M. F. LANSDALE.

AMALGAMATOR.

APPLICATION FILED NOV. 21, 1907.

941,371.

Patented Nov. 30, 1909.

3 SHEETS—SHEET 1.

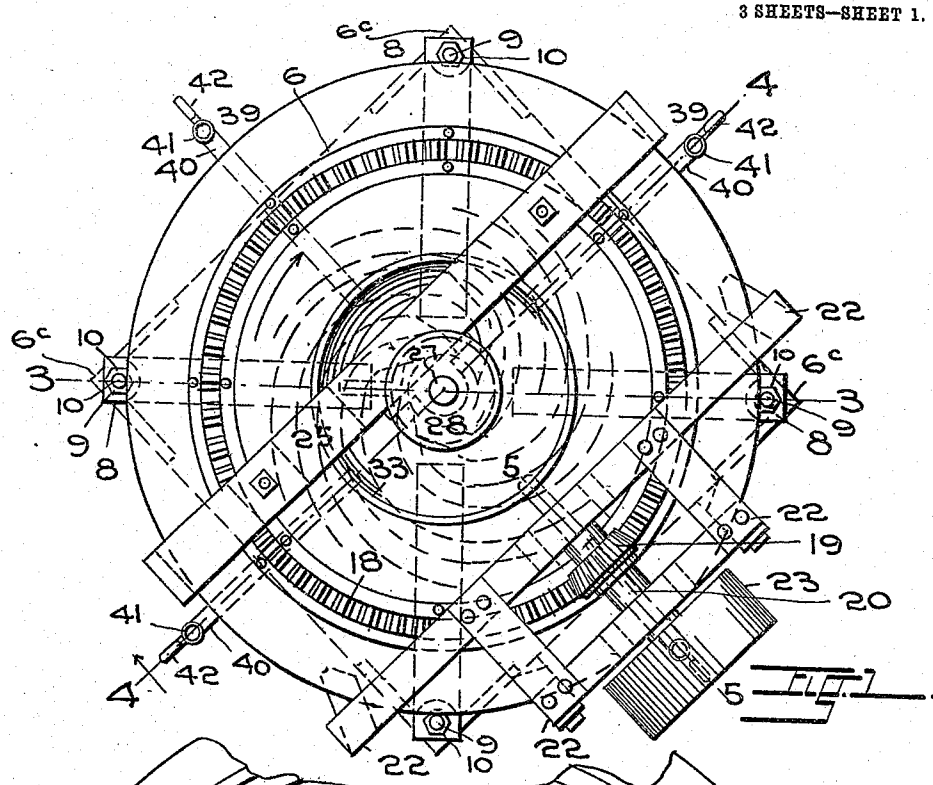

FIG. 1.

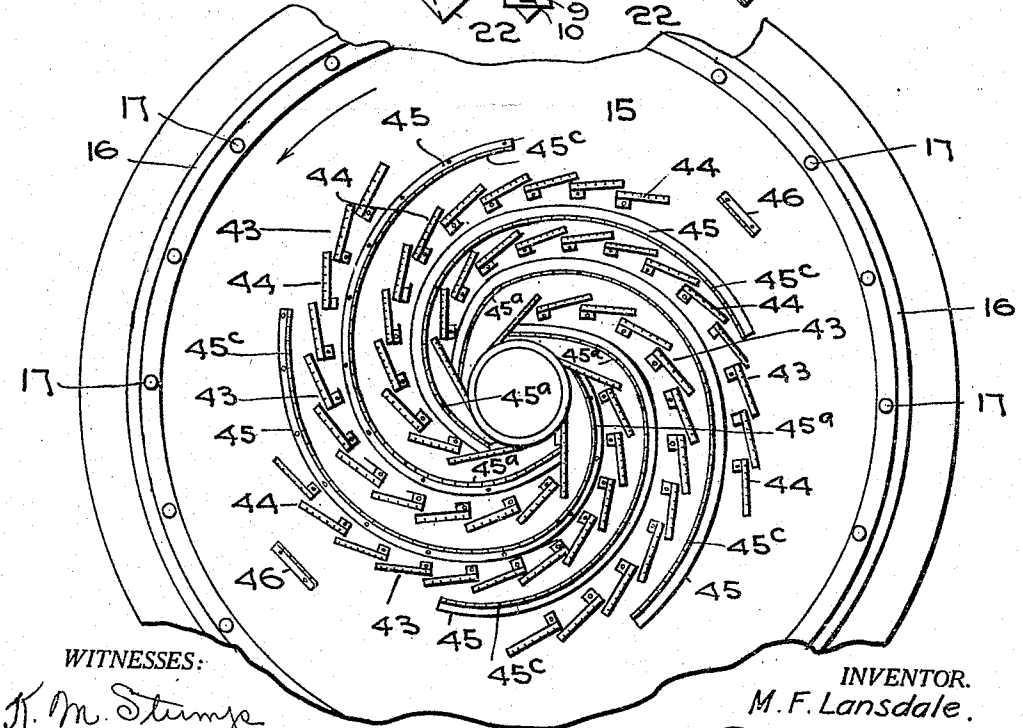

FIG. 2.

WITNESSES:

K. M. Stumpf

N. S. Downs.

INVENTOR.

M. F. Lansdale.

BY

ATTORNEY.

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3 SHEETS—SHEET 2.

Fig. 3.

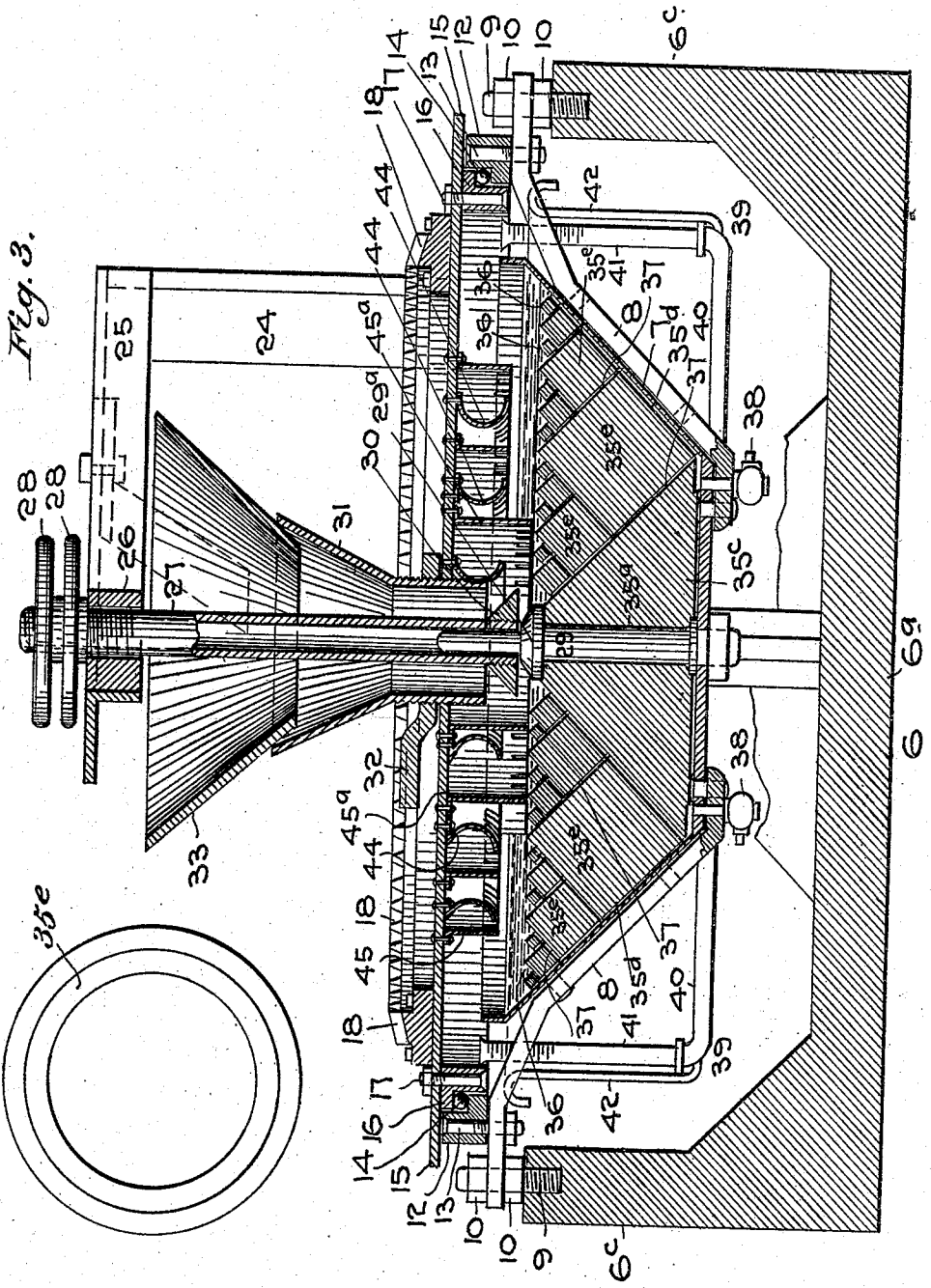

Fig. 9.

WITNESSES:

K. M. Stumpf

N. S. Downs.

INVENTOR.

M. F. Lansdale

BY

ATTORNEY.

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3 SHEETS—SHEET 3.

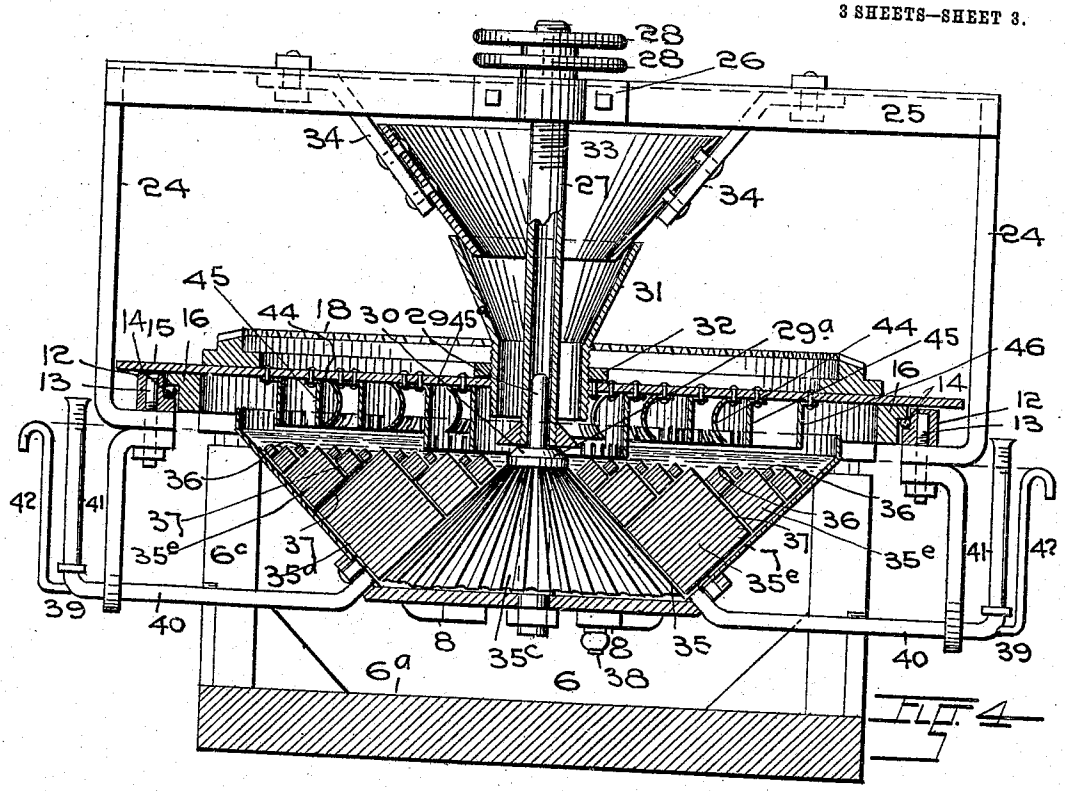

FIG. 4.

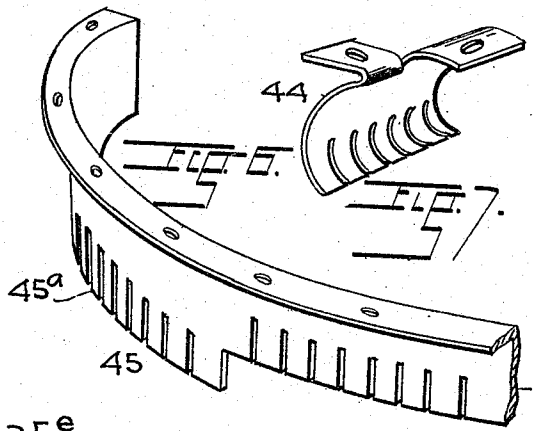

FIG. 6.

FIG. 7.

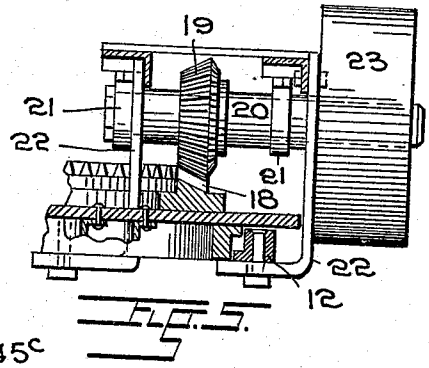

FIG. 5.

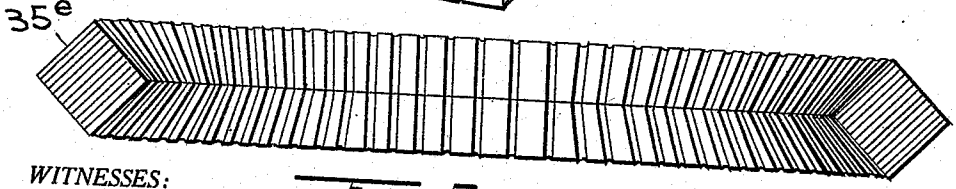

FIG. 8.

WITNESSES:

H. M. Stump

N. E. Downs.

INVENTOR.

M. F. Lansdale

BY

ATTORNEY.

UNITED STATES PATENT OFFICE.

MERRIT F. LANSDALE, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO HIRAM G. FOWLER, OF DENVER, COLORADO.

AMALGAMATOR.

941,371. Specification of Letters Patent. Patented Nov. 30, 1909.

Application filed November 21, 1907. Serial No. 403,213.

To all whom it may concern:

Be it known that I, MERRIT F. LANSDALE, a citizen of the United States of America, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Amalgamators, of which the following is a specification.

This invention relates to improvements in amalgamators and its object is to provide a device by means of which the precious metals may be speedily and effectively separated from the earthy particles with which they are associated and which during this operation will simultaneously separate the coarser particles from the finer matter and discharge the residuant dross.

Further objects of my invention will be brought out in the following description, reference being had to the accompanying drawings in the various views of which like parts are similarly designated and in which—

Figure 1— represents a plan view of the device, Fig. 2— an enlarged underneath view of the revolving disk, Fig. 3— an enlarged vertical section taken along a line 3—3, Fig. 1, Fig. 4— a vertical section taken along the line 4—4, Fig. 1, Fig. 5— a fragmentary section taken along a line 5—5, Fig. 1, Fig. 6— a fragmentary, perspective view of one of the comb elements employed in the device, Fig. 7— a perspective view of one of the sections which form the sizing element associated with the machine, Fig. 8— an enlarged sectional view of one of the sections comprised in the filling of the mercury pan and Fig. 9, a plan view of one of the annular members comprised in the filling which occupies the mercury receptacle.

Referring to the drawings, the reference character 6 designates the base of the apparatus, consisting of a plate 6^a and four diagonally opposite standards 6^c upon which the circular mercury pan 7 is supported. The latter is to this end, provided with four outwardly extending arms 8 which are secured in engagement with its outer surface, by means of rivets or other fastening means and whose outer horizontally ranging, apertured extremities respectively surround vertical stud bolts 9 which are screwed into correspondingly threaded holes in the upper portions of the standards or uprights 6^c of the base.

Nuts 10 screwed upon the studs in engagement with the upper and lower surfaces of the surrounding portion of the arms 8, are applied for the purpose of adjusting the position of the arms in relation to the respective uprights for the purpose of maintaining the upper edge of the pan 7 in the horizontal plane, during the operation of the apparatus. An internally recessed ring 12 secured by means of bolts 13 upon the horizontal extremities of the arms 8, in concentric relation to the pan 7, provides a runway for a plurality of metal balls 14 which, in practice, sustain a revoluble disk 15 which to this end, is provided with a depending concentric ring 16, formed similarly to the the ring 12 and secured upon the lower surface of the disk by means of bolts 17. The disk 15 is furthermore provided with a concentrically disposed, circular rack 18, bolted upon its upper surface and into which meshes a beveled pinion 19 secured upon a horizontal shaft 20 which is rotatably mounted in bearings 21 which are rigidly connected with the annulus 12 through instrumentality of a set of connected brackets 22.

A pulley 23 at the outer extremity of the shaft 20 is employed in the transmission of a rotary motion to the said shaft and a consequent revolving movement to the disk 15, from a conveniently located source of energy.

Uprights 24 whose lower extremities are rigidly secured to the ring 12, support at their upper extremities, a horizontally extending beam 25, provided with a centrally disposed journal box 26 through which projects a tubular stem 27 the upper, threaded portion of which is equipped with two nuts 28, the lower one of which engages the upper edge of the box 26. The lower extremity of the tubular stem projecting into the pan 7, loosely surrounds the upper portion of a vertical stud 29 which is secured to the bottom of the pan in central relation thereto, and it is provided with a surrounding, conical collar 30 which in practice controls the outflow of matter from a funnel 31 which concentrically surrounds the stem 27

and is vertically adjustably held in a central opening of the disk 15, by means of a jam nut 32.

A conical feed hopper 33 extends into the upper portion of the funnel and is suspended from the beam 25 by the use of suitable brackets 34.

The greater portion of the pan 7 is occupied by a filling 35 which is supported upon the bottom in engagement with its inner circumferential surface. The upper surface of this filling extending below the upper edge of the pan, presents a plurality of concentric, circular ridges or riffles 36, and is in communication with the bottom surface of the said pan by a number of internal, slanting passages 37 through which during the operation of the apparatus, the amalgam sinks to be subsequently discharged through valves 38. The filling 35 has a central bore 35^a through which the before mentioned stud 29 projects and it is held in position upon the bottom of the pan by engagement with an integral collar 29^a on the said stud. It may be formed in one piece or it may consist, as is shown in the drawings, of a central, conical core 35^c and a surrounding annular portion 35^d and the latter may, for convenience in manufacture, be composed of a plurality of adjoining annular members 35^e, diamond shaped in cross section. The various members comprising the filling in this case, are formed in their contacting surfaces with a plurality of grooves or corrugations which coöperatively constitute the before mentioned channels or passages 37, and the vertices of the uppermost annular sections 35^e form the above named riffles 36. The pan 7 is furthermore provided with four diametrically opposite gages 39 each composed of a horizontal conduit 40, an extremity of which is secured in an aperture in the bottom of the pan, a vertical sight glass 41, held upon the upwardly bent, opposite extremity of the conduit 40 and an overflow pipe 42 whose lower end extends into the conduit 40 and whose upper goose-neck extremity determines the level of the quicksilver in the pan.

By means of the sight glasses which preferably are graduated, the observer may ascertain the relation of the pan and the therein contained mercury to the horizontal plane and the position of the said pan is accordingly adjusted so as to bring the surface of the metallic fluid on a level, by manipulation of the nuts 10 on the studs 9.

The function of the pipes 42 is to prevent waste of quicksilver in case, by accidental displacement of the pan, it should tend to overflow its rim, the terminal portions of the goose-neck extremities being, during the operation of the device, in communication with a subjacent trough or receptacle in which the mercury may collect and which not forming part of the apparatus, has been omitted from the drawings.

The revoluble disk 15 has upon its under surface two series of elements which by engagement with the mercury and the pulverous or gravelly matter fed into the pan through the funnel 31, aid and consummate the process of separating by amalgamation, the fine particles of precious metal from the rock or sand and pebbles through which they are distributed. The elements comprised in each of the series are of spiral form and radiate from the center of the disk, to terminate a short distance from its circumferential edge. The series are respectively adapted to size the gravelly matter by separating the coarser particles from the finer ones and conveying them to the outer portion of the pan and to carry the extraneous matter or residue which remains upon the mercury after the values have been extracted, to the rim of the receptacle. Both series are furthermore adapted to agitate and stir the value-containing matter so as to bring each particle thereof in contact with the amalgamating fluid. The elements 43 comprised in the first named one of the two series each consist of a plurality of successively, spirally arranged concave rakes 44 (shown in detail in Fig. 7 of the drawings) whose function is to lift the gravelly matter through which they are impelled and to carry the coarser particles in its concavity to the outer edge of the pan while the finer particles with which the metallic constituents are intermixed, fall through the interstices between the teeth, upon the surface of the mercury. The elements 45 which constitute the other series are disposed alternately with the members of the series hereabove described and each consists of a spirally formed comb, the innermost portion 45^a of which extends, in practice, below the level of the mercury, while its outer portions 45^c being reduced in width, terminates above the said level.

The portions 45^a being arranged subjacent the mouth of the funnel 31 are intended to intermix the gravelly or pulverous matter with the mercury, while the outer portions merely convey the worthless matter which floats upon the mercury after the values have been extracted, to the outer portion of the pan. Two or more auxiliary combs 46 secured to the disk intermediate the extremities of the elements 43 and 45 and its circumferential edge are provided to prevent accumulation of the gangue at the subjacent outer portion of the pan and to accelerate its discharge over the edge thereof.

Having thus described the mechanical construction of my improved amalgamator, its operation is as follows: After the pan 7 has been leveled by adjustment of the nuts 10 on the studs 9 as is hereinbefore de-

scribed, the pulverized rock or the sand and gravel are fed into the pan through the conical hopper 33 and the subjacent funnel 31, the outflow of which is regulated in accordance with the character of the matter under treatment by raising or lowering the valve 30 which may readily be accomplished by manipulation of the nuts 28. The revolving disk 15 impels the innermost parts 45[a] of the comb-elements 45 through the portion of the quicksilver below the mouth of the funnel, thereby causing thorough intermixing of the matter discharged from the said funnel and the metallic fluid. The amalgam resulting from the affinity of the metallic constituents of the earthy matter for the quicksilver, sinks through the slanting passages 37 in the filling 35, to the bottom of the pan where they accumulate to be discharged at certain intervals through the valves 38. While this process is carried on, the curved rakes 44 which constitute the elements 43, continuously lift and stir the gravelly matter thereby separating the coarser, worthless particles from the finer constituents of the said matter and bringing each of the latter in contact with the mercury. The pebbles and other coarser parts which are held in the concavity of the rakes are by reason of the spiral form of the elements of which the said rakes form part and the revolving motion of the disk, carried to the outer portion of the pan from where they are impelled toward and over the circumferential rim by the outward movement of the succeeding, continuously supplied matter. The auxiliary combs 46, accelerate this movement by preventing packing of the accumulating matter as is hereinabove explained. The quicksilver contained in the outer portion of the pan, where it is not disturbed by the movement of the parts 45[a] of the combs 45, speedily finds and retains its level by contact with the circular ridges or riffles 36 on the upper surface of the filling 35, which furthermore prevent splashing and spilling of the mercury by the centrifugal action of the revolving elements 43 and 45 and the matter engaged thereby and effectively keep the fluid from granulating. The finer constituents of the matter under treatment which fall through the interstices of the rakes 44 upon the surface of the quicksilver, are subsequently engaged by the reduced portions 45[c] of the spiral rakes 45 which carry the uppermost earthy matter to the outer portion of the pan from where it is discharged together with the coarser particles, in the manner hereinbefore explained. It will thus be observed that by simultaneously sizing the pulverous or gravelly matter and extracting the values therefrom, continuously discharging the extraneous parts of the ore and causing the amalgam to pass instantaneously from the surface of the mercury to the lower portion of the pan, my apparatus is well adapted to treat a quantity of metalliferous matter in the minimum of time, while the combined actions of the sizing and combing elements of the revolving disk and the riffled filling in the pan effect a thorough intermixture of the quicksilver and the constituents of the earthy matter and a consequent clean extraction of the metallic particles forming part thereof.

The construction and arrangement of the mercury receptacle permit operation of the device with a minimum quantity of quicksilver and effectively prevent waste or loss thereof.

Having thus described my invention what I claim is:—

1. In an amalgamator, a mercury receptacle having an outlet in its bottom portion and a substantially horizontal surface intermediate its upper edge and its bottom, the said surface being composed of a plurality of annular riffles and having openings intermediate the latter, in communication with the said outlet.

2. In an amalgamator, a mercury receptacle having an outlet in its bottom portion, a filling occupying the said receptacle in engagement with its sides, its upper surface extending below the upper edge thereof, the said filling having a plurality of channels leading from the said surface to the said outlet.

3. In an amalgamator, a mercury receptacle having an outlet in its bottom portion, a filling occupying the said receptacle, its upper surface extending below the edge thereof, the said filling comprising a conical core, and a surrounding portion, the engaging surfaces of which have downwardly ranging grooves.

4. In an amalgamator, a mercury receptacle having an outlet in its bottom portion, a filling occupying the said receptacle its upper surface extending below the edge thereof, the said filling comprising a conical core and a plurality of adjoining annuli, diamond shaped in cross section, the engaging surfaces of the said core and the said annuli having downwardly ranging grooves.

5. An amalgamator comprising in combination, a mercury receptacle, and a revoluble element having coöperative members respectively adapted to simultaneously size and stir matter disposed upon the surface of fluid contained in the said receptacle and to remove the upper portion of the said matter to the circumferential edge of the receptacle.

6. In an amalgamator, a mercury receptacle and a superposed revoluble element having a series of depending members projecting spirally from its center and each adapted to size matter disposed upon the

surface of the liquid contained in the said receptacle.

7. In an amalgamator, a mercury receptacle and a superposed revoluble element having a series of depending members projecting spirally from its center and each composed of a plurality of successively arranged, curved, toothed members.

8. In an amalgamator, a mercury receptacle and a superposed revoluble disk having a series of depending spiral combs projecting outwardly from its center, their central portions being adapted to enter the fluid contained in the said receptacle while their outer portions extend above the surface thereof.

9. In an amalgamator, a mercury receptacle and a superposed, revoluble element having two series of alternately arranged concave and flat, toothed spiral members projecting outwardly from its central portion.

10. In an amalgamator, a mercury receptacle, a superposed revoluble disk having depending elements projecting radially from its center and adapted to engage matter disposed upon the surface of fluid contained in the said receptacle and depending rakes disposed intermediate the outer extremities of the said elements and the circumferential edge of the said disk.

11. An amalgamator comprising in combination, a base, a mercury receptacle adjustably supported thereon, a circular member having a ball run in fixed relation to the said receptacle, a disk revolubly supported upon the said member above the receptacle and having depending elements adapted to engage matter disposed upon fluid contained in the said receptacle and a superposed circular gear, a driving mechanism connected with the said member, operatively engaging the said gear, a superposed frame secured to the said member, a hopper suspended from the said frame, a funnel adjustably projecting through the said disk, and an adjustable valve adapted to regulate the outflow from the said funnel.

12. An amalgamator comprising in combination a mercury receptacle, means to adjust its position in relation to the horizontal plane, sight glasses arranged at opposite points to denote the level of fluid contained in the said receptacle and overflow conduits communicating with the said glasses whereby fluid when rising above a predetermined height therein is discharged therefrom.

In testimony whereof I have affixed my signature in presence of two witnesses.

MERRIT F. LANSDALE.

Witnesses:
G. J. ROLLANDET,
K. H. STUMP.