F. H PRENTISS.

APPARATUS FOR SEPARATING PRECIOUS METALS FROM ASSOCIATED MATERIALS.

APPLICATION FILED NOV. 8, 1905.

995,718. Patented June 20, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

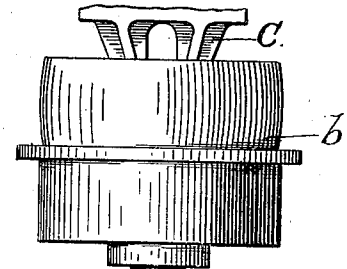
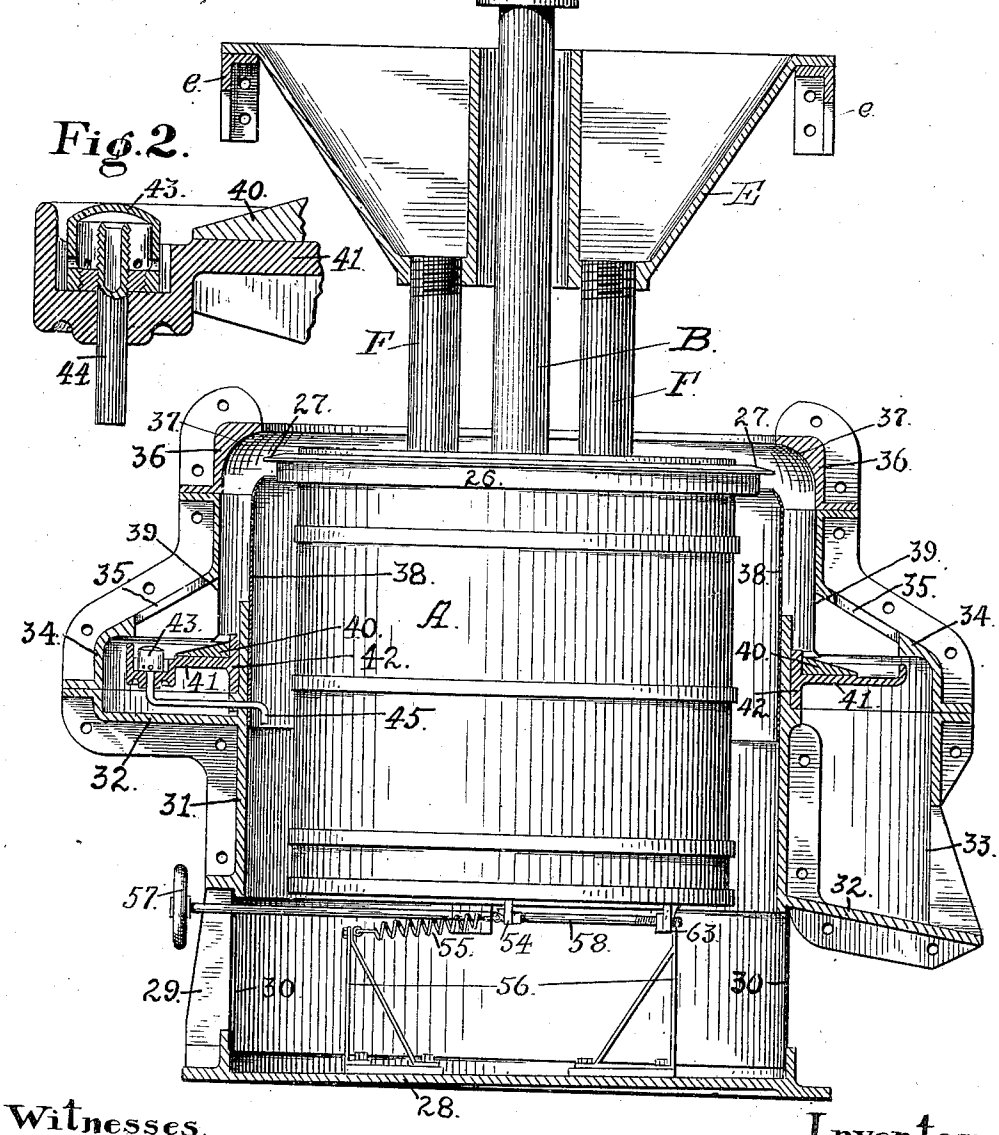


Fig. 2.



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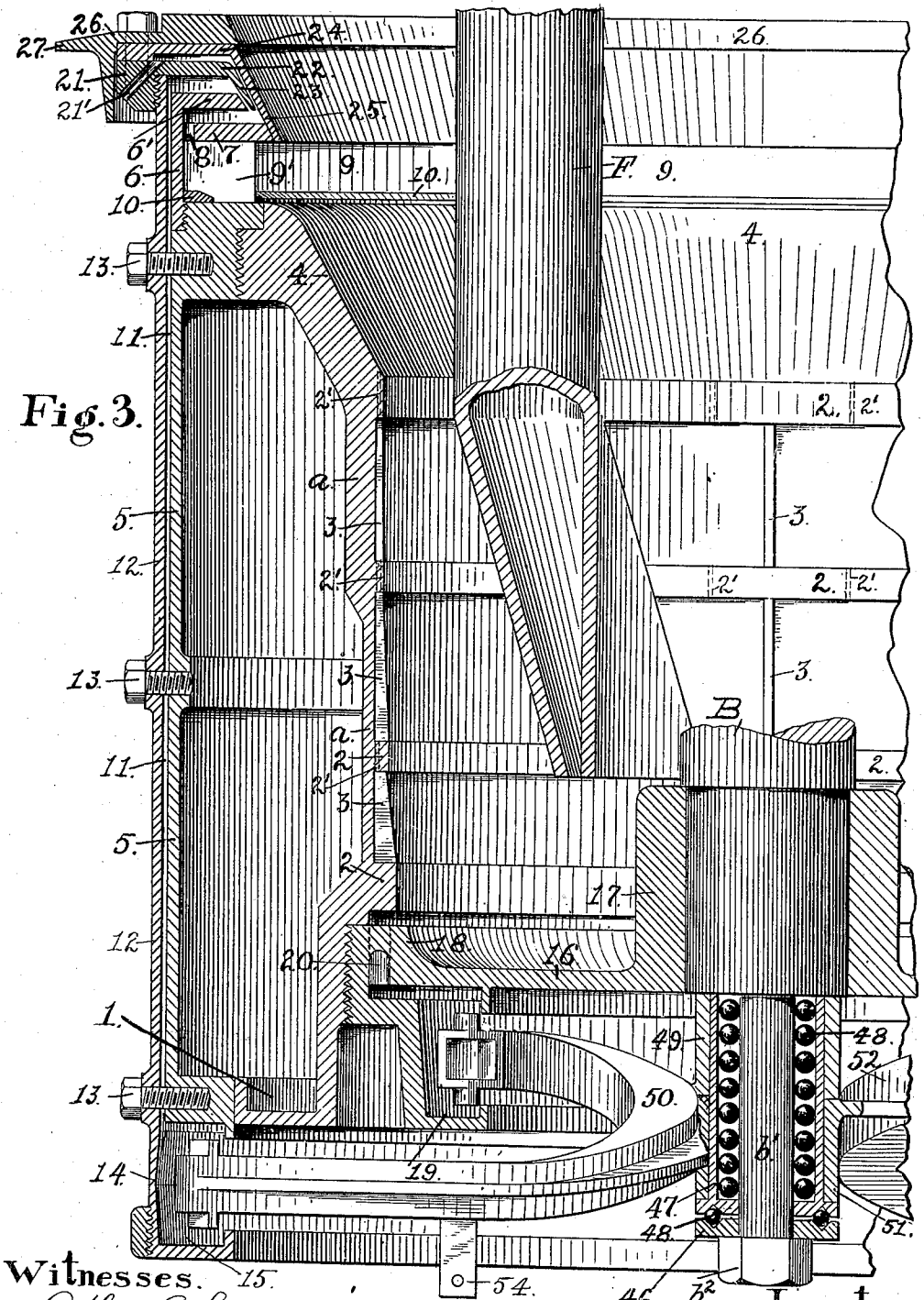
3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

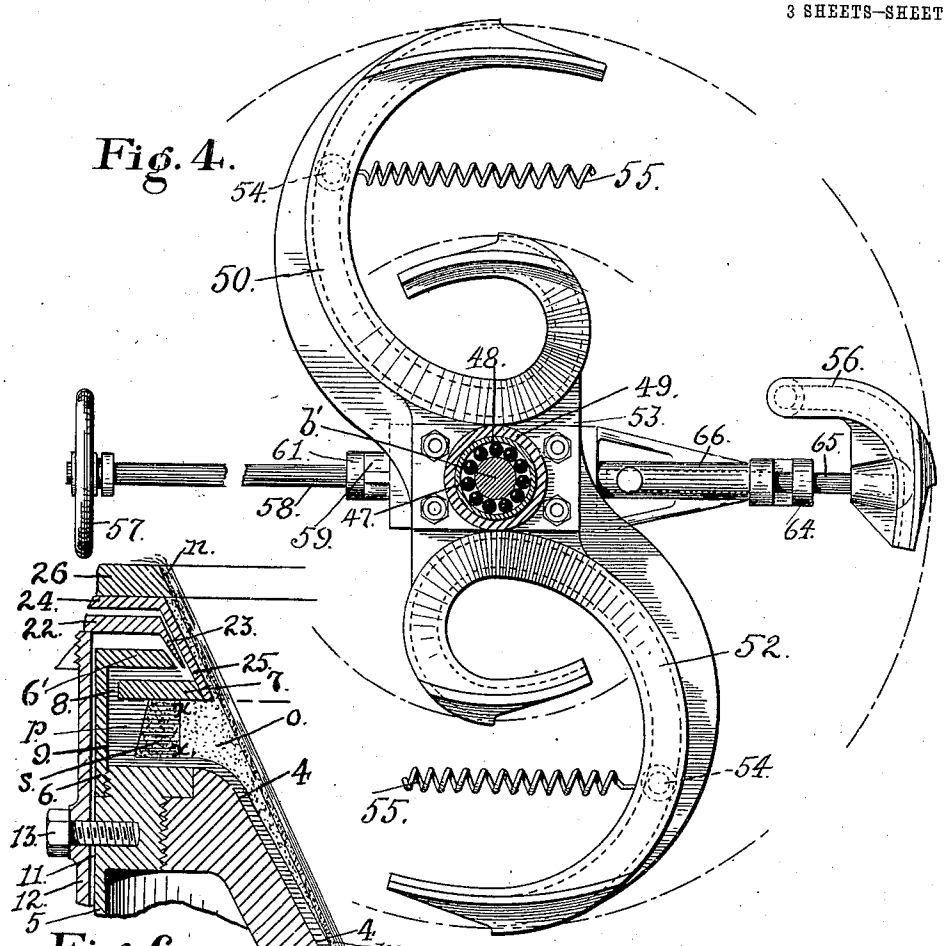
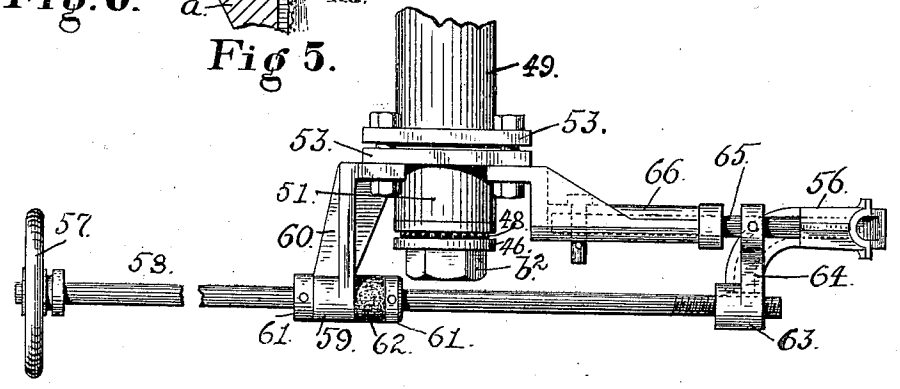


Fig. 6.

Fig 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

FREDERICK H. PRENTISS, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO AMERICAN EXPLORATION AND GUARANTY COMPANY, OF PHOENIX, ARIZONA TERRITORY, A CORPORATION OF ARIZONA TERRITORY.

APPARATUS FOR SEPARATING PRECIOUS METALS FROM ASSOCIATED MATERIALS.

995,718. Specification of Letters Patent. Patented June 20, 1911.

Application filed November 8, 1905. Serial No. 286,340.

To all whom it may concern:

Be it known that I, FREDERICK H. PRENTISS, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Apparatus for Separating Precious Metals from Associated Materials; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of separating apparatus or machines involving what is commonly called centrifugal action, due to a highly speeded rotating basket. On the side of the basket a wall of mercury is maintained, against which are projected particles of sand or pulverized ore containing gold, platinum or substances having a specific gravity greater than mercury or other particles that will unite with the mercury.

My invention has for its object the provision of a machine of this class, having large capacity and high efficiency; to which ends my invention consists in novel means for establishing and maintaining an efficient mercury wall, with an ever-changing receiving face or film circulating through the basket; novel means for separating the mercury from the gangue and water, at the top of the basket, novel means for diverting, at will, the mercury from the circulation and discharging it from the basket into an outside receptacle, and other details of construction and arrangement, all of which I shall hereinafter fully describe by reference to the accompanying drawings, in which—

Figure 1 is a part section and part elevation of the machine, the rotating basket being in full, and the outer casing in section. Fig. 2 is a sectional view, enlarged, of the mercury trap. Fig. 3 is a vertical section, enlarged, of one side of the rotating basket. Fig. 4 is a top view of the mercury return conduits and of the adjustable mercury discharge conduit. Fig. 5 is an elevation of the mercury discharge conduit. Fig. 6 is a detail view of the protected rim overflow and its approaches, illustrating the action of the material.

The rotating basket, which, as a whole in Fig. 1 is designated by A, is suspended by the shaft B, which is, itself, rotatably suspended from its upper end by any suitable means, as, for example, by a bracket, a portion of which, in Fig. 1, is designated by C. The upper end of the shaft B is provided with a pulley *b* by which rotation is imparted to the shaft, to rotate the basket at the desired speed. The construction of the basket is shown in Fig. 3, wherein the essential features will be best understood by describing the details of the construction shown, which represent a practical form of the device, though I do not confine myself to such constructive details. The cavity of the basket is formed by an annular wall *a*, which, at its bottom may be formed into an exterior circumscribing projection 1. On the inner surface of this wall is a vertical series of annular barrier flanges 2, which project inwardly, successively to a greater distance from the top flange of the series to the bottom, thereby dividing the interior of said wall into a vertical series of annular chambers, of decreasing depth from bottom to top. In these chambers, at intervals, are vertical baffles 3, extending between the barrier flanges, and dividing the chambers into an annular series of pockets. Above the upper barrier, the wall *a* flares outwardly, as shown at 4, to its top. Around this inner wall *a* is fitted the outer wall 5, which, at its top, is screwed to the inner wall *a*, and at its bottom meets the projection 1. Screwed to the top of the outer wall 5, is an angle band 6, the horizontal top or flange 6′ of which extends inwardly and is beveled on its edge as shown. Below this inwardly extending flange 6′ of the angle band 6, and separated from it, is an inwardly extending beveled edged flange 7, in which, near the band, are made holes 8. This flange is part of the angle band 6 and forms with the top of the outer wall 5 a mercury collecting chamber 9, in which is a series of baffles, one of which is shown at 9′. In the base of the chamber 9 is a stiffening rib 10. Around the outer wall 5, and separated therefrom by an annular space 11, is the exterior shell 12, which is secured to the wall 5 by means of stud bolts 13. The lower end of the exterior shell 12 extends below the lower end of the outer wall 5, the inner surface of said extended portion being dished as shown at 14, and the lower end being formed into a trough 15. Screwed into the lower end of the inner wall *a* is the bottom casting 16,

the center of which is provided with a hub 17, which is firmly secured upon the rotating shaft B near its lower end. The upper surface of this bottom casting forms the bottom of the basket cavity, and has an upwardly curved rim 18, terminating just below and farther in than the lowermost annular barrier 2. The bottom casting 16 is provided at its lower portion with an annular trough 19, which communicates through inclined holes 20, with the upper surface of the casting and with the cavity of the basket.

Screwed to the top of the exterior shell 12 is a ring 21, which has an inwardly extending plate 22, overlapping the top of the exterior shell, and separated from the top or horizontally extending flange 6′ of the angle band 6. The inner edge of this plate is formed with a downwardly extending lip 23, which overlaps and is separated from the beveled inner edge of the top flange 6′ of said angle band. Upon top of the ring 21 is an annular plate 24 which extends inwardly and is separated from the plate 22, and has a downwardly and inwardly inclined flange 25, passing by and separated from the inclined lip 23, of the plate 22, and forming a close joint at its lower extremity with the inclined inner edge of the inwardly extending flange 7. Through the ring 21 are made holes 21′. On top of the plate 24 and encircling the ring 21, is the annular cap plate 26, having an outer lip 27.

The stationary casing which encircles the basket A is shown in Fig. 1. 28 is a base plate or cup with its bottom inclined from one side to the other. From this plate rise at intervals standards, one of which is shown at 29. Fitting down into the base cup part way, and rising to the top of the standards and lying within them, is an annular guard shell 30. On top of the standards is supported a shell 31, which is formed on its exterior with a trough 32, inclined from one side in both directions to its lower part on the other side, where it is provided with a discharge opening 33. Upon the flange of this trough 32 is supported an inclosing band 34, provided with openings 35, and on top of this band is supported the annular cap 36, the inner wall of which is curved as shown at 37, which curve lies opposite the outer lip 27 of the basket, and said curve may be made with an amalgamated surface. Fitting down within the shell 31 and extending above said shell with its top curved inwardly to approach the upper part of the cap 26 of the basket is an annular amalgamated plate 38. Fitting the inner surface of the inclosing band 34 is an annular amalgamated plate 39 which extends down to and opens upon the inclined surface of the annular band 40, resting upon the ledge trough 41, of a ring 42 fitting about the shell 31. The outer edge of the ledge 41 is upwardly flanged as shown, to form an overflow trough, and in one part of said ledge is formed a depression in which is fitted a mercury trap, more particularly seen in Fig. 2. This trap consists of a cap 43 perforated near its base. In this cap rises an adjustably fitted overflow pipe 44, an extension 45 of which leads through the exterior shell 31, and opens into the space between said shell and the basket.

The lower extremity b' of the drive shaft B is reduced as shown in Fig. 3, and is provided with a terminal nut b^2, upon which rests a bearing plate 46. Fitted around the reduced shaft end b' is an antifriction sleeve 47, which bears upon both shaft end b' and the plate 46 through the intervention of balls 48. Secured to this sleeve, near its upper portion is the hub 49 of a convolute return conduit 50, which lies within the lower part of the basket on one side, its lower open extremity lying opposite and in proximity to the dished extension surface 14 of the outer wall 5, and its upper open extremity lying opposite the trough chamber 19 of the basket bottom casting 16. Upon the lower portion of the sleeve 47 is secured the hub 51 of a second convolute return conduit 52 which occupies a correspondingly opposite position to the conduit 50, as shown in Fig. 4. The two hubs 49 and 51 are bolted together through the flanges 53 as shown in Fig. 5. From each return conduit projects downwardly through the open lower end of the basket proper, a lug 54, to each of which is secured a spring 55, the other end of which is secured to a fixed standard 56′ rising from the base 28.

In Figs. 4 and 5 is shown a mercury discharge conduit 56 the outer open end of which lies near the dished surface 14, which is indicated in Fig. 4 by the outer dotted circle, and the lower or inner end discharges into the underlying base 28. This conduit is adjustably mounted in a direction radially to the axis of the basket, and is adapted to have its open outer or receiving end projected closer to the dished surface 14 than the ends of the return conduits 50 and 52, as is indicated in Fig. 4, or to be withdrawn to a greater distance from said surface. This adjustment is effected by means of the hand wheel 57, the stem 58 of which is rotatably mounted in a bearing 59 on the lower end of a bracket 60 depending from one of the hub flanges 53, as shown in Fig. 5, said bearing being flanked by fixed collars 61 and intervening cushion 62. The object of this cushion, which represents any form of yielding adjustment, is to diminish the force and effect of a blow caused by oscillation of the basket upon the conduit in case the latter is advanced too far, by means of the hand wheel 57 or through any cause

comes in contact with the rotating basket. It is obvious that any other form of spring may be used, or any suitable yielding adjustment. The extremity of the stem 58 is threaded in a nut 63 on the lower end of an arm 64, set on a slide shaft 65, which carries the conduit 56. The shaft 65 is mounted slidably in a bracket 66, secured to the flange 53.

In Fig. 1, E is a feed hopper to be fixed by the brackets *e* to a suitable support. This hopper freely encircles the shaft B and has extending downwardly from it the feed pipes F, the lower ends of which as seen in Fig. 3, in connection with one of them, pass into the basket and open out a short distance above the bottom thereof.

The construction of the machine will be better understood from a description of its operation. The material to be separated, in a pulverized or divided condition, or in the form of sand, together with water and a suitable amount of mercury, is fed from the hopper E through pipes F, and drops to the bottom 16 of the basket. Herein, owing to the centrifugal action of the highly speeded rotating basket, the material is thrown outwardly and separated into annular layers according to the specific gravity of its several components. The outermost of these layers is the mercury wall maintained by centrifugal action. Into this wall the heavier particles are projected and retained, said wall being confined by the barriers 2, and deleterious wave motion prevented by the baffles 3. On the inner surface of the mercury wall is a constantly rising thin layer or film of fresh and continually changing mercury which passes the several barrier flanges. Inside this ever changing film of mercury is the rising layer of sand or gangue, and the water. When the thin film of mercury and the sand and water rise past the upper barrier flange 2, they travel in the same order over the flaring upper end 4 of the wall *a*, until reaching the top, the thin film of mercury passes beneath the wedge of stationary compacted sand hereafter referred to, into the capacious collecting chamber 9, while the gangue and water pass over the wedge of sand to and over the inclined flange 25 of the plate 24, and through the open center of the cap plate 26, over which they are delivered. Any particles of mercury which may still accompany the gangue, are projected against the amalgam surfaces 38 and 39. The agglomerated particles of mercury then pass with the gangue to the mercury ledge trough 41 in which they settle, while the gangue overflows therefrom, into the trough 32 from which it is discharged. Since the water and sand discharged from the basket will continue to flow in a rotary and downward direction after striking the outer stationary casing, the effect will be that any fine particles of mercury contained will be forced by centrifugal action, against the coppered or silvered surface and will amalgamate with it and be retained. When the mercury thus collected by the silver or copper surface becomes excessive, it will be discharged from these surfaces in the condition of globules of considerable size since the fine particles of floured mercury will have been collected together. The ledge trough 41 is filled with mercury to a height determined by the adjustable mercury trap 43, the object of the trap being to carry away any excess of mercury and to prevent the mercury in the trough from overflowing the ledge trough. The action of the mercury surface in this trough is to arrest and save any particles of mercury which may accompany the waste sand which proceeds from the basket, and which is discharged circumferentially upon the annular band 40 and thence across the surface of the mercury into the waste trough 32. The excess of mercury which accumulates in the ledge trough 41 is caught in the trap 43, and overflowing the pipe 44, is carried by the extension pipe 45 into the space between the shell 31 and the basket A, and falls down into the cup base 28, from which it is collected for reuse. The rising film of mercury which was previously separated at the top of the wall *a*, enters the capacious annular collection chamber 9, and thence passes up through the holes 8 in flange 7, into the space between said flange and the horizontal top flange 6′, of the angle band 6. The mercury in this space passes through the channel between the inner edge of the top flange 6′ and the outer surface of the lip 23 of the plate 22, and thence flows into and drops down through the annular space 11, between the exterior shell 12 and the outer wall 5, and into the trough 15 at the lower end of the exterior shell. Any excess of the mercury film, (which will only happen when loading up the machine), passes through the space between the lip 23 and the inner flange 25 of the plate 24, and thence is discharged through the holes 21′ into the space immediately exterior to the basket, and falls down into the cup base 28, whence it is recovered.

It will be noted that the mounting of the mercury return conduits is such that said conduits are independent of the basket's rotation, and that they yield sufficiently, owing to their springs 55 to compensate for any friction due to their ball bearing connections with the shaft B. It follows, therefore, that the main body of the mercury in the trough 15, thrown by centrifugal force into the dished extension 14, is rotated in the path of the outer lower open ends of the return conduits. By these conduits this mercury is picked up and carried upwardly through them and discharged from their open upper

ends into the trough 19 of the basket bottom casting 16. From this trough it travels upwardly through the holes 20 into the basket cavity again, and once more mingles with the material, for a repetition of its course and operation.

When it is desired to clear the trough 15 of all the mercury, and to prevent it from going back into the basket, that is, to divert the circulation, the discharge conduit 56 is adjusted by means of the screw stem 58 to carry its outer end to a circle beyond that of the return conduits, so that it picks up all the mercury and discharges it into the cup base below. In order to provide for the discharge of the wall of mercury in the basket, it will be noted that small seepage holes 2′ are made through the barriers 2. Through these a small percentage of mercury always flows, but when the mercury circulation is stopped by the use of the discharge conduit 56, the mercury wall in the basket will soon all flow up through the holes 2′ and pass down through the space 11, and be caught and discharged by the conduit 56.

It will also be noted that the mercury return conduits are so mounted or connected with the basket, that they are not only independent of the basket's rotation, but also that both the basket and the conduits are thereby compelled to oscillate together about a common center, and thus any injury to the conduits due to blows resulting from the basket's oscillation, is avoided. This complete independence of the return conduits of the rotation of the basket is important in affording an opportunity to so arrange the conduits that if desired their relation to the basket's rotation may not only be that which is shown, namely, a non-rotation, but said conduits may have a rotation of their own, but different from that of the basket.

The advantage of what I may term the protected rim-overflow and its approaches, must also be specially noted. For this purpose reference is made to Fig. 6. In this figure the mercury is denoted by horizontal shading, the water by vertical shading, and the sand by dots. The inclination of the surface 4—4, is a matter of importance, since it is desirable that the direction of this surface should make only a slight angle with the sand surface *m*—*n*. The thin film of flowing mercury passing over the surface 4—4 begins to encounter a body of sand at the point *m* where the sand, however, has a thickness of only say one-hundredth of an inch. The thickness of the sand gradually increases as shown in Fig. 6. At the point *m* and for some distance beyond, the layer of sand is so thin that it is not compacted into a hard mass by centrifugal action and floats on the surface of the mercury in such a manner that any varying thickness in the moving mercury film is immediately accommodated, and the film of mercury, if temporarily increased in thickness, passes readily enough below the layer of thin sand. This would not be the case were the layer of sand of considerable thickness as it is shown to be at point marked *c*. This wedged shape mass of sand with its greatest width as shown at *o* and terminating in the acute angle at *m*, may be considered as a permanent and stationary mass of sand not affected by the flowing water and over which the sand fed into the basket is continually discharged. When, however, the mercury reaches a point where the layer of sand is so thick as to make it rigid, the mercury will force its way into the interstices of the sand, and by displacing the water, find accommodation in such manner. Were, however, the sand layer thick and rigid where first encountered by the mercury, there would be a tendency for some of the mercury to escape over the surface of the sand whenever a momentary increase in thickness of the flowing mercury film took place. The angle at which a body of sand will stand so that particles of sand will just begin to roll down the slope under the action of gravitation, is called the angle of repose. The angle which the surface of the sand will assume in a rotating basket, that is to say, the angle which in Fig. 6 the line *m*—*n* makes with the axis of rotation may be called the angle of repose, under the action of flowing water and centrifugal force. The mercury escapes at the overflow rim 6′, the flowing film of mercury previously passing into a quiescent body of mercury designated by *p* in the chamber 9. This body of mercury extends inward as far as the line *x*—*x*, vertically beneath the rim of flange 6′. The pressure of the overlying sand shown at *o* forces the sand into the mercury as shown at *s*. The distance to which sand will be thus submerged depends upon the thickness of the superimposed layer of sand and its specific gravity, but is quite independent of centrifugal force. Magnetite, which is the heaviest component of black sand, would be submerged into the mercury to a distance equal to about three quarters of the thickness of the superimposed layer of magnetite, whereas garnet or quartz would be submerged to a less extent. The inlet for mercury 8, to the overflow discharge of flange 6′, is located at such a distance outwardly from the rim of said flange as to enable the mercury flowing through holes 8, to be entirely free from particles of submerged sand. The mercury after passing the intake port or hole 8, passes outside the controlling lip 23, while any excess passes inside said lip. This lip, therefore, controls the proper thickness of the flowing mercury film, and takes care of

any excess. This protected rim overflow, it will be seen, is part of the basket itself. If it were undertaken to regulate the flow of the mercury by means of a stationary pick-up conduit, the slight swaying of the rotating basket would cause a variable thickness of mercury film, and a lack of uniformity in the flow, which would entail a loss of mercury.

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

1. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket having a wall over the inner surface of which the material, together with a film of mercury moves relatively to the basket mainly in the direction of its length, and having also a passage exterior to said wall, in communication above and below with the inner surface thereof, to receive and conduct the mercury in a direction opposite to its movement over said wall, means in the basket for separating said mercury at the limit of its movement over the wall from its accompanying material, and means for returning the mercury at the limit of its movement in said exterior passage to the inner surface of said wall, to repeat its movement thereover.

2. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket having a wall over the inner surface of which the material, together with a film of mercury moves relatively to the basket mainly in the direction of its length and having also a passage exterior to said wall, concentric therewith, and in communication above and below with the inner surface thereof, to receive and conduct the mercury in a direction opposite to its movement over said wall, means in the basket for separating said mercury at the limit of its movement over the wall from its accompanying material, and means for returning the mercury at the limit of its movement in said exterior passage to the inner surface of said wall, to repeat its movement thereover.

3. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket having a wall over the inner surface of which the material, together with a film of mercury moves relatively to the basket mainly in the direction of its length, and having also a passage exterior to said wall, in communication above and below with the inner surface thereof, to receive and conduct the mercury in a direction opposite to its movement over said wall, means in the basket for separating said mercury at the limit of its movement over the wall from its accompanying material, and a conduit interposed between said passage and wall, and independent of the basket's rotation, for returning the mercury at the limit of its movement in said passage to the wall, to repeat its movement thereover.

4. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket having a wall over the inner surface of which the material, together with a film of mercury moves relatively to the basket mainly in the direction of its length, and having also a passage exterior to said wall, in communication above and below with the inner surface thereof, to receive and conduct the mercury in a direction opposite to its movement over said wall, means in the basket for separating said mercury at the limit of its movement over the wall from its accompanying material, a conduit interposed between said passage and wall, for returning the mercury at the limit of its movement in said passage to the wall, to repeat its movement thereover, and a means for mounting said conduit to render it independent of the basket's rotation, and in case of oscillation to compel both basket and conduit to oscillate together.

5. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket having a wall over the inner surface of which the material, together with a film of mercury moves relatively to the basket mainly in the direction of its length and having also a passage exterior to said wall, in communication above and below with the inner surface thereof, to receive and conduct the mercury in a direction opposite to its movement over said wall, means in the basket for separating said mercury at the limit of its movement over the wall from its accompanying material, a conduit interposed between said passage and wall, and independent of the basket's rotation, for returning the mercury at the limit of its movement in said passage to the wall, to repeat its movement thereover, and a second conduit, independent of the basket's rotation and adjustable at will to intercept the mercury in said passage and divert it from the basket, to a destination exterior thereto.

6. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket having a wall over the inner surface of which the material, together with a film of mercury moves relatively to the basket mainly in the direction of its length, and having also a passage exterior to said wall, in communication above and below with the inner surface thereof, to receive and conduct the mercury in a direction opposite to its movement over said wall, means in the basket for separating said mercury at the limit of its movement over the wall from its accompanying material, a conduit interposed between said passage and

wall and independent of the basket's rotation, for returning the mercury at the limit of its movement in said passage to the wall, to repeat its movement thereover, and a second conduit, independent of the basket's rotation and adjustable at will to intercept the mercury in said passage and divert it from the basket, to a destination exterior thereto, and means for mounting both conduits to compel the basket and conduits to oscillate together.

7. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket through which a circulation of mercury is maintained, a conduit interposed in the path of said circulation arranged to transfer the mercury from one part of the basket to another part thereof, and means for mounting said conduit to render it independent of the basket's rotation and in case of oscillation to compel both basket and conduit to oscillate together.

8. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket through which a circulation of mercury is maintained, a conduit interposed in the path of said circulation arranged to transfer the mercury from one part of the basket to another part thereof, and a yielding connection for said conduit to cause it to adjust itself to the basket's irregular movements in case of contact with said basket.

9. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket through which a circulation of mercury is maintained, a conduit interposed in the path of said circulation arranged to transfer the mercury from one part of the basket to another part thereof, means for mounting said conduit to render it independent of the basket's rotation, and a spring attached to the conduit to prevent its rotation and to permit a slight movement to accommodate it to the oscillation of the basket.

10. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket through which a circulation of mercury is maintained, a conduit independent of the basket's rotation arranged to intercept the mercury and divert it from the basket to a destination exterior thereto, means for adjusting said conduit to throw it into and out of action at will, and means for mounting said conduit to compel both basket and conduit to oscillate together about a common center.

11. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket through which a circulation of mercury is maintained, a conduit independent of the basket's rotation arranged to intercept the mercury and divert it from the basket to a destination exterior thereto, means for adjusting said conduit to throw it into and out of action at will, and means for causing it to adjust itself to the basket's irregular movements in case of contact with said basket.

12. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket through which a circulation of mercury is maintained, a conduit arranged to intercept and withdraw mercury from a compartment of the basket, and a yielding adjustment for said conduit, to cause it to adjust itself in case of contact with the rotating basket, to the basket's irregular movements.

13. In an apparatus for separating precious metals from associated materials, the combination of a rotating basket through which a circulation of mercury is maintained, a conduit independent of the basket's rotation, interposed in the path of said circulation and arranged to transfer the mercury from one part of the basket to another part thereof, a second conduit, independent of the basket's rotation and adjustable at will to intercept the mercury, and divert it from the basket to a destination exterior thereto, and means for mounting said conduits to compel both basket and conduits to oscillate together.

14. In an apparatus for separating precious metals from associated materials, a rotating basket having beyond the point of separation of the flowing mercury and gangue, an overflow flange for the gangue, an overflow flange for the mercury outside of and protected by the gangue overflow flange, and a controlling lip between the two flanges for dividing the mercury overflow into two passages with separate outlets, both flanges and lip being parts of the rotating basket.

15. In an apparatus for separating precious metals from associated materials, a rotating basket having beyond the point of separation of the flowing mercury and gangue, an overflow flange for the gangue, an overflow flange for the mercury outside of and protected by the gangue overflow flange, both flanges being parts of the rotating basket, and said basket having also a capacious annular chamber for the mercury encircling the zone of separation of the mercury and gangue and below and separated from the mercury overflow flange, said chamber having outlets at its larger diameter for the flow of the mercury to its overflow flange.

16. In an apparatus for separating precious metals from associated materials, a rotating basket having beyond the point of separation of the flowing mercury and gangue, an overflow flange for the gangue, an overflow flange for the mercury outside

of and protected by the gangue overflow flange, both flanges being parts of the rotating basket, said basket having also a capacious annular chamber for the mercury encircling the zone of separation of the mercury and gangue and below and separated from the mercury overflow flange, said chamber having outlets at its larger diameter for the flow of the mercury to its overflow flange, and a controlling lip between the two overflow flanges for dividing the mercury overflow into two passages with separate outlets.

17. In an apparatus for separating precious metals from associated materials, a rotating basket in which mercury is maintained in circulation, said basket having an outward inclination of the interior surface at one end over which the mercury flows, the inclination beginning at the point where the mercury begins to diverge and to separate from the overlying layer of sand, or other material lighter than mercury, the angle of inclination in the direction of the flow being slightly greater with reference to the axis of rotation than the angle of repose assumed by the sand under the influence of flowing water and centrifugal force, said basket having also beyond the zone of separation of the mercury and gangue a circumscribing chamber to receive the mercury, said chamber having outlets sufficiently removed in a radial direction from the axis of rotation to permit the discharge of mercury free from particles of sand.

18. In an apparatus for separating precious metals from associated materials, a rotating basket in which mercury is maintained in circulation, said basket having an outward inclination of the interior surface at one end over which the mercury flows, the inclination beginning at the point where the mercury begins to diverge and to separate from the overlying layer of sand, or other material lighter than mercury, the angle of inclination in the direction of the flow being slightly greater with reference to the axis of rotation than the angle of repose assumed by the sand under the influence of flowing water and centrifugal force, and said basket having also an overflow discharge for the mercury and a capacious annular chamber for the mercury encircling the zone of separation of the mercury and gangue, said chamber having an intake passage communicating with the overflow discharge at a sufficiently greater distance from the axis of rotation than the discharge to permit an inflow of mercury free from particles of submerged sand.

19. In an apparatus for separating precious metals from associated materials, a rotating basket in which mercury is maintained in circulation, said basket having an outward inclination of the interior surface at one end over which the mercury flows, the inclination beginning at the point where the mercury begins to diverge and to separate from the overlying layer of sand, or other material lighter than mercury, the angle of inclination in the direction of the flow being slightly greater with reference to the axis of rotation than the angle of repose assumed by the sand under the influence of flowing water and centrifugal force, said basket having also a capacious annular chamber for the mercury encircling the zone of separation of the mercury and gangue, said chamber having an intake passage communicating with the overflow discharge at a sufficiently greater distance from the axis of rotation than the discharge to permit an inflow of mercury free from particles of submerged sand, and an overflow discharge for mercury protected from contact with water and sand and communicating with a passage for returning the mercury to the other end of the basket.

20. In an apparatus for separating precious metals from associated materials a rotating basket in which mercury is maintained in circulation, said basket having an overflow discharge for mercury at one end, protected from contact with water and sand, and communicating with a passage for returning the mercury to the other end of the basket, and said basket having also an intake passage communicating with the overflow discharge at a sufficiently greater distance from the axis of rotation than the discharge to permit an inflow of mercury free from particles of submerged sand.

In witness whereof I have hereunto set my hand.

FREDERICK H. PRENTISS.

Witnesses:

J. COMPTON,

D. B. RICHARDS.