, through the mercury where the gold and certain other of the precious metals will be collected into an amalgam, due to the natural affinity of mercury for those metals. As all the pulp material, except the contained metals, is lighter than the mercury, the pulp or residual slime water, sand, and the like will be forced upwardly above the level of the mercury and then be subjected to the suction through the discharge line consisting of pipes 20, 28, 30, and 32 where the refuse can be disposed of as desired. It will be noted that this cycle of operation is a continuous one. This permits the relatively small unit to handle large quantities of material without any supervision or attention.

When it is desired to make the actual gold recovery from the mercury the amalgam is drawn out through the discharge valve 74; whence it can then be treated in a retort and the precious metal recovered in the conventional manner.

In the alternate arrangement shown in Figure

11 the equipment is identical excepting that the feed and discharge pipes are reversed. In this instance the material is fed in through pipe 64 and bell 52 discharges this material out through its plurality of openings 54 and the material is drawn by suction through the mercury and then rises within bell or dome 50 and is finally discharged out through the discharge pipe 76 and ultimately out through the hose, or flexible tubing 32a. As before, the vent valve 24a is employed to control the water level in the unit and the clean up is made through the delivery valve 74a.

The foregoing description and the accompanying drawings are believed to clearly disclose a preferred embodiment of my invention, but it will be understood that this disclosure is merely illustrative and that such changes in the invention may be made as are fairly within the scope and spirit of the following claims:

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

1. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool, a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom, a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum.

2. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool, a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom and having a plurality of radial fins, a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum.

3. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool; a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom and comprising a plurality of radial fins, each such fin having a depending tongue fitted in the end of said pipe; a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum.

4. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool; a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom and comprising a plurality of radial fins, each such fin being provided with a depending tongue fitted in the end of said pipe, and fin extension portions on the lower end; a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum.

5. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool, a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom, a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum, said means comprising a suction bell associated with the upper face of the distributor head, and a discharge pipe line.

6. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool, a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom, a frusto-conical distributor head enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum, said means comprising a suction bell having a plurality of spaced apart depending legs resting upon said distributor dome and a discharge pipe line.

7. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe extending through the drum bottom to convey material to be treated to the drum and having its discharge end above the mercury pool, a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom, a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, means to control the slime-water level in said drum, and suction means in the upper portion of said drum for removing said slime-water.

8. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool, a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom, a frusto-conical distributor dome enclosing said baffle and said pipe end, and having an inner rounded impact surface and also having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum.

9. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool; a baffle associated with the discharge end of the supply pipe to part the fluid flowing therefrom and comprising a plurality of radial fins, each such fin having a depending tongue fitted in the end of said pipe; a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum, said means comprising a suction bell associated with the upper face of the distributor dome, and a discharge pipe line.

10. An amalgamator comprising a drum having a pool of mercury in its lower portion, an upwardly directed supply pipe to convey material to be treated to the drum and having its discharge end above the mercury pool; a baffle associated with the discharge end of the supply

pipe to part the fluid flowing therefrom and comprising a plurality of radial fins, each such fin having a depending tongue fitted in the end of said pipe; a frusto-conical distributor dome enclosing said baffle and said pipe end, and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum, said means comprising a suction bell having a plurality of spaced-apart depending legs resting upon said distributor dome and a discharge pipe line.

11. An amalgamator comprising a drum having a pool of mercury in its lower portion, an

upright supply pipe to convey material to the drum and having its discharge end directed upwardly above the mercury pool, a comminutor in the discharge end of said pipe and comprising a plurality of radial fins to part the fluid flowing therefrom, a plurality of divider fins surrounding the outer surface of said pipe and depending into close proximity to the tank bottom, a distributor dome enclosing said pipe end, and said divider fins and having walls depending into the mercury pool, and slime-water removal means in the upper portion of said drum.

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