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METHOD AND APPARATUS FOR SEPARATING MINERALS AND METALS.

APPLICATION FILED AUG. 24, 1914.

1,198,126.

Patented Sept. 12, 1916.

2 SHEETS—SHEET 1.

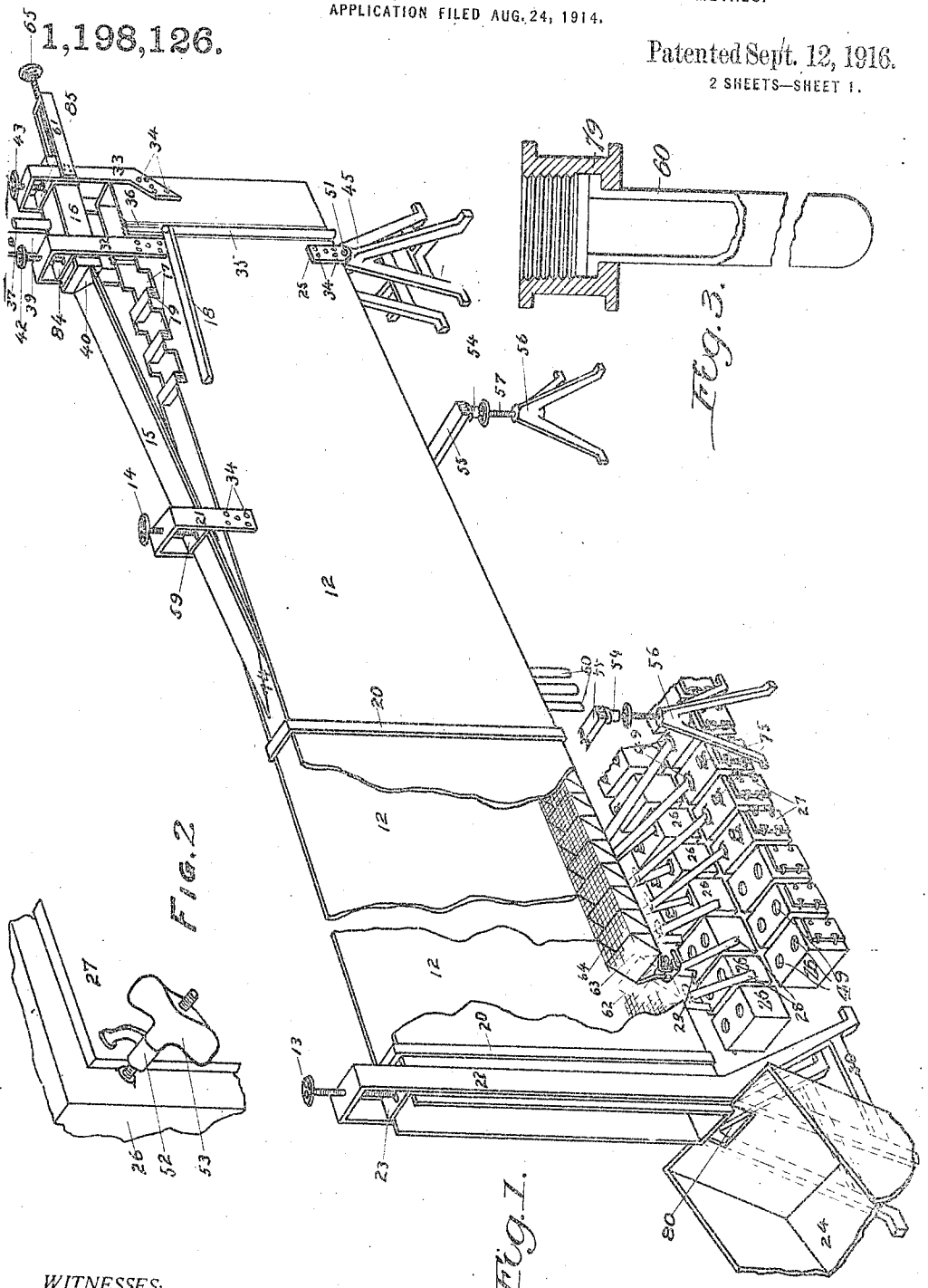


FIG. 1.

FIG. 2.

FIG. 3.

WITNESSES:

Leonard Stuewe

Cora A. Spaulding

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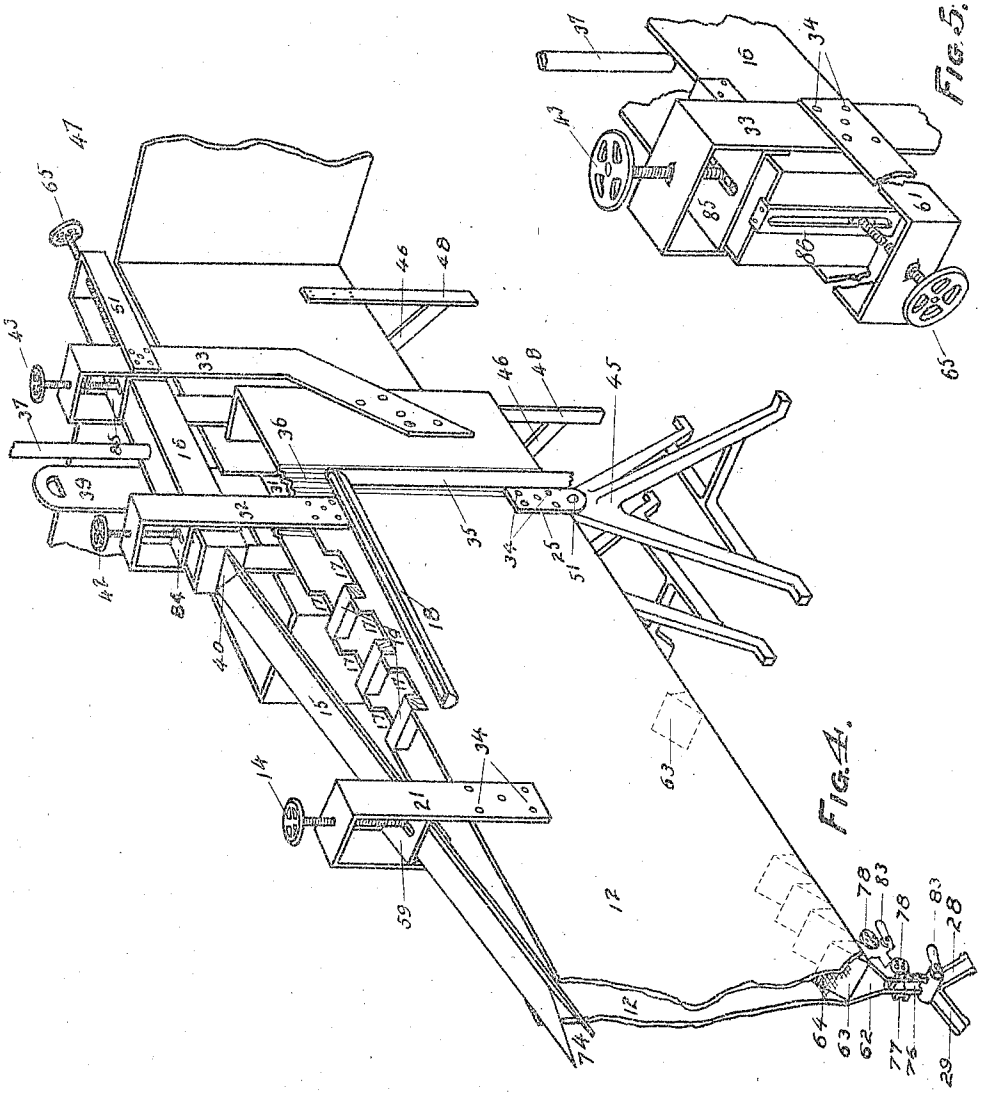


FIG. 4.

FIG. 3.

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METHOD AND APPARATUS FOR SEPARATING MINERALS AND METALS.

1,198,126. Specification of Letters Patent. Patented Sept. 12, 1916.

Application filed August 24, 1914. Serial No. 858,406.

To all whom it may concern:

Be it known that I, JOHN FREDERICK HEDMAN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Method of and Apparatus for Separating Minerals and Metals, of which the following is a specification.

My invention relates to the method of and apparatus for separating minerals from minerals, minerals from metals and metals from metals, by precipitating them, after comminution, in a body of moving water whereby the motion of the water separates the minerals or metals according to their specific gravities, as they sink in the moving water. After the separation has taken place the material passes into receptacles provided for the purpose.

The object of my invention is to provide a simple, inexpensive and effective method and apparatus for making and maintaining a separation of minerals, metals and minerals, and metals, having different specific gravities from each other.

In the operation of my invention it is desirable to segregate the crushed material into several grades or sizes, such as coarse, medium and fine, by means of selectors, screens or other method of sizing, material of different sizes to be handled in different separating flumes, but one of which is shown here. It should be understood, however, that a less or greater number of grades may be provided for as desired.

In the drawings accompanying this specification: Figure 1 shows an enlarged perspective view of a separating flume with a portion of one side broken away, exposing the serrated bottom and screen resting thereon. Fig. 2 is a detail showing a clamp and application thereof to a cover for a side opening in a water-tight receptacle which receives such of the separated material as is directed to it. Fig. 3 shows a sectional view of one of the glass tubes, with a screw connection. Fig. 4 is a perspective view showing an enlargement of the rear portion of a flume with the feed launder and reservoir connections. Fig. 5 is an enlarged view of the rear portion of the feed launder, showing method of adjusting same.

Referring to the drawings, in which like numerals indicate like parts throughout the various views, 12 designates the side of the separating flume, which flume may be raised or lowered by means of screw 13 near the forward end, thus changing the inclination of the flume and thereby assisting in regulating the speed of the water flowing therein. Screw 14, operating through the transverse portion of vertically disposed yoke 21 and band 59, is used to raise or lower trough 15. The crushed materials to be separated are, after being graded or sized, carried by water through pipe 37 into feed launder 16, from which they pass through opening 40 to the inclined V-shaped trough 15 and thence to the surface of the water flowing in the separating flume. As the materials pass along the V-shaped trough the heaviest finds its way to the bottom, the lightest to the top, and the balance arranging themselves between according to the specific gravity of each, thus making a primary separation. Surplus water entering the flume is carried off through spillways 17 into gutters 18. Skimmers 19 are placed near the forward end of the spillways 17 to skim off and divert through the spillways the excess water, thus assisting in maintaining a steady flow through the flume. Bands 20 are placed around the flumes at intervals to prevent spreading of the sides. The inverted U-shaped member 21, designated as a yoke, is mounted on each flume and the transverse portion of the yoke is provided with a threaded opening through which operates a screw 14, at the lower end of which is attached a band 59 in which V-shaped trough 15 is slidably disposed. Vertical yoke 22 is similar in construction to yoke 21, except the latter is attached to the sides of the flume while the former is not so attached but extends downwardly on either side and the lower ends are formed into legs or supports 30. The upper transverse portion of yoke 22 is provided with a threaded opening through which screw 13 operates. A band 23 passes around the flume at the forward end and this band is punctured at the center of its upper transverse portion to receive the lower end of screw 13, which screw is extended through said opening and provided with enlargements or shoulders on which the

band rests. Waste water and waste material pass out of the forward end of the flume into trough 24. Plates 25 are attached to the sides of the flume near the rear end, with their lower part extending below the flume bottom and perforated to receive the ends of a transverse rock-shaft 51 on which the rear end of the flume rests. Receptacles 26 are placed below the separating flume to receive the separated material and are closed water tight except as to connecting tubes 28 and 29 through which the separated material passes from the separating flume into the receptacle, displacing an equivalent bulk of water which passes up into the flume. A cover 27 is provided to close a side opening in each receptacle 26, said opening being used for the purpose of removing contents of the receptacle.

31 is a conduit for carrying water from a reservoir to the rear end of the separating flume.

32 is the forward and 33 the rear vertical supporting yoke of feed launder 16 and they are similar in operation and construction to yoke 21.

34 indicates screws, bolts or other means of fastening yokes, plates, etc., and where such yokes, plates or other parts are attached to sides 12 of separating flume the screws, bolts or other fastening devices do not project inwardly beyond the inner surface of sides 12 but must be flush therewith to prevent eddying or disturbance of the flowing water in the separating flume.

35 is a drain pipe for carrying off surplus water from gutter 18, while 36 is a flexible connection between the separating flume and the conduit 31 and is arranged to permit movement of the separating flume without leakage when the flume is raised or lowered.

39 is a gate for shutting off the flow of water from the conduit to the separating flume.

40 is the opening in the forward end of the feed launder 16 through which material to be separated passes into trough 15.

42 and 43 are screws for raising and lowering forward and rear ends, respectively, of the feed launder 16, and, with the screws 14 and 65, permit the trough 15 to be kept in proper relation to the water flowing in the separating flume.

45 is the rear pedestal, on which the separating flume is pivotally supported.

46 and 48 are a brace and a support, respectively, for the conduit 31 through which water passes from the reservoir 47 to the separating flume. In the reservoir 47 the water is kept at a fixed level, by means of float valves or otherwise, to assist in maintaining as nearly as possible an unvarying flow through the separating flume.

49 indicates openings, in the top of receptacles 26, through which the separated material passes into the receptacles. A plurality of such openings permits combining in one receptacle the material coming to adjoining separations, by transferring the lower end of the tubes 28 or 29 as desired.

52 is a clamp and 53 a thumb screw for holding the cover 27 in water-tight relation to the receptacle 26.

To prevent sagging of the flume, transverse supports 55 are placed below same and intermediate the ends thereof, said supports being adjustable, as to elevation, by means of screws 57 operating in a pedestal 56, the upper end of screws 57 being socketed in member 54 attached to a support 55.

59 is a band slidably disposed about trough 15, and through the upper transverse portion of which passes a screw 14.

At the outlets along the bottom of the separating flume, where the quantity of material deposited is small, a large receptacle is unnecessary and may be dispensed with. Instead there are provided glass tubes 60 which are closed at the lower ends and which receive any material deposited in that separation and expose it to view. Trough 15 and connecting feed launder 16 are longitudinally adjusted by means of a horizontal yoke 61, which has a threaded opening through the center of its transverse portion, through which opening operates a screw 65, the forward end of said screw extending through a slotted member 86, as shown in Fig. 5.

To avoid having neutral zones between separations the bottom of each separating flume is broken into a series of inverted V-shaped partitions 63, on top of which rests screen 64, and down the inclined surface of said inverted V-shaped partitions the separated material moves into passage 62 which is provided between adjoining inverted V-shaped partitions. Screen 64 is of such mesh as will afford easy passage through it of material to be separated in the flume in which it is placed, and it is intended to minimize the rolling motion which the partitions 63 would tend to impart to water flowing over them.

74 indicates the lower end of a trough 15 showing the bottom at the lower end cut off at and in a plane parallel with the surface of the water in the separating flume for the purpose of maintaining the relative positions of material passing down the trough and while such material is above the surface of the water.

75 is a plug for closing the inlet 49 in the top of each receptacle 26 when such inlet is not being used.

80 is a slot in the trough 24 to permit lowering the separating flume.

Various changes in the form, proportion, and the minor details of construction may

be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

I claim:

1. A process of separating minerals, metals, and minerals and metals, consisting in initially stratifying sized ores by flow in liquid, then flowing the stratified material upon the top of a body of liquid having a uniform, unobstructed, inclined flow, the delivery of the stratified material being such that the progressively lighter strata are delivered at successive points along the body of liquid in the direction of the flow, causing the components of the different strata to settle through the flowing body of liquid according to their respective specific gravities, and separately removing the components so differentiated.

2. In an apparatus of the character described a flume presenting a smooth, straight, unobstructed channel, having a series of outlets through the bottom, receptacles below and connected with the interior of the flume through said outlets, the receptacles and connections being closed against external discharge, a series of broad overflows in the sides of the flume at the top near the inlet end and deflectors extending across the flume from side to side at the down stream ends of the overflows, means for supplying water in volume sufficient to fill the flume to the overflows.

3. In an apparatus of the character described an adjustable flume having a series of transverse deflectors extending across it from side to side at the top near the inlet end, rectangular spillways in each side adjacent to the deflectors, a current-regulating screen floor, said flume presenting a smooth, straight, unobstructed channel between the upper surface of the screen floor and a plane in line with the bottom surface of the deflectors, a series of transverse partitions extending across the flume from side to side beneath the screen floor, receptacles below the flume, hollow connections between the interior of the flume and the receptacles said receptacles and connections being closed against external discharge, means for delivering material in a stratified condition to the surface of the current in the flume, means for supplying water in volume sufficient to fill the flume to the overflows.

4. In an apparatus of the character described a vertically adjustable flume open to full capacity at both ends and throughout its course, having a flat screen floor, a series of transverse deflectors extending across the flume from side to side at the top near the inlet end, broad overflow spillways in the flume sides adjacent to the deflectors, said flume presenting on its inside a smooth, straight, unobstructed channel between the top of the screen floor and the bottom of the deflectors, a series of longitudinally spaced transverse partitions beneath the screen floor on which the screen floor rests, receptacles below the flume, hollow connections between the interior of the flume and the receptacles said receptacles and connections being closed against external discharge, means for delivering material in a stratified condition to the surface of the current in the flume, means for supplying water in volume sufficient to fill the flume to the overflows.

5. The combination of a classifying flume provided with means for supplying a current of water thereto and longitudinally spaced concentrates discharge means, a V-shaped inclined stratifying trough extending into proximity to the water level in the flume and having its delivery end undercut parallel to said water level.

6. The combination of a classifying flume provided with means for supplying a current of water thereto, longitudinally spaced concentrates discharge means, a vertically adjustable inclined V-shaped stratifying trough extending into proximity to the water level in the flume and having its delivery end undercut parallel to said water level.

In witness that I claim the foregoing I have hereunto subscribed my name this 14th day of August, 1914.

J. FRED. HEDMAN.

Witnesses:

FRANK F. ROBB,

O. H. BRAGDON.